VORWORT

Liebe Schülerinnen und Schüler,

Die Metropol Bildungsinstitution ist eine internationale Kette, die seit 1995 mit Diensleistungen wie Schulungen, Publikationen und Beratungen Schüler/ -innen auf die Studienberechtigungsprüfung vorbereitet und sowohl in der Türkei als auch in verschiedenen Ländern der Welt Niederlassungen und Vertretungen besitzt.

Unsere İnstitutionen unterstützen Schüler/ -innen türkischer und ausländischer Staatsbürgerschaft, die sich auf die Prüfungen zur Aufnahme von ausländischen Schülern/ -innen alias Prüfung für auslandsstämmige Schüler/ -innen (YÖS), die von den Universitäten in der Türkei veranstaltet werden, vorbereiten und an diesen Universitäten studieren möchten.

Die von renommierten Universitäten angebotene Prüfung (YÖS) ist in zwei Bereichen erfolgreich zu bestehen. Der erste Teil betrifft die Fähigkeit Grundlagenkenntnisse zu erwerben, wobei der zweite Teil die Sprachkenntnisse im Türkischen prüft.

Mit Hilfe dieser Eignungstests werden die türkischen Sprachkenntnisse der Schüler/ -innen ermittelt, dabei haben sie keinen Einfluss auf die Platzierungspunkte. Ausschlaggebend für die Platzierung der Bewerber/innen an den Universitäten ist der Grundlernfähigkeitstest, bei dem die allgemeine Mindestpunktzahl der Prüfung und die erforderliche Punktzahl des erstrebten Studienfachs zu erreichen ist.

Dieser Test beinhaltet Fragen zur allgemeinen Fähigkeit (IQ), Mathematik und Geometrie. In Anbetracht der Tatsache, dass der Mathematik 40% der Prüfung darstellt, ist es für Sie von Vorteil den Fokus auf diesen Bereich zu legen, um unter die Besten zu kommen.

Um an den renommierten Hoschulen der Türkei studieren zu können, empfehlen wir Ihnen, an unseren YÖS-Vorbereitungskursen teilzunehmen und sich von unseren kompetenten und erfahrenen Lehrkräften , die die Publikationen vorbereitet haben, untersützen zu lassen.

Wir wünschen allen YÖS Kandidaten viel Erfolg!

ВСТУПЛЕНИЕ

Уважаемые студенты!

Образовательные учреждения Metropol – это международная сеть учебных заведений, которая с 1995 года по сегодняшний день предоставляет для студентов, готовящихся к вступительным экзаменам в университет, поддержку в виде курсов, публикаций и консультаций. Образовательные учреждения Metropol имеют филиалы и представительства в Турции и в разных странах мира.

Наши учреждения оказывают поддержку иностранным и турецким студентам, которые нацелены получить высшее образование в университетах Турции и готовятся к сдаче вступительных экзаменов для иностранных студентов, известных как экзамены для иностранных студентов YÖS, проводящихся данными университетами.

Экзамены YÖS организуются ведущими университетами Турции и состоят из двух отдельных частей: теста "Основные навыки обучения" и экзамена на знание турецкого языка. Тест на знание турецкого языка включен в экзамен для определения уровня владения турецким языком студентов, сдающих экзамен, и на распределение результатов не влияет. Распределение осуществляется на основании результатов теста "Основные навыки обучения", который принимается во внимание при оценке экзамена и на этапе приёма в университет.

Поэтому, для того, чтобы успешно сдать экзамены, прежде всего, Вы должны получить более высокий балл, чем граничный балл, определенный для теста "Основные навыки обучения", и достичь запланированной оценки.

Экзаменационный тест "Основные навыки обучения" содержит вопросы на уровень интеллекта (IQ), вопросы по математике и геометрии. Учитывая, что 40% вопросов теста составляют вопросы на уровень интеллекта (IQ), правильно

Для того, чтобы иметь возможность получить образование в элитных вузах Турции, мы предлагаем вам принять участие в подготовительных курсах YÖS и получить поддержку наших опытных преподавателей, которые являются специалистами в своей области и готовят наши публикации.

Мы желаем успехов всем кандидатам, готовящимся к экзамену **YÖS!**

METROPOL BILDUNGSINSTITUTIONEN

ОБРАЗОВАТЕЛЬНЫЕ УЧРЕЖДЕНИЯ METROPOL

İçindekiler / Contents

BÖLÜM / CHAPTER 1 ..... 1- 34

GEOMETRİK KAVRAMLAR ve AÇILAR / GEOMETRICAL CONCEPTS and ANGLES

- Tanımsız Kavramlar / Undefined Concepts 3
- Tanımlar / Definitions 4
- Açılar / Angles ..... 5 - 20
  - Bir Açının Ölçüsü / The Measure of an Angle 5
  - Komşu Açılar / Adjacant Angles ..... 5 - 6
  - Açıortay / Bisector ..... 6 - 7
  - Ters Açılar / Opposite Angles ..... 7 - 8
  - Açı Çeşitleri / Types of Angle ..... 8 - 10
  - Paralel İki Doğrunun Bir Kesenle Yaptığı Açılar / Angles Formed When Two Paralle Lines Intersected By a Transversal 10 - 19 .....
  - Kenarları Dik Olan Açılar / Angles with Perpendecular Sides ..... 19 - 20

▲ Çözümlü Test / Test With Solutions ..... 21 - 24
▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 25 - 26
▲ Alıştırmalar / Exercises ..... 27 - 28
▲ Konu Testleri / Practice Tests ..... 29 - 34

BÖLÜM / CHAPTER 2 ..... 35 - 66

ÜÇGENDE AÇILAR / ANGLES in TRIANGLE

- Üçgende Açılar / Angles in Triangle ..... 37 - 46
  - Üçgende Açı Özellikleri / Angle Properties in a Triangle ..... 37 - 39
  - Üçgen Çeşitleri / Types of Triangle ..... 39 - 43
  - Üçgenen Yardımcı Elemanları / The Auxiliary Elements of a Triangle ..... 44 - 46

▲ Çözümlü Test / Test With Solutions ..... 49 - 52
▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 53 - 54
▲ Alıştırmalar / Exercises ..... 55 - 58
▲ Konu Testleri / Practice Tests ..... 59 - 66

BÖLÜM / CHAPTER 3 ..... 67 - 110

ÜÇGENDE YARDIMCI ELEMANLAR / THE AUXILIARY ELEMENT in a TRIANGLE

- Açıortay / Bisector ..... 69 - 75
  - Üçgende Açıortay / The Bisector in a Triangle ..... 70 - 75
- Üçgende Kenarortay / The Median in a Triangle ..... 75 - 81
  - Kenarortayın Özellikleri / Properties of Median ..... 76 - 81
- Üçgende Yükseklik / The Altitude in a Triangle 82

▲ Çözümlü Test / Test With Solutions ..... 83 - 86
▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 87 - 88
▲ Alıştırmalar / Exercises ..... 89 - 94
▲ Konu Testleri / Practice Tests ..... 95 - 110

İçindekiler / Contents

BÖLÜM / CHAPTER 4 ..... 111 - 154

ÖZEL ÜÇGENLER / SPECIAL TRIANGLES

- Dik Üçgen / Right Triangle ..... 113 - 122
  - Pisagor Teoremi / Pythagorean Theorem ..... 113 - 114
  - Dik Üçgende Kenarortay Teoremi / Median theorem in a Right Triangle 114
  - Açılarına Göre Özel Dik Açılı Üçgenler / Special Right Angled Triangles According to the Angles ..... 115 - 118
  - Kenar Uzunluklarına Göre Özel Dik Açılı Üçgenler / Special Right Angled Triangles According to the Side Lengths ..... 118 - 120
  - Öklit Bağlantıları / Euclidean Relations ..... 121 - 122
- İkizkenar Üçgen / Isosceles Triangle ..... 122 - 127
  - İkizkenar Üçgenin Özellikleri / Properties of an Isosceles Triangle ..... 123 - 127
- Eşkenar Üçgen / Equilateral Triangle ..... 127 - 130
  - Eşkenar Üçgenin Özellikleri / Properties of an Equilateral Triangle ..... 128 - 130
- ▲ Çözümlü Test / Test With Solutions ..... 131 - 134
- ▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 135 - 138
- ▲ Alıştırmalar / Exercises ..... 139 - 142
- ▲ Konu Testleri / Practice Tests ..... 143 - 154

BÖLÜM / CHAPTER 5 ..... 155 - 216

ÜÇGENLERDE BENZERLİK ve ALAN / SIMILARITY and AREA in TRIANGLES

- Üçgenlerde Benzerlik / Similarity in Triangles ..... 157 - 166
  - Benzerlik Teoremleri / The Similarity Triangles ..... 157 - 163
  - Özel Teoremler / Special Theorems ..... 164 - 166
- Üçgende Alan / Area in Triangle ..... 166 - 174
  - Üçgende Alan Bağlantıları / The Area Relations in Triangle ..... 166 - 174
- ▲ Çözümlü Test / Test With Solutions ..... 175 - 182
- ▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 183 - 186
- ▲ Alıştırmalar / Exercises ..... 187 - 192
- ▲ Konu Testleri / Practice Tests ..... 193 - 216

BÖLÜM / CHAPTER 6 ..... 217 - 238

ÜÇGENDE AÇI – KENAR BAĞINTILARI / ANGLES – SIDE RELATIONS in TRIANGLE

- Üçgende Açı – Kenar Bağıntıları / Angle – Side Relations in Triangle ..... 219 - 226
- ▲ Çözümlü Test / Test With Solutions ..... 227 - 230
- ▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 231 - 232
- ▲ Alıştırmalar / Exercises ..... 233 - 234
- ▲ Konu Testleri / Practice Tests ..... 235 - 238

BÖLÜM / CHAPTER 7 ..... 239 - 262

ÇOKGENLER ve DÖRTGENLER / POLYGONS and QUADRANGLES

- Çokgenler / Polygons ..... 241 - 248
  - Konveks Çokgenin Özellikleri / Properties of Convex Polygon ..... 242 - 244
  - Düzgün Çokgen / Regular Polygon ..... 245 - 248
- Dörtgenler / Quadrangles ..... 248 - 252
  - Dörtgenlerin Özellikleri / Properties of Quadrangles ..... 248 - 252
- ▲ Çözümlü Test / Test With Solutions ..... 253 - 254
- ▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 255 - 256
- ▲ Alıştırmalar / Exercises ..... 257 - 258
- ▲ Konu Testleri / Practice Tests ..... 259 - 262

İçindekiler / Contents

BÖLÜM / CHAPTER 8 ..... 263 - 304

PARALELKENAR ve EŞKENAR DÖRTGEN / PARALLELOGRAM and EQUILATERAL QUADRANGLE

- Paralelkenar / Parallelogram ..... 265 - 273
  - Paralelkenarın Özellikleri / Properties of a Parallelogram ..... 265 - 269
  - Bir Paralelkenarın Alanı / The Area of a Parallelogram ..... 269 - 273
- Eşkenar Dörtgen / Equilateral Quadrangle ..... 273 - 274
  - Eşkenar Dörtgenin Özellikleri / Properties of Equilateral Quadrangle 274
- ▲ Çözümlü Test / Test With Solutions ..... 275 - 278
- ▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 279 - 282
- ▲ Alıştırmalar / Exercises ..... 283 - 286
- ▲ Konu Testleri / Practice Tests ..... 287 - 304

BÖLÜM / CHAPTER 9 ..... 305 - 338

DİKDÖRTGEN ve KARE / RECTANGLE and SQUARE

- Dikdörtgen / Rectangle ..... 307 - 310
  - Dikdörtgenin Çevresi ve Alanı / The Perimeter and Area of a Rectangle ..... 307 - 308
  - Dikdörtgenin Köşegen Uzunlukları / The Length of The Diagonals of a Rectangle ..... 308 - 310
- Kare / Square ..... 310 - 312
  - Karenin Çevresi ve Alanı / The Perimeter and Area of a Square ..... 310 - 311
  - Karenin Köşegen Uzunlukları / The Length of The Diagonal in a Square ..... 311 - 312
- ▲ Çözümlü Test / Test With Solutions ..... 313 - 316
- ▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 317 - 318
- ▲ Alıştırmalar / Exercises ..... 319 - 322
- ▲ Konu Testleri / Practice Tests ..... 323 - 338

BÖLÜM / CHAPTER 10 ..... 341 - 370

YAMUK ve DELTOİD / TRAPEZOID and DELTOID

- Yamuk / Trapezoid ..... 341 - 349
  - Yamuğun Özellikleri / Properties of a Trapezoid ..... 342 - 344
  - İkizkenar Yamuk / Isosceles Trapezoid ..... 344 - 346
  - Dik Yamuk / Right Trapezoid ..... 346 - 347
  - Yamuğun Alanı ile İlgili Özellikler / Properties Related to Area of a Trapezoid ..... 347 - 349
- Deltoid / Diltoid (Kite) ..... 349 - 350
- ▲ Çözümlü Test / Test With Solutions ..... 351 - 354
- ▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 355 - 356
- ▲ Alıştırmalar / Exercises ..... 357 - 360
- ▲ Konu Testleri / Practice Tests ..... 361 - 370

İçindekiler / Contents

BÖLÜM / CHAPTER 11 ..... 371 - 408

ÇEMBERDE UZUNLUK ve AÇI / LENGTH and ANGLE in CIRCLE

- Çember / The Circle ..... 373 - 379
  - Çemberin Elemanları / Elements of a Circle ..... 373 - 374
  - Çemberde Teğet ve Kiriş ile İlgili Özellikler / Properties Related to Targent and Secant in Circles ..... 374 - 377
  - Teğetler Dörtgeni / Circumscribed Quadrilateral ..... 378 - 379
- İki Çemberin Birbirine Göre Durumu ile İlgili Özellikler / Properties Related to Position of Two Circles Relative to Each Other ..... 380 - 383
  - İki Çemberin Ortak Teğetleri / Common Tangets of Two Circles ..... 381 - 383
- Çemberde Açı / Angle in a Circle ..... 380 - 388
  - Çemberde Açı Çeşitleri / Angle Types in Circle ..... 380 - 387
  - Kirişler Dörtgeni / The Inscribed Quadrilateral 388
- ▲ Çözümlü Test / Test With Solutions ..... 389 - 392
- ▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 393 - 396
- ▲ Alıştırmalar / Exercises ..... 397 - 400
- ▲ Konu Testleri / Practice Tests ..... 401 - 408

BÖLÜM / CHAPTER 12 ..... 409 - 442

ÇEMBERDE KUVVET, ÇEVRE ve ALAN / POWER, CIRCUMFERENCE and AREA in a CIRCLE

- Çemberde Kuvvet / Power in Circle ..... 411 - 414
  - Bir Noktanın Bir Çembere Göre Kuvveti / Power of a Point with Respect to a Circle ..... 411 - 412
  - Kuvvet Ekseni / The Axis of Power ..... 413 - 414
- Çemberde Çevre, Alan ve Benzerlik / Circumference, Area and Similarity in Circle ..... 414 - 415
- Daire ve Daire Dilimi / Circle and Circular Sector ..... 414 - 418
  - Darie Diliminin Alanı / Area of Circular Sector ..... 415 - 416
  - Dairenin Alanı / The Area of a Circular Region 416
  - Daire Parçası / Circular Segment ..... 416 - 418
- Çemberlerde Benzerlik ile İlgili Özellikler / Properties According to The Similarity in Circles ..... 418 - 420
- ▲ Çözümlü Test / Test With Solutions ..... 421 - 424
- ▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 425 - 428
- ▲ Alıştırmalar / Exercises ..... 429 - 432
- ▲ Konu Testleri / Practice Tests ..... 433 - 442

BÖLÜM / CHAPTER 13 ..... 443 - 476

DOĞRUNUN ANALİTİĞİ / LINE in ANALYTIC GEOMETRY

- Kartezyen Düzlem / The Cartesian Plane ..... 445 - 456
  - Dik Koordinat Sistemi / Cartesian Coordinates ..... 446 - 447
  - Bir Doğru Parçasını Belli Oranda Bölen Bir Noktanın Koordinatları
    The Coordinates of a Point That Divides a Line Segment into a Certain Ratio ..... 447 - 449
  - Bir Doğrunun Eğimi / Slope and Equation of a Line ..... 450 - 451
  - Doğru Denklemleri / Linear Equations ..... 452 - 455
  - Özel Doğru Denklemleri / The Special Line Equations 455
  - İki Doğru Arasındaki Açı / The Angle Between Two Lines ..... 455 - 456
  - Bir Noktanın Bir Doğruya Olan En Kısa Uzaklığı / The Shortest Distance of a Point From a Line 456
  - Paralel İki Doğru Arasındaki Uzaklık / The Distance Between Two Parallel Lines 456
- ▲ Çözümlü Test / Test With Solutions ..... 457 - 460
- ▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 461 - 464
- ▲ Alıştırmalar / Exercises ..... 465 - 466
- ▲ Konu Testleri / Practice Tests ..... 467 - 476

İçindekiler / Contents

BÖLÜM / CHAPTER 14 ..... 477 - 494

ÇEMBERİN ANALİTİĞİ / CIRCEL in ANALYTIC GEOMETRY

- Merkezi ve Yarıçpı Bilinen Çemberin Denklemi / The Equation of a Circle Whose and Center are Known 479
- Çemberin Genel Denklemi / General Equation of a Circle ..... 479 - 484
  - Özel Çemberler / The Specifical circles ..... 480 - 484
- ▲ Çözümlü Test / Test With Solutions ..... 485 - 486
- ▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 487 - 488
- ▲ Alıştırmalar / Exercises ..... 489 - 490
- ▲ Konu Testleri / Practice Tests ..... 491 - 494

BÖLÜM / CHAPTER 15 ..... 495 - 522

KATI CİSİMLER / SOLIDS

- Prizmalar / Prisms ..... 497 - 498
  - Prizma Çeşitleri / Kinds of Prisms ..... 497 - 498
- Dikdörtgenler Prizması / The Rectangular Prisms 499
- Kare Dik Prizma / The Square Right Prism 500
- Küp / Cube ..... 501 - 502
- Silindir / Cylinder ..... 502 - 503
- Piramit / Pyramid ..... 504 - 509
  - Düzgün Piramit / Regular Pyramid ..... 504 - 505
  - Düzgün Dörtyüzlü / The Regular Tetrahedron ..... 505 - 506
  - Dik Koni / Right Cone ..... 507 - 509
- Küre / Sphere ..... 509 - 510
- ▲ Çözümlü Test / Test With Solutions ..... 511 - 514
- ▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 515 - 516
- ▲ Alıştırmalar / Exercises ..... 517 - 518
- ▲ Konu Testleri / Practice Tests ..... 519 - 522

BÖLÜM / CHAPTER 16 ..... 523 - 552

VEKTÖRLER / VECTORS

- Yönlü Doğru Parçası / Directed Line Segment 525
- Vektör'ün Tanımı / Definition of a Vektor ..... 525 - 531
  - Konum Vektörü / Position Vector ..... 526 - 527
  - Bir Vektörün Uzunluğu (Normu) / The Length (Norm) of a Vector 527
  - Vektörlerde Toplama ve Çıkarma / Addition and Subtraction in Vectors 528
  - Bir Vektörün Bir Skaler İle Çarpımı / Product of a Vector by a Scalar 529
  - Vektörlerin Skaler (İç) Çarpımı / Scalar (Inner) Product of Two Vectors ..... 529 - 530
  - Birim Vektör / Unit Vector 531
  - Paralrl Vektörler / Parallel Vectors 531
- Uzayda Vektörler / Vectors in Space ..... 532 - 536
  - Uzayda Vektörelerin Uzunluğu (Normu) / The (Length) Norm of Vecttors in Space 532
  - Uzayda Vektörelerin Bir Skaler İle Çarpımı / The Product of Vectors by a Scalar in Space 532
  - Uzayda Vektörelerin Kümesinde Toplama İşlemi / Addition in Set of Vectors in Space 533
  - Uzayda Vektörelerin Skaler (İç) Çarpımı / Scalar Product of Vectors in Space ..... 533 - 534
  - Uzayda İki Vektör Arasındaki Açı / Angle Berween Two Vectors in Space ..... 534 - 535
  - Uzayda Dik Vektörler / Perpendicular Vectors in Space 535
  - Uzayda Paralel Vektörler / Parallel Vectrors in Space 536
- ▲ Çözümlü Test / Test With Solutions ..... 537 - 540
- ▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 541 - 542
- ▲ Alıştırmalar / Exercises ..... 543 - 544
- ▲ Konu Testleri / Practice Tests ..... 545 - 552

BÖLÜM CHAPTER 1

TARİHSEL NOT / HISTORICAL NOTE

Emmy Amalie Noether [1882 – 1935]

Soyut cebir ve kuramsal fiziğe çığır açıcı katkılarıyla bilinen bir Alman matematikçidir. Noether'in matematik çalışmaları üç döneme ayrılmıştır. İlkinde (1908 – 1919), cebirsel değişmezler ve sayı alanları üzerine etkin katkılar sağlamıştır. Varyasyonlar hesabındaki diferansiyel sabitler üzerine çalışmaları, Noether teoremi, "modern fiziğin gelişmesine yol gösteren şimdiye kadar kanıtlanmış en önemli matematik teorilerisi" olarak sayılır. İkinci dönemde (1920 – 1926), "soyut cebri değiştiren" çalışmasına başladı. Yaşamı boyunca ve hatta bugün bile Noether; Pavel Alexandrov, Hermann Weyl, ve Jean Dieudonné gibi matematikçiler tarafından tarihteki en iyi kadın matematikçi olarak gösterildi. Üçüncü döneminde (1927 – 1935), değişmez cebirler ve hiperkompleks sayılar hakkında çalışmalar yapmıştır ve grupların representation teorisi ve modüller ve idealler teorilerini birleştirmiştir.

She was a German mathematician known for her ground breaking contributions to abstract algebra and theoretical physics. Noether's mathematical studies are divided into three "periods". In the first (1908 – 1919), she made effective contributions to algebraic constants and number spaces. Working on differential constants in the calculations of variants, Noether's theorem is counted as "the most important mathematical theories that have proven so far to lead to the development of modern physics". In the second period (1920 – 1926), she began her "abstract abstraction" study. Noether throughout his life and even today; named by Pavel Alexandrov, Hermann Weyl, and Jean Dieudonné as the best female mathematician in history. In the third period (1927 – 1935), she published major works on invariant algebra, hypercomplex numbers, groups representation theory, she also had united modular and ideal theories.

GEOMETRİK KAVRAMLAR VE AÇILAR
GEOMETRICAL CONCEPT and ANGLES

Bu bölüm, 36 çözümlü örnek, 12 çözümlü test sorusu, 6 çözümlü YÖS sorusu, 12 alıştırma sorusu, 36 test sorusu içermektedir.

This chapter includes 36 examples with solutions, 12 test questions with solutions, 6 YÖS questions with solutions, 12 exercise questions and 36 test questions.

BÖLÜM / CHAPTER 1 ..... 1- 34

GEOMETRİK KAVRAMLAR ve AÇILAR / GEOMETRICAL CONCEPTS and ANGLES

- Tanımsız Kavramlar / Undefined Concepts 3
- Tanımlar / Definitions 4
- Açılar / Angles ..... 5 - 20
  - Bir Açının Ölçüsü / The Measure of an Angle 5
  - Komşu Açılar / Adjacant Angles ..... 5 - 6
  - Açıortay / Bisector ..... 6 - 7
  - Ters Açılar / Opposite Angles ..... 7 - 8
  - Açı Çeşitleri / Types of Angle ..... 8 - 10
  - Paralel İki Doğrunun Bir Kesenle Yaptığı Açılar / Angles Formed When Two Paralle Lines Intersected By a Transversal ..... 10 - 19
  - Kenarları Dik Olan Açılar / Angles with Perpendecular Sides ..... 19 - 20
- Çözümlü Test / Test With Solutions ..... 21 - 24
- YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 25 - 26
- Alıştırmalar / Exercises ..... 27 - 28
- Konu Testleri / Practice Tests ..... 29 - 34

BÖLÜM 01 CHAPTER

AÇILAR / ANGLES

TANIMSIZ KAVRAMLAR / UNDEFINED CONCEPTS

- **Nokta**: Uzayda konumu olan fakat boyutu olmayan bir kavramdır.
  Point: A concept which has position in space, but not size .

A noktası / The point A
(Noktalar büyük harfle gösterilir. / Points are represented by capital letters.)

- **Doğru:** İki yönde sınırsız noktalar kümesidir. İki türlü gösterimi vardır.
  Line: A set of points unbounded through both directions. It has two represantations.

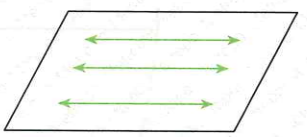
d doğrusu / The line d
(Küçük harfle gösterilir.
Represented by small letters.)

EF doğrusu / The line EF
(Doğrunun üzerindeki iki büyük harfle gösterilir.
Represented by two capital letters on the line.)

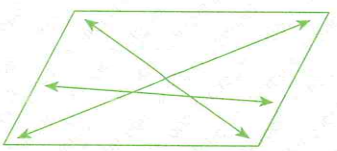
- **Düzlem:** Üzerinde kesişen iki doğrunun her noktasının değmesi gereken düzgün yüzeydir.
  Plane: A plane surface that all the points of two lines intersecting on it need to touch.

P düzlemi / The plane P

- Aynı düzlem içerisinde bulunan n tane farklı doğru, düzlemi en az (n + 1) bölgeye ayırır.
  n different lines in the same plane separate the plane to minimum of (n + 1) parts.



- Aynı düzlem içerisinde bulunan n tane farklı doğru, düzlemi en çok $\left(\frac{n.(n+1)}{2}+1\right)$ bölgeye ayırır.
  n different lines in the same plane separate the plane to maximum of $\left(\frac{n.(n+1)}{2}+1\right)$ parts.



Örnek / Example 1

6 farklı doğru bir düzlemi en az kaç bölgeye ayırır?
6 different lines seperate a plane to at least how many regions?

A) 5 B) 6 C) 7 D) 8 E) 22

Çözüm / Solution Yanıt / Answer **C**

$n = 6 \Rightarrow (n + 1) = (6 + 1)$
$= 7$

Örnek / Example 2

Bir düzlem içerisinde kesişen kaç tane doğru düzlemi 46 bölgeye ayırır?
How many lines intersectingin a plane separate plane to 46 regions?

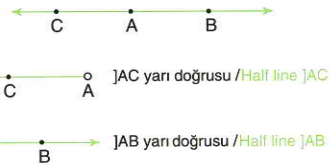
A) 7 B) 9 C) 11 D) 13 E) 15

Çözüm / Solution Yanıt / Answer **B**

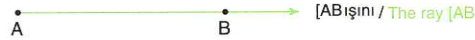
$\frac{n\cdot(n+1)}{2}+1 = 46 \Rightarrow n = 9$

TANIMLAR / DEFINITIONS

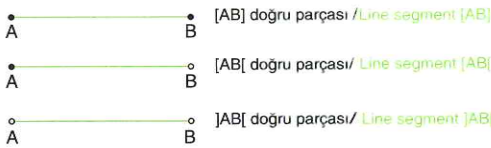
- **Yarı doğru:** Bir doğrunun üzerindeki herhangi bir nokta çıkarıldığında o doğru, iki yarı doğruya ayrılmış olur.
  The half line: If any point on a line is removed, then the line becomes divided into two half lines.



- **Işın:** Başlangıç noktası belli ve bir yöne doğru devam eden sınırsız noktalar kümesidir.
  The ray: it is a set composed of infinite number of points which has a certain origin and moves towards a certain way.



- **Doğru Parçası:** Bir doğrunun A ve B noktaları ile bunların arasında kalan tüm noktaların kümesine, **AB doğru parçası** denir.
  Line Segment: The set composed of the points A and B of a line and all the points between them is called line segment AB.



- |AB|, AB doğru parçasının uzunluğu
  |AB|, the length of the line segment AB

Örnek / Example 3

⇒ [LM ∩ [NK = ?

A) [KM] B) [LK] C) [LN] D) KM E) LN

Çözüm / Solution

Yanıt / Answer **C**

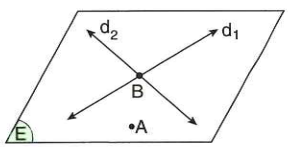
[LM :

[NK :

[LM ∩ [NK : L N

: [LN]

Örnek / Example 4



Aşağıdakilerden hangisi yanlıştır?

Which of the followings is not true?

A) $A \in E$ B) $d_1 \subset E$ C) $d_2 \subset E$

D) $d_1 \cap d_2 = \{B\}$ E) $A \in d_1$

Çözüm / Solution

Yanıt / Answer **E**

$A \in E$ ✓

$d_1 \subset E$ ✓

$d_2 \subset E$ ✓

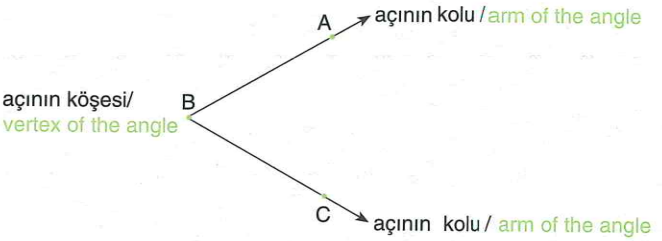
$d_1 \cap d_2 = \{B\}$ ✓

$A \notin d_1$ ×

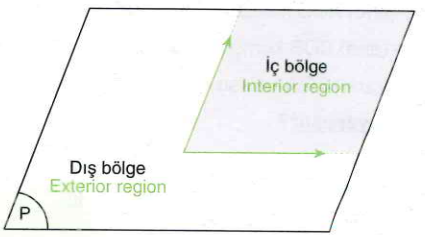
AÇILAR / ANGLES

Başlangıç noktaları ortak olan iki ışının birleşimine **açı** denir
The union of two rays with mutual starting points is called an angle.

$[BA \cup [BC = \widehat{ABC} = \widehat{CBA} = \widehat{B}$



- Açı, bir düzlemi iki ayrık kümeye ayırır:
  An angle separates a plane into two disjoint sets:
  1. İç bölge / Interior region
  2. Dış bölge / Exterior region

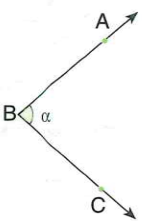


ÖNEMLİ / IMPORTANT

Açı ile iç bölgesinin birleşimine, **açısal bölge** denir ve $(\widehat{ABC})$ ile gösterilir.
The union of angle and its interior region is called an angular region and denoted by $(\widehat{ABC})$

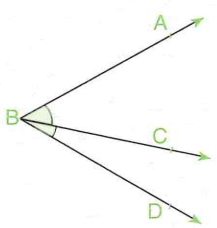
BİR AÇININ ÖLÇÜSÜ / THE MEASURE of an ANGLE

Bir ABC açısına karşılık gelen α pozitif reel sayısına ABC açısının ölçüsü denir.
ABC açısının ölçüsü $m(\widehat{ABC}) = m(\widehat{CBA}) = m(\widehat{B}) = \alpha$ şeklinde ifade edilir.
A positive real number α which is assigned to an angle ABC is called the measure of angle ABC.
The measure of angle ABC is denoted as $m(\widehat{ABC}) = m(\widehat{CBA}) = m(\widehat{B}) = \alpha$



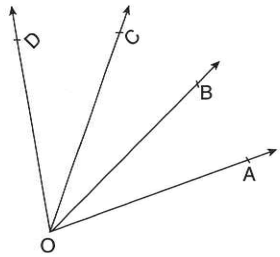
KOMŞU AÇILAR / ADJACENT ANGLES

Başlangıç noktaları ve birer kolları ortak, iç bölgeleri ayrık olan iki açıya **komşu açılar** denir.
Any two angles whicn have one side and vertex point in common but separated interior regions are called **adjacent angles.**



$\widehat{ABC}$ ile $\widehat{CBD}$ komşu açılardır.
$\widehat{ABC}$ and $\widehat{CBD}$ are adjacent angles.

Örnek / Example 5



I. $\widehat{AOB}$ ve (and) $\widehat{AOC}$ komşu açılardır (adjacent angles).

II. $\widehat{DOC}$ ve (and) $\widehat{COB}$ komşu açılardır (adjacent angles).

III. $\widehat{COB}$ ve (and) $\widehat{BOA}$ komşu açılardır (adjacent angles).

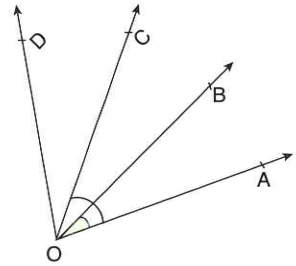
⇒ **Hangileri yanlıştır?**

Which ones are not true?

A) I B) I, I C) I, III D) II, III E) I, II, III

Çözüm / Solution Yanıt / Answer **A**

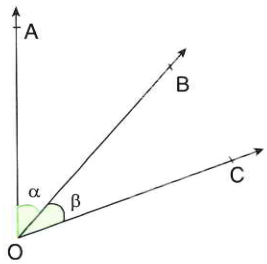
I.



$\widehat{AOB}$ ve $\widehat{AOC}$ komşu açılar değildir.

$\widehat{AOB}$ and $\widehat{AOC}$ aren't adjacent angles.

Örnek / Example 6



I. α ve (and) β komşu açılardır (adjacent angles).

II. $\alpha = \beta$

III. $\alpha \neq \beta$

⇒ **Hangileri doğru olabilir?**

Which ones can be true?

A) I B) I, II C) II, III D) I, III E) I, II, III

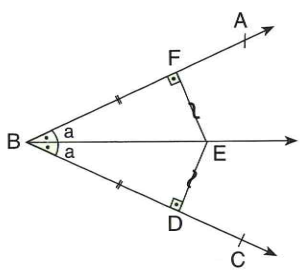
Çözüm / Solution Yanıt / Answer **E**

I, II, III

AÇIORTAY / BISECTOR

Bir açının kollarından eşit uzaklıkta bulunan noktalar kümesine **açıortay** denir.

A bisector is a set composed of points which are at the same distance from the arms of an angle.



[BE: açıortay / bisector

$m(\widehat{FBE}) = m(\widehat{EBD})$
$[FE] \perp [BA]$
$[ED] \perp [BC]$

$\Rightarrow$ IDEI = IEFI
IBFI = IBDI

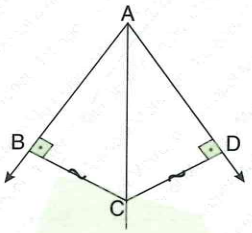
ÖNEMLİ / IMPORTANT

- Açıortay üzerindeki her nokta açının kollarından eşit uzaklıkta bulunur.
  All the points that lie on the bisector are of the same distance from the arms of the angle.

- Bir açının kollarından eşit uzaklıkta bulunan her nokta, açıortay üzerindedir.
  Each point which is in the same distance from the arms of an angle, lies on the bisector.

Örnek / Example 7

$|BC| = |CD|$,
$m(\widehat{BAC}) = \alpha + 10°$,
$m(\widehat{CAD}) = 3\alpha - 40°$
$\Rightarrow$ α = ?



A) 10° B) 15° C) 20° D) 25° E) 30°

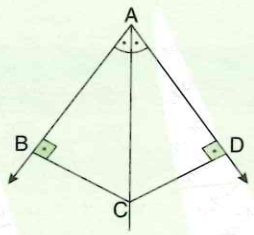
Çözüm / Solution

Yanıt / Answer **D**

$\alpha + 10° = 3\alpha - 40°$
$50° = 2\alpha$
$25° = \alpha$

Örnek / Example 8

$m(\widehat{BAC}) = m(\widehat{CAD})$,
$|AB| = (3x + 2)$ br(u),
$|AD| = (5x - 10)$ br(u)
$\Rightarrow$ **x = ? br(u)**



A) 4 B) 6 C) 8 D) 10 E) 12

Çözüm / Solution

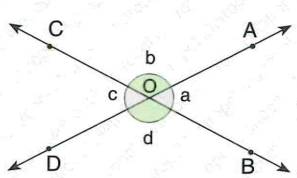
Yanıt / Answer **B**

$|AB| = |AD| \Rightarrow 3x + 2 = 5x - 10$
$12 = 2x$
$6 = x$

TERS AÇILAR / OPPOSITE ANGLES

Kesişen iki doğrunun oluşturduğu dört açıdan, komşu olmayan eşit iki açıya **ters açı** denir.

When two lines intersect and form four angles, any two equal angles which are not adjacent are said to be opposite angles.

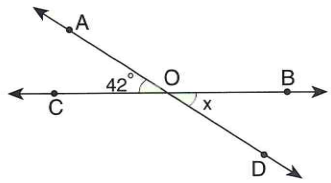


$\Rightarrow$

- $\widehat{AOB}$ ile $\widehat{COD}$ ters açılardır. $\widehat{AOB}$ and $\widehat{COD}$ are opposite angles.
- $\widehat{AOC}$ ile $\widehat{BOD}$ ters açılardır. $\widehat{AOC}$ and $\widehat{BOD}$ are opposite angles.
- Ters açıların ölçüleri eşittir. The measures of the opposite angles are equal.

$m(\widehat{AOB}) = m(\widehat{COD}) \Rightarrow a = c$
$m(\widehat{AOC}) = m(\widehat{BOD}) \Rightarrow b = d$

Örnek / Example 9



$m(\widehat{AOC}) = 42° \Rightarrow \mathbf{m(\widehat{BOD}) = x = ?}$

A) 21° B) 42° C) 48° D) 63° E) 138°

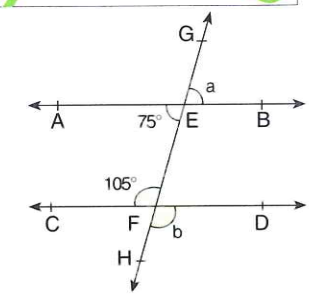
Çözüm / Solution Yanıt / Answer **B**

$m(\widehat{AOC}) = m(\widehat{BOD})$

$m(\widehat{BOD}) = x = 42°$

Örnek / Example 10

AB // CD,
$m(\widehat{AEF}) = 75°$,
$m(\widehat{CFE}) = 105°$
$\Rightarrow$ **a + b = ?**



A) 30°° B) 60° C) 90° D) 135° E) 180°

Çözüm / Solution Yanıt / Answer **E**

$\widehat{AEF}$ ve $\widehat{BEG}$ ters açılardır.

$\widehat{AEF}$ and $\widehat{BEG}$ are opposite angles.

$\Rightarrow a = 75°$

$\widehat{DFH}$ ve $\widehat{CFE}$ ters açılardır.

$\widehat{DFH}$ and $\widehat{CFE}$ are opposite angles.

$\Rightarrow b = 105°$

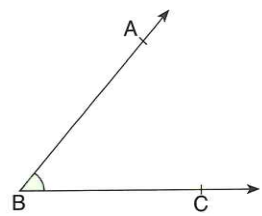
$\Rightarrow a + b = 75° + 105°$
$= 180°$

AÇI ÇEŞİTLERİ / TYPES OF ANGLE

1. Dar Açı / Acute Angle

$0 < m(\widehat{ABC}) < 90°$ ise $\widehat{ABC}$ bir dar açıdır.

If $0 < m(\widehat{ABC}) < 90°$, $\widehat{ABC}$ is an **acute angle**.

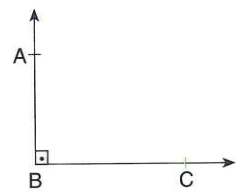


$0 < m(\widehat{ABC}) < 90°$

2. Dik Açı / Right Angle

$m(\widehat{ABC}) = 90°$ ise $\widehat{ABC}$ bir dik açıdır.

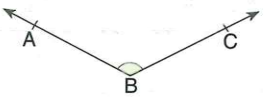
If $m(\widehat{ABC}) = 90°$, $\widehat{ABC}$ is a **right angle**.



$m(\widehat{ABC}) = 90°$

3. Geniş Açı / Obtuse Angle

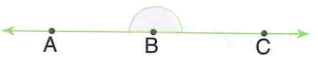
$90° < m(\widehat{ABC}) < 180°$ ise $\widehat{ABC}$ bir geniş açıdır.
If $90° < m(\widehat{ABC}) < 180°$, $\widehat{ABC}$ is an obtuse angle.



$90° < m(\widehat{ABC}) < 180°$

4. Doğru Açı / Straight Angle

$m(\widehat{ABC}) = 180°$ ise $\widehat{ABC}$ doğru açıdır.
If $m(\widehat{ABC}) = 180°$, $\widehat{ABC}$ is a straight angle.



$m(\widehat{ABC}) = 180°$

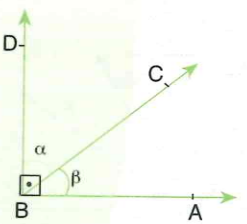
5. Tam Açı / Round Angle [Perigon Angle]

$m(\widehat{B}) = 360°$ ise $\widehat{B}$ tam açıdır.
If $m(\widehat{B}) = 360°$, $\widehat{B}$ is a round angle.

6. Tümler Açılar / Complementary Angles

Ölçülerinin toplamı 90° olan iki açıya **tümler açı** denir.

Two angles that add up to 90° are called complementary angles.



$\alpha + \beta = 90°$

Örnek / Example 11

α ve β tümler açılardır.

α and β are complementary angles.

$\alpha = 22,5° \Rightarrow \beta = ?$

A) 45° B) 67,5° C) 90° D) 135° E) 180°

Çözüm / Solution

Yanıt / Answer **B**

$\alpha + \beta = 90°$

$\Rightarrow \alpha = 22,5°$

$\Rightarrow \beta = 90° - 22,5°$

$= 67,5°$

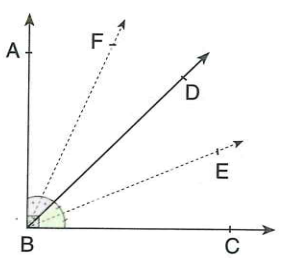
Örnek / Example 12

$m(\widehat{DBE}) = m(\widehat{EBC})$,

$m(\widehat{DBF}) = m(\widehat{FBA})$,

$[BA \perp [BC$

$\Rightarrow m(\widehat{FBE}) = ?$



A) 15° B) 30° C) 45° D) 60° E) 75°

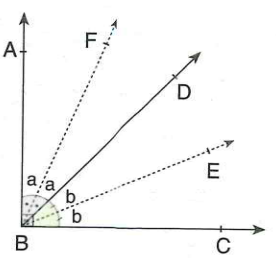
Çözüm / Solution

Yanıt / Answer **C**

$[BA \perp [BC \Rightarrow 2a + 2b = 90°$

$a + b = 45°$

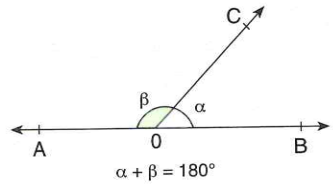
$m(\widehat{FBE}) = a + b = 45°$



7. Bütünler Açılar / Supplementary Angles

Ölçülerinin toplamı 180° olan iki açıya **bütünler açı** denir.

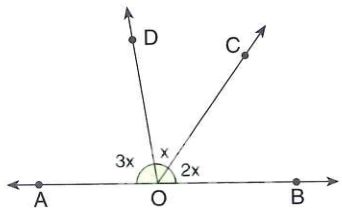
Two angles that add up to 180° are called **supplementary angles.**



$\alpha + \beta = 180°$

Örnek / Example 13

$m(\widehat{BOC}) = 2x$,
$m(\widehat{COD}) = x$,
$m(\widehat{DOA}) = 3x$
$\Rightarrow x = ?$



A) 15° B) 30° C) 45° D) 60° E) 70°

Çözüm / Solution

Yanıt / Answer **B**

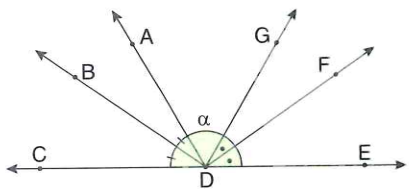
$m(\widehat{BOC}) + m(\widehat{COD}) + m(\widehat{DOA}) = 180°$

$2x + x + 3x = 180°$

$6x = 180°$

$x = 30°$

Örnek / Example 14

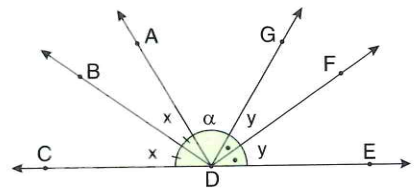


$m(\widehat{BDF}) = 140° \Rightarrow m(\widehat{ADG}) = \alpha = ?$

A) 90° B) 95° C) 100° D) 105° E) 110°

Çözüm / Solution

Yanıt / Answer **C**



$2x + \alpha + 2y = 180°$

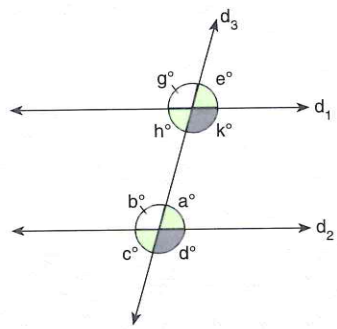
$-\quad x + \alpha + y = 140°$

$x + y = 40°$

$x + \alpha + y = 140° \Rightarrow \alpha + 40 = 140°$

$\alpha = 100°$

PARALEL İKİ DOĞRUNUN BİR KESENLE YAPTIĞI AÇILAR
ANGLES FORMED WHEN TWO PARALLEL LINES INTERSECTED BY a TRANSVERSAL



$d_1 // d_2$

d_3 : kesen / transversal

Yöndeş Açılar / Corresponding Angles

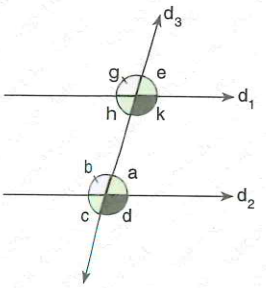
Birer kenarı ortak, diğer kenarları aynı yönde paralel olan açılar **yöndeş açılar**dır.

Angles with one common side and one same-direction parallel side are called **corresponding angles**.

Yandaki şekilde / In the figure beside,

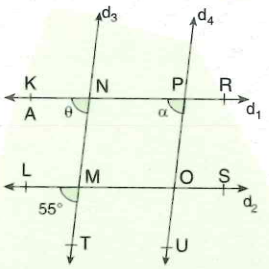
$[d_1 \parallel d_2]$

a ve (and) e
b ve (and) g
c ve (and) h
d ve (and) k
$\Rightarrow$ Yöndeş açılar olup, bu açıların ölçüleri eşittir. Are corresponding angles, measures of these angles are equal.
$\Rightarrow$ $m(\hat{a}) = m(\hat{e})$, $m(\hat{b}) = m(\hat{g})$, $m(\hat{c}) = m(\hat{h})$, $m(\hat{d}) = m(\hat{k})$



Örnek / Example 15

$d_1 \parallel d_2$, $d_3 \parallel d_4$,
$m(\widehat{LMT}) = 55°$,
$m(\widehat{KNM}) = \theta$,
$m(\widehat{NPO}) = \alpha$
$\Rightarrow \alpha + \theta = ?$



A) 55° B) 85° C) 100° D) 110° E) 130°

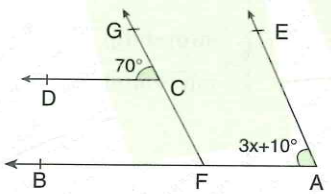
Çözüm / Solution

Yanıt / Answer **D**

$d_1 \parallel d_2 \Rightarrow \theta$ ve $\widehat{LMT}$ yöndeş açılardır.
θ and LMT are corresponding angles
$\Rightarrow \theta = m(\widehat{LMT}) = 55°$
$d_3 \parallel d_4 \Rightarrow \theta = \alpha$ (corresponding angles)
$\Rightarrow \theta = 55° = \alpha$
$\Rightarrow \theta + \alpha = 55° + 55° = 110°$

Örnek / Example 16

$[AB \parallel [CD$,
$[FG \parallel [AE$,
$m(\widehat{DCG}) = 70°$,
$m(\widehat{EAF}) = 3x + 10°$
$\Rightarrow x = ?$



A) 10° B) 15° C) 20° D) 25° E) 30°

Çözüm / Solution

Yanıt / Answer **C**

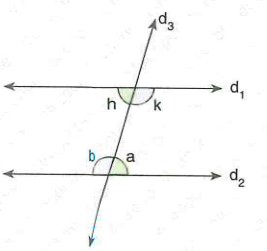
$[AB \parallel [CD \Rightarrow m(\widehat{DCG}) = m(\widehat{BFC}) = 70°$
$[FG \parallel [AE \Rightarrow m(\widehat{EAF}) = m(\widehat{BFC})$
$m(\widehat{EAF}) = 70°$
$3x + 10° = 70°$
$3x = 60°$
$x = 20°$

İç Ters Açılar / Alternate Interior Angles

Yandaki şekilde / In the figure beside,

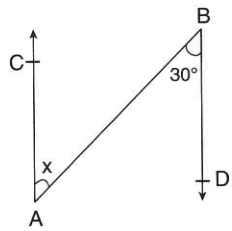
$[d_1 \parallel d_2]$

a ve (and) h
k ve (and) b
$\Rightarrow$ İç ters açılar olup, bu açıların ölçüleri eşittir. Are alternate interior angles, measures of these angles are equal.
$\Rightarrow$ $m(\hat{a}) = m(\hat{h})$, $m(\hat{k}) = m(\hat{b})$



Örnek / Example 17

[AC // [BD,
$m(\widehat{DBA}) = 30°$
$\Rightarrow$ **$m(\widehat{CAB}) = x = ?$**



A) 10° B) 15° C) 20° D) 25° E) 30°

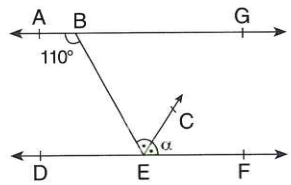
Çözüm / Solution Yanıt / Answer **E**

[AC // [BD:
$\widehat{DBA}$ ve $\widehat{CAB}$ iç ters açılardır.
$\widehat{DBA}$ and $\widehat{CAB}$ are alternate interior angles.

$\Rightarrow m(\widehat{DBA}) = m(\widehat{CAB})$
$\Rightarrow x = 30°$

Örnek / Example 18

AG // DF,
$m(\widehat{ABE}) = 110°$,
$m(\widehat{BEC}) = m(\widehat{CEF})$
$\Rightarrow$ **$m(\widehat{CEF}) = \alpha = ?$**



A) 50° B) 55° C) 60° D) 65° E) 70°

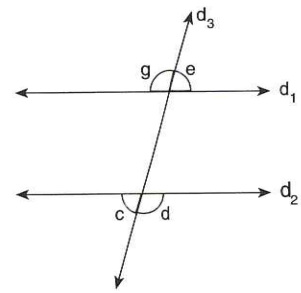
Çözüm / Solution Yanıt / Answer **B**

$m(\widehat{ABE}) = m(\widehat{BEF})$
$110° = 2\alpha$
$55° = \alpha$

Dış Ters Açılar / Alternate Exterior Angles

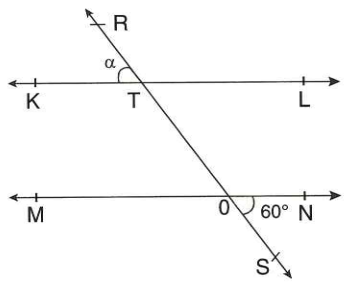
Yandaki şekilde / In the figure beside,
$[d_1 // d_2]$

d ve (and) g, c ve (and) e $\Rightarrow$ Dış ters açılar olup, bu açıların ölçüleri eşittir. Are alternate exterior angles, measures of these angles are equal. $\Rightarrow$ $m(\widehat{d}) = m(\widehat{g})$, $m(\widehat{c}) = m(\widehat{e})$



Örnek / Example 19

KL // MN,
$m(\widehat{SON}) = 60°$
$\Rightarrow$ **$m(\widehat{KTR}) = \alpha = ?$**



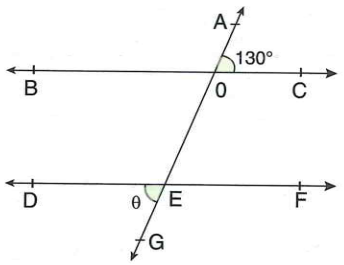
A) 120° B) 90° C) 70° D) 60° E) 30°

Çözüm / Solution Yanıt / Answer **D**

$m(\widehat{KTR}) = m(\widehat{OTL}) = \alpha$
KL // MN:
$m(\widehat{OTL}) = m(\widehat{SON})$
$\alpha = 60°$

Örnek / Example 20

BC // DF,
$m(\widehat{AOC}) = 130°$
$\Rightarrow m(\widehat{DEG}) = \theta = ?$



A) 100° B) 120° C) 130° D) 145° E) 150°

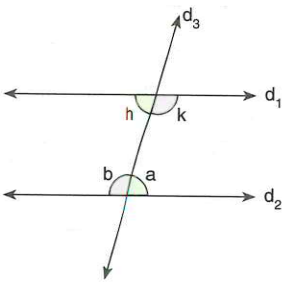
Çözüm / Solution Yanıt / Answer **C**

BC // DF:
$m(\widehat{AOC}) = m(\widehat{BOE}) = m(\widehat{DEG})$
$130° = \theta$

Karşı Durumlu Açılar / Consecutive Interior Angles

Yandaki şekilde / In the figure beside,
$[d_1 // d_2]$

a ve (and) k
b ve (and) h
$\Rightarrow$ Karşı durumlu açılar olup, bu açıların ölçüleri toplamı 180° dir.
Are consecuvite interior angles, sum of measures of these angles is 180°.
$\Rightarrow m(\hat{a}) + m(\hat{k}) = 180°$
$m(\hat{b}) + m(\hat{h}) = 180°$



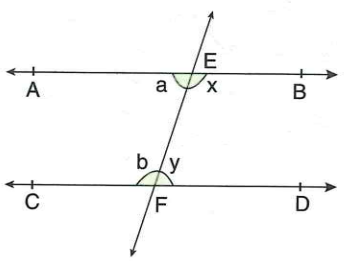
ÖNEMLİ/ IMPORTANT

Geometri sorularını çözerken iki doğrunun paralel olduğu özel olarak söylenmedikçe, paralel olduğunu düşünmeyiniz.

In any geometry problem, we can not assume that two lines are parallel unless the question or diagram specifically tells us so.

Örnek / Example 21

AB // CD,
$m(\widehat{AEF}) = a$,
$m(\widehat{BEF}) = x$,
$m(\widehat{CFE}) = b$,
$m(\widehat{DFE}) = y$
$\Rightarrow x + y + a + b = ?$



A) 90° B) 180° C) 270° D) 360° E) 540°

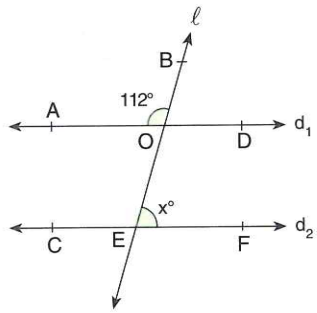
Çözüm / Solution Yanıt / Answer **D**

AB // CD:
$x + y = 180°$, $a + b = 180°$

$$\begin{array}{rr} & x + y = 180° \\ + & a + b = 180° \\ \hline & x + y + a + b = 360° \end{array}$$

Örnek / Example 22

$d_1 \parallel d_2$,
$m(\widehat{AOB}) = 112°$
$\Rightarrow$ **$m(\widehat{OEF}) = x = ?$**



A) 60° B) 64° C) 68° D) 72° E) 76°

Çözüm / Solution Yanıt / Answer **C**

$m(\widehat{AOB}) = 112° \Rightarrow m(\widehat{DOE}) = 112°$

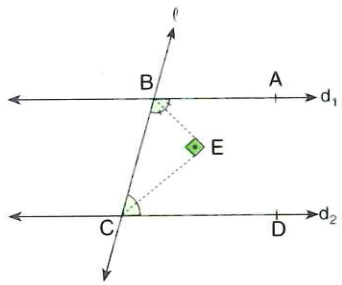
$m(\widehat{DOE}) + m(\widehat{OEF}) = 180°$

$112° + m(\widehat{OEF}) = 180°$

$m(\widehat{OEF}) = 180° - 112°$

$m(\widehat{OEF}) = 68°$

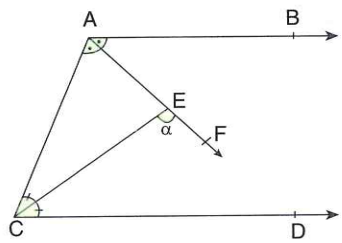
Sonuç 1 / Conclusion 1



$d_1 \parallel d_2$,
$m(\widehat{ABE}) = m(\widehat{EBC})$
$m(\widehat{BCE}) = m(\widehat{ECD})$
$\Rightarrow [BE] \perp [CE]$

Örnek / Example 23

$[AB \parallel [CD$,
$m(\widehat{BAF}) = m(\widehat{FAC})$,
$m(\widehat{DCE}) = m(\widehat{ECA})$
$\Rightarrow$ **$m(\widehat{FEC}) = \alpha = ?$**



A) 30° B) 45° C) 60° D) 90° E) 135°

Çözüm / Solution Yanıt / Answer **D**

$m(\widehat{AEC}) = 90°$ (Sonuç 1 / Conclusion 1)

$m(\widehat{AEC}) + m(\widehat{CEF}) = 180°$

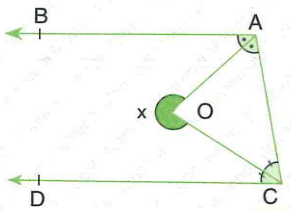
$90° + \alpha = 180°$

$\alpha = 180° - 90°$

$= 90°$

Örnek / Example 24

[AB // [CD,
$m(\widehat{BAO}) = m(\widehat{CAO})$
$m(\widehat{DCO}) = m(\widehat{OCA})$
⇒ **x = ?**



A) 90° B) 120° C) 150° D) 270° E) 300°

Çözüm / Solution

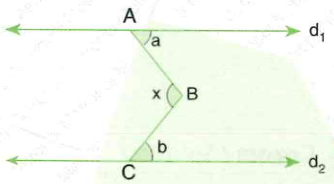
Yanıt / Answer **D**

$m(\widehat{AOC}) = 90°$ (Sonuç 1 / Conclusion 1)

$\widehat{O}$ tam açıdır. $\widehat{O}$ is round angle.

⇒ $x = 360° - m(\widehat{AOC})$
⇒ $x = 360° - 90°$
⇒ $x = 270°$

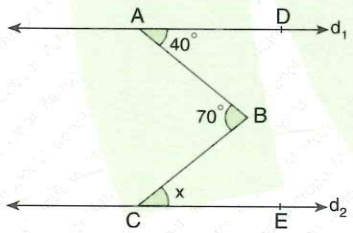
Sonuç 2 / Conclusion 2



$d_1 // d_2 \Rightarrow x = a + b$

Örnek / Example 25

$d_1 // d_2$,
$m(\widehat{DAB}) = 40°$,
$m(\widehat{ABC}) = 70°$
⇒ **$m(\widehat{BCE}) = x = ?$**



A) 15° B) 30° C) 45° D) 60° E) 75°

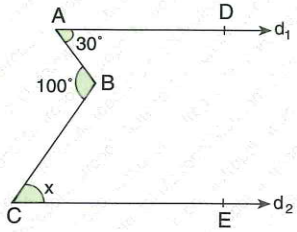
Çözüm / Solution

Yanıt / Answer **B**

$m(\widehat{DAB}) + m(\widehat{BCE}) = m(\widehat{ABC})$ (Sonuç 2 / Conclusion 2)
$40° + x = 70°$
$x = 70° - 40°$
$x = 30°$

Örnek / Example 26

[AD // [CE,
$m(\widehat{DAB}) = 30°$,
$m(\widehat{ABC}) = 100°$
⇒ **$m(\widehat{BCE}) = x = ?$**



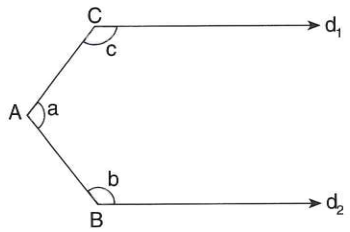
A) 20° B) 30° C) 40° D) 50° E) 70°

Çözüm / Solution

Yanıt / Answer **E**

[AD // [CE:
$m(\widehat{DAB}) + m(\widehat{ECB}) = m(\widehat{ABC})$ (Sonuç 2 / Conclusion 2)
$30° + x = 100°$
$x = 100° - 30°$
$= 70°$

Sonuç 3 / Conclusion 3



$d_1 \,//\, d_2 \Rightarrow a+b+c=360°$

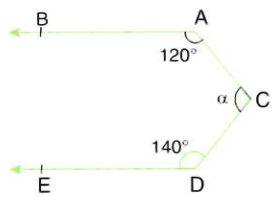
ÖNEMLİ / IMPORTANT

Sonuç 3'e benzer şekilde; iki paralel doğru arasında aynı yöne bakan n tane açı varsa, bu açıların ölçüleri toplamı, **(n – 1)·180°**'ye eşittir.

In figures similar to conclusion to 3, if there is "n" angles facing the same side, the sum of maesure of these angles equals to (n – 1)·180°.

Örnek / Example 27

$[AB \,//\, [DE$,
$m(\widehat{BAC}) = 120°$,
$m(\widehat{EDC}) = 140°$
$\Rightarrow$ **$m(\widehat{ACD}) = \alpha = ?$**



A) 70° B) 80° C) 90° D) 100° E) 110°

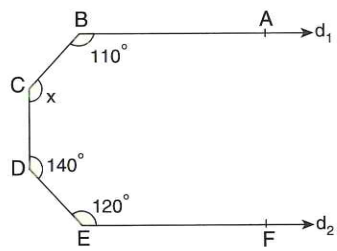
Çözüm / Solution

Yanıt / Answer **D**

$m(\widehat{BAC}) + m(\widehat{ACD}) + m(\widehat{EDC}) = 360°$
$120° + \alpha + 140° = 360°$
$\alpha = 360° - 260°$
$= 100°$

Örnek / Example 28

$d_1 \,//\, d_2$,
$m(\widehat{ABC}) = 110°$,
$m(\widehat{BCD}) = x$,
$m(\widehat{CDE}) = 140°$,
$m(\widehat{DEF}) = 120°$
$\Rightarrow$ **$x = ?$**



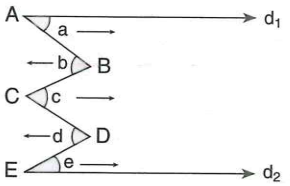
A) 130° B) 140° C) 150° D) 160° E) 170°

Çözüm / Solution

Yanıt / Answer **E**

$m(\widehat{ABC}) + m(\widehat{BCD}) + m(\widehat{CDE}) + m(\widehat{DEF}) = (4-1)\cdot 180°$
$110° + x + 140° + 120° = 540°$
$x = 170°$

Sonuç 4 / Conclusion 4



$d_1 \parallel d_2 \Rightarrow a+c+e=b+d$

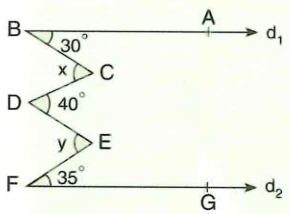
ÖNEMLİ / IMPORTANT

Sonuç 4 için; "sağa bakan açıların toplamı, sola bakan açıların toplamına eşittir" ifadesi kullanılabilir.

You can use "the total of right-facing angles equal to the total of left-facing angles" expressions for conclusion 4.

Örnek / Example 29

$d_1 \parallel d_2$,
$m(\widehat{ABC}) = 30°$,
$m(\widehat{BCD}) = x$,
$m(\widehat{CDE}) = 40°$,
$m(\widehat{DEF}) = y$
$m(\widehat{EFG}) = 35°$
$\Rightarrow x+y = ?$



A) 75° B) 90° C) 105° D) 120° E) 135°

Çözüm / Solution

Yanıt / Answer C

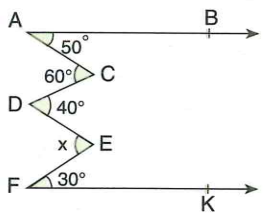
$m(\widehat{ABC}) + m(\widehat{CDE}) + m(\widehat{EFG}) = m(\widehat{BCD}) + m(\widehat{DEF})$

$30° + 40° + 35° = x + y$

$105° = x + y$

Örnek / Example 30

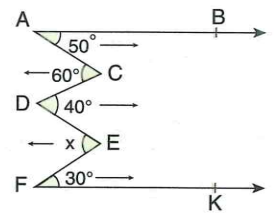
$[AB \parallel [FK$,
$m(\widehat{BAC}) = 50°$,
$m(\widehat{ACD}) = 60°$,
$m(\widehat{CDE}) = 40°$,
$m(\widehat{EFK}) = 30°$
$\Rightarrow$ **$m(\widehat{DEF}) = x = ?$**



A) 30° B) 45° C) 60° D) 75° E) 80°

Çözüm / Solution

Yanıt / Answer C



$m(\widehat{BAC}) + (\widehat{CDE}) + m(\widehat{EFK}) = m(\widehat{ACD}) + m(\widehat{DEF})$

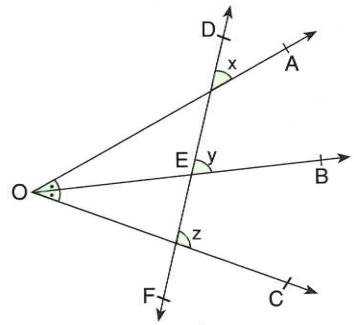
$50° + 40° + 30° = 60° + x$

$120° = 60° + x$

$60° = x$

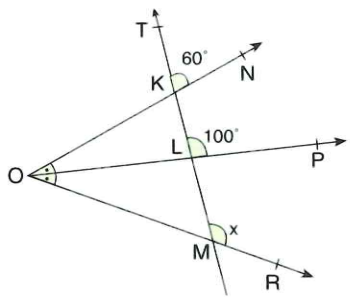
Sonuç 5 / Conclusion 5

$m(\widehat{AOB}) = m(\widehat{BOC}) \Rightarrow y = \frac{x+z}{2}$



Örnek / Example 31

$m(\widehat{KOL}) = m(\widehat{LOM})$,
$m(\widehat{TKN}) = 60°$,
$m(\widehat{KLP}) = 100°$
$\Rightarrow$ **$m(\widehat{LMR}) = x = ?$**



A) 100° B) 120° C) 130° D) 140° E) 150°

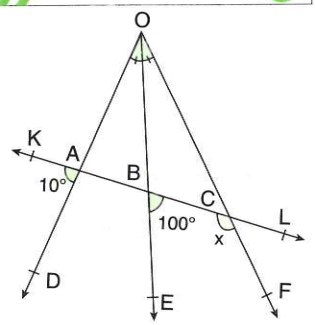
Çözüm / Solution

Yanıt / Answer **D**

$100° = \frac{x + 60°}{2}$ (Sonuç 5 / Conclusion 5)
$200° = x + 60°$
$140° = x$

Örnek / Example 32

$m(\widehat{AOB}) = m(\widehat{BOC})$,
$m(\widehat{DAK}) = 10°$,
$m(\widehat{CBE}) = 100°$
$\Rightarrow$ **$m(\widehat{BCF}) = x = ?$**



A) 100° B) 130° C) 150° D) 165° E) 175°

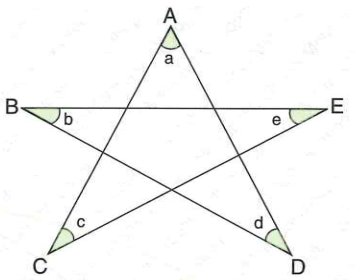
Çözüm / Solution

Yanıt / Answer **C**

$m(\widehat{CBE}) = 100° \Rightarrow m(\widehat{EBA}) = 80°$
$80° = \frac{x + 10°}{2} \Rightarrow 160° = x + 10° \Rightarrow 150° = x$ (Sonuç 5 / Conclusion 5)

Sonuç 6 / Conclusion 6

$a+b+c+d+e=180°$



ÖNEMLİ / IMPORTANT

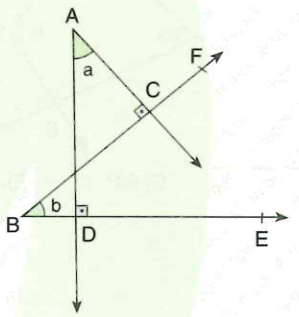
n kanatlı bir yıldızın kanat iç açılarının ölçülerinin toplamı **(n – 4)·180°** dir.

The sum of measures of inner angles of a n-wing star is **(n – 4)·180°.**

KENARLARI DİK OLAN AÇILAR / ANGLES with PERPENDICULAR SIDES

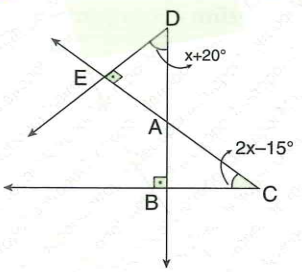
Özellik 1 / Property 1

$[AD \perp [BE$
$[AC \perp [BC$
$\Rightarrow m(\widehat{DAC}) = m(\widehat{CBE})$
$\Rightarrow a = b$



Örnek / Example 33

$[DE \perp [CE,$
$[DB \perp [CB,$
$m(\widehat{BCA}) = 2x-15°$
$m(\widehat{EDA}) = x+20°$
$\Rightarrow$ **x = ?**



A) 25° B) 35° C) 45° D) 55° E) 65°

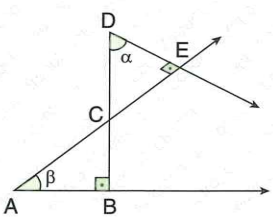
Çözüm / Solution

Yanıt / Answer **B**

$[DE \perp [CE]$
$[DB \perp [CB]$
$\Rightarrow m(\widehat{BCA}) = m(\widehat{EDB})$
$x+20° = 2x-15°$
$35° = x$

Örnek / Example 34

$[DE \perp [AC,$
$[DB \perp [AB,$
$m(\widehat{BAC}) = \beta,$
$m(\widehat{EDC}) = \alpha,$
$\beta = 3\alpha - 80°$
$\Rightarrow$ **α = ?**



A) 20° B) 30° C) 40° D) 50° E) 60°

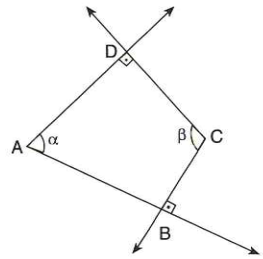
Çözüm / Solution

Yanıt / Answer **C**

$[DE \perp [AC]$
$[DB \perp [AB]$
$\Rightarrow \alpha = \beta$
$\Rightarrow \alpha = \beta, \beta = 3\alpha - 80°$
$\Rightarrow \alpha = 3\alpha - 80°$
$80° = 2\alpha$
$40° = \alpha$

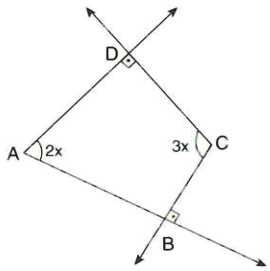
Özellik 2 / Property 2

$$\left.\begin{matrix}[AD \perp [CD \\ [AB \perp [CB\end{matrix}\right\} \Rightarrow \alpha + \beta = 180^\circ$$



Örnek / Example 35

$[AD \perp [CD$,
$[AB \perp [CB$,
$m(\widehat{DAB}) = 2x$,
$m(\widehat{DCB}) = 3x$,
$\Rightarrow$ **x = ?**



A) 18° B) 36° C) 48° D) 54° E) 72°

Çözüm / Solution

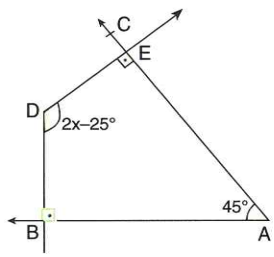
Yanıt / Answer **B**

$$\left.\begin{matrix}[AD \perp [CD \\ [AB \perp [CB\end{matrix}\right\} \Rightarrow m(\widehat{DAB}) + m(\widehat{DCB}) = 2x + 3x = 180^\circ$$

$$5x = 180^\circ$$
$$x = 36^\circ$$

Örnek / Example 36

$[DB \perp [AB$,
$[DE \perp [AC$,
$m(\widehat{BAC}) = 45^\circ$,
$m(\widehat{BDE}) = 2x - 25^\circ$
$\Rightarrow$ **x = ?**



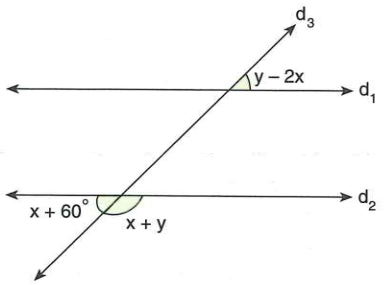
A) 60° B) 70° C) 80° D) 90° E) 100°

Çözüm / Solution

Yanıt / Answer **C**

$$\left.\begin{matrix}[DB \perp [AB \\ [DE \perp [AC\end{matrix}\right\} \Rightarrow m(\widehat{EDB}) + m(\widehat{BAC}) = 180^\circ$$
$$\Rightarrow 2x - 25^\circ + 45^\circ = 180^\circ$$
$$\Rightarrow 2x = 180^\circ - 20^\circ$$
$$\Rightarrow 2x = 160^\circ$$
$$\Rightarrow x = 80^\circ$$

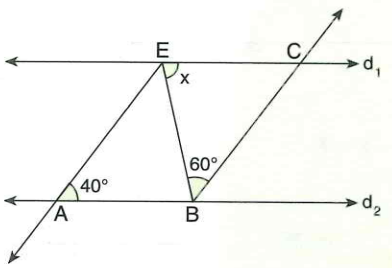
1.



$d_1 \mathbin{/\!/} d_2 \Rightarrow \mathbf{y = ?}$

A) 24° B) 32° C) 36° D) 96° E) 108°

2.

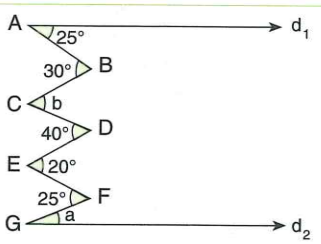


$d_1 \mathbin{/\!/} d_2$, $[EA \mathbin{/\!/} [BC$, $m(\widehat{EAB}) = 40°$, $m(\widehat{EBC}) = 60°$,

$\Rightarrow \mathbf{m(\widehat{BEC}) = x = ?}$

A) 20° B) 30° C) 50° D) 60° E) 80°

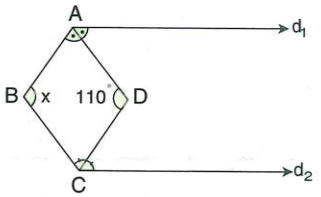
3.



$d_1 \mathbin{/\!/} d_2 \Rightarrow \mathbf{a + b = ?}$

A) 30° B) 35° C) 40° D) 45° E) 50°

4.



$d_1 \mathbin{/\!/} d_2$, $[AD]$ ve $[CD]$ açıortaydır.

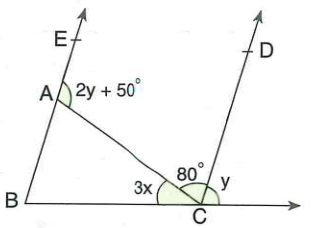
$d_1 \mathbin{/\!/} d_2$, $[AD]$ and $[CD]$ are bisectors.

$m(\widehat{ADC}) = 110° \Rightarrow \mathbf{m(\widehat{ABC}) = x = ?}$

A) 100° B) 110° C) 120° D) 130° E) 140°

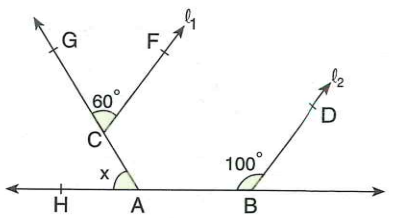
5. $[BA \mathbin{/\!/} [CD$

$\Rightarrow \mathbf{x + y = ?}$



A) 40° B) 50° C) 60° D) 75° E) 80°

6.



$\ell_1 \mathbin{/\!/} \ell_2 \Rightarrow \mathbf{x = ?}$

A) 20° B) 30° C) 40° D) 50° E) 60°

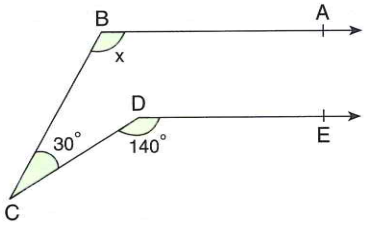
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $[BA \parallel [DE$,

$m(\widehat{BCD}) = 30°$

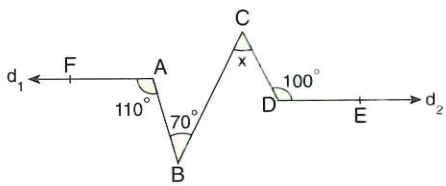
$m(\widehat{CDE}) = 140°$

$\Rightarrow$ **$m(\widehat{CBA}) = x = ?$**



A) 170° B) 150° C) 130° D) 120° E) 110°

8.

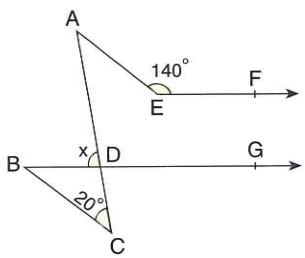


$d_1 \parallel d_2$, $m(\widehat{FAB}) = 110°$, $m(\widehat{ABC}) = 70°$,

$m(\widehat{CDE}) = 100° \Rightarrow$ **$m(\widehat{BCD}) = x = ?$**

A) 70° B) 65° C) 60° D) 55° E) 50°

9.



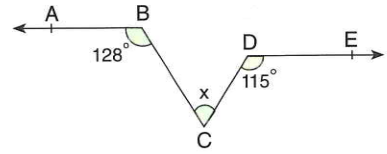
$[EF \parallel [BG$, $[AE] \parallel [BC]$,

$m(\widehat{AEF}) = 140°$, $m(\widehat{BCA}) = 20°$

$\Rightarrow$ **$m(\widehat{BDA}) = x = ?$**

A) 80° B) 75° C) 70° D) 65° E) 60

10.

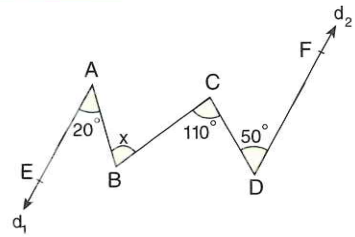


$[DE \parallel [BA$, $m(\widehat{ABC}) = 128°$

$m(\widehat{CDE}) = 115° \Rightarrow$ **$m(\widehat{BCD}) = x = ?$**

A) 57° B) 60° C) 63° D) 66° E) 69°

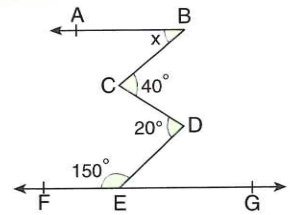
11.



$d_1 \parallel d_2 \Rightarrow$ **$x = ?$**

A) 70° B) 75° C) 80° D) 85° E) 90°

12.



$[BA \parallel [FG$

$\Rightarrow$ **$m(\widehat{ABC}) = x = ?$**

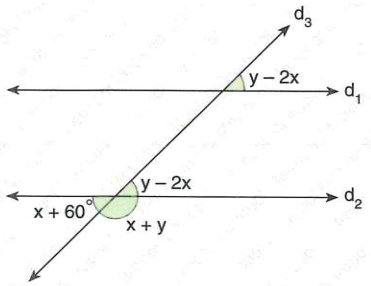
A) 10° B) 20° C) 30° D) 40° E) 50°

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	E	E	E	B	C	E	C	E	C	C	E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



$x + y + x + 60^\circ = 180^\circ \Rightarrow 2x + y = 120^\circ$ ....**(1)**

$y - 2x + x + y = 180^\circ \Rightarrow 2y - x = 180^\circ$

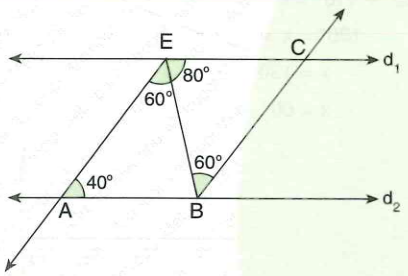
$x = 2y - 180^\circ$ ....**(2)**

$\left.\begin{array}{l} 2x + y = 120^\circ \text{.....(1)} \\ x = 2y - 180^\circ \text{.....(2)} \end{array}\right\} \Rightarrow 2(2y - 180^\circ) + y = 120^\circ$

$5y = 480^\circ \Rightarrow y = 96^\circ$

Yanıt / The Answer is D

2.



$[EA // [BC \Rightarrow m(\widehat{EBC}) = m(\widehat{AEB}) = 60^\circ$

$d_1 // d_2 \Rightarrow m(\widehat{EAB}) + m(\widehat{AEC}) = 180^\circ$

$40^\circ + m(\widehat{AEC}) = 180^\circ$

$m(\widehat{AEC}) = 140^\circ = m(\widehat{AEB}) + m(\widehat{BEC})$

$140^\circ = 60^\circ + m(\widehat{BEC})$

$\Rightarrow m(\widehat{BEC}) = 80^\circ$

Yanıt / The Answer is E

3. $d_1 // d_2 \Rightarrow$

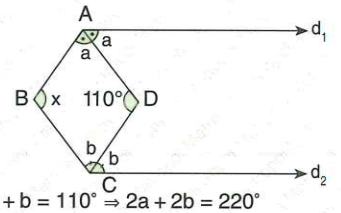
$25^\circ + b + 20^\circ + a = 30^\circ + 40^\circ + 25^\circ$

$a + b + 45^\circ = 95^\circ$

$a + b = 50^\circ$

Yanıt / The Answer is E

4.



$a + b = 110^\circ \Rightarrow 2a + 2b = 220^\circ$

$2a + 2b + x = 360^\circ$

$220^\circ + x = 360^\circ \Rightarrow x = 140^\circ$

Yanıt / The Answer is E

5. $[BA // [CD \Rightarrow 2y + 50^\circ + 80^\circ = 180^\circ$

$2y = 50^\circ \Rightarrow y = 25^\circ$

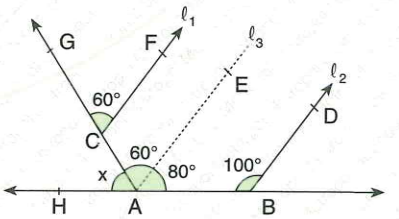
$3x + 80^\circ + y = 180^\circ$

$3x + 105^\circ = 180^\circ \Rightarrow x = 25^\circ$

$x + y = 25^\circ + 25^\circ = 50^\circ$

Yanıt / The Answer is B

6.



$m(\widehat{BAE}) = 180^\circ - 100^\circ = 80^\circ$

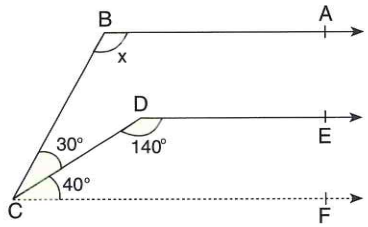
$m(\widehat{CAE}) = m(\widehat{FCG}) = 60^\circ$ [yöndeş açılar / the corresponding angles]

$x = 180^\circ - (60^\circ + 80^\circ) = 40^\circ$

Yanıt / The Answer is C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



$m(\widehat{DCF}) + m(\widehat{CDE}) = 180^\circ$ [karşı durumlu açılar / the consecutive interior angles]

$m(\widehat{DCF}) + 140^\circ = 180^\circ \Rightarrow m(\widehat{DCF}) = 40^\circ$

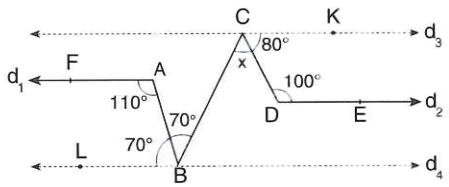
$m(\widehat{ABC}) + m(\widehat{BCF}) = 180^\circ$

$x + 70 = 180^\circ$

$x = 110^\circ$

Yanıt / The Answer is E

8.



$m(\widehat{FAB}) + m(\widehat{ABL}) = 180^\circ$ [karşı durumlu açılar / the consecutive interior angles]

$110 + m(\widehat{ABL}) = 180^\circ$

$m(\widehat{ABL}) = 70^\circ$

$m(\widehat{DCK}) + m(\widehat{CDE}) = 180^\circ$ [karşı durumlu açılar / the consecutive interior angles]

$m(\widehat{DCK}) + 100 = 180^\circ$

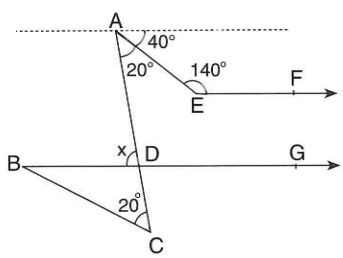
$m(\widehat{DCK}) = 80^\circ$

$m(\widehat{CBL}) = m(\widehat{BCK})$

$70^\circ + 70^\circ = x + 80^\circ \Rightarrow x = 60^\circ$

Yanıt / The Answer is C

9.

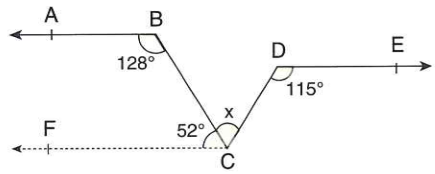


$[AE] // [BC] \Rightarrow m(\widehat{BCD}) = m(\widehat{DAE}) = 20^\circ$

$x = 20^\circ + 40^\circ = 60^\circ$

Yanıt / The Answer is E

10.



$m(\widehat{ABC}) + m(\widehat{BCF}) = 180^\circ$

$128^\circ + m(\widehat{BCF}) = 180^\circ$

$m(\widehat{BCF}) = 52^\circ$

$m(BCF) + m(\widehat{BCD}) = m(\widehat{CDE}) = 115^\circ$

$m(\widehat{BCD}) = x = 63^\circ$

Yanıt / The Answer is C

11. $m(\widehat{EAB}) + m(\widehat{BCD}) = m(\widehat{ABC}) + m(\widehat{CDF})$

$20^\circ + 110^\circ = x + 50^\circ$

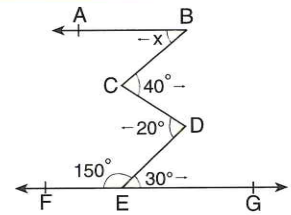
$130^\circ = x + 50^\circ$

$x = 130^\circ - 50^\circ$

$x = 80^\circ$

Yanıt / The Answer is C

12.



$[BA // FG \Rightarrow x + 20^\circ = 40^\circ + 30^\circ$

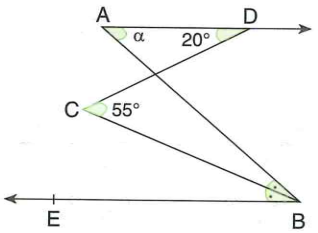
$x = 70^\circ - 20^\circ$

$= 50^\circ$

Yanıt / The Answer is E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

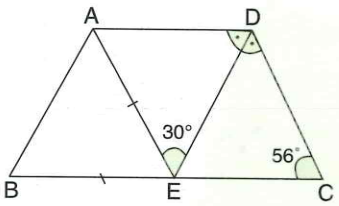
1. $[AD] \parallel [BE$
$\Rightarrow \alpha = ?$



A) 70° B) 65° C) 60° D) 55° E) 50°

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2018]

2.

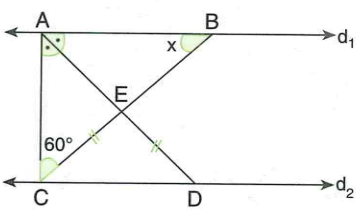


$[AD] \parallel [BC]$
$\Rightarrow \mathbf{m(\widehat{ABE}) = ?}$

A) 40° B) 44° C) 46° D) 56° D) 64°

[İSTANBUL ÜNİVERSİTESİ – YÖS 2017]

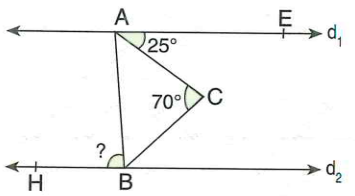
3. $d_1 \parallel d_2$,
$|EC| = |ED|$
$m(\widehat{ACB}) = 60° \Rightarrow \mathbf{x = ?}$



A) 20° B) 25° C) 30°
D) 35° E) 40°

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2017]

4.

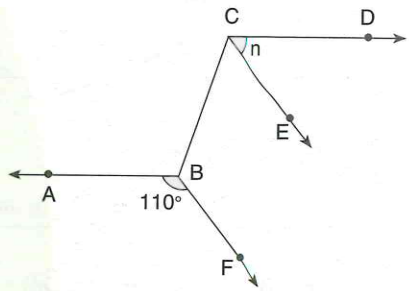


$d_1 \parallel d_2, |AB| = |BC|, m(\widehat{EAC}) = 25°,$
$m(\widehat{ACB}) = 70° \Rightarrow \mathbf{m(\widehat{ABH}) = ?}$

A) 115° B) 110° C) 105° D) 100° E) 95°

[İSTANBUL ÜNİVERSİTESİ – YÖS 2017]

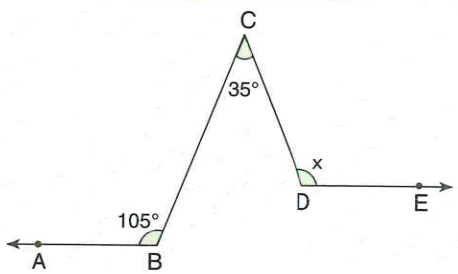
5. $[BA \parallel [CD,$
$[BF \parallel [CE,$
$m(\widehat{ABF}) = 110°$
$\Rightarrow \mathbf{m(\widehat{DCE}) = n = ?}$



A) 30° B) 40° C) 50° D) 60° E) 70°

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2014]

6.



$[BA \parallel [DE, m(\widehat{ABC}) = 105°, m(\widehat{BCD}) = 35° \Rightarrow \mathbf{m(\widehat{CDE}) = x = ?}$

A) 80° B) 95° C) 100° D) 110° D) 115°

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2013]

YANITLAR / ANSWERS

1	2	3	4	5	6
A	C	E	E	E	D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $[AD \parallel [BE$:

$m(\widehat{ADC}) + m(\widehat{EBC}) = m(\widehat{DCB})$

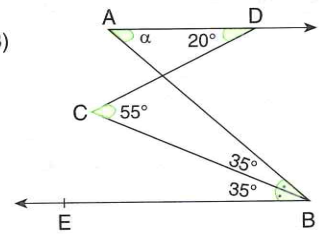
$20^\circ + m(\widehat{EBC}) = 55^\circ$

$m(\widehat{EBC}) = 35^\circ$

$m(\widehat{DAB}) = m(\widehat{ABE})$

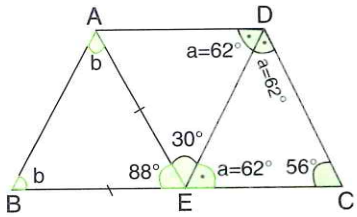
$\alpha = 35^\circ + 35^\circ$

$= 70^\circ$



Yanıt/ The Answer is A

2.



$[AD \parallel [BC \Rightarrow m(\widehat{CED}) = m(\widehat{EDA}) = m(\widehat{EDC})$

$2a + 56^\circ = 180^\circ$

$2a = 124^\circ$

$a = 62^\circ$

$m(\widehat{AEB}) = 180^\circ - (30^\circ + 62^\circ)$

$m(\widehat{AEB}) = 180^\circ - 92^\circ$

$m(\widehat{AEB}) = 88^\circ$

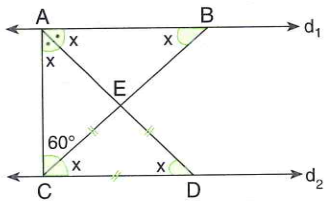
$2b + 88^\circ = 180^\circ$

$2b = 92^\circ$

$b = 46^\circ = m(\widehat{ABE})$

Yanıt / The Answer is C

3.



$d_1 \parallel d_2 \Rightarrow m(\widehat{ECD}) = x$

$|EC| = |ED| \Rightarrow m(\widehat{EDC}) = x$

$\widehat{ACD}$: $x + (60^\circ + x) + x = 180^\circ$

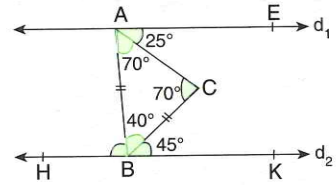
$3x + 60^\circ = 180^\circ$

$3x = 120^\circ$

$x = 40^\circ$

Yanıt / The Answer is E

4.



$d_1 \parallel d_2$

$\Rightarrow m(\widehat{EAC}) + m(\widehat{CBK}) = m(\widehat{ACB})$

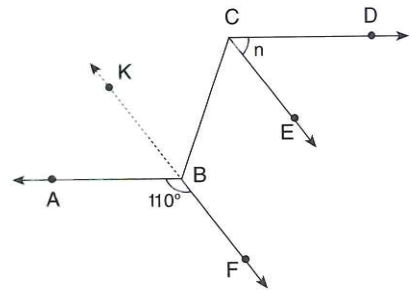
$25^\circ + m(\widehat{CBK}) = 70^\circ \Rightarrow m(\widehat{CBK}) = 45^\circ$

$|AB| = |BC| \Rightarrow m(\widehat{BAC}) = 70^\circ \Rightarrow m(\widehat{ABH}) = 180^\circ - (40^\circ + 45^\circ)$

$= 95^\circ$

Yanıt / The Answer is E

5.



$[BK \parallel [CE$ çizilirse / If $[BE \parallel [CE$ drawn

$m(\widehat{KBA}) + m(\widehat{ABF}) = 180^\circ$ [Doğru açı / Straight angle]

$m(\widehat{KBA}) + 110^\circ = 180^\circ$

$m(\widehat{KBA}) = 70^\circ$

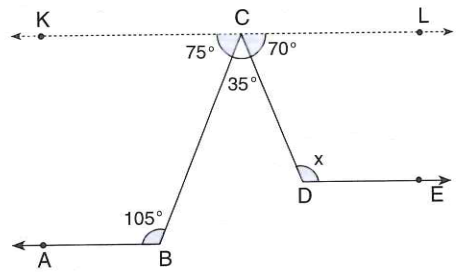
$m(\widehat{KBC}) = m(\widehat{BCE}) = \alpha$

$m(\widehat{DCB}) = m(\widehat{ABC})$

$\alpha + n = 70^\circ + \alpha \Rightarrow n = 70^\circ$

Yanıt/ The Answer is E

6.



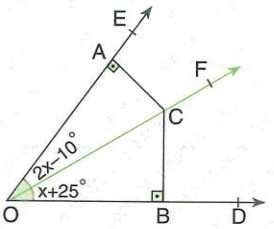
$m(\widehat{ABC}) + m(\widehat{KCB}) = 180^\circ \Rightarrow m(\widehat{KCB}) = 75^\circ$

$70^\circ + x = 180^\circ \Rightarrow x = 110^\circ$

Yanıt / The Answer is D

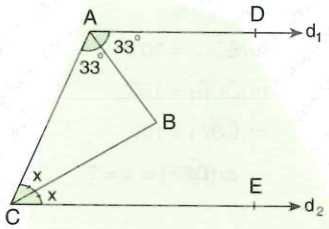
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. [OC bir açıortaydır.
[OC is a bisector.
[CA] ⊥ [OA,
[CB] ⊥ [OB,
$m(\widehat{AOC}) = 2x-10°$,
$m(\widehat{BOC}) = x+25°$
⇒ **$m(\widehat{AOC}) = ?$**



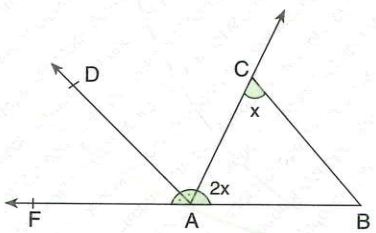
Yanıt / The Answer is 60°

2. $d_1 // d_2$,
$m(\widehat{BAD}) = m(\widehat{CAB}) = 33°$,
$m(\widehat{ACB}) = m(\widehat{BCE}) = x$
⇒ **x = ?**



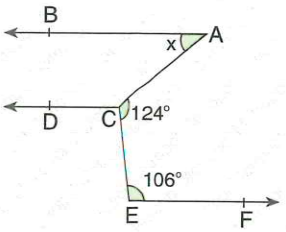
Yanıt / The Answer is 57°

3. [AD bir açıortaydır
[AD is a bisector.
[AD // [BC],
$m(\widehat{ACB}) = x$,
$m(\widehat{CAB}) = 2x$
⇒ **$m(\widehat{ABC}) = ?$**



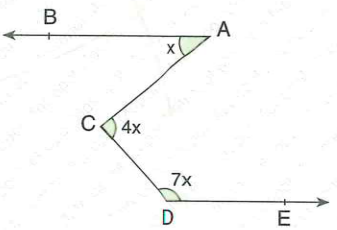
Yanıt / The Answer is 45°

4. [AB // [CD // [EF,
$m(\widehat{ACE}) = 124°$,
$m(\widehat{CEF}) = 106°$
⇒ **$m(\widehat{BAC}) = x = ?$**



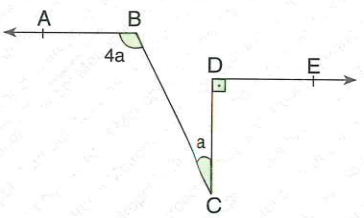
Yanıt / The Answer is 50°

5. [AB // [DE ,
$m(\widehat{BAC}) = x$,
$m(\widehat{ACD}) = 4x$,
$m(\widehat{CDE}) = 7x$
⇒ **x = ?**



Yanıt / The Answer is 18°

6. [BA // [DE,
[CD] ⊥ [DE,
$m(\widehat{ABC}) = 4a$,
$m(\widehat{BCD}) = a$
⇒ **a = ?**



Yanıt / The Answer is 30°

METROPOL YAYINLARI • METROPOL PUBLICATIONS

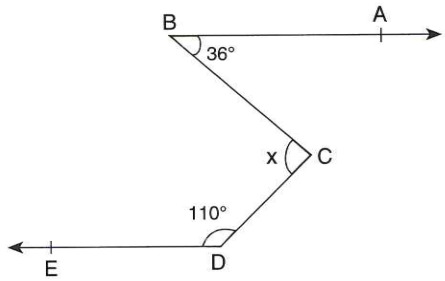
7. $[BA \parallel [DE$,

$m(\widehat{ABC}) = 36°$,

$m(\widehat{BCD}) = x$,

$m(\widehat{CDE}) = 110°$

$\Rightarrow$ **x = ?**



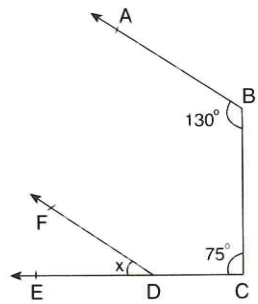
Yanıt / The Answer is 106°

8. $[BA \parallel [DF$,

$m(\widehat{ABC}) = 130°$

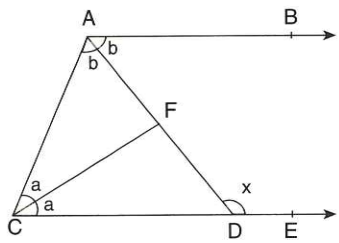
$m(\widehat{BCE}) = 75°$

$\Rightarrow$ **$m(\widehat{FDE}) = x$ = ?**



Yanıt / The Answer is 25°

9.



[AD] ve [CF] birer açıortaydır.

[AD] and [CF] are bisectors.

$[AB \parallel [CD$,

$b - a = 16°$

$\Rightarrow$ **$m(\widehat{ADE}) = x$ = ?**

Yanıt / The Answer is 127°

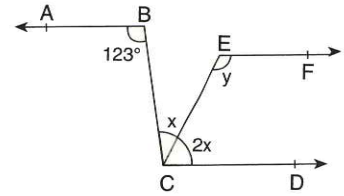
10. $[BA \parallel [EF \parallel [CD$

$m(\widehat{ABC}) = 123°$,

$m(\widehat{BCE}) = x$,

$m(\widehat{ECD}) = 2x$

$\Rightarrow$ **$m(\widehat{CEF}) = y$ = ?**



Yanıt / The Answer is 98°

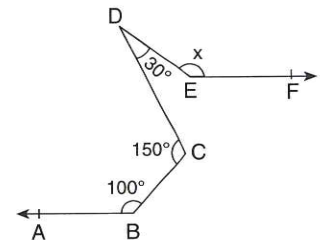
11. $[EF \parallel [BA$,

$m(\widehat{EDC}) = 30°$,

$m(\widehat{DCB}) = 150°$,

$m(\widehat{CBA}) = 100°$

$\Rightarrow$ **$m(\widehat{DEF}) = x$ = ?**



Yanıt / The Answer is 140°

12. $[BA \parallel [DE$,

$[DF \parallel [BC]$,

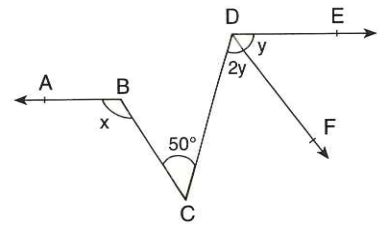
$m(\widehat{ABC}) = x$,

$m(\widehat{CDF}) = 2y$,

$m(\widehat{FDE}) = y$,

$m(\widehat{BCD}) = 50°$

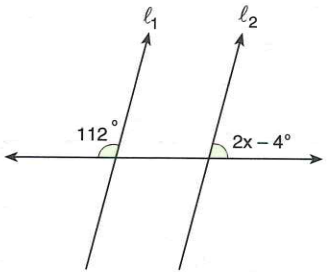
$\Rightarrow$ **x = ?**



Yanıt / The Answer is 155°

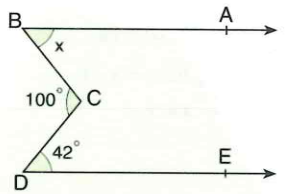
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $\ell_1 // \ell_2 \Rightarrow$ **x = ?**



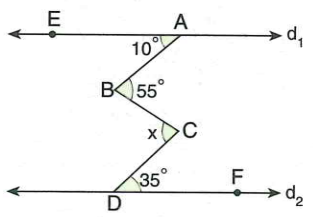
A) 18° B) 24° C) 36° D) 38° E) 68°

2. [BA // [DE,
$m(\widehat{EDC}) = 42°$,
$m(\widehat{DCB}) = 100°$
$\Rightarrow$ **$m(\widehat{CBA}) = x$ = ?**



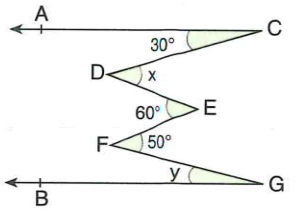
A) 42° B) 48° C) 56° D) 58° E) 68°

3. $d_1 // d_2$,
$m(\widehat{EAB}) = 10°$,
$m(\widehat{ABC}) = 55°$,
$m(\widehat{CDF}) = 35°$
$\Rightarrow$ **$m(\widehat{BCD}) = x$ = ?**



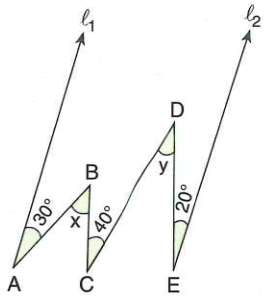
A) 70° B) 80° C) 90° D) 100° E) 110°

4. [CA // [GB,
x = 2y
$\Rightarrow$ **y = ?**



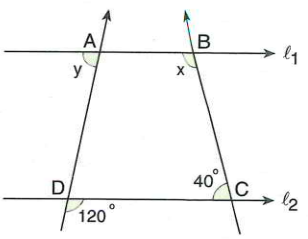
A) 10° B) 20° C) 30° D) 40° E) 50°

5. $\ell_1 // \ell_2$,
$m(\widehat{A}) = 30°$,
$m(\widehat{C}) = 40°$,
$m(\widehat{E}) = 20°$
$\Rightarrow$ **x + y = ?**



A) 70° B) 80° C) 90° D) 100° E) 110°

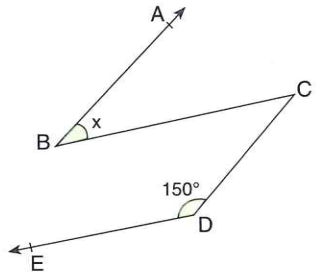
6. $\ell_1 // \ell_2$
$\Rightarrow$ **x – y = ?**



A) 60° B) 65° C) 70° D) 75° E) 80°

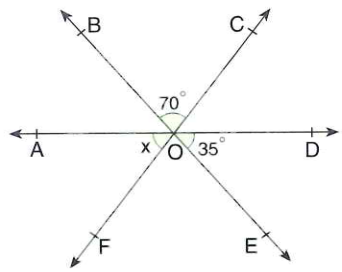
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [BA] // [DC],
[BC] // [DE,
$m(\widehat{D}) = 150°$
$\Rightarrow$ **x = ?**



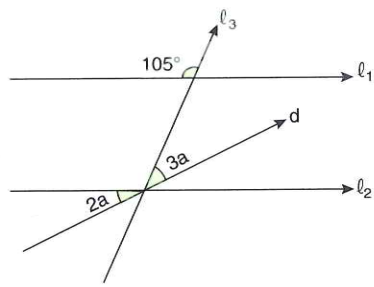
A) 45° B) 40° C) 35°
D) 30° E) 25°

8. $m(\widehat{BOC}) = 70°$,
$m(\widehat{DOE}) = 35°$
$\Rightarrow$ **$m(\widehat{AOF})$ = ?**



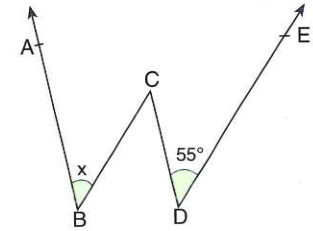
A) 60° B) 70° C) 75°
D) 80° E) 85°

9. $\ell_1 // \ell_2 \Rightarrow$ **a = ?**



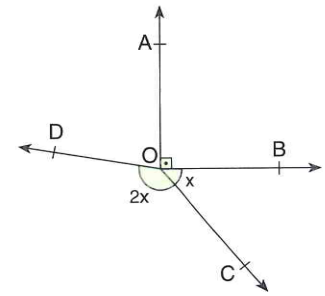
A) 5° B) 10° C) 15°
D) 20° E) 25°

10. [BA // [CD],
[BC] // [DE
$\Rightarrow$ **x = ?**



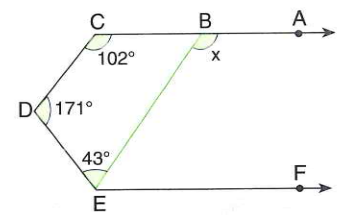
A) 40° B) 45° C) 50°
D) 55° E) 60°

11. [OA $\perp$ [OB,
$m(\widehat{COB}) = x$,
$m(\widehat{COD}) = 2x$,
$m(\widehat{DOA}) = x + 6$
$\Rightarrow$ **x = ?**



A) 52° B) 58° C) 61°
D) 66° E) 70°

12. [CA // [EF,
$m(\widehat{BCD}) = 102°$,
$m(\widehat{CDE}) = 171°$,
$m(\widehat{DEB}) = 43°$
$\Rightarrow$ **$m(\widehat{ABE}) = x$ = ?**



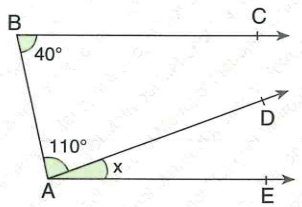
A) 136° B) 138° C) 140°
D) 142° E) 144°

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	D	B	D	C	E	D	C	C	D	D	A

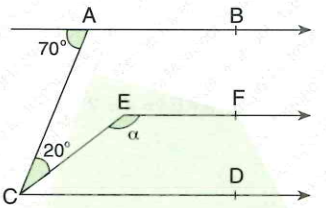
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $[BC] // [AE]$,
$m(\widehat{B}) = 40°$
$m(\widehat{BAD}) = 110°$
$\Rightarrow$ **x = ?**



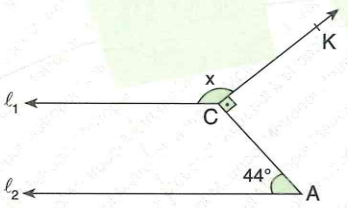
A) 10° B) 20° C) 30°
D) 40° E) 50°

2. $[AB // [EF // [CD$
$\Rightarrow$ **$m(\widehat{CEF}) = \alpha$ = ?**



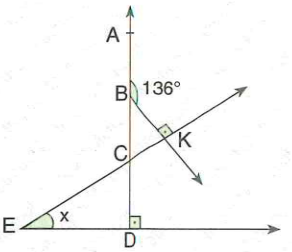
A) 100° B) 105° C) 110°
D) 120° E) 130°

3. $\ell_1 // \ell_2$,
$[CK \perp [CA]$,
$m(\widehat{A}) = 44°$
$\Rightarrow$ **x = ?**



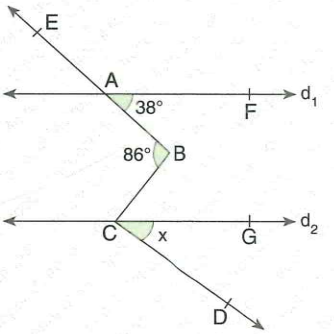
A) 122° B) 124° C) 134°
D) 136° E) 140°

4. $m(\widehat{BDE}) = 90°$,
$m(\widehat{CKB}) = 90°$,
$m(\widehat{ABK}) = 136°$
$\Rightarrow$ **x = ?**



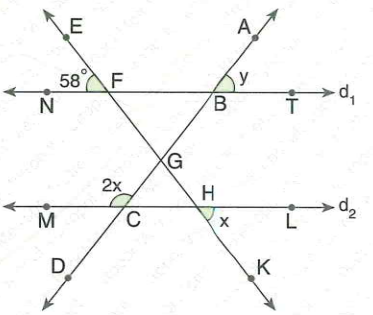
A) 46° B) 44° C) 42°
D) 36° E) 34°

5. $d_1 // d_2$,
$[BE // [CD$,
$m(\widehat{FAB}) = 38°$,
$m(\widehat{ABC}) = 86°$
$\Rightarrow$ **$m(\widehat{GCD}) = x$ = ?**



A) 38° B) 44° C) 56°
D) 69° E) 75°

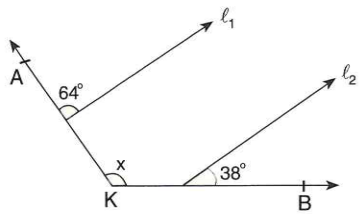
6. $d_1 // d_2$,
$m(\widehat{EFN}) = 58°$,
$m(\widehat{ABT}) = y$,
$m(\widehat{GCM}) = 2x$,
$m(\widehat{LHK}) = x$
$\Rightarrow$ **y = ?**



A) 54° B) 58° C) 62°
D) 64° E) 72°

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.

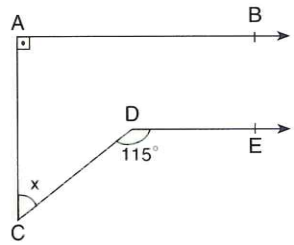


$\ell_1 \,//\, \ell_2 \Rightarrow$ **m(AKB) = x = ?**

A) 98° B) 100° C) 102°

D) 120° E) 130°

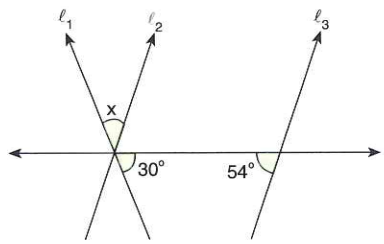
8. [AB // [DE,
$m(\widehat{A}) = 90°$,
$m(\widehat{D}) = 115°$
$\Rightarrow$ **x = ?**



A) 40° B) 35° C) 30°

D) 25° E) 20°

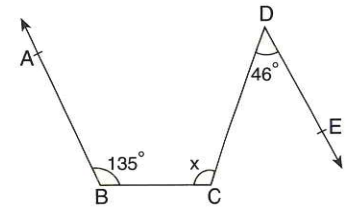
9. $\ell_2 \,//\, \ell_3$
$\Rightarrow$ **x = ?**



A) 76° B) 82° C) 86°

D) 92° E) 96°

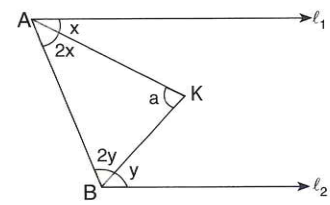
10. [BA // [DE,
$m(\widehat{ABC}) = 135°$,
$m(\widehat{CDE}) = 46°$
$\Rightarrow$ **m(BCD) = x = ?**



A) 50° B) 65° C) 75°

D) 86° E) 91°

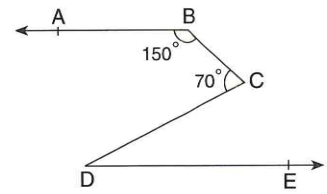
11. $\ell_1 \,//\, \ell_2$
$\Rightarrow$ **m(AKB) = a = ?**



A) 45° B) 50° C) 55°

D) 60° E) 70°

12. [BA // DE,
$m(\widehat{ABC}) = 150°$,
$m(\widehat{BCD}) = 70°$
$\Rightarrow$ **m(CDE) = ?**



A) 20° B) 25° C) 30°

D) 35° E) 40°

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	E	C	B	A	D	C	D	E	E	D	E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $d_1 \parallel d_2$,

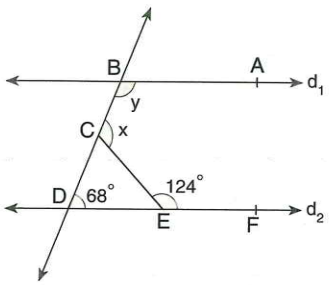
$m(\widehat{ABC}) = y$,

$m(\widehat{BCE}) = x$,

$m(\widehat{CDE}) = 68°$,

$m(\widehat{CEF}) = 124°$

$\Rightarrow$ **x – y = ?**



A) 12° B) 14° C) 15°

D) 16° E) 18°

2. $d_1 // d_2$,

$m(\widehat{LAK}) = m(\widehat{KAB})$,

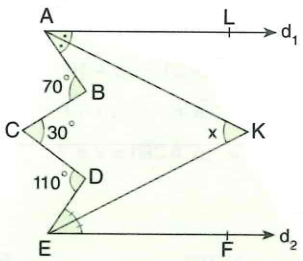
$m(\widehat{DEK}) = m(\widehat{KEF})$,

$m(\widehat{ABC}) = 70°$

$m(\widehat{BCD}) = 30°$

$m(\widehat{CDE}) = 110°$

$\Rightarrow$ **$m(\widehat{AKE}) = x$ = ?**



A) 55° B) 67° C) 72°

D) 75° E) 83°

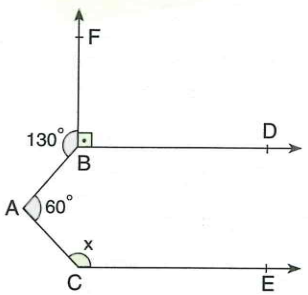
3. [BD // [CE,

[BD ⊥ [BF,

$m(\widehat{ABF}) = 130°$,

$m(\widehat{BAC}) = 60°$

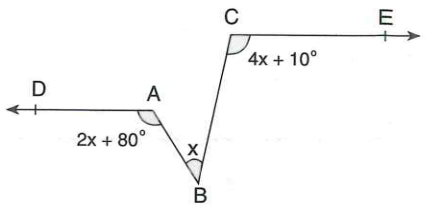
$\Rightarrow$ **$m(\widehat{ACE}) = x$ = ?**



A) 120° B) 130° C) 140°

D) 150° E) 160°

4.



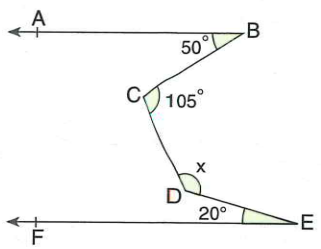
[AD // [CE $\Rightarrow$ **x = ?**

A) 15° B) 16° C) 17°

D) 18° E) 20°

5. [BA // [EF

$\Rightarrow$ **$m(\widehat{CDE}) = x$ = ?**



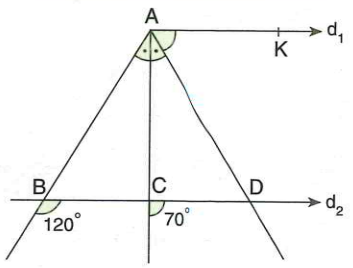
A) 145° B) 140° C) 135°

D) 130° E) 125°

6. $d_1 // d_2$,

$m(\widehat{BAC}) = m(\widehat{CAD})$

$\Rightarrow$ **$m(\widehat{KAD}) = ?$**

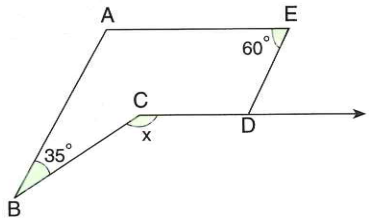


A) 10° B) 20° C) 30°

D) 40° E) 50

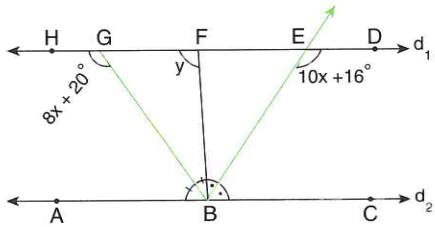
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [BA] // [DE],
[AE] // [CD],
$m(\widehat{E}) = 60°$,
$m(\widehat{B}) = 35°$
$\Rightarrow$ **x = ?**



A) 125° B) 130° C) 155°
D) 160° E) 165°

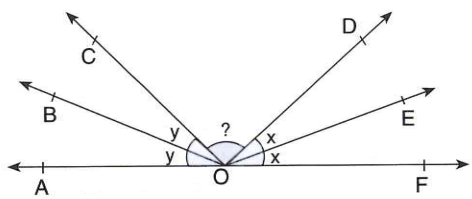
8.



$d_1 // d_2$,
$m(\widehat{HGB}) = 8x + 20°$,
$m(\widehat{DEB}) = 10x + 16°$,
$m(\widehat{ABG}) = m(\widehat{GBF})$,
$m(\widehat{FBE}) = m(\widehat{EBC}) \Rightarrow$ **$m(\widehat{GFB}) = y = ?$**

A) 68° B) 69° C) 70°
D) 71° E) 72°

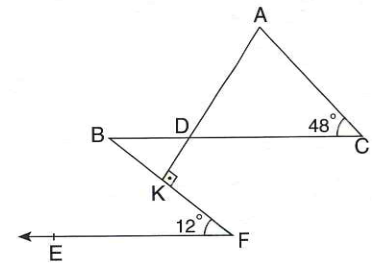
9.



$m(\widehat{AOB}) = m(\widehat{BOC}) = y$,
$m(\widehat{DOE}) = m(\widehat{EOF}) = x$,
$m(\widehat{COE}) = 145°$,
$m(\widehat{BOD}) = 140° \Rightarrow$ **$m(\widehat{COD}) = ?$**

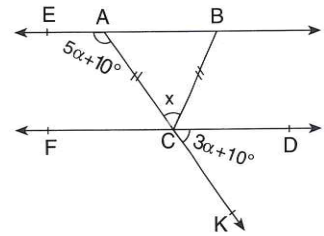
A) 110° B) 120° C) 125°
D) 130° E) 140°

10. [FE // [BC],
[AK] $\perp$ [BF]
$\Rightarrow$ **$m(\widehat{KAC}) = ?$**



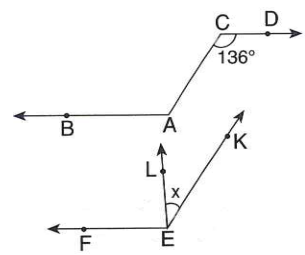
A) 44° B) 48° C) 52°
D) 54° E) 56°

11. [BE // FD,
|AC| = |BC|,
$m(\widehat{EAC}) = 5\alpha + 10°$,
$m(\widehat{DCK}) = 3\alpha + 10°$
$\Rightarrow$ **$m(\widehat{ACB}) = x = ?$**



A) 70° B) 60° C) 50°
D) 40° E) 30°

12. [AB // [EF// [CD,
[EK // [AC],
[EL $\perp$ [AB,
$m(\widehat{ACD}) = 136°$
$\Rightarrow$ **$m(\widehat{LEK}) = x = ?$**



A) 36° B) 42° C) 46°
D) 52° E) 64°

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
A	D	E	D	A	B	C	A	D	D	D	C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

BÖLÜM CHAPTER 2

TARİHSEL NOT / HISTORICAL NOTE

Isaac Newton [1643 – 1727]

İngiliz matematikçi, fizikçi, astronom, mucit, filozof, ilahiyatçı. Newton 1661 yılında Cambridge'de Trinity College'e girdi. Cambridge'deki üç yıl boyunca cebir, geometri ve trigonometri dersleri aldı. Alan, yay uzunluğu, tanjant bulma gibi eskiden kullanılan yöntemleri diferansiyel hesaplamayı temel alarak birleştirdi. 1667'de Newton , üniversite tekrar açılınca Cambridge'e geri döndü ve iki yıl sonra matematik profesörü oldu. Newton tarihin en önemli bilim eserlerinden biri olan "Philosophiæ Naturalis Principia Mathematica (Doğa Felsefesinin Matematiksel İlkeleri)" kitabını Latince yayınladı. Kitapta ispatlar geometri ile yapılmış, evrensel kütle çekimi açıklanmış ve cisimlerin kütleleri ile doğru orantılı, mesafeleri ile ters orantılı birbirlerini çektiklerini açıklamıştır.

English mathematician, physicist, astronomer, inventor, philosopher, and theologian. Newton entered Trinity College in Cambridge in 1661. For three years in Cambridge he studied algebra, geometry and trigonometry. He combined previously used methods in area, arc length, and tangent with findings based on differential calculation. In 1667, Newton returned to Cambridge when the university was reopened, and two years later he became a professor of mathematics. Newton published one of the most important works of science in history, the "Philosophiæ Naturalis Principia Mathematica (The Mathematical Principles of Nature Philosophy)" book in Latin. In the book, the proofs were made with geometry, explaining universal gravitational attraction, and explaining that they are in direct proportion to the masses of objects and inversely proportional to their distances.

ÜÇGENDE AÇILAR / ANGLES in TRIANGLE

Bu bölüm, 24 çözümlü örnek, 12 çözümlü test sorusu, 6 çözümlü YÖS sorusu, 24 alıştırma sorusu, 48 test sorusu içermektedir.
This chapter includes 24 examples with solutions, 12 test questions with solutions, 6 YÖS questions with solutions, 24 exercise questions and 48 test questions.

BÖLÜM / CHAPTER 2 ..... 35 - 66

ÜÇGENDE AÇILAR / ANGLES in TRIANGLE

- Üçgende Açılar / Angles in Triangle ..... 37 - 46
  - Üçgende Açı Özellikleri / Angle Properties in a Triangle ..... 37 - 39
  - Üçgen Çeşitleri / Types of Triangle ..... 39 - 43
  - Üçgenen Yardımcı Elemanları / The Auxiliary Elements of a Triangle ..... 44 - 46
- Çözümlü Test / Test With Solutions ..... 49 - 52
- YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 53 - 54
- Alıştırmalar / Exercises ..... 55 - 58
- Konu Testleri / Practice Tests ..... 59 - 66

BÖLÜM
02
CHAPTER

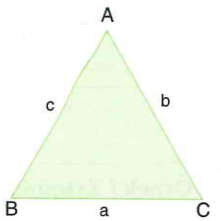
ÜÇGENDE AÇILAR
ANGLES in TRIANGLE

ÜÇGENDE AÇILAR / ANGLES in TRIANGLE

Tanım: Bir düzlemde, doğrusal olmayan herhangi üç noktayı birleştiren doğru parçalarının birleşimine **üçgen** denir.

Definition: The union of three line segments joining three line non–colinear points in a plane is called a triangle.

$[AB] \cup [AC] \cup [BC] = \widehat{ABC}$



ÜÇGENDE AÇI ÖZELLİKLERİ / ANGLE PROPERTIES in a TRIANGLE

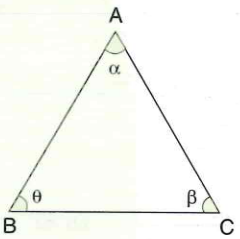
Özellik 1 / Property 1

Bir üçgenin iç açılarının toplamı 180° dir.

The sum of the interior angles of a triangle is 180°.

$m(\widehat{A}) + m(\widehat{B}) + m(\widehat{C}) = 180^\circ$

$\alpha + \beta + \theta = 180^\circ$



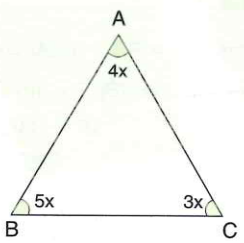
Örnek / Example 1

$m(\widehat{BAC}) = 4x$,

$m(\widehat{ACB}) = 3x$,

$m(\widehat{ABC}) = 5x$

$\Rightarrow$ **x = ?**



A) 15° B) 20° C) 25° D) 30° E) 35°

Çözüm / Solution

Yanıt / Answer **A**

$m(\widehat{A}) + m(\widehat{B}) + m(\widehat{C}) = 180^\circ$

$4x + 5x + 3x = 180^\circ$

$12x = 180^\circ$

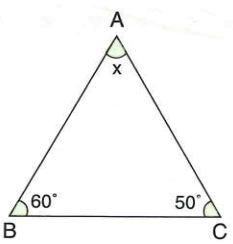
$x = 15^\circ$

Örnek / Example 2

$m(\widehat{ABC}) = 60^\circ$

$m(\widehat{ACB}) = 50^\circ$

$\Rightarrow$ **$m(\widehat{BAC}) = x = ?$**



A) 40° B) 50° C) 60° D) 70° E) 80°

Çözüm / Solution

Yanıt / Answer **D**

$m(\widehat{ABC}) + m(\widehat{BAC}) + m(\widehat{ACB}) = 180^\circ$

$60^\circ + x + 50^\circ = 180^\circ$

$x + 110^\circ = 180^\circ$

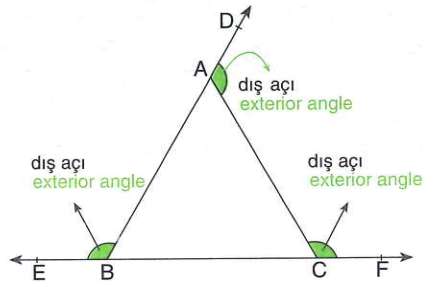
$x = 70^\circ$

Özellik 2 / Property 2

Bir üçgenin dış açılarının toplamı 360° dir.

The sum of the exterior angles of a triangle is 360°.

$$m(\widehat{DAC}) + m(\widehat{ACF}) + m(\widehat{ABE}) = 360^\circ$$

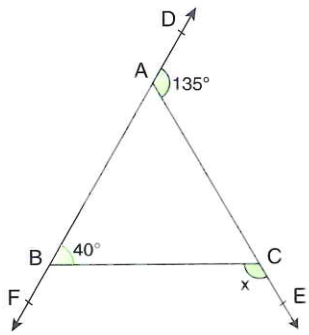


Örnek / Example 3

$m(\widehat{DAC}) = 135^\circ$,

$m(\widehat{ABC}) = 40^\circ$,

$\Rightarrow$ **$m(\widehat{BCE}) = x = ?$**



A) 75° B) 80° C) 85° D) 90° E) 95°

Çözüm / Solution

Yanıt / Answer **C**

$m(\widehat{ABC}) = 40^\circ \Rightarrow m(\widehat{CBF}) = 140^\circ$

$m(\widehat{BCE}) + m(\widehat{CBF}) + m(\widehat{DAC}) = 360^\circ$

$x + 140^\circ + 135^\circ = 360^\circ$

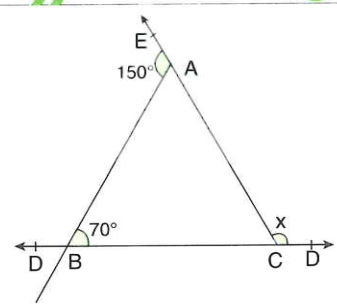
$x = 85^\circ$

Örnek / Example 4

$m(\widehat{BAE}) = 150^\circ$

$m(\widehat{ABC}) = 70^\circ$

$\Rightarrow$ **$m(\widehat{ACD}) = x = ?$**



A) 100° B) 110° C) 120° D) 130° E) 140°

Çözüm / Solution

Yanıt / Answer **A**

$m(\widehat{ABC}) = 70^\circ \Rightarrow m(\widehat{ABD}) = 110^\circ$

$m(\widehat{ABD}) + m(\widehat{BAE}) + m(\widehat{ACD}) = 360^\circ$

$110^\circ + 150^\circ + x = 360^\circ$

$260^\circ + x = 360^\circ$

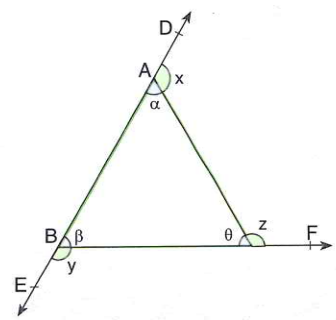
$x = 100^\circ$

Özellik 3 / Property 3

Bir üçgende bir dış açının ölçüsü, kendisine komşu olmayan iki iç açının ölçüleri toplamına eşittir.

The measure of an exterior angle of a triangle is equal to the sum of the measures of the two remote interior angles.

$$x = \beta + \theta$$
$$y = \alpha + \theta$$
$$z = \alpha + \beta$$

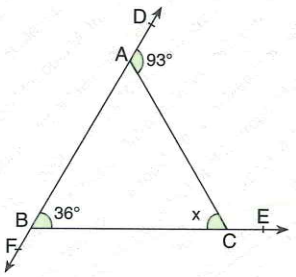


Örnek / Example 5

$m(\widehat{DAC}) = 93°$,

$m(\widehat{ABC}) = 36°$

$\Rightarrow$ **$m(\widehat{ACB}) = x = ?$**



A) 51° B) 55° C) 57° D) 63° E) 70°

Çözüm / Solution Yanıt / Answer **C**

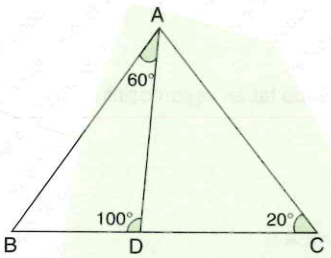
$m(\widehat{DAC}) = m(\widehat{ABC}) + m(\widehat{ACB})$

$93° = 36° + x°$

$x = 57°$

Örnek / Example 6

$\Rightarrow$ **$m(\widehat{BAC}) = ?$**



A) 80° B) 100° C) 120° D) 140° E) 160°

Çözüm / Solution Yanıt / Answer **D**

$m(\widehat{BDA}) = m(\widehat{BCA}) + m(\widehat{DAC})$

$100° = 20° + m(\widehat{DAC})$

$80° = m(\widehat{DAC})$

$m(\widehat{BAC}) = 60° + 80° = 140°$

ÖNEMLİ / IMPORTANT

Çift yönlü gerektirme ($\Leftrightarrow$) sembolü geometride sık kullanılan bir semboldür. "Birinci önerme geçerli ise ikinci önerme de geçerli, ikinci önerme geçerli ise birinci önerme de geçerlidir." anlamına gelir.

The expression "if and only if" ($\Leftrightarrow$) is frequenrly used in geometry. This symbol means that, "if first proposition is true the second proposition is also true, if the second proposition is true, the first proposition is also true."

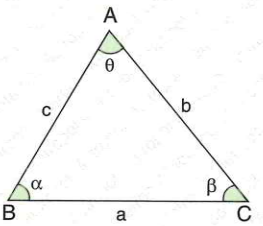
ÜÇGEN ÇEŞİTLERİ / TYPES of TRIANGLE

Çeşitkenar Üçgen / Scalene Triangle

Üç kenarının uzunluğu birbirinden farklı olan üçgendir.

Scalene triangles are triangles with no two sides equal.

$|AB| \neq |AC| \neq |BC| \Leftrightarrow \alpha \neq \beta \neq \theta$

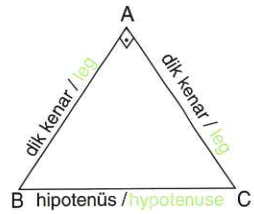


Dik Üçgen / Right Triangle

Bir açısı 90° olan üçgendir. Bu yüzden bu üçgenin diğer iki açısının toplamı 90° dir. Dik üçgenin en uzun kenarı 90° lik açının karşısındaki kenardır. Bu kenara **hipotenüs,** diğer kenarlara **dik kenarlar** denir.

A right triangle has one angle equal to 90°. Therefore, the sum of the other two angles of a right triangle is 90°. The longest side of a right triangle which is always opposite the right angle is called the **hypotenuse** and other sides are called **legs**.

$$[BA] \perp [AC] \Leftrightarrow m(\widehat{BAC}) = 90^\circ$$

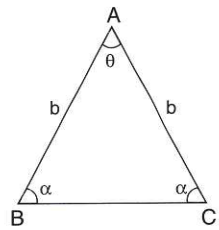


İkizkenar Üçgen / Isosceles Triangle

İki kenarının uzunluğu eşit olan üçgene **ikizkenar üçgen** denir. İkizkenar üçgende taban açıları eşittir.

A triangle in which length of its two sides equal is called an isosceles triangle.
Base angles are equal in any isosceles triangle.

$$|AB| = |AC| \Leftrightarrow m(\widehat{B}) = m(\widehat{C}) \neq m(\widehat{A})$$

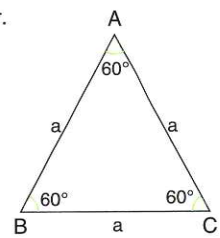


Eşkenar Üçgen / Equilateral Triangle

Bütün kenarları eşit uzunlukta olan üçgene **eşkenar üçgen** denir. Bir eşkenar üçgenin tüm iç açıları 60° derecedir.

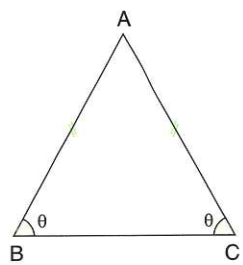
A triangle in which length of its all sides equal is called an equilateral triangle.
Each angle of an equilateral triangle is 60°.

$$|AB| = |AC| = |BC| \Leftrightarrow m(\widehat{A}) = m(\widehat{B}) = m(\widehat{C}) = 60^\circ$$



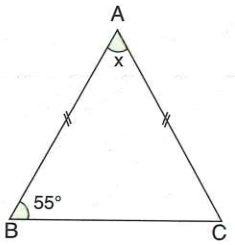
İkizkenar Üçgende Açılar / Angles of an Isosceles Triangle

$$|AB| = |AC| \Leftrightarrow m(\widehat{B}) = m(\widehat{C})$$



Örnek / Example 7

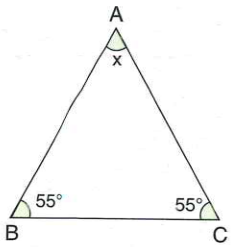
IABI = IACI,
$m(\widehat{A}) = x$,
$m(\widehat{B}) = 55°$
$\Rightarrow x = ?$



A) 70° B) 72° C) 76° D) 80° E) 84°

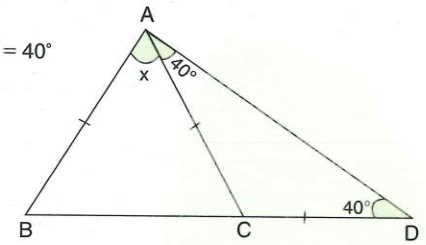
Çözüm / Solution Yanıt / Answer **A**

IABI = IACI $\Rightarrow m(\widehat{B}) = m(\widehat{C}) = 55°$
$\widehat{ABC} \Rightarrow m(\widehat{A}) + m(\widehat{B}) + m(\widehat{C}) = 180°$
$55° + 55° + x = 180°$
$110° + x = 180°$
$x = 180° - 110°$
$x = 70°$



Örnek / Example 8

IABI = IACI = ICDI,
$m(\widehat{CAD}) = m(\widehat{CDA}) = 40°$
$\Rightarrow m(\widehat{BAC}) = x = ?$



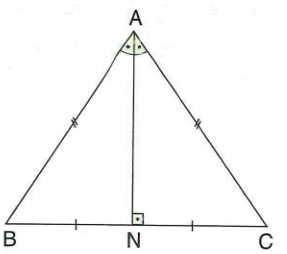
A) 100° B) 80° C) 60° D) 40° E) 20°

Çözüm / Solution Yanıt / Answer **E**

$m(\widehat{ACD}) + m(\widehat{CAD}) + m(\widehat{ADC}) = 180°$
$m(\widehat{ACD}) + 40° + 40° = 180°$
$m(\widehat{ACD}) = 180 - 80°$
$m(\widehat{ACD}) = 100°$
$m(\widehat{ACD}) = 100° \Rightarrow m(\widehat{ACB}) = 80°$
IACI = IABI $\Rightarrow m(\widehat{ABC}) = 80°$
$m(\widehat{ABC}) + m(\widehat{ACB}) + m(\widehat{BAC}) = 180°$
$80° + 80° + x = 180°$
$160° + x = 180°$
$x = 20°$

- İkizkenar üçgende, tepe açısından indirilen açıortay, kenarortay ve yükseklik aynı doğru üzerindedir.
  In an isosceles triangle the bisector, the median and the altitude through a vertex which cuts the opposite side are on the same line.

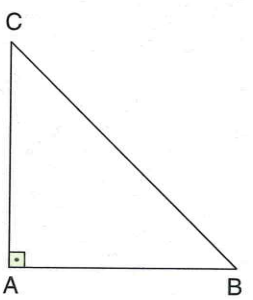
- Bir üçgende açıortay, kenarortay ve yükseklik niceliklerinden herhangi ikisi çakışıyorsa (aynı doğru üzerinde ise) bu üçgen ikizkenardır.
  If any two of the bisector, the median and the altitude through a vertex coincide in a triangle (are on the same line), then we can say that this is an isosceles triangle.



Dik Üçgende Açılar / Angles is an Right Triangle

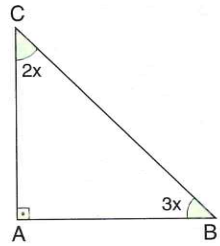
Özellik 1 / Property 1

$[CA] \perp [AB] \Leftrightarrow m(\widehat{C}) + m(\widehat{B}) = 90°$



Örnek / Example 9

$[CA] \perp [AB]$,
$m(\widehat{ACB}) = 2x$,
$m(\widehat{ABC}) = 3x$
$\Rightarrow$ **x = ?**



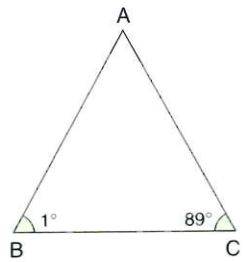
A) 15° B) 18° C) 21° D) 24° E) 27°

Çözüm / Solution Yanıt / Answer **B**

$[CA] \perp [AB] \Rightarrow 2x + 3x = 90°$
$5x = 90°$
$x = 18°$

Örnek / Example 10

$m(\widehat{ABC}) = 1°$,
$m(\widehat{BCA}) = 89°$
$\Rightarrow$ **$m(\widehat{BAC}) = ?$**



A) 100° B) 98° C) 90° D) 89° E) 45°

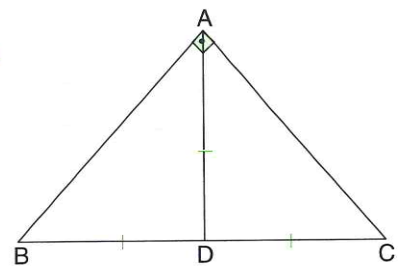
Çözüm / Solution Yanıt / Answer **C**

$m(\widehat{ABC}) + m(\widehat{BCA}) + m(\widehat{BAC}) = 180°$
$1° + 89° + m(\widehat{BAC}) = 180°$
$m(\widehat{BAC}) = 180° - 90°$
$= 90°$

Özellik 2 / Property 2

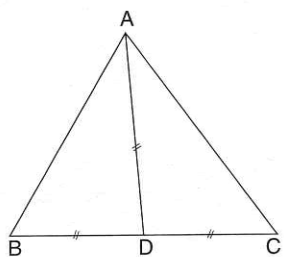
Dik üçgende hipotenüse ait kenarortayın uzunluğu, hipotenüs uzunluğunun yarısına eşittir.
In a right triangle, the length of median on the hypotenuse is equal to half the length of hypotenuse.

$[AB] \perp [AC] \Leftrightarrow |AD| = |BD| = |DC|$



Örnek / Example 11

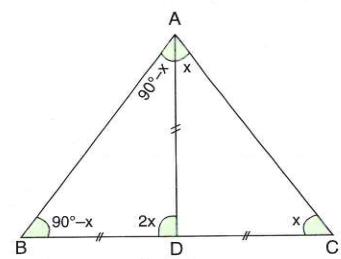
$|AD| = |BD| = |DC|$
$\Rightarrow$ **$m(\widehat{BAC}) = ?$**



A) 45° B) 60° C) 90° D) 120° E) 150°

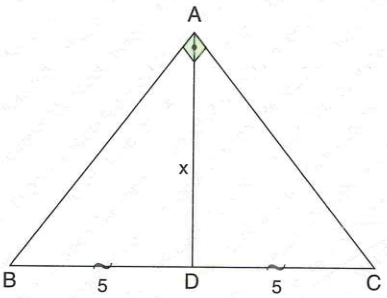
Çözüm / Solution Yanıt / Answer **C**

$m(\widehat{BAC}) = 90° - x + x$
$m(\widehat{BAC}) = 90°$



Örnek / Example 12

$m(\widehat{BAC}) = 90°$,
$|BD| = |DC| = 5$ br (u),
$|AD| = x$ br (u)
$\Rightarrow$ **$|AD| = x = ?$ br (u)**



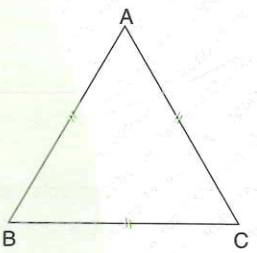
A) 1 B) $\frac{5}{2}$ C) 5 D) 10 E) 15

Çözüm / Solution Yanıt / Answer **C**

$m(\widehat{BAC}) = 90°, |BD| = |DC| \Rightarrow |AD| = |BD| = |DC|$
[Muhteşem üçlü/ The perfect triple]
$\Rightarrow |AD| = x = 5$ br (u)

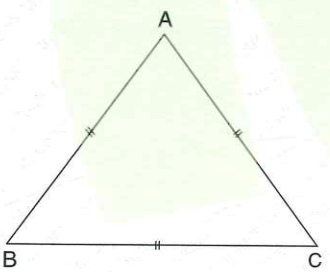
Eşkenar Üçgende Açılar / Angles of an Equilateral Triangle

$$|AB| = |AC| = |BC| \Leftrightarrow m(\widehat{A}) = m(\widehat{B}) = m(\widehat{C}) = 60°$$



Örnek / Example 13

$|AB| = |BC| = |AC|$
$\Rightarrow$ **$m(\widehat{A}) + m(\widehat{B}) = ?$**



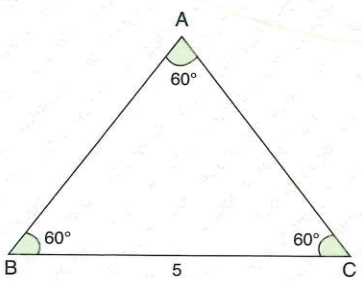
A) 60° B) 90° C) 120° D) 150° E) 180°

Çözüm / Solution Yanıt / Answer **C**

$|AB| = |BC| = |AC| \Leftrightarrow m(\widehat{A}) = m(\widehat{B}) = m(\widehat{C}) = 60°$
$\Rightarrow m(\widehat{A}) + m(\widehat{B}) = 60° + 60°$
$= 120°$

Örnek / Example 14

$m(\widehat{A}) = 60°$,
$m(\widehat{B}) = 60°$,
$m(\widehat{C}) = 60°$,
$|BC| = 5$ br (u)
$\Rightarrow$ **$|AB| + |AC| = ?$ br (u)**



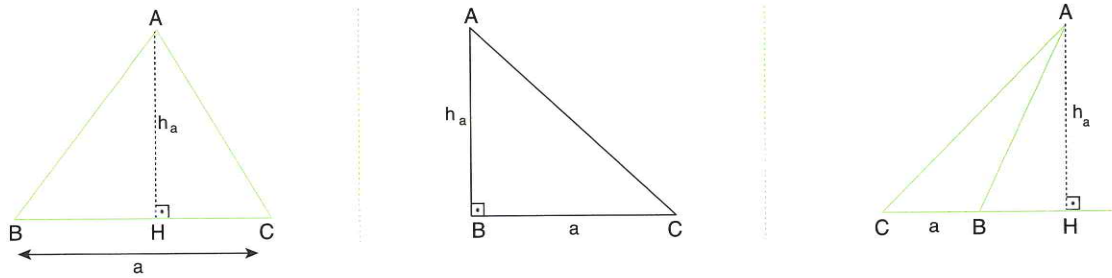
A) 5 B) 10 C) 15 D) 20 E) 25

Çözüm / Solution Yanıt / Answer **B**

$m(\widehat{A}) = m(\widehat{B}) = m(\widehat{C}) \Leftrightarrow |AB| = |BC| = |AC| = 5$ br (u)
$\Rightarrow |AB| + |AC| = 5 + 5 = 10$ br (u)

ÜÇGENİN YARDIMCI ELEMANLARI / THE AUXILIARY ELEMENTS of a TRIANGLE

Yükseklik / Height



Bir üçgenin yüksekliği, üçgenin bir köşesinden karşı kenara dik çizilen doğrudur. h_a şekildeki üçgenlerde BC kenarına ait olan yüksekliktir.

The altitude of the triangle is a line drawn from one vertex perpendicular to the opposite side. We use h_a for the height of side BC.

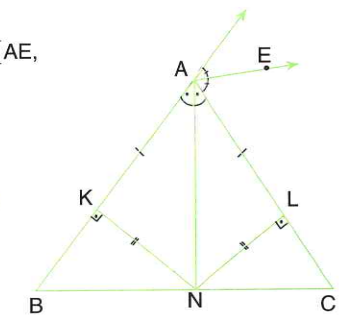
Açıortay / Bisector

Bir üçgende, bir iç açıyı eşit iki parçaya bölen doğru parçasına **iç açıortay,** bir dış açıyı iki eşit parçaya bölen doğru parçasına **dış açıortay** denir. Şekildeki ABC üçgeninde [AN, iç açıortay ise IKNI = INLI, IAKI = IALI dir.[AE, dış açıortaydır.

The interior bisector of a triangle the line that divides an interior angle of the triangle into two equal parts.

The exterior bisector of a triangle is the line that divides an exterior angle of the triangle into two equal parts.

In the figure, if IANI is an interior bisector, IKNI is equal to INLI and IAKI is equal to IALI. AE is an exterior bisector.



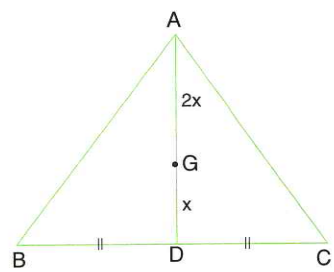
Kenarortay / Median

Bir üçgenin, bir köşesini karşı kenarın orta noktasıyla birleştiren doğru parçasına **kenarortay** denir.

Bir üçgende, üç kenarortay üçgenin iç bölgesinde bir noktada kesişir. Bu noktaya **üçgenin ağırlık merkezi** denir. Şekildeki ABC üçgeninde IAGI = 2.IGDI olup G noktası ağırlık merkezi, [AD, kenarortay, IBDI = IDCI dir.

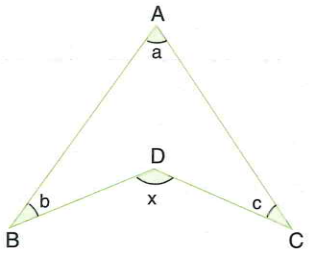
The median of a triangle is the line drawn from a vertex to the midpoint of its opposite side.

In a triangle medians intersect at a point in the interior area. And this point is called the center of gravity of the triangle. In the figure beside, IAGI = 2·IGDI The point G is center of gravity and [AD is a median, and IBDI = IDCI.



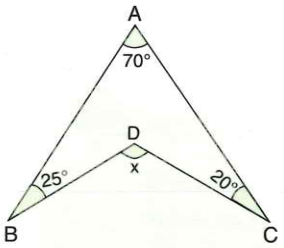
Sonuç 1 / Conclusion 1

$m(\widehat{BAC}) = a$,
$m(\widehat{ABD}) = b$,
$m(\widehat{ACD}) = c$,
$m(\widehat{BDC}) = x$
$\Rightarrow$ $x = a + b + c$



Örnek / Example 15

$m(\widehat{BAC}) = 70°$,
$m(\widehat{ACD}) = 20°$,
$m(\widehat{ABD}) = 25°$
$\Rightarrow$ $m(\widehat{BDC}) = x = ?$



A) 100° B) 105° C) 115° D) 120° E) 125°

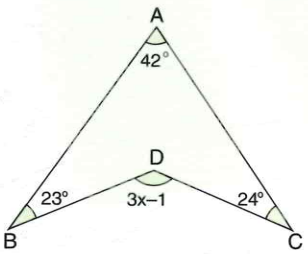
Çözüm / Solution

Yanıt / Answer **C**

$m(\widehat{BDC}) = m(\widehat{DBA}) + m(\widehat{BAC}) + m(\widehat{ACD})$
$x = 25° + 70° + 20°$
$x = 115°$

Örnek / Example 16

$m(\widehat{BAC}) = 42°$
$m(\widehat{ABD}) = 23°$
$m(\widehat{ACD}) = 24°$
$m(\widehat{BDC}) = 3x-1$
$\Rightarrow$ $x = ?$



A) 25° B) 30° C) 35° D) 40° E) 42°

Çözüm / Solution

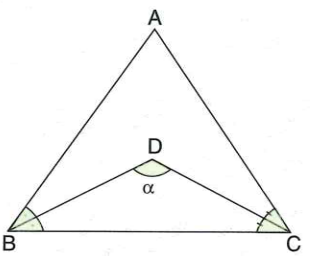
Yanıt / Answer **B**

$m(\widehat{BDC}) = 42° + 23° + 24°$
$3x - 1° = 89°$
$3x = 90°$
$x = 30°$

Sonuç 2 / Conclusion 2

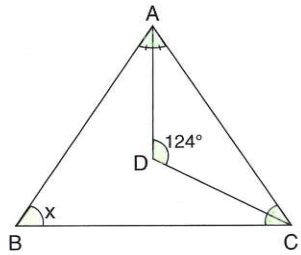
[DB] ve [DC] iç açıortaydır.
DB] and [DC] are interior bisectors.

$$m(\widehat{BDC}) = \alpha = 90° + \frac{m(\widehat{A})}{2}$$



Örnek / Example 17

$m(\widehat{BAD}) = m(\widehat{DAC})$,
$m(\widehat{BCD}) = m(\widehat{DCA})$,
$m(\widehat{ADC}) = 124°$
$\Rightarrow$ **$m(\widehat{ABC}) = x = ?$**



A) 64° B) 66° C) 68° D) 70° E) 72°

Çözüm / Solution Yanıt / Answer **C**

$m(\widehat{ADC}) = 90° + \frac{m(\widehat{ABC})}{2}$

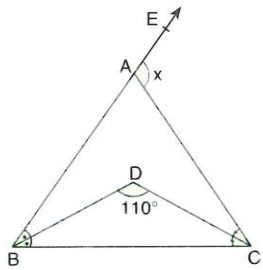
$124° = 90° + \frac{x}{2}$

$34° = \frac{x}{2}$

$68° = x$

Örnek / Example 18

$m(\widehat{ABD}) = m(\widehat{DBC})$,
$m(\widehat{ACD}) = m(\widehat{DCB})$,
$m(\widehat{BDC}) = 110°$
$\Rightarrow$ **$m(\widehat{CAE}) = x = ?$**



A) 120° B) 127° C) 136° D) 140° E) 144°

Çözüm / Solution Yanıt / Answer **D**

$m(\widehat{BDC}) = 90° + \frac{m(\widehat{A})}{2}$

$110° = 90° + \frac{m(\widehat{A})}{2}$

$40° = m(\widehat{A})$

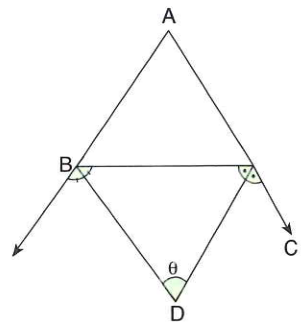
$x + 40° = 180°$

$x = 140°$

Sonuç 3 / Conclusion 3

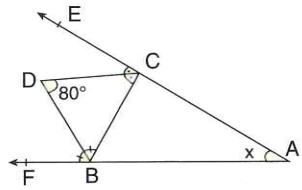
[BD] ve [CD] dış açıortaylardır.
[BD] and [CD] are exterior angle bisectors.

$$m(\widehat{BDC}) = \theta = 90° - \frac{m(\widehat{A})}{2}$$



Örnek / Example 19

$m(\widehat{DCE}) = m(\widehat{DCB})$,
$m(\widehat{FBD}) = m(\widehat{DBC})$,
$m(\widehat{BDC}) = 80°$
$\Rightarrow$ **$m(\widehat{CAB}) = x = ?$**



A) 10° B) 15° C) 20° D) 25° E) 30°

Çözüm / Solution Yanıt / Answer **C**

$m(\widehat{BDC}) = 90° - \frac{m(\widehat{CAB})}{2}$

$80° = 90° - \frac{m(\widehat{CAB})}{2}$

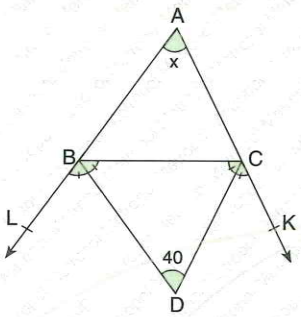
$80° = 90° - \frac{x}{2}$

$\frac{x}{2} = 10°$

$x = 20°$

Örnek / Example 20

$m(\widehat{CBD}) = m(\widehat{DBL})$,
$m(\widehat{BCD}) = m(\widehat{DCK})$,
$m(\widehat{D}) = 40°$
$\Rightarrow$ **$m(\widehat{A}) = x = ?$**



A) 90° B) 95° C) 100° D) 105° E) 110°

Çözüm / Solution

Yanıt / Answer **C**

$m(\widehat{BDC}) = 90° - \frac{m(\widehat{A})}{2}$

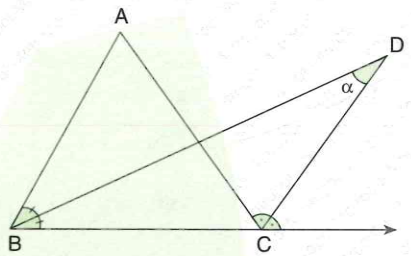
$40° = 90° - \frac{x}{2}$

$x = 100°$

Sonuç 4 / Conclusion 4

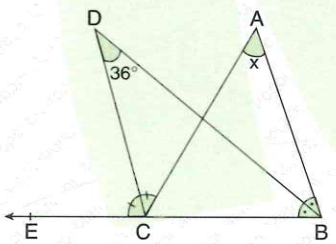
[BD], iç açıortay; [DC] dış açıortaydır.
[BD] is the interior angle bisector;
[DC] is the exterior angle bisector.

$$m(\widehat{BDC}) = \alpha = \frac{m(\widehat{A})}{2}$$



Örnek / Example 21

$m(\widehat{ABD}) = m(\widehat{DBC})$,
$m(\widehat{ECD}) = m(\widehat{DCA})$,
$m(\widehat{CDB}) = 36°$
$\Rightarrow$ **$m(\widehat{CAB}) = x = ?$**



A) 36° B) 72° C) 18° D) 90° E) 54°

Çözüm / Solution

Yanıt / Answer **B**

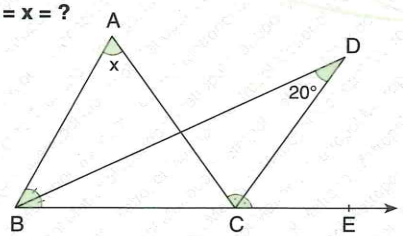
$m(\widehat{CDB}) = \frac{m(\widehat{A})}{2}$

$36° = \frac{x}{2}$

$72° = x$

Örnek / Example 22

$m(\widehat{ABD}) = m(\widehat{DBC})$, $m(\widehat{ACD}) = m(\widehat{DCE})$,
$m(\widehat{BDC}) = 20° \Rightarrow$ **$m(\widehat{BAC}) = x = ?$**



A) 35° B) 40° C) 45° D) 50° E) 55°

Çözüm / Solution

Yanıt / Answer **B**

$m(\widehat{BDC}) = \frac{m(\widehat{A})}{2}$

$20° = \frac{x}{2}$

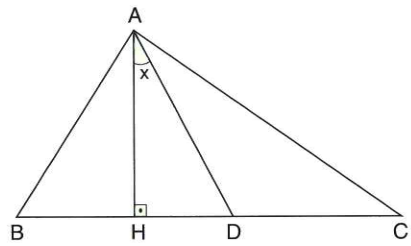
$40° = x$

Sonuç 5 / Conclusion 5

[Açıortay – Yükseklik / Bisector – Height]

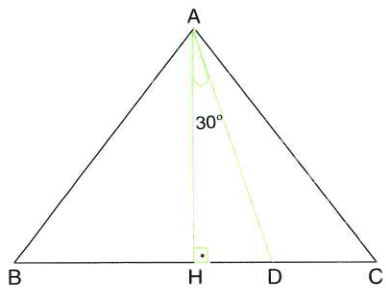
$m(\widehat{BAD}) = m(\widehat{DAC})$ ve (and) $[AH] \perp [BC]$

$$\Rightarrow x = \left|\frac{m(\widehat{B}) - m(\widehat{C})}{2}\right|$$



Örnek / Example 23

$[AD]$ açıortay / bisector,
$[AH] \perp [BC]$,
$m(\widehat{HAD}) = 30°$
$\Rightarrow |m(\widehat{B}) - m(\widehat{C})| = ?$



A) 15° B) 20° C) 30° D) 45° E) 60°

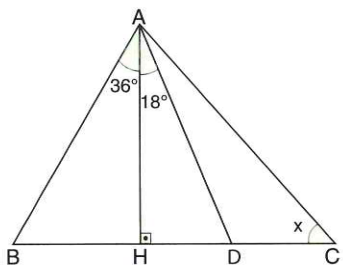
Çözüm / Solution

Yanıt / Answer **E**

$$30° = \left|\frac{m(\widehat{B}) - m(\widehat{C})}{2}\right|$$
$$30° = \frac{|m(\widehat{B}) - m(\widehat{C})|}{2}$$
$$60° = |m(\widehat{B}) - m(\widehat{C})|$$

Örnek / Example 24

$[AH] \perp [BC]$,
$m(\widehat{BAD}) = m(\widehat{DAC})$,
$m(\widehat{BAH}) = 36°$,
$m(\widehat{HAD}) = 18°$
$\Rightarrow m(\widehat{ACB}) = x = ?$



A) 16° B) 18° C) 20° D) 24° E) 30°

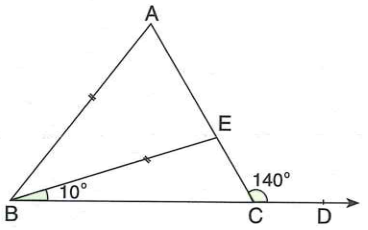
Çözüm / Solution

Yanıt / Answer **B**

$m(\widehat{ABH}) + m(\widehat{BAH}) = 90°$
$m(\widehat{ABH}) + 36° = 90°$
$m(\widehat{ABH}) = 54°$

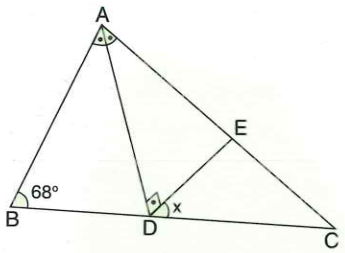
$$m(\widehat{HAD}) = \left|\frac{x - 54°}{2}\right|$$
$$18° = \left|\frac{54° - x}{2}\right|$$
$36° = 54° - x \Rightarrow x = 18°$

1. $|AB| = |BE|$,
$m(\widehat{ACD}) = 140°$,
$m(\widehat{EBC}) = 10°$
$\Rightarrow$ **$m(\widehat{ABE}) = ?$**



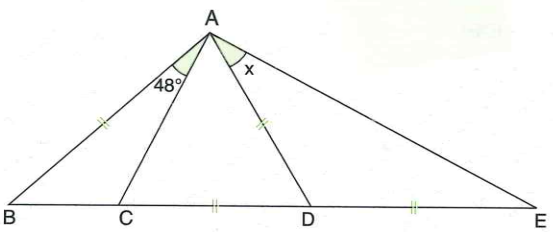
A) 55° B) 60° C) 70°
D) 75° E) 80°

2. [AD] bir açıortaydır.
[AD] is a bisector.
$[AD] \perp [DE]$,
$m(\widehat{BAC}) = 82°$,
$m(\widehat{ABC}) = 68°$
$\Rightarrow$ **$x = ?$**



A) 18° B) 19° C) 26°
D) 27° E) 38°

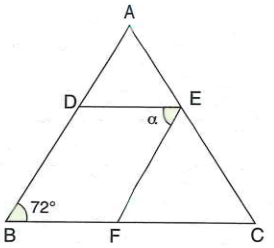
3.



$|AB| = |CD| = |AD| = |DE|$,
$m(\widehat{BAC}) = 48° \Rightarrow$ **$m(\widehat{DAE}) = x = ?$**

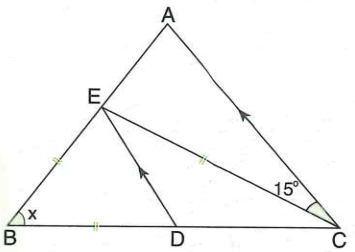
A) 12° B) 14° C) 16°
D) 18° E) 20°

4. $|AB| = |BC|$,
$|AD| = |AE|$,
$|CE| = |CF|$,
$m(\widehat{B}) = 72°$
$\Rightarrow$ **$m(\widehat{DEF}) = \alpha = ?$**



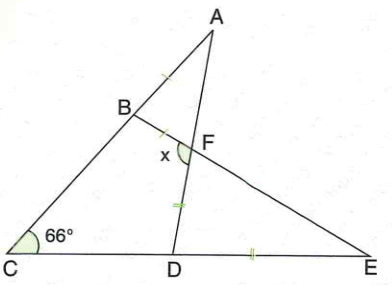
A) 36° B) 42° C) 48°
D) 54° E) 72°

5. $[DE] \,//\, [AC]$,
$|BE| = |BD| = |EC|$,
$m(\widehat{ECA}) = 15°$
$\Rightarrow$ **$m(\widehat{EBD}) = x = ?$**



A) 35° B) 40° C) 45°
D) 50° E) 55°

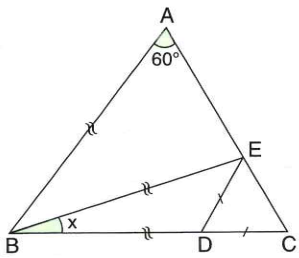
6. $|AB| = |BF|$
$|DF| = |DE|$
$m(\widehat{ACD}) = 66°$
$\Rightarrow$ **$m(\widehat{BFD}) = x = ?$**



A) 132° B) 136° C) 138°
D) 140° E) 142°

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



$|AB| = |BE| = |BD|$, $|DE| = |DC|$,

$m(\widehat{A}) = 60°$

$\Rightarrow$ **$m(\widehat{CBE}) = x = ?$**

A) 20° B) 25° C) 30°

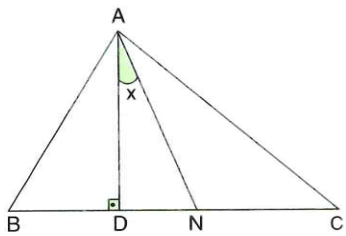
D) 35° E) 40°

8. $[AD] \perp [BC]$,

$m(\widehat{BAN}) = m(\widehat{NAC})$,

$m(\widehat{B}) - m(\widehat{C}) = 38°$

$\Rightarrow$ **$m(\widehat{DAN}) = x = ?$**



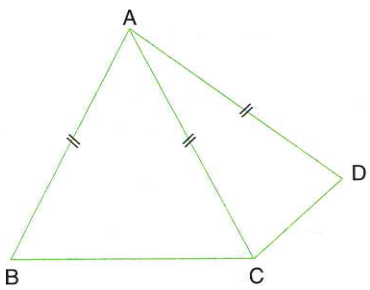
A) 14° B) 17° C) 19°

D) 22° E) 52°

9. $|AB| = |AC| = |AD|$,

$m(\widehat{BAD}) = 84°$

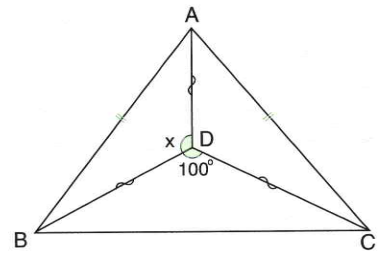
$\Rightarrow$ **$m(\widehat{BCD}) = ?$**



A) 138° B) 140° C) 142°

D) 144° E) 146°

10.



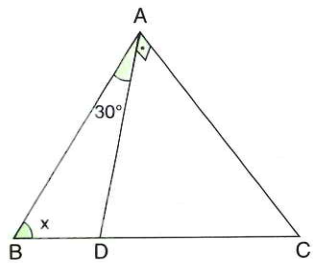
$|AB| = |AC|$, $|AD| = |DC| = |BD|$,

$m(\widehat{BDC}) = 100° \Rightarrow$ **$m(\widehat{ADB}) = x = ?$**

A) 105° B) 115° C) 120°

D) 130° E)135°

11.



$[DA] \perp [CA]$, $|DC| = 2.|AB|$,

$m(\widehat{BAD}) = 30° \Rightarrow$ **$m(\widehat{ABC}) = x = ?$**

A) 20° B) 30° C) 40°

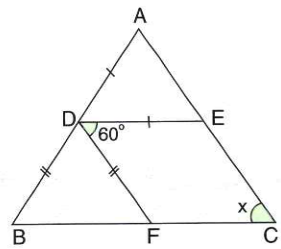
D) 50° E) 60°

12. $|AD| = |DE|$,

$|DB| = |DF|$,

$m(\widehat{EDF}) = 60°$

$\Rightarrow$ **$m(\widehat{ACB}) = x = ?$**



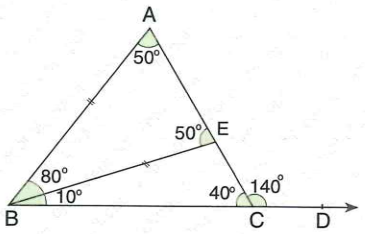
A) 45° B) 50° C) 55° D) 60° E) 65°

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
E	B	B	D	D	E	A	C	A	D	C	D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



$m(\widehat{BEA}) = 10^\circ + 40^\circ = 50^\circ$

$|AB| = |BE| \Rightarrow m(\widehat{BAE}) = 50^\circ$

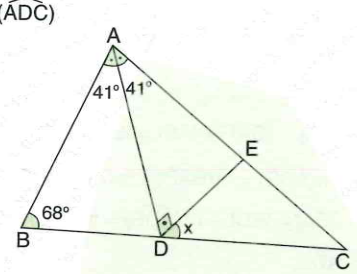
$m(\widehat{ABE}) = 180^\circ - (50^\circ + 50^\circ) = 80^\circ$

Yanıt / The Answer is E

2. $m(\widehat{ABC}) + m(\widehat{BAD}) = m(\widehat{ADC})$

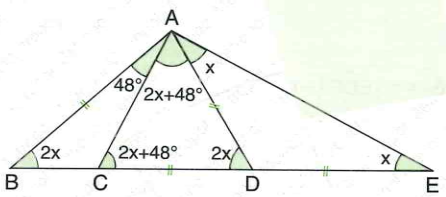
$68^\circ + 41^\circ = 90^\circ + x$

$x = 19^\circ$



Yanıt / The Answer is B

3.



$\widehat{ACD}$:

$m(\widehat{A}) + m(\widehat{C}) + m(\widehat{D}) = 180^\circ$

$2x + 48^\circ + 2x + 48^\circ + 2x = 180^\circ$

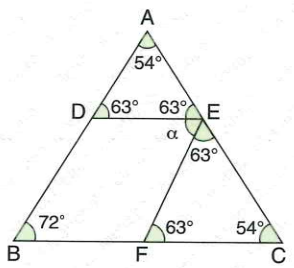
$6x + 96^\circ = 84^\circ$

$6x = 84^\circ$

$x = 14^\circ$

Yanıt / The Answer is B

4.



$|AB| = |BC| \Rightarrow m(\widehat{A}) = m(\widehat{C}) = \frac{180^\circ - 72^\circ}{2} = 54^\circ$

$|AD| = |AE| \Rightarrow m(\widehat{AED}) = m(\widehat{ADE}) = 63^\circ$

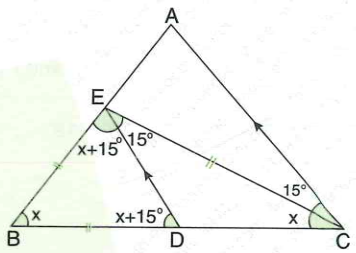
$|CE| = |CF| \Rightarrow m(\widehat{CEF}) = m(\widehat{CFE}) = 63^\circ$

$\Rightarrow \alpha + 63^\circ + 63^\circ = 180^\circ$

$\Rightarrow \alpha = 54^\circ$

Yanıt / The Answer is D

5.



$[DE] // [AC] \Rightarrow m(\widehat{ACE}) = m(\widehat{CED}) = 15^\circ$

$m(\widehat{EDB}) = m(\widehat{BED}) = x + 15^\circ$

$m(\widehat{ECD}) = m(\widehat{EBC}) = x$

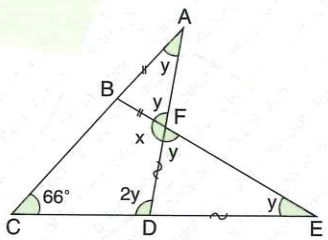
$\Rightarrow (x + 15^\circ) + (x + 15^\circ) + x = 180^\circ$

$3x = 150^\circ$

$x = 50^\circ$

Yanıt / The Answer is D

6.



$\widehat{ACD}$;

$y + 2y + 66^\circ = 180^\circ$

$3y = 114^\circ$

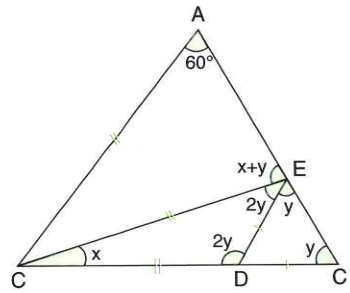
$y = 38^\circ$

$x + y = 180^\circ \Rightarrow y = 180^\circ - 38^\circ = 142^\circ$

Yanıt / The Answer is E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



$|AB| = |BE|$
$x + y = 60°$

$m(\widehat{EBC}) + m(\widehat{BEC}) + m(\widehat{BCE}) = 180°$
$x + 2y + y + y = 180°$
$x + 4y = 180°$

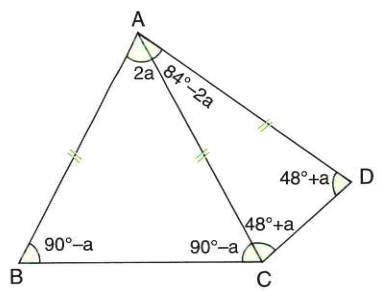
$-4/x + y = 60°$
$x + 4y = 180°$
$-3x = -60°$
$x = 20°$

Yanıt / The Answer is A

8. $m(\widehat{DAN}) = \frac{1}{2} \cdot |m(\widehat{B}) - m(\widehat{C})| = \frac{1}{2} \cdot 38° = 19°$

Yanıt / The Answer is C

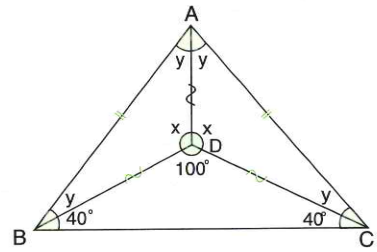
9.



$m(\widehat{BCD}) = 90° - a + 48° + a$
$= 138°$

Yanıt / The Answer is A

10. $x + x + 100° = 360°$
$2x = 260°$
$x = 130°$



Yanıt / The Answer is D

11. $[DA] \perp [CA] \Rightarrow |AE| = |ED| = |EC| = k$ br/u,

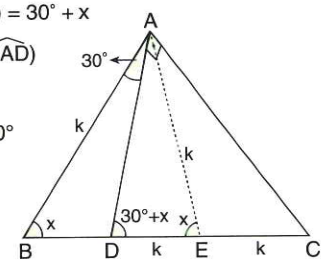
$m(\widehat{ADE}) = m(\widehat{BAD}) + m(\widehat{ABD}) = 30° + x$

$|EA| = |ED| \Rightarrow m(\widehat{ADE}) = m(\widehat{EAD})$

$\widehat{ADE}$;

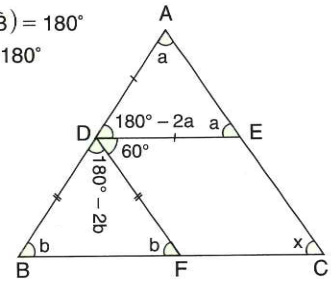
$(30° + x) + (30° + x) + x = 180°$

$3x = 120° \Rightarrow x = 40°$



Yanıt / The Answer is D

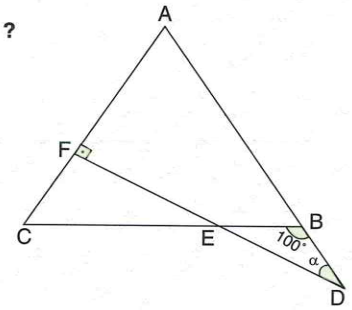
12. $m(\widehat{ADE}) + m(\widehat{EDF}) + m(\widehat{FDB}) = 180°$
$180° - 2a + 60° + 180° - 2b = 180°$
$2a + 2b = 180°$
$b + a + x = 180°$
$120° + x = 180° \Rightarrow x = 60°$



Yanıt / The Answer is D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

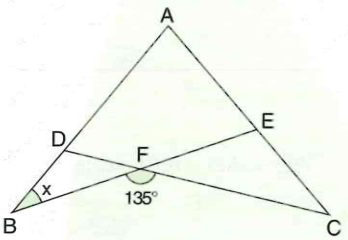
1. $|AB| = |BC|$, $[DF] \perp [AC]$, $m(\widehat{DBC}) = 100°$ $\Rightarrow \alpha = ?$



A) 20° B) 30° C) 40° D) 50° E) 60°

[İNÖNÜ ÜNİVERSİTESİ – YÖS 2018]

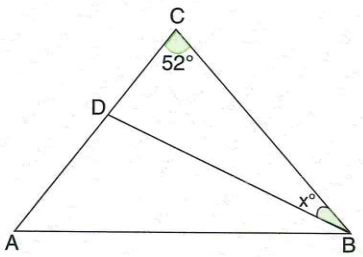
2. $m(\widehat{BFC}) = 135°$
$|AB| = |BE|$
$|AC| = |CD|$
$x = m(\widehat{ABE}) = ?$



A) 28° B) 30° C) 32° D) 42° E) 48°

[İSTANBUL ÜNİVERSİTESİ – YÖS 2016]

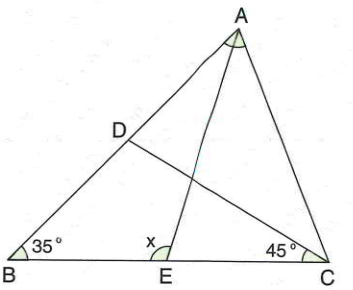
3. ABC bir üçgendir.
ABC is a triangle.
$m(\widehat{DCB}) = 52°$
$|AC| = |BC|$
$|AD| = |AB|$
$\Rightarrow m(\widehat{DBC}) = x° = ?$



A) 5 B) 6 C) 8 D) 11 E) 15

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2016]

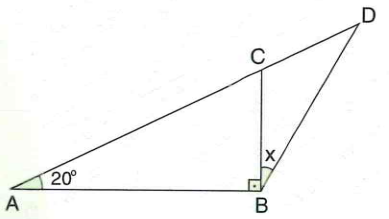
4. $m(\widehat{BAE}) = m(\widehat{EAC})$,
$m(\widehat{ABC}) = 35°$
$m(\widehat{DCB}) = 45°$
$|AD| = |DC|$
$\Rightarrow m(\widehat{AEB}) = x = ?$



A) 100° B) 105° C) 110° D) 115° E) 120°

[İSTANBUL ÜNİVERSİTESİ – YÖS 2015]

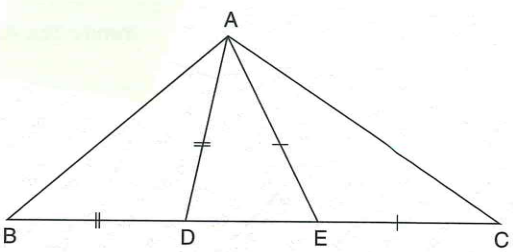
5. $|AC| = 2 \cdot |DB|$
$\Rightarrow x = ?$



A) 45° B) 35° C) 30° D) 20° E) 15°

[İSTANBUL ÜNİVERSİTESİ – YÖS 2015]

6.



$|AE| = |EC|$, $|AD| = |BD|$, $m(\widehat{DAE}) = 26° \Rightarrow m(\widehat{BAC}) = ?$

A) 103° B) 105° C) 110° D) 115° E) 120°

[AKDENİZ ÜNİVERSİTESİ – YÖS 2014]

YANITLAR / ANSWERS

1	2	3	4	5	6
C	B	B	E	C	A

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $|ABI| = |BCI| \Rightarrow m(\widehat{A}) = m(\widehat{C}) = 50^\circ$

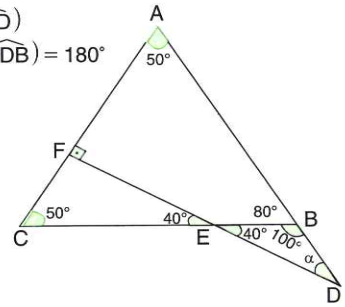
$m(\widehat{FCE}) + m(\widehat{CEF}) = 90^\circ$

$\Rightarrow m(\widehat{CEF}) = 40^\circ = m(\widehat{BED})$

$m(\widehat{DBE}) + m(\widehat{BED}) + m(\widehat{EDB}) = 180^\circ$

$100^\circ + 40^\circ + \alpha = 180^\circ$

$\alpha = 40^\circ$

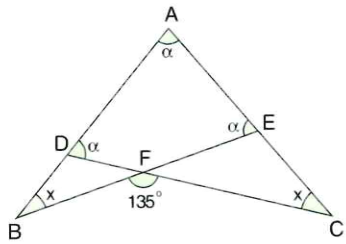


Yanıt / The Answer is C

2. $|ABI| = |BEI| \Rightarrow m(\widehat{A}) = m(\widehat{E}) = \alpha$

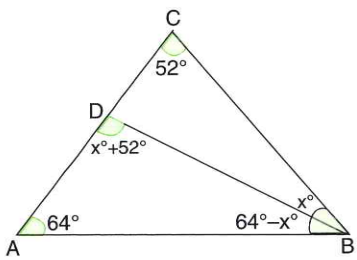
$|ACI| = |CDI| \Rightarrow m(\widehat{A}) = m(\widehat{D}) = \alpha$

$x + 2\alpha = 180^\circ,\ 2x + \alpha = 135^\circ \Rightarrow x = 30^\circ$



Yanıt / The Answer is B

3.



$|ACI| = |BCI| \Rightarrow m(\widehat{A}) = m(\widehat{B}) = \dfrac{180^\circ - 52^\circ}{2} = 64^\circ$

$|ADI| = |ABI| \Rightarrow x + 52^\circ = 64^\circ - x^\circ$

$2x = 12^\circ$

$x = 6^\circ$

Yanıt / The Answer is B

4. $m(\widehat{DBC}) + m(\widehat{BCD}) = m(\widehat{CDA})$

$35^\circ + 45^\circ = 80^\circ = m(\widehat{CDA})$

$m(\widehat{DAE}) = m(\widehat{EAC}) = \alpha$

$|ADI| = |DCI| \Rightarrow m(\widehat{DCA}) = 2\alpha$

$m(\widehat{CDA}) + m(\widehat{DAC}) + m(\widehat{DCA}) = 180^\circ$

$80^\circ + 2\alpha + 2\alpha = 180^\circ$

$4\alpha = 100^\circ \Rightarrow \alpha = 25^\circ$

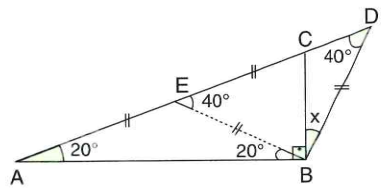
$m(\widehat{B}) + m(\widehat{BAE}) + m(\widehat{BEA}) = 180^\circ$

$35^\circ + 25^\circ + x = 180^\circ$

$x = 120^\circ$

Yanıt / The Answer is E

5.



$|BEI| = |AEI| = |ECI|$ çizilirse, muhteşem üçlü oluşur.

If $|BEI| = |AEI| = |ECI|$ is drawn, it becomes the great trio.

$|BEI| = |DBI|$

$|AEI| = |EBI| \Rightarrow m(\widehat{A}) = m(\widehat{EBE}) = 20^\circ$

$m(\widehat{DEB}) = m(\widehat{A}) + m(\widehat{AEB}) = 20^\circ + 20^\circ = 40^\circ$

$|EBI| = |DBI| \Rightarrow m(\widehat{DEB}) = m(\widehat{D}) = 40^\circ$

$m(\widehat{A}) + m(\widehat{D}) + m(\widehat{ABD}) = 180^\circ$

$20^\circ + 40^\circ + 90^\circ + x = 180^\circ$

$x = 30^\circ$

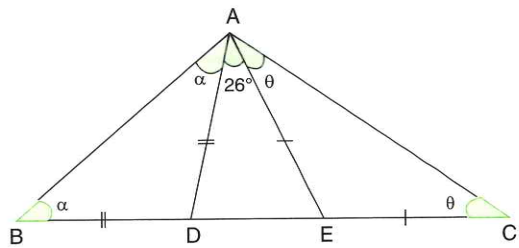
Yanıt / The Answer is C

6. $|ADI| = |BDI| \Rightarrow m(\widehat{BAD}) = m(\widehat{ABD}) = \alpha$

$|AEI| = |ECI| \Rightarrow m(\widehat{EAC}) = m(\widehat{ACE}) = \theta$

$\widehat{ABC},\ \alpha + 26^\circ + \theta + \alpha + \theta = 180^\circ \Rightarrow \alpha + \theta = 77^\circ$

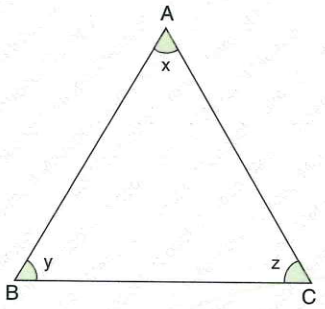
$m(\widehat{BAC}) = \alpha + 26^\circ + \theta = 77^\circ + 26^\circ = 103^\circ$



Yanıt / The Answer is A

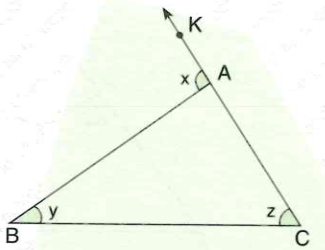
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $m(\widehat{A}) = x$,
$m(\widehat{B}) = y$,
$m(\widehat{C}) = z$,
$y + z - x = 70°$
$\Rightarrow$ **x = ?**



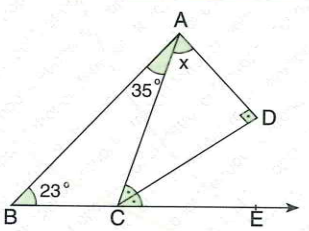
Yanıt / The Answer is 55°

2. $m(\widehat{KAB}) = x$,
$m(\widehat{B}) = y$,
$m(\widehat{C}) = z$,
$x + y + z = 176°$
$\Rightarrow$ **$m(\widehat{BAC})$ = ?**



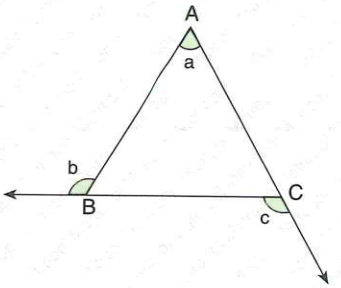
Yanıt / The Answer is 92°

3. $[AD] \perp [CD]$,
$m(\widehat{BAC}) = 35°$
$m(\widehat{DAC}) = 23°$
$m(\widehat{ACD}) = m(\widehat{DCE})$
$\Rightarrow$ **$m(\widehat{CAD}) = x$ = ?**



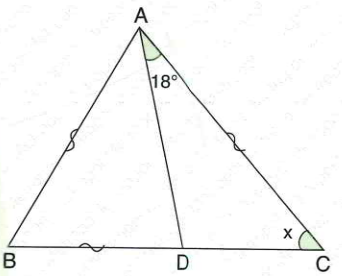
Yanıt / The Answer is 61°

4. $a + b + c = 260°$
$\Rightarrow$ **a = ?**



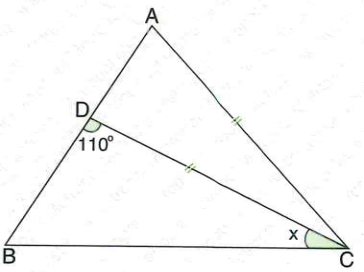
Yanıt / The Answer is 40°

5. $|AB| = |BD| = |AC|$,
$m(\widehat{DAC}) = 18°$
$\Rightarrow$ **$m(\widehat{C}) = x$ = ?**



Yanıt / The Answer is 48°

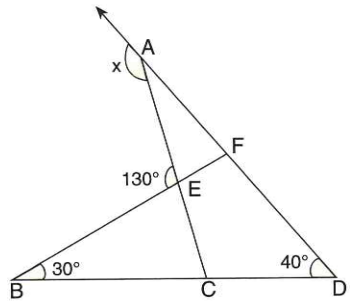
6. $|BA| = |BC|$,
$|CA| = |CD|$,
$m(\widehat{BDC}) = 110°$
$\Rightarrow$ **$m(\widehat{BCD}) = x$ = ?**



Yanıt / The Answer is 30°

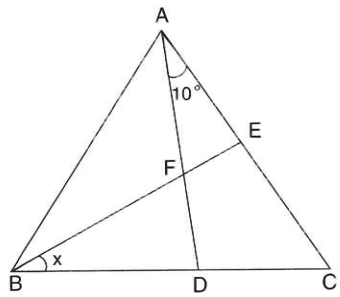
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $m(\widehat{CBE}) = 30°$,
$m(\widehat{ADB}) = 40°$,
$m(\widehat{AEB}) = 130°$
$\Rightarrow$ **x = ?**



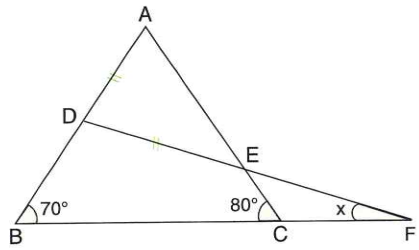
Yanıt / The Answer is 120°

8. $[AD] \cap [BE] = \{F\}$,
$|BD| = |BE| = |AB|$,
$m(\widehat{DAC}) = 10°$
$\Rightarrow$ **$m(\widehat{EBC})$ = x = ?**



Yanıt / The Answer is 20°

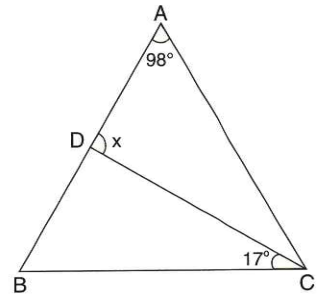
9.



$[DF] \cap [AC] = \{E\}$, $|AD| = |DE|$, $m(\widehat{B}) = 70°$
$m(\widehat{ACB}) = 80° \Rightarrow$ **$m(\widehat{BFD})$ = x = ?**

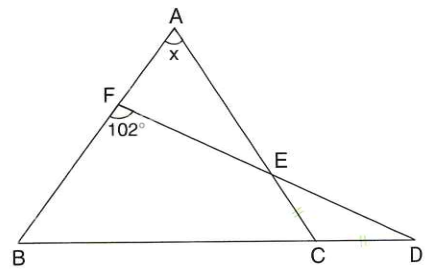
Yanıt / The Answer is 50°

10. $|AB| = |AC|$,
$m(\widehat{BAC}) = 98°$,
$m(\widehat{BCD}) = 17°$
$\Rightarrow$ **$m(\widehat{CDA})$ = x = ?**



Yanıt / The Answer is 58°

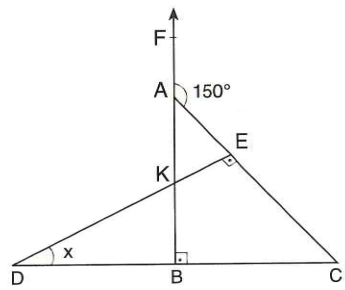
11.



$|AB| = |AC|$, $|DC| = |CE|$,
$m(\widehat{BFD}) = 102° \Rightarrow$ **$m(\widehat{BAC})$ = x = ?**

Yanıt / The Answer is 76°

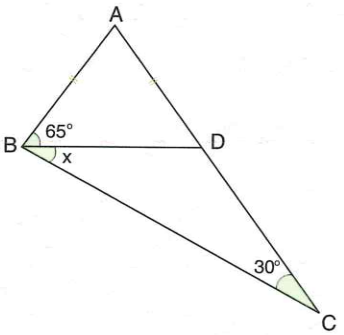
12. $[AB] \perp [DC]$,
$[DE] \perp [AC]$,
$m(\widehat{FAC}) = 150°$
$\Rightarrow$ **$m(\widehat{D})$ = x = ?**



Yanıt / The Answer is 30°

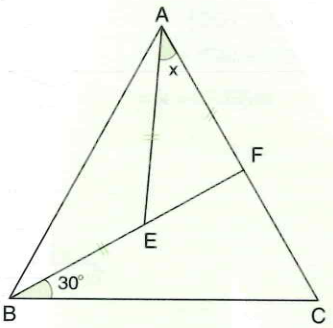
METROPOL YAYINLARI • METROPOL PUBLICATIONS

13. $|AB| = |AD|$,
$m(\widehat{ABD}) = 65°$,
$m(\widehat{BCD}) = 30°$
$\Rightarrow$ **$m(\widehat{CBD}) = x = ?$**



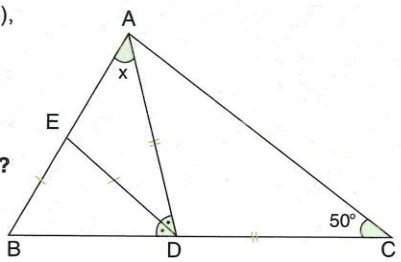
Yanıt / The Answer is 35°

14. $|BA| = |BC|$,
$|BE| = |EA| = |AF|$,
$m(\widehat{FBC}) = 30°$
$\Rightarrow$ **$m(\widehat{EAF}) = x = ?$**



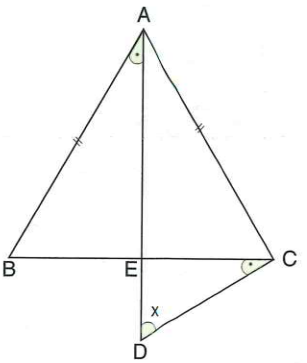
Yanıt / The Answer is 12°

15. $m(\widehat{ADE}) = m(\widehat{EDB})$,
$|BE| = |ED|$,
$|AD| = |DC|$,
$m(\widehat{C}) = 50°$
$\Rightarrow$ **$m(\widehat{BAD}) = x = ?$**



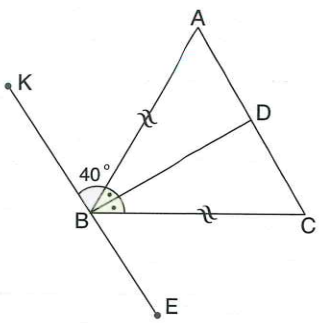
Yanıt / The Answer is 30°

16. $|AB| = |AC|$,
$m(\widehat{BAC}) = 94°$,
$m(\widehat{BAD}) = m(\widehat{BCD})$
$\Rightarrow$ **$m(\widehat{ADC}) = x = ?$**



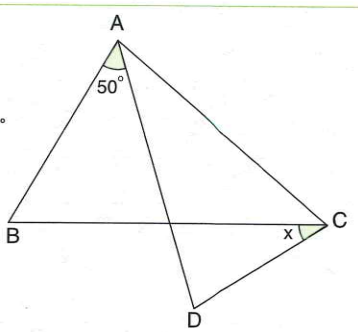
Yanıt / The Answer is 43°

17. $[EK] // [AC]$,
$m(\widehat{ABD}) = m(\widehat{DBC})$,
$m(\widehat{KBA}) = 40°$,
$|AB| = |BC|$
$\Rightarrow$ **$m(\widehat{DBC}) = ?$**



Yanıt / The Answer is 50°

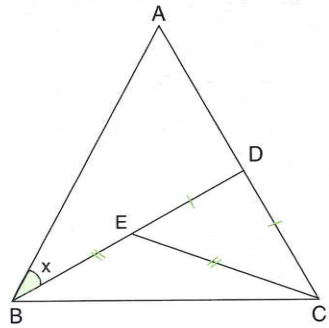
18. $|AC| = |AD|$,
$m(\widehat{BAD}) = 50°$,
$m(\widehat{ABC}) - m(\widehat{ACB}) = 10°$
$\Rightarrow$ **$m(\widehat{BCD}) = x = ?$**



Yanıt / The Answer is 30°

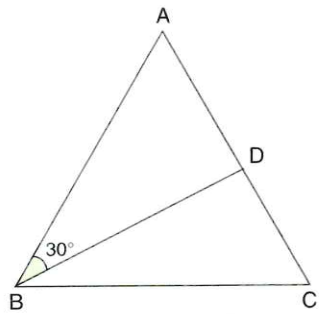
METROPOL YAYINLARI • METROPOL PUBLICATIONS

19. $|AB| = |BC| = |AC|$,
$|BE| = |EC|$,
$|ED| = |DC|$
$\Rightarrow$ **$m(\widehat{ABE}) = x = ?$**



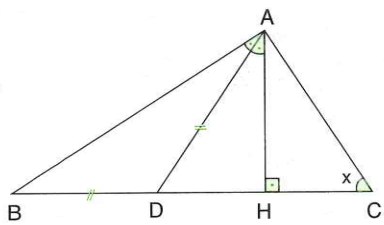
Yanıt / The Answer is 40°

20. $|AB| = |AC|$,
$|BD| = |BC|$,
$m(\widehat{DBA}) = 30°$
$\Rightarrow$ **$m(\widehat{ADB}) = ?$**



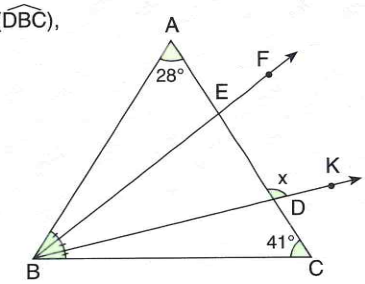
Yanıt / The Answer is 110°

21. $[AH] \perp [BC]$,
$|BD| = |DA|$,
$m(\widehat{BAD}) = m(\widehat{DAH})$,
$m(\widehat{BAC}) = 100$
$\Rightarrow$ **$x = ?$**



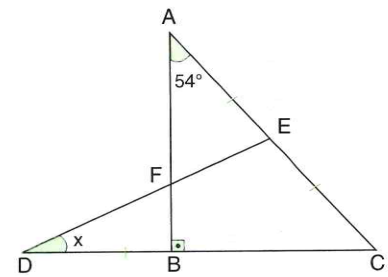
Yanıt / The Answer is 50°

22. $m(\widehat{ABE}) = m(\widehat{EBD}) = m(\widehat{DBC})$,
$m(\widehat{A}) = 28°$,
$m(\widehat{C}) = 41°$
$\Rightarrow$ **$m(\widehat{EDK}) = x = ?$**



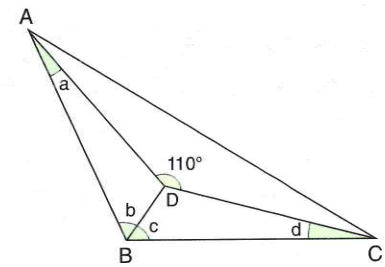
Yanıt / The Answer is 102°

23. $[AB] \perp [DC]$,
$|DB| = |AE| = |EC|$,
$\Rightarrow$ **$m(\widehat{EDC}) = x = ?$**



Yanıt / The Answer is 18°

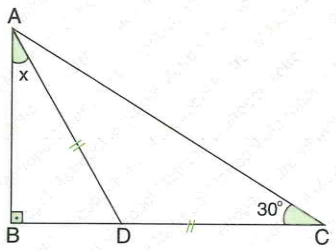
24. $b - a = 20°$,
$c - d = 30°$
$m(\widehat{ADC}) = 110°$
$\Rightarrow$ **$m(\widehat{ABC}) = ?$**



Yanıt / The Answer is 80°

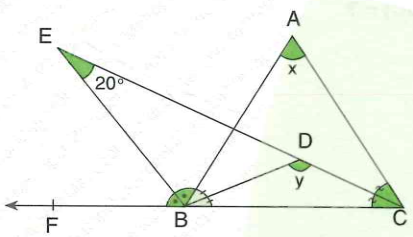
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $[AB] \perp [BC]$,
$|AD| = |DC|$,
$m(\widehat{DCA}) = 30°$
$\Rightarrow$ **x = ?**



A) 25° B) 30° C) 35°
D) 40° E) 45°

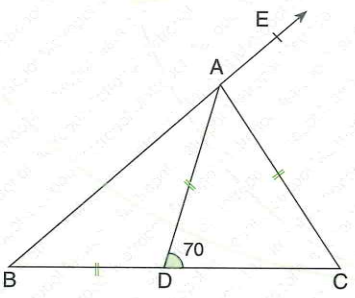
2.



$m(\widehat{FBE}) = m(\widehat{EBA})$, $m(\widehat{ABD}) = m(\widehat{DBC})$,
$m(\widehat{ACE}) = m(\widehat{ECB})$, $m(\widehat{BEC}) = 20°$ $\Rightarrow$ **x + y = ?**

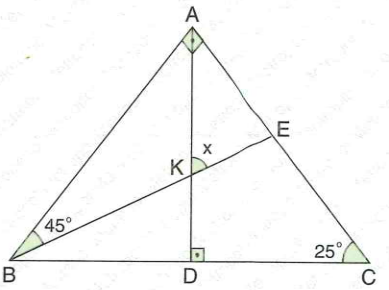
A) 95° B) 100° C) 110°
D) 120° E) 150°

3. $|BD| = |AD| = |AC|$,
$m(\widehat{ADC}) = 70°$
$\Rightarrow$ **$m(\widehat{EAC})$ = ?**



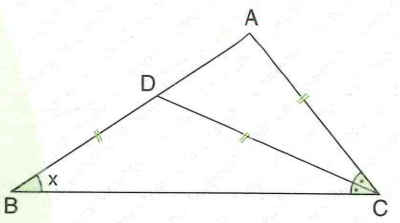
A) 110° B) 108° C) 105°
D) 100° E) 95°

4. $m(\widehat{ABE}) = 45°$,
$m(\widehat{BCA}) = 25°$,
$[AB] \perp [AC]$,
$[AD] \perp [BC]$,
$\Rightarrow$ **x = ?**



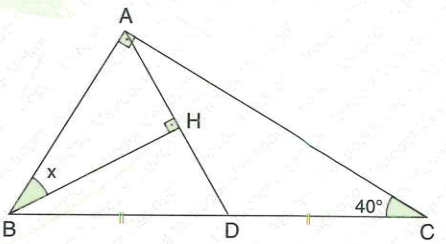
A) 15° B) 20° C) 45°
D) 60° E) 70°

5. [DC] bir açıortaydır.
[DC] is a bisector.
$m(\widehat{ACD}) = m(\widehat{DCB})$
$|AC| = |CD| = |DB|$
$\Rightarrow$ **x = ?**



A) 30° B) 36° C) 40°
D) 42° E) 46°

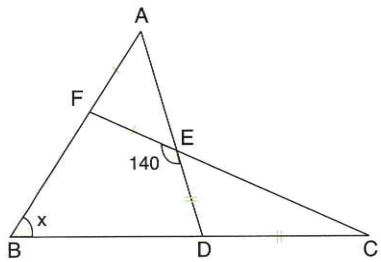
6. $[AB] \perp [AC]$,
$[BH] \perp [AD]$,
$|BD| = |DC|$,
$m(\widehat{C}) = 40°$
$\Rightarrow$ **x = ?**



A) 30° B) 35° C) 40°
D) 45° E) 50°

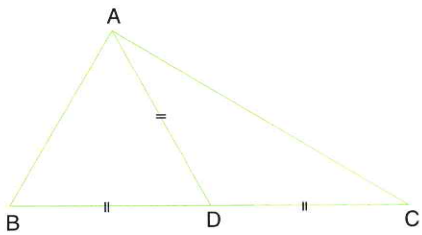
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $|AF| = |FE|$,
$|ED| = |DC|$,
$m(\widehat{DEF}) = 140°$
$\Rightarrow$ **x = ?**



A) 70° B) 60° C) 50°
D) 40° E) 30°

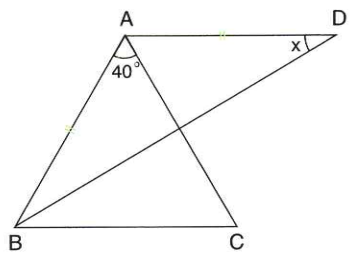
8.



$|AD| = |BD| = |DC|$, $m(\widehat{BAD}) = 2 \cdot m(\widehat{C})$
$\Rightarrow$ **$m(\widehat{ADC})$ = ?**

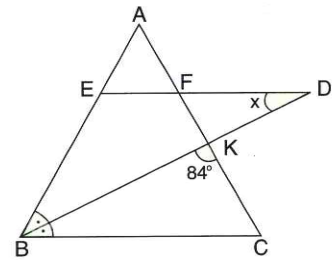
A) 90° B) 100° C) 120°
D) 135° E) 150°

9. $|AB| = |AC| = |AD|$,
$[AD] // [BC]$,
$m(\widehat{BAC}) = 40°$
$\Rightarrow$ **x = ?**



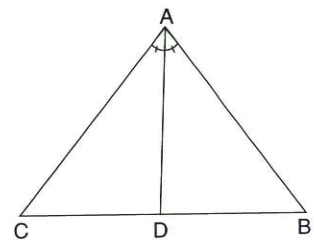
A) 30° B) 35° C) 40°
D) 45° E) 50°

10. $|AB| = |AC|$,
$m(\widehat{ABD}) = m(\widehat{DBC})$,
$DE // BC$,
$m(\widehat{BKC}) = 84°$
$\Rightarrow$ **x = ?**



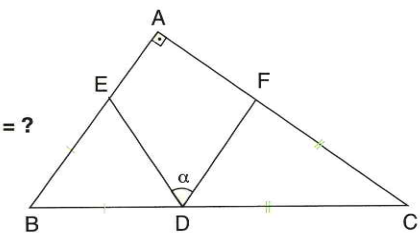
A) 24° B) 26° C) 28°
D) 30° E) 32°

11. $m(\widehat{DAB}) = m(\widehat{CAD})$,
$m(\widehat{B}) = m(\widehat{C}) + 32°$
$\Rightarrow$ **$m(\widehat{ADC})$ = ?**



A) 90° B) 100° C) 106°
D) 110° E) 150°

12. $[BA] \perp [AC]$,
$|BD| = |BE|$,
$|FC| = |DC|$
$\Rightarrow$ **$m(\widehat{EDF}) = \alpha$ = ?**



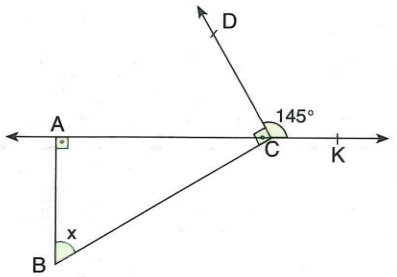
A) 30° B) 45° C) 60°
D) 62,5° E) 75°

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
B	E	C	E	B	C	B	C	B	E	C	B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



[AB] ⊥ [CA, [CD ⊥ [BC] $m(\widehat{DCK}) = 145°$,

⇒ **x = ?**

A) 35° B) 40° C) 45°

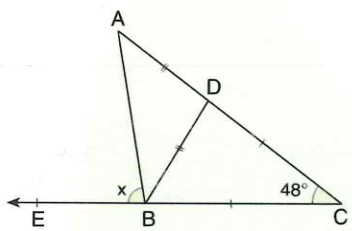
D) 50° E) 55°

2. IDAI = IDBI,

ICBI = IDCI,

$m(\widehat{ACE}) = 48°$

⇒ **$m(\widehat{ABE}) = x = ?$**



A) 81° B) 83° C) 91°

D) 97° E) 99°

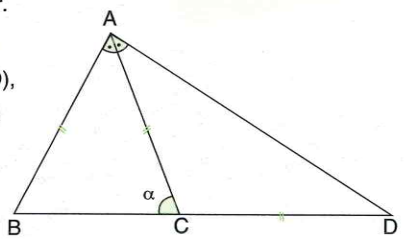
3. [AC] bir açıortaydır.

[AC] is a bisector.

$m(\widehat{BAC}) = m(\widehat{CAD})$,

IABI = IACI = ICDI

⇒ **$\alpha = ?$**



A) 36° B) 40° C) 45°

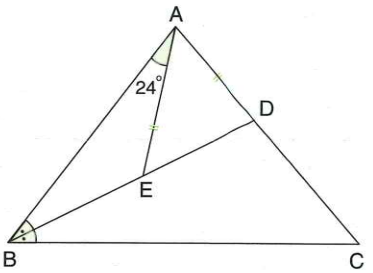
D) 72° E) 80°

4. $m(\widehat{ABD}) = m(\widehat{DBC})$,

IAEI = IADI,

$m(\widehat{BAE}) = 24°$

⇒ **$m(\widehat{ACB}) = ?$**



A) 12° B) 18° C) 24°

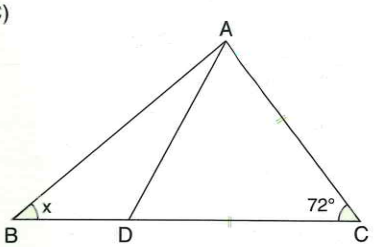
D) 36° E) 48°

5. $m(\widehat{BAC}) = 3\ m(\widehat{ABC})$

IACI = ICDI,

$m(\widehat{ACB}) = 72°$

⇒ **$m(\widehat{ABD}) = x = ?$**



A) 14° B) 24° C) 27°

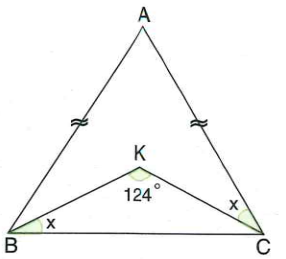
D) 29° E) 36°

6. IABI = IACI,

$m(\widehat{KBC}) = m(\widehat{KCA}) = x$,

$m(\widehat{K}) = 124°$

⇒ **$m(\widehat{ACB}) = ?$**

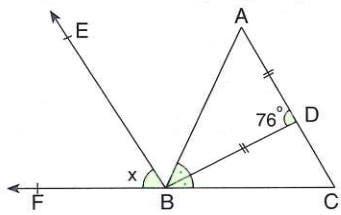


A) 34° B) 48° C) 52°

D) 56° E) 64°

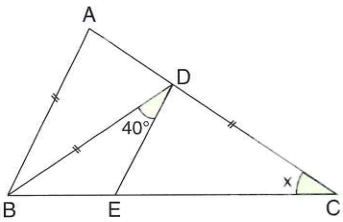
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [CA] // [BE],
IADI = IDBI,
$m(\widehat{ABD}) = m(\widehat{DBC})$,
$m(\widehat{ADB}) = 76°$
$\Rightarrow$ **$m(\widehat{EBF}) = x = ?$**



A) 18° B) 24° C) 30°
D) 32° E) 36°

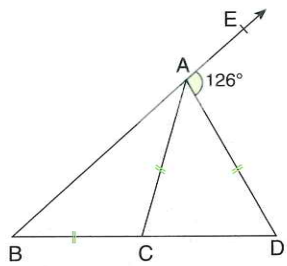
8.



IABI = IBDI = IDCI,
[DE] // [AB],
$m(\widehat{BDE}) = 40° \Rightarrow$ **$m(\widehat{ACB}) = x = ?$**

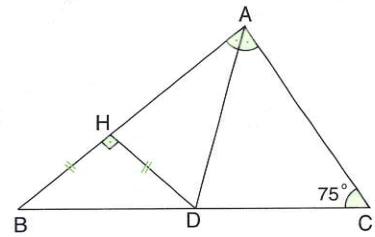
A) 20° B) 25° C) 30°
D) 35° E) 40°

9. IBCI = ICAI = IADI,
$m(\widehat{DAE}) = 126°$
$\Rightarrow$ **$m(\widehat{CAD}) = ?$**



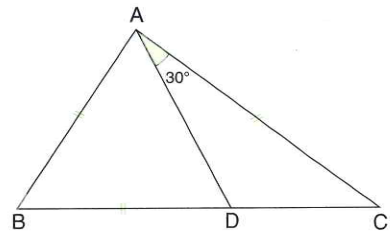
A) 10° B) 12° C) 15°
D) 18° E) 24°

10. [AD], bir açıortaydır.
[AD] is a bisector.
$m(\widehat{BAD}) = m(\widehat{DAC})$,
[DH] $\perp$ [AB],
IBHI = IDHI,
$m(\widehat{DCA}) = 75°$
$\Rightarrow$ **$m(\widehat{HDA}) = ?$**



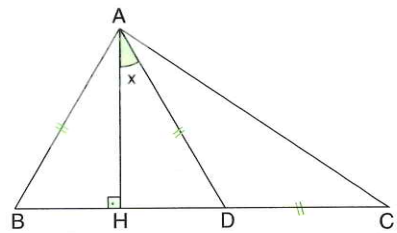
A) 30° B) 40° C) 45°
D) 55° E) 60°

11. IABI = IACI = IBDI,
$m(\widehat{CAD}) = 30°$
$\Rightarrow$ **$m(\widehat{BAC}) = ?$**



A) 85° B) 90° C) 95°
D) 100° E) 110°

12.



IBAI = IADI = IDCI, ICAI = ICBI,
[AH] $\perp$ [BC] $\Rightarrow$ **$m(\widehat{HAD}) = x = ?$**

A) 16° B) 18° C) 20°
D) 24° E) 36°

YANITLAR / ANSWERS

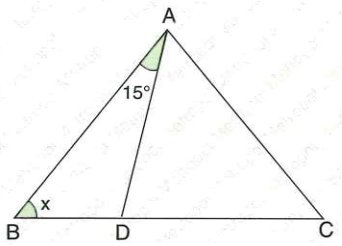
1	2	3	4	5	6	7	8	9	10	11	12
A	A	D	C	C	D	B	D	B	E	D	B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $|AB| = |AC| = |CD|$,

$m(\widehat{BAD}) = 15°$

$\Rightarrow$ **$m(\widehat{ABD}) = x = ?$**



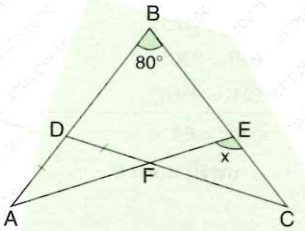
A) 30° B) 40° C) 50°

D) 60° E) 70°

2. $|BD| = |BC|$,
$|AD| = |DF|$,

$m(\widehat{DBC}) = 80°$

$\Rightarrow$ **$m(\widehat{FEC}) = x = ?$**



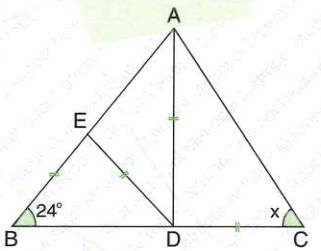
A) 100° B) 102° C) 105°

D) 110° E) 118°

3. $|BE| = |ED| = |AD| = |DC|$,

$m(\widehat{ABC}) = 24°$

$\Rightarrow$ **$m(\widehat{ACD}) = x = ?$**



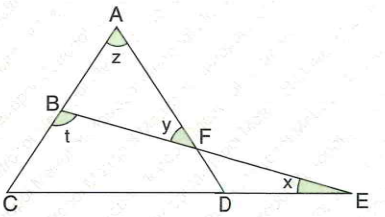
A) 55° B) 60° C) 65°

D) 70° E) 54°

4. $|EC| = |EB|$,

$z + y + t = 160°$

$\Rightarrow$ **$m(\widehat{FED}) = x = ?$**



A) 12° B) 14° C) 16°

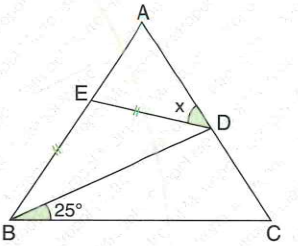
D) 18° E) 20°

5. $|AB| = |AC|$,

$|ED| = |EB|$,

$m(\widehat{DBC}) = 25°$

$\Rightarrow$ **$m(\widehat{EDA}) = x = ?$**



A) 25° B) 35° C) 40°

D) 45° E) 50°

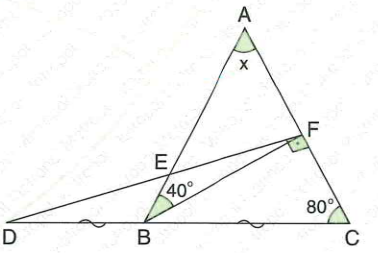
6. $[DF] \perp [AC]$,

$|DB| = |BC|$,

$m(\widehat{C}) = 80°$,

$m(\widehat{EBF}) = 40°$

$\Rightarrow$ **$m(\widehat{A}) = x = ?$**

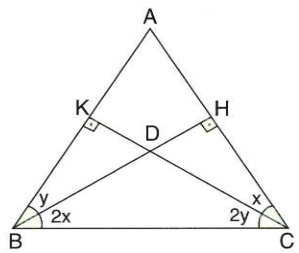


A) 40° B) 42° C) 45°

D) 48° E) 52°

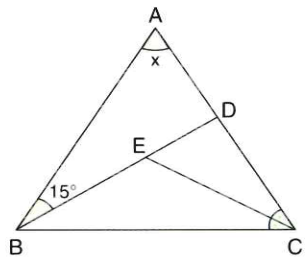
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $[BH] \perp [AC]$,
$[CK] \perp [AB]$,
$m(\widehat{ABH}) = y$,
$m(\widehat{HBC}) = 2x$,
$m(\widehat{ACK}) = x$,
$m(\widehat{KCB}) = 2y$
$\Rightarrow$ **$m(\widehat{BAC}) = ?$**



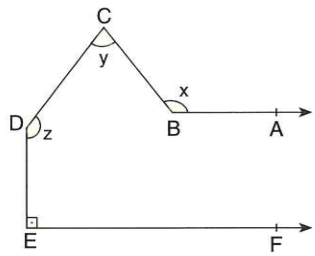
A) 62° B) 72° C) 82°
D) 92° E) 102°

8. $m(\widehat{DCE}) = m(\widehat{ECB})$,
$|AB| = |BC|$,
$|CD| = |CE|$,
$m(\widehat{ABD}) = 15°$
$\Rightarrow$ **$m(\widehat{BAC}) = x = ?$**



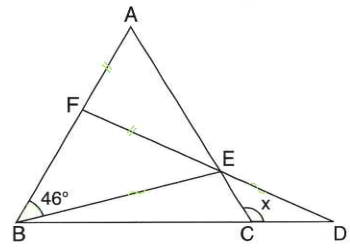
A) 45° B) 50° C) 55°
D) 60° E) 65°

9. $[BA] // [EF]$,
$[DE] \perp [EF]$,
$x + y + z = 280°$
$\Rightarrow$ **$x = ?$**



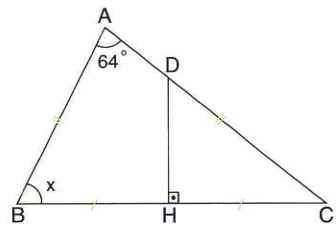
A) 92° B) 93° C) 94°
D) 95° E) 96°

10. $|AF| = |FE|$,
$|BE| = |ED|$,
$m(\widehat{ABE}) = 46°$
$\Rightarrow$ **$m(\widehat{ACD}) = x = ?$**



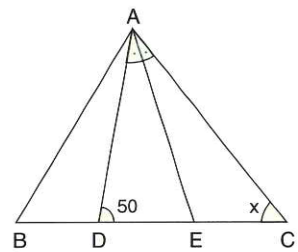
A) 112° B) 113° C) 114°
D) 115° E) 116°

11. $[DH] \perp [BC]$,
$|AB| = |DC|$,
$|BH| = |HC|$,
$m(\widehat{A}) = 64°$
$\Rightarrow$ **$m(\widehat{B}) = x = ?$**



A) 84° B) 88° C) 92°
D) 96° E) 100°

12. $|AB| = |AC| = |BE|$,
$m(\widehat{ADE}) = 50°$
$\Rightarrow$ **$m(\widehat{ACE}) = x = ?$**



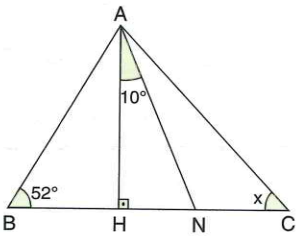
A) 20° B) 25° C) 30°
D) 35° E) 40°

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	C	E	E	E	A	B	D	D	B	A	B

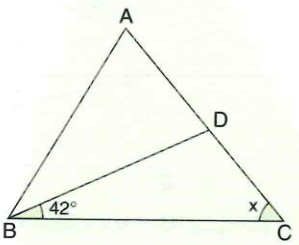
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $[AH] \perp [BC]$,
$m(\widehat{BAN}) = m(\widehat{CAN})$,
$m(\widehat{ABH}) = 52°$
⇒ **$m(\widehat{ACB}) = x = ?$**



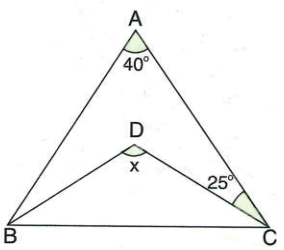
A) 32° B) 38 C) 42° D) 48° E) 56°

2. $|AB| = |BD| = |AC|$,
$m(\widehat{DBC}) = 42°$
⇒ **$m(\widehat{ACB}) = x = ?$**



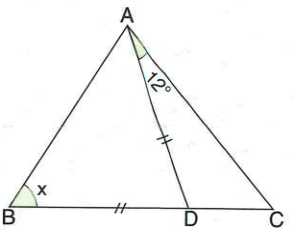
A) 40° B) 46° C) 48° D) 50° E) 54°

3. $|AB| = |BC|$,
$|DB| = |DC|$,
$m(\widehat{BAC}) = 40°$,
$m(\widehat{ACD}) = 25°$
⇒ **$m(\widehat{BDC}) = x = ?$**



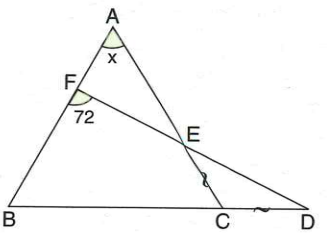
A) 140° B) 145° C) 150° D) 155° E) 160°

4. $|AD| = |DB|$,
$|AB| = |AC|$,
$m(\widehat{DAC}) = 12°$
⇒ **$m(\widehat{ABD}) = x = ?$**



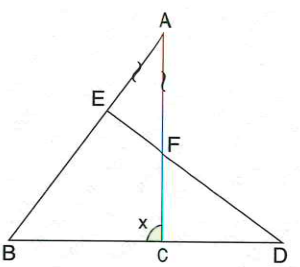
A) 55° B) 56° C) 57° D) 58° E) 59°

5. $|AB| = |AC|$,
$|DC| = |CE|$,
$m(\widehat{BFD}) = 72°$
⇒ **$m(\widehat{BAC}) = x = ?$**



A) 24° B) 36° C) 48° D) 60° E) 72°

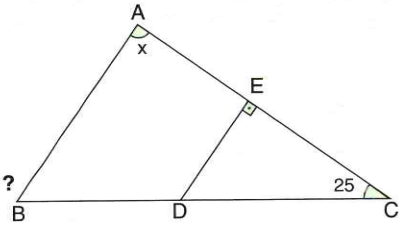
6. $|AE| = |AF|$,
$|AC| = |CB|$,
$|BE| = |ED|$
⇒ **$m(\widehat{ACB}) = x = ?$**



A) 72° B) 80° C) 108° D) 120° E) 135°

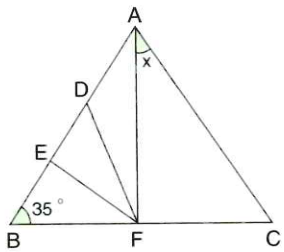
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $[DE] \perp [AC]$,
$|AB| = |BD|$,
$|AE| = |EC|$,
$m(\widehat{ACB}) = 25°$
$\Rightarrow$ **$m(\widehat{BAC}) = x = ?$**



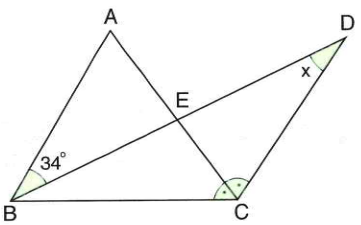
A) 25° B) 50° C) 60°
D) 75° E) 100°

8. $|AF| = |AC|$,
$|BE| = |EF| = |FD| = |DA|$,
$m(\widehat{B}) = 35°$
$\Rightarrow$ **$m(\widehat{FAC}) = x = ?$**



A) 35° B) 40° C) 45°
D) 50° E) 55°

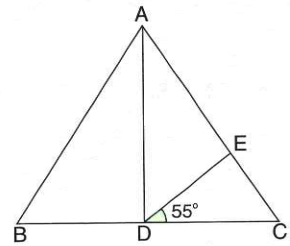
9.



$|AB| = |AC|$, $|BC| = |CD|$, $m(\widehat{BCA}) = m(\widehat{DCA})$,
$m(\widehat{ABE}) = 34°$ $\Rightarrow$ **$m(\widehat{EDC}) = x = ?$**

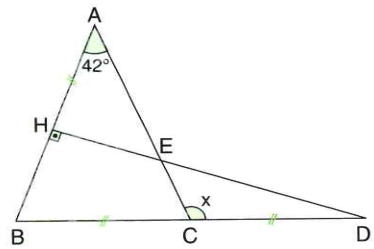
A) 28° B) 30° C) 32°
D) 34° E) 36°

10. $|AB| = |AD| = |AE|$,
$m(\widehat{EDC}) = 55°$
$\Rightarrow$ **$m(\widehat{BAC}) = ?$**



A) 75° B) 90° C) 110°
D) 125° E) 140°

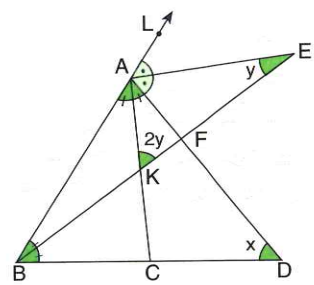
11.



$[DH] \perp [AB]$, $|AH| = |BC| = |CD|$,
$m(\widehat{BAC}) = 42° \Rightarrow$ **$m(\widehat{ECD}) = x = ?$**

A) 112° B) 126° C) 132°
D) 144° E) 152°

12. $m(\widehat{LAE}) = m(\widehat{EAF})$,
$m(\widehat{DAC}) = m(\widehat{CAB})$,
$m(\widehat{ABK}) = m(\widehat{KBC})$,
$m(\widehat{AEF}) = y$,
$m(\widehat{AKE}) = 2y$
$\Rightarrow$ **$m(\widehat{ADC}) = x = ?$**



A) 50° B) 60° C) 70° D) 80° E) 90°

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
A	B	C	B	B	C	D	B	A	C	B	B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

BÖLÜM CHAPTER 3

TARİHSEL NOT / HISTORICAL NOTE

Hypatia [370 – 415]

Doğu Roma İmparatorluğu'nun bir parçası olan İskenderiye'de yaşamış olan Helenistik bir Neoplatoncu filozof, astronom ve matematikçidir. Felsefe ve astronomi öğrettiği İskenderiye'deki Neoplatonik okulunun önemli bir düşünürüydü. Yaşamı oldukça iyi kaydedilmiş ilk kadın matematikçidir. Babası Theon'un yazdığı "Öklid'in Elementleri" adlı eser üzerine düzenleme yapmıştır.

She was a Hellenistic Neoplatonist philosopher, astronomer, and mathematician who lived in Alexandria, Egypt, then part of the Eastern Roman Empire. She was a prominent thinker of the Neoplatonic school in Alexandria, where she taught philosophy and astronomy. She is the first female mathematician whose life is reasonably well recorded. She also made arrangements on the book written by her father Theon, "The Elements of Euclid".

ÜÇGENDE YARDIMCI ELEMANLAR
THE AUXILIARY ELEMENTS in a TRIANGLE

Bu bölüm, 24 çözümlü örnek, 12 çözümlü test sorusu, 6 çözümlü YÖS sorusu, 36 alıştırma sorusu, 96 test sorusu içermektedir.
This chapter includes 24 examples with solutions, 12 test questions with solutions, 6 YÖS questions with solutions, 36 exercise questions and 96 test questions.

BÖLÜM / CHAPTER 3 ..... 67 - 110

ÜÇGENDE YARDIMCI ELEMANLAR / THE AUXILIARY ELEMENT in a TRIANGLE

- Açıortay / Bisector ..... 69 - 75
  - Üçgende Açıortay / The Bisector in a Triangle ..... 70 - 75
- Üçgende Kenarortay / The Median in a Triangle ..... 75 - 81
  - Kenarortayın Özellikleri / Properties of Median ..... 76 - 81
- Üçgende Yükseklik / The Altitude in a Triangle 82
- Çözümlü Test / Test With Solutions ..... 83 - 86
- YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 87 - 88
- Alıştırmalar / Exercises ..... 89 - 94
- Konu Testleri / Practice Tests ..... 95 - 110

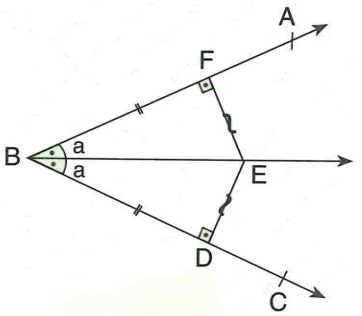
BÖLÜM
03
CHAPTER

ÜÇGENDE YARDIMCI ELEMANLAR
THE AUXILIARY ELEMENTS in a TRIANGLE

AÇIORTAY / BISECTOR

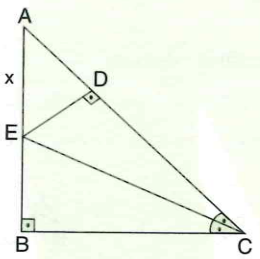
[BE : açıortay / bisector

$m(\widehat{CBE}) = m(\widehat{ABE})$
$[BC] \perp [ED]$
$[BA \perp [EF]$
$\Rightarrow$ ***IBFI = IBDI***
IEFI = IEDI



Örnek / Example 1

$[ED] \perp [AC]$,
$[EB] \perp [BC]$,
$m(\widehat{ACE}) = m(\widehat{ECB})$,
$|AC| = 20$ cm,
$|BC| = 12$ cm,
$|ED| = 6$ cm
$\Rightarrow$ **$|AE| = x = ?$ cm**

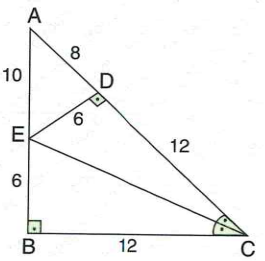


A) 6 B) 8 C) 10 D) 12 E) 15

Çözüm / Solution

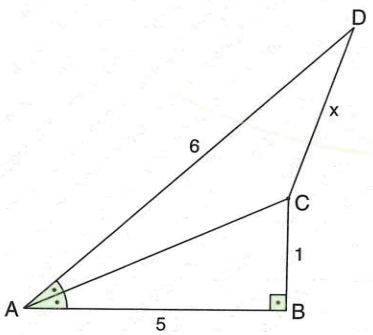
Yanıt / Answer **C**

$|BC| = |DC| \Rightarrow |DC| = 12$ cm
$|ED| = |EB| \Rightarrow |EB| = 6$ cm
$|AC|^2 = |BC|^2 + |AB|^2$
$20^2 = 12^2 + |AB|^2$
$|AB| = 16$ cm
$|AE| = |AB| - |EB|$
$|AE| = 16 - 6$
$|AE| = 10$ cm



Örnek / Example 2

$m(\widehat{ABC}) = 90°$,
$m(\widehat{DAC}) = m(\widehat{CAB})$,
$|AB| = 5$ br (u),
$|BC| = 1$ br (u)
$|AD| = 6$ br (u)
$\Rightarrow$ **$|CD| = x = ?$**

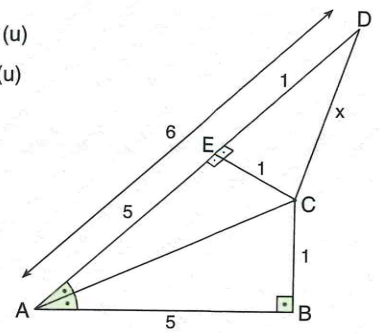


A) 2 B) $\sqrt{2}$ C) 3 D) $3\sqrt{2}$ E) 4

Çözüm / Solution

Yanıt / Answer **B**

$|BC| = 1$ br (u) $\Rightarrow |CE| = 1$ br (u)
$\Rightarrow |AE| = 5$ br (u)
$|ED| = 6 - 5 = 1$ br (u)
$\widehat{CED}$:
$x^2 = 1^2 + 1^2$
$x^2 = 2$
$x = \sqrt{2}$ br (u)



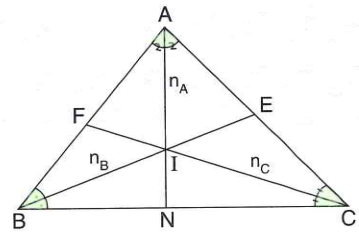
ÜÇGENDE AÇIORTAY / THE BISECTOR in a TRIANGLE

Bir üçgende, bir iç açıyı eşit iki açıya ayıran ışına üçgenin **iç açıortayı** denir.

İç açıortaylar, $|AN| = n_A$, $|CF| = n_C$, $|BE| = n_B$

An interior angle bisector in a triangle is a ray which cuts an interior angle to two equal angles.

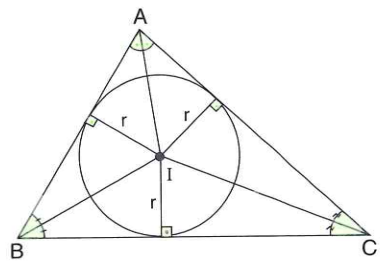
Bisectors; $|AN| = n_A$, $|CF| = n_C$, $|BE| = n_B$.



İç Teğet Çember / The Internally Tangent Circle

İç teğet çember, üçgenin kenarlarına içten teğet olan çemberdir. İç teğet çemberin merkezi, iç açıortayların kesim noktasıdır.

The internally tangent circle is a circle tangent to sides of a triangle from inside. The center of internally tangent circle is the intesection point of the interior bisectors.

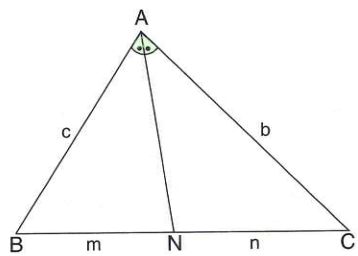


İç Açıortay Teoremi / The Interior Angle Bisector Theorem

$$m(\widehat{BAN}) = m(\widehat{NAC}) \Leftrightarrow \frac{c}{b} = \frac{m}{n}$$

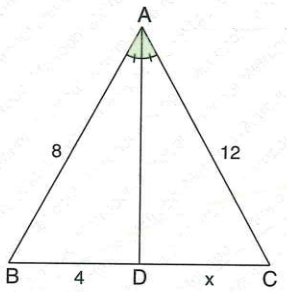
$$\Leftrightarrow \frac{c}{m} = \frac{b}{n}$$

$$\Leftrightarrow c \cdot n = b \cdot m$$



Örnek / Example 3

$m(\widehat{BAD}) = m(\widehat{DAC})$,
$|AB| = 8$ cm,
$|BD| = 4$ cm,
$|AC| = 12$ cm
$\Rightarrow |DC| = x = ?$



A) 3 B) 6 C) 9 D) 12 E) 15

Çözüm / Solution

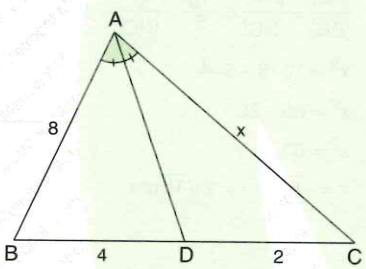
Yanıt / Answer **B**

[AD] : açıortay / bisector

$$\frac{|AB|}{|BD|} = \frac{|AC|}{|DC|} \Leftrightarrow \frac{8}{4} = \frac{12}{x}$$
$$\Leftrightarrow 8 \cdot x = 48$$
$$\Rightarrow x = 6 \text{ cm}$$

Örnek / Example 4

$m(\widehat{BAD}) = m(\widehat{DAC})$,
$|AB| = 8$ cm,
$|BD| = 4$ cm,
$|DC| = 2$ cm
$\Rightarrow |AC| = x = ?$



A) 4 B) 6 C) 9 D) 12 E) 15

Çözüm / Solution

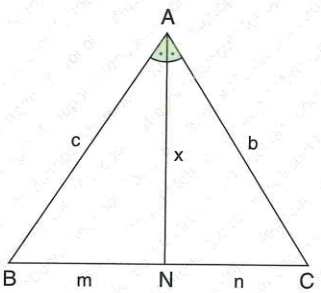
Yanıt / Answer **A**

[AD] : açıortay / bisector

$$\frac{|AB|}{|BD|} = \frac{|AC|}{|DC|} \Leftrightarrow \frac{8}{4} = \frac{x}{2}$$
$$\Leftrightarrow 16 = 4x$$
$$\Rightarrow 4 = x$$

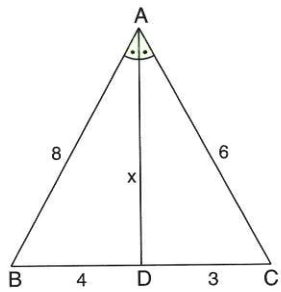
Bir İç Açıortayın Uzunluğu / The Length of an Interior Angle Bisector

[AN] : açıortay / bisector (n_A)
$m(\widehat{BAN}) = m(\widehat{NAC})$
$\Rightarrow x^2 = b \cdot c - m \cdot n$



Örnek / Example 5

$m(\widehat{BAD}) = m(\widehat{DAC})$,
$|AB| = 8$ cm,
$|AC| = 6$ cm,
$|BD| = 4$ cm,
$|DC| = 3$ cm
$\Rightarrow$ **$|AD| = x = ?$**



A) 3 B) 4 C) 5 D) 6 E) 7

Çözüm / Solution

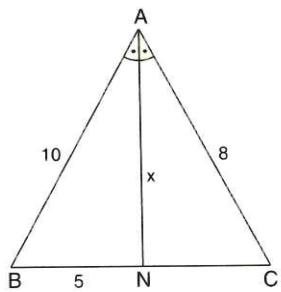
Yanıt / Answer **D**

[AD] : iç açıortay / interior bisector

$x^2 = |AC| \cdot |AB| - |BD| \cdot |DC|$
$x^2 = 6 \cdot 8 - 4 \cdot 3$
$x^2 = 36$
$x = 6$ cm

Örnek / Example 6

$m(\widehat{BAN}) = m(\widehat{NAC})$,
$|AB| = 10$ cm,
$|AC| = 8$ cm, $|BN| = 5$ cm
$\Rightarrow$ **$|AN| = x = ?$ cm**



A) $2\sqrt{15}$ B) $3\sqrt{15}$ C) $4\sqrt{15}$ D) $6\sqrt{15}$ E) $7\sqrt{15}$

Çözüm / Solution

Yanıt / Answer **A**

[AN] : açıortay / bisector

$\frac{|AB|}{|BN|} = \frac{|AC|}{|NC|} \Leftrightarrow \frac{10}{5} = \frac{8}{|NC|} \Rightarrow 2 = \frac{8}{|NC|} \Rightarrow |NC| = 4$ cm

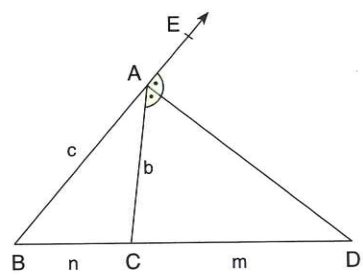
$x^2 = 10 \cdot 8 - 5 \cdot 4$
$x^2 = 80 - 20$
$x^2 = 60$
$x = \sqrt{60} \Rightarrow x = 2\sqrt{15}$ cm

Dış Açıortay Teoremi / The Exterior Angle Bisector Theorem

[AD] : dış açıortay / the exterior bisector

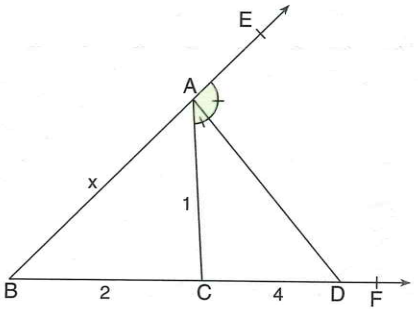
$$\frac{|AC|}{|AB|} = \frac{|DC|}{|DB|} \Leftrightarrow \frac{b}{c} = \frac{m}{m+n}$$

$$\Leftrightarrow \frac{c}{b} = \frac{m+n}{m}$$



Örnek / Example 7

$m(\widehat{CAD}) = m(\widehat{DAE})$,
$|BC| = 2$ cm,
$|AC| = 1$ cm,
$|CD| = 4$ cm
$\Rightarrow$ **$|AB| = x = ?$ cm**



A) $\frac{1}{2}$ B) 1 C) $\frac{3}{2}$ D) 2 E) 3

Çözüm / Solution

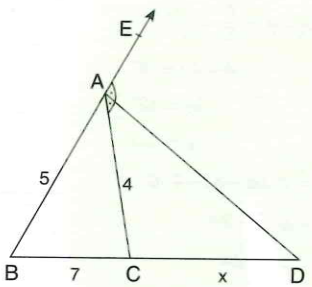
Yanıt / Answer **C**

[AD] : dış açıortay / exterior bisector

$$\frac{|CD|}{|BD|} = \frac{|AC|}{|AB|} \Leftrightarrow \frac{4}{4+2} = \frac{1}{x}$$
$$\Leftrightarrow \frac{4}{6} = \frac{1}{x}$$
$$\Leftrightarrow 4x = 6$$
$$\Leftrightarrow x = \frac{3}{2} \text{ cm}$$

Örnek / Example 8

$m(\widehat{EAD}) = m(\widehat{DAC})$,
$|AB| = 5$ cm,
$|AC| = 4$ cm,
$|BC| = 7$ cm
$\Rightarrow$ **$|CD| = x = ?$**



A) 24 B) 26 C) 28 D) 30 E) 32

Çözüm / Solution

Yanıt / Answer **C**

[AD] : dış açıortay / the exterior bisector

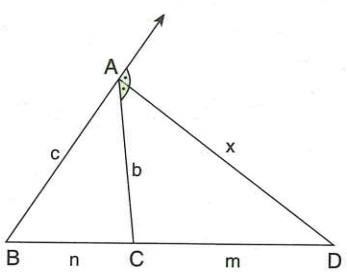
$$\frac{|AC|}{|AB|} = \frac{|DC|}{|DB|} \Leftrightarrow \frac{4}{5} = \frac{x}{x+7}$$
$$\Rightarrow 4x + 28 = 5x$$
$$\Rightarrow 28 = x$$

Dış Açıortayın Uzunluğu / The Length of an Exterior Angle Bisector

[AD] : dış açıortay / the exterior bisector (n'_A)

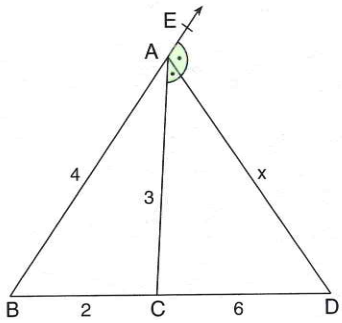
$|AD|^2 = |DC| \cdot |DB| - |AC| \cdot |AB|$

$\Rightarrow$ ***$x^2 = m \cdot (m+n) - b \cdot c$***



Örnek / Example 9

$m(\widehat{CAD}) = m(\widehat{DAE})$,
$|BC| = 2$ cm,
$|AB| = 4$ cm,
$|AC| = 3$ cm,
$|CD| = 6$ cm
$\Rightarrow$ **$|AD| = x = ?$**



A) 3 B) 6 C) 9 D) 12 E) 15

Çözüm / Solution

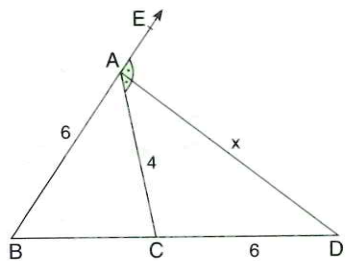
Yanıt / Answer **B**

[AD] : dış açıortay / exterior bisector

$x^2 = 6 \cdot (6+2) - 3 \cdot 4$
$x^2 = 6 \cdot 8 - 12$
$x^2 = 48 - 12$
$x^2 = 36$
$x = 6$

Örnek / Example 10

$m(\widehat{EAD}) = m(\widehat{DAC})$,
$|AB| = 6$ cm,
$|AC| = 4$ cm,
$|CD| = 6$ cm
$\Rightarrow$ **$|AD| = x = ?$ cm**



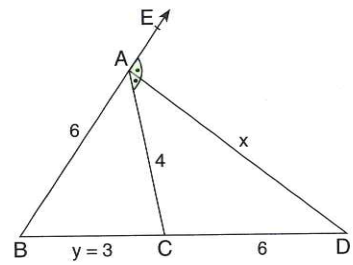
A) $2\sqrt{11}$ B) $2\sqrt{13}$ C) $\sqrt{26}$ D) $\sqrt{30}$ E) $\sqrt{43}$

Çözüm / Solution

Yanıt / Answer **D**

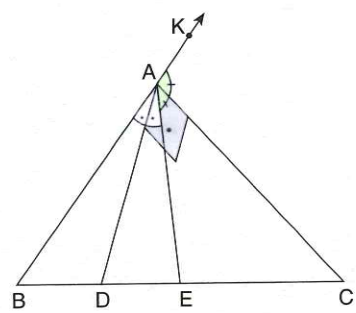
$|BC| = y \Rightarrow \frac{4}{6} = \frac{6}{6+y}$
$24 + 4y = 36$
$4y = 12$
$y = 3$ cm

$x^2 = 6 \cdot (6+3) - 4 \cdot 6$
$x^2 = 6 \cdot 9 - 24$
$x^2 = 54 - 24$
$x^2 = 30$
$x = \sqrt{30}$ cm



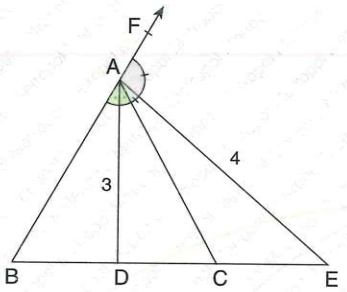
İç Açıortay ile Dış Açıortay Arasındaki İlişki / The Relationship Between Interior Bisector and Exterior Bisector

[AD], iç açıortay / [AD] is an interior bisector (n_A)
[AC], dış açıortay / [AD] is an exterior bisector (n'_A)
$\Rightarrow$ ***$m(\widehat{DAC}) = 90^\circ$***



Örnek / Example 11

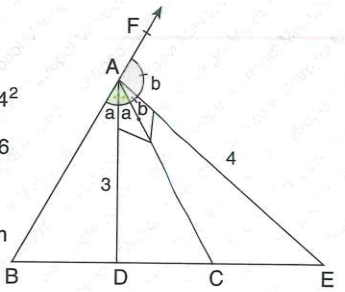
$m(\widehat{BAD}) = m(\widehat{DAC})$,
$m(\widehat{CAE}) = m(\widehat{EAF})$,
$|AD| = 3$ cm,
$|AE| = 4$ cm
$\Rightarrow$ **$|DE| = ?$ cm**



A) 3 B) 5 C) 6 D) 8 E) 10

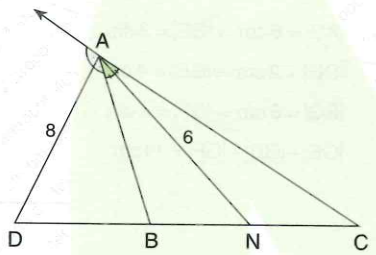
Çözüm / Solution Yanıt / Answer **B**

$2 \cdot a + 2 \cdot b = 180°$
$a + b = 90° = m(\widehat{DAE})$
$m(\widehat{DAE}) = 90° \Rightarrow |DE|^2 = 3^2 + 4^2$
$|DE|^2 = 9 + 16$
$|DE|^2 = 25$
$\Rightarrow |DE| = 5$ cm



Örnek / Example 12

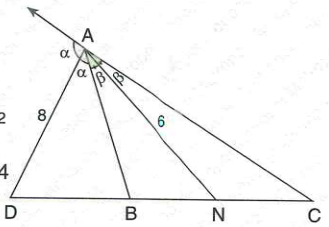
[AN], iç açıortay; [AD] dış açıortaydır.
[AN] is an interior bisector; [AD] is an exterior bisector.
$|AD| = 8$ cm,
$|AN| = 6$ cm
$\Rightarrow$ **$|DN| = ?$ cm**



A) 3 B) 5 C) 6 D) 8 E) 10

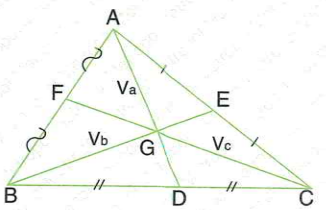
Çözüm / Solution Yanıt / Answer **E**

$2\alpha + 2\beta = 180°$
$\alpha + \beta = 90° = m(\widehat{DAN})$
$m(\widehat{DAN}) = 90° \Rightarrow |DN|^2 = 6^2 + 8^2$
$|DN|^2 = 36 + 64$
$|DN|^2 = 100$
$\Rightarrow |DN| = 10$ cm



ÜÇGENDE KENARORTAY / THE MEDIAN in a TRIANGLE

Tanım: Bir üçgende her kenarın orta noktasını, bu noktanın karşısındaki köşeye birleştiren doğru parçasına **kenarortay** denir.
$[AD] = V_a$, $[BE] = V_b$, $[CF] = V_c$ doğru parçaları; [BC], [AC], [AB] kenarlarına ait kenarortaylardır.
Bir üçgende, üç kenarortay üçgenin iç bölgesinde bir noktada kesişir. Bu noktaya **üçgenin ağırlık merkezi** denir. ABC üçgeninin ağırlık merkezi G noktasıdır.



Definition: A **median** is a line segment combining a vertex and the midpoint of the opposite side.
$|AD| = V_a$, $|BE| = V_b$, $|CF| = V_c$ are the lengths of the medians related to the sides [BC], [AC], [AB].
In a triangle medians intersect at a point in the interior area. This point is called the **center of gravity of the triangle**. The center of the gravity of the triangle ABC is the point G.

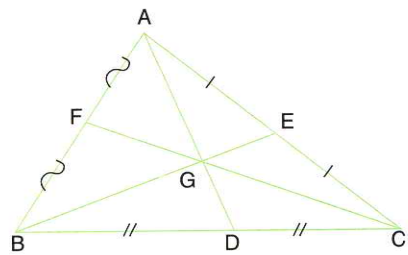
KENARORTAYIN ÖZELLİKLERİ / PROPERTIES of MEDIAN

Özellik 1 / Property 1

$|AG| = 2.|GD|$

$|BG| = 2.|GE|$

$|CG| = 2.|GF|$



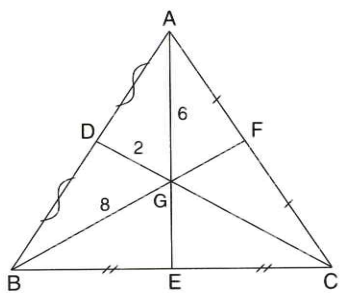
Örnek / Example 13

$|AG| = 6$ cm,

$|DG| = 2$ cm,

$|BG| = 8$ cm

$\Rightarrow |GF| + |GC| + |GE| = ?$ cm



A) 10 B) 11 C) 12 D) 13 E) 14

Çözüm / Solution

Yanıt / Answer **B**

G noktası, ABC üçgeninin ağırlık merkezidir.

G is center of the gravity of the triangle ABC.

$|AG| = 6$ cm $\Rightarrow |GE| = 3$ cm

$|DG| = 2$ cm $\Rightarrow |GC| = 4$ cm

$|BG| = 8$ cm $\Rightarrow |GF| = 4$ cm

$|GE| + |GC| + |GF| = 11$ cm

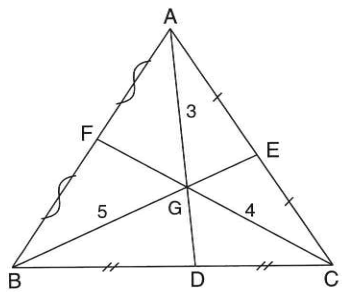
Örnek / Example 14

$|AG| = 3$ cm,

$|BG| = 5$ cm,

$|CG| = 4$ cm

$\Rightarrow \vartheta_a + \vartheta_b + \vartheta_c = ?$ cm



A) 15 B) 16 C) 17 D) 18 E) 19

Çözüm / Solution

Yanıt / Answer **D**

$|AD| = \vartheta_a$, $|BE| = \vartheta_b$, $|CF| = \vartheta_c$,

$|AG| = 3$ cm $\Rightarrow |GD| = \frac{3}{2}$ cm

$\Rightarrow |AD| = 3 + \frac{3}{2} = \frac{9}{2}$ cm

$|BG| = 5$ cm $\Rightarrow |GE| = \frac{5}{2}$ cm

$\Rightarrow |BE| = 5 + \frac{5}{2} = \frac{15}{2}$ cm

$|CG| = 4$ cm $\Rightarrow |FG| = 2$ cm

$\Rightarrow |CF| = 4 + 2 = 6$ cm

$\vartheta_a + \vartheta_b + \vartheta_c = \frac{9}{2} + \frac{15}{2} + 6 = 18$ cm

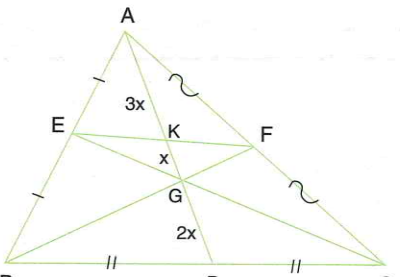
Özellik 2 / Property 2

G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
G is the center of gravity of triangle ABC.

$|KG| = \frac{1}{6} \cdot |AD| = \frac{1}{6} \cdot V_a$

$|AG| = \frac{1}{2} \cdot |AD| = \frac{1}{2} \cdot V_a$

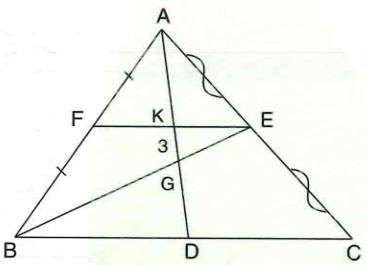
$|GD| = \frac{1}{3} \cdot |AD| = \frac{1}{3} \cdot V_a$



[3 – 1 – 2 Kuralı / The 3 – 1 – 2 Rule]

Örnek / Example 15

$|AF| = |FB|$,
$|AE| = |EC|$,
$|KG| = 3$ cm
$\Rightarrow$ **$|AD|$ = ? cm**



A) 14 B) 16 C) 18 D) 20 E) 22

Çözüm / Solution

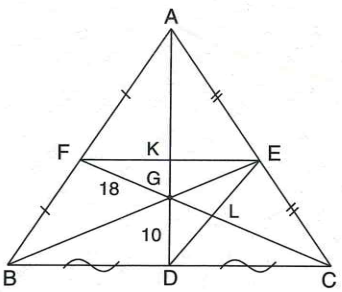
Yanıt / Answer **C**

$\left.\begin{matrix} |AF| = |FB| \\ |AE| = |EC| \end{matrix}\right\} \Rightarrow$ G noktası, ABC üçgeninin ağırlık merkezidir.
G is the center of the gravity of the triangle ABC.

$\left.\begin{matrix} |AK| = 3x \\ |KG| = x \\ |GD| = 2x \end{matrix}\right\} \Rightarrow |KG| = 3\text{ cm} = x$
$\Rightarrow |AD| = 6x = 18\text{ cm}$

Örnek / Example 16

$|FG| = 18$ cm,
$|GD| = 10$ cm
$\Rightarrow$ **$|FC| + |AD|$ = ? cm**



A) 80 B) 82 C) 84 D) 86 E) 88

Çözüm / Solution

Yanıt / Answer **C**

G noktası, ABC üçgeninin ağırlık merkezidir.
G is the center of the gravity of the triangle ABC.

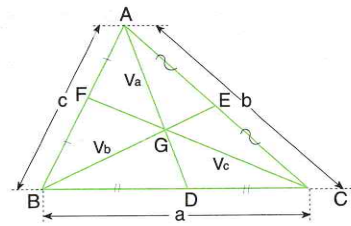
$|GD| = 10 \Rightarrow |AD| = 30$ cm
$|FG| = 18 \Rightarrow |FC| = 54$ cm
$|FC| + |AD| = 84$ cm

Özellik 3 / Property 3

Kenarortay Teoremi / The Median Theorem:

ABC üçgeninde, V_a, V_b, V_c kenarortay uzunlukları; a, b, c kenar uzunluklarıdır.

In triangle ABC, V_a, V_B and V_C are the lengths of the medians and a, b, c are the lengths of the sides.

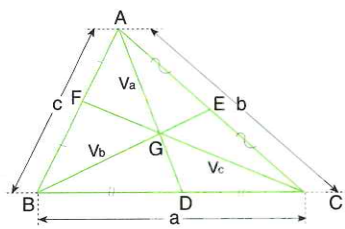


$$2V_a^2 = b^2 + c^2 - \frac{a^2}{2}$$

$$2V_b^2 = a^2 + c^2 - \frac{b^2}{2}$$

$$2V_c^2 = a^2 + b^2 - \frac{c^2}{2}$$

Sonuç / Conclusion



$$2V_a^2 = b^2 + c^2 - \frac{a^2}{2}$$

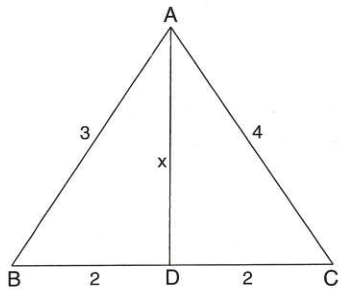
$$2V_b^2 = a^2 + c^2 - \frac{b^2}{2}$$

$$+\quad 2V_c^2 = a^2 + b^2 - \frac{c^2}{2}$$

$$4\cdot\left(V_a^2 + V_b^2 + V_c^2\right) = 3\cdot\left(a^2 + b^2 + c^2\right)$$

Örnek / Example 17

$|AB| = 3$ cm,
$|AC| = 4$ cm,
$|BD| = |DC| = 2$ cm,
$|AD| = x$ cm
$\Rightarrow$ **x = ? cm**



A) $\sqrt{\frac{2}{3}}$ B) $\sqrt{\frac{15}{2}}$ C) $\sqrt{\frac{17}{2}}$ D) $\sqrt{17}$ E) $\sqrt{2}$

Çözüm / Solution

Yanıt / Answer **C**

$|AD| = \vartheta_a = x$,

$$2\cdot\vartheta_a^{\,2} = b^2 + c^2 - \frac{a^2}{2}$$

$$2\cdot x^2 = 16 + 9 - 8$$

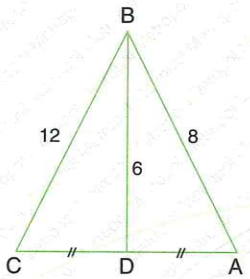
$$2\cdot x^2 = 17$$

$$x^2 = \frac{17}{2}$$

$$\Rightarrow x = \sqrt{\frac{17}{2}}$$

Örnek / Example 18

|AD| = |DC|,
|AB| = 8 cm,
|BC| = 12 cm,
|BD| = 6 cm
⇒ **|AC| = ? cm**



A) $4\sqrt{17}$ B) $5\sqrt{17}$ C) $6\sqrt{17}$ D) $7\sqrt{17}$ E) $8\sqrt{17}$

Çözüm / Solution

Yanıt / Answer **A**

$$2\cdot V_b^2 = a^2 + c^2 - \frac{b^2}{2}$$

$$2\cdot(6^2) = 8^2 + 12^2 - \frac{b^2}{2}$$

$$72 = 64 + 144 - \frac{b^2}{2}$$

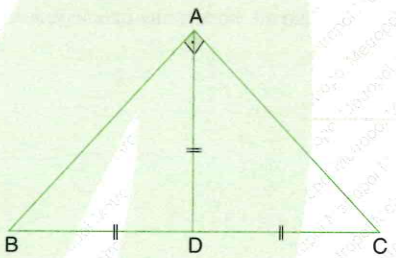
$$\frac{b^2}{2} = 136$$

$$b^2 = 272 \Rightarrow b = 4\sqrt{17}\ \text{cm}$$

Özellik 4 / Property 4

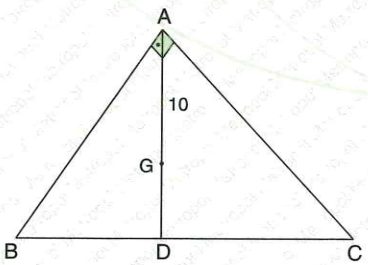
[BA] ⊥ [AC] ⇔ |BD| = |DC| = |AD|

[Muhteşem üçlü / The Perfect Triple]



Örnek / Example 19

G noktası ABC üçgeninin ağırlık merkezidir.
G is center of the gravity of the triangle ABC.
|AG| = 10 cm
⇒ **|BC| = ? cm**



A) 15 B) 20 C) 25 D) 30 E) 35

Çözüm / Solution

Yanıt / Answer **D**

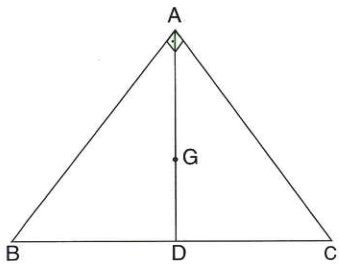
$|AG| = 10\ \text{cm} \Rightarrow |GD| = 5\ \text{cm}$

$\Rightarrow |AD| = 15\ \text{cm}$

$|AD| = |BD| = |DC| \Rightarrow |BC| = 15 + 15 = 30\ \text{cm}$

Örnek / Example 20

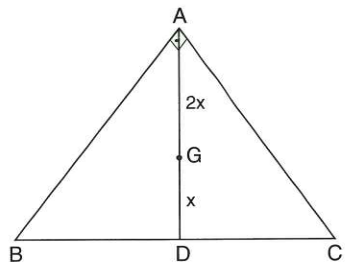
G noktası ABC üçgeninin ağırlık merkezidir.
G is center of the gravity of the triangle ABC.
$|BC| = 12$ cm
$\Rightarrow$ **$|AG| = ?$ cm**



A) 2 B) 4 C) 6 D) 8 E) 12

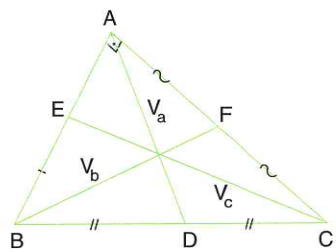
Çözüm / Solution Yanıt / Answer **B**

$|BD| = |DC| = \frac{12}{2} = 6$ cm
$|AD| = |BD| = |DC| = 6$
$3x = 6 \Rightarrow x = 2$
$|AG| = 2x = 2 \cdot 2 = 4$ cm



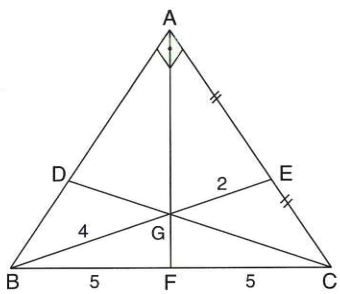
Özellik 5 / Property 5

ABC dik üçgeninde V_a, hipotenüse ait kenarortay uzunluğudur.
In right triangle ABC, V_a length of the median corresponding to the hypotenuse.
5.$Va^2 = Vb^2 + Vc^2$



Örnek / Example 21

G noktası ABC üçgeninin ağırlık merkezidir.
G is center of the gravity of the triangle ABC.
$|BF| = |FC| = 5$ cm,
$|GE| = 2$ cm,
$|BG| = 4$ cm
$\Rightarrow$ **$|CD| = ?$ cm**



A) $\sqrt{79}$ B) $\sqrt{80}$ C) $\sqrt{83}$ D) $\sqrt{89}$ E) $\sqrt{98}$

Çözüm / Solution Yanıt / Answer **D**

$\left.\begin{array}{l}|AF| = \vartheta_a \\ |BE| = \vartheta_b \\ |CD| = \vartheta_c\end{array}\right\} \Rightarrow |AF| = \vartheta_a = |BF| = |FC| = 5$ cm
$|BE| = \vartheta_b = 6$ cm
$m(\widehat{BAC}) = 90°$
$\Rightarrow 5 \cdot \vartheta_a^2 = \vartheta_b^2 + \vartheta_c^2$
$\Rightarrow 5 \cdot 5^2 = 6^2 + |CD|^2$
$\Rightarrow 125 = 36 + |CD|^2$
$\Rightarrow 89 = |CD|^2$
$\Rightarrow \sqrt{89} = |CD|$

Örnek / Example 22

G noktası ABC üçgeninin ağırlık merkezidir.

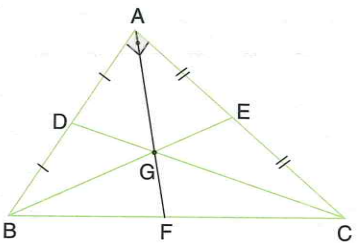
G is center of the gravity of triangle ABC in the figure.

$m(\widehat{BAC}) = 90°$,

$|BE| = 8$ cm,

$|CD| = 6$ cm

$\Rightarrow$ **$|AF|$ = ? cm**



A) $5\sqrt{5}$ B) $4\sqrt{5}$ C) $3\sqrt{5}$ D) $2\sqrt{5}$ E) $\sqrt{5}$

Çözüm / Solution Yanıt / Answer **D**

$$\left.\begin{array}{l}\vartheta_b = |BE| = 8\,cm\\ \vartheta_c = |CD| = 6\,cm\\ \vartheta a = |AF|\end{array}\right\} \Rightarrow m(\widehat{BAC}) = 90°,$$

$$5\cdot\vartheta_a^2 = \vartheta_b^2 + \vartheta_c^2$$

$$5\cdot|AF|^2 = 8^2 + 6^2$$

$$5\cdot|AF|^2 = 64 + 36$$

$$|AF|^2 = 20$$

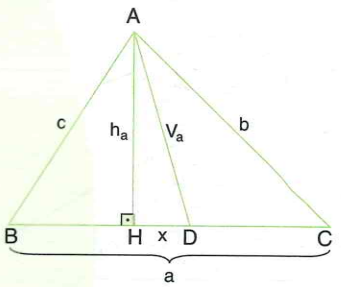
$$|AF| = \sqrt{20} = 2\sqrt{5}\ cm$$

Özellik 6 / Property 6

Şekildeki ABC üçgeninde, [AH] yükseklik, [AD] kenarortaydır.

In the triangle ABC, [AH] is the altitude and [AD] is the median.

$$x = \frac{|b^2 - c^2|}{2a}$$

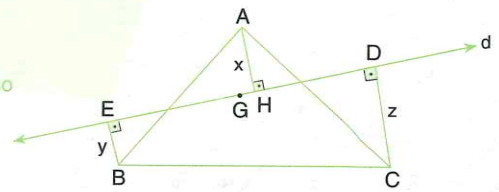


Özellik 7 / Property 7

d doğrusu şekildeki ABC üçgeninin ağırlık merkezinden geçen bir doğru olup [AH] $\perp$ d, [BE] $\perp$ d, [CD] $\perp$ d dir.

The line d in the figure passes through center of the gravity in the triangle ABC and also [AH] $\perp$ d, [BE] $\perp$ d, [CD] $\perp$ d.

$|AH| = x$, $|BE| = y$, $|CD| = z$ $\Rightarrow$ ***x = y + z***



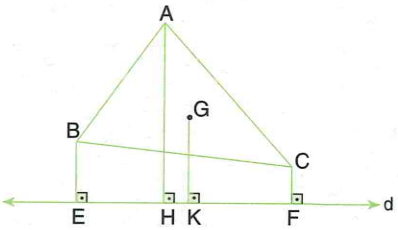
Özellik 8 / Property 8

G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.

The point G is center of the gravity in the ABC triangle.

$d \cap \widehat{ABC} = \phi$, [BE] $\perp$ d, [AH] $\perp$ d, [GK] $\perp$ d, [CF] $\perp$ d

$\Rightarrow$ ***|AH| + |BE| + |CF| = 3|GK|***

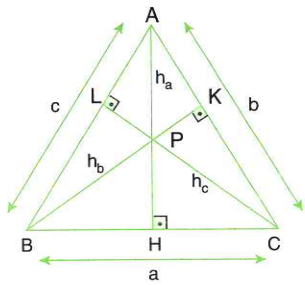


ÜÇGENDE YÜKSEKLİK / THE ALTITUDE in a TRIANGLE

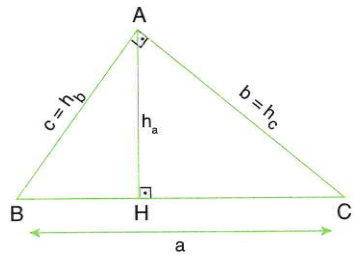
Bir üçgende, bir köşeden karşı kenara indirilen dik doğru parçasına, üçgenin bu kenara ait **yüksekliği** denir.

In a triangle, the length of the line segment from a vertex to the opposite side which is perpendicular to the opposite side is called the **altitude** of the triangle corresponding to this side.

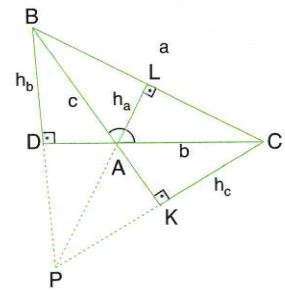
$m(\widehat{A}), m(\widehat{B}), m(\widehat{C}) < 90°$



$m(\widehat{A}) = 90°$



$m(\widehat{A}) > 90°$



Örnek / Example 23

$m(\widehat{BAC}) > 90°$,

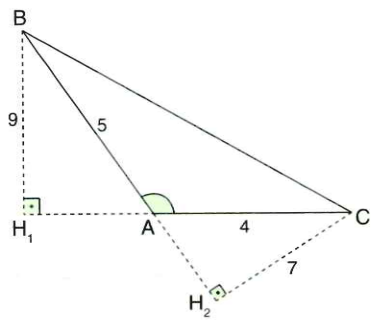
$|BH_1| = 9$ cm,

$|AB| = 5$ cm,

$|CH_2| = 7$ cm,

$|AC| = 4$ cm

$\Rightarrow h_b + h_c = ?$



A) 9 B) 13 C) 12 D) 11 E) 16

Çözüm / Solution

Yanıt / Answer **E**

$b = 4$ cm $\Rightarrow h_b = 9$ cm

$c = 5$ cm $\Rightarrow h_c = 7$ cm

$\Rightarrow h_b + h_c = 16$ cm

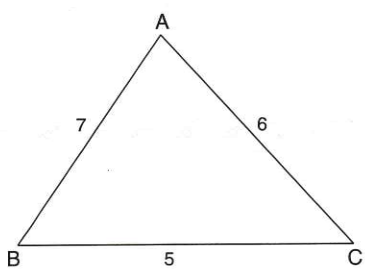
Örnek / Example 24

$h_a = 10$ cm,

$h_c = 6$ cm,

$h_b = x$ cm,

$x \in Z \Rightarrow \sum x = ?$ cm



A) 15 B) 17 C) 19 D) 21 E) 24

Çözüm / Solution

Yanıt / Answer **E**

$a = 5$ cm, $b = 6$ cm, $c = 7$ cm

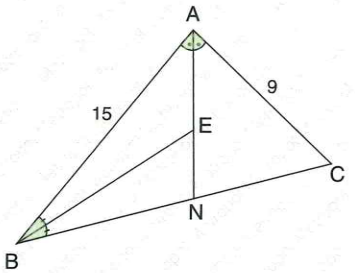
$a < b < c \Leftrightarrow h_a > h_b > h_c$

$\Rightarrow 10 > x > 6$

$x \in Z \Rightarrow x = \{7, 8, 9\}$

$\Rightarrow \sum x = 7 + 8 + 9 = 24$ cm

1.



[AN] ve [BE] açıortaydır.

[AN] and [BE] are bisectors.

$|AB| = 15$ cm, $|AC| = 9$ cm, $|BC| = 16$ cm $\Rightarrow \frac{|EN|}{|AE|} = ?$

A) $\frac{1}{3}$ B) $\frac{2}{3}$ C) $\frac{3}{2}$ D) 2 E) 3

2. [AD] açıortaydır.

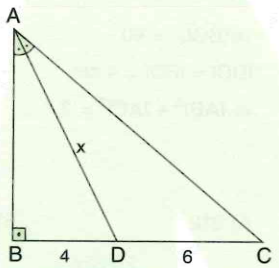
[AD] is a bisector.

$m(\widehat{ABC}) = 90°$,

$|BD| = 4$ cm,

$|DC| = 6$ cm

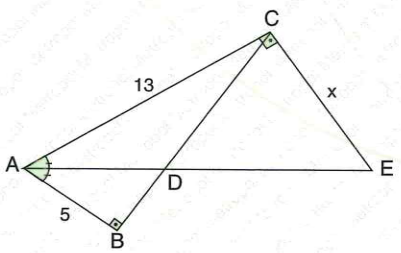
$\Rightarrow$ **$|AD| = x = ?$ cm**



A) $2\sqrt{5}$ B) $4 + \sqrt{5}$ C) $\sqrt{5} + \sqrt{6}$

D) $4 + \sqrt{6}$ E) $4\sqrt{6}$

3.



$m(\widehat{ABD}) = m(\widehat{ACE}) = 90°$,

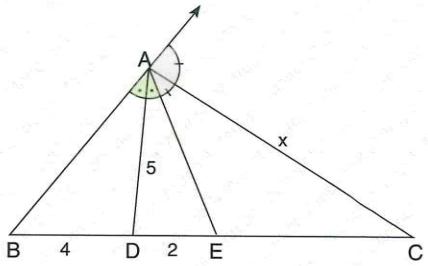
[AD] bir açıortaydır.

[AD] is a bisector.

$|AB| = 5$ cm, $|AC| = 13$ cm $\Rightarrow$ **$|CE| = x = ?$ cm**

A) $\frac{50}{39}$ B) $\frac{26}{3}$ C) $\frac{16}{3}$ D) 3 E) 7

4.



[AD], iç açıortay; [AC] ise bir dış açıortaydır.

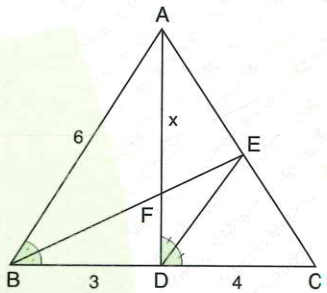
[AD] is an interior bisector; [AC] is an exterior bisector.

$|AD| = 5$ cm, $|BD| = 4$ cm, $|DE| = 2$ cm $\Rightarrow$ **$|AC| = x = ?$ cm**

A) $\sqrt{13}$ B) 4 C) $\sqrt{33}$

D) 6 E) $\sqrt{39}$

5.



[BE] ve [DE] açıortaydır.

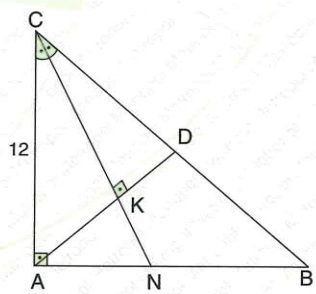
[BE] and [DE] are bisectors.

$|BD| = 3$ cm, $|DC| = 4$ cm, $|AB| = 6$ cm $\Rightarrow$ **$|AF| = x = ?$ cm**

A) $\frac{15}{8}$ B) $\frac{16}{7}$ C) $\frac{16}{9}$

D) $\frac{17}{8}$ E) $\frac{18}{7}$

6.



[CN], iç açıortay; [AD], kenarortaydır.

[CN] is an interior angle bisector; [AD] is a median.

$[CK] \perp [AD]$, $m(\widehat{CAB}) = 90°$,

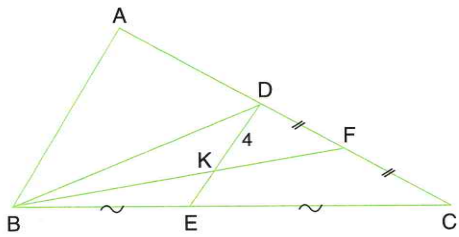
$|AC| = 12$ cm, $|BC| = 24$ cm $\Rightarrow$ **$|KD| = ?$ cm**

A) $\frac{11}{3}$ B) 4 C) 6

D) $\frac{20}{3}$ E) $\frac{25}{3}$

METROPOL YAYINLARI • METROPOL PUBLICATIONS

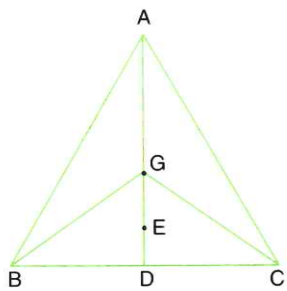
7.



[BD] kenarortaydır. / [BD] is a median.
IDFI = IFCI ve (and) IDKI = 4 cm, IBEI = IECI ⇒ **IABI = ? cm**

A) 6 B) 8 C) 10
D) 12 E) 14

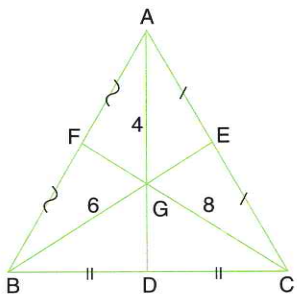
8. G noktası, ABC üçgeninin ağırlık merkezi;
E noktası GBC üçgeninin ağırlık merkezidir.
The point G is center of the gravity of the triangle ABC; the point E is center of the gravity in the triangle GBC.



⇒ $\frac{\text{IEGI}}{\text{IADI}} = ?$

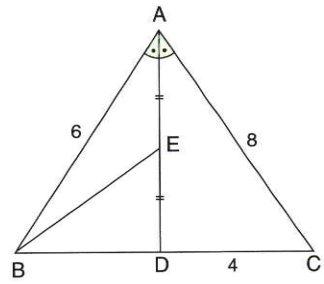
A) $\frac{1}{9}$ B) $\frac{2}{9}$ C) $\frac{1}{3}$
D) $\frac{4}{9}$ E) $\frac{2}{3}$

9. G noktası, ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity of the triangle ABC.
IAGI = 4 cm,
IBGI = 6 cm,
ICGI = 8 cm,
IBCI = a cm,
IACI = b cm,
IABI = c cm
⇒ $a^2 + b^2 + c^2 = ?$



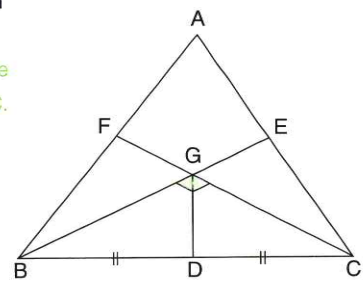
A) 344 B) 346 C) 348
D) 350 E) 352

10. $m(\widehat{BAD}) = m(\widehat{DAC})$,
IABI = 6 cm,
IACI = 8 cm,
IDCI = 4 cm,
IAEI = IEDI
⇒ **IBEI = ? cm**



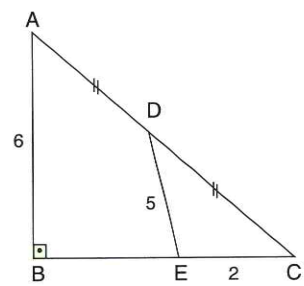
A) 3 B) $\frac{3\sqrt{3}}{2}$ C) $3\sqrt{3}$
D) 6 E) $\frac{3\sqrt{6}}{2}$

11. G noktası, ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity of the triangle ABC.
$m(\widehat{BGC}) = 90°$,
IDCI = IBDI = 4 cm,
⇒ $\text{IABI}^2 + \text{IACI}^2 = ?$



A) 312 B) 316 C) 320
D) 324 E) 328

12. [BC] ⊥ [AB],
IABI = 6 cm,
IDEI = 5 cm,
IECI = 2 cm
⇒ **IBEI = ? cm**



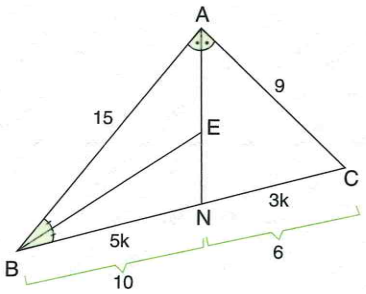
A) 8 B) 10 C) 12
D) 14 E) 16

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
B	E	B	E	B	C	D	B	C	E	C	B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



$\frac{|AB|}{|AC|} = \frac{|BN|}{|NC|} \Rightarrow \frac{15}{9} = \frac{|BN|}{|NC|} \Rightarrow \frac{|BN|}{|NC|} = \frac{5k}{3k}$

$5k + 3k = 16$

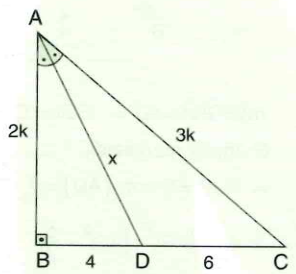
$8k = 16$

$k = 2$ ve (and) $|BN| = 10$ cm

$\frac{|EN|}{|EA|} = \frac{|BN|}{|BA|} \Rightarrow \frac{10}{15} = \frac{2}{3}$

Yanıt / The Answer is B

2. $\frac{|AB|}{|AC|} = \frac{4}{6} = \frac{2}{3}$



$\Rightarrow (3k)^2 = (2k)^2 + 10^2$

$\Rightarrow 9k^2 = 4k^2 + 100$

$5k^2 = 100$

$k^2 = 20$

$k = 2\sqrt{5}$ cm

$x^2 = (4\sqrt{5})\cdot(6\sqrt{5}) - 6\cdot 4$

$x^2 = 96\,\text{cm}^2 \Rightarrow x = 4\sqrt{6}$ cm

Yanıt / The Answer is E

3. $|CB| = \sqrt{13^2 - 5^2} = 12$ cm

$\frac{13}{5} = \frac{|CD|}{|DB|}$

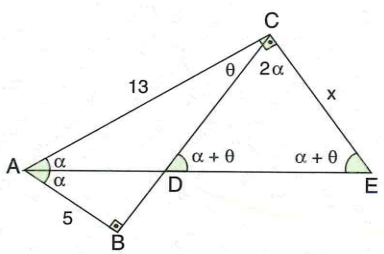
$\Rightarrow |CD| = 13k$,

$|DB| = 5k$, $|CB| = 18k$

$18k = 12 \Rightarrow k = \frac{2}{3}$

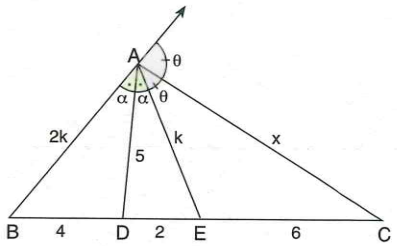
$|DC| = 13k = \frac{26}{3}$

$|DC| = |CE| = x = \frac{26}{3}$ cm



Yanıt / The Answer is B

4.



$\frac{|ED|}{|DB|} = \frac{|AE|}{|AB|} = \frac{|EC|}{|BC|} \Leftrightarrow \frac{2}{4} = \frac{k}{2k} = \frac{|EC|}{|EC| + 4 + 2}$

$2 \cdot |EC| = |EC| + 6$

$|EC| = 6$ cm

$2\cdot\alpha + 2\cdot\theta = 180^\circ \Rightarrow \alpha + \theta = 90^\circ$

$|AD|^2 + |AC|^2 = |DC|^2$

$5^2 + x^2 = (2+6)^2$

$x^2 = 39\,\text{cm} \Rightarrow x = \sqrt{39}\,\text{cm}$

Yanıt / The Answer is E

5. $\widehat{ABD}$:

$\frac{|BD|}{|BA|} = \frac{|FD|}{|AF|} = \frac{1}{2} = \frac{k}{2k}$

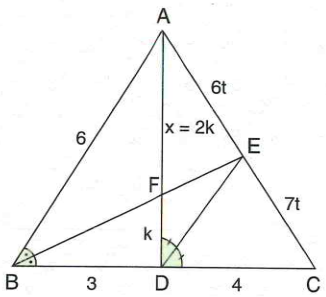
$\widehat{ABC}$:

$\frac{|BC|}{|AB|} = \frac{|EC|}{|EA|} = \frac{7}{6} = \frac{7t}{6t}$

$\widehat{ADC}$:

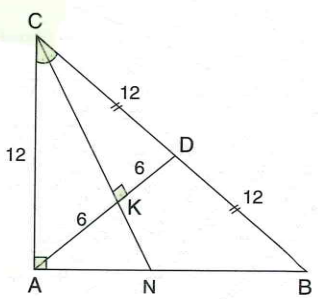
$\frac{|DC|}{|AD|} = \frac{|EC|}{|EA|} = \frac{4}{3k} = \frac{7}{6}$

$k = \frac{8}{7} \Rightarrow |AF| = x = 2k = \frac{16}{7}$ cm



Yanıt / The Answer is B

6.



[AD], kenarortaydır. / [AD], is a median.

$|BC| = 24$ cm $\Rightarrow |CD| = |BD| = 12$ cm

[CK], ACD üçgeninin hem yüksekliği hem açıortayıdır.

$\widehat{ACD}$ ikizkenardır.

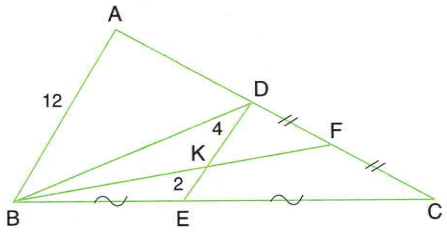
[CK] is the altitude and also the angle bisector in the triangle ACD. ACD triangle is isosceles.

$|AC| = 12$ cm, $|AK| = |KD| = 6$ cm

Yanıt / The Answer is C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



K noktası, BDC üçgeninin ağırlık merkezidir.

K is center of the gravity of $\widehat{BDC}$.

$|DK| = 4$ cm $\Rightarrow |KE| = 2$ cm

$|DE| = 4 + 2 = 6$ cm

D ile E orta noktalardır. / D and E are the middle points.

$[DE] // [AB]$

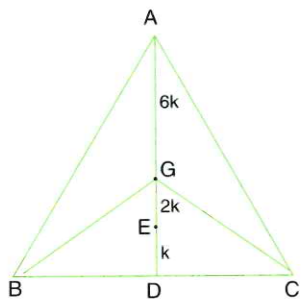
$|DE| = \frac{|AB|}{2}$, $6 = \frac{|AB|}{2} \Rightarrow |AB| = 12$ cm

Yanıt / The Answer is D

8. $|ED| = k \Rightarrow |GE| = 2k$

$|GD| = 3k \Rightarrow |AG| = 6k$

$\frac{|EG|}{|AD|} = \frac{2k}{9k} = \frac{2}{9}$



Yanıt / The Answer is B

9. $[AD] = V_a = 4 + 2 = 6$ cm $\Rightarrow V_a^2 = 36$

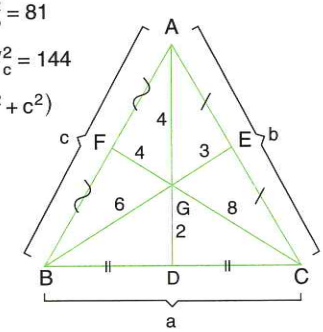
$[BE] = V_b = 6 + 3 = 9$ cm $\Rightarrow V_b^2 = 81$

$[CF] = V_c = 8 + 4 = 12$ cm $\Rightarrow V_c^2 = 144$

$\Rightarrow 4\left(V_a^2 + V_b^2 + V_c^2\right) = 3(a^2 + b^2 + c^2)$

$\Rightarrow 4 \cdot 261 = 3 \cdot (a^2 + b^2 + c^2)$

$\Rightarrow a^2 + b^2 + c^2 = 348$



Yanıt / The Answer is C

10. $\frac{|AB|}{|BD|} = \frac{|AC|}{|DC|} \Rightarrow \frac{6}{|BD|} = \frac{8}{4}$

$|BD| = 3$ cm

$|AD|^2 = 6 \cdot 8 - 4 \cdot 3$

$|AD|^2 = 36$

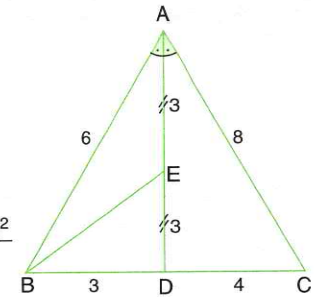
$|AD| = 6$ cm

$2 \cdot |BE|^2 = |AB|^2 + |BD|^2 - \frac{|AD|^2}{2}$

$2 \cdot |BE|^2 = 36 + 9 - \frac{36}{2}$

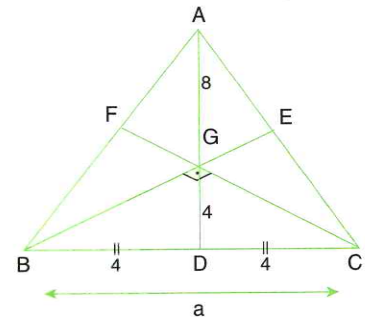
$2 \cdot |BE|^2 = 45 - 18$

$2 \cdot |BE|^2 = 27 \Rightarrow |BE| = \frac{3\sqrt{6}}{2}$ cm



Yanıt / The Answer is E

11.



$m(\widehat{BGC}) = 90° \Rightarrow |BD| = |DC| = |GD| = 4$ cm

G ağırlık merkezidir. / G is center of the gravity.

$\Rightarrow |GA| = 8$ cm, $[AD] = \vartheta_a = 12$ cm

$2 \cdot \vartheta_a^2 = |AB|^2 + |AC|^2 - \frac{a^2}{2}$

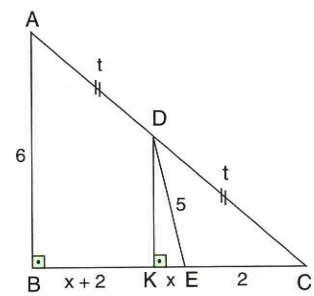
$2 \cdot 12^2 = |AB|^2 + |AC|^2 - \frac{8^2}{2}$

$288 + 32 = |AB|^2 + |AC|^2$

$320 = |AB|^2 + |AC|^2$

Yanıt / The Answer is C

12.



$\frac{|CD|}{|CA|} = \frac{|DK|}{|AB|} = \frac{t}{2t} \Rightarrow |DK| = 3$ cm

$|DE|^2 = |DK|^2 + |KE|^2$

$25 = 3^2 + |KE|^2 \Rightarrow |KE| = 4$ cm

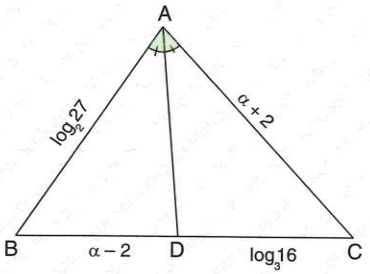
$|KE| = 4$ cm $\Rightarrow |BK| = 6$ cm

$|BE| = 10$ cm

Yanıt / The Answer is B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



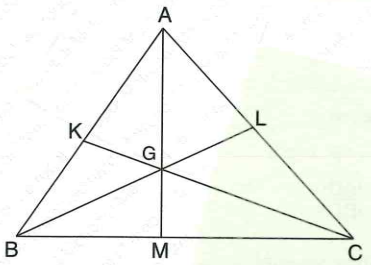
$m(\widehat{BAD}) = m(\widehat{DAC})$

$\Rightarrow \alpha = ?$

A) 3 B) 4 C) 5 D) 6 E) 7

[İSTANBUL ÜNİVERSİTESİ – YÖS 2018]

2.



Şekildeki ABC üçgeninde G ağırlık merkezidir.

G is center of the gravity of triangle ABC in the figure.

$|AB| = 10\sqrt{2}$ cm,

$|GM| = 8$ cm,

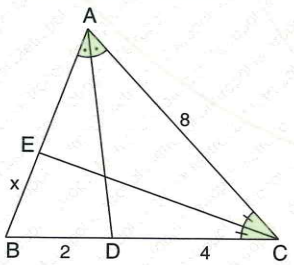
$|BG| = 6$ cm

$\Rightarrow |GC| = ?$ cm

A) 6 B) 8 C) $4\sqrt{6}$ D) $6\sqrt{6}$ E) $8\sqrt{6}$

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2018]

3.

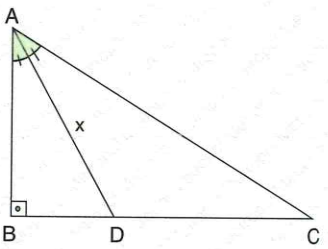


$\Rightarrow x = ?$

A) $\frac{4}{3}$ B) $\frac{3}{2}$ C) $\frac{12}{7}$ D) $\frac{9}{5}$ E) $\frac{11}{6}$

[İSTANBUL ÜNİVERSİTESİ – YÖS 2017]

4.



$m(\widehat{BAD}) = m(\widehat{DAC})$

$|AB| = 3$, $|AC| = 5$

$[AB] \perp [BC]$

$|AD| = x = ?$

A) $\frac{3}{2}$ B) $\frac{3\sqrt{5}}{2}$ C) $\frac{3\sqrt{3}}{2}$ D) $\frac{2\sqrt{5}}{2}$ E) $\frac{2\sqrt{3}}{2}$

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2016]

5.

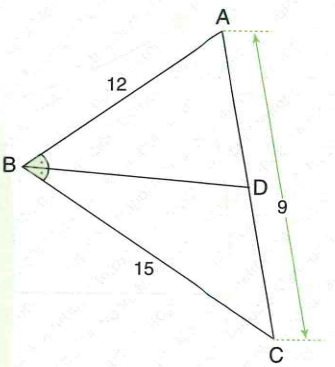
$m(\widehat{ABD}) = m(\widehat{CBD})$,

$|AB| = 12$ cm,

$|BC| = 15$ cm,

$|AC| = 9$ cm

$\Rightarrow |AD| = ?$ cm



A) 4 B) 6 C) 8 D) 10 E) 12

[İSTANBUL ÜNİVERSİTESİ – YÖS 2015]

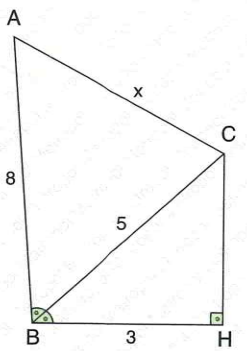
6.

$|AB| = 8$ cm,

$|CB| = 5$ cm,

$|BH| = 3$ cm

$\Rightarrow |AC| = ?$ cm



A) $\sqrt{29}$ B) $\sqrt{34}$ C) $\sqrt{39}$ D) $\sqrt{41}$ E) $\sqrt{55}$

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2014]

YANITLAR / ANSWERS

1	2	3	4	5	6
B	C	C	B	A	D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $m(\widehat{BAD}) = m(\widehat{DAC}) \Rightarrow [AD]: n_A$

$$\Rightarrow \frac{\log_2 27}{\alpha - 2} = \frac{\alpha + 2}{\log_3 16}$$

$$\Rightarrow \log_2 27 \cdot \log_3 16 = (\alpha - 2)\cdot(\alpha + 2)$$

$$\Rightarrow 3 \cdot \log_2 3 \cdot 4 \cdot \log_3 2 = \alpha^2 - 4$$

$$\Rightarrow 12 \cdot \log_2 3 \cdot \log_3 2 = \alpha^2 - 4$$

$$\Rightarrow 12 + 4 = \alpha^2$$

$$\Rightarrow 16 = \alpha^2 \Rightarrow 4 = \alpha$$

Yanıt / The Answer is B

2. $|GM| = 8\,cm \Rightarrow |AG| = 16\,cm$

$|KG| = x\,cm \Rightarrow |GC| = 2x\,cm$

$\widehat{AGB}$:

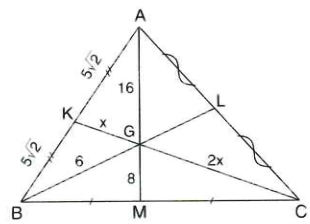
$$2 \cdot x^2 = 16^2 + 6^2 - \frac{(10\sqrt{2})^2}{2}$$

$$2x^2 = 256 + 36 - 100$$

$$2x^2 = 192$$

$$x^2 = 96$$

$$x = \sqrt{96} \Rightarrow x = 4\sqrt{6}\,cm$$



Yanıt / The Answer is C

3. $m(\widehat{BAD}) = m(\widehat{DAC})$,

$$\frac{|AB|}{|BD|} = \frac{|AC|}{|DC|} \Leftrightarrow \frac{|AB|}{2} = \frac{8}{4}$$

$$\Leftrightarrow |AB| = 4\,cm$$

$$\Leftrightarrow |AE| = (4 - x)\,cm$$

$m(\widehat{BCE}) = m(\widehat{ECA})$,

$$\frac{|AC|}{|AE|} = \frac{|BC|}{|BE|} \Leftrightarrow \frac{8}{4-x} = \frac{6}{x}$$

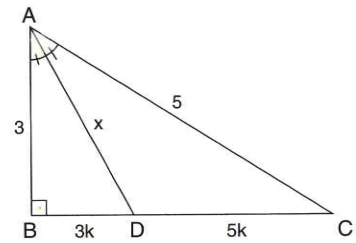
$$\Leftrightarrow 8x = 24 - 6x$$

$$\Leftrightarrow 14x = 24$$

$$\Leftrightarrow x = \frac{12}{7}\,cm$$

Yanıt / The Answer is C

4.



$$\frac{|AB|}{|AC|} = \frac{|BD|}{|DC|} \Rightarrow \frac{3}{5} = \frac{|BD|}{|DC|}$$

$$|AC|^2 = |AB|^2 + |BC|^2$$

$$5^2 = 3^2 + |BC|^2 \Rightarrow |BC| = 4\ cm = 8k \Rightarrow k = \frac{1}{2}\ cm$$

$$x^2 = 3^2 + \left(\frac{3}{2}\right)^2 \Rightarrow x^2 = \frac{45}{4} \Rightarrow x = \frac{3\sqrt{5}}{2}\ cm$$

Yanıt / The Answer is B

5. $|AD| = x\,cm$

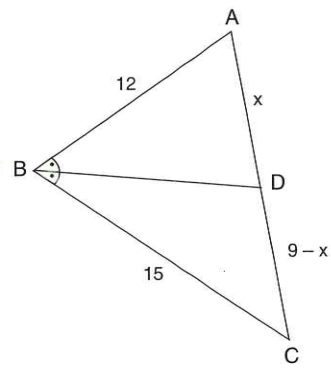
$$\Rightarrow |DC| = (9 - x)\,cm$$

$$\frac{|AB|}{|BC|} = \frac{|AD|}{|DC|}$$

[iç açıortay teoremi / interior bisector theorem]

$$\frac{12}{15} = \frac{x}{9-x}$$

$$x = 4\,cm$$



Yanıt / The Answer is A

6. $[CD] \perp [AB]$ çizilirse / If $[CD] \perp [AB]$ is drawn,

[BC] açıortay / bisector] $\Rightarrow$ $|DB| = |BH| = 3\,cm$

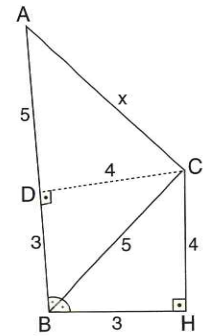
$[CD] \perp [AB]$

$[CH] \perp [BH]$ $\Rightarrow$ $|DC| = |CH| = 4\,cm$

$|AD| = |AB| - |DB| \Rightarrow |AD| = 8 - 3 = 5\,cm$

$|AD|^2 + |DC|^2 = |AC|^2$

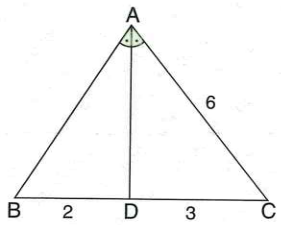
$5^2 + 4^2 = x^2 \Rightarrow x = \sqrt{41}\,cm$



Yanıt / The Answer is D

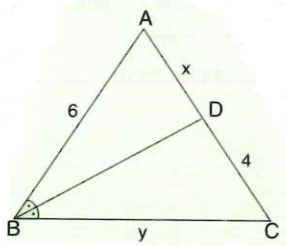
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. [AD], bir açıortaydır.
[AD] is a bisector.
|AC| = 6 cm,
|BD|= 2 cm,
|DC| = 3 cm
⇒ **|AB| = ? cm**



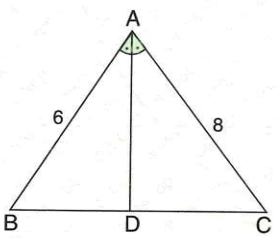
Yanıt / The Answer is 4

2. [BD], bir açıortaydır.
[BD] is a bisector.
|AB| = 6 cm,
|DC| = 4 cm,
|AD|= x cm,
|BC| = y cm
⇒ **x · y = ?**



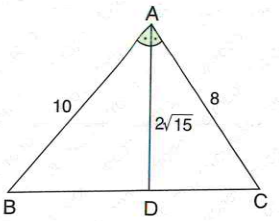
Yanıt / The Answer is 24

3. [AD], bir açıortaydır.
[AD] is a bisector.
|AB| = 6 cm,
|AC| = 8 cm,
|BD| = (x – 2) cm,
|DC| = (2x – 6) cm
⇒ **x = ? cm**



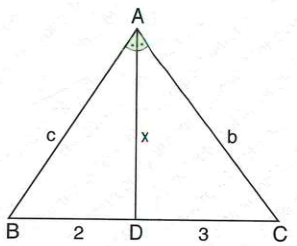
Yanıt / The Answer is 5

4. [AD], bir açıortaydır.
[AD] is a bisector.
|AB| = 10 cm,
|AC| = 8 cm,
|AD| = $2\sqrt{15}$ cm
⇒ **|BC| = ? cm**



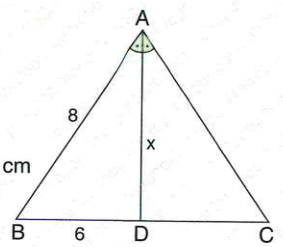
Yanıt / The Answer is 9

5. [AD], bir açıortaydır.
[AD] is a bisector.
b – c = 2 cm,
|BD| = 2 cm,
|DC| = 3 cm
⇒ **|AD| = x = ? cm**



Yanıt / The Answer is $3\sqrt{2}$

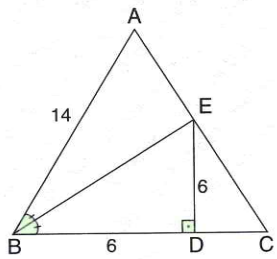
6. [AD], bir açıortaydır.
[AD] is a bisector.
|AB| = 8 cm,
|BD| = 6 cm
Çevre / The perimeter (ABC) = 28 cm
⇒ **|AD| = x = ?**



Yanıt / The Answer is $2\sqrt{7}$

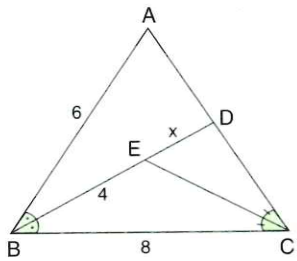
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $m(\widehat{ABE}) = m(\widehat{EBC})$,
$[ED] \perp [BD]$,
$|AB| = 14$ cm,
$|BD| = 6$ cm,
$|ED| = 6$ cm
$\Rightarrow$ **$|AE| = ?$ cm**



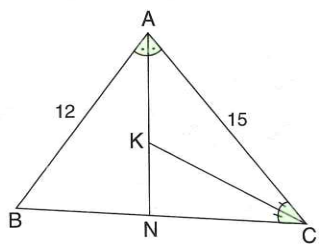
Yanıt / The Answer is 10

8. [BD] ve [CE] birer açıortaydır.
[BD] and [CE] are bisectors.
$|AB| = 6$ cm,
$|BC| = 8$ cm,
$|AC| = 7$ cm,
$|BE| = 4$ cm
$\Rightarrow$ **$|ED| = x = ?$ cm**



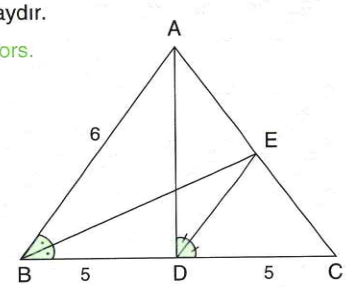
Yanıt / The Answer is 2

9. $m(\widehat{BAN}) = m(\widehat{NAC})$,
$m(\widehat{ACK}) = m(\widehat{KCN})$,
$|AB| = 12$ cm,
$|AC| = 15$ cm,
$|BC| = 9$ cm
$\Rightarrow$ $\frac{|KA|}{|KN|} = ?$



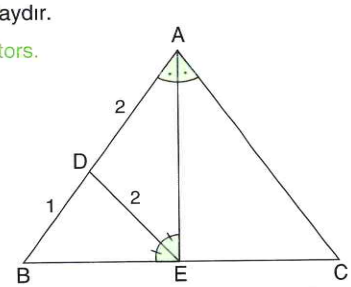
Yanıt / The Answer is 3

10. [BE] ve [DE] birer açıortaydır.
[BE] and [DE] are bisectors.
$|AB| = 6$ cm,
$|BD| = |DC| = 5$ cm
$\Rightarrow$ **$|AD| = ?$ cm**



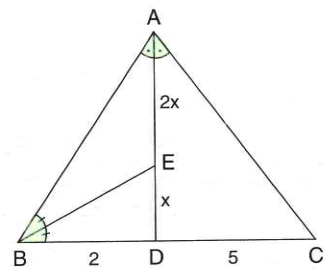
Yanıt / The Answer is 3

11. [AE] ve [ED] birer açıortaydır.
[AE] and [ED] are bisectors.
$|ED| = |DA| = 2$ cm,
$|BD| = 1$ cm
$\Rightarrow$ **$|AC| = ?$ cm**



Yanıt / The Answer is 6

12.

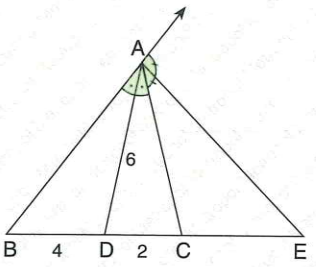


[AD] ve [BE] açıortaydır.
[AD] and [BE] are bisectors.
$|AE| = (2x)$ cm, $|ED| = x$ cm, $|DC| = 5$ cm, $|BD| = 2$ cm
$\Rightarrow$ **Çevre / The perimeter (ABC) = ? cm**

Yanıt / The Answer is 21

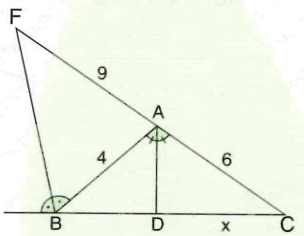
METROPOL YAYINLARI • METROPOL PUBLICATIONS

13. [AD] iç; [AE] dış açıortaydır.
[AD] is an interior bisector;
[AE] is an exterior bisector.
|AD| = 6 cm,
|BD| = 4 cm,
|DC| = 2 cm
⇒ **|AE| = ? cm**



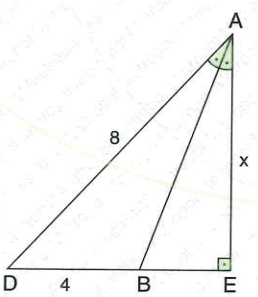
Yanıt / The Answer is $2\sqrt{7}$

14. [BF] dış; [AD] iç açıortaydır.
[BF] is an interior bisector;
[AD] is an exterior bisector.
|FA| = 9 cm,
|AB| = 4 cm,
|AC| = 6 cm
⇒ **|DC| = x = ? cm**



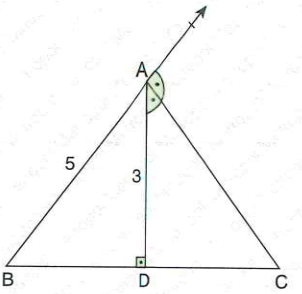
Yanıt / The Answer is 4

15. [AB], bir iç açıortaydır.
[AB] is an interior bisector.
[AE] ⊥ [BD],
|AD| = 8 cm,
|DB| = 4 cm
⇒ **|AE| = x = ? cm**



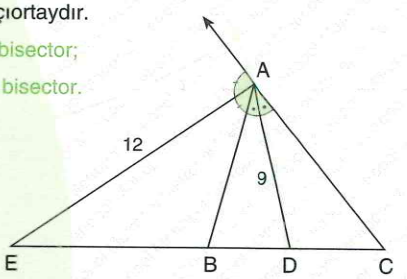
Yanıt / The Answer is $\frac{24}{5}$

16. [AC], bir dış açıortaydır.
[AC] is an exterior bisector.
[AD] ⊥ [BC],
|AD| = 3 cm,
|AB| = 5 cm
⇒ **|DC| = ? cm**



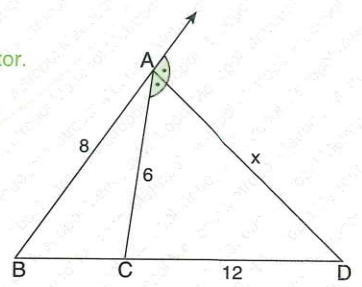
Yanıt / The Answer is 6

17. [AD] iç; [AE] dış açıortaydır.
[AD] is an interior bisector;
[AE] is an exterior bisector.
|AD| = 9 cm,
|AE| = 12 cm,
|ED| = 5·|DC|
⇒ **|DC| = ? cm**



Yanıt / The Answer is 3

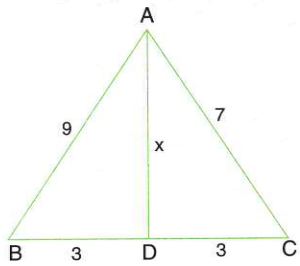
18. [AD], bir dış açıortaydır.
[AD] is an exterior bisector.
|AB| = 8 cm,
|AC| = 6 cm,
|CD| = 12 cm
⇒ **|AD| = x = ? cm**



Yanıt / The Answer is 12

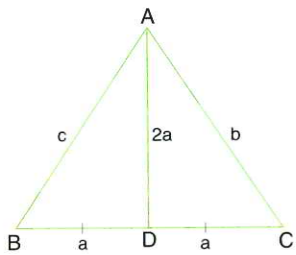
METROPOL YAYINLARI • METROPOL PUBLICATIONS

19. $|AB| = 9$ cm,
$|BD| = |DC| = 3$ cm,
$|AC| = 7$ cm
$\Rightarrow$ **$|AD| = x = ?$ cm**



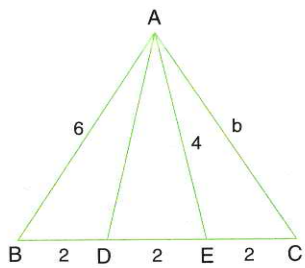
Yanıt / The Answer is $2\sqrt{14}$

20. $|BD| = |DC| = a$ cm,
$|AD| = |BC| = 2a$ cm,
$b^2 + c^2 = 40$ cm^2
$\Rightarrow$ **$|DC| = a = ?$ cm**



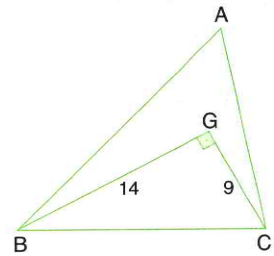
Yanıt / The Answer is 2

21. $|AB| = 6$ cm,
$|AE| = 4$ cm,
$|BD| = |DE| = |EC| = 2$ cm
$\Rightarrow$ **$|AC| = b = ?$ cm**



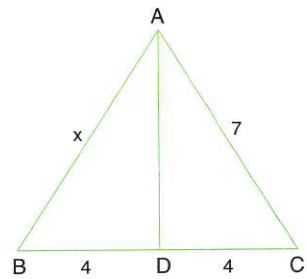
Yanıt / The Answer is $3\sqrt{2}$

22. G noktası, ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$|BG| = 24$ cm,
$|GC| = 9$ cm
$\Rightarrow$ **$|AC| = ?$ cm**



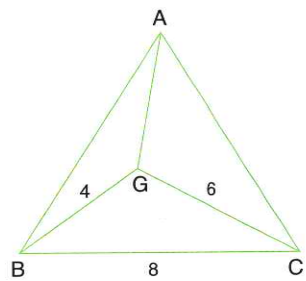
Yanıt / The Answer is 30

23. $|BD| = |DC| = 4$ cm
$|AC| = 7$ cm,
$|AD| = \frac{\sqrt{106}}{2}$ cm
$\Rightarrow$ **$|AB| = x = ?$ cm**



Yanıt / The Answer is 6

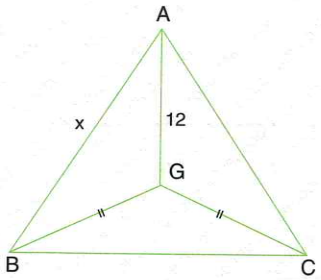
24. G noktası, ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$|BG| = 4$ cm,
$|GC| = 6$ cm,
$|BC| = 8$ cm
$\Rightarrow$ **$|AG| = ?$ cm**



Yanıt / The Answer is $2\sqrt{10}$

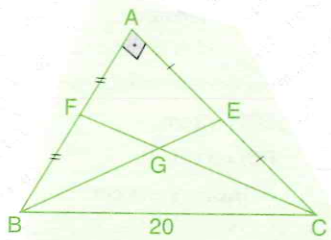
METROPOL YAYINLARI • METROPOL PUBLICATIONS

25. G noktası, ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$|AG| = 12$ cm,
$|BC| = 48$ cm,
$|BG| = |CG|$
$\Rightarrow$ **$|AB| = x = ?$ cm**



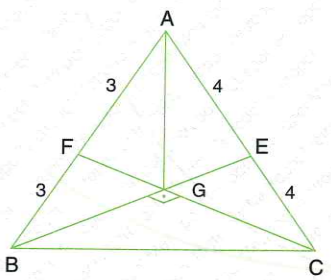
Yanıt / The Answer is 30

26. $|BC| = 20$ cm,
$|BE| = 15$ cm
$\Rightarrow$ **$|CF| = ?$ cm**



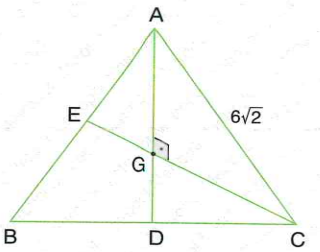
Yanıt / The Answer is $5\sqrt{11}$

27. G noktası, ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$[BE] \perp [CF]$,
$|BE| = 48$ cm,
$|CF| = 36$ cm
$\Rightarrow$ **$|AG| = ?$ cm**



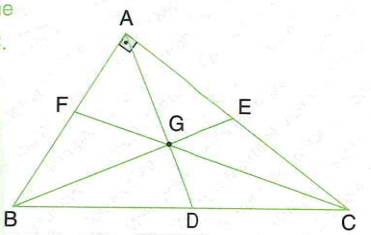
Yanıt / The Answer is 40

28. G noktası, ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$[AD] \perp [EC]$,
$|EG| = |GD|$,
$|AC| = 6\sqrt{2}$ cm
$\Rightarrow$ **$|BC| = ?$ cm**



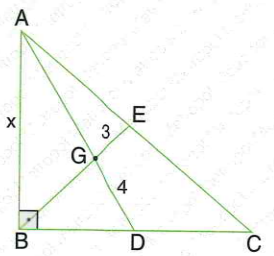
Yanıt / The Answer is $6\sqrt{5}$

29. G noktası, ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$[BA] \perp [AC]$,
$|AD| = 4\sqrt{5}$ cm,
$|BE| = 16$ cm
$\Rightarrow$ **$|CF| = ?$ cm**



Yanıt / The Answer is 12

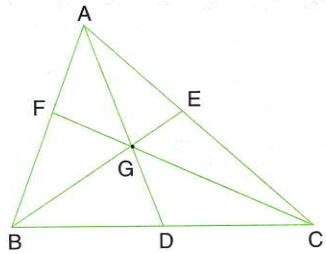
30. G noktası, ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$|GE| = 3$ cm,
$|GD| = 4$ cm
$\Rightarrow$ **$|AB| = x = ?$ cm**



Yanıt / The Answer is $2\sqrt{21}$

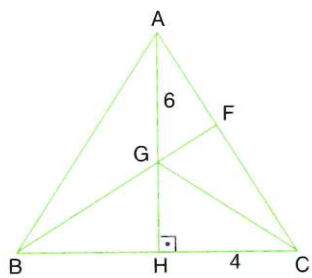
METROPOL YAYINLARI • METROPOL PUBLICATIONS

31. G noktası, ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
|AG| = 10 cm,
|BE| = 12 cm,
|FC| = 15 cm
⇒ **|BD| = ? cm**



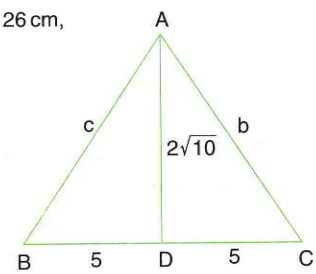
Yanıt / The Answer is $\sqrt{57}$

32. G noktası, ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
|AH] ⊥ [BC],
|HC| = 4 cm,
|AG| = 6 cm
⇒ **|GF| = ? cm**



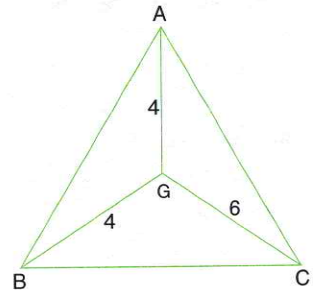
Yanıt / The Answer is $\frac{5}{2}$

33. Çevre / The perimeter (ABC) = 26 cm,
|BD| = |DC| = 5 cm,
|AB| = c cm,
|AC| = b cm,
|AD| = $2\sqrt{10}$ cm
⇒ **b · c = ?**



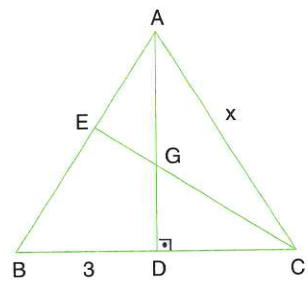
Yanıt / The Answer is 63

34. G noktası, ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
|GA| = |GB| = 4 cm,
|GC| = 6 cm
⇒ **|AC| = ? cm**



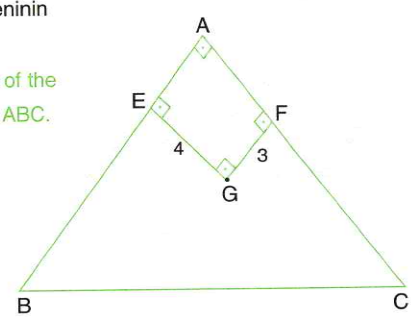
Yanıt / The Answer is $2\sqrt{22}$

35. G noktası, ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
|EG| = $\sqrt{3}$ cm,
|BD| = 3 cm
⇒ **|AC| = x = ? cm**



Yanıt / The Answer is 6

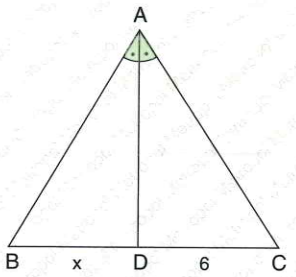
36. G noktası, ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
[BA] ⊥ [AC],
[GE] ⊥ [AB],
[GF] ⊥ [AC],
|GE| = 4 cm,
|GF| = 3 cm
⇒ **|BC| = ?**



Yanıt / The Answer is 15

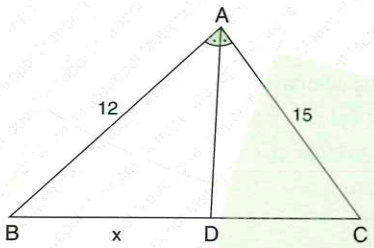
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $m(\widehat{BAD}) = m(\widehat{DAC})$,
$3 \cdot |AB| = 2 \cdot |AC|$,
$|DC| = 6$ cm
$\Rightarrow$ **$|BD| = x = ?$ cm**



A) 4 B) 5 C) 6 D) 8 E) 10

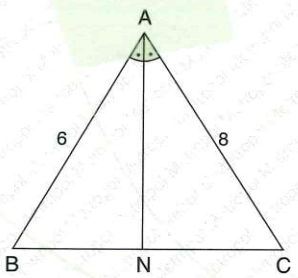
2.



$m(\widehat{BAD}) = m(\widehat{DAC})$, $|AB| = 12$ cm, $|AC| = 15$ cm,
$|BC| = 18$ cm $\Rightarrow$ **$|BD| = x = ?$ cm**

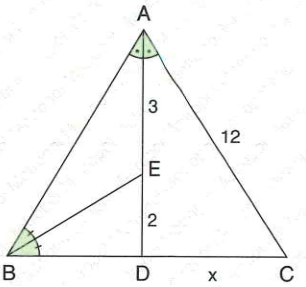
A) 5 B) 6 C) 7 D) 8 E) 9

3. [AN], bir açıortaydır.
[AN] is a bisector.
$|AB| = 6$ cm,
$|AC| = 8$ cm,
$|BC| = 7$ cm
$\Rightarrow$ **$|AN| = ?$ cm**



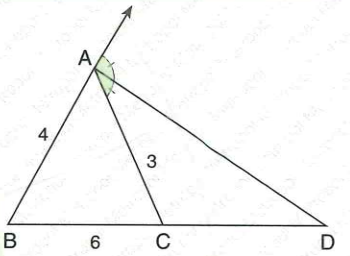
A) 2 B) 3 C) 4 D) 5 E) 6

4. [AD] ve [BE] açıortaydır.
[AD] and [BE] are bisectors.
$|AC| = 12$ cm,
$|AE| = 3$ cm,
$|ED| = 2$ cm
$\Rightarrow$ **$|DC| = x = ?$ cm**



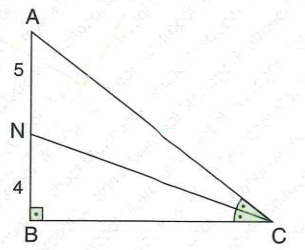
A) 2 B) 4 C) 6 D) 8 E) 10

5. [AD], bir dış açıortaydır.
[AD] is an exterior bisector.
$|AC| = 3$ cm,
$|CB| = 6$ cm,
$|AB| = 4$ cm
$\Rightarrow$ **$|CD| = ?$ cm**



A) 6 B) 12 C) 18 D) 24 E) 36

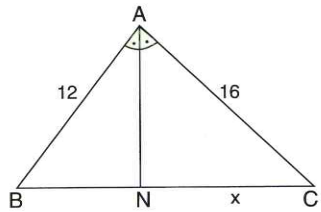
6. [CN], bir açıortaydır.
[CN] is a bisector.
$[AB] \perp [BC]$,
$|AN| = 5$ cm,
$|NB| = 4$ cm
$\Rightarrow$ **$|BC| = ?$ cm**



A) 12 B) 15 C) 16 D) 18 E) 24

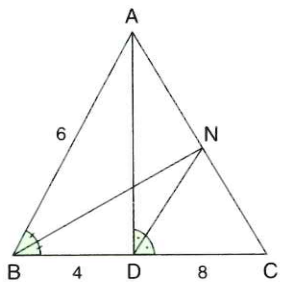
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $m(\widehat{BAN}) = m(\widehat{NAC})$,
$|AB| = 12$ cm,
$|AC| = 16$ cm,
$|BC| = 35$ cm
$\Rightarrow$ **$|NC| = x = ?$ cm**



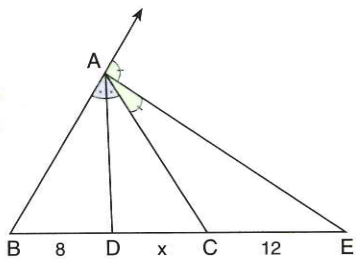
A) 14 B) 15 C) 16 D) 20 E) 25

8. [BN] ve [DN]
birer açıortaydır.
[BN] and [DN]
are bisectors.
$|AB| = 6$ cm,
$|BD| = 4$ cm,
$|DC| = 8$ cm
$\Rightarrow$ **$|AD| = ?$ cm**



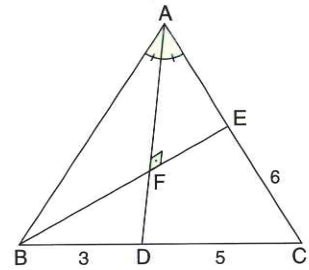
A) 2 B) 4 C) 6 D) 8 E) 10

9. [AD], bir iç açıortay;
[AE], bir dış açıortaydır.
[AD] is an interior bisector;
[AE] is an exterior bisector.
$|BD| = 8$ cm,
$|CE| = 12$ cm
$\Rightarrow$ **$|DC| = x = ?$ cm**



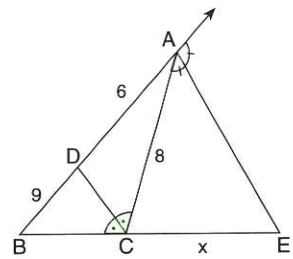
A) 2 B) 4 C) 5 D) 6 E) 10

10. [AD], bir açıortaydır.
[AD] is a bisector.
[AD] $\perp$ [BE],
$|EC| = 6$ cm,
$|DC| = 5$ cm,
$|BD| = 3$ cm
$\Rightarrow$ **$|AC| = ?$ cm**



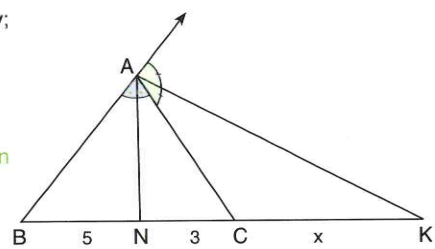
A) 9 B) 12 C) 15 D) 18 E) 20

11. [CD], bir iç açıortay
[AE], bir dış açıortaydır.
[CD] is an interior bisector,
[AE] is an exterior bisector.
$|AC| = 8$ cm,
$|AD| = 6$ cm,
$|DB| = 9$ cm
$\Rightarrow$ **$|CE| = x = ?$ cm**



A) $\frac{96}{7}$ B) $\frac{80}{7}$ C) $\frac{72}{7}$ D) $\frac{48}{7}$ E) $\frac{24}{7}$

12. [AN], bir iç açıortay;
[AK], bir dış açıortaydır.
[AN] is an interior bisector; [AK] is an exterior bisector.
$|BN| = 5$ cm,
$|NC| = 3$ cm
$\Rightarrow$ **$|CK| = x = ?$ cm**



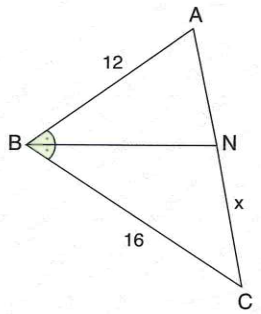
A) 10 B) 12 C) 16 D) 18 E) 20

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
A	D	E	D	C	A	D	B	B	C	A	B

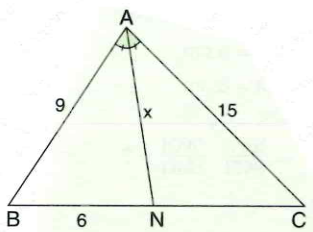
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $m(\widehat{ABN}) = m(\widehat{NBC})$,
$|AB| = 12$ cm,
$|BC| = 16$ cm,
$|AC| = 14$ cm
$\Rightarrow$ **$|NC| = x = ?$ cm**



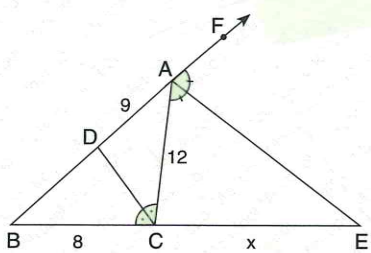
A) 6 B) 7 C) 8
D) 9 E) 10

2. $m(\widehat{BAN}) = m(\widehat{NAC})$,
$|AB| = 9$ cm,
$|AC| = 15$ cm,
$|BN| = 6$ cm
$\Rightarrow$ **$|AN| = x = ?$ cm**



A) $5\sqrt{3}$ B) $5\sqrt{2}$ C) 6
D) 8 E) $3\sqrt{6}$

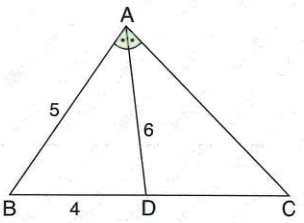
3.



[CD], bir iç açıortay; [AE], bir dış açıortaydır.
[CD] is a bisector; [AE] is an exterior bisector.
$|AD| = 9$ cm, $|BC| = 8$ cm, $|AC| = 12$ cm
$\Rightarrow$ **$|CE| = x = ?$ cm**

A) 16 B) 18 C) 24
D) 26 E) 32

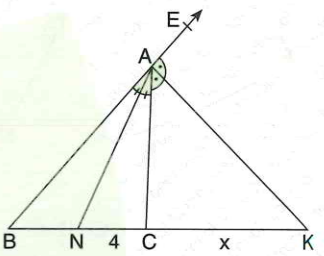
4.



$m(\widehat{BAD}) = m(\widehat{DAC})$, $|AB| = 5$ cm,
$|BD| = 4$ cm, $|AD| = 6$ cm
$\Rightarrow$ **Çevre / The perimeter (ABC) = ? cm**

A) 30 B) 32 C) 36
D) 40 E) 45

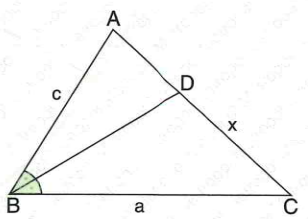
5.



[AN], bir iç açıortay; [AK], bir dış açıortaydır.
[AN] is a interior bisector; [AK] is an exterior bisector.
$2 \cdot |AB| = 3 \cdot |AC|$, $|NC| = 4$ cm $\Rightarrow$ **$|CK| = x = ?$ cm**

A) 10 B) 12 C) 18
D) 20 E) 30

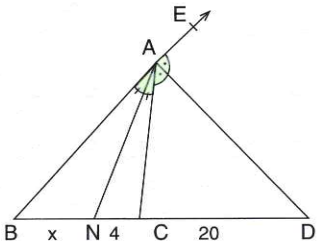
6. $m(\widehat{ABD}) = m(\widehat{DBC})$,
$|AB| = c$ cm,
$|BC| = a$ cm,
$|AC| = 20$ cm,
$\frac{a+c}{a} = \frac{5}{2}$
$\Rightarrow$ **$|DC| = x = ?$ cm**



A) 6 B) 7,2 C) 7,6
D) 8 E) 9,6

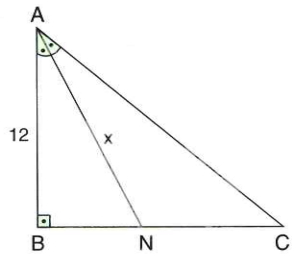
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $m(\widehat{DAE}) = m(\widehat{DAC})$,
$m(\widehat{BAN}) = m(\widehat{NAC})$,
$|NC| = 4$ cm,
$|CD| = 20$ cm
$\Rightarrow$ **$|BN| = x = ?$ cm**



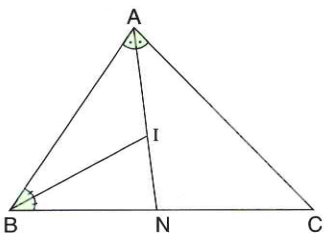
A) 3 B) 4 C) 5
D) 6 E) 8

8. [AN], bir açıortaydır.
[AN] is a bisector.
$|AB| = 12$ cm,
$|BC| = 16$ cm
$\Rightarrow$ **$|AN| = x = ?$ cm**



A) 6 B) $6\sqrt{5}$ C) 8
D) 9 E) $12\sqrt{5}$

9.

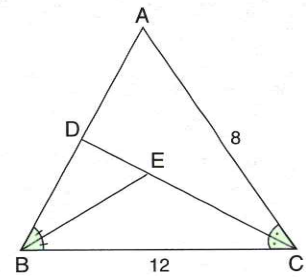


$m(\widehat{BAN}) = m(\widehat{NAC})$, $m(\widehat{ABI}) = m(\widehat{IBN})$, $\frac{|IA|}{|IN|} = \frac{5}{3}$,

Çevre / The perimeter (ABC) = 40 cm $\Rightarrow$ **$|BC| = ?$ cm**

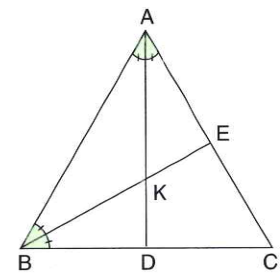
A) 9 B) 9,6 C) 12
D) 12,6 E) 15

10. $m(\widehat{ABE}) = m(\widehat{EBC})$,
$m(\widehat{ACD}) = m(\widehat{DCB})$,
$\frac{|DE|}{|EC|} = \frac{1}{3}$,
$|BC| = 12$ cm,
$|AC| = 8$ cm
$\Rightarrow$ **$|AD| = ?$ cm**



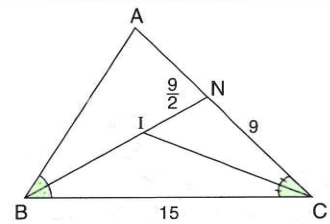
A) $\frac{4}{3}$ B) 2 C) $\frac{8}{3}$
D) $\frac{40}{27}$ E) $\frac{50}{27}$

11. [AD] ve [BE] birer açıortaydır.
[AD] and [BE] are bisectors.
$|AC| = 6$ cm,
$|BC| = 8$ cm,
$|AB| = 12$ cm
$\Rightarrow \frac{|BK|}{|KE|} \cdot \frac{|KD|}{|AK|} = ?$



A) $\frac{8}{27}$ B) $\frac{11}{27}$ C) $\frac{20}{27}$
D) $\frac{40}{27}$ E) $\frac{50}{27}$

12. $m(\widehat{ABN}) = m(\widehat{NBC})$,
$m(\widehat{BCI}) = m(\widehat{ICN})$,
$|BC| = 15$ cm,
$|NC| = 9$ cm,
$|IN| = \frac{9}{2}$ cm



$\Rightarrow$ **Çevre / The perimeter (ABC) = ? cm**

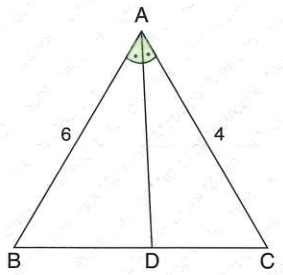
A) 54 B) 48 C) 42
D) 39 E) 36

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	A	E	E	D	D	D	B	E	C	D	B

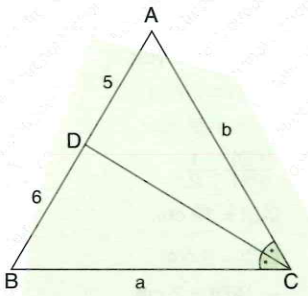
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. [AD], bir açıortaydır.
[AD] is a bisector.
|AB| = 6 cm,
|AC| = 4 cm,
|BC| = 8 cm
⇒ **|BD| = ? cm**



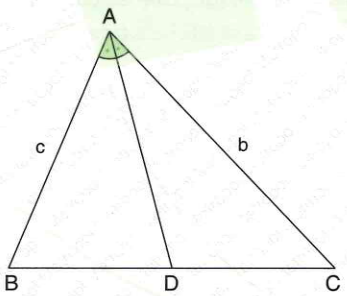
A) 2,8 B) 3,6 C) 4,2
D) 4,8 E) 5,2

2. [CD], bir açıortaydır.
[CD] is a bisector.
|AD| = 5 cm,
|BD| = 6 cm,
a – b = 4 cm
⇒ **a = ? cm**



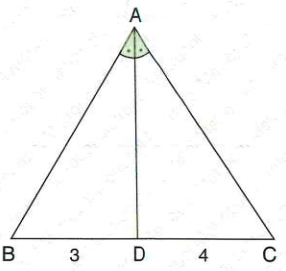
A) 16 B) 18 C) 20
D) 22 E) 24

3. [AD], bir açıortaydır.
[AD] is a bisector.
$\frac{b+c}{c} = 4$,
|BC| = 12 cm
⇒ **|BD| = ? cm**



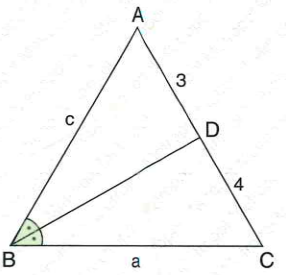
A) 3 B) 4 C) 5
D) 6 E) 8

4. [AD], bir açıortaydır.
[AD] is a bisector.
|BD| = 3 cm,
|DC| = 4 cm,
|AB| + |BC| + |AC| = 35 cm
⇒ **|AC| = ? cm**



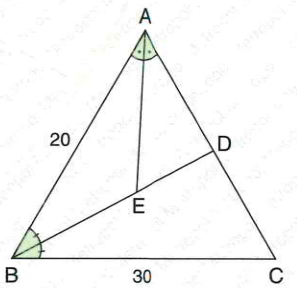
A) 12 B) 13 C) 14
D) 15 E) 16

5. [BD], bir açıortaydır.
[BD] is a bisector.
|AD| = 3 cm,
|DC| = 4 cm,
a + c = 28 cm
⇒ **c = ? cm**



A) 9 B) 10 C) 12
D) 15 E) 16

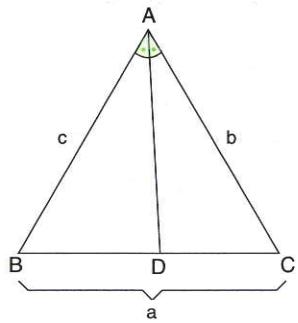
6. [AE] ve [BD]
birer açıortaydır.
[AE] and [BD]
are bisectors.
|BC| = 30 cm,
|AB| = 20 cm,
4·|DE| = 3·|BE|
⇒ **|AC| = ? cm**



A) 15 B) 20 C) 24
D) 27,5 E) 37,5

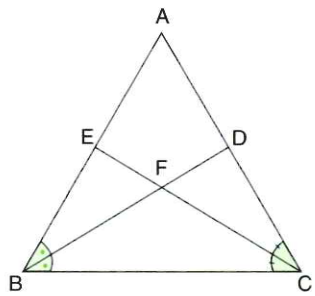
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [AD], bir açıortaydır.
[AD] is a bisector.
$2\cdot a = 3\cdot b = 5\cdot c$,
$b = 20$ cm
$\Rightarrow$ **$|BD| = ?$ cm**



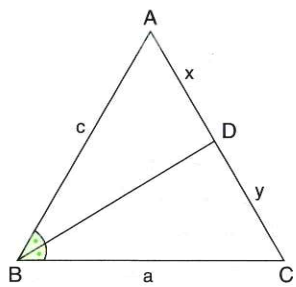
A) 11,25 B) 12,5 C) 13,2
D) 14 E) 18

8. [BD] ve [CE]
birer açıortaydır.
[BD] and [CE]
are bisectors.
$|AE| = 3$ cm,
$|AD| = 6$ cm,
$|DC| = 3$ cm
$\Rightarrow$ **$|BC| = ?$ cm**



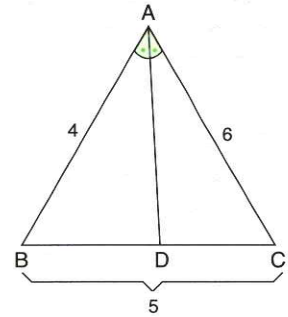
A) $\frac{9}{5}$ B) 2 C) $\frac{12}{5}$
D) 3 E) $\frac{19}{5}$

9. [BD], bir açıortaydır.
[BD] is a bisector.
$|DC| = y$,
$|AD| = x$,
$4\cdot y = 5\cdot x$,
$a + c = 27$ cm
$\Rightarrow$ **$a = ?$ cm**



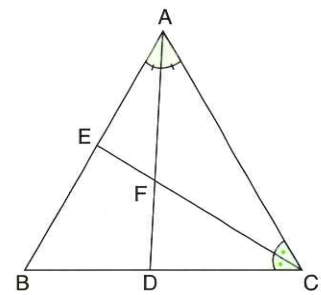
A) 20 B) 18 C) 15
D) 12 E) 10

10. [AD], bir açıortaydır.
[AD] is a bisector.
$|AB| = 4$ cm,
$|AC| = 6$ cm,
$|BC| = 5$ cm
$\Rightarrow$ **$|AD| = ?$ cm**



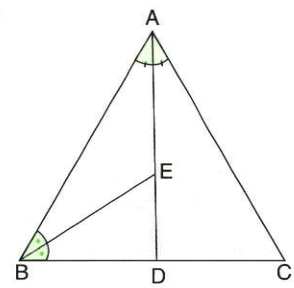
A) $4\sqrt{2}$ B) $3\sqrt{2}$ C) $3\sqrt{3}$
D) 3 E) 4

11. [CE] ve [AD]
birer açıortaydır.
[CE] and [AD]
are bisectors.
$\frac{|FD|}{|FA|} = \frac{1}{2}$,
$|AB| = 12$ cm,
$|AC| = 6$ cm
$\Rightarrow$ **$|AD| = ?$ cm**



A) 4 B) $4\sqrt{2}$ C) $3\sqrt{2}$
D) $3\sqrt{6}$ E) 6

12. [AD] ve [BE] birer açıortaydır.
[AD] and [BE] are bisectors.
$|AB| = 9$ cm,
$|AC| = 12$ cm,
$|BC| = 14$ cm
$\Rightarrow$ **$\frac{|AE|}{|ED|} = ?$**



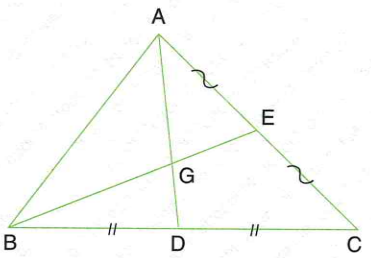
A) $\frac{2}{3}$ B) $\frac{3}{2}$ C) $\frac{4}{3}$
D) $\frac{5}{2}$ E) $\frac{5}{3}$

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	E	A	E	C	E	A	A	C	B	D	B

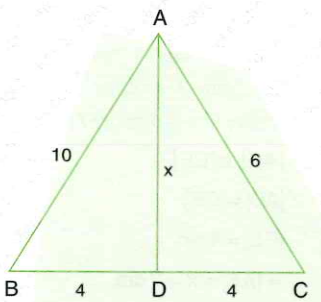
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. |BD| = |DC|,
|AE| = |EC|,
[AD] ∩ [BE] = {G},
|GD| = (3x – 4) cm,
|AG| = (4x – 2) cm
⇒ **|AD| = ? cm**



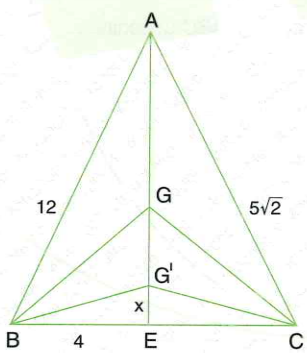
A) 12 B) 14 C) 15
D) 18 E) 20

2. |AB| = 10 cm,
|AC| = 6 cm,
|BD| = |DC| = 4 cm
⇒ **|AD| = x = ? cm**



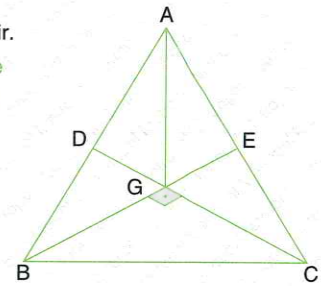
A) $2\sqrt{13}$ B) $4\sqrt{13}$ C) $\sqrt{26}$
D) $2\sqrt{26}$ E) 16

3. G noktası, ABC üçgeninin; G' ise GBC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC; the point G' is center of the gravity in the triangle GBC.
|AB| = 12 cm,
|AC| = $5\sqrt{2}$ cm,
|BE| = 4 cm
⇒ **|G'E| = x = ? cm**



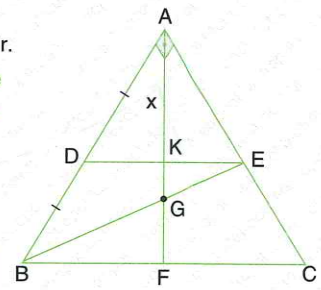
A) 1 B) 2 C) 3
D) 4 E) 5

4. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
[BE] ⊥ [DC],
|GE| = 3 cm,
|DG| = 4 cm
⇒ **|AG| = ? cm**



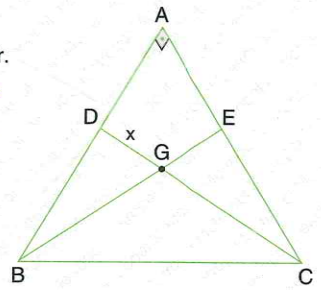
A) 5 B) 8 C) 10
D) 12 E) 15

5. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
[AB] ⊥ [AC],
|AD| = |DB|,
|BC| = 36 cm
⇒ **|AK| = x = ? cm**



A) 3 B) 6 C) 9
D) 12 E) 15

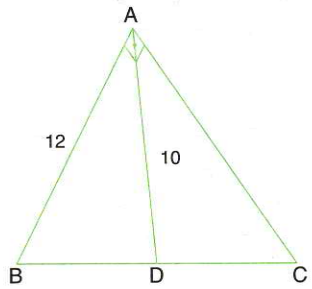
6. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
[AB] ⊥ [AC],
|BE| = 15 cm,
|AC| = 18 cm
⇒ **|DG| = x = ? cm**



A) $2\sqrt{5}$ B) $2\sqrt{10}$ C) $3\sqrt{10}$
D) $4\sqrt{3}$ E) 15

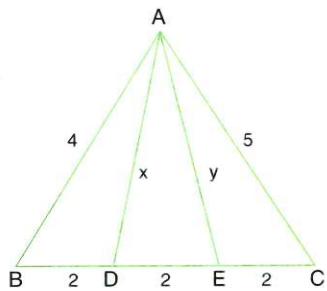
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [AD], bir kenarortaydır.
[AD] is a median.
[AB] ⊥ [AC],
|AB| = 12 cm,
|AD| = 10 cm
⇒ **|AC| = ? cm**



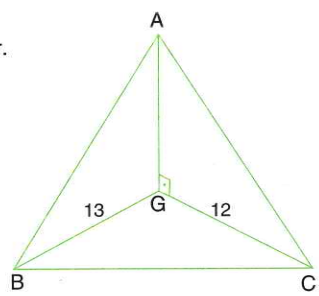
A) 9 B) 12 C) 14
D) 15 E) 16

8. |AB| = 4 cm,
|AC| = 5 cm,
|BD| = |DE| = |EC| = 2 cm
⇒ **$x^2 + y^2$ = ?**



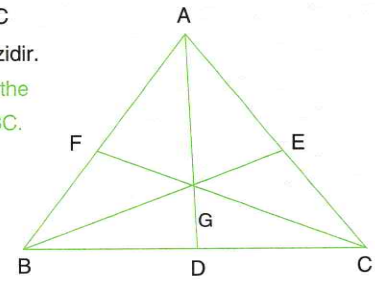
A) 25 B) 36 C) 49
D) 64 E) 81

9. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
|BG| = 13 cm,
|GC| = 12 cm
⇒ **|AG| = ? cm**



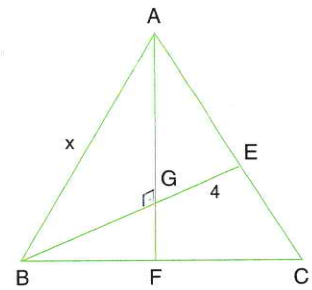
A) 3 B) 4 C) 5
D) 9 E) 12

10. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
|BE| = 9 cm
|CF| = 12 cm
|BC| = 10 cm
⇒ **|AD| = ? cm**



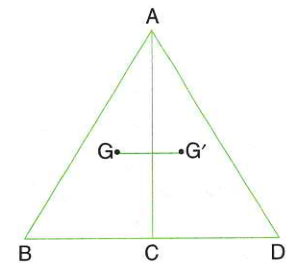
A) 9 B) 10 C) 15
D) $10\sqrt{2}$ E) $6\sqrt{5}$

11. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
[AF] ⊥ [BE],
|AC| = |CB|,
|GE| = 4 cm
⇒ **|AB| = x = ? cm**



A) $3\sqrt{2}$ B) $4\sqrt{2}$ C) $5\sqrt{2}$
D) $8\sqrt{2}$ E) $9\sqrt{2}$

12. G, ABC üçgeninin;
G', ACD üçgeninin
ağırlık merkezidir.
G is center of the gravity triangle ABC, G' is center of the gravity of the triangle ACD.
|GG'| = 12 cm ⇒ **|BD| = ? cm**



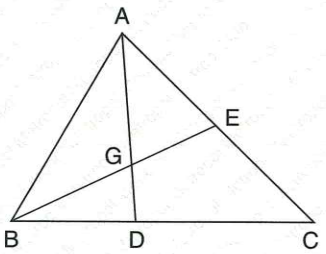
A) 36 B) 48 C) 60
D) 64 E) 96

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	A	A	C	C	B	E	A	C	C	D	A

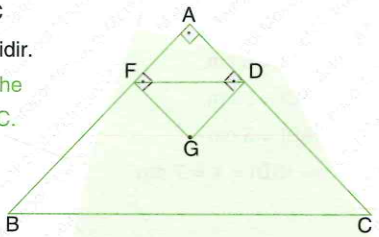
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$|AG| = y$ cm,
$|GD| = x$ cm,
$|BG| = 2x + 6$ cm,
$|GE| = y - 2$ cm
$\Rightarrow$ **$|AD| = ?$ cm**



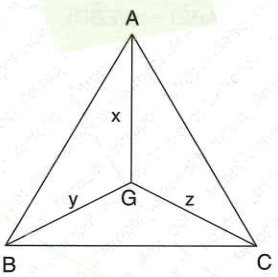
A) 12 B) 15 C) 18
D) 21 E) 24

2. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$[BA] \perp [CA]$,
$[GF] \perp [AB]$,
$[GD] \perp [AC]$,
$|FD| = 12$ cm
$\Rightarrow$ **$|BC| = ?$ cm**



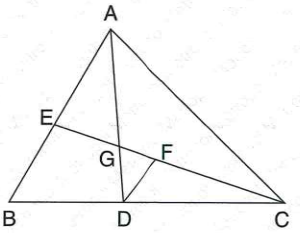
A) 24 B) 28 C) 36
D) 40 E) 48

3. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$x + y + z = 20$ cm
$\Rightarrow$ **$V_a + V_b + V_c = ?$ cm**



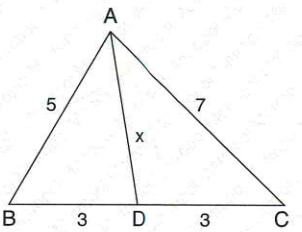
A) 28 B) 30 C) 36
D) 40 E) 60

4. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$[DF] \,//\, [AB]$,
$|CF| + |EG| = 20$ cm
$\Rightarrow$ **$|GF| = ?$ cm**



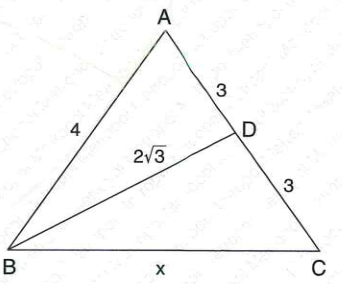
A) 4 B) 6 C) 9
D) 12 E) 18

5. $|BD| = |DC| = 3$ cm,
$|AC| = 7$ cm,
$|AB| = 5$ cm
$\Rightarrow$ **$|AD| = ?$ cm**



A) $2\sqrt{3}$ B) $3\sqrt{2}$ C) $4\sqrt{2}$
D) $5\sqrt{2}$ E) $2\sqrt{7}$

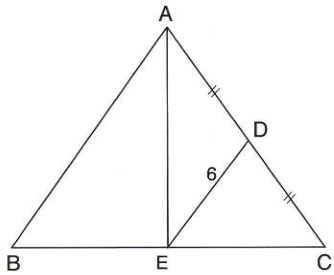
6. $|AD| = |DC| = 3$ cm,
$|BD| = 2\sqrt{3}$ cm,
$|AB| = 4$ cm
$\Rightarrow$ **$|BC| = x = ?$ cm**



A) $2\sqrt{6}$ B) 5 C) $\sqrt{26}$
D) $3\sqrt{3}$ E) $\sqrt{30}$

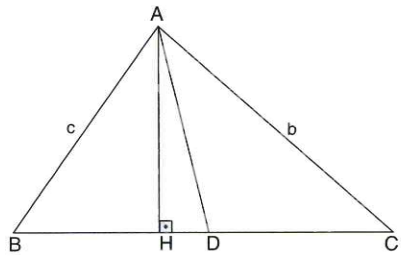
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. |AB| = |AC|,
|AD| = |DC|,
|BE| = |EC|,
|DE| = 6 cm
⇒ **|AC| = ? cm**



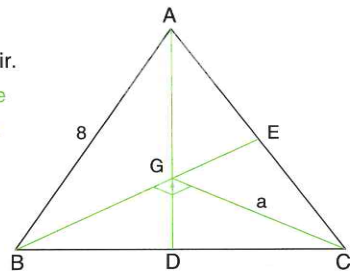
A) 10 B) 11 C) 12
D) 13 E) 14

8. |BD| = |DC|,
b – c = 4 cm,
b + c = 12 cm,
|BC| = 8 cm
⇒ **|HD| = ? cm**



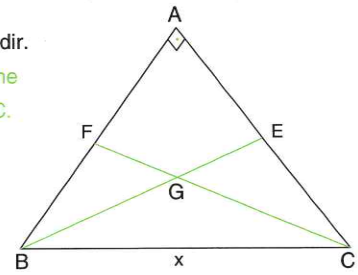
A) 1 B) 1,5 C) 2
D) 2,5 E) 3

9. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$m(\widehat{BGC}) = 90°$
|AB| = 8 cm
⇒ **|CG| = a = ? cm**



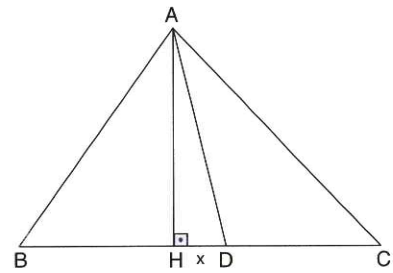
A) 6 B) 7 C) 8
D) 9 E) 10

10. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
[AB] ⊥ [AC],
|BG| = 6 cm,
|CG| = 8 cm
⇒ **|BC| = x = ? cm**



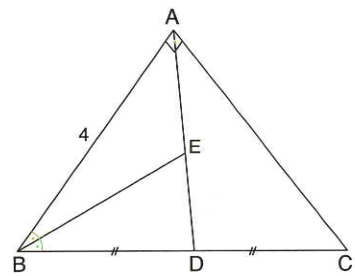
A) $6\sqrt{5}$ B) $5\sqrt{5}$ C) $4\sqrt{5}$
D) $3\sqrt{5}$ E) $2\sqrt{5}$

11. |BD| = |DC|,
|BC| = 6 cm,
|AC| = 7 cm,
|AB| = 5 cm
⇒ **|HD| = x = ? cm**



A) 1 B) 1,5 C) 2
D) 2,5 E) 3

12. [AB] ⊥ [AC],
$m(\widehat{ABE}) = m(\widehat{EBD})$,
|AB| = 4 cm,
|BC| = 12 cm,
|BD| = |DC|
⇒ **|AE| = ?**



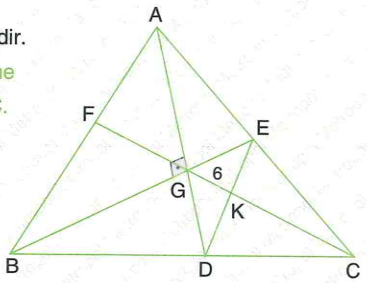
A) 4 B) 3 C) 2
D) $\frac{12}{5}$ E) $\frac{14}{5}$

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
B	C	B	A	E	C	C	E	C	A	C	D

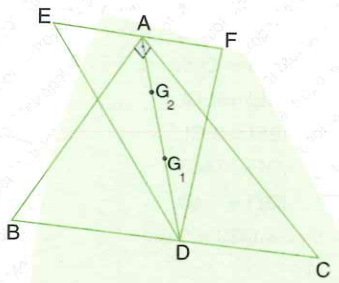
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$m(\widehat{AGB}) = 90°$,
$|KG| = 6$ cm
$\Rightarrow$ **$|AB| = ?$ cm**



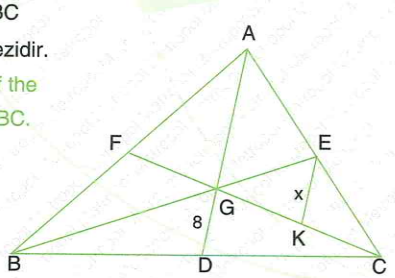
A) 12 B) 18 C) 20
D) 24 E) 36

2. G_1, şekildeki ABC üçgeninin ağırlık merkezi; G_2, şekildeki EDF üçgeninin ağırlık merkezidir.
G_1 is center of the gravity of $\widehat{ABC}$ in the figure, G_2 is center of the gravity of $\widehat{EDF}$ in the figure.
$[BA] \perp [AC]$, $|BC| = 36$ cm $\Rightarrow$ **$|G_1G_2| = ?$ cm**



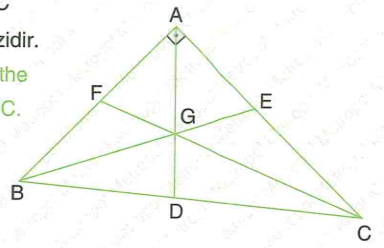
A) 4 B) 5 C) 6
D) 8 E) 10

3. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$|FG| = |GK|$,
$|GD| = 8$ cm
$\Rightarrow$ **$|EK| = x = ?$ cm**



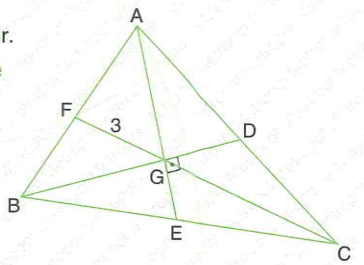
A) 8 B) 7 C) 6
D) 4 E) 3

4. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$[BA] \perp [AC]$,
$|CF| = 24$ cm,
$|BE| = 18$ cm
$\Rightarrow$ **$|AB|^2 + |AC|^2 = ?$ cm**



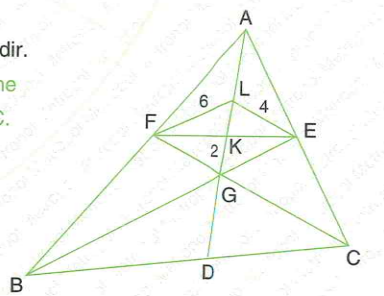
A) 720 B) 480 C) 392
D) 360 E) 216

5. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$[AE] \perp [BD]$,
$|GF| = 3$ cm
$\Rightarrow$ **$|AC|^2 + |BC|^2 = ?$**



A) 180 B) 196 C) 215
D) 300 E) 325

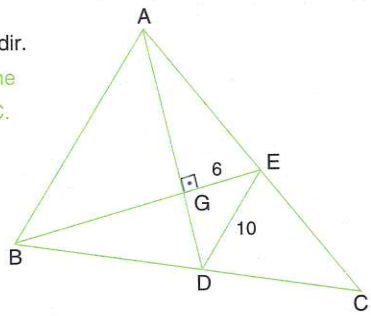
6. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$[FL] \,//\, [BE]$,
$[EL] \,//\, [FC]$,
$[AD] \cap [FE] = \{K\}$,
$|FL| = 6$ cm,
$|LE| = 4$ cm,
$|KG| = 2$ cm $\Rightarrow$ **$|AD| + |BE| = |CF| = ?$**



A) 24 B) 28 C) 36
D) 40 E) 42

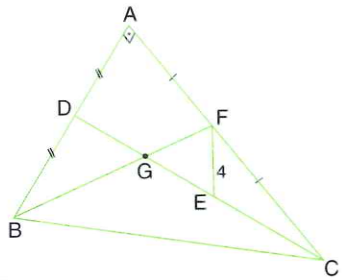
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$[AD] \perp [BE]$,
$|GE| = 6$ cm,
$|DE| = 10$ cm
$\Rightarrow$ **$|BC| = ?$ cm**



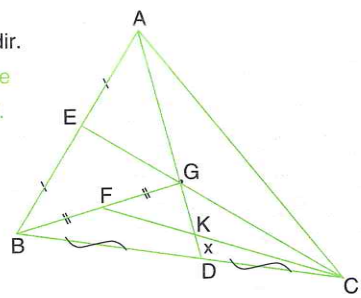
A) $2\sqrt{13}$ B) $4\sqrt{13}$ C) $6\sqrt{6}$
D) $12\sqrt{3}$ E) $8\sqrt{13}$

8. $[BA] \perp [AC]$,
$|AD| = |DB|$,
$|DG| = |GE| = |EC|$,
$|AF| = |FC|$,
$|EF| = 4$ cm
$\Rightarrow$ **$|BF|^2 + |CD|^2 = ?$**



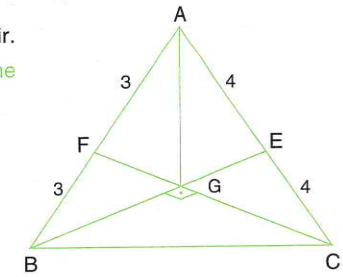
A) 180 B) 240 C) 320
D) 720 E) 900

9. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$|BF| = |FG|$,
$|AD| = 24$ cm
$\Rightarrow$ **$|KD| = x = ?$ cm**



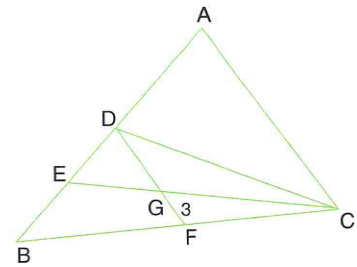
A) $\frac{3}{2}$ B) 2 C) $\frac{5}{2}$
D) $\frac{8}{3}$ E) 4

10. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$|AF| = |FB| = 3$ cm
$|AE| = |EC| = 4$ cm
$m(\widehat{BGC}) = 90°$
$\Rightarrow$ **$|AG| = ?$ cm**



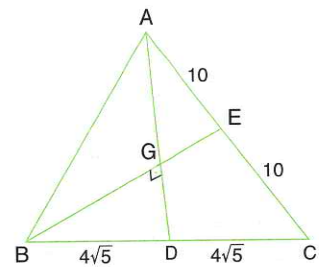
A) $2\sqrt{5}$ B) $\sqrt{5}$ C) 10 D) 5 E) 2

11. $[DF] \cap [CE] = \{G\}$,
$|AD| = |DB|$,
$|DE| = |EB|$,
$|BF| = |FC|$,
$[DF] \,//\, [AC]$,
$|GF| = 3$ cm
$\Rightarrow$ **$|AC| = ?$ cm**



A) 6 B) 9 C) 12 D) 15 E) 18

12. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$[BE] \perp [AD]$,
$|AE| = |EC| = 10$ cm,
$|BD| = |DC| = 4\sqrt{5}$ cm
$\Rightarrow$ **$|AB| = ?$ cm**



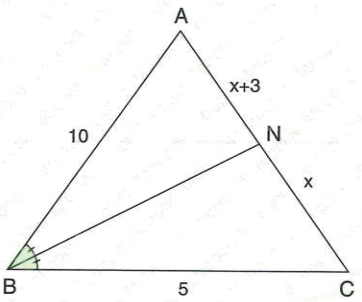
A) 8 B) 10 C) 12 D) 15 E) 20

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	C	A	A	A	E	E	D	D	A	E	C

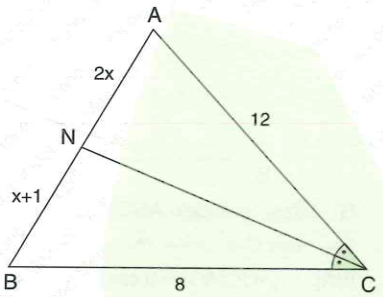
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. [BN], bir açıortaydır.
[BN] is a bisector.
⇒ **x = ? cm**



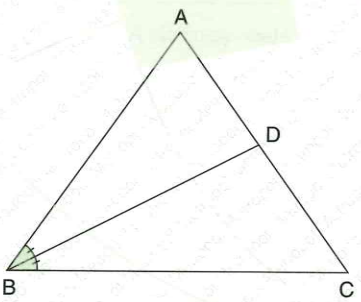
A) 1 B) 2 C) 3
D) 4 E) 5

2. [CN], bir açıortaydır.
[CN] is a bisector.
⇒ **|BN| = ? cm**



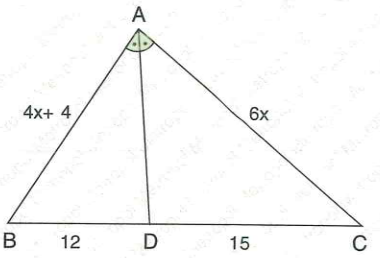
A) 5 B) 4 C) 3
D) 2 E) 1

3. $m(\widehat{ABD}) = m(\widehat{CBD})$,
|AC| = 8 cm,
|AB| = 6 cm,
|BC| = 4 cm
⇒ **|AD| = ? cm**



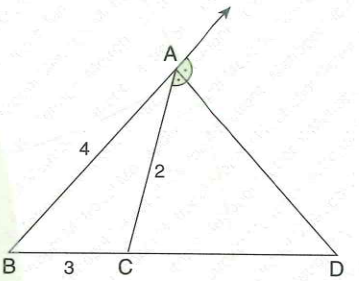
A) $\frac{12}{5}$ B) $\frac{13}{5}$ C) $\frac{24}{5}$
D) 5 E) $\frac{26}{5}$

4. $m(\widehat{BAD}) = m(\widehat{DAC})$
⇒ **|AC| = ? cm**



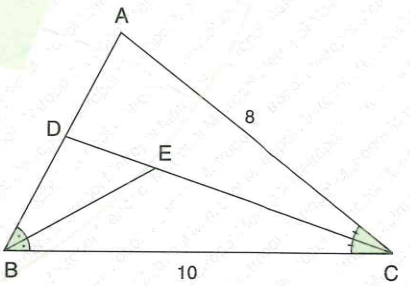
A) 15 B) 24 C) 30
D) 36 E) 42

5. [AD], bir dış açıortaydır.
[AD] is an exterior bisector.
⇒ **|BD| = ? cm**



A) 5 B) 6 C) 7
D) 8 E) 9

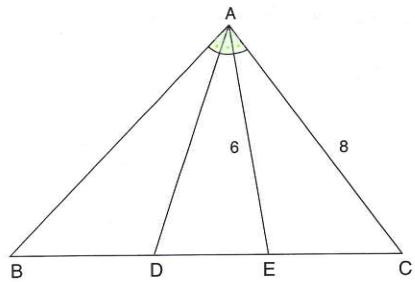
6. [DC] ve [BE] birer açıortaydır.
[DC] and [BE] are bisectors.
|AB| = 6 cm,
|AC| = 8 cm,
|BC| = 10 cm
⇒ $\frac{|DE|}{|EC|} = ?$



A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{2}{3}$
D) $\frac{3}{4}$ E) $\frac{2}{5}$

METROPOL YAYINLARI • METROPOL PUBLICATIONS

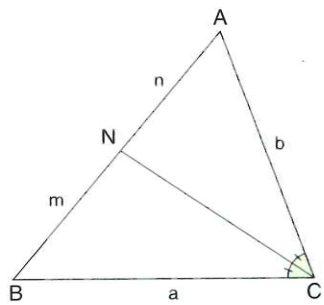
7.



$m(\widehat{BAD}) = m(\widehat{DAE}) = m(\widehat{EAC})$, $|AB| = 2 \cdot |BD|$,
$|AC| = 8$ cm, $|AE| = 6$ cm $\Rightarrow$ **$|AD| \cdot |EC| = ?$**

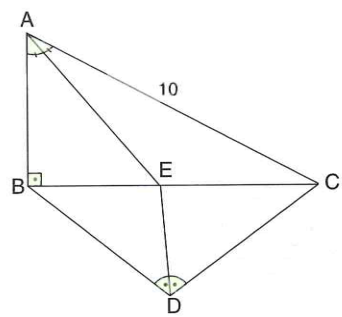
A) 64 B) 42 C) 34
D) 24 E) 20

8. [CN], bir iç açıortaydır.
[CN] is an interior bisector.
$m = 1{,}25 \cdot n$
$a + b = 18$ cm
$\Rightarrow$ **$a = ?$ cm**



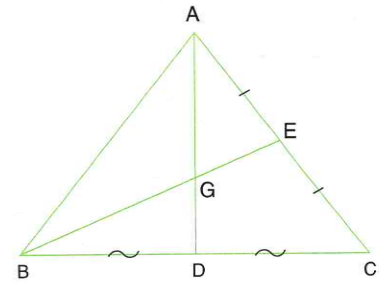
A) 8 B) 9 C) 10
D) 11 E) 12

9. [AE] ve [DE] birer açıortaydır.
[AE] and [DE] are bisectors.
$5 \cdot |BD| = 3 \cdot |DC|$,
$|AC| = 10$ cm
$\Rightarrow$ **$|AB| = ?$ cm**



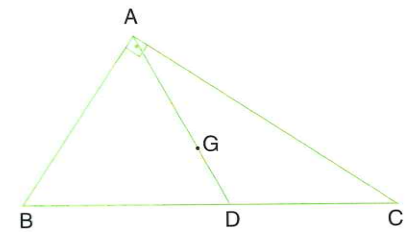
A) 5,4 B) 6 C) 6,3
D) $\frac{15}{2}$ E) 9

10. $|AE| = |EC|$,
$|BD| = |DC|$,
$|BG| = (3x - 1)$ cm,
$|GE| = (x + 3)$ cm
$\Rightarrow$ **$|GE| = ?$ cm**



A) 7 B) 8 C) 9
D) 10 E) 12

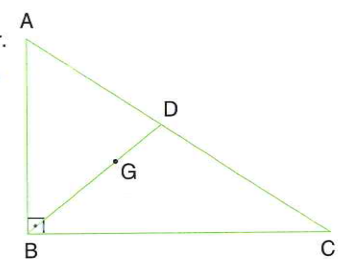
11.



G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
[BA] $\perp$ [AC], $|AG| = 6$ cm $\Rightarrow$ **$|BC| = ?$ cm**

A) 12 B) 14 C) 16
D) 18 E) 20

12. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
[AB] $\perp$ [BC],
$|AC| = 24$ cm
$\Rightarrow$ **$|GD| = ?$ cm**



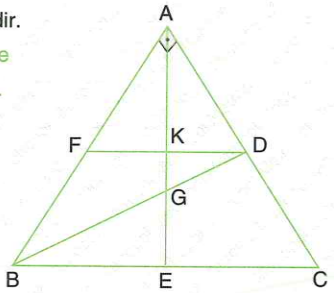
A) 4 B) $\frac{9}{2}$ C) 5
D) $\frac{11}{2}$ E) 6

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	B	C	C	B	B	D	C	B	D	D	A

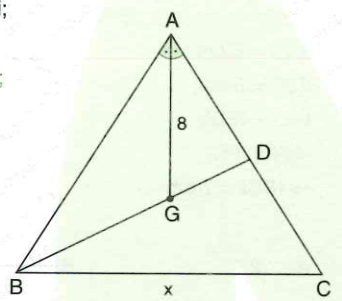
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
[AB] ⊥ [AC],
|AF| = |FB|,
|KG| = 3 cm
⇒ **|BC| = ? cm**



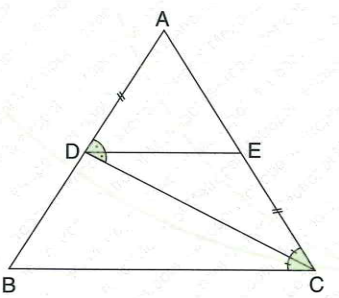
A) 18 B) 24 C) 36
D) 64 E) 72

2. G noktası, ağırlık merkezi;
[AG], bir açıortaydır.
G is center of the gravity;
[AG] is a angle bisector.
|DC| = 10 cm,
|AG| = 8 cm
⇒ **|BC| = x = ? cm**



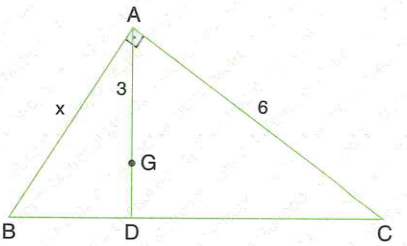
A) 36 B) 32 C) 28
D) 24 E) 20

3. $m(\widehat{ADE}) = m(\widehat{EDC})$,
$m(\widehat{ACD}) = m(\widehat{DCB})$,
|AD| = |EC|,
|DB| = 8 cm,
|BC| = 12 cm
$\Rightarrow \frac{|DC|}{|EC|} = ?$



A) 1 B) $\frac{3}{2}$ C) 2
D) $\frac{5}{2}$ E) 3

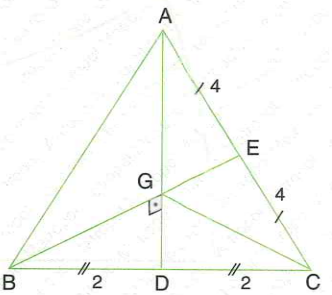
4.



G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
[BA] ⊥ [AC], |AG| = 3 cm, |AC| = 6 cm
⇒ **|AB| = x = ? cm**

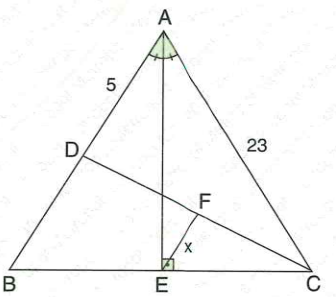
A) $2\sqrt{5}$ B) $3\sqrt{5}$ C) 5
D) 6 E) 7

5. [AD] ⊥ [BE],
|AE| = |EC| = 4 cm,
|BD| = |DC| = 2 cm
⇒ **|CG| = ? cm**



A) $\sqrt{2}$ B) $\sqrt{3}$ C) $\sqrt{5}$
D) $\sqrt{7}$ E) 4

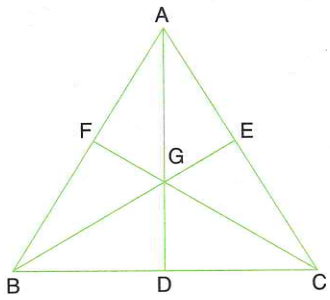
6. [AE], bir açıortaydır.
[AE] is a bisector.
[AE] ⊥ [BC],
|DF| = |FC|,
|AD| = 5 cm,
|AC| = 23 cm
⇒ **|FE| = x = ? cm**



A) 8 B) 9 C) 10
D) 11 E) 12

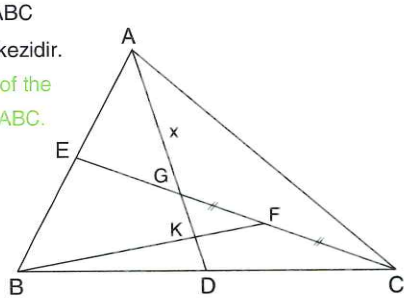
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$|BE| = 18$ cm,
$|CF| = 21$ cm,
$|AD| = 21$ cm
$\Rightarrow$ **$|BC| = ?$ cm**



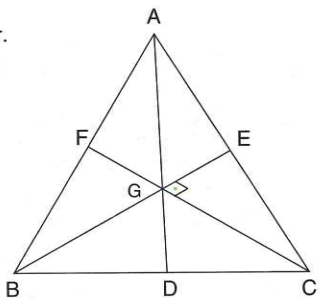
A) 20 B) 21 C) 22
D) 23 E) 24

8. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$|GF| = |FC|$
$|KG| = 4$ cm
$\Rightarrow$ **$|AG| = x = ?$**



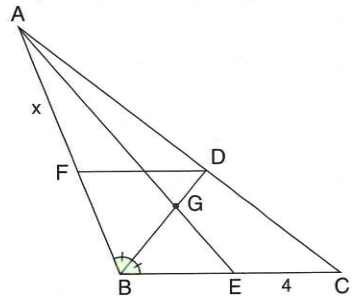
A) 8 B) 9 C) 10
D) 12 E) 16

9. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$|AG| = 6$ cm
$\Rightarrow$ **$|BC| = ?$ cm**



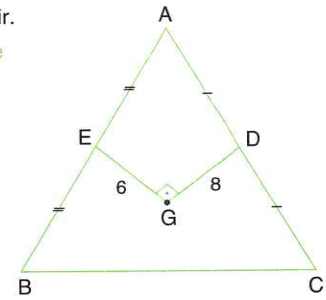
A) 6 B) 8 C) 10
D) 12 E) 15

10. G, ağırlık merkezi; [BD] açıortaydır.
G is center of the gravity; [BD] is a angle bisector.
[FD] // [BC],
$|EC| = 4$ cm
$\Rightarrow$ **$|AF| = x = ?$ cm**



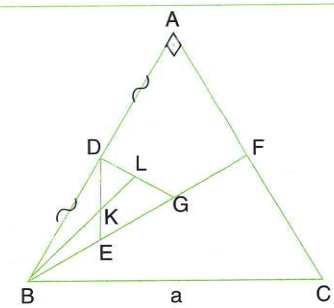
A) 1 B) 2 C) 3
D) 4 E) 5

11. G noktası, şekildeki ABC üçgeninin ağırlık merkezidir.
The point G is center of the gravity in the triangle ABC.
$|EG| = 6$ cm,
$|GF| = 8$ cm,
$|AE| = |EB|$,
$|AF| = |FC|$
$\Rightarrow$ **$|BC| = ?$ cm**



A) 12 B) 16 C) 20
D) 24 E) 28

12. G, ABC üçgeninin; K, BDG üçgeninin ağırlık merkezidir.
G is center of the gravity of $\widehat{ABC}$;
K is center of the gravity $\widehat{BDG}$.
$[BA] \perp [AC]$,
$|AD| = |DB|$, $|KE| = 2$ cm $\Rightarrow$ **$|BC| = a = ?$ cm**



A) 12 B) 16 C) 18
D) 24 E) 36

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	B	C	B	E	B	C	D	A	D	C	E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

BÖLÜM CHAPTER 4

TARİHSEL NOT / HISTORICAL NOTE

Pisagor (Pythagoras) [570 – 495 BC]

İyonyalı matematikçi, filozof, ve Pisagorculuk olarak bilinen akımın kurucusudur. En iyi bilinen önermesi, kendi adıyla anılan Pisagor teoremidir. "Sayıların babası" olarak bilinir. Pisagor ve öğrencileri her şeyin matematikle ilgili olduğuna, sayıların nihâî gerçek olduğuna, matematik aracılığıyla her şeyin tahmin edilebileceğine ve ölçülebileceğine inanmışlardır.

Ionian mathematician, philosopher, and founder of the trend currently known as Pythagoras. His best known proposition is the Pythagorean theorem, which is called by its name. He is known as the "father of numbers". Pythagoras and his students believed that everything was related to mathematics, numbers were the ultimate truth, and everything could be predicted and measured through mathematics.

ÖZEL ÜÇGENLER
SPECIAL TRIANGLES

Bu bölüm, 34 çözümlü örnek, 12 çözümlü test sorusu, 12 çözümlü YÖS sorusu, 24 alıştırma sorusu, 72 test sorusu içermektedir.

This chapter includes 34 examples with solutions, 12 test questions with solutions, 12 YÖS questions with solutions, 24 exercise questions and 72 test questions.

BÖLÜM / CHAPTER 4 ..... 111 - 154

ÖZEL ÜÇGENLER / SPECIAL TRIANGLES

- Dik Üçgen / Right Triangle ..... 113 - 122
  - Pisagor Teoremi / Pythagorean Theorem ..... 113 - 114
  - Dik Üçgende Kenarortay Teoremi / Median theorem in a Right Triangle 114
  - Açılarına Göre Özel Dik Açılı Üçgenler / Special Right Angled Triangles According to the Angles ..... 115 - 118
  - Kenar Uzunluklarına Göre Özel Dik Açılı Üçgenler / Special Right Angled Triangles According to the Side Lengths ..... 118 - 120
  - Öklit Bağlantıları / Euclidean Relations ..... 121 - 122
- İkizkenar Üçgen / Isosceles Triangle ..... 122 - 127
  - İkizkenar Üçgenin Özellikleri / Properties of an Isosceles Triangle ..... 123 - 127
- Eşkenar Üçgen / Equilateral Triangle ..... 127 - 130
  - Eşkenar Üçgenin Özellikleri / Properties of an Equilateral Triangle ..... 128 - 130

▲ Çözümlü Test / Test With Solutions ..... 131 - 134

▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 135 - 138

▲ Alıştırmalar / Exercises ..... 139 - 142

▲ Konu Testleri / Practice Tests ..... 143 - 154

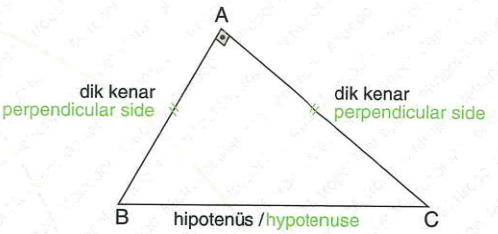
BÖLÜM 04 CHAPTER

ÖZEL ÜÇGENLER SPECIAL TRIANGLES

DİK ÜÇGEN / RIGHT TRIANGLE

[BA] ⊥ [CA] ise ABC dik üçgendir. [AB] ve [AC] dik kenarlardır. Dik açı karşısındaki [BC] kenarı ise hipotenüstür. A dik köşe olup, dik üçgenin aynı zamanda diklik merkezidir.

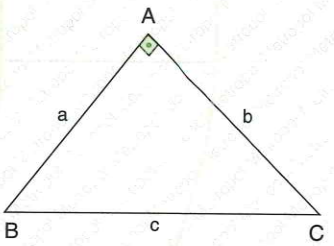
If [BA] ⊥ [CA], then $\widehat{ABC}$ is a right triangle. [AB] and [AC] are the perpendicular sides. The side [BC], opposite to the right angle is the hypotenuse. A is the right vertex, and also the orthocenter of the right triangle.



PİSAGOR TEOREMİ / PYTHAGOREAN THEOREM

Pisagor Teoremi: Bir dik üçgende, dik kenar uzunluklarının karelerinin toplamı, hipotenüs uzunluğunun karesine eşittir. Bu teoremden, iki kenarı bilinen bir dik üçgenin üçüncü kenarı bulunabilir.

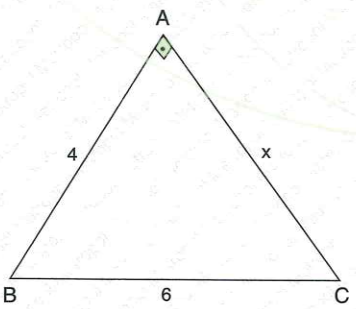
Pythagorean Theorem: In a right triangle, the sum of the squares of the lengths of the two perpendicular sides is equal to the square of the hypotenuse. If we know the lengths of any two sides of a right triangle. By using the Pythagorean theorem, we find the length of the third side.



$a^2 + b^2 = c^2$

Örnek / Example 1

[AB] ⊥ [AC],
|AB| = 4 cm,
|BC| = 6 cm
⇒ **|AC| = x = ? cm**



A) $2\sqrt{13}$ B) $5\sqrt{2}$ C) 5 D) $2\sqrt{6}$ E) $2\sqrt{5}$

Çözüm / Solution Yanıt / Answer **E**

$[AB] \perp [AC] \Leftrightarrow 6^2 = x^2 + 4^2$

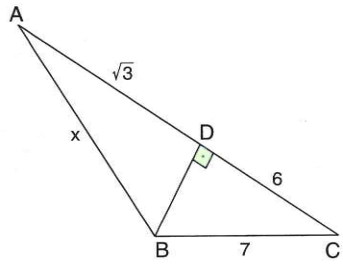
$\Leftrightarrow 36 = x^2 + 16$

$\Leftrightarrow 20 = x^2$

$\Leftrightarrow 2\sqrt{5} = x$

Örnek / Example 2

$[BD] \perp [AC]$,
$|AD| = \sqrt{3}$ cm,
$|DC| = 6$,
$|BC| = 7$
$\Rightarrow$ **$|AB| = x = ?$ cm**



A) 3 B) 4 C) 5 D) 6 E) 7

Çözüm / Solution Yanıt / Answer **B**

$m(\widehat{BDC}) = 90° \Leftrightarrow 7^2 = 6^2 + |BD|^2$
$\Leftrightarrow 49 = 36 + |BD|^2$
$13 = |BD|^2$

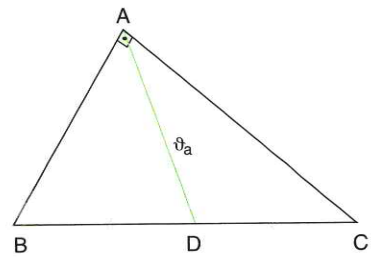
$m(\widehat{BDA}) = 90° \Leftrightarrow x^2 = (\sqrt{3})^2 + 13$
$\Leftrightarrow x^2 = 3 + 13$
$x^2 = 16$
$x = 4$

DİK ÜÇGENDE KENARORTAY TEOREMİ / MEDIAN THEOREM in a RIGHT TRIANGLE

Bir dik üçgende, hipotenüse çizilen kenarortay hipotenüs uzunluğunun yarısına eşittir.
In a right triangle, the median drawn to hypotenuse is half the length of the hypotenuse.

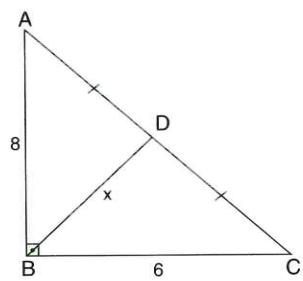
ϑ_a : Kenarortay / Median

$[BA] \perp [CA]$, $|BD| = |DC| \Rightarrow$ ***$|AD| = \vartheta_a = \frac{|BC|}{2}$***



Örnek / Example 3

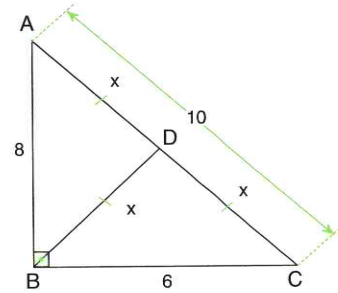
$m(\widehat{B}) = 90°$,
$|AD| = |DC|$,
$|AB| = 8$ cm,
$|BC| = 6$ cm
$\Rightarrow$ **$|BD| = x = ?$ cm**



A) 25 B) 20 C) 15 D) 10 E) 5

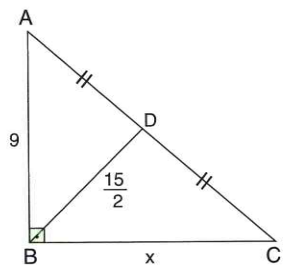
Çözüm / Solution Yanıt / Answer **E**

$|AC|^2 = |AB|^2 + |BC|^2$
$= 8^2 + 6^2$
$= 64 + 36 = 100$
$|AC| = 10$ cm
$|AD| = |DC| = |BD|$
$\Rightarrow 2x = 10$ cm
$x = 5$ cm



Örnek / Example 4

$[AB] \perp [BC]$,
$|AD| = |DC|$,
$|AB| = 9$ cm,
$|BD| = \frac{15}{2}$ cm
$\Rightarrow$ **$|BC| = x = ?$ cm**



A) 5 B) 6 C) 8 D) 10 E) 12

Çözüm / Solution Yanıt / Answer **E**

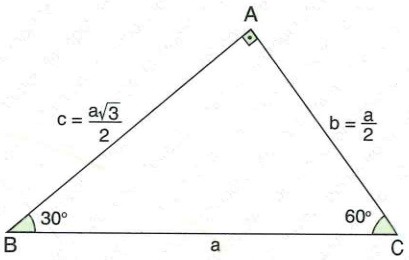
$\left.\begin{matrix}[AB] \perp [BC] \\ |AD| = |DC|\end{matrix}\right\} \Rightarrow |BD| = |AD| = |DC|$
$\Rightarrow |AC| = 15$ cm

$m(\widehat{ABC}) = 90° \Rightarrow |AC|^2 = |AB|^2 + |BC|^2$
$15^2 = 9^2 + x^2$
$144 = x^2$
$12 = x$

AÇILARINA GÖRE ÖZEL DİK AÇILI ÜÇGENLER
SPECIAL RIGHT ANGLED TRIANGLES ACCORDING to the ANGLES

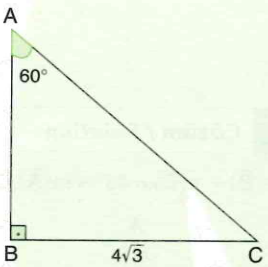
30°– 60°– 90° Dik Üçgeni / 30°– 60°– 90° Right Triangle

$$\left.\begin{array}{l}[BA]\perp[CA]\\ m(\widehat{ABC})=30^\circ\\ m(\widehat{ACB})=60^\circ\end{array}\right\}\Rightarrow \begin{array}{l}|AC|=\dfrac{|BC|}{2}\Rightarrow b=\dfrac{a}{2}\\ |AB|=\dfrac{|BC|\cdot\sqrt{3}}{2}\Rightarrow c=\dfrac{a\sqrt{3}}{2}\end{array}$$



Örnek / Example 5

$[AB]\perp[BC]$,
$m(\widehat{BAC})=60^\circ$,
$|BC|=4\sqrt{3}$ cm
$\Rightarrow |AB|+|AC|=?$



A) 4 B) 8 C) 12 D) 16 E) 20

Çözüm / Solution Yanıt / Answer **C**

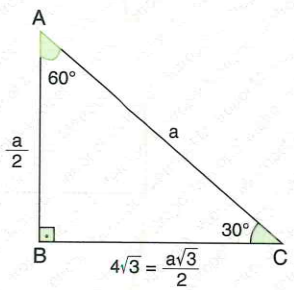
$\dfrac{a\sqrt{3}}{2}=4\sqrt{3}$

$a\sqrt{3}=8\sqrt{3}$

$a=8$

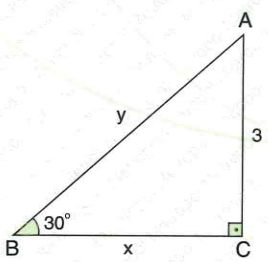
$|AC|=8$ cm, $|AB|=4$ cm

$|AC|+|AB|=8+4=12$ cm



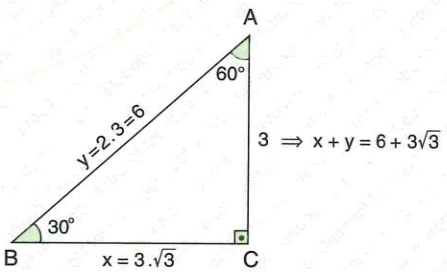
Örnek / Example 6

$[AC]\perp[BC]$,
$|AC|=3$ cm,
$|AB|=y$ cm,
$|BC|=x$ cm
$\Rightarrow x+y=?$ cm



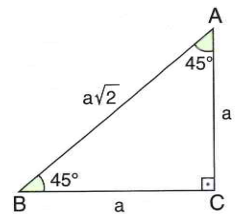
A) $6+3\sqrt{3}$ B) $7+3\sqrt{3}$ C) $8+3\sqrt{3}$
D) $9+3\sqrt{3}$ E) $10+3\sqrt{3}$

Çözüm / Solution Yanıt / Answer **A**



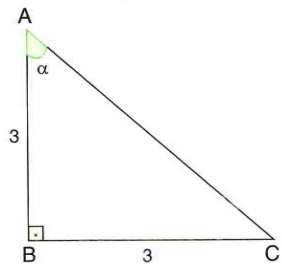
45°– 45°– 90° Dik Üçgeni / 45°– 45°– 90° Right Triangle

$$\left.\begin{matrix}[AC]\perp[BC] \\ m(\widehat{A}) = m(\widehat{B}) = 45^\circ\end{matrix}\right\} \Rightarrow \begin{matrix}|BC| = |AC| = a \\ |AB| = a\cdot\sqrt{2} = a\sqrt{2}\end{matrix}$$



Örnek / Example 7

$[AB]\perp[BC]$,
$|AB| = |BC| = 3$ cm
$\Rightarrow$ **$m(\widehat{A}) = \alpha = ?$**



A) 15° B) 30° C) 45° D) 60° E) 75°

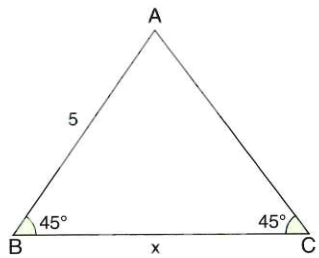
Çözüm / Solution — Yanıt / Answer C

$$\left.\begin{matrix}[AB]\perp[BC] \\ |AB| = |BC| = 3\,cm\end{matrix}\right\} \Rightarrow m(\widehat{A}) = m(\widehat{C})$$

$m(\widehat{A}) + m(\widehat{C}) = 90^\circ \Rightarrow m(\widehat{A}) = m(\widehat{C}) = 45^\circ$
$m(\widehat{A}) = \alpha = 45^\circ$

Örnek / Example 8

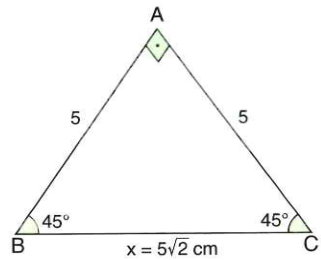
$m(\widehat{B}) = m(\widehat{C}) = 45^\circ$,
$|AB| = 5$ cm
$\Rightarrow$ **$|BC| = x = ?$**



A) 5 B) $5\sqrt{2}$ C) $5\sqrt{3}$ D) $5\sqrt{5}$ E) 10

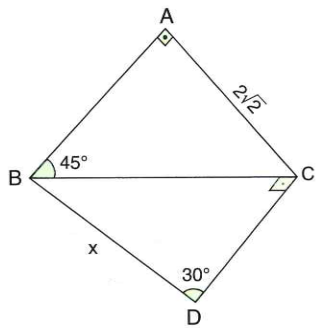
Çözüm / Solution — Yanıt / Answer B

$m(\widehat{B}) = m(\widehat{C}) = 45^\circ \Rightarrow m(\widehat{A}) = 90^\circ$



Örnek / Example 9

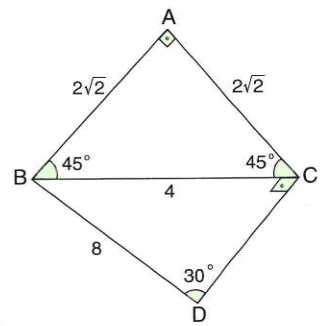
$m(\widehat{BAC}) = 90^\circ$,
$m(\widehat{BCD}) = 90^\circ$,
$m(\widehat{ABC}) = 45^\circ$
$m(\widehat{BDC}) = 30^\circ$,
$|AC| = 2\sqrt{2}$ cm
$\Rightarrow$ **$|BD| = x = ?$ cm**



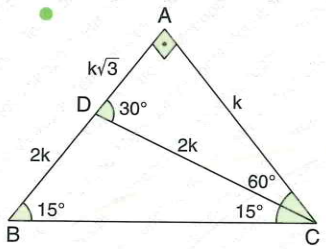
A) 4 B) 6 C) 8 D) 10 E) 12

Çözüm / Solution — Yanıt / Answer C

$|BC| = \sqrt{2}\cdot|AC|$
$= \sqrt{2}\cdot(2\sqrt{2}) = 4$ cm
$|BD| = 2\cdot|BC|$
$x = |BD| = 2\cdot 4 = 8$ cm

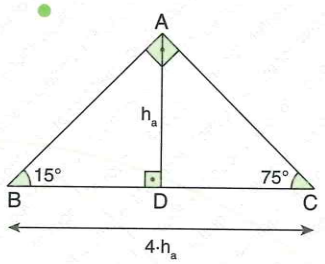


15°– 75°– 90° Dik Üçgeni / 15°– 75°– 90° Right Triangle



$m(ABC) = 15°, m(ACB) = 75°$

$\Rightarrow |AC| = k, |AB| = k \cdot (\sqrt{3}+2)$



$|AD| = h_a \Leftrightarrow |BC| = 4 \cdot h_a$

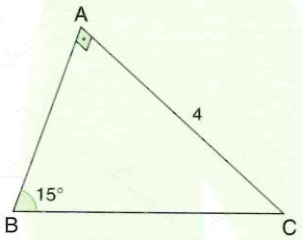
Örnek / Example 10

$[AB] \perp [AC]$,

$m(\widehat{ABC}) = 15°$,

$|AC| = 4$ cm

$\Rightarrow$ **$|AB|$ = ? cm**

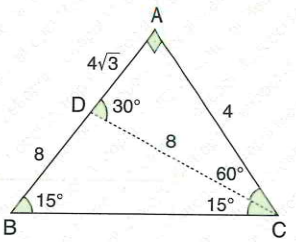


A) $4\sqrt{3}$ B) $4\sqrt{3}+8$ C) 8 D) $8\sqrt{3}$ E) $8\sqrt{3}+4$

Çözüm / Solution

Yanıt / Answer **B**

$|AC| = 4 \Rightarrow |AB| = 4\sqrt{3}+8$ cm



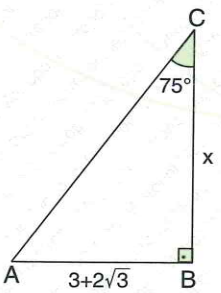
Örnek / Example 11

$[AB] \perp [BC]$,

$m(\widehat{ACB}) = 75°$,

$|AB| = 3+2\sqrt{3}$ cm

$\Rightarrow$ **$|BC| = x$ = ?**



A) $1+\sqrt{3}$ B) $1+\sqrt{2}$ C) $2\sqrt{3}$ D) $\sqrt{3}$ E) $\sqrt{2}$

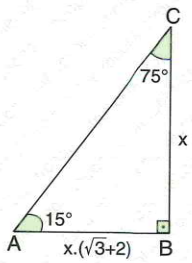
Çözüm / Solution

Yanıt / Answer **D**

$x \cdot (\sqrt{3}+2) = 3+2\sqrt{3}$

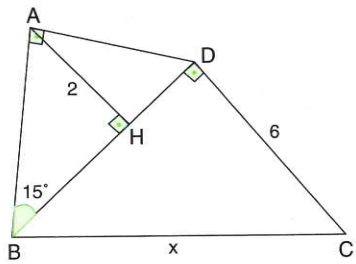
$x \cdot \cancel{(\sqrt{3}+2)} = \sqrt{3}\cancel{(\sqrt{3}+2)}$

$x = \sqrt{3}$ cm



Örnek / Example 12

$[AB] \perp [AD]$,
$[AH] \perp [BD]$,
$[BD] \perp [DC]$,
$|AH| = 2$ cm,
$|CD| = 6$ cm
$\Rightarrow |BC| = x = ?$ cm



A) 7 B) 8 C) 9 D) 10 E) 12

Çözüm / Solution Yanıt / Answer **D**

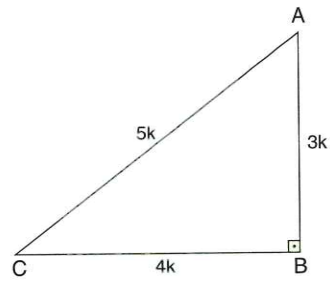
$\left.\begin{matrix} m(\widehat{ABD}) = 15^\circ \\ [AH] \perp [BD] \end{matrix}\right\} \Rightarrow |AH| = 2\,cm,$
$|BD| = 2 \cdot 4 = 8\,cm$

$m(\widehat{BDC}) = 90^\circ \Leftrightarrow |BD|^2 + |DC|^2 = |BC|^2$
$8^2 + 6^2 = x^2$
$100 = x^2$
$10 = x$

KENAR UZUNLUKLARINA GÖRE ÖZEL DİK AÇILI ÜÇGENLER
SPECIAL RIGHT ANGLED TRIANGLES ACCORDING to the SIDE LENGTHS

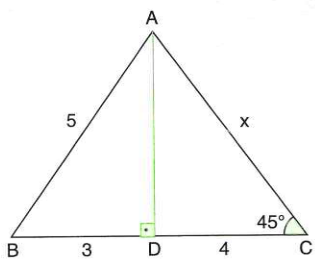
3 – 4 – 5 Dik Üçgeni / 3 – 4 – 5 Right Triangle

$[AB] \perp [BC]$,
$\left.\begin{matrix} |AB| = 3k \\ |BC| = 4k \end{matrix}\right\} \Rightarrow |AC| = 5k$



Örnek / Example 13

$[AD] \perp [BC]$,
$m(\widehat{ACD}) = 45^\circ$,
$|BD| = 3$ cm,
$|CD| = 4$ cm,
$|AB| = 5$ cm
$\Rightarrow |AC| = x = ?$ cm



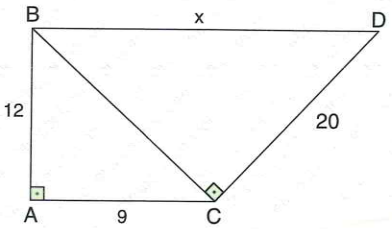
A) 4 B) $4\sqrt{2}$ C) $4\sqrt{3}$ D) $4\sqrt{5}$ E) $5\sqrt{2}$

Çözüm / Solution Yanıt / Answer **B**

$m(\widehat{BDA}) = 90^\circ$,
$|AD|^2 + |BD|^2 = |AB|^2$
$|AD|^2 = 16 \Rightarrow |AD| = 4$ cm
$m(\widehat{ACD}) = 45^\circ \Rightarrow m(\widehat{DAC}) = 45^\circ$
$|DC| = |AD| = 4$ cm
$|AC| = x = 4\sqrt{2}$ cm

Örnek / Example 14

$m(\widehat{BAC}) = 90°$,
$m(\widehat{BCD}) = 90°$,
$|AB| = 12$ cm,
$|CD| = 20$ cm
$|AC| = 9$ cm
$\Rightarrow$ **$|BD| = x = ?$ cm**



A) 15 B) 20 C) 22 D) 24 E) 25

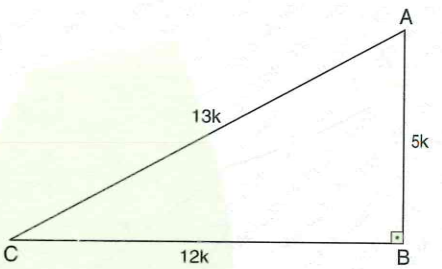
Çözüm / Solution Yanıt / Answer **E**

$|AB| = 4 \cdot 3$, $|AC| = 3 \cdot 3$ $\Rightarrow |BC| = 5 \cdot 3 = 15$ cm

$|BC| = 3 \cdot 5$, $|CD| = 4 \cdot 5$ $\Rightarrow |BD| = 5 \cdot 5 = 25$ cm

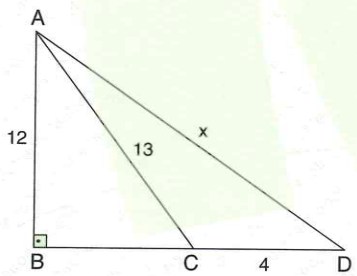
5 – 12 – 13 Dik Üçgeni / 5 – 12 – 13 Right Triangle

$[AB] \perp [BC]$,
$|AB| = 5k$, $|CB| = 12k$ $\Rightarrow$ ***$|AC| = 13k$***



Örnek / Example 15

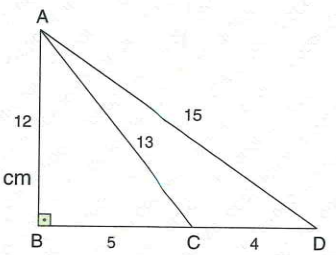
$[AB] \perp [BC]$,
$|AB| = 12$ cm,
$|AC| = 13$ cm,
$|DC| = 4$ cm
$\Rightarrow$ **$|AD| = x = ?$ cm**



A) 15 B) 18 C) 21 D) 24 E) 27

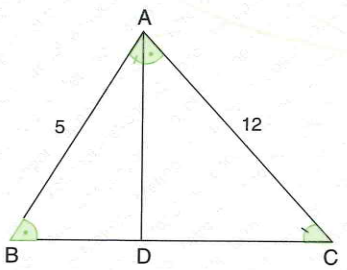
Çözüm / Solution Yanıt / Answer **A**

$|AC|^2 = |AB|^2 + |BC|^2$
$13^2 = 12^2 + |BC|^2$
$25 = |BC|^2$
$|BC| = 5$ cm
$|AB| = 4 \cdot 3$, $|BD| = 3 \cdot 3$ $\Rightarrow |AD| = 5 \cdot 3 = 15$ cm



Örnek / Example 16

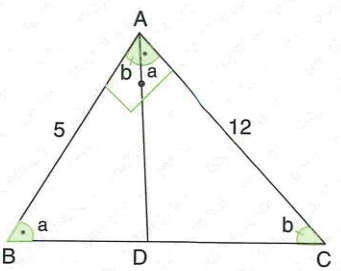
$m(\widehat{ABC}) = m(\widehat{DAC})$,
$m(\widehat{BAD}) = m(\widehat{ACD})$,
$|AB| = 5$ cm,
$|AC| = 12$ cm
$\Rightarrow$ **$|BC| = ?$ cm**



A) 13 B) 14 C) 15 D) 16 E) 17

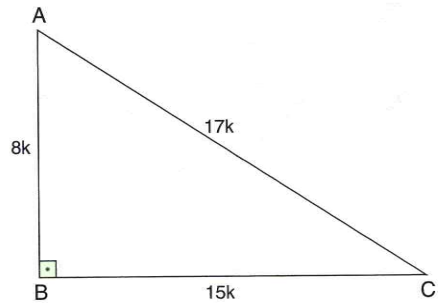
Çözüm / Solution Yanıt / Answer **A**

$2a + 2b = 180°$
$a + b = 90°$
$\Rightarrow |BC| = 13$ cm



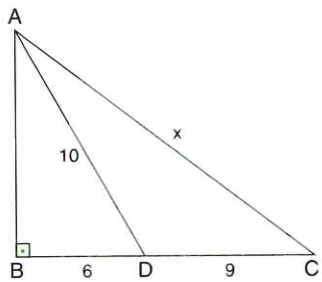
8 – 15 – 17 Dik Üçgeni / 8 – 15 – 17 Right Triangle

$[AB] \perp [BC]$,
$|AB| = 8k$, $|CB| = 15k$ $\Rightarrow$ ***|AC| = 17k***



Örnek / Example 17

$[AB] \perp [BC]$,
$|AD| = 10$ cm,
$|BD| = 6$ cm,
$|DC| = 9$ cm
$\Rightarrow$ **$|AC| = x = ?$ cm**



A) 13 B) 14 C) 15 D) 16 E) 17

Çözüm / Solution

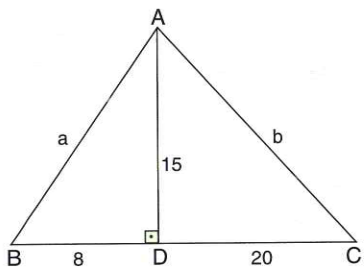
Yanıt / Answer **E**

$|AD| = 5 \cdot 2$, $|BD| = 3 \cdot 2$ $\Rightarrow |AB| = 4 \cdot 2 = 8$ cm

$|AB| = 8$ cm, $|BC| = 15$ cm $\Rightarrow |AC| = x = 17$ cm

Örnek / Example 18

$[AD] \perp [BC]$,
$|BD| = 8$ cm,
$|AD| = 15$ cm,
$|DC| = 20$ cm
$\Rightarrow$ **$a + b = ?$ cm**



A) 38 B) 40 C) 42 D) 44 E) 46

Çözüm / Solution

Yanıt / Answer **C**

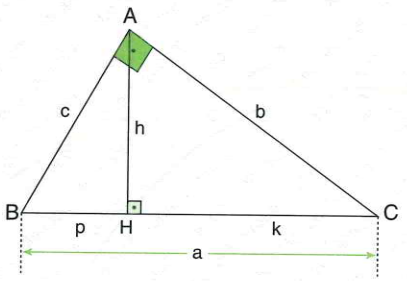
$|BD| = 8$ cm, $|AD| = 15$ cm $\Rightarrow a = 17$ cm

$|AD| = 3 \cdot 5$ cm, $|DC| = 4 \cdot 5$ cm $\Rightarrow b = 5 \cdot 5 = 25$ cm

$a + b = 17 + 25 = 42$ cm

ÖKLİT BAĞINTILARI / EUCLIDEAN RELATIONS

Bir dik üçgende hipotenüse ait yükseklik çizildiğinde, Öklit bağıntıları elde edilir. / In a right triangle, when the altitude to the hypotenuse is drawn, the Euclidean relations are obtained.



[AH] ⊥ [BC],
m(BAC) = 90°,
|AH| = h cm,
|BH| = p cm,
|HC| = k cm,
|AB| = c cm,
|AC| = b cm,
|BC| = a cm

Öklit Bağıntıları / Euclidean Relationships:

1. $h^2 = p \cdot k$ [Yükseklik özelliği / Property of altitude]
2. $c^2 = p \cdot a$ [Dış kenar özelliği / Property of exterior side]
3. $b^2 = k \cdot a$ [Dış kenar özelliği / Property of exterior side]

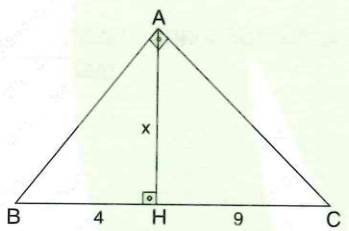
Sonuçlar / The conclusions:

i. $\frac{1}{h^2} = \frac{1}{b^2} + \frac{1}{c^2}$

ii. $a \cdot h = b \cdot c$ [Alan özelliği / Property of area]

Örnek / Example 19

[AH] ⊥ [BC],
[AB] ⊥ [AC],
|BH| = 4 cm,
|HC| = 9 cm
⇒ **|AH| = x = ? cm**



A) 4 B) 5 C) 6 D) 7 E) 8

Çözüm / Solution

Yanıt / Answer **C**

$\left.\begin{matrix}[AH] \perp [BC] \\ [AB] \perp [AC]\end{matrix}\right\} \Rightarrow |AH|^2 = |BH| \cdot |HC|$

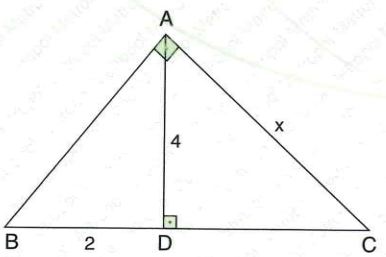
$x^2 = 4 \cdot 9$

$x^2 = 36$

$x = 6$ cm

Örnek / Example 20

[AB] ⊥ [AC],
[AD] ⊥ [BC],
|BD| = 2 cm,
|DA| = 4 cm
⇒ **|AC| = x = ? cm**



A) 4 B) $2\sqrt{5}$ C) 8 D) $4\sqrt{5}$ E) 16

Çözüm / Solution

Yanıt / Answer **D**

$|AD|^2 = |BD| \cdot |DC|$

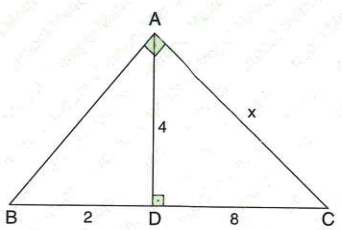
$\Rightarrow 4^2 = 2 \cdot |DC|$

$|DC| = 8$ cm

$|AC|^2 = |DC| \cdot |BC|$

$\Rightarrow |AC|^2 = 8 \cdot 10 = 80$

$|AC| = \sqrt{80} = 4\sqrt{5}$ cm



Örnek / Example 21

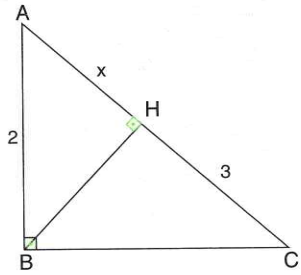
[AB] ⊥ [BC],

[BH] ⊥ [AC],

|AB| = 2 cm,

|CH| = 3 cm

⇒ **|AH| = x = ? cm**



A) 1 B) 3 C) 4 D) 5 E) 6

Çözüm / Solution Yanıt / Answer **A**

$$\left.\begin{matrix}[AB]\perp[BC]\\ [BH]\perp[AC]\end{matrix}\right\} \Rightarrow |AB|^2 = |AH|\cdot|AC|$$

$$2^2 = x(x+3)$$

$$4 = x(x+3)$$

$$1 = x$$

Örnek / Example 22

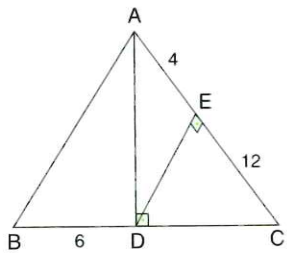
$m(\widehat{ADC}) = m(\widehat{DEC}) = 90°$,

|AE| = 4 cm,

|EC| = 12 cm,

|BD| = 6 cm

⇒ **|AB| = ? cm**



A) 8 B) 10 C) 12 D) 14 E) 16

Çözüm / Solution Yanıt / Answer **B**

$m(\widehat{ADC}) = m(\widehat{DEC}) = 90° \Rightarrow |AD|^2 = 4\cdot(4+12)$

$|AD|^2 = 64$

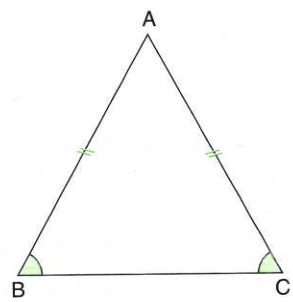
$|AD| = 8$ cm

$|AB|^2 = |AD|^2 + |BD|^2 \Rightarrow |AB|^2 = 64 + 36$

$|AB| = 10$ cm

İKİZKENAR ÜÇGEN / ISOSCELES TRIANGLE

$$|AB| = |AC| \Leftrightarrow m(\widehat{B}) = m(\widehat{C})$$

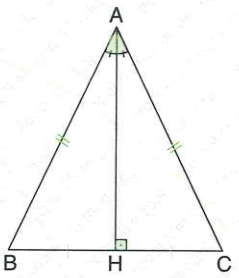


İKİZKENAR ÜÇGENİN ÖZELLİKLERİ / PROPERTIES of an ISOSCELES TRIANGLE

Özellik 1 / Property 1

İkizkenar üçgende, tabana ait yükseklik aynı zamanda açıortay ve kenarortaydır. / The altitude related to the base of an isosceles triangle is also bisector and median at the same time.

$$\left.\begin{matrix}|AB| = |AC| \\ [AH] \perp [BC]\end{matrix}\right\} \Rightarrow |BH| = |HC|$$
$$m(\widehat{BAH}) = m(\widehat{HAC})$$

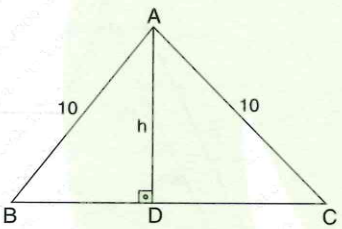


Örnek / Example 23

$|AB| = |AC| = 10$ cm

$|BC| = 12$ cm

$\Rightarrow |AD| = h = ?$ cm



A) 5 B) 6 C) 7 D) 8 E) 9

Çözüm / Solution

Yanıt / Answer **D**

$[AD] \perp [BC]$

$|BC| = 12$ cm,

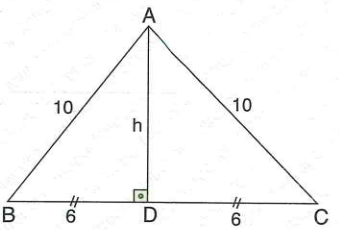
$\Rightarrow |BD| = |DC|$

(Özellik 1 / Property 1)

$|AB|^2 = |AD|^2 + |BD|^2$

$100 = h^2 + 36$

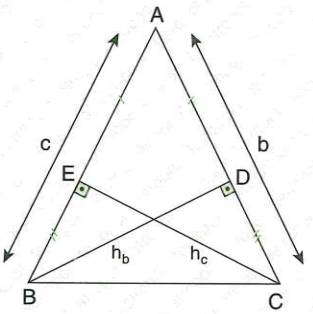
$65 = h^2 \Rightarrow h = 8$ cm



Özellik 2 / Property 2

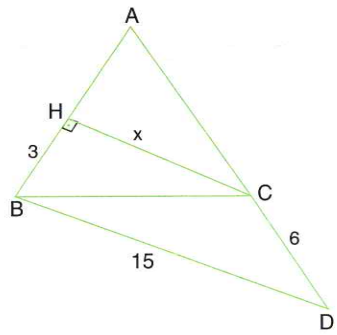
İkizkenar üçgende, eşit olan kenarlara ait yükseklik uzunlukları birbirine eşittir. / In an isosceles triangle, the lengths of altitudes to the equal sized sides are equal.

$b = c \Leftrightarrow h_b = h_c$



Örnek / Example 24

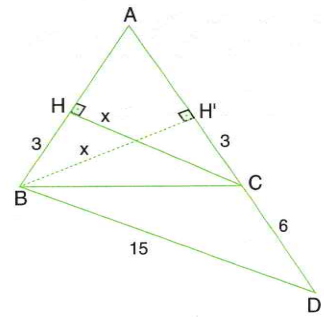
$[AB] \perp [CH]$,
$|AB| = |AC|$,
$|BH| = 3$ cm,
$|BD| = 15$ cm,
$|CD| = 6$ cm
$\Rightarrow$ **x = ? cm**



A) 9 B) 10 C) 11 D) 12 E) 13

Çözüm / Solution Yanıt / Answer **D**

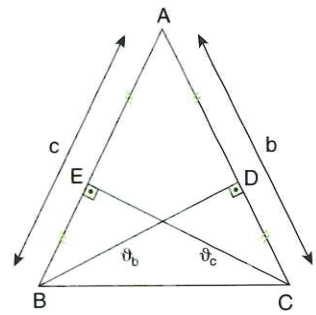
$|AB| = |AC|$
$\Rightarrow |CH| = |BH'| = x$
$\Rightarrow |BH| = |CH'|$
$\widehat{BH'D}$:
$m(\widehat{BH'D}) = 90^\circ \Leftrightarrow x^2 + 9^2 = 15^2$
$x^2 = 144$
$x = 12$ cm



Özellik 3 / Property 3

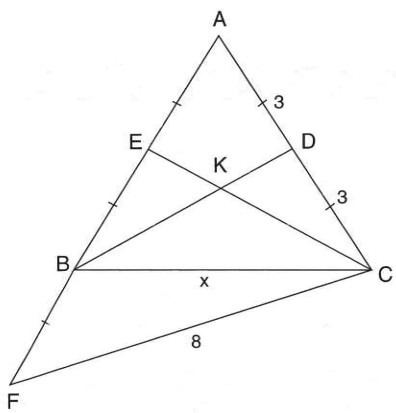
İkizkenar üçgende, eşit olan kenarlara ait kenarortay uzunlukları birbirine eşittir. / In an isosceles triangle, the lengths of the medians to the equal sized sides are equal.

$b = c \Leftrightarrow \vartheta_b = \vartheta_c$



Örnek / Example 25

$|AB| = |AC|$,
$|BD| = 7$ cm,
$|AD| = |DC| = 3$ cm,
$|AE| = |BE| = |BF|$
$\Rightarrow$ **|BC| = x = ? cm**



A) $\sqrt{\frac{5}{2}}$ B) $\sqrt{\frac{15}{2}}$ C) $\sqrt{\frac{17}{2}}$ D) $\sqrt{\frac{33}{2}}$ E) $\sqrt{\frac{95}{2}}$

Çözüm / Solution Yanıt / Answer **E**

$|AB| = |AC| \Leftrightarrow |BD| = |EC|$
$\Leftrightarrow \vartheta_b = \vartheta_c$
$|AC| = 6$ cm $\Rightarrow |AB| = 6$ cm
$|BD| = 7$ cm $\Rightarrow |EC| = 7$ cm
$\widehat{ECF} \Rightarrow$
[BC] : Kenarortay / Median

$$2 \cdot |BC|^2 = |EC|^2 + |CF|^2 - \frac{|EF|^2}{2}$$

$$2 \cdot x^2 = 7^2 + 8^2 - \frac{6^2}{2}$$

$$2x^2 = 49 + 64 - 18$$

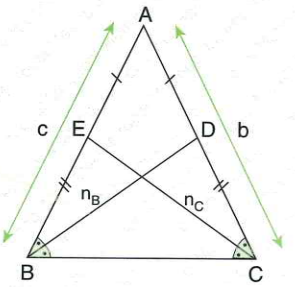
$$2x^2 = 95 \Rightarrow x^2 = \frac{95}{2}$$

$$x = \sqrt{\frac{95}{2}} \text{ cm}$$

Özellik 4 / Property 4

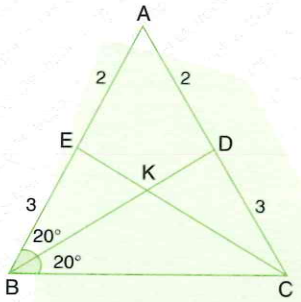
İkizkenar üçgende, eşit olan kenarlara ait açıortay uzunlukları birbirine eşittir. / In an isosceles triangle, the lengths of the bisectors to the equal sized sides are equal.

$b = c \Leftrightarrow n_B = n_C$



Örnek / Example 26

$m(\widehat{EBK}) = m(\widehat{KBC}) = 20°$,
$|AE| = |AD| = 2$ cm,
$|EB| = |DC| = 3$ cm,
$[EC] \cap [BD] = \{K\}$,
$\Rightarrow m(\widehat{BKC}) = ?$



A) 100° B) 120° C) 140° D) 160° E) 165°

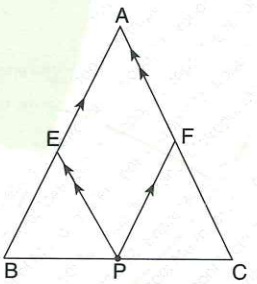
Çözüm / Solution

Yanıt / Answer **C**

$|AB| = |AC|$
$|AE| = |AD|$
$|EB| = |DC|$
$m(\widehat{EBK}) = m(\widehat{KBC})$
$\Rightarrow m(\widehat{BCK}) = m(\widehat{KCD}) = 20°$
$\Leftrightarrow m(\widehat{BKC}) = 180° - 40° = 140°$

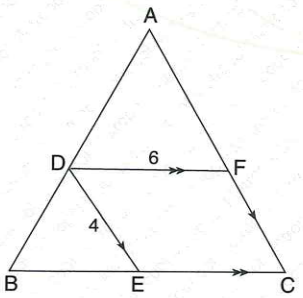
Özellik 5 / Property 5

$|AB| = |AC|$
$[PF] // [AB]$
$[PE] // [AC]$
$\Rightarrow |PF| + |PE| = |AB| = |AC|$



Örnek / Example 27

$|AC| = |BC|$,
$[DE] // [AC]$,
$[DF] // [BC]$,
$|DE| = 4$ cm,
$|DF| = 6$ cm
$\Rightarrow |AC| = ?$



A) 6 B) 7 C) 8 D) 9 E) 10

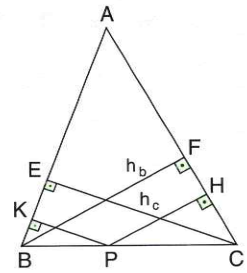
Çözüm / Solution

Yanıt / Answer **E**

$|AC| = |BC|$
$[DE] // [AC]$
$[DF] // [BC]$
$\Rightarrow |DE| + |DF| = |AC| = |BC|$
$\Rightarrow 4 + 6 = |AC| = |BC|$
$\Rightarrow 10 = |AC| = |BC|$

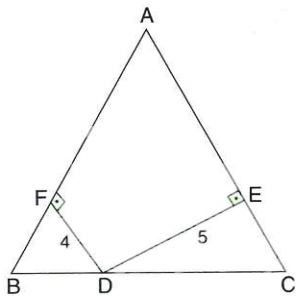
Özellik 6 / Property 6

$|AB| = |AC|$, $P \in [BC]$,
$[PH] \perp |AC|$ ve (and) $[PK] \perp [AB]$
$\Rightarrow |PH| + |PK| = h_b = h_c$



Örnek / Example 28

$|AB| = |AC|$,
$|FD| = 4$ cm,
$|ED| = 5$ cm,
$[DF] \perp [AB]$,
$[DE] \perp [AC]$
$\Rightarrow h_b = ?$



A) 4 B) 5 C) 7 D) 8 E) 9

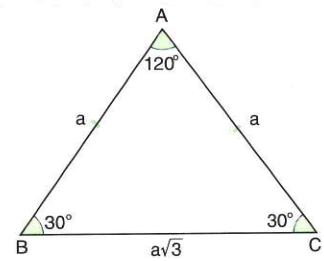
Çözüm / Solution

Yanıt / Answer **E**

$|AB| = |AC|$
$[DF] \perp [AB]$
$[DE] \perp [AC]$
$\Rightarrow |DF| + |DE| = h_b = h_c$
$\Rightarrow 4 + 5 = h_b = h_c$
$\Rightarrow 9 = h_b = h_c$

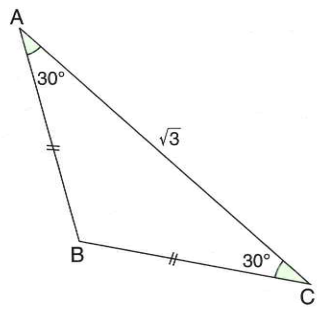
Özellik 7 / Property 7

120°- 30°- 30° ikizkenar üçgeninde,
In the 120°- 30° - 30° isosceles triangle,
$|AB| = |AC| = a \Rightarrow |BC| = a\sqrt{3}$



Örnek / Example 29

$|AB| = |BC|$,
$m(\widehat{A}) = m(\widehat{C}) = 30°$,
$|AC| = \sqrt{3}$ cm
$\Rightarrow |AB| \cdot |BC| = ?$



A) $\frac{1}{2}$ B) $\sqrt{2}$ C) 1 D) $\sqrt{3}$ E) $\frac{3}{2}$

Çözüm / Solution

Yanıt / Answer **C**

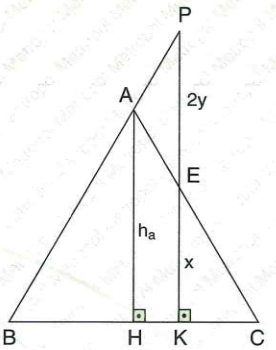
$|AB| = |BC|$
$m(\widehat{A}) = m(\widehat{C}) = 30°$
$\Rightarrow m(\widehat{B}) = 120°$

[Özellik 7 / Property 7]

$a \cdot \sqrt{3} = \sqrt{3}$
$a = 1$ cm
$\Rightarrow |AB| = |BC| = 1$ cm
$\Rightarrow |AB| \cdot |BC| = 1$

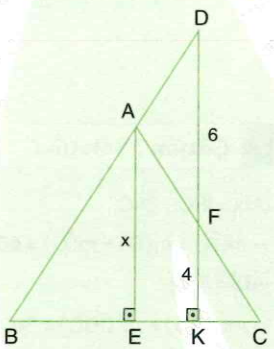
Özellik 8 / Property 8

$$\left.\begin{array}{l}[AH]\perp[BC]\\ [PK]\perp[BC]\\ [PK]\cap[AC]=\{E\}\\ |PE|=2y,\ |EK|=x\\ |AB|=|AC|\end{array}\right\}\Rightarrow h_a=x+y$$



Örnek / Example 30

$|AB|=|AC|$,
$[AE]\perp[BC]$,
$[DK]\perp[BC]$,
$|FK|=4$ cm,
$|DF|=6$ cm
$\Rightarrow |AE|=x=?$ cm



A) 5 B) $\frac{11}{2}$ C) 6 D) $\frac{13}{2}$ E) 7

Çözüm / Solution

Yanıt / Answer **E**

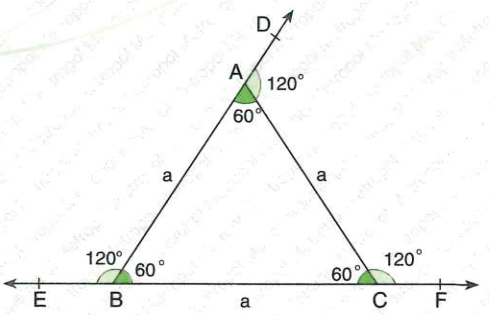
[Özellik 8 / Property 8]

$2y = 6 \Rightarrow y = 3$

$x = 3 + 4 = 7$ cm

EŞKENAR ÜÇGEN / EQUILATERAL TRIANGLE

$$|AB| = |AC| = |BC| = a \Leftrightarrow m(\widehat{A}) = m(\widehat{B}) = m(\widehat{C}) = 60^\circ$$
$$\Leftrightarrow m(\widehat{A'}) = m(\widehat{B'}) = m(\widehat{C'}) = 120^\circ$$



EŞKENAR ÜÇGENİN ÖZELLİKLERİ / PROPERTIES of an EQUILATERAL TRIANGLE

Özellik 1 / Property 1

Bir eşkenar üçgende, tüm yardımcı elemanların uzunlukları birbirine eşittir. / In an equilateral triangle, length of all auxiliary elements are equal to each other.

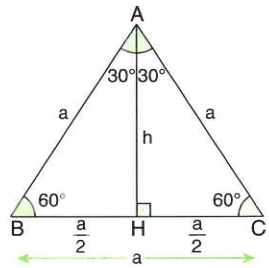
$h_a = h_b = h_c = n_A = n_B = n_C = \vartheta_a = \vartheta_b = \vartheta_c$

Özellik 2 / Property 2

$|AB| = |AC| = |BC| = a,$

$\Rightarrow h = \frac{a\sqrt{3}}{2}$

$\Rightarrow A(\widehat{ABC}) = \frac{a^2\sqrt{3}}{4}$



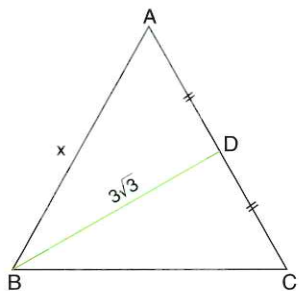
Örnek / Example 31

$|AB| = |BC| = |AC|,$

$|AD| = |DC|,$

$|BD| = 3\sqrt{3}$ cm

$\Rightarrow |AB| = x = ?$ cm



A) 6 B) 7 C) 8 D) $6\sqrt{3}$ E) 12

Çözüm / Solution

Yanıt / Answer **A**

$|AB| = |BC| = |AC|$

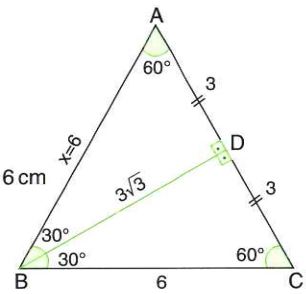
$\Rightarrow m(\widehat{A}) = m(\widehat{B}) = m(\widehat{C}) = 60°$

$|AD| = |DC|$

$\Rightarrow m(\widehat{ABD}) = m(\widehat{DBC}) = 30°$

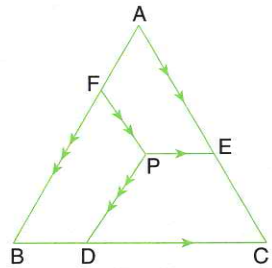
$\widehat{ABD}$:

$|BD| = 3\sqrt{3}$ cm, $|AD| = 3$, $|AB| = x = 6$ cm



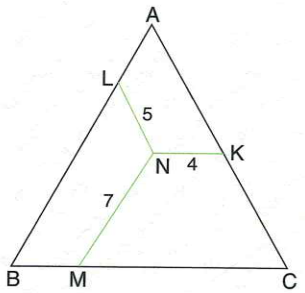
Özellik 3 / Property 3

$|AB| = |AC| = |BC| = a$
$[PE] // [BC]$
$[PD] // [AB]$
$[PF] // [AC]$
$\Rightarrow |PE| + |PD| + |PF| = a$



Örnek / Example 32

|AB| = |AC| = |BC|,
[NK] // [BC],
[MN] // [AB],
[LN] // [AC],
|NK| = 4 cm,
|NM| = 7 cm,
|LN| = 5 cm



⇒ **Çevre / The perimeter (ABC) = ? cm**

A) 16 B) 24 C) 27 D) 36 E) 48

Çözüm / Solution

Yanıt / Answer **E**

[Özellik 3 / Property 3]

|LN| + |NK| + |NM| = |AB| = |AC| = |BC|

5 + 4 + 7 = |AB| = |AC| = |BC|

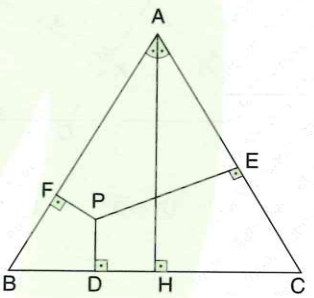
16 = |AB| = |AC| = |BC|

⇒ Çevre / The perimeter (ABC) = 16·3 = 48 cm

Özellik 4 / Property 4

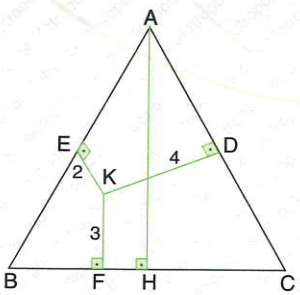
|AB| = |AC| = |BC| = a
[AH] ⊥ [BC]
[PD] ⊥ [BC]
[PE] ⊥ [AC]
[PF] ⊥ [AB]

$\Rightarrow |PD| + |PE| + |PF| = |AH| = h = \frac{a\sqrt{3}}{2}$



Örnek / Example 33

|AB| = |AC| = |BC|,
[KE] ⊥ [AB],
[KF] ⊥ [BC],
[KD] ⊥ [AC],
|KE| = 2 cm,
|KF| = 3 cm,
|KD| = 4 cm
⇒ **|AH| = ? cm**



A) 9 B) 8 C) 7 D) $4\sqrt{3}$ E) 6

Çözüm / Solution

Yanıt / Answer **A**

[Özellik 4 / Property 4]

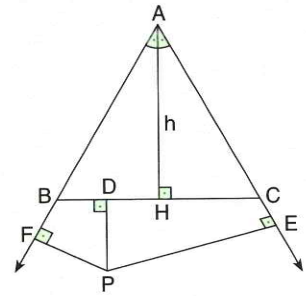
|KE| + |KF| + |KD| = |AH| = h

2 + 3 + 4 = |AH| = h

9 = |AH| = h

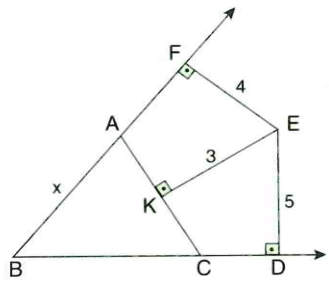
Özellik 5 / Property 5

$$\left.\begin{array}{l}|AB| = |AC| = |BC| \\ [PF] \perp [AB \\ [PD] \perp [BC] \\ [PE] \perp [AC \\ [AH] \perp [BC]\end{array}\right\} \Rightarrow |PF| + |PE| - |PD| = h = \frac{a\sqrt{3}}{2}$$



Örnek / Example 34

$|AB| = |AC| = |BC|$,
$[EF] \perp [BF$,
$[ED] \perp [BD$,
$[EK] \perp [AC]$,
$|EF| = 4$ cm,
$|EK| = 3$ cm,
$|ED| = 5$ cm
$\Rightarrow |AB| = x = ?$ cm



A) $2\sqrt{2}$ B) 3 C) 4 D) $4\sqrt{3}$ E) 6

Çözüm / Solution

Yanıt / Answer **D**

[Özellik 5 / Property 5]

$$|EF| + |ED| - |EK| = h = \frac{a\sqrt{3}}{2}$$

$$4 + 5 - 3 = h = \frac{a\sqrt{3}}{2}$$

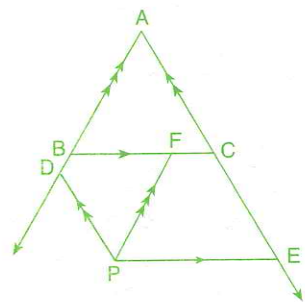
$$6 = h = \frac{a\sqrt{3}}{2}$$

$$12 = a\sqrt{3}$$

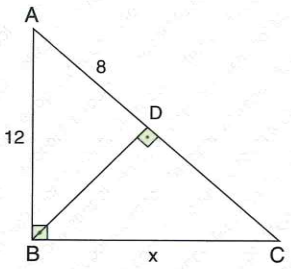
$$4\sqrt{3} = a = x$$

Özellik 6 / Property 6

$$\left.\begin{array}{l}|AB| = |AC| = |BC| = a \\ [PE] // [BC] \\ [PF] // [AD \\ [PD] // [AC\end{array}\right\} \Rightarrow |PD| + |PE| - |PF| = a$$

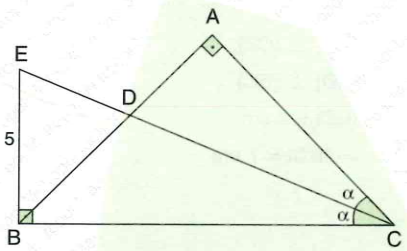


1. $m(\widehat{ABC}) = 90°$,
$[BD] \perp [AC]$,
$|AB| = 12$ cm,
$|AD| = 8$ cm
$\Rightarrow$ **x = ? cm**



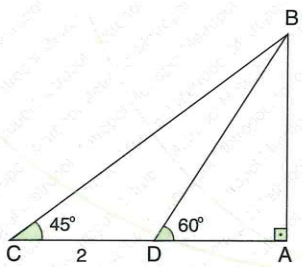
A) $6\sqrt{2}$ B) $4\sqrt{3}$ C) $6\sqrt{3}$
D) $4\sqrt{5}$ E) $6\sqrt{5}$

2. [CD] açıortaydır.
[CD] is a bisector.
$m(\widehat{A}) = 90°$,
$[EB] \perp [BC]$,
$|EB| = 5$ cm
$\Rightarrow$ **|DB| = ? cm**



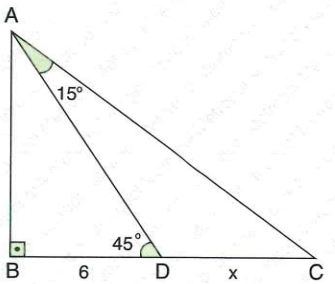
A) 3 B) 4 C) 4,5
D) 5 E) 6

3. $m(\widehat{BCA}) = 45°$,
$m(\widehat{BDA}) = 60°$,
$|CD| = 2$ cm,
$m(\widehat{A}) = 90°$
$\Rightarrow$ **|AB| = ? cm**



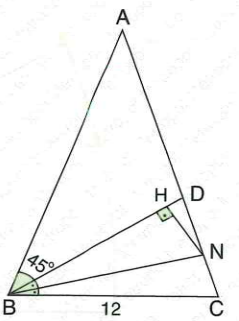
A) $\frac{\sqrt{3}}{2}$ B) $\sqrt{3}+1$ C) 2
D) $\sqrt{3}+3$ E) 6

4. $m(\widehat{DAC}) = 15°$,
$m(\widehat{BDA}) = 45°$,
$|BD| = 6$ cm,
$m(\widehat{B}) = 90°$
$\Rightarrow$ **|DC| = x = ? cm**



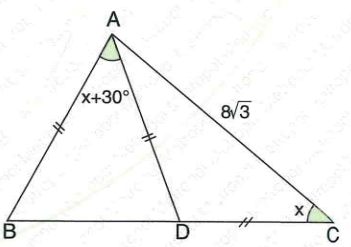
A) 3 B) $6(\sqrt{3}-1)$ C) $3(\sqrt{3}-1)$
D) $3\sqrt{2}$ E) $2\sqrt{6}$

5. $|AB| = |AC|$,
$|BD| = |BC| = 12$ cm,
$m(\widehat{DBN}) = m(\widehat{NBC})$,
$[NH] \perp [BD]$,
$m(\widehat{ABD}) = 45°$
$\Rightarrow$ **|HD| · |HB| = ?**



A) 9 B) $9\sqrt{3}$ C) 16
D) $16\sqrt{2}$ E) 24

6.

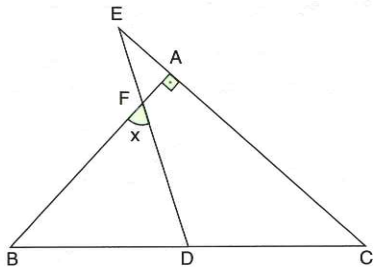


$|AB| = |AD| = |DC|$, $m(\widehat{BAD}) = x + 30°$, $m(\widehat{ACB}) = x$,
$|AC| = 8\sqrt{3}$ cm $\Rightarrow$ **|BC| = ? cm**

A) 12 B) 16 C) $16\sqrt{3}$
D) 24 E) 132

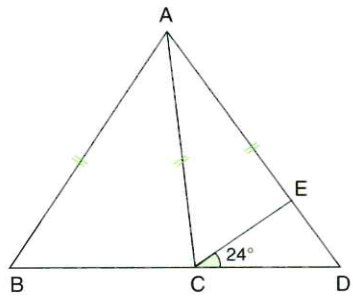
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $[BA] \perp [EC]$,
$|BD| = |DC|$,
$|DE| = |BA|$
$\Rightarrow$ **$m(\widehat{BFD}) = x = ?$**



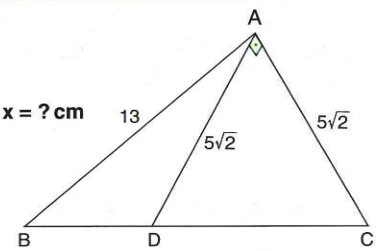
A) 30° B) 45° C) 60°
D) 75° E) 78°

8. $|AB| = |AC| = |AE|$,
$m(\widehat{ECD}) = 24°$
$\Rightarrow$ **$m(\widehat{BAD}) = ?$**



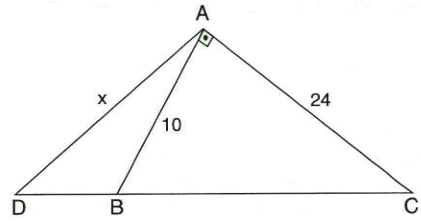
A) 36° B) 48° C) 64°
D) 72° E) 84°

9. $m(\widehat{DAC}) = 90°$,
$|AD| = |AC| = 5\sqrt{2}$ cm,
$|AB| = 13$ cm $\Rightarrow$ **$|BD| = x = ?$ cm**



A) 4 B) 5 C) 7
D) $4\sqrt{2}$ E) $5\sqrt{2}$

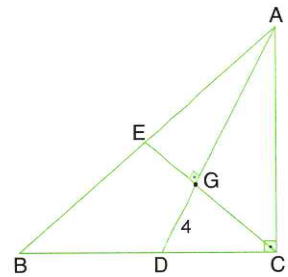
10.



$m(\widehat{BAC}) = 90°$, $m(\widehat{ADC}) = 2 \cdot m(\widehat{ACB})$,
$|AC| = 24$ cm, $|AB| = 10$ cm $\Rightarrow$ **$|AD| = x = ?$ cm**

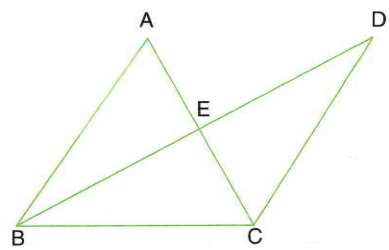
A) 11 B) 12 C) 13
D) 14 E) 15

11. G, ağırlık merkezidir.
G is center of the gravity.
$[AC] \perp [CB]$,
$[AD] \perp [EC]$
$|GD| = 4$ cm
$\Rightarrow$ **$|BC| = ?$ cm**



A) $2\sqrt{3}$ B) $4\sqrt{3}$ C) $8\sqrt{3}$
D) $10\sqrt{3}$ E) $12\sqrt{3}$

12.



$|AB| = |AC| = |BC|$, $[AB] \,//\, [CD]$, $|BC| = |CD|$,
Çevre / The perimeter $(\widehat{DEC}) = 18 + 6\sqrt{3}$ cm
$\Rightarrow$ **Çevre / The perimeter $(\widehat{ABC}) = ?$ cm**

A) $12 \cdot (2 + \sqrt{3})$ B) 24 C) $9 \cdot (2 + \sqrt{3})$
D) 36 E) 48

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
E	D	D	B	A	B	C	B	C	C	C	D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $|AB|^2 = |AD|\cdot|AC|$

$144 = 8\cdot(8 + |DC|) \Rightarrow |DC| = 10$ cm

$|BC|^2 = |CD|\cdot|AC|$

$x^2 = 10\cdot 18 = 180 \Rightarrow x = \sqrt{180} = 6\sqrt{5}$ cm

Yanıt / The Answer is E

2. $m(\widehat{ACD}) = m(\widehat{ECB}) = \alpha$,

$m(\widehat{ADC}) = m(\widehat{EDB}) = 90° - \alpha$,

$m(\widehat{DEB}) = 90° - \alpha$,

$m(\widehat{BEC}) = m(\widehat{EDB})$,

$\Rightarrow |EB| = |DB| = 5$ cm

Yanıt / The Answer is D

3. $m(\widehat{B}) = m(\widehat{C}) = 45°$

$\Rightarrow |AB| = |AC|$

$|AD| = x \Rightarrow |AB| = x + 2$

$m(\widehat{DBA}) = 30°$ ve (and)

$m(\widehat{ADB}) = 60°$

$\Rightarrow x\sqrt{3} = x + 2$

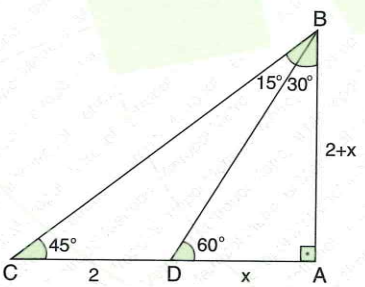
$(x\sqrt{3} - x) = 2$

$x(\sqrt{3} - 1) = 2$

$x = \dfrac{2}{\sqrt{3}-1}$

$x = \dfrac{2\sqrt{3}+2}{2} \Rightarrow x = \sqrt{3} + 1$ cm

$|AB| = x + 2 = \sqrt{3} + 3$ cm



Yanıt / The Answer is D

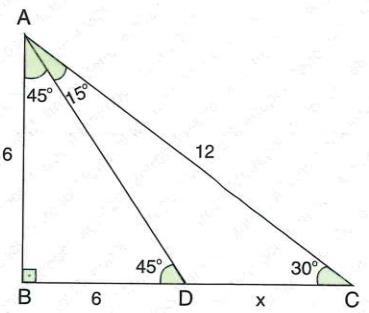
4. $m(\widehat{BAD}) = m(\widehat{ADB})$

$\Rightarrow |AB| = |BD| = 6$

$|AC| = 2\cdot 6 = 12$

$|BC| = 6\sqrt{3} = 6 + x$

$x = 6(\sqrt{3} - 1)$ cm



Yanıt / The Answer is B

5. $m(\widehat{BAC}) = x \Rightarrow m(\widehat{DBC}) = x + 45°$

$3x + 90° = 180°$

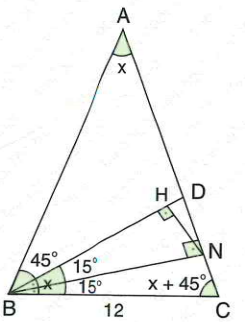
$3x = 90°$

$x = 30°$

$m(\widehat{DBN}) = 15°$

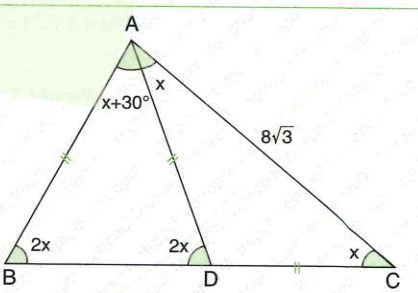
$|NH| = \dfrac{|BD|}{4} = \dfrac{12}{4} = 3$ cm

$|HD|\cdot|HB| = |NH|^2 = 9$



Yanıt / The Answer is A

6.



$m(\widehat{ACD}) = m(\widehat{DAC}) = x$,

$m(\widehat{ADB}) = m(\widehat{ABC}) = 2x$

$5x + 30° = 180°$

$5x = 150° \Rightarrow x = 30°$

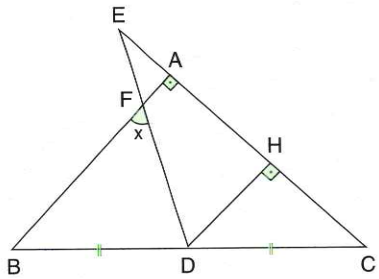
$m(\widehat{BAC}) = 2x + 30° = 90°$

$m(\widehat{ACB}) = 30°$, $m(\widehat{ABC}) = 60° \Rightarrow |BC| = 16$ cm

Yanıt / The Answer is B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



$[DH] \perp [AC] \Rightarrow [DH] // [AB]$,

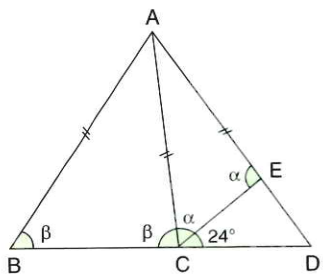
$|DH| = \frac{|AB|}{2} = \frac{|DE|}{2}$

$m(\widehat{DEC}) = 30°$

$m(\widehat{EFA}) = m(\widehat{BFD}) = x = 60°$

Yanıt / The Answer is C

8.



$|AC| = |AE| \Rightarrow m(\widehat{ACE}) = m(\widehat{AEC}) = \alpha$

$|AB| = |AC| \Rightarrow m(\widehat{ABC}) = m(\widehat{ACB}) = \beta$

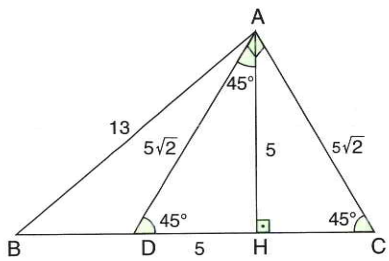
$\alpha + \beta + 24° = 180° \Rightarrow \alpha + \beta = 156°$

$m(\widehat{BAD}) = m(\widehat{BAC}) + m(\widehat{CAD})$

$= 180° - 2\beta + 180° - 2\alpha = 360° - 2 \cdot (\alpha + \beta) = 48°$

Yanıt / The Answer is B

9.



$m(\widehat{ADC}) = m(\widehat{ACD}) = 45°$

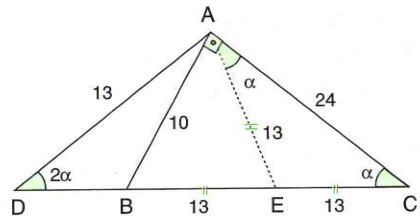
$|AD| = \sqrt{2} \cdot |AH| \Rightarrow |AH| = 5$ cm

$13^2 = 5^2 + |BH|^2 \Rightarrow |BH| = 12$ cm

$|BD| = |BH| - |DH| = 12 - 5 = 7$ cm

Yanıt / The Answer is C

10.



$|BC|^2 = 10^2 + 24^2 = 676 \Rightarrow |BC| = 26$ cm,

$|BE| = |EC| \Rightarrow m(\widehat{EAC}) = m(\widehat{ECA})$

$m(\widehat{AED}) = 2\alpha \Rightarrow |AD| = |AE| = x = 13$ cm

Yanıt / The Answer is C

11. $[CD]//[AB]$,

$\Rightarrow m(\widehat{BAC}) = m(\widehat{ACD}) = 60°$,

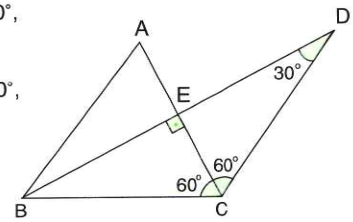
$|BC| = |CD|$,

$\Rightarrow m(\widehat{DBC}) = m(\widehat{BDC}) = 30°$,

$m(\widehat{DEC}) = 90°$,

$|BC| = |CD| = a$,

$|CE| = \frac{a}{2}$, $|DE| = \frac{a\sqrt{3}}{2}$,



Çevre / The perimeter $(\widehat{DEC}) = a + \frac{a}{2} + \frac{a\sqrt{3}}{2} = 18 + 6\sqrt{3}$

$\frac{3a + a\sqrt{3}}{2} = 6(3 + \sqrt{3}) \Rightarrow a(3 + \sqrt{3}) = 12(3 + \sqrt{3})$

$a = 12$ cm $\Rightarrow$ Çevre / The perimeter $(\widehat{ABC}) = 36$ cm

Yanıt / The Answer is D

12. $2 \cdot |DG| = |AG| \Rightarrow |AG| = 8$

$|CG|^2 = |DG| \cdot |AG|$

$|CG| = 4\sqrt{2}$ cm

$|DC|^2 = |DG|^2 + |GC|^2$

$|DC|^2 = 4^2 + (4\sqrt{2})^2$

$|DC| = 4\sqrt{3}$ cm

$|BC| = 2 \cdot |DC|$

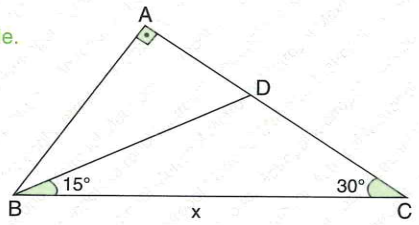
$|BC| = 8\sqrt{3}$ cm

Yanıt / The Answer is C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. BAC bir dik üçgendir.
BAC is a right triangle.

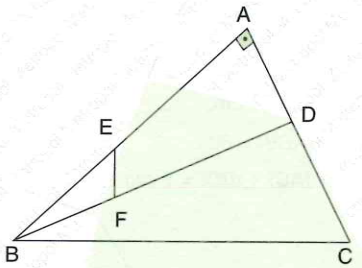
$m(\widehat{DBC}) = 15°$,
$m(\widehat{ACB}) = 30°$,
$|DC| = 4(\sqrt{3}-1)$ cm,
$\Rightarrow |BC| = x = ?$



A) 10 B) 8 C) 6 D) 4 E) 2

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2018]

2. $[AB] \perp [AC]$
$|AD| = |DC|$
$|BE| = |EA|$
$\frac{|DF|}{|BD|} = \frac{2}{3}$
$|BC| = 36$
$\Rightarrow |EF| = ?$

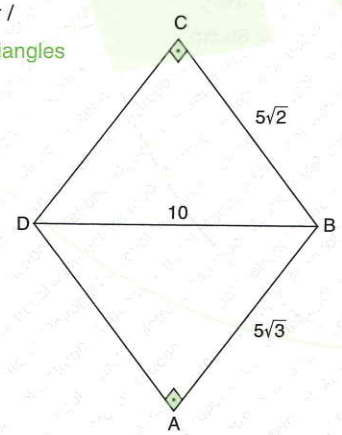


A) 4 B) $4\sqrt{2}$ C) 6 D) $\frac{13}{2}$ E) $5\sqrt{2}$

[İSTANBUL ÜNİVERSİTESİ – YÖS 2017]

3. ABD ve BCD dik üçgenler /
ABD and BCD are right triangles

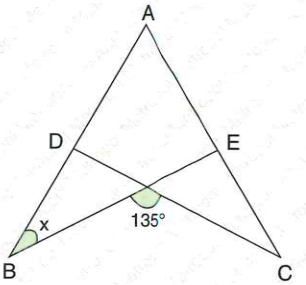
$|AB| = 5\sqrt{3}$ cm
$|BC| = 5\sqrt{2}$ cm
$|DB| = 10$ cm
$\Rightarrow m(\widehat{ADC}) = ?$



A) 105° B) 110° C) 120° D) 125° E) 150°

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2017]

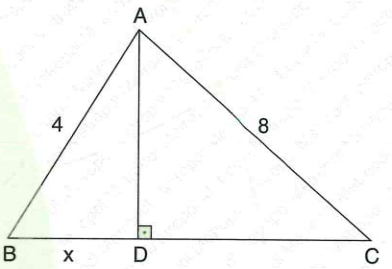
4. $m(\widehat{BFC}) = 135°$
$|AB| = |BE|$
$|AC| = |CD|$
$\Rightarrow x = m(\widehat{ABE}) = ?$



A) 28° B) 30° C) 32° D) 42° E) 48°

[İSTANBUL ÜNİVERSİTESİ – YÖS 2016]

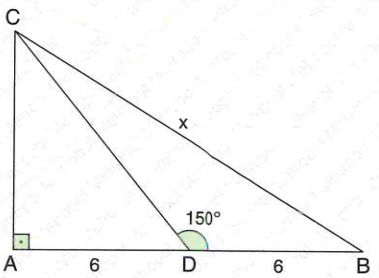
5. $m(\widehat{ADC}) = 90°$
$|AC| = 8$,
$|AB| = 4$,
$|BC| = 10$
$|BD| = x = ?$



A) $\frac{5}{4}$ B) $\frac{11}{7}$ C) 2 D) $\frac{13}{5}$ E) 7

[İSTANBUL ÜNİVERSİTESİ – YÖS 2014]

6. $|AD| = |DB| = 6$ cm,
$m(\widehat{A}) = 90°$,
$m(\widehat{CDB}) = 150°$,
$|BC| = x = ?$ cm



A) $2\sqrt{3}$ B) $4\sqrt{3}$ C) $2\sqrt{13}$ D) $2\sqrt{39}$ E) $12\sqrt{3}$

[İSTANBUL ÜNİVERSİTESİ – YÖS 2014]

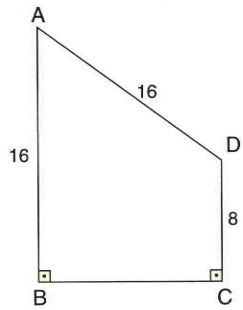
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $|DC| \perp |BC|$

$|AB| = |AD| = 16$ cm

$|DC| = 8$ cm

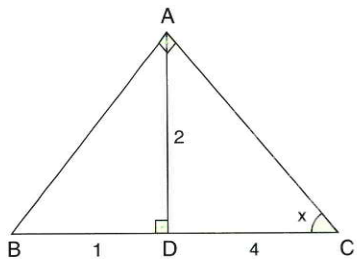
$\Rightarrow$ **m(BÂD) = ?**



A) 30° B) 40° C) 50° D) 60° E) 70°

[İSTANBUL ÜNİVERSİTESİ – YÖS 2013]

8.



$[AD] \perp [BC]$, $[AB] \perp [AC]$, $|AD| = 2$ cm, $|BD| = 1$ cm

$m(\widehat{ACB}) = x \Rightarrow$ **tan x = ?**

A) $\frac{1}{2}$ B) 2 C) $\frac{\sqrt{5}}{2}$ D) $\frac{\sqrt{5}}{5}$ E) $\sqrt{3}$

[KARADENİZ TEKNİK ÜNİVERSİTESİ – YÖS 2013]

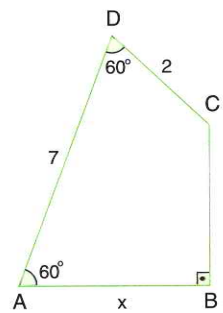
9. $CB \perp AB$,

$m(\widehat{ADC}) = m(\widehat{DAB}) = 60°$,

$|DC| = 2$ cm,

$|AD| = 7$ cm,

$|AB| = x$ = ? cm



A) $\frac{7}{2}$ B) 4 C) $\frac{9}{2}$ D) 5 E) $\frac{11}{2}$

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2013]

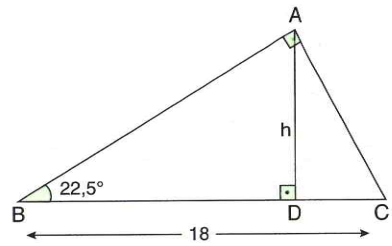
10. $m(\widehat{BAC}) = 90°$,

$m(\widehat{ABC}) = 22{,}5°$,

$|BC| = 18$ cm,

$|AD| = h$ cm

$\Rightarrow$ **h = ? cm**



A) $9\sqrt{2}$ B) $\frac{9\sqrt{2}}{2}$ C) $\frac{9\sqrt{2}}{4}$ D) $\frac{81}{4}$ E) $\frac{9}{4}$

[YÖS 2000]

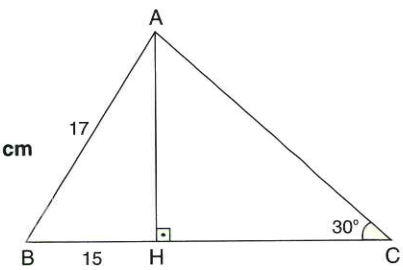
11. $[AH] \perp [BC]$,

$|AB| = 17$ cm,

$|BH| = 15$ cm,

$m(\widehat{ACB}) = 30°$,

$\Rightarrow$ **$|AC| + |BC|$ = ? cm**



A) $29 + 6\sqrt{3}$ B) $31 + 8\sqrt{3}$ C) $33 + 8\sqrt{3}$

D) 29 E) 33

[YÖS 1999]

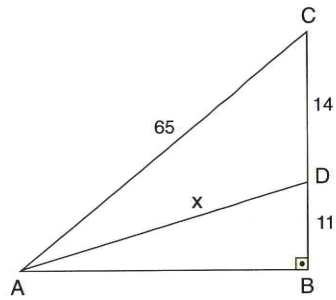
12. $[AB] \perp [BC]$,

$|AC| = 65$ cm,

$|CD| = 14$ cm,

$|BD| = 11$ cm.

$\Rightarrow$ **$|AD| = x$ = ? cm**



A) 57 B) 58 C) 59

D) 60 E) 61

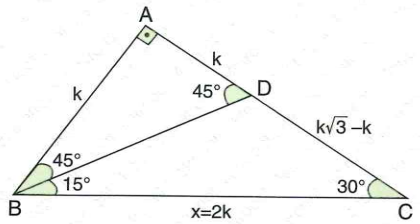
[YÖS 1998]

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
B	C	A	B	D	D	D	A	C	B	B	E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



$m(\widehat{ADB}) = m(\widehat{DBC}) + m(\widehat{DCB})$

$m(\widehat{ADB}) = 15° + 30°$

$m(\widehat{ADB}) = 45°$

$m(\widehat{BAD}) = 90° \Rightarrow m(\widehat{ABD}) = 45°$

$|AD| = k = |AB| \Rightarrow |AC| = k\sqrt{3}$

$\Rightarrow |DC| = k\sqrt{3} - k = 4(\sqrt{3}-1)$

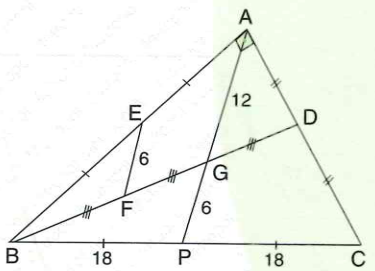
$k(\sqrt{3}-1) = 4(\sqrt{3}-1)$

$k = 4$

$\Rightarrow |BC| = x = 2 \cdot k = 8\,cm$

Yanıt / The Answer is B

2.



$[AP] : \vartheta_a$

G ağırlık merkezi / the center of gravity,

$\Rightarrow |BP| = |PC| = 18\,cm$

$\Rightarrow |BP| = |PC| = |AP| = 18\,cm$

[Muhteşem Üçlü / The Perfect Triple]

$[EF] // [AP] \Rightarrow \frac{|AG|}{2} = |EF|$

$\Rightarrow \frac{12}{2} = |EF|$

$\Rightarrow 6 = |EF|$

Yanıt / The Answer is C

3. $|DB|^2 = |BC|^2 + |DC|^2$

$10^2 = (5\sqrt{2})^2 + |DC|^2$

$100 = 50 + |DC|^2$

$50 = |DC|^2$

$5\sqrt{2} = |DC|$

$|DC| = |BC| = 5\sqrt{2} \Leftrightarrow m(\widehat{CDB}) = m(\widehat{CBD}) = 45°\ldots(1)$

$|DB|^2 = |AB|^2 + |AD|^2$

$10^2 = (5\sqrt{3})^2 + |AD|^2$

$100 = 75 + |AD|^2$

$25 = |AD|^2$

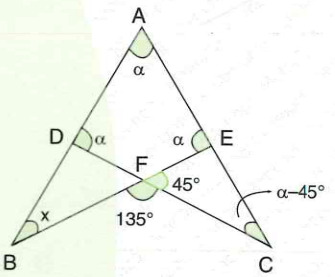
$5 = |AD| \Rightarrow m(\widehat{ABD}) = 30°, m(\widehat{ADB}) = 60°\ldots(2)$

(1) & (2) : $m(\widehat{ADC}) = m(\widehat{ADB}) + m(\widehat{CDB})$

$= 60° + 45° = 105°$

Yanıt / The Answer is A

4.



$m(\widehat{DAC}) + m(\widehat{ACD}) + m(\widehat{ADC}) = 180°$

$\alpha + \alpha - 45° + \alpha = 180°$

$3\alpha = 180° + 45°$

$3\alpha = 225°$

$\alpha = 75°$

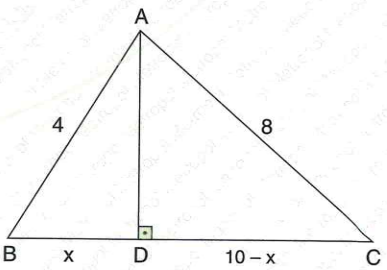
$x + 2\alpha = 180°$

$\Rightarrow x + 75° \cdot 2 = 180°$

$\Rightarrow x = 180° - 150° = 30°$

Yanıt / The Answer is B

5.



$16 - x^2 = 64 - (10-x)^2$

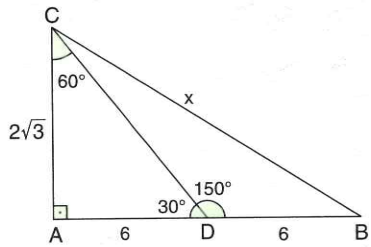
$16 - x^2 = 64 - 100 + 20x - x^2$

$52 = 20x \Rightarrow x = \frac{13}{5}$

Yanıt / The Answer is D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

6.



$m(\widehat{CDB}) = 150° \Rightarrow m(\widehat{ADC}) = 30°$

$\Rightarrow |AD| = 6\,cm, |CA| = 2\sqrt{3}$

$\Rightarrow m(\widehat{CAB}) = 90°, |CB|^2 = |CA|^2 + |AB|^2$

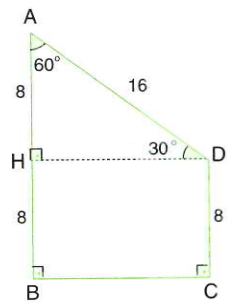
$\Rightarrow x^2 = (2\sqrt{3})^2 + (12)^2$

$x^2 = 12 + 144$

$\Rightarrow x = 2\sqrt{39}$ cm

Yanıt / The Answer is D

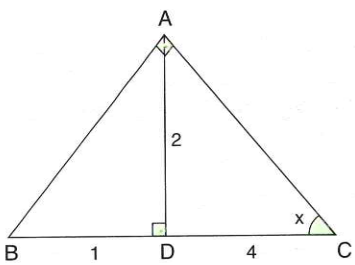
7.



$\Rightarrow m(\widehat{BAD}) = 60°$

Yanıt / The Answer is D

8.



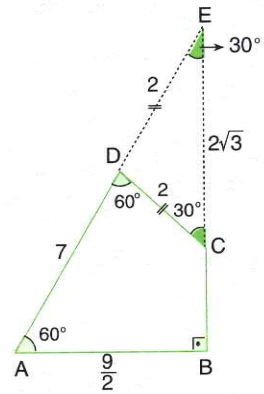
$2^2 = 1 \cdot |DC|$

$|DC| = 4\,cm$

$\tan x = \frac{|AD|}{|DC|} = \frac{2}{4} = \frac{1}{2}$

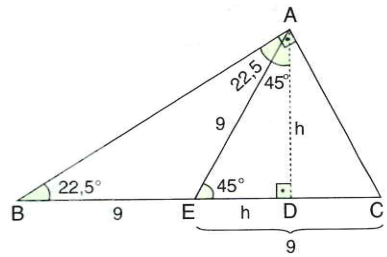
Yanıt / The Answer is A

9.



Yanıt / The Answer is C

10.

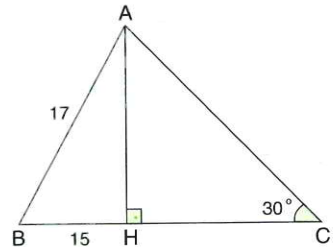


$h^2 + h^2 = 9^2$

$2h^2 = 81 \Rightarrow h = \frac{9\sqrt{2}}{2}$ cm

Yanıt / The Answer is B

11.



$|AH|^2 = 289 - 225 = 64$

$|AH| = 8\,cm$

$|AC| = 2 \cdot |AH| = 16\,cm$

$|HC| = 16 \cdot \frac{\sqrt{3}}{2} = 8\sqrt{3}$ cm

$|AC| + |BC| = 15 + 8\sqrt{3} + 16$

$= 31 + 8\sqrt{3}$ cm

Yanıt / The Answer is B

12. $|BC| = 14 + 11 = 25$

$|AB|^2 = 65^2 - 25^2 = 3600$

$|AB| = 60$ cm

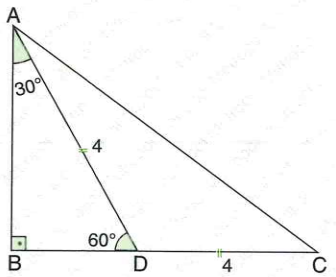
$|AD|^2 = 60^2 + 11^2 = 3721$

$|AD| = 61$ cm

Yanıt / The Answer is E

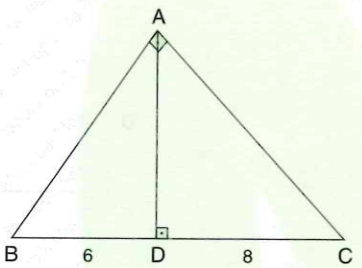
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $[AB] \perp [BC]$,
$m(\widehat{BAD}) = 30°$,
$m(\widehat{ADB}) = 60°$,
$|AD| = |DC| = 4$ cm
$\Rightarrow$ **$|AC| = ?$ cm**



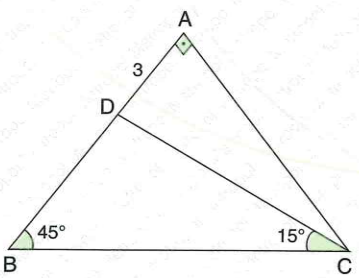
Yanıt / The Answer is $4\sqrt{3}$

2. $[BA] \perp [AC]$,
$[AD] \perp [BC]$,
$|BD| = 6$ cm,
$|DC| = 8$ cm
$\Rightarrow \frac{|AB|}{|AC|} = ?$



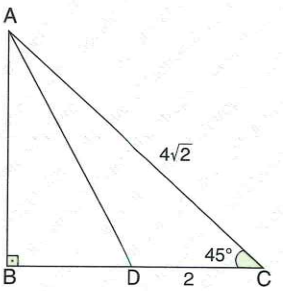
Yanıt / The Answer is $\frac{\sqrt{3}}{2}$

3. $[AB] \perp [AC]$,
$m(\widehat{DCB}) = 15°$,
$m(\widehat{ABC}) = 45°$,
$|AD| = 3$ cm
$\Rightarrow$ **$|AB| = ?$ cm**



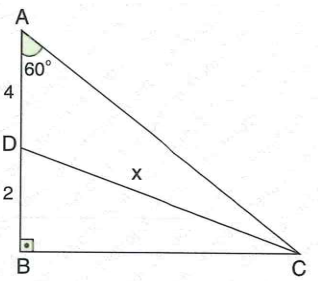
Yanıt / The Answer is $3\sqrt{3}$

4. $[AB] \perp [BC]$,
$m(\widehat{C}) = 45°$,
$|AC| = 4\sqrt{2}$ cm,
$|DC| = 2$ cm
$\Rightarrow$ **$|AD| = ?$ cm**



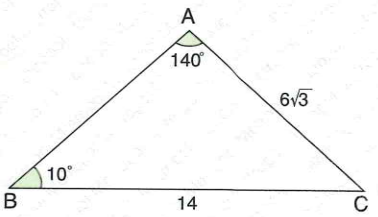
Yanıt / The Answer is $2\sqrt{5}$

5. $[AB] \perp [BC]$,
$m(\widehat{BAC}) = 60°$,
$|AD| = 4$ cm,
$|DB| = 2$ cm
$\Rightarrow$ **$|DC| = x = ?$ cm**



Yanıt / The Answer is $4\sqrt{7}$

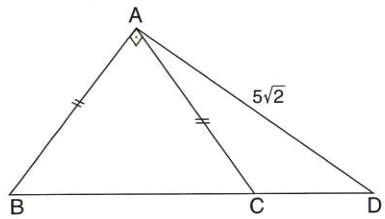
6. $m(\widehat{BAC}) = 140°$,
$m(\widehat{ABC}) = 10°$,
$|AC| = 6\sqrt{3}$ cm,
$|BC| = 14$ cm
$\Rightarrow$ **$|AB| = ?$ cm**



Yanıt / The Answer is $2\sqrt{13}$

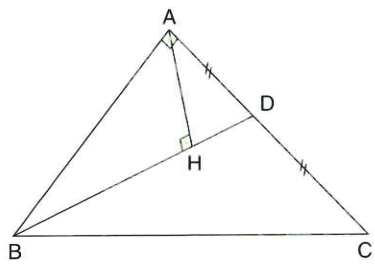
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $[BA] \perp [AC]$,
$|AB| = |AC|$,
$|BC| = 2 \cdot |CD|$,
$|AD| = 5\sqrt{2}$ cm
$\Rightarrow$ **$|AB|$ = ? cm**



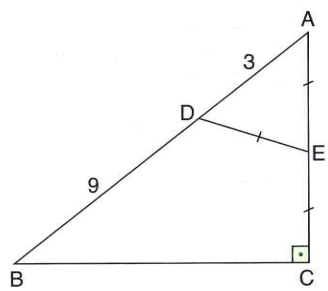
Yanıt / The Answer is $2\sqrt{5}$

8. $[BA] \perp [AC]$,
$[AH] \perp [BD]$,
$|AD| = |DC|$,
$|AH| = 2$ cm,
$|BH| = 4$ cm
$\Rightarrow$ **$|BC|$ = ? cm**



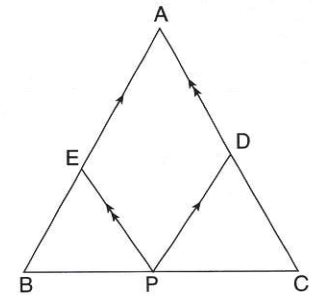
Yanıt / The Answer is $2\sqrt{10}$

9. $m(\widehat{ACB}) = 90°$,
$|AE| = |EC| = |ED|$,
$|AD| = 3$ cm,
$|BD| = 9$ cm
$\Rightarrow$ **$|BC|$ = ? cm**



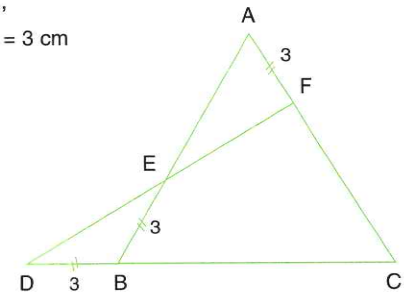
Yanıt / The Answer is $6\sqrt{3}$

10. $|AB| = |AC|$,
$[PE] // [AC]$,
$[PD] // [AB]$,
$|PE| + |PD| = 4 + 4\sqrt{3}$ cm
$\Rightarrow$ **$|AB|$ = ? cm**



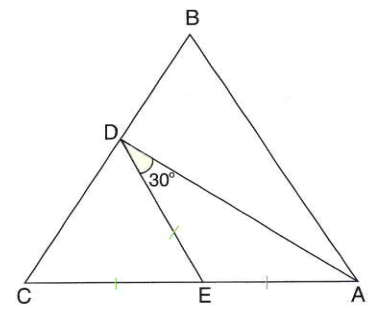
Yanıt / The Answer is $4 + 4\sqrt{3}$

11. $|AB| = |AC| = |BC|$,
$|AF| = |BD| = |BE| = 3$ cm
$\Rightarrow$ **$|EF|$ = ? cm**



Yanıt / The Answer is $3\sqrt{3}$

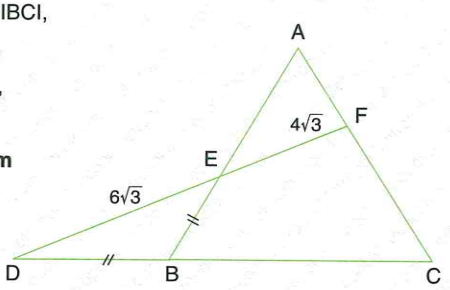
12. $|BC| = |AB|$,
$|AE| = |ED| = |EC|$,
$m(\widehat{EDA}) = 30°$,
$|DE| = 4$ cm
$\Rightarrow$ **$|BA|$ = ? cm**



Yanıt / The Answer is 8

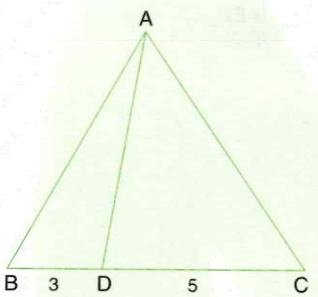
METROPOL YAYINLARI • METROPOL PUBLICATIONS

13. $|AB| = |AC| = |BC|$,
$|DB| = |BE|$,
$|DE| = 6\sqrt{3}$ cm,
$|EF| = 4\sqrt{3}$ cm
$\Rightarrow$ **$|BC| = ?$ cm**



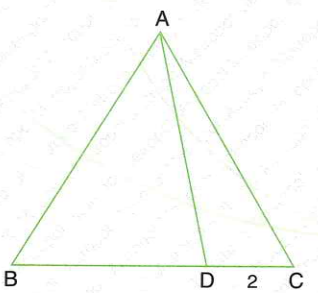
Yanıt / The Answer is 14

14. $|AB| = |AC| = |BC|$,
$|BD| = 3$ cm,
$|DC| = 5$ cm
$\Rightarrow$ **$|AD| = ?$ cm**



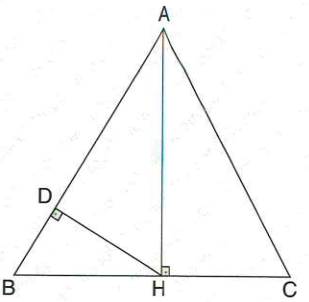
Yanıt / The Answer is 7

15. $|AB| = |AC| = |BC|$,
$A(\widehat{ABC}) = 9\sqrt{3}$ cm^2,
$|DC| = 2$ cm
$\Rightarrow$ **$|BD| = ?$ cm**



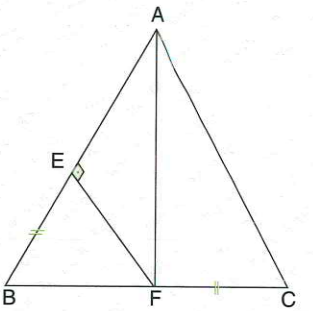
Yanıt / The Answer is 4

16. $|AB| = |AC| = |BC|$,
$[AH] \perp [BC]$,
$[HD] \perp [AB]$,
$|AC| = 12$ cm
$\Rightarrow$ **$|HD| = ?$ cm**



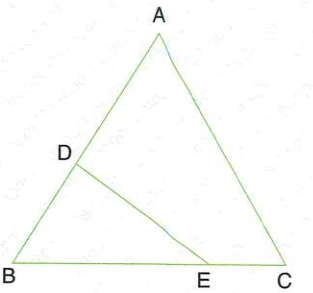
Yanıt / The Answer is $3\sqrt{3}$

17. $|AB| = |AC| = |BC|$,
$|FC| = |EB|$,
$[FE] \perp [AB]$
$\Rightarrow$ **$\frac{|AF|}{|BC|} = ?$**



Yanıt / The Answer is $\frac{\sqrt{7}}{3}$

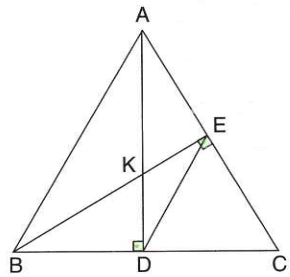
18. $|AB| = |AC| = |BC| = 9$ cm,
$|AD| = 2 \cdot |BD|$,
$[AB] \perp [DE]$
$\Rightarrow$ **$|DE| = ?$ cm**



Yanıt / The Answer is $3\sqrt{3}$

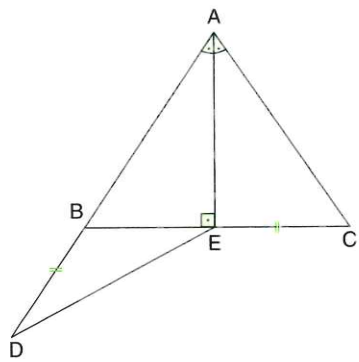
METROPOL YAYINLARI • METROPOL PUBLICATIONS

19. $[AD] \perp [BC]$,
$[BE] \perp [AC]$,
$|AB| = |AC|$,
$|ED| = 7$ cm
$\Rightarrow$ **$|BC| = ?$ cm**



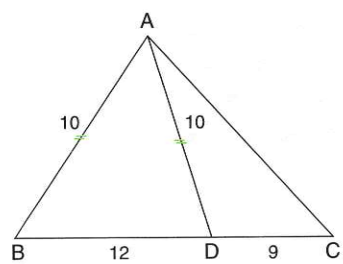
Yanıt / The Answer is 14

20. $|AB| = |AC| = |BC|$,
$m(\widehat{BAE}) = m(\widehat{EAC})$
$|BD| = |EC|$,
$|AC| = 10$ cm
$\Rightarrow$ **$|DE| = ?$ cm**



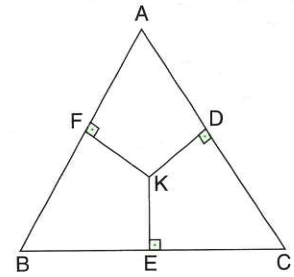
Yanıt / The Answer is $5\sqrt{3}$

21. $|AB| = |AD| = 10$ cm,
$|BD| = 12$ cm,
$|DC| = 9$ cm
$\Rightarrow$ **$|AC| = ?$ cm**



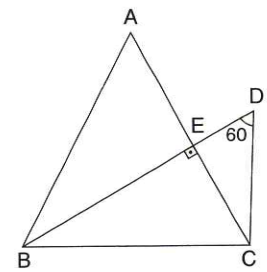
Yanıt / The Answer is 17

22. $|AB| = |BC| = |AC|$,
$[KF] \perp [AB]$,
$[KD] \perp [AC]$,
$[KE] \perp [BC]$,
$|AB| = 12\sqrt{3}$ cm,
$2 \cdot |KF| = 3 \cdot |KD| = 6 \cdot |KE|$
$\Rightarrow$ **$|KF| - |KD| = ?$ cm**



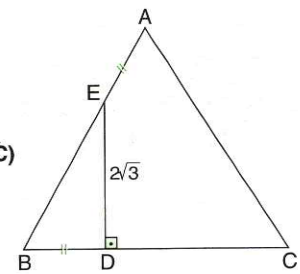
Yanıt / The Answer is 3

23. $[CE] \perp [BD]$,
$|AB| = |AC| = |BC|$,
$m(\widehat{EDC}) = 60°$
$\Rightarrow \dfrac{|AE|}{|DC|} = ?$



Yanıt / The Answer is $\frac{\sqrt{3}}{2}$

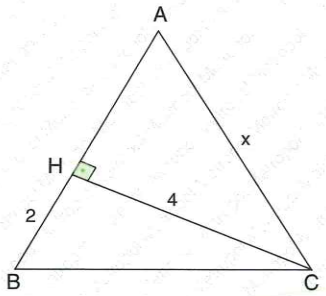
24. $|AB| = |AC| = |BC|$,
$|AE| = |BD|$,
$|ED| = 2\sqrt{3}$ cm,
$[ED] \perp [BD]$
$\Rightarrow$ **Çevre / The perimeter $(\widehat{ABC})$ $= ?$ cm**



Yanıt / The Answer is 18

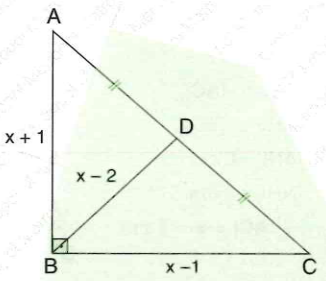
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $[CH] \perp [AB]$,
$|ABI = |ACI$,
$|HC| = 4$ cm,
$|HB| = 2$ cm
$\Rightarrow$ **$|AC| = x = ?$ cm**



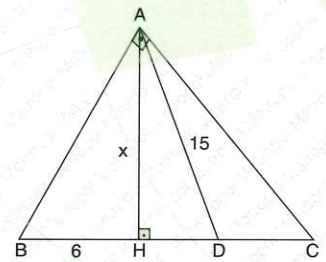
A) 2 B) 3 C) 4
D) 5 E) 6

2. $[AB] \perp [BC]$,
$|ADI = |DCI$,
$|AB| = (x + 1)$ cm,
$|BD| = (x - 2)$ cm,
$|BC| = (x - 1)$ cm
$\Rightarrow$ **$x = ?$ cm**



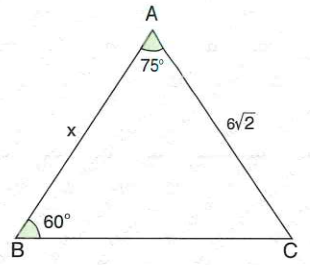
A) 7 B) 8 C) 9
D) 10 E) 11

3. [AD], kenarortaydır.
[AD] is a median.
$[AB] \perp [AC]$,
$[AH] \perp [BC]$,
$|BH| = 6$ cm,
$|AD| = 15$ cm
$\Rightarrow$ **$|AH| = x = ?$ cm**



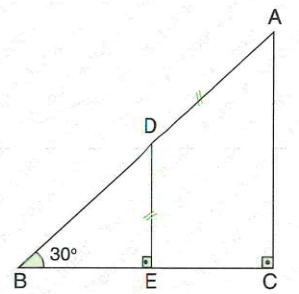
A) 8 B) 9 C) 10
D) 11 E) 12

4. $m(\widehat{BAC}) = 75°$,
$m(\widehat{ABC}) = 60°$,
$|AC| = 6\sqrt{2}$ cm
$\Rightarrow$ **$|AB| = x = ?$ cm**



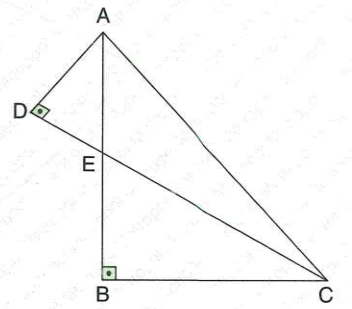
A) $\sqrt{3}$ B) $2\sqrt{3}$ C) $3\sqrt{3}$
D) $4\sqrt{3}$ E) $5\sqrt{3}$

5. $[AC] \perp [BC]$,
$[DE] \perp [BC]$,
$m(\widehat{EBD}) = 30°$,
$|ED| = |DA|$,
$|EC| = 10$ cm
$\Rightarrow$ **$|AB| = ?$ cm**



A) $2\sqrt{3}$ B) $5\sqrt{3}$ C) $10\sqrt{3}$
D) $15\sqrt{3}$ E) $20\sqrt{3}$

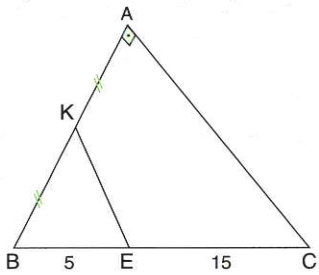
6. $m(\widehat{D}) = m(\widehat{B}) = 90°$,
$|AB| = |BC| = 6\sqrt{2}$ cm,
$|DC| = 8$ cm
$\Rightarrow$ **$|AD| = ?$ cm**



A) $5\sqrt{5}$ B) $4\sqrt{5}$ C) $3\sqrt{5}$
D) $2\sqrt{5}$ E) $\sqrt{5}$

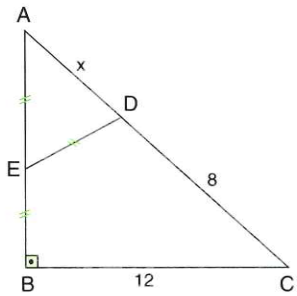
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $[AB] \perp [AC]$,
$|AK| = |KB|$,
$|BE| = 5$ cm,
$|EC| = 15$ cm
$\Rightarrow$ **$|KE| = ?$ cm**



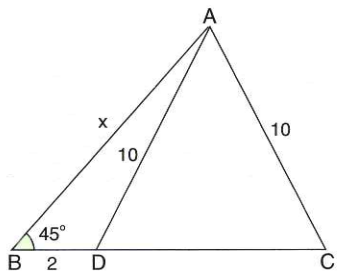
A) 4 B) 5 C) 6
D) 7 E) 8

8. $[AB] \perp [BC]$,
$|AE| = |EB| = |DE|$,
$|BC| = 12$ cm,
$|DC| = 8$ cm
$\Rightarrow$ **$|AD| = x = ?$ cm**



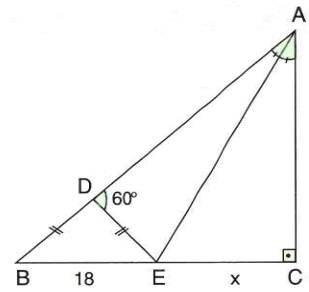
A) 7 B) 8 C) 9
D) 10 E) 11

9. $m(\widehat{ABD}) = 45°$,
$|AD| = |AC| = 10$ cm,
$|BD| = 2$ cm
$\Rightarrow$ **$|AB| = x = ?$ cm**



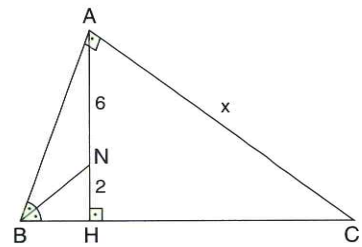
A) $6\sqrt{2}$ B) $8\sqrt{2}$ C) $10\sqrt{2}$
D) $12\sqrt{2}$ E) $16\sqrt{2}$

10. $[AE]$, açıortaydır.
[AE] is a bisector.
$[AC] \perp [BC]$,
$m(\widehat{ADE}) = 60°$,
$|BD| = |DE|$,
$|BE| = 18$ cm
$\Rightarrow$ **$|EC| = x = ?$ cm**



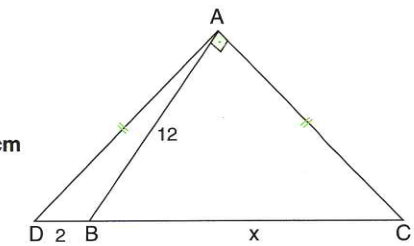
A) 6 B) 9 C) 12
D) 15 E) 18

11. $[BN]$, açıortaydır.
[BN] is a bisector.
$[AB] \perp [AC]$,
$[AH] \perp [BC]$,
$|AN| = 6$ cm,
$|NH| = 2$ cm
$\Rightarrow$ **$|AC| = x = ?$ cm**



A) 8 B) 10 C) 12
D) 18 E) 24

12. $|AD| = |AC|$,
$[BA] \perp [AC]$,
$|AB| = 12$ cm,
$|DB| = 2$ cm
$\Rightarrow$ **$|BC| = x = ?$ cm**



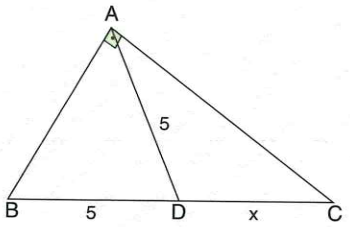
A) 18 B) $12\sqrt{3}$ C) $4\sqrt{7}$
D) $6\sqrt{7}$ E) 16

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	A	E	D	E	B	B	D	B	B	E	A

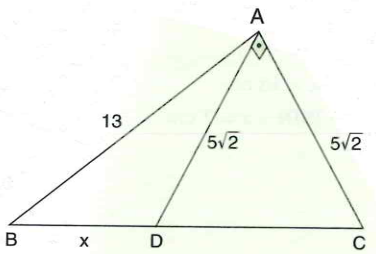
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. [AB] ⊥ [AC],
|AD| = |DB| = 5 cm
⇒ **|DC| = x = ? cm**



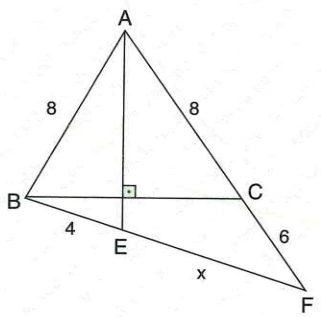
A) 5 B) 10 C) 15
D) 20 E) 25

2. [AD] ⊥ [AC],
|AD| = |AC| = $5\sqrt{2}$ cm,
|AB| = 13 cm
⇒ **|BD| = x = ? cm**



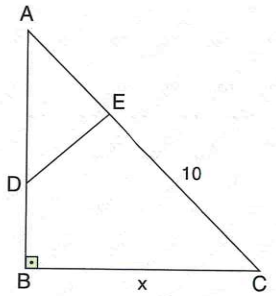
A) 4 B) 6 C) 7
D) 10 E) 11

3. [AE] ⊥ [BC],
|AB| = |AC| = 8 cm,
|BE| = 4 cm,
|CF| = 6 cm
⇒ **|EF| = x = ? cm**



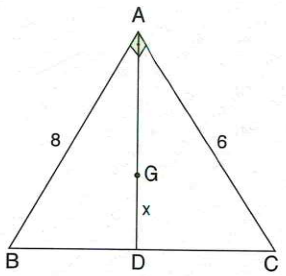
A) 4 B) 5 C) 6
D) 7 E) 8

4. ABC dik üçgen,
ADE eşkenar üçgendir.
ABC is a right triangle,
ADE is an equilateral triangle.
|CE| = 10 cm,
$|BD| = \frac{|AD|}{3}$
⇒ **|BC| = x = ? cm**



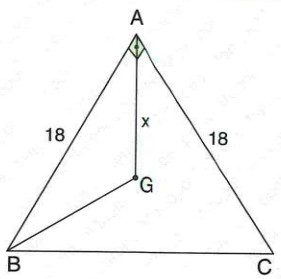
A) $8\sqrt{3}$ B) $9\sqrt{3}$ C) $10\sqrt{3}$
D) $12\sqrt{3}$ E) $15\sqrt{3}$

5. G, ağırlık merkezidir.
G is center of the gravity.
$m(\widehat{BAC}) = 90°$,
|AC| = 6 cm,
|AB| = 8 cm
⇒ **|GD| = x = ? cm**



A) $\frac{2}{3}$ B) $\frac{4}{3}$ C) $\frac{5}{3}$
D) 2 E) $\frac{7}{3}$

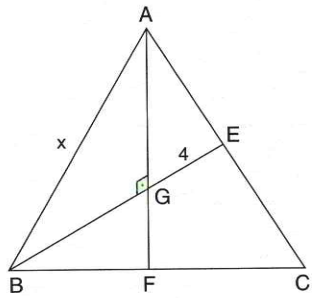
6. ABC dik üçgen,
G, ağırlık merkezidir.
ABC is a right triangle,
G is center of the gravity.
|AB| = |AC| = 18 cm
⇒ **|AG| = x = ? cm**



A) $\sqrt{2}$ B) $3\sqrt{2}$ C) $5\sqrt{2}$
D) $6\sqrt{2}$ E) $8\sqrt{2}$

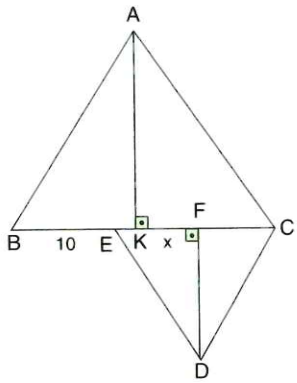
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. G, ağırlık merkezidir.
G is center of the gravity.
$[BE] \perp [AF]$,
$|AC| = |CB|$,
$|GE| = 4$ cm
$\Rightarrow$ **$|AB| = x = ?$ cm**



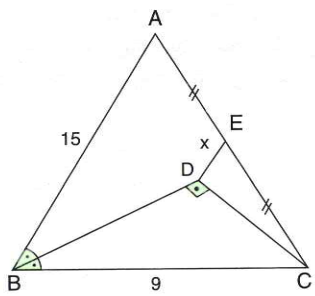
A) $\sqrt{2}$ B) $4\sqrt{2}$ C) $8\sqrt{2}$
D) $12\sqrt{2}$ E) $16\sqrt{2}$

8. $[AK] \perp [BC]$,
$[DF] \perp [BC]$,
$|AB| = |AC|$,
$|DE| = |DC|$,
$|BE| = 10$ cm
$\Rightarrow$ **$|KF| = x = ?$ cm**



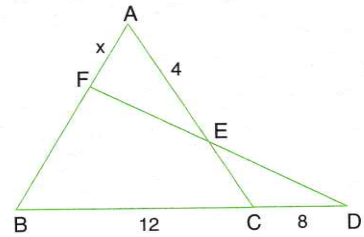
A) 4 B) 5 C) 6
D) 8 E) 10

9. [BD], açıortaydır.
[BD] is a bisector.
$|AE| = |EC|$,
$|AB| = 15$ cm,
$|BC| = 9$ cm
$\Rightarrow$ **$|DE| = x = ?$ cm**



A) 2 B) 3 C) 4
D) 5 E) 6

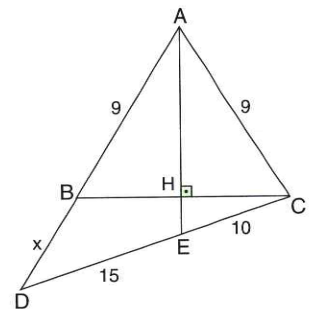
10.



ABC eşkenar üçgendir. / ABC is an equilateral triangle.
$|BC| = 12$ cm, $|CD| = 8$ cm, $|AE| = 4$ cm
$\Rightarrow$ **$|AF| = x = ?$ cm**

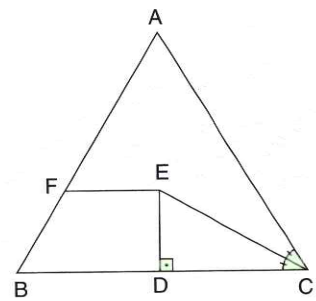
A) 4 B) 6 C) 2
D) 16 E) 5

11. $[AH] \perp [BC]$,
$|AB| = |AC| = 9$ cm,
$|CE| = 10$ cm,
$|ED| = 15$ cm
$\Rightarrow$ **$|BD| = x = ?$ cm**



A) 3 B) $\frac{7}{2}$ C) 4
D) $\frac{9}{2}$ E) 5

12. ABC eşkenar üçgen,
[CE] açıortaydır.
ABC is an equilateral triangle, [CE] is a angle bisector.
$[FE] // [BC]$,
$|BD| = |DC|$,
$|AC| = 18$ cm
$\Rightarrow$ **$|FE| = ?$ cm**



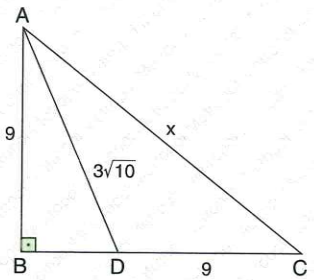
A) 3 B) 6 C) 9
D) 12 E) 15

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
A	C	D	A	C	D	C	B	B	C	D	B

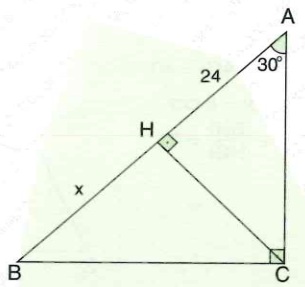
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $[AB] \perp [BC]$,
$|AB| = |DC| = 9$ cm,
$|AD| = 3\sqrt{10}$ cm
$\Rightarrow$ **$|AC| = x = ?$**



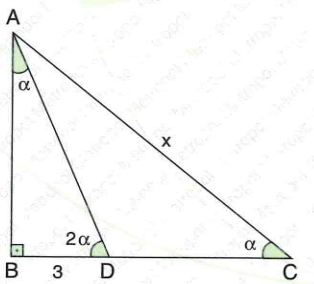
A) 12 B) 15 C) 17
D) 20 E) 25

2. $[HC] \perp [AB]$,
$[AC] \perp [BC]$,
$m(\widehat{BAC}) = 30°$,
$|AH| = 24$ cm
$\Rightarrow$ **$|BH| = x = ?$ cm**



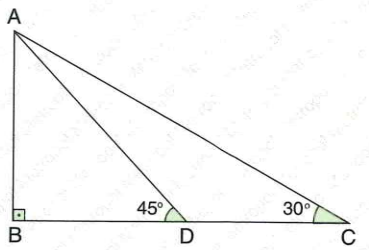
A) 8 B) 6 C) 4
D) 2 E) 1

3. $m(\widehat{BAD}) = m(\widehat{ACD}) = \alpha$,
$m(\widehat{ADB}) = 2\alpha$,
$[AB] \perp [BC]$,
$|BD| = 3$ cm
$\Rightarrow$ **$|AC| = x = ?$ cm**



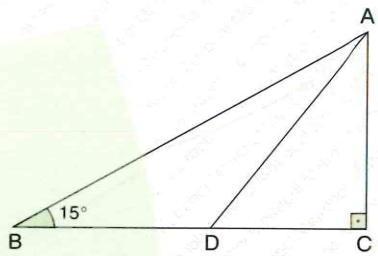
A) 3 B) 6 C) $3\sqrt{3}$
D) $6\sqrt{3}$ E) 9

4. $[AB] \perp [BC]$,
$m(\widehat{ADB}) = 45°$,
$m(\widehat{ACB}) = 30°$
$\Rightarrow$ **$\frac{|AD|}{|AC|} = ?$**



A) $\frac{\sqrt{2}}{2}$ B) $\sqrt{3}$ C) 2
D) 3 E) $\frac{3}{2}$

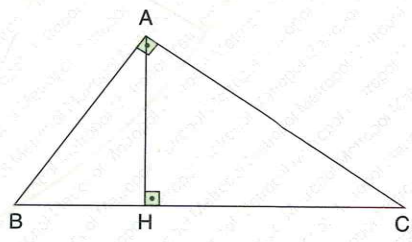
5.



$m(\widehat{ABC}) = 15°$, $|BD| = |AD| = 4\sqrt{3}$ cm
$\Rightarrow$ **$|DC| = ?$ cm**

A) 4 B) $4\sqrt{2}$ C) 5
D) 6 E) $6\sqrt{2}$

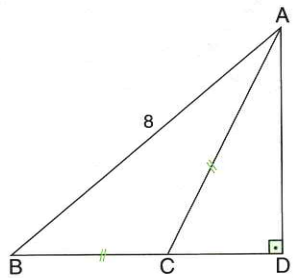
6. $[AB] \perp [AC]$,
$[AH] \perp [BC]$,
$|AC| = 2 \cdot |AH|$
$\Rightarrow$ **$\frac{|AB|}{|CH|} = ?$**



A) $\sqrt{2}$ B) $\frac{2}{3}$ C) $\sqrt{3}$
D) 2 E) $2\sqrt{3}$

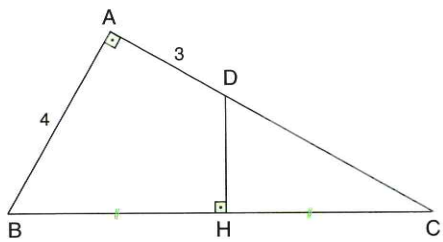
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $[AD] \perp [BD]$,
$|AB| = 8$ cm,
$|AC| = |BC| = 5$ cm
$\Rightarrow$ **$|AD| = ?$ cm**



A) 3,6 B) 4 C) 4,2
D) 4,8 E) 5

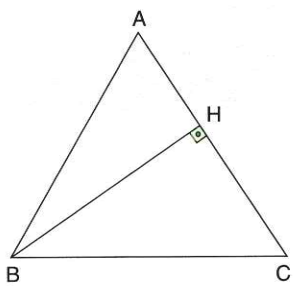
8.



$m(\widehat{A}) = 90°$, $[DH] \perp [BC]$, $|BH| = |HC|$,
$|AD| = 3$ cm, $|AB| = 4$ cm $\Rightarrow$ **$|CH| = ?$ cm**

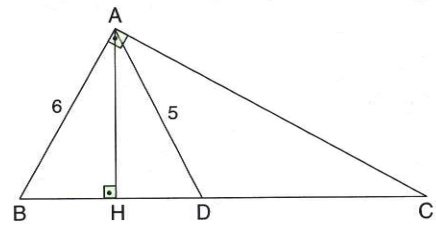
A) $2\sqrt{5}$ B) 4 C) $3\sqrt{3}$
D) 5 E) $5\sqrt{2}$

9. $|AB| = |AC| = 10$ cm,
$|BC| = 12$ cm
$\Rightarrow$ **$|BH| = ?$ cm**



A) 7,5 B) 8 C) 8,5
D) 9 E) 9,6

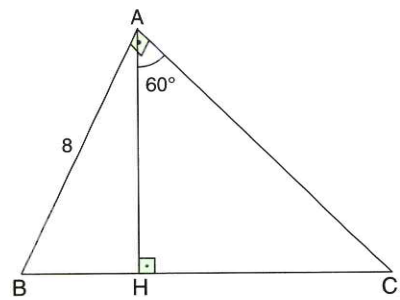
10.



$m(\widehat{BAC}) = 90°$, $[AH] \perp [BC]$, $|BD| = |DC|$,
$|AB| = 6$ cm, $|AD| = 5$ cm $\Rightarrow$ **$|AH| = ?$ cm**

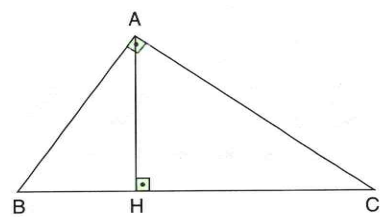
A) 3 B) 4 C) 4,2
D) 4,8 E) 5,2

11. $[AB] \perp [AC]$,
$[AH] \perp [BC]$,
$m(\widehat{HAC}) = 60°$
$|AB| = 8$ cm
$\Rightarrow$ **$\frac{|BH|}{|HC|} = ?$**



A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{1}{4}$
D) $\frac{2}{3}$ E) $\frac{3}{4}$

12. $[AB] \perp [AC]$,
$[AH] \perp [BC]$,
$m(\widehat{ABC}) = 60°$,
$|AC| = 4\sqrt{3}$ cm
$\Rightarrow$ **$A(\widehat{ABH}) = ?$ cm^2**



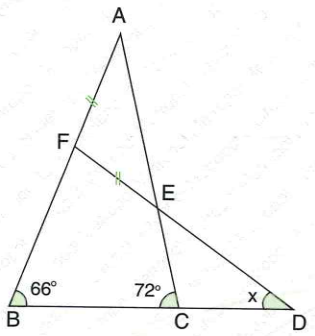
A) $2\sqrt{3}$ B) 3 C) $3\sqrt{3}$
D) 4 E) $4\sqrt{3}$

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
B	A	D	A	D	B	D	A	E	D	B	A

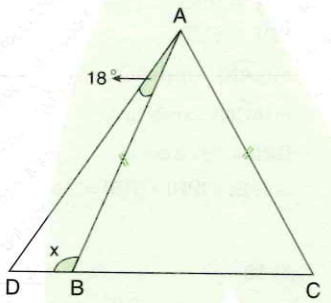
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $|AF| = |FE|$,
$m(\widehat{ABD}) = 66°$,
$m(\widehat{ACB}) = 72°$
$\Rightarrow$ **$m(\widehat{BDF}) = x = ?$**



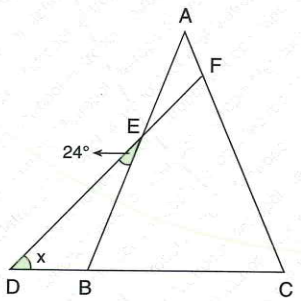
A) 24° B) 30° C) 34° D) 40° E) 42°

2. $|AB| = |AC|$,
$|DA| = |DC|$,
$m(\widehat{DAB}) = 18°$
$\Rightarrow$ **$m(\widehat{ABD}) = x = ?$**



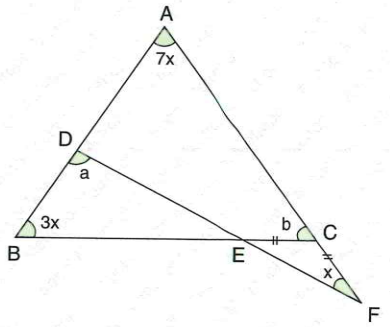
A) 136° B) 132° C) 128° D) 118° E) 114°

3. $|AB| = |AC|$,
$|DF| = |DC|$,
$m(\widehat{DEB}) = 24°$
$\Rightarrow$ **$m(\widehat{FDC}) = x = ?$**



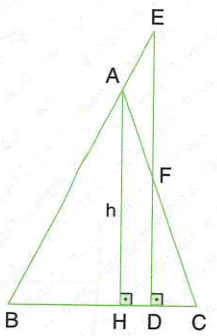
A) 36° B) 42° C) 44° D) 52° E) 56°

4. $|EC| = |CF|$,
$m(\widehat{BAF}) = 7x$,
$m(\widehat{ABC}) = 3x$,
$m(\widehat{AFD}) = x$,
$m(\widehat{BDF}) = a$,
$m(\widehat{ACB}) = b$
$\Rightarrow$ **$a + b = ?$**



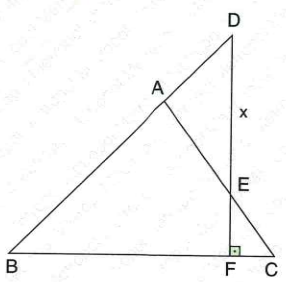
A) 75° B) 90° C) 120° D) 130° E) 150°

5. $|AB| = |AC|$,
$[ED] \perp [BC]$,
$[AH] \perp [BC]$,
$[AC] \cap [ED] = \{F\}$,
$|ED| = 16$ cm,
$|FD| = 8$ cm
$\Rightarrow$ **$|AH| = h = ?$ cm**



A) 10 B) 12 C) 14 D) 15 E) 16

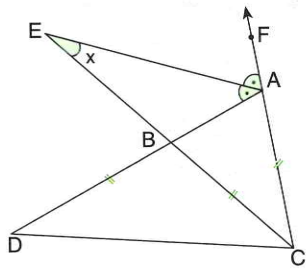
6. $|AB| = |AC|$,
$|DA| = |AE| = |DE|$,
$[DF] \perp [BC]$,
$|AB| = 30$ cm,
$|EF| = 6$ cm
$\Rightarrow$ **$|DE| = x = ?$ cm**



A) 15 B) 16 C) 18 D) 20 E) 24

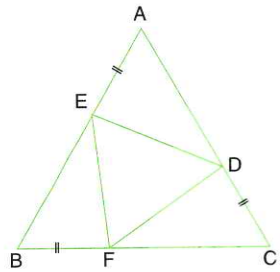
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $|AC| = |BC| = |BD|$,
$|DA| = |DC|$,
$m(\widehat{FAE}) = m(\widehat{EAD})$
$\Rightarrow$ **$m(\widehat{AEC}) = x = ?$**



A) 15° B) 12° C) 14°
D) 18° E) 21°

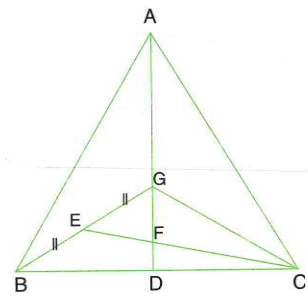
8.



ABC, eşkenar üçgendir. / ABC is an equilateral triangle.
$|AE| = |BF| = |DC|$, $|FC| = 2|BF|$,
Çevre / The perimeter $(\widehat{EFD}) = 18\sqrt{3}$ cm
$\Rightarrow$ **Çevre / The perimeter $(\widehat{ABC}) = ?$ cm**

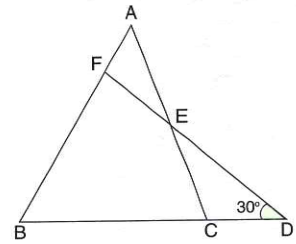
A) $24\sqrt{3}$ B) 36 C) $36\sqrt{3}$
D) 48 E) 54

9. ABC eşkenar üçgen, G noktası şekildeki ABC üçgeninin ağırlık merkezidir.
ABC is an equilateral triangle. G is the center of gravity of $\widehat{ABC}$ in the figure.
$|BE| = |EG|$,
$|FD| = 2$ cm
$\Rightarrow$ **$|CE| = ?$ cm**



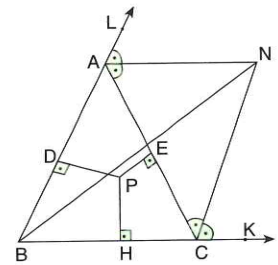
A) 9 B) $6\sqrt{7}$ C) $9\sqrt{7}$
D) 12 E) $3\sqrt{26}$

10. ABC eşkenar üçgendir.
ABC is an equilateral triangle.
$m(\widehat{FDB}) = 30°$,
$2|AE| = |EC|$,
$|AF| = 4$ cm
$\Rightarrow$ **$|DF| = ?$ cm**



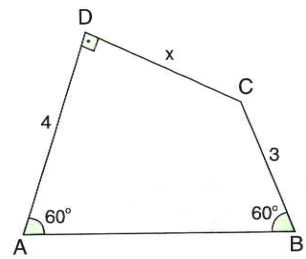
A) $20\sqrt{3}$ B) $32\sqrt{3}$ C) 36
D) 40 E) 48

11. ABC eşkenar üçgendir.
ABC is an equilateral triangle.
$[PH] \perp [BC]$,
$[PE] \perp [AC]$,
$[PD] \perp [AB]$,
$m(\widehat{LAN}) = m(\widehat{NAC})$,
$m(\widehat{ACN}) = m(\widehat{NCK})$,
$|BN| = 18\sqrt{3}$ cm
$\Rightarrow$ **$|PE| + |PH| + |PD| = ?$ cm**



A) 18 B) 12 C) $9\sqrt{3}$
D) $12\sqrt{3}$ E) $18\sqrt{3}$

12. $m(\widehat{ADC}) = 90°$,
$m(\widehat{DAB}) = m(\widehat{ABC}) = 60°$,
$|AD| = 4$ cm,
$|CB| = 3$ cm
$\Rightarrow$ **$|DC| = x = ?$ cm**



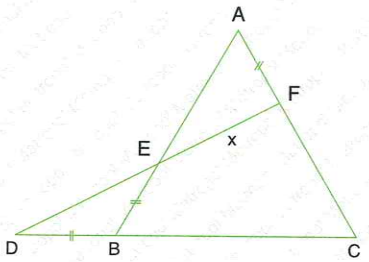
A) 1 B) $\sqrt{2}$ C) $\sqrt{3}$
D) 2 E) 5

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
B	E	C	E	B	C	D	E	B	A	C	C

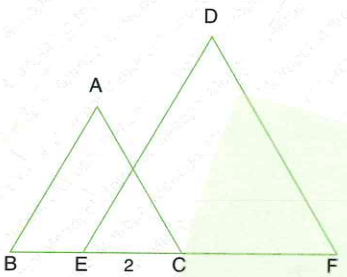
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. ABC eşkenar üçgendir.
ABC is an equilateral triangle.
$|DB| = |BE| = |AF|$,
$|BC| = 9$ cm
$\Rightarrow$ **$|EF| = x = ?$ cm**



A) 3 B) $3\sqrt{2}$ C) $3\sqrt{3}$
D) 6 E) 8

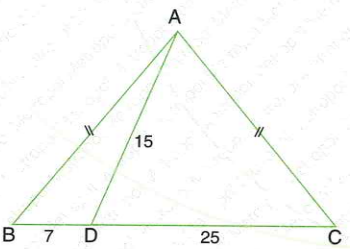
2.



ABC ve DEF eşkenar üçgendir.
ABC and DEF are an equilateral triangles.
$|EC| = 2$ cm, $|BF| = 18$ cm
$\Rightarrow$ **Çevre / The perimeter $\left(m(\widehat{ABC}) + m(\widehat{DEF})\right) = ?$ cm**

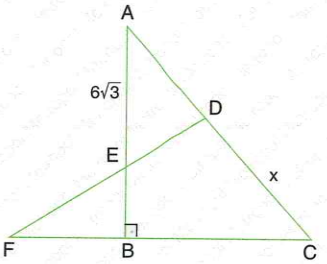
A) 24 B) 27 C) 36
D) 48 E) 60

3. $|AB| = |AC|$,
$|AD| = 15$ cm,
$|BD| = 7$ cm,
$|DC| = 25$ cm
$\Rightarrow$ **$|AC| = ?$ cm**



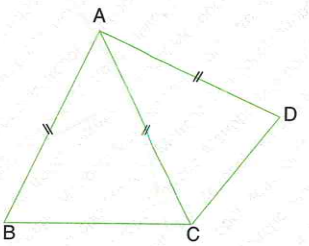
A) 16 B) 20 C) 24
D) 27 E) 28

4. FDC eşkenar üçgendir.
FDC is an equilateral triangle.
$[AB] \perp [FC]$,
$|AE| = 6\sqrt{3}$ cm,
$2|FB| = |BC|$
$\Rightarrow$ **$|DC| = x = ?$ cm**



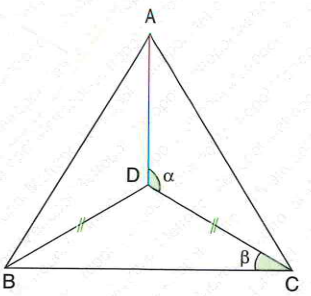
A) 12 B) $12\sqrt{3}$ C) 18
D) $18\sqrt{3}$ E) 24

5. $|AB| = |AC| = |AD|$,
$m(\widehat{BAD}) = 94°$
$\Rightarrow$ **$m(\widehat{BCD}) = ?$**



A) 130° B) 131° C) 132°
D) 133° E) 134°

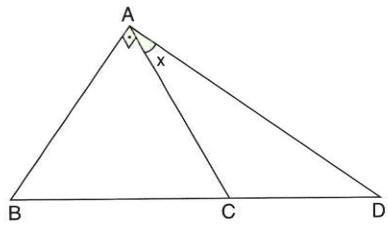
6. ABC eşkenar üçgendir.
ABC is an equilateral triangle.
$m(\widehat{ADC}) = \alpha$,
$m(\widehat{DCB}) = \beta$,
$|BD| = |DC|$
$\alpha + \beta = 110°$
$\Rightarrow$ **$\alpha = ?$**



A) 60° B) 70° C) 80°
D) 90° E) 100°

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



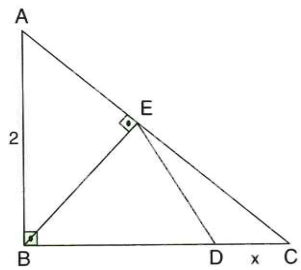
ABC dik üçgendir. / ABC is a right triangle.

|AB| = |AC|, |BC| = |AD| ⇒ **m(CAD) = x = ?**

A) 15° B) 30° C) 45°

D) 60° E) 75°

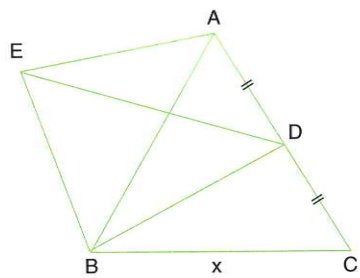
8. BED eşkenar üçgendir.
BED is an equilateral triangle.
[AB] ⊥ [BC],
[BE] ⊥ [AC],
|BA| = 2 cm
⇒ **|DC| = x = ? cm**



A) 1 B) 2 C) $\sqrt{3}$

D) $2\sqrt{3}$ E) 4

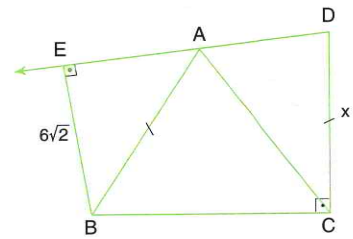
9. ABC ve DEB eşkenar üçgendir.
ABC and DEB are equilateral triangles.
|AD| = |DC|,
|AE| = 8 cm
⇒ **|BC| = x = ? cm**



A) 4 B) $4\sqrt{3}$ C) 8

D) $16\sqrt{3}$ E) 16

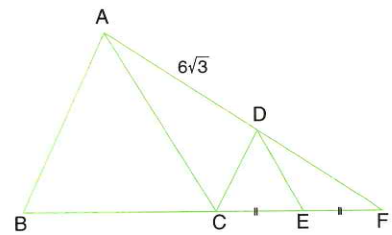
10. ABC eşkenar üçgendir.
ABC is an equilateral triangle.
[BE] ⊥ [DE,
[DC] ⊥ [BC],
|AB| = |DC|,
|EB| = $6\sqrt{2}$ cm
⇒ **|DC| = x = ? cm**



A) 6 B) $6\sqrt{2}$ C) $6\sqrt{3}$

D) 12 E) $12\sqrt{3}$

11.

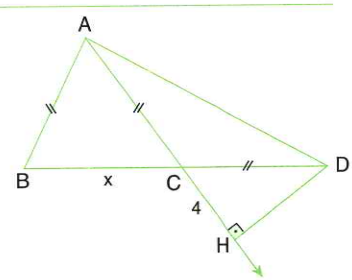


ABC ve DEC eşkenar üçgendir.
ABC and DEC are equilateral triangles.
|CE| = |EF|, |AD| = $6\sqrt{3}$ cm ⇒ **|BF| = ? cm**

A) 12 B) 18 C) 24

D) 30 E) 36

12. [AH ⊥ [DH],
|AB| = |AC| = |CD|,
m(BAC) + m(CDH) = 90°,
|CH| = 4 cm
⇒ **|BC| = x = ? cm**



A) 6 B) 8 C) 10

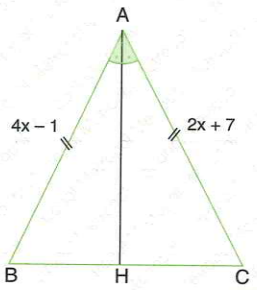
D) 12 E) 16

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	E	B	C	D	E	A	C	E	D	C	B

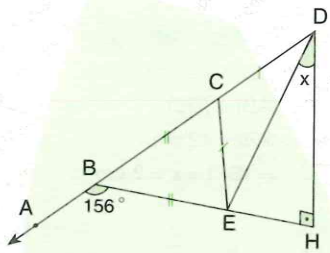
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $|AB| = |AC|$,
$|AB| = (4x - 1)$ cm,
$|AC| = (2x + 7)$ cm,
$|BC| = 18$ cm
$\Rightarrow$ **$|AH| = ?$ cm**



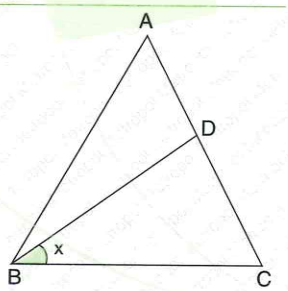
A) 9 B) 10 C) 11
D) 12 E) 15

2. $[DH] \perp [BH]$,
$[BC] = [BE]$,
$|EC| = |CD|$,
$m(\widehat{ABH}) = 156°$
$\Rightarrow$ **$m(\widehat{EDH}) = x = ?$**



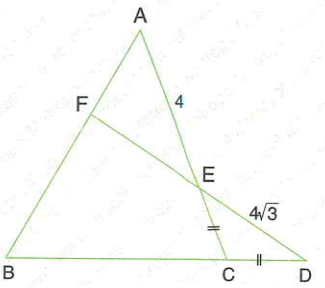
A) 24 B) 27 C) 30
D) 33 E) 42

3. $m(\widehat{ACB}) = 2 \cdot m(\widehat{BAC})$,
$D \in [AC]$,
$|AB| = |AC|$,
$|BD| = |BC|$
$\Rightarrow$ **$m(\widehat{DBC}) = x = ?$**



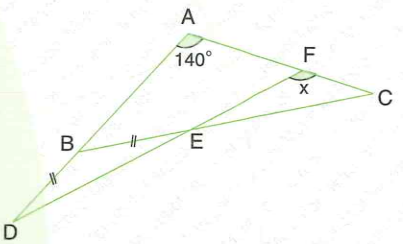
A) 48 B) 42 C) 36
D) 32 E) 24

4. ABC eşkenar üçgendir.
ABC is an equilateral triangle.
$|CD| = |CE|$,
$|AE| = 4$ cm,
$|ED| = 4\sqrt{3}$ cm
$\Rightarrow$ **$A(\widehat{ABC}) = ?\ cm^2$**



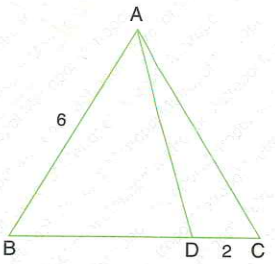
A) $9\sqrt{3}$ B) $16\sqrt{3}$ C) $36\sqrt{3}$
D) $48\sqrt{3}$ E) $64\sqrt{3}$

5. $[BC] \cap [DF] = \{E\}$,
$|BD| = |BE|$,
$|AB| = |AC|$,
$m(\widehat{DAC}) = 140°$
$\Rightarrow$ **$m(\widehat{DFC}) = x = ?$**



A) 150 B) 160 C) 165
D) 170 E) 175

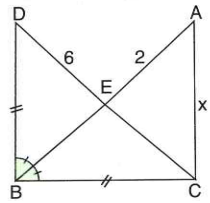
6. $|AB| = |AC| = |BC|$,
$|AB| = 6$ cm,
$|DC| = 2$ cm
$\Rightarrow$ **$|AD| = ?$ cm**



A) 3 B) 5 C) $2\sqrt{7}$
D) $4\sqrt{2}$ E) $4\sqrt{3}$

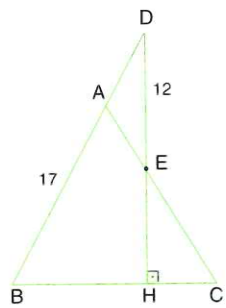
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. |BD| = |BC|,
|DE| = 6 cm,
|EA| = 2 cm
⇒ **|AC| = x = ?**



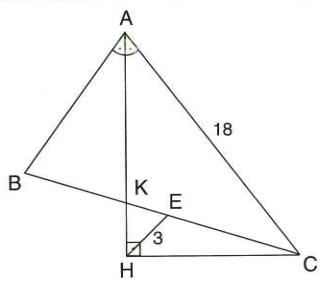
A) $6\sqrt{2}$ B) $5\sqrt{2}$ C) $4\sqrt{3}$
D) $\sqrt{39}$ E) $2\sqrt{10}$

8. ABC ikizkenar üçgendir.
ABC is an isosceles triangle.
|AB| = |AC|,
[DH] ⊥ [BC],
|AB| = 17 cm,
|BC| = 16 cm,
|DE| = 12 cm
⇒ **|EH| = ? cm**



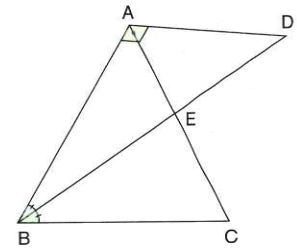
A) 6 B) 7 C) 8
D) 9 E) 12

9. [AH] ⊥ [HC],
$m(\widehat{BAH}) = m(\widehat{HAC})$,
[AH] ∩ [BC] = {K},
|HE| // |AB|
|HE| = 3 cm,
|AC| = 18 cm
⇒ **|AB| = ? cm**



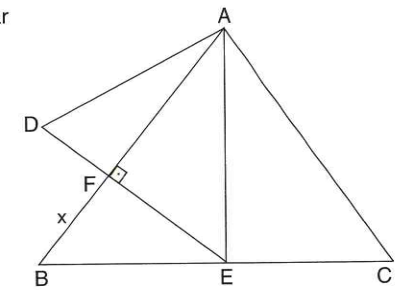
A) 9 B) 10 C) 12
D) 14 E) 15

10. |AB| = |AC| = |BC|,
[BA] ⊥ [AD],
$m(\widehat{ABD}) = m(\widehat{EBC})$,
|EC| = $\sqrt{3}$ cm
⇒ **|AD| = ? cm**



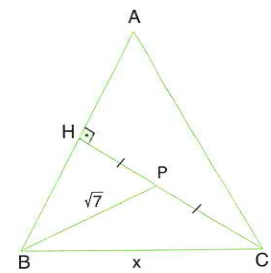
A) 1 B) $\sqrt{3}$ C) 2
D) $2\sqrt{3}$ E) 3

11. ABC ve ADE eşkenar üçgenler /
ABC and ADE are equilateral triangles.
[AB] ⊥ [DE],
|AB| = 12 cm
⇒ **|BF| = x = ? cm**



A) 1 B) 2 C) 3
D) 4 E) 5

12. ABC eşkenar üçgen,
[CH] yüksekliktir.
ABC is an equilateral triangle, [CH] is the height.
|HP| = |PC|,
|BP| = $\sqrt{7}$ cm
⇒ **|BC| = x = ? cm**



A) 2 B) 3 C) 4
D) 5 E) 6

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	B	C	B	A	C	E	D	C	C	C	C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

BÖLÜM CHAPTER 5

TARİHSEL NOT / HISTORICAL NOTE

Thales of Miletus [624 – 546 BC]

Yunan filozof, matematikçi ve astronomdur. Yunanistan'ın yedi bilgelerinden biriydi. Çoğu, en başta Aristoteles, onu Yunan geleneğinde ilk filozof olarak kabul etti ve tarihsel olarak Batı medeniyetinde bilimsel felsefe ile ilgilendiği bilinen ilk birey olarak kabul edildi.

A Greek philosopher mathematician and astronomer. He was one of the seven wisdoms of Greece. A lot of people, first and foremost Aristotle, regarded him as the first philosopher in the Greek tradition. He was regarded as the first person known historically to be engaged with scientific philosophy in Western civilization.

ÜÇGENLERDE BENZERLİK ve ALAN
SIMILARITY and AREA in TRIANGLES

Bu bölüm, 35 çözümlü örnek, 24 çözümlü test sorusu, 12 çözümlü YÖS sorusu, 36 alıştırma sorusu, 144 test sorusu içermektedir.

This chapter includes 35 examples with solutions, 24 test questions with solutions, 12 YÖS questions with solutions, 36 exercise questions and 144 test questions.

BÖLÜM / CHAPTER 5 ..... 155 - 216

ÜÇGENLERDE BENZERLİK ve ALAN / SIMILARITY and AREA in TRIANGLES

- Üçgenlerde Benzerlik / Similarity in Triangles ..... 157 - 166
  - Benzerlik Teoremleri / The Similarity Triangles ..... 157 - 163
  - Özel Teoremler / Special Theorems ..... 164 - 166
- Üçgende Alan / Area in Triangle ..... 166 - 174
  - Üçgende Alan Bağlantıları / The Area Relations in Triangle ..... 166 - 174
- Çözümlü Test / Test With Solutions ..... 175 - 182
- YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 183 - 186
- Alıştırmalar / Exercises ..... 187 - 192
- Konu Testleri / Practice Tests ..... 193 - 216

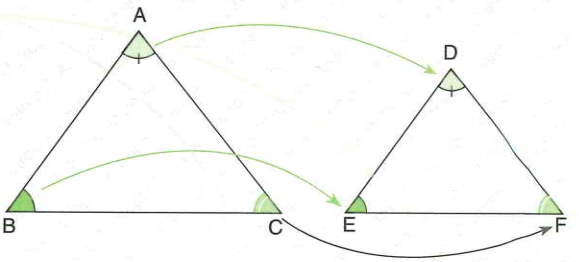
BÖLÜM
05
CHAPTER

ÜÇGENLERDE BENZERLİK ve ALAN
SİMİLARITY and AREA in TRIANGLES

ÜÇGENLERDE BENZERLİK / SIMILARITY in TRIANGLES

$m(\widehat{A}) = m(\widehat{D})$
$m(\widehat{B}) = m(\widehat{E})$ ve (and) $\frac{|AB|}{|DE|} = \frac{|BC|}{|EF|} = \frac{|AC|}{|DF|} \Leftrightarrow \widehat{ABC} \sim \widehat{DEF}$
$m(\widehat{C}) = m(\widehat{F})$

[$\widehat{ABC}$ ve $\widehat{DEF}$ benzerdir. / $\widehat{ABC}$ and $\widehat{DEF}$ are similar.]



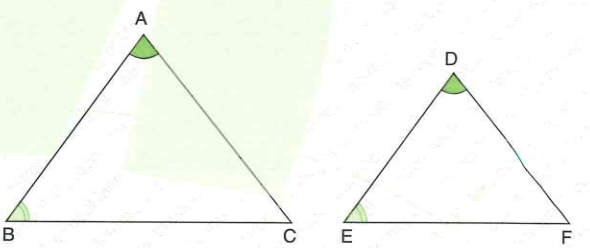
ÖNEMLİ / IMPORTANT

İki üçgen benzer ise, bu üçgenlerin benzer kenarlarının ortak oranı, benzerlik oranı olarak adlandırılır.
If two triangles are similar, the common ratio of their corresponding sides is called the ratio of similitude.

BENZERLİK TEOREMLERİ / THE SIMILARITY THEOREMS

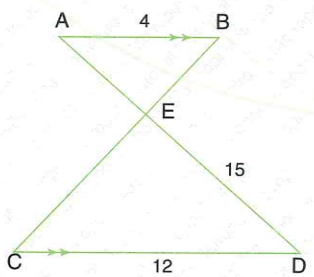
Açı – Açı (A.A.) Benzerlik Teoremi / The Angle – Angle Similarity Theorem (A.A.)

$\left.\begin{matrix} m(\widehat{A}) = m(\widehat{D}) \\ m(\widehat{B}) = m(\widehat{E}) \end{matrix}\right\} \Leftrightarrow \widehat{ABC} \sim \widehat{DEF}\ (A.A.)$



Örnek / Example 1

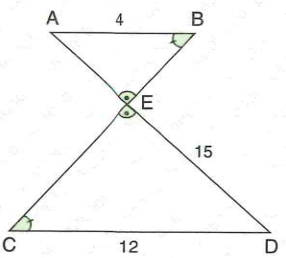
[AB] // [CD],
|AB| = 4 cm,
|CD| = 12 cm,
|ED| = 15 cm
⇒ **|AE| = x = ? cm**



A) 5 B) 6 C) 7 D) 8 E) 9

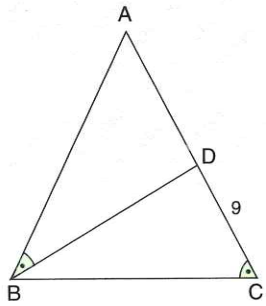
Çözüm / Solution Yanıt / Answer **A**

$m(\widehat{AEB}) = m(\widehat{CED})$
$[AB]//[CD] \Rightarrow m(\widehat{ABE}) = m(\widehat{ECD})$
$\widehat{ABE} \sim \widehat{DCE}$ (A.A.)
$\frac{|AB|}{|CD|} = \frac{|AE|}{|ED|} \Rightarrow \frac{4}{12} = \frac{x}{15}$
$12 \cdot x = 15 \cdot 4$
$x = 5$ cm



Örnek / Example 2

$m(\widehat{ACB}) = m(\widehat{ABD})$,
$2 \cdot |AD| = |AB|$,
$|DC| = 9$ cm
$\Rightarrow$ **$|AB| = ?$ cm**



A) 9 B) 8 C) 7 D) 6 E) 5

Çözüm / Solution Yanıt / Answer **D**

$|AD| = k \Rightarrow |AB| = 2k$

$\widehat{ABD} \sim \widehat{ACB}$ (A.A.)

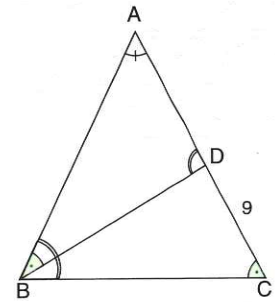
$\frac{|AD|}{|AB|} = \frac{|AB|}{|AC|}$

$\frac{k}{2k} = \frac{2k}{k+9}$

$4k^2 = k^2 + 9k$

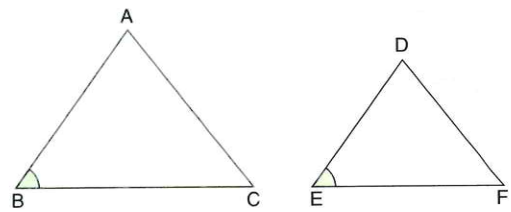
$3k^2 = 9k \Rightarrow k = 3$

$|AB| = 2 \cdot k = 2 \cdot 3 = 6$ cm



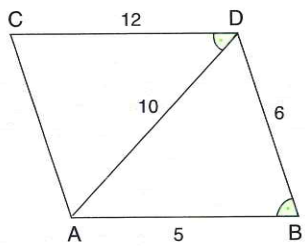
Kenar – Açı – Kenar (K.A.K.) Benzerlik Teoremi / The Side – Angle – Side Similarity Theorem (S.A.S.)

$\frac{|AB|}{|DE|} = \frac{|BC|}{|EF|}$ *ve (and)* $m(\widehat{B}) = m(\widehat{E}) \Leftrightarrow \widehat{ABC} \sim \widehat{DEF}$ *(K.A.K)*



Örnek / Example 3

$m(\widehat{CDA}) = m(\widehat{DBA})$,
$|DC| = 12$ cm,
$|DB| = 6$ cm,
$|AB| = 5$ cm,
$|DA| = 10$ cm
$\Rightarrow$ **$|CA| = ?$ cm**



A) 6 B) 10 C) 15 D) 16 E) 20

Çözüm / Solution Yanıt / Answer **E**

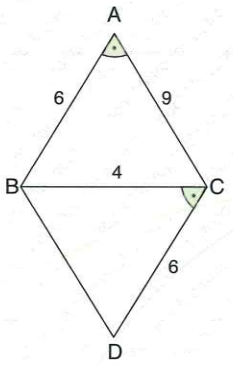
$m(\widehat{CDA}) = m(\widehat{DBA})$,

$\left.\begin{array}{l} \frac{|DC|}{|DB|} = \frac{12}{6} \\ \frac{|DA|}{|BA|} = \frac{10}{5} \end{array}\right\} \Rightarrow \widehat{CDA} \sim \widehat{DBA}$ (K.A.K.)

$\frac{|DC|}{|DB|} = \frac{|DA|}{|BA|} = 2 \Rightarrow \frac{|CA|}{|DA|} = 2 \Rightarrow |CA| = 2 \cdot 10 = 20$ cm

Örnek / Example 4

$m(\widehat{BAC}) = m(\widehat{BCD})$,
$|AB| = |DC| = 6$ cm, $|AC| = 9$ cm,
$|BC| = 4$ cm $\Rightarrow$ **$|BD| = ?$ cm**



A) $\frac{8}{3}$ B) $\frac{7}{3}$ C) 2 D) $\frac{5}{3}$ E) $\frac{4}{3}$

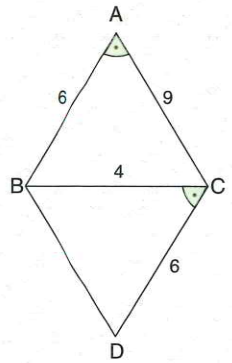
Çözüm / Solution Yanıt / Answer **A**

$$\left.\begin{array}{l} m(\widehat{BAC}) = m(\widehat{BCD}) \\ \frac{|AB|}{|BC|} = \frac{|AC|}{|CD|} = \frac{3}{2} \end{array}\right\} \Rightarrow \widehat{ABC} \sim \widehat{CBD}$$

$$\Rightarrow \frac{|BC|}{|BD|} = \frac{3}{2}$$

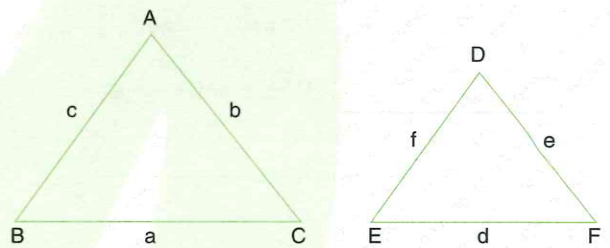
$$\frac{4}{|BD|} = \frac{3}{2} \Rightarrow 8 = 3 \cdot |BD|$$

$$|BD| = \frac{8}{3} \text{ cm}$$



Kenar – Kenar – Kenar (K.K.K.) Benzerlik Teoremi / Side – Side – Side Similarity Theorem (S.S.S.)

$$\frac{|BC|}{|EF|} = \frac{|AC|}{|DF|} = \frac{|AB|}{|DE|} \left(\frac{a}{d} = \frac{b}{e} = \frac{c}{f}\right) \Leftrightarrow \widehat{ABC} \sim \widehat{DEF} \ (K.K.K)$$



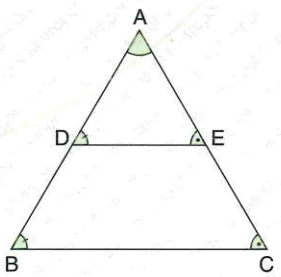
Temel Benzerlik Teoremi / The Basic Similarity Theorem

$[DE] // [BC]$,

$\widehat{ADE} \sim \widehat{ABC}$

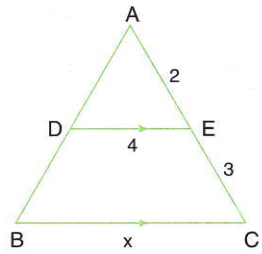
$$\frac{|AD|}{|AB|} = \frac{|AE|}{|AC|} = \frac{|DE|}{|BC|}$$

$$\frac{|AD|}{|DB|} = \frac{|AE|}{|EC|}$$



Örnek / Example 5

[DE] // [BC],
|AE| = 2 cm,
|EC| = 3 cm,
|DE| = 4 cm
⇒ **|BC| = x = ? cm**



A) 10 B) 11 C) 12
D) 13 E) 14

Çözüm / Solution Yanıt / Answer **A**

$\widehat{ADE} \sim \widehat{ABC}$

$\frac{|AE|}{|AC|} = \frac{|DE|}{|BC|} \Rightarrow \frac{2}{2+3} = \frac{4}{x}$

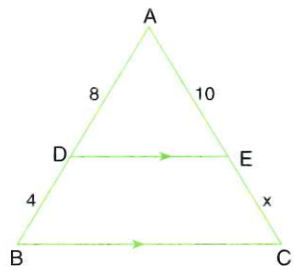
$2x = 5 \cdot 4$

$2x = 20$

$x = 10$

Örnek / Example 6

[DE] // [BC],
|AD| = 8 cm,
|AE| = 10 cm,
|BD| = 4 cm
⇒ **|EC| = x = ? cm**



A) 1 B) 3 C) 5
D) 7 E) 9

Çözüm / Solution Yanıt / Answer **C**

$[DE] // [BC] \Rightarrow \frac{|AD|}{|DB|} = \frac{|AE|}{|EC|}$

$\Rightarrow \frac{8}{4} = \frac{10}{x}$

$\Rightarrow 2 = \frac{10}{x}$

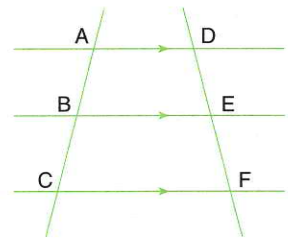
$\Rightarrow 2x = 10$

$\Rightarrow x = 5\,cm$

1. Thales Teoremi / 1st Thales Theorem

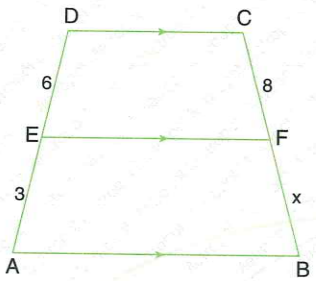
$[AD] // [BE] // [CF] \Rightarrow \frac{|AB|}{|BC|} = \frac{|DE|}{|EF|}$

$\frac{|AB|}{|AC|} = \frac{|DE|}{|DF|}$



Örnek / Example 7

[AB] // [EF] // [CD],
|DE| = 6 cm,
|AE| = 3 cm,
|CF| = 8 cm
⇒ **|BF| = x = ? cm**



A) 2 B) 4 C) 6 D) 8 E) 10

Çözüm / Solution Yanıt / Answer **B**

[AB] // [EF] // [CD]:

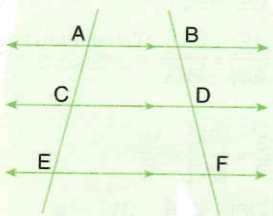
$$\frac{|DE|}{|AE|} = \frac{|CF|}{|BF|} \Leftrightarrow \frac{6}{3} = \frac{8}{x}$$

$6x = 24$

$x = 4$ cm

Örnek / Example 8

[AB] // [CD] // [EF],
|AC| = 2·|CE|
|DF| = 6 cm
⇒ **|BF| = ? cm**



A) 12 B) 18 C) 20 D) 24 E) 26

Çözüm / Solution Yanıt / Answer **B**

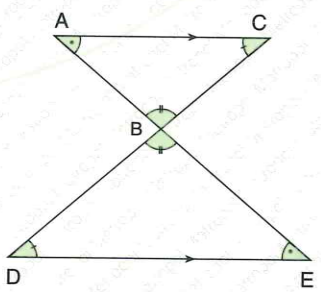
$$\frac{|AC|}{|CE|} = \frac{|BD|}{|DF|} \Rightarrow \frac{|BD|}{|DF|} = 2$$

|DF| = 6 cm ⇒ |BD| = 12 cm

|BF| = |DF| + |BD| ⇒ |BF| = 12 + 6 = 18 cm

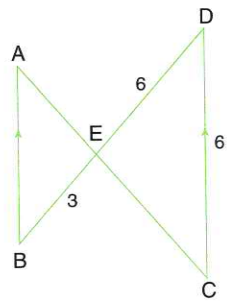
2. Thales Teoremi / 2nd Thales Theorem

[AC] // [DE], $\frac{|AB|}{|BE|} = \frac{|CB|}{|BD|} = \frac{|AC|}{|DE|}$



Örnek / Example 9

[AB] // [DC],
|BE| = 3 cm,
|DC| = 6 cm,
|ED| = 6 cm
⇒ **|AB| = ? cm**



A) 2 B) $\frac{5}{2}$ C) 3 D) $\frac{7}{2}$ E) 4

Çözüm / Solution

Yanıt / Answer **C**

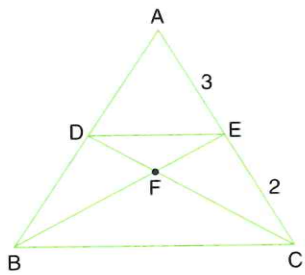
$\frac{|AB|}{|DC|} = \frac{|BE|}{|ED|} = \frac{|AE|}{|EC|}$

$\Rightarrow \frac{|AB|}{6} = \frac{3}{6}$

|AB| = 3 cm

Örnek / Example 10

[BE] ∩ [DC] = {F},
[DE] // [BC],
|AE| = 3 cm,
|EC| = 2 cm,
|DF| = 6 cm
⇒ **|FC| = ? cm**



A) 8 B) 10 C) 15 D) 20 E) 21

Çözüm / Solution

Yanıt / Answer **B**

[DE] // [BC]:

$\frac{|AE|}{|AC|} = \frac{|DE|}{|BC|}$ (Temel Benzerlik Teoremi / The Basic Similarity Theorem)

$\frac{3}{5} = \frac{|DE|}{|BC|} = \frac{3k}{5k}$

$\frac{|DE|}{|BC|} = \frac{|DF|}{|FC|} \Rightarrow \frac{3k}{5k} = \frac{6}{|FC|}$

$\Rightarrow |FC| = 10$ cm

Sonuçlar / Conclusions

1. $\widehat{ABC} \sim \widehat{DEF} \Leftrightarrow \frac{a}{d} = \frac{b}{e} = \frac{c}{f} = k$ (k benzerlik oranıdır. / k is the ratio of similitude.)

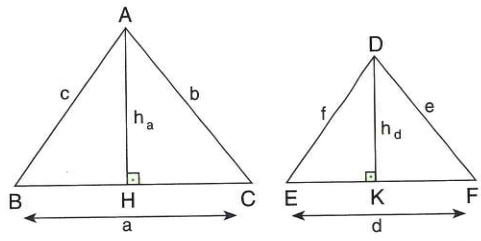
2. $\widehat{ABC} \sim \widehat{DEF} \Leftrightarrow \frac{h_a}{h_d} = \frac{h_b}{h_e} = \frac{h_c}{h_f} = k$

3. $\widehat{ABC} \sim \widehat{DEF} \Leftrightarrow \frac{\vartheta_a}{\vartheta_d} = \frac{\vartheta_b}{\vartheta_e} = \frac{\vartheta_c}{\vartheta_f} = k$

4. $\widehat{ABC} \sim \widehat{DEF} \Leftrightarrow \frac{n_A}{n_D} = \frac{n_B}{n_E} = \frac{n_C}{n_F} = k$

5. $\widehat{ABC} \sim \widehat{DEF} \Leftrightarrow \frac{\text{Çevre / The Perimeter}(\widehat{ABC})}{\text{Çevre / The Perimeter}(\widehat{DEF})} = k$

6. $\widehat{ABC} \sim \widehat{DEF} \Leftrightarrow \frac{A(\widehat{ABC})}{A(\widehat{DEF})} = k^2$



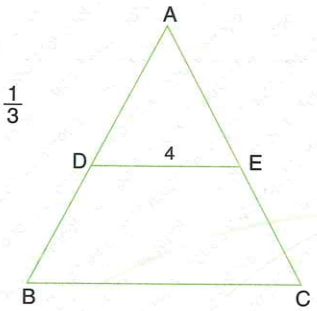
Örnek / Example 11

[DE] // [BC],

|DE| = 4 cm,

$\frac{\text{Çevre / The perimeter } (\widehat{ADE})}{\text{Çevre / The perimeter } (\widehat{ABC})} = \frac{1}{3}$

⇒ **|BC| = ? cm**



A) 8 B) 12 C) 15 D) 16 E) 18

Çözüm / Solution — Yanıt / Answer B

$[DE] // [BC] \Leftrightarrow \widehat{ADE} \sim \widehat{ABC}$

$\frac{|AD|}{|AB|} = \frac{|AE|}{|AC|} = \frac{|DE|}{|BC|} = \frac{Ç(\widehat{ADE})}{Ç(\widehat{ABC})} = k$

$\frac{\text{Çevre / The perimeter } (\widehat{ADE})}{\text{Çevre / The perimeter } (\widehat{ABC})} = \frac{1}{3} = k$

$\frac{4}{|BC|} = \frac{1}{3} \Rightarrow |BC| = 12\,cm$

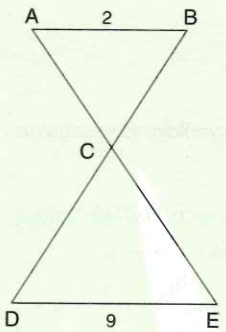
Örnek / Example 12

[AB] // [DE],

|AB| = 2 cm,

|ED| = 9 cm

$\Rightarrow \frac{\text{Çevre / The perimeter } (\widehat{ABC})}{\text{Çevre / The perimeter } (\widehat{EDC})} = ?$



A) $\frac{9}{2}$ B) $\frac{2}{9}$ C) 1 D) $\frac{1}{9}$ E) $\frac{1}{2}$

Çözüm / Solution — Yanıt / Answer B

$[AB] // [DE] \Leftrightarrow \widehat{ABC} \sim \widehat{EDC}$

$\widehat{ABC} \sim \widehat{EDC} \Rightarrow \frac{|AB|}{|DE|} = k = \frac{2}{9}$

$\frac{\text{Çevre / The Perimeter } (\widehat{ABC})}{\text{Çevre / The Perimeter } (\widehat{EDC})} = k = \frac{2}{9}$

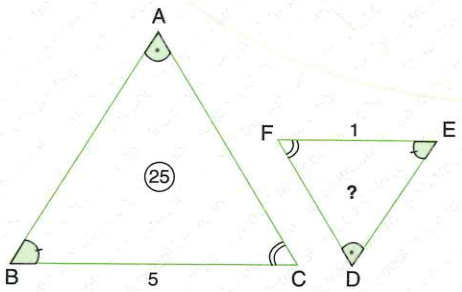
Örnek / Example 13

$A(\widehat{ABC}) = 25\ cm^2$,

|BC| = 5 cm,

|FE| = 1 cm

⇒ **$A(\widehat{DEF}) = ?\ cm^2$**



A) 1 B) 5 C) 10 D) 15 E) 20

Çözüm / Solution — Yanıt / Answer A

$\widehat{ABC} \sim \widehat{DEF} \Leftrightarrow \frac{|BC|}{|EF|} = k$

$\Leftrightarrow \frac{5}{1} = k$

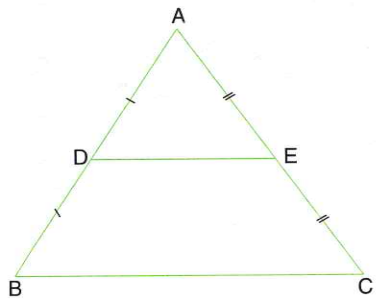
$\Leftrightarrow 5 = k$

$\frac{A(\widehat{ABC})}{A(\widehat{DEF})} = k^2 = 5^2 = 25 \Rightarrow \frac{25}{A(\widehat{DEF})} = \frac{25}{1}$

$\Rightarrow A(\widehat{DEF}) = 1\ cm^2$

Örnek / Example 14

[DE] // [BC],
|AE| = |EC|,
|AD| = |DB|,
$A(\widehat{ADE}) = 6\ cm^2$
$\Rightarrow$ **A(BDEC) = ? cm^2**



A) 6 B) 12 C) 18 D) 24 E) 30

Çözüm / Solution Yanıt / Answer **C**

$[DE] // [BC] \Leftrightarrow \widehat{ADE} \sim \widehat{ABC}$

$\frac{|AD|}{|AB|} = \frac{|AE|}{|AC|} = k$

$|AD| = x \Rightarrow |AB| = 2x \Rightarrow k = \frac{x}{2x} = \frac{1}{2}$

$\frac{A(\widehat{ADE})}{A(\widehat{ABC})} = k^2 \Rightarrow \frac{6}{A(\widehat{ABC})} = \frac{1}{4} \Rightarrow A(\widehat{ABC}) = 24\ cm^2$

$A(BDEC) = A(\widehat{ABC}) - A(\widehat{ADE}) = 24 - 6 = 18\ cm^2$

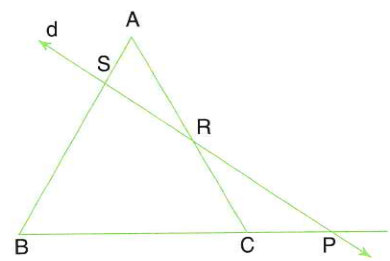
ÖZEL TEOREMLER / SPECIAL THEOREMS

Menelaus Teoremi / Menelaus Theorem

Bir ABC üçgeninin BC kenarının uzantısı ile [AB] ve [AC] kenarını kesen d doğrusu verildiğinde aşağıdaki eşitlik vardır. Bu eşitliğe **Menelaus Toremi** denir.

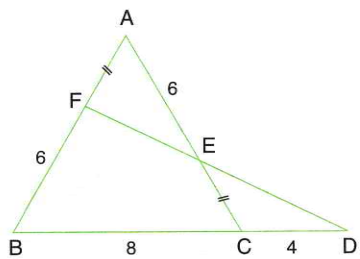
If the extention of side [BC] in the triangle ABC intersects with a line like d which cuts sides [AB],[AC] sides, the following equation can be obtained. This equation is called **Menelaus Theorem**.

$$\frac{|PC|}{|PB|} \cdot \frac{|BS|}{|AS|} \cdot \frac{|AR|}{|CR|} = 1 \text{ veya (or) } \frac{|AS|}{|AB|} \cdot \frac{|BC|}{|CP|} \cdot \frac{|PR|}{|RS|} = 1$$



Örnek / Example 15

|CD| = 4 cm,
|BC| = 8 cm,
|BF| = 6 cm,
|AE| = 6 cm
$\Rightarrow$ **|AF| = |EC| = x = ? cm**



A) 2 B) $2\sqrt{3}$ C) 4 D) $4\sqrt{3}$ E) 6

Çözüm / Solution Yanıt / Answer **B**

ABC üçgenine Menelaus Teoremi uygulanırsa aşağıdaki sonuç elde edilir.

By applying Menelaus Theorem to the ABC triangle, we obtain following result.

$\frac{|DC|}{|DB|} \cdot \frac{|BF|}{|FA|} \cdot \frac{|AE|}{|EC|} = 1$

$\frac{4}{12} \cdot \frac{6}{|FA|} \cdot \frac{6}{|EC|} = 1$

$12 = |EC| \cdot |FA|$

$|EC| = |FA| = x \Rightarrow x^2 = 12$

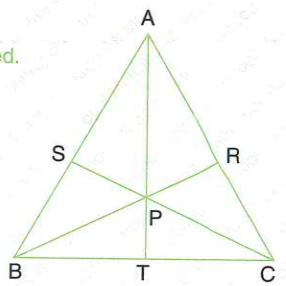
$x = 2\sqrt{3}\ cm$

Seva Teoremi / Ceva Theorem

Şekildeki ABC üçgeninde **Seva Teoremi** uygulanırsa aşağıdaki eşitlik elde edilir.

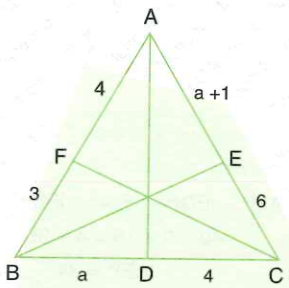
If we apply **Ceva Theorem** for the triangle ABC in the figure, the following equation will be obtained.

$$\frac{|AS|}{|BS|}\cdot\frac{|BT|}{|CT|}\cdot\frac{|CR|}{|AR|}=1$$



Örnek / Example 16

|DC| = |AF| = 4 cm,
|FB| = 3 cm,
|BD| = a cm,
|EC| = 6 cm,
|EA| = (a + 1) cm
⇒ **a = ? cm**



A) 1 B) 2 C) 3 D) 4 E) 5

Çözüm / Solution

Yanıt / Answer **A**

ABC üçgenine Seva Teoremi uygulanırsa aşağıdaki sonuç elde edilir.

Applying Ceva Theorem to the ABC triangle we obtain following result.

$$\frac{|BD|}{|DC|}\cdot\frac{|CE|}{|AE|}\cdot\frac{|AF|}{|FB|}=1$$

$$\frac{a}{4}\cdot\frac{6}{a+1}\cdot\frac{4}{3}=1$$

$$2a = a + 1$$

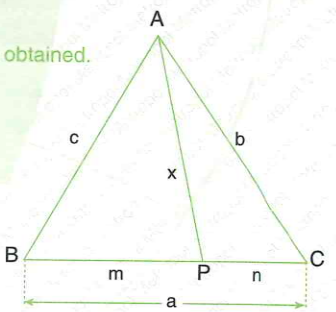
$$a = 1\,cm$$

Stewart Teoremi / Stewart Theorem

Şekildeki ABC üçgeninde **Stewart Teoremi** uygulanırsa aşağıdaki eşitlik elde edilir.

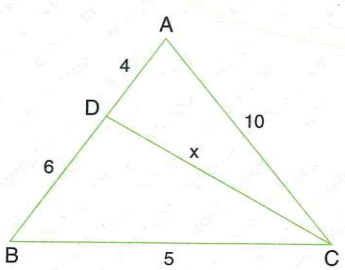
If we apply **Stewart Theorem** for the triangle ABC in the figure, the following equation will be obtained.

$$x^2=\frac{b^2\cdot m+c^2\cdot n}{a}-m\cdot n$$



Örnek / Example 17

|AD| = 4 cm,
|BD| = 6 cm,
|AC| = 10 cm,
|BC| = 5 cm
⇒ **|CD| = x = ? cm**



A) $\sqrt{31}$ B) $\sqrt{34}$ C) $\sqrt{41}$ D) $\sqrt{46}$ E) $\sqrt{51}$

Çözüm / Solution

Yanıt / Answer **D**

ABC üçgeninde Stewart Teoremi uygulanırsa aşağıdaki sonuç elde edilir.

By applying Stewart Theorem to the triangle ABC we obtain following result.

$$x^2=\frac{|BC|^2\cdot|AD|+|AC|^2\cdot|BD|}{|AB|}-|AD|\cdot|DB|$$

$$x^2=\frac{25\cdot4+100\cdot6}{10}-6\cdot4$$

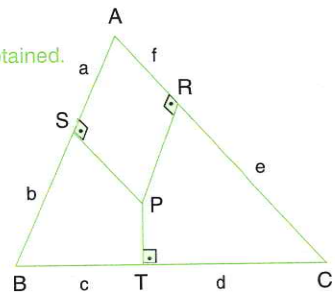
$$x^2 = 46\,cm^2 \Rightarrow |CD| = x = \sqrt{46}\,cm$$

Carnot Teoremi / Carnot Theorem

Şekildeki ABC üçgeninde **Carnot Teoremi** uygulanırsa aşağıdaki eşitlik elde edilir.

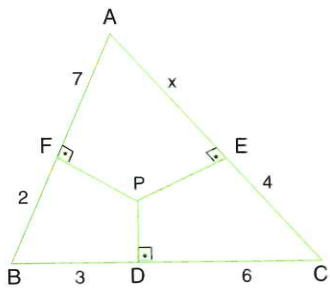
If we apply **Carnot Theorem** to for the triangle ABC in the figure, the following equation will be obtained.

$$a^2 + c^2 + e^2 = b^2 + d^2 + f^2$$



Örnek / Example 18

|BD| = 3 cm,
|DC| = 6 cm,
|BF| = 2 cm,
|AF| = 7 cm,
|EC| = 4 cm
⇒ **|AE| = x = ? cm**



A) $\sqrt{34}$ B) $\sqrt{41}$ C) $\sqrt{43}$ D) $\sqrt{47}$ E) $\sqrt{51}$

Çözüm / Solution

Yanıt / Answer **A**

ABC üçgeninde Carnot Teoremi uygulanırsa aşağıdaki sonuç elde edilir.

by applying Carnot Theorem to the triangle ABC, we obtain following result.

$$|AF|^2 + |BD|^2 + |EC|^2 = |FB|^2 + |DC|^2 + |AE|^2$$
$$49 + 9 + 16 = 4 + 36 + |AE|^2$$
$$|AE|^2 = 34$$
$$|AE| = \sqrt{34} \text{ cm}$$

ÜÇGENDE ALAN / AREA in TRIANGLE

ÜÇGENDE ALAN BAĞINTILARI / THE AREA RELATIONS in TRIANGLE

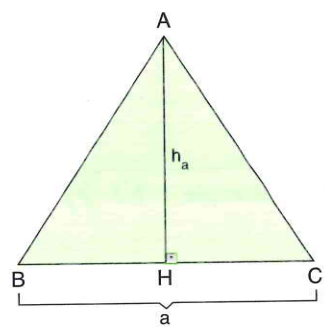
Bir üçgenin alanı, bir kenar ve o kenara ait yüksekliğinin çarpımının yarısına eşittir.

The area of a triangle is one-half the product of the altitude to a side and the side.

a : taban / base

h_a : yükseklik / height

$[AH] \perp [BC]$, $A(\widehat{ABC}) = \frac{a \cdot h_a}{2}$

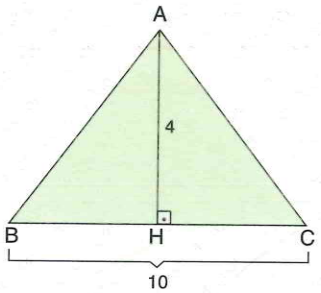


ÖNEMLİ / IMPORTANT

$m(\widehat{A}) = 90° \Rightarrow$ Alan (Area) $= \frac{|BA| \cdot |AC|}{2}$

Örnek / Example 19

[AH] ⊥ [BC],
IBCI = 10 cm,
IAHI = 4 cm
⇒ $A(\widehat{ABC}) = ?\ cm^2$



A) 18 B) 20 C) 22 D) 24 E) 26

Çözüm / Solution Yanıt / Answer **B**

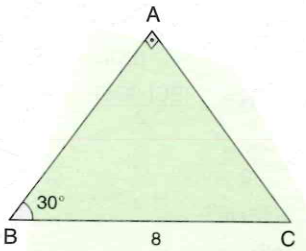
$$A(\widehat{ABC}) = \frac{IAHI \cdot IBCI}{2}$$

$$= \frac{4 \cdot 10}{2}$$

$$= 20\ cm^2$$

Örnek / Example 20

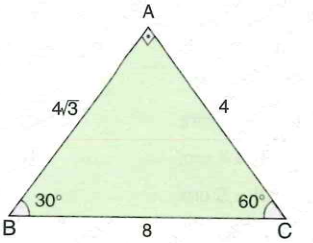
[AB] ⊥ [AC],
$m(\widehat{ABC}) = 30°$,
IBCI = 8 cm
⇒ $A(\widehat{ABC}) = ?\ cm^2$



A) $8\sqrt{3}$ B) $7\sqrt{3}$ C) $6\sqrt{3}$ D) $5\sqrt{3}$ E) $3\sqrt{3}$

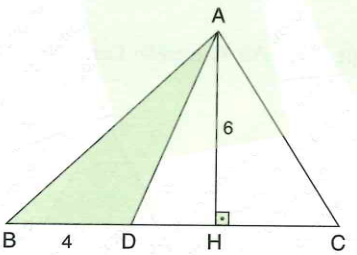
Çözüm / Solution Yanıt / Answer **A**

$$A(\widehat{ABC}) = \frac{4 \cdot 4\sqrt{3}}{2} = 8\sqrt{3}\ cm^2$$



Örnek / Example 21

[AH] ⊥ [BC],
IAHI = 6 cm,
IBDI = 4 cm
⇒ $A(\widehat{ABD}) = ?\ cm^2$



A) 18 B) 16 C) 14 D) 12 E) 10

Çözüm / Solution Yanıt / Answer **D**

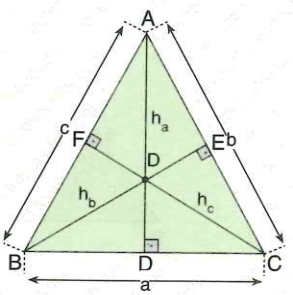
$$A(\widehat{ABD}) = \frac{IBDI \cdot IAHI}{2}$$

$$= \frac{4 \cdot 6}{2}$$

$$= 12\ cm^2$$

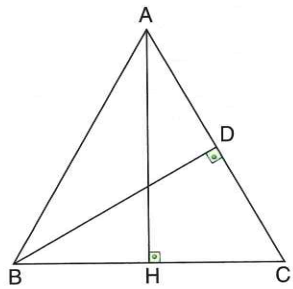
Farklı Tabanlara Göre Alan / Areas Related to Different Bases

$$A(\widehat{ABC}) = \frac{a \cdot h_a}{2} = \frac{b \cdot h_b}{2} = \frac{c \cdot h_c}{2}$$



Örnek / Example 22

|BD| = 8 cm,
|AC| = 9 cm,
|AH| = 6 cm
⇒ **|BC| = ? cm**



A) 10 B) 10,5 C) 11 D) 12 E) 12,5

Çözüm / Solution Yanıt / Answer **D**

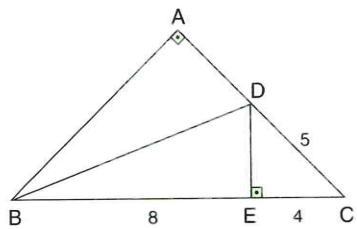
$$A(\widehat{ABC}) = \frac{|BC|\cdot|AH|}{2} = \frac{|AC|\cdot|BD|}{2} \Rightarrow \frac{|BC|\cdot 6}{2} = \frac{9\cdot 8}{2}$$

$$|BC|\cdot 6 = 72$$

$$|BC| = 12\,cm$$

Örnek / Example 23

[BA] ⊥ [AC],
[DE] ⊥ [BC],
|BE| = 8 cm,
|EC| = 4 cm,
|DC| = 5 cm
⇒ **|AB| = ? cm**



A) 6,8 B) 7 C) 7,2 D) 7,4 E) 7,6

Çözüm / Solution Yanıt / Answer **C**

$$[DE]\perp[EC] \Rightarrow \left.\begin{matrix}|DC| = 5\,cm\\ |EC| = 4\,cm\end{matrix}\right\} \Rightarrow |DE| = 3\,cm$$

$$A(\widehat{BDC}) = \frac{|BC|\cdot|DE|}{2}$$

$$= \frac{12\cdot 3}{2}$$

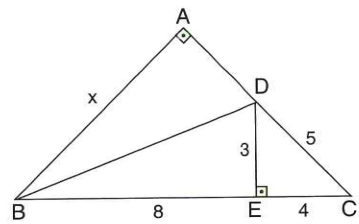
$$= 18\,cm^2$$

$$|AB| = x$$

$$\Rightarrow A(\widehat{BDC}) = \frac{|DC|\cdot|AB|}{2}$$

$$18 = \frac{5.x}{2}$$

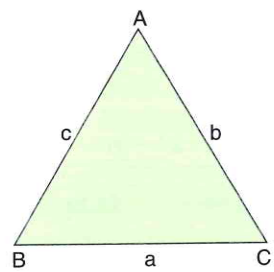
$$x = 7,2\,cm$$



Tüm Kenar Uzunlukları Bilinen Üçgenin Alanı / The Area of Triangle with All The Side Lengths Known

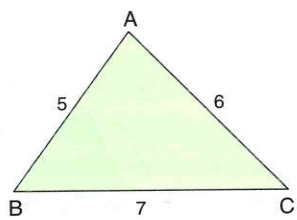
$$2u = a+b+c \Rightarrow u = \frac{a+b+c}{2}$$

$$A(\widehat{ABC}) = \sqrt{u.(u-a).(u-b).(u-c)}$$



Örnek / Example 24

|AB| = 5 cm,
|AC| = 6 cm,
|BC| = 7 cm
⇒ **A(ABC) = ? cm²**



A) $\sqrt{6}$ B) $2\sqrt{6}$ C) $3\sqrt{6}$ D) $4\sqrt{6}$ E) $6\sqrt{6}$

Çözüm / Solution Yanıt / Answer **E**

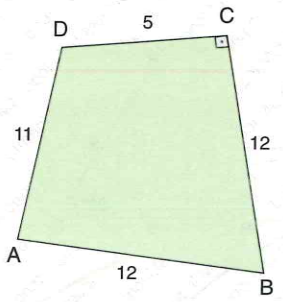
$$u = \frac{5+6+7}{2} = 9 \Rightarrow A(\widehat{ABC}) = \sqrt{9\cdot(9-5)\cdot(9-6)\cdot(9-7)}$$

$$= \sqrt{9\cdot 4\cdot 3\cdot 2}$$

$$= 3\cdot 2\cdot\sqrt{6} = 6\sqrt{6}\,cm^2$$

Örnek / Example 25

[DC] ⊥ [CB],
|DC| = 5 cm,
|CB| = |BA| = 12 cm,
|DA| = 11 cm
⇒ **A(ABCD) = ? cm²**



A) $6+30\sqrt{5}$ B) $30+36\sqrt{5}$ C) $36+30\sqrt{5}$
D) $30+6\sqrt{105}$ E) $36+6\sqrt{105}$

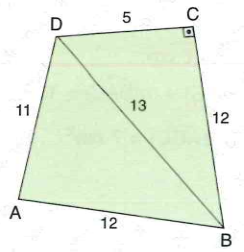
Çözüm / Solution Yanıt / Answer **D**

$$A(\widehat{DCB}) = \frac{|DC|\cdot|BC|}{2}$$
$$= \frac{5\cdot 12}{2}$$
$$= 30$$

$$\widehat{ABD} \Rightarrow u = \frac{11+12+13}{2}$$
$$u = \frac{36}{2} \Rightarrow u = 18$$

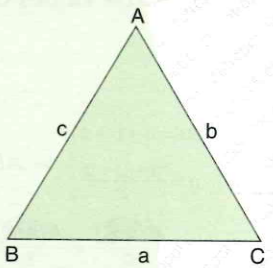
$$A(\widehat{ABD}) = \sqrt{18\cdot(18-11)\cdot(18-12)\cdot(18-13)}$$
$$= \sqrt{18\cdot 7\cdot 6\cdot 5}$$
$$= \sqrt{36\cdot 105} = 6\sqrt{105}$$

$$A(ABCD) = A(\widehat{DCB}) + A(\widehat{ABD})$$
$$= 30 + 6\cdot\sqrt{105}\ cm^2$$



İki Kenarı Ve Bu Kenarlar Arasındaki Kalan Açısı Bilinen Üçgenin Alanı
The Area of a Triangle with Lengths of Two Sides and The Measure Of The Angle Between Them

$$A(\widehat{ABC}) = \frac{b\cdot c}{2}\cdot \sin\widehat{A} = \frac{a\cdot c}{2}\cdot \sin\widehat{B} = \frac{a\cdot b}{2}\cdot \sin\widehat{C}$$



ÖNEMLİ / IMPORTANT

A, B veya C açılarından herhangi biri 90° ise, sin90° = 1 olduğundan, üçgenin alanı en büyük değerini alır ve aşağıdaki bağıntılarla hesaplanır.
If any one of angles A, B or C is 90°, the area of the triangle takes its maximum value as sin90° = 1, and calculated using relations below.

$m(\widehat{A}) = 90° \Rightarrow A(\widehat{ABC}) = \frac{b\cdot c}{2}$

$m(\widehat{B}) = 90° \Rightarrow A(\widehat{ABC}) = \frac{a\cdot c}{2}$

$m(\widehat{C}) = 90° \Rightarrow A(\widehat{ABC}) = \frac{a\cdot b}{2}$

Önemli bazı açıların sinüs değerleri / Sinus values of some important angles:

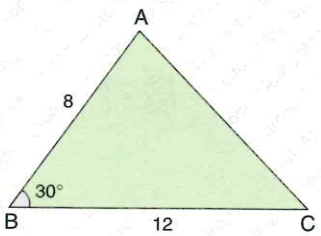
$\sin 30° = \sin 150° = \frac{1}{2}$

$\sin 45° = \sin 135° = \frac{\sqrt{2}}{2}$

$\sin 60° = \sin 120° = \frac{\sqrt{3}}{2}$

Örnek / Example 26

$m(\widehat{ABC}) = 30°$, ,
|AB| = 8 cm,
|BC| = 12 cm
⇒ **$A(\widehat{ABC})$ = ? cm²**



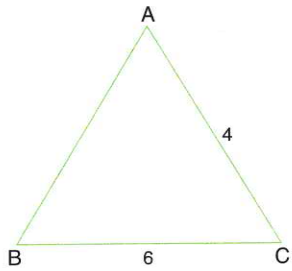
A) 18 B) 22 C) 24 D) 25 E) 26

Çözüm / Solution Yanıt / Answer **C**

$$A(\widehat{ABC}) = \frac{1}{2}\cdot 8\cdot 12\cdot \sin 30,$$
$$= \frac{1}{2}\cdot 8\cdot 12\cdot \frac{1}{2} = 24\ cm^2$$

Örnek / Example 27

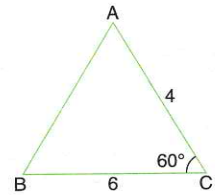
|AC| = 4 cm,
|BC| = 6 cm,
$m(\widehat{ABC}) + m(\widehat{BAC}) = 120°$
$\Rightarrow$ **$A(\widehat{ABC}) = ?\ cm^2$**



A) 12 B) $12\sqrt{3}$ C) 6 D) $6\sqrt{3}$ E) 3

Çözüm / Solution Yanıt / Answer **D**

$m(\widehat{ABC}) + m(\widehat{BAC}) = 120° \Rightarrow m(\widehat{ACB}) = 60°$

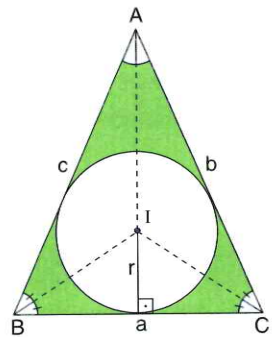


$A(\widehat{ABC}) = \frac{1}{2} \cdot 4 \cdot 6 \cdot \sin 60° = 12 \cdot \frac{\sqrt{3}}{2} = 6\sqrt{3}\ cm^2$

İç Teğet Çemberinin Yarıçapı r ve Çevresi 2u Olan Üçgenin Alanı
The Area of a Triangle with Incircle Radius of r and Perimeter of 2u

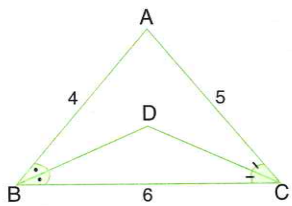
$$\left.\begin{array}{l} 2u = a+b+c \\ u = \frac{a+b+c}{2} \end{array}\right| \Rightarrow \boldsymbol{A(\widehat{ABC}) = u \cdot r}$$

$$\Rightarrow \frac{\boldsymbol{A(\widehat{AIB})}}{\boldsymbol{c}} = \frac{\boldsymbol{A(\widehat{AIC})}}{\boldsymbol{b}} = \frac{\boldsymbol{A(\widehat{BIC})}}{\boldsymbol{a}}$$



Örnek / Example 28

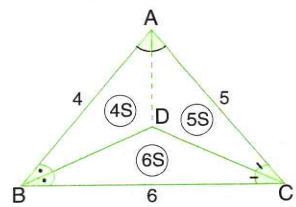
|AB| = 4 cm,
|AC| = 5 cm,
|BC| = 6 cm,
$m(\widehat{ABD}) = m(\widehat{DBC})$,
$m(\widehat{BCD}) = m(\widehat{ACD})$
$\Rightarrow \boldsymbol{\frac{A(\widehat{BCD})}{A(\widehat{ABC})} = ?}$



A) $\frac{6}{11}$ B) $\frac{4}{11}$ C) $\frac{3}{11}$ D) $\frac{2}{5}$ E) $\frac{3}{5}$

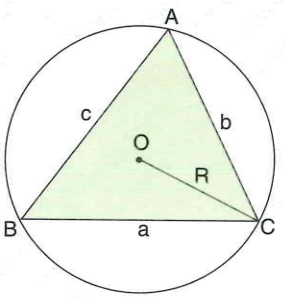
Çözüm / Solution Yanıt / Answer **D**

$A(\widehat{ABC}) = 4S + 5S + 6S = 15S$
$A(\widehat{BCD}) = 6S$
$\Rightarrow \frac{A(\widehat{BCD})}{A(\widehat{ABC})} = \frac{6S}{15S} = \frac{2}{5}$



Çevrel Çemberinin Yarıçapı R Olan Üçgenin Alanı
The Area of a Triangle with Excircle Radius of r

$$A(\widehat{ABC}) = \frac{a \cdot b \cdot c}{4R}$$



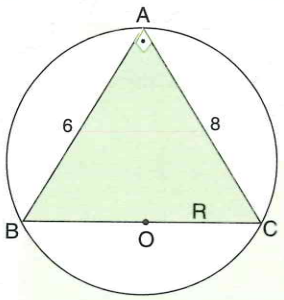
Örnek / Example 29

$[AB] \perp [AC]$,

$|AB| = 6$ cm,

$|AC| = 8$ cm

$\Rightarrow$ **R = ? cm**



A) 10 B) 8 C) 6 D) 5 E) 1

Çözüm / Solution

Yanıt / Answer **D**

$$A(\widehat{ABC}) = \frac{|BA| \cdot |AC|}{2} = \frac{6 \cdot 8}{2} = 24\,cm^2$$

$$A(\widehat{ABC}) = \frac{a \cdot b \cdot c}{4R} = 24\,cm^2$$

$a = 10\,cm, b = 8\,cm, c = 6\,cm$

$$\Rightarrow \frac{10 \cdot 8 \cdot 6}{4 \cdot R} = 24$$

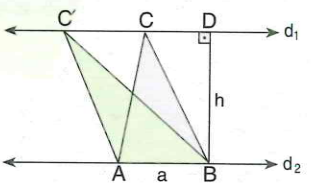
$\Rightarrow R = 5\,cm$

Sonuç 1 / Conclusion 1

Yükseklikleri ve taban uzunlukları eşit olan üçgenlerin alanları da eşittir.

Two triangles with equal altitudes and related base lengths have equal areas.

$d_1 // d_2 \Rightarrow A(\widehat{ABC}) = A(\widehat{ABC'})$



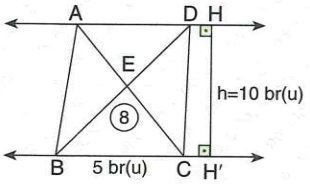
Örnek / Example 30

$|HH'| = 10$ br (u),

$|BC| = 5$ br (u),

$A(\widehat{BCE}) = 8$ br^2 (u^2)

$\Rightarrow$ **$A(\widehat{ABE}) + A(\widehat{DEC}) =$? br^2 (u^2)**



A) 30 B) 32 C) 34 D) 36 E) 38

Çözüm / Solution

Yanıt / Answer **C**

$$A(\widehat{ABC}) = A(\widehat{DBC}) = \frac{5 \cdot 10}{2} = 25\,br^2\,(u^2)$$

$$A(\widehat{ABE}) = 25 - 8 = 17\,br^2\,(u^2)$$

$$A(\widehat{DEC}) = 25 - 8 = 17\,br^2\,(u^2)$$

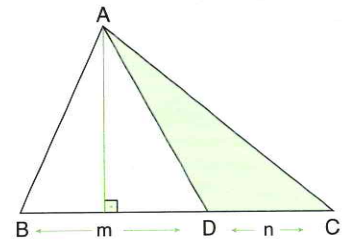
$$A(\widehat{ABE}) + A(\widehat{DEC}) = 17 + 17 = 34\,br^2\,(u^2)$$

Sonuç 2 / Conclusion 2

Yükseklikleri eşit olan üçgenlerin alanlarının oranı; o yüksekliğe ait taban uzunlukları oranına eşittir.

The ratio of the areas of two triangles with equal altitudes is equal to the ratio of related base lengths.

$$\frac{A(\widehat{ABD})}{A(\widehat{ADC})} = \frac{m}{n}$$

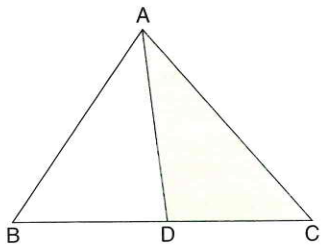


Örnek / Example 31

$|BD| = 3 \cdot |DC|$,

$A(\widehat{ABD}) = 12\ br^2\ (u^2)$

$\Rightarrow$ **$A(\widehat{ADC}) = ?\ br^2\ (u^2)$**



A) 1 B) 3 C) 4 D) 6 E) 12

Çözüm / Solution

Yanıt / Answer **C**

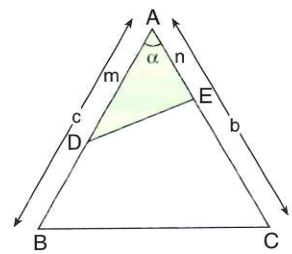
$$\frac{|BD|}{|DC|} = \frac{A(\widehat{ABD})}{A(\widehat{ADC})}$$

$$\Rightarrow 3 = \frac{12}{A(\widehat{ADC})}$$

$$\Rightarrow A(\widehat{ADC}) = 4\ br^2\ (u^2)$$

Sonuç 3 / Conclusion 3

$$\frac{A(\widehat{ADE})}{A(\widehat{ABC})} = \frac{\frac{1}{2} \cdot m \cdot n \cdot \sin\alpha}{\frac{1}{2} \cdot b \cdot c \cdot \sin\alpha} = \frac{m \cdot n}{b \cdot c}$$



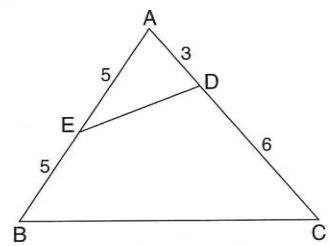
Örnek / Example 32

$|AD| = 3$ cm,

$|AE| = |EB| = 5$ cm,

$|DC| = 6$ cm

$\Rightarrow$ **$\frac{A(\widehat{AED})}{A(BEDC)} = ?$**



A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{1}{4}$ D) $\frac{1}{5}$ E) $\frac{1}{6}$

Çözüm / Solution

Yanıt / Answer **D**

$$\frac{A(\widehat{AED})}{A(\widehat{ABC})} = \frac{3 \cdot 5}{10 \cdot 9} = \frac{1}{6} = \frac{S}{6S}$$

$$A(BEDC) = A(\widehat{ABC}) - A(\widehat{AED})$$

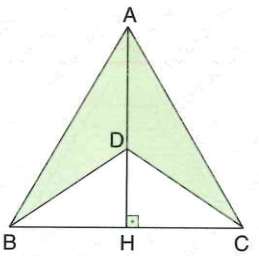
$$= 6S - S$$

$$= 5S$$

$$\frac{A(\widehat{AED})}{A(BEDC)} = \frac{S}{5S} = \frac{1}{5}$$

Sonuç 4 / Conclusion 4

$$A(ABDC) = \frac{|BC| \cdot |AD|}{2}$$



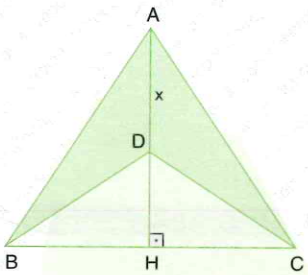
Örnek / Example 33

[BC] ⊥ [AH],

IBCI = 12 cm,

A(ABDC) = 36 cm²

⇒ **IADI = x = ? cm**



A) 6 B) 7 C) 8 D) 9 E) 10

Çözüm / Solution

Yanıt / Answer **A**

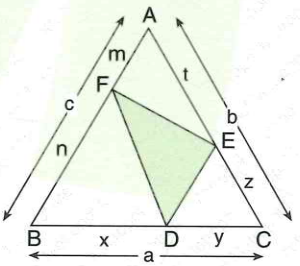
$$A(ABDC) = \frac{IADI \cdot IBCI}{2}$$

$$36 = \frac{x \cdot 12}{2}$$

$$x = 6\,cm$$

Sonuç 5 / Conclusion 5

$$\frac{A(\widehat{DEF})}{A(\widehat{ABC})} = \frac{x \cdot z \cdot m + y \cdot t \cdot n}{a \cdot b \cdot c}$$

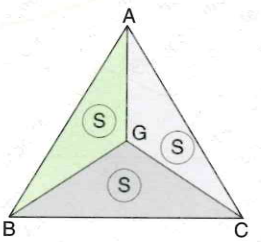


Sonuç 6 / Conclusion 6

G noktası ABC üçgeninin ağırlık merkezidir.

The point G is center of the gravity in $\widehat{ABC}$.

$$A(\widehat{AGB}) = A(\widehat{AGC}) = A(\widehat{BGC})$$



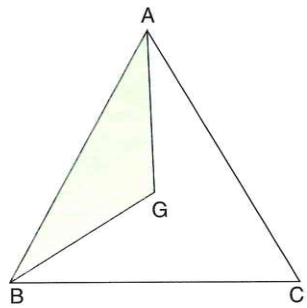
Örnek / Example 34

G noktası ABC üçgeninin ağırlık merkezidir.

The point G is center of the gravity in $\widehat{ABC}$.

$A(ACBG) = 40\ cm^2$

$\Rightarrow$ **$A(\widehat{BGA}) = ?\ cm^2$**



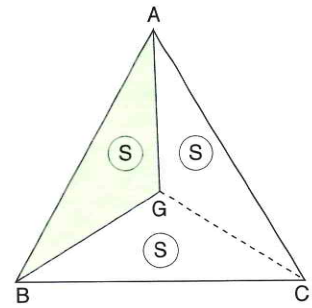
A) 5 B) 10 C) 20 D) 25 E) 30

Çözüm / Solution Yanıt / Answer **C**

$2S = 40\ cm^2$

$S = 20\ cm^2$

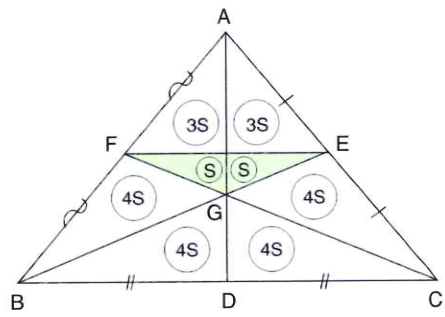
$A(\widehat{BGA}) = S = 20\ cm^2$



Sonuç 7 / Conclusion 7

G noktası, ABC üçgeninin ağırlık merkezidir.

The point G is center of the gravity in $\widehat{ABC}$.



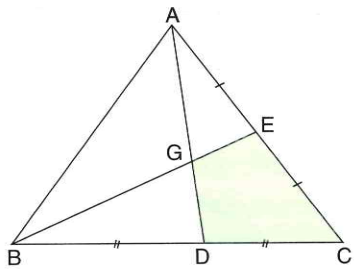
Örnek / Example 35

$|BD| = |DC|$,

$|AE| = |EC|$,

$A(\widehat{ABC}) = 18\ cm^2$

$\Rightarrow$ **$A(GDCE) = ?\ cm^2$**



A) 3 B) 5 C) 6 D) 9 E) 12

Çözüm / Solution Yanıt / Answer **C**

$A(\widehat{ABC}) = 18\ cm^2 \Rightarrow |AE| = |EC|$ ve (and)

$A(\widehat{ABE}) = A(\widehat{EBC}) = 9\ cm^2$

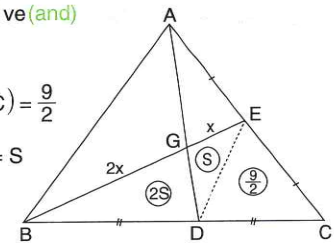
$|BD| = |DC| \Rightarrow A(\widehat{BED}) = A(\widehat{DEC}) = \frac{9}{2}$

$|GE| = x, |BG| = 2x \Rightarrow A(\widehat{GED}) = S$

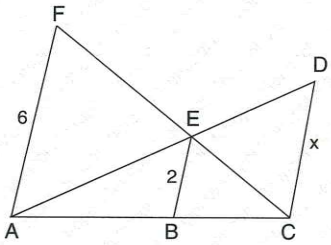
$\Rightarrow A(\widehat{BGD}) = 2S$

$\Rightarrow 3S = \frac{9}{2}, S = \frac{3}{2}$

$A(GDCE) = S + \frac{9}{2} = \frac{3}{2} + \frac{9}{2} = 6\ cm^2$

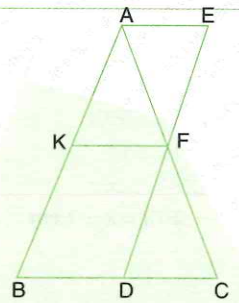


1. [AF] // [BE] // [DC],
|AF| = 6 cm,
|EB| = 2 cm
⇒ **|DC| = x = ? cm**



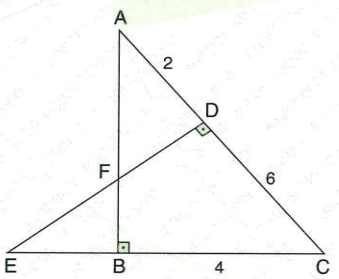
A) 2,5 B) 3 C) 3,5
D) 4 E) 5

2. [AE] // [BC] // [KF],
$\frac{|AE|}{|DC|} = \frac{3}{2}$
⇒ $\frac{|KF|}{|BC|} = ?$



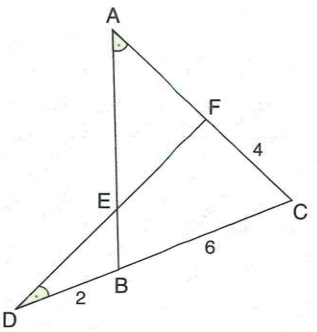
A) $\frac{3}{5}$ B) $\frac{2}{5}$ C) $\frac{1}{5}$
D) $\frac{1}{3}$ E) $\frac{1}{4}$

3. [AB] ⊥ [BC],
[ED] ⊥ [AC],
|AD| = 2 cm,
|DC| = 6 cm,
|BC| = 4 cm
⇒ **|EB| = ? cm**



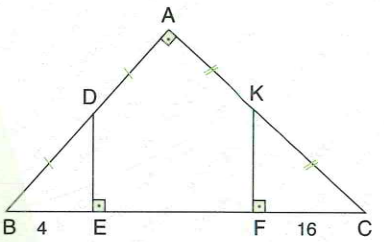
A) 6 B) 8 C) 9
D) 10 E) 12

4. [AB] ∩ [DF] = {E},
|FC| = 4 cm,
|DB| = 2 cm,
|BC| = 6 cm
⇒ **|AF| = ? cm**



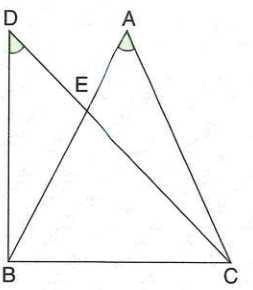
A) $\frac{9}{2}$ B) 5 C) 6
D) 7 E) 8

5. [AB] ⊥ [AC],
[DE] ⊥ [BC],
[KF] ⊥ [BC],
|FC| = 16 cm,
|BE| = 4 cm
⇒ **|EF| = ? cm**



A) 8 B) 20 C) 16
D) 12 E) 18

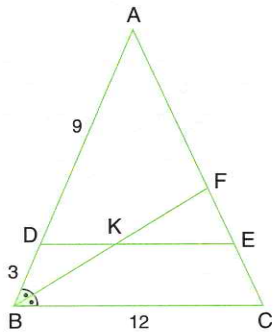
6. $m(\widehat{D}) = m(\widehat{A})$,
|EB| = |EC|
⇒ $\frac{|DC|}{|AB|} = ?$



A) $\frac{1}{4}$ B) $\frac{1}{3}$ C) $\frac{1}{2}$
D) 1 E) $\frac{3}{2}$

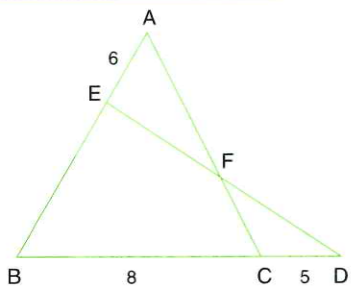
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [BF] bir açıortaydır.
[BF] is a bisector.
[DE] // [BC],
|AD| = 9 cm,
|DB| = 3 cm,
|BC| = 12 cm
⇒ $\frac{|FE|}{|FC|}$ = ?



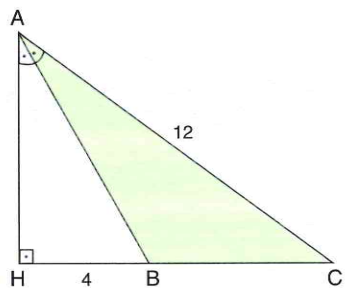
A) 1 B) $\frac{1}{2}$ C) $\frac{1}{3}$
D) $\frac{1}{4}$ E) $\frac{1}{6}$

8. $A(\widehat{AEF}) = A(\widehat{FCD})$
|BC| = 8 cm,
|CD| = 5 cm,
|AE| = 6 cm
⇒ **|BE| = x = ? cm**



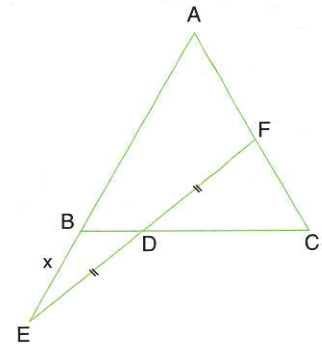
A) 9 B) $\frac{46}{5}$ C) $\frac{48}{5}$
D) 10 E) $\frac{52}{5}$

9. [AB] bir açıortaydır.
[AB] is a bisector.
$m(\widehat{H}) = 90°$,
|HB| = 4 cm,
|AC| = 12 cm
⇒ **$A(\widehat{ABC})$ = ? cm²**



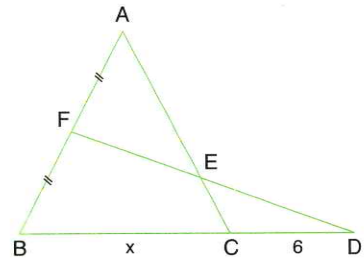
A) 36 B) 30 C) 24
D) 20 E) 18

10. |ED| = |DF|,
|DC| = 4|BD|,
|AE| = 20 cm
⇒ **|BE| = x = ? cm**



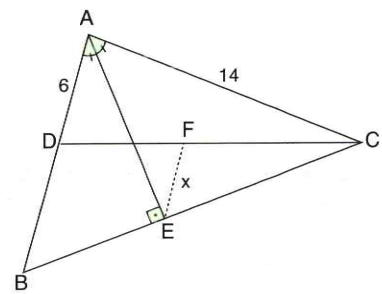
A) 7 B) $\frac{15}{2}$ C) 8
D) $\frac{17}{2}$ E) 9

11. [FD] ∩ [AC] = {E},
|AE| = 5·|EC|,
|AF| = |FB|,
|CD| = 6 cm
⇒ **|BC| = x = ? cm**



A) 20 B) 24 C) 25
D) 28 E) 32

12. [AE] açıortaydır.
[AE] is a bisector.
AE ⊥ BC,
|AD| = 6 cm,
|AC| = 14 cm,
|FE| = x,
|DF| = |FC|
⇒ **x = ? cm**



A) $\frac{5}{2}$ B) $\frac{7}{2}$ C) 2
D) 3 E) 4

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
B	A	B	E	B	D	B	C	C	B	B	E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $[AF] /\!/ [BE] : \frac{2}{6} = \frac{|BC|}{|AC|} \Rightarrow \frac{1}{3} = \frac{|BC|}{|AC|}$

$|BC| = t, |AB| = 2t$

$[BE] /\!/ [DC] : \frac{2}{x} = \frac{|AB|}{|AC|} = \frac{2t}{3t} \Rightarrow x = 3\,cm$

Yanıt / The Answer is B

2. $\widehat{AFE} \sim \widehat{CFD} \Leftrightarrow \frac{|AF|}{|CF|} = \frac{|AE|}{|CD|} = \frac{3}{2}$

$\widehat{AKF} \sim \widehat{ABC} \Leftrightarrow \frac{|AF|}{|AC|} = \frac{|KF|}{|BC|}$

$2|AF| = 3|FC| \Rightarrow |AF| = 3n \Rightarrow |FC| = 2n$

$|AC| = 3n + 2n = 5n$

$\frac{|AF|}{|AC|} = \frac{|KF|}{|BC|} \Rightarrow \frac{3n}{5n} = \frac{|KF|}{|BC|}$

$\Rightarrow \frac{|KF|}{|BC|} = \frac{3}{5}$

Yanıt / The Answer is A

3. $m(\widehat{E}) = \alpha, m(\widehat{BFE}) = \beta$

$\Rightarrow m(\widehat{A}) = \alpha, m(\widehat{C}) = \beta$

$\widehat{ABC} \sim \widehat{EDC}$

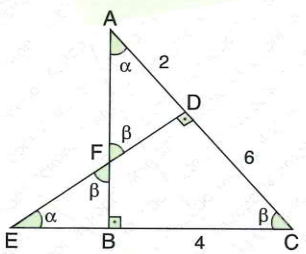
$\frac{|AB|}{|ED|} = \frac{|BC|}{|DC|} = \frac{|AC|}{|EC|}$

$\frac{|BC|}{|DC|} = \frac{4}{6} \Rightarrow \frac{|AC|}{|EC|} = \frac{4}{6}$

$\frac{8}{|EC|} = \frac{4}{6}$

$|EC| = 12\,cm$

$|EB| = |EC| - |BC| = 12 - 4 = 8\,cm$



Yanıt / The Answer is B

4. $m(\widehat{D}) = m(\widehat{A}),\ m(\widehat{F}) = m(\widehat{B}),$

$\widehat{ABC} \sim \widehat{DFC}$

$\frac{|AB|}{|DF|} = \frac{|BC|}{|FC|} = \frac{|AC|}{|DC|} \Rightarrow \frac{|BC|}{|FC|} = \frac{6}{4}$

$\frac{|BC|}{|FC|} = \frac{|AC|}{|DC|} \Rightarrow \frac{6}{4} = \frac{|AC|}{8} \Rightarrow |AC| = \frac{6 \cdot 8}{4} = 12\,cm$

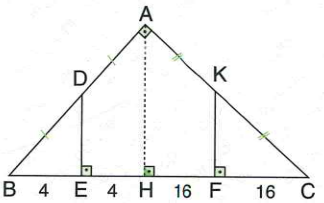
$|AF| = |AC| - |FC| = 12 - 4 = 8\,cm$

Yanıt / The Answer is E

5. $[AH] /\!/ [DE] /\!/ [KF] :$

$|BE| = |EH| = 4\ cm,\ |FC| = |HF| = 16\ cm$

$|EF| = 4 + 16 = 20\ cm$



Yanıt / The Answer is B

6. $m(\widehat{DEB}) = m(\widehat{AEC})$

$m(\widehat{DEB}) = m(\widehat{AEC}), m(\widehat{D}) = m(\widehat{A}) \Rightarrow m(\widehat{DBA}) = m(\widehat{ACD})$

$|EB| = |EC|, m(\widehat{DBA}) = m(\widehat{ACD}) \Rightarrow m(\widehat{DBC}) = m(\widehat{ACB})$

$\widehat{DCB} \sim \widehat{ABC}$ (A.A.A)

$\frac{|DC|}{|AB|} = \frac{|DB|}{|AC|} = \frac{|CB|}{|BC|},$

$\frac{|CB|}{|BC|} = 1 \Rightarrow \frac{|DC|}{|AB|} = 1$

Yanıt / The Answer is D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $\widehat{ADE} \sim \widehat{ABC}$ (A.A.A)

$\frac{|AD|}{|AB|} = \frac{|AE|}{|AC|} = \frac{|DE|}{|BC|} \Rightarrow \frac{9}{12} = \frac{|DE|}{12}$

$\Rightarrow |DE| = 9\,cm$

$[DE] // [BC] \Rightarrow m(\widehat{DBK}) = m(\widehat{DKB})$

$|BD| = |DK| = 3$ cm

$|KE| = |DE| - |DK|$

$|KE| = 9 - 3 = 6$ cm

$m(\widehat{DKB}) = m(\widehat{FKE})$,

$[KE]//[BC] \Rightarrow \widehat{FKE} \sim \widehat{FBC}$ (A.A.A)

$\frac{|FK|}{|FB|} = \frac{|FE|}{|FC|} = \frac{|KE|}{|BC|}$,

$\frac{|KE|}{|BC|} = \frac{6}{12} \Rightarrow \frac{|FE|}{|FC|} = \frac{6}{12} = \frac{1}{2}$

Yanıt / The Answer is B

8. $A(\widehat{AEF}) = A(\widehat{FCD}) = S_1$,

$A(BCFE) = S_2$

$A(\widehat{ABC}) = S_2 + S_1$

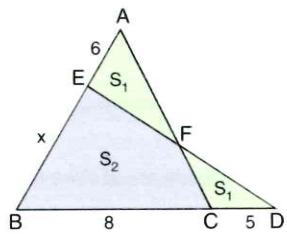
$A(BED) = S_2 + S_1$

$\Rightarrow A(\widehat{ABC}) = A(\widehat{BED})$

$\frac{1}{2} \cdot (x+6) \cdot 8 \cdot \sin\widehat{B} = \frac{1}{2} \cdot x \cdot 13 \cdot \sin\widehat{B}$

$8x + 48 = 13x$

$5x = 48 \Rightarrow x = \frac{48}{5}$ cm



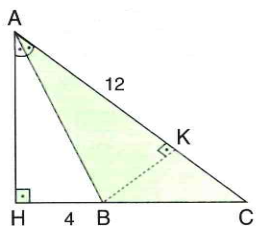
Yanıt / The Answer is C

9. $[BK] \perp [AC]$

$|BK| = |HB| = 4$ cm

$A(\widehat{ABC}) = \frac{12 \cdot 4}{2}$

$= 24\,cm^2$



Yanıt / The Answer is C

10. $\widehat{EKD} \sim \widehat{EAF}$

$\frac{|ED|}{|DF|} = \frac{|EK|}{|KA|} \Rightarrow$

$|EK| = |KA| = 10$ cm

$|EB| = x \Rightarrow$

$|BK| = 10 - x$

$[DK]//[AC] \Rightarrow$

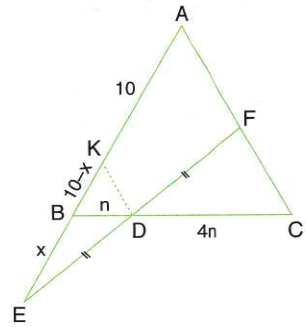
$\widehat{KBD} \sim \widehat{ABC}$

$\frac{|KB|}{|AB|} = \frac{|BD|}{|BC|}$

$\frac{10-x}{20-x} = \frac{1}{5}$

$50 - 5x = 20 - x$

$30 = 4x \Rightarrow x = \frac{15}{2}$ cm



Yanıt / The Answer is B

11. $[FN]//[BC] \Rightarrow |AN| = |NC|$

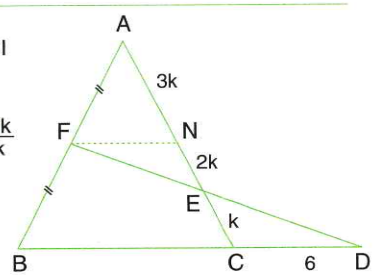
$\widehat{FNE} \sim \widehat{DCE}$ (A.A)

$\frac{|NE|}{|CE|} = \frac{|FE|}{|DE|} = \frac{|FN|}{6} = \frac{2k}{k}$

$|FN| = \frac{12k}{k} = 12$ cm

$\widehat{AFN} \sim \widehat{ABC}$ (A.A)

$\frac{12}{|BC|} = \frac{|AN|}{|AC|} = \frac{1}{2} \Rightarrow |BC| = 12 \cdot 2 = 24$ cm



Yanıt / The Answer is B

12. $|DF| = |FC|$,

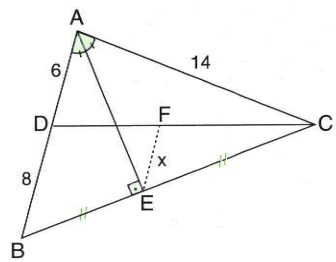
$|BE| = |EC|$

$\widehat{CDB} \sim \widehat{CFE}$

$\frac{|DB|}{|FE|} = \frac{|CD|}{|CF|}$

$\frac{8}{x} = \frac{2}{1} \Rightarrow 2x = 8$

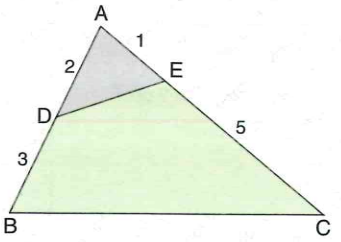
$\Rightarrow x = 4$ cm



Yanıt / The Answer is E

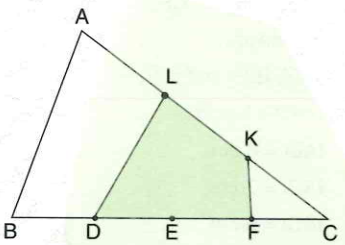
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $\dfrac{A(\widehat{ADE})}{A(\widehat{BCED})} = ?$



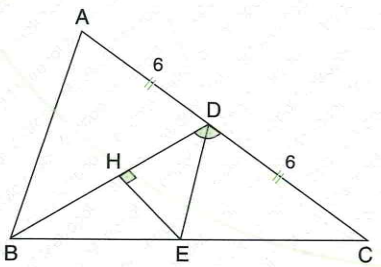
A) $\frac{1}{14}$ B) $\frac{1}{12}$ C) $\frac{2}{3}$ D) $\frac{2}{15}$ E) $\frac{3}{5}$

2. $|AL| = |LK| = |KC|$,
$|BD| = |DE| = |EF| = |FC|$,
$A(\widehat{ABC}) = 72\ cm^2$
$\Rightarrow$ **A(LDFK) = ? cm²**



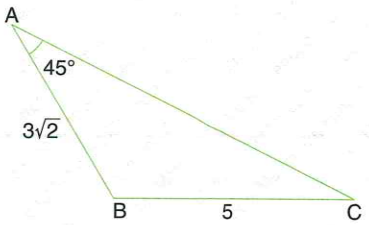
A) 18 B) 24 C) 30 D) 36 E) 40

3. $[BD] \perp [EH]$,
$|BD| = 10\ cm$,
$|AD| = |DC| = 6\ cm$,
$|HE| = 3\ cm$,
$m(\widehat{BDE}) = m(\widehat{EDC})$
$\Rightarrow$ **$A(\widehat{ABC}) = ?\ cm^2$**



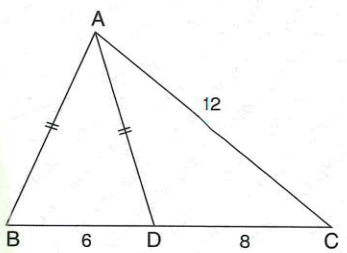
A) 36 B) 40 C) 48 D) 30 E) 32

4. $|AB| = 3\sqrt{2}\ cm$,
$|BC| = 5\ cm$,
$m(\widehat{BAC}) = 45°$
$\Rightarrow$ **$A(\widehat{ABC}) = ?\ cm^2$**



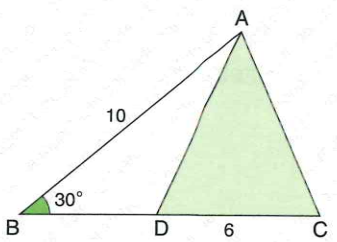
A) 8,5 B) 9 C) 9,5 D) 10 E) 10,5

5. $|AB| = |AD|$,
$|AC| = 12\ cm$,
$|BD| = 6\ cm$,
$|DC| = 8\ cm$
$\Rightarrow$ **$A(\widehat{ABC}) = ?\ cm^2$**



A) $15\sqrt{3}$ B) $7\sqrt{23}$ C) $8\sqrt{21}$ D) $8\sqrt{15}$ E) $9\sqrt{15}$

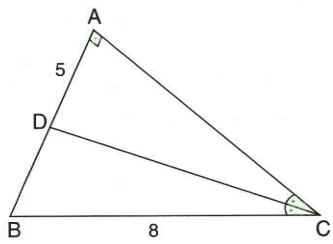
6. $|AB| = 10\ cm$,
$|DC| = 6\ cm$,
$m(\widehat{ABC}) = 30°$
$\Rightarrow$ **$A(\widehat{ADC}) = ?\ cm^2$**



A) 9 B) 12 C) 15 D) 18 E) 21

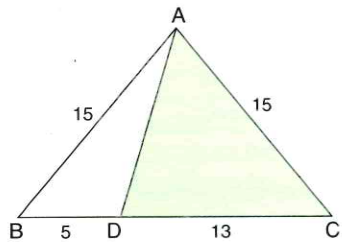
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [CD] bir açıortaydır.
[CD] is a bisector.
$m(\widehat{A}) = 90°$,
$|DA| = 5$ cm,
$|BC| = 8$ cm
$\Rightarrow$ **$A(\widehat{DBC}) = ?\ cm^2$**



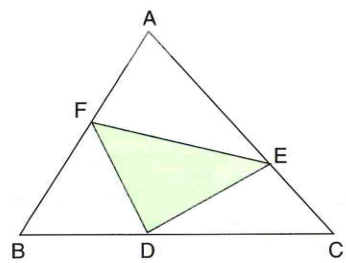
A) 10 B) 15 C) 20
D) 40 E) 50

8. $|AB| = |AC| = 15$ cm,
$|BD| = 5$ cm,
$|DC| = 13$ cm
$\Rightarrow$ **$A(\widehat{ADC}) = ?\ cm^2$**



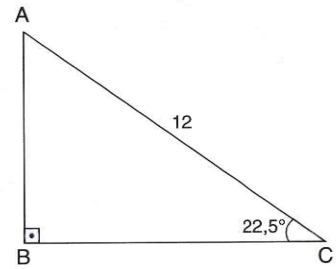
A) 78 B) 75 C) 70
D) 65 E) 63

9. $|AF| = |FB|$,
$|AE| = 3 \cdot |EC|$,
$|DC| = 2 \cdot |BD|$,
$A(\widehat{ABC}) = 72\ cm^2$
$\Rightarrow$ **$A(\widehat{FED}) = ?\ cm^2$**



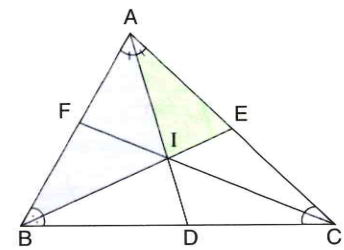
A) 25 B) 24 C) 23
D) 22 E) 21

10. $[AB] \perp [BC]$,
$m(\widehat{ACB}) = 22{,}5°$,
$|AC| = 12$ cm
$\Rightarrow$ **$A(\widehat{ABC}) = ?\ cm^2$**



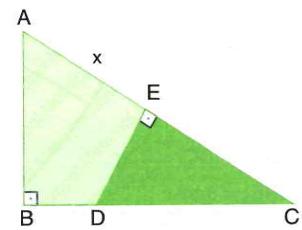
A) $9\sqrt{3}$ B) $2\sqrt{2}$ C) $18\sqrt{2}$
D) $5\sqrt{3}$ E) $20\sqrt{2}$

11. [AD], [BE] ve [CF] açıortaydır.
[AD], [BE] and [CF] are the bisectors.
$|AB| = 6$ cm,
$|AC| = 7$ cm,
$|BC| = 8$ cm
$\Rightarrow \dfrac{A(\widehat{ABI})}{A(\widehat{AIE})} = ?$



A) $\frac{3}{2}$ B) 2 C) $\frac{5}{7}$
D) 3 E) $\frac{7}{2}$

12. $[AB] \perp [BC]$,
$[AC] \perp [ED]$,
$A(AEDB) = A(\widehat{EDC})$,
$|AB| = 6$ cm,
$|BC| = 8$ cm
$\Rightarrow$ **$|AE| = x = ?$ cm**



A) $10-5\sqrt{2}$ B) $10-4\sqrt{2}$ C) $10-3\sqrt{3}$
D) $10-2\sqrt{3}$ E) $10-3\sqrt{2}$

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
A	C	C	E	B	C	C	A	E	C	B	B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.

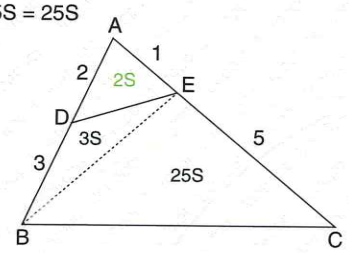
$\frac{A(\widehat{DEB})}{A(\widehat{AED})} = \frac{3}{2}$

$A(\widehat{DEB}) = 3S,$

$A(\widehat{ADE}) = 2S \Rightarrow \frac{A(\widehat{ABC})}{A(\widehat{BEC})} = \frac{1}{5}$

$A(\widehat{BEC}) = 5 \cdot A(\widehat{ABE}) = 5 \cdot 5S = 25S$

$\frac{A(\widehat{ADE})}{A(BCED)} = \frac{2S}{28S} = \frac{1}{14}$



Yanıt / The Answer is A

2.

$A(\widehat{BDA}) = \frac{72}{4} = 18\,cm^2$

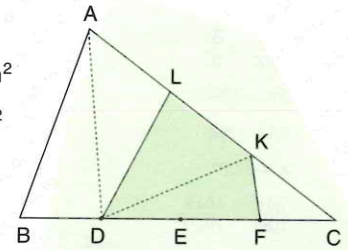
$A(\widehat{ADC}) = 72-18 = 54\,cm^2$

$A(\widehat{DLC}) = 54.\frac{2}{3} = 36\,cm^2$

$A(\widehat{DKC}) = \frac{36}{2} = 18\,cm^2$

$A(\widehat{KFC}) = \frac{18}{3} = 6\,cm^2$

$A(LDKF) = 36-6 = 30\,cm^2$



Yanıt / The Answer is C

3.

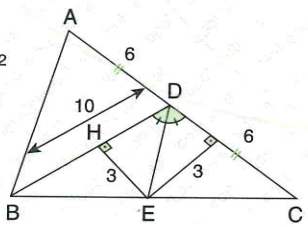
$A(\widehat{BED}) = \frac{10 \cdot 3}{2} = 15\,cm^2$

$A(\widehat{DEC}) = \frac{6 \cdot 3}{2} = 9\,cm^2$

$A(\widehat{BDC}) = 15+9 = 24\,cm^2$

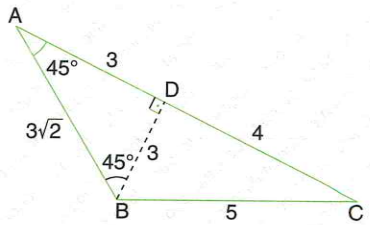
$A(\widehat{ABD}) = A(\widehat{BDC}) = 24\,cm^2$

$A(\widehat{ABC}) = 24+24 = 48\,cm^2$



Yanıt / The Answer is C

4.



$[BD] \perp [AC]$:

$A(\widehat{ABC}) = \frac{3 \cdot 7}{2} = \frac{21}{2}$

$= 10,5\,cm^2$

Yanıt / The Answer is E

5.

$|BH| = |HD| = 3\,cm$

$|AH|^2 + |HC|^2 = |AC|^2$

$|AH|^2 + 11^2 = 12^2$

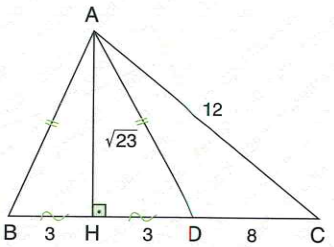
$|AH|^2 = 144-121$

$|AH| = \sqrt{23}\,cm$

$A(\widehat{ABC}) = \frac{|BC| \cdot |AH|}{2}$

$= \frac{14 \cdot \sqrt{23}}{2}$

$= 7\sqrt{23}\,cm^2$



Yanıt / The Answer is B

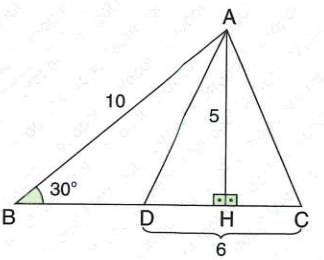
6.

$|AH| = \frac{10}{2} = 5\,cm$

$A(\widehat{ADC}) = \frac{|DC| \cdot |AH|}{2}$

$= \frac{6 \cdot 5}{2}$

$= 15\,cm^2$

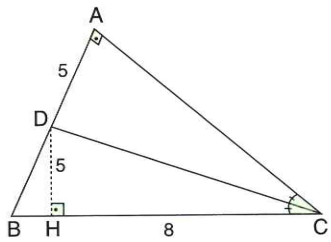


Yanıt / The Answer is C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [CD] bir açıortaydır.
[CD] is a bisector.
$[DH] \perp [BC]$
$|AD| = |DH| = 5$ cm

$$A(\widehat{DBC}) = \frac{8 \cdot 5}{2} = 20 \text{ cm}^2$$



Yanıt / The Answer is C

8. $|BH| = |HC| = 9$ cm

$|AH|^2 + |HC|^2 = |AC|^2$

$|AH|^2 + 9^2 = 15^2$

$|AH|^2 = 225-81$

$|AH|^2 = 144$

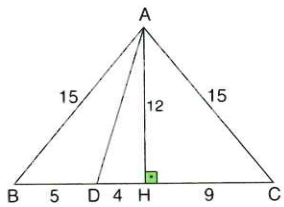
$|AH| = 12$ cm

$$A(\widehat{ADC}) = \frac{|DC| \cdot |AH|}{2}$$

$$= \frac{13 \cdot 12}{2}$$

$$= 13 \cdot 6$$

$$= 78 \text{ cm}^2$$



Yanıt / The Answer is A

9. $|AF| = |FB| = x$, $|EC| = y$, $|AE| = 3y$, $|BD| = z$, $|DC| = 2z \Rightarrow$

$$A(\widehat{AFE}) = \frac{x}{2x} \cdot \frac{3y}{4y} \cdot 72 = 27 \text{ cm}^2$$

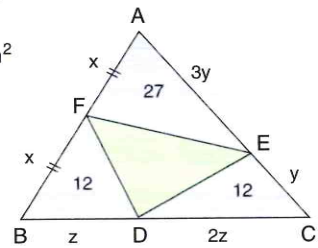
$$A(\widehat{BDE}) = \frac{x}{2x} \cdot \frac{z}{3z} \cdot 72 = 12 \text{ cm}^2$$

$$A(\widehat{DCE}) = \frac{2z}{3z} \cdot \frac{y}{4y} \cdot 72 = 12 \text{ cm}^2$$

$A(\widehat{FDE}) = 72-(27+12+12)$

$= 72-51$

$= 21 \text{ cm}^2$



Yanıt / The Answer is E

10. $$|BD| = \frac{|AC|}{2} = \frac{12}{2} = 6 \text{ cm}$$

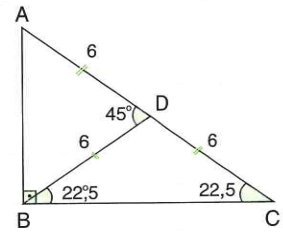
$m(\widehat{DBC}) = m(\widehat{DCB}) = 22,5°$

$m(\widehat{ADB}) = 22,5° + 22,5° = 45°$

$$A(\widehat{ADB}) = \frac{1}{2} \cdot 6 \cdot 6 \cdot \frac{\sqrt{2}}{2}$$

$$= \frac{36\sqrt{2}}{4} = 9\sqrt{2} \text{ cm}^2$$

$A(\widehat{ABC}) = 2 \cdot A(\widehat{ADB}) = 2 \cdot 9\sqrt{2} = 18\sqrt{2} \text{ cm}^2$



Yanıt / The Answer is C

11. $|AE| = x \Rightarrow |EC| = 7 - x$

$$\frac{|AE|}{|EC|} = \frac{|AB|}{|BC|}$$

$$\frac{x}{7-x} = \frac{6}{8}$$

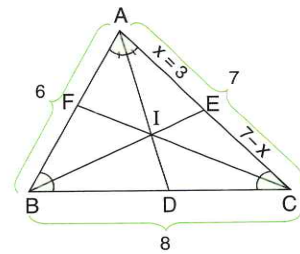
$8x = 42-6x$

$14x = 42$

$x = 3$ cm

$$\frac{|BI|}{|IE|} = \frac{|AB|}{|AE|}$$

$$\frac{|BI|}{|IE|} = \frac{6}{3} = 2 \qquad \frac{A(\widehat{ABI})}{A(\widehat{AIE})} = \frac{|BI|}{|IE|} = 2$$



Yanıt / The Answer is B

12. $m(\widehat{CED}) = m(\widehat{CBA}) = 90°$

$m(\widehat{C}) = m(\widehat{C})$

$\widehat{CED} \sim \widehat{CBA}$ (A.A.)

$$\frac{|CE|}{|CB|} = \frac{|CD|}{|CA|} = \frac{|ED|}{|BA|} = k$$

$A(\widehat{EDC}) = A(AEDB) = S \Rightarrow A(\widehat{ABC}) = 2S$

$$\frac{A(\widehat{EDC})}{A(\widehat{ABC})} = \frac{1}{2} = k^2 \Rightarrow k = \frac{1}{\sqrt{2}}$$

$|AC| = 10$, $|EC| = 10-x$

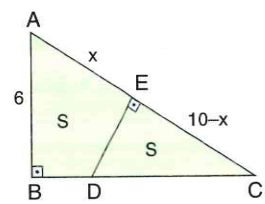
$$\frac{|CE|}{|CB|} = k \Rightarrow \frac{10-x}{8} = \frac{1}{\sqrt{2}}$$

$10\sqrt{2}-x\sqrt{2} = 8$

$10\sqrt{2}-8 = x\sqrt{2}$

$$x = \frac{10\sqrt{2}-8}{\sqrt{2}}$$

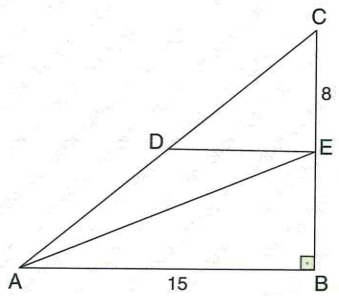
$$= \frac{\sqrt{2} \cdot (10-4\sqrt{2})}{\sqrt{2}} = 10-4\sqrt{2} \text{ cm}$$



Yanıt / The Answer is B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

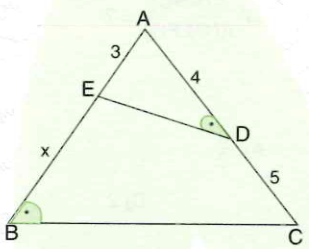
1. [DE] // [AB],
[AB] ⊥ [BC],
|AB| = 15 cm,
|EC| = 8,
3·|AD| = 2·|DC|
⇒ **Alan($\widehat{AED}$) = ?**
Area($\widehat{AED}$) = ?



A) 18 B) 20 C) 24 D) 28 E) 33

[İSTANBUL ÜNİVERSİTESİ – YÖS 2018]

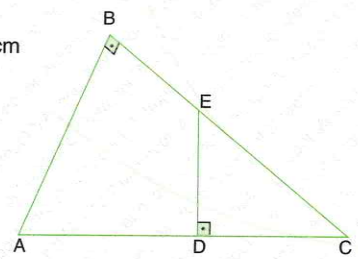
2. m($\widehat{ABC}$) = m($\widehat{ADE}$),
|AD| = 4, |DC| = 5,
|AE| = 3
⇒ **x = |BE| = ?**



A) 7 B) 8 C) 9 D) 10 E) 11

[İSTANBUL ÜNİVERSİTESİ – YÖS 2017]

3. |AD| = |DC|
|AB| = 12 cm, |AE| = 5 cm
A($\widehat{EDC}$) = ? cm²

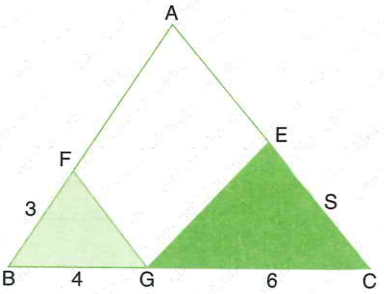


A) 39 B) 40 C) 60 D) 68 E) 70

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2016]

4. |AB| = |AC|

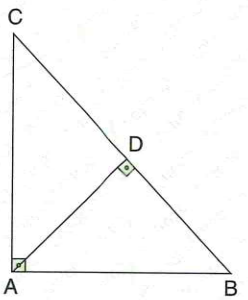
$\frac{A(\widehat{EGC})}{A(\widehat{BFG})} = ?$



A) $\frac{2}{5}$ B) $\frac{3}{5}$ C) 1 D) $\frac{5}{3}$ E) $\frac{5}{2}$

[İSTANBUL ÜNİVERSİTESİ – YÖS 2016]

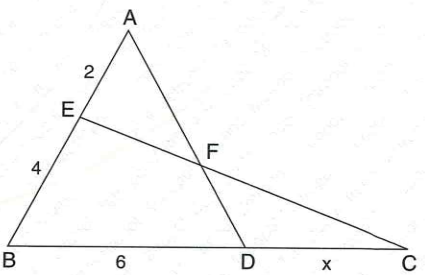
5. ABC bir üçgendir.
ABC is a triangle.
|DB| = 4 cm,
|AB| = 6 cm
⇒ **A($\widehat{ABC}$) = ? cm²**



A) 12 B) $7\sqrt{5}$ C) $9\sqrt{5}$ D) $\frac{7}{2}\sqrt{5}$ E) $3\sqrt{2}$

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2015]

6.



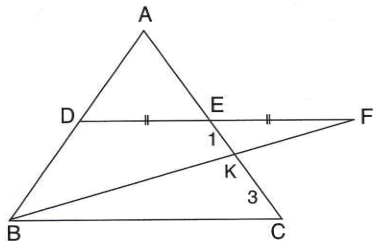
|AE| = 2 cm, |EB| = 4 cm, |BD| = 6 cm,
A($\widehat{BCE}$) = 2·A($\widehat{ABD}$) ⇒ **|DC| = x = ? cm**

A) 12 B) 11 C) 10 D) 19 E) 18

[AKDENİZ ÜNİVERSİTESİ – YÖS 2014]

METROPOL YAYINLARI • METROPOL PUBLICATIONS

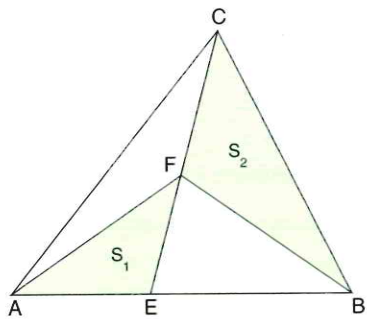
7. DF // BC,
IDEI = IEFI
IEKI = 1 cm
IKCI = 3 cm
IACI = ? cm



A) 5 B) $\frac{11}{2}$ C) 6 D) $\frac{13}{2}$ E) 7

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2013]

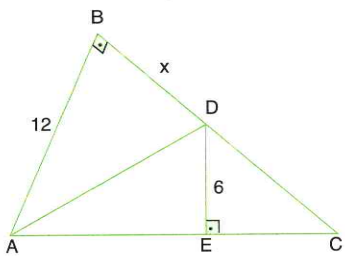
8. ABC üçgen / triangle,
IEFI = 2 cm,
IAEI = IFCI = 3 cm,
IEBI = 4 cm,
$A(\widehat{ABC}) = 35\ cm^2$,
$A(\widehat{AEF}) = S_1\ cm^2$,
$A(\widehat{CFB}) = S_2\ cm^2$
$\Rightarrow$ **$S_1 + S_2$ = ? cm^2**



A) 16 B) 17 C) 18 D) 19 E) 20

[KARADENİZ TEKNİK ÜNİVERSİTESİ – YÖS 2013]

9.



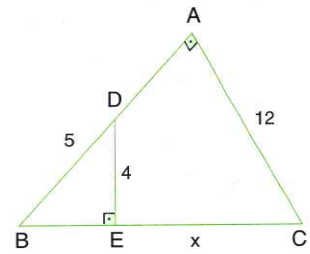
[AB] ⊥ [BC], [DE] ⊥ [AC], IABI = 12 cm, IDEI = 6 cm,
IACI = 20 cm, IBDI = x cm $\Rightarrow$ **x = ? cm**

A) 6 B) 7 C) 8 D) 9 E) 10

[KARADENİZ TEKNİK ÜNİVERSİTESİ – YÖS 2013]

METROPOL YAYINLARI • METROPOL PUBLICATIONS

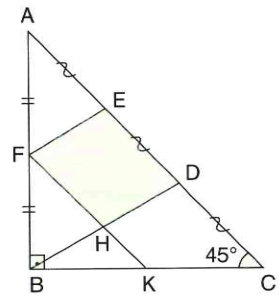
10. $m(\widehat{AED}) = m(\widehat{BCA}) = 90°$
IADI = 5 cm,
IBCI = 12 cm,
IDEI = 4 cm
$\Rightarrow$ **IEBI = x = ? cm**



A) 12 B) 13 C) 15 D) 18 D) 19

[İSTANBUL ÜNİVERSİTESİ – YÖS 2013]

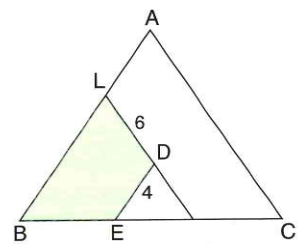
11. [FK] // [AC],
$m(\widehat{ABC}) = 90°$,
$m(\widehat{BCA}) = 45°$,
IAEI = IEDI = IDCI,
IAFI = IFBI
$\Rightarrow \frac{A(\widehat{ABC})}{A(DEFH)} = ?$



A) $\frac{3}{2}$ B) $\frac{5}{2}$ C) $\frac{7}{3}$ D) 2 E) 3

[YÖS 2009]

12. [DE] // [AB],
[LD] // [AC],
IABI = IBCI = IACI,
ILDI = 6 cm,
IDEI = 4 cm
$\Rightarrow$ **A(BEDL) = ? cm^2**



A) $21\sqrt{3}$ B) $79\sqrt{3}$ C) $94\sqrt{3}$ D) $\frac{79\sqrt{3}}{4}$ E) $\frac{105\sqrt{3}}{4}$

[YÖS 2007]

YANITLAR / ANSWERS

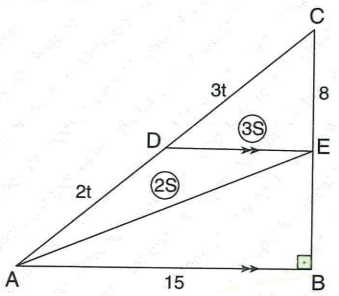
1	2	3	4	5	6	7	8	9	10	11	12
C	C	A	A	C	A	C	C	A	A	E	A

1. $3\cdot|ADI| = 2\cdot|DCI| \Rightarrow |ADI| = 2t,\ |DCI| = 3t$

$5S = \dfrac{8\cdot 15}{2} \Rightarrow 5S = 60$

$\Rightarrow S = 12$

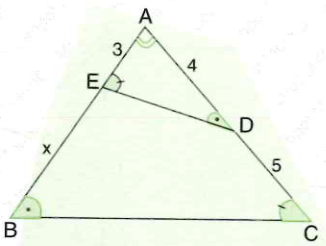
$A(\widehat{AED}) = 2\cdot S = 2\cdot 12 = 24$



Yanıt / The Answer is C

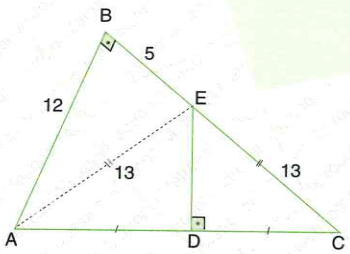
2. $\widehat{AED} \sim \widehat{ACB} \Leftrightarrow \dfrac{3}{4+5} = \dfrac{4}{3+x}$

$\dfrac{3}{9} = \dfrac{4}{3+x} \Rightarrow x = 9$



Yanıt / The Answer is C

3.



$|AEI|^2 = |ABI|^2 + |BEI|^2$

$|AEI|^2 = 12^2 + 5^2 \Rightarrow |AEI| = 13\,cm$

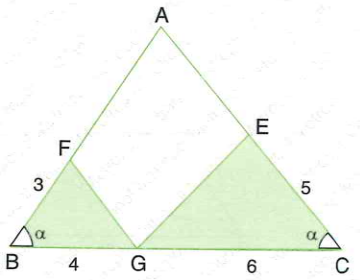
$\left.\begin{matrix}[ED] \perp [BC] \\ |ADI| = |DCI|\end{matrix}\right\} \Rightarrow |AEI| = |ECI| = 13\,cm$

$A(\widehat{AEC}) = \dfrac{|ECI|\cdot|ABI|}{2} = \dfrac{13\cdot 12}{2} = 78\,cm^2$

$A(\widehat{EDC}) = \dfrac{A(\widehat{AEC})}{2} = \dfrac{78}{2} = 39\,cm^2$

Yanıt / The Answer is A

4.



$\dfrac{A(\widehat{EGC})}{A(\widehat{BFG})} = \dfrac{\frac{1}{2}\cdot|CEI|\cdot|CGI|\cdot\sin\alpha}{\frac{1}{2}\cdot|BFI|\cdot|BGI|\cdot\sin\alpha}$

$= \dfrac{5\cdot 6}{3\cdot 4} = \dfrac{5}{2}$

Yanıt / The Answer is E

5. $|ADI|^2 + |DBI|^2 = |ABI|^2$ [Pisagor teoremi / Pythagorean Theorem]

$|ADI|^2 + 4^2 = 6^2$

$|ADI| = 2\sqrt{5}$ cm

$|ADI|^2 = |CDI|\cdot|DBI|$ [Öklit bağıntısı / Euclidean Relationships]

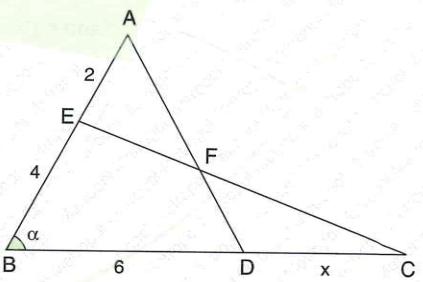
$(2\sqrt{5})^2 = |CDI|\cdot 4$

$20 = |CDI|\cdot 4 \Rightarrow |CDI| = 5$ cm

$A(\widehat{ABC}) = \dfrac{|ADI|\cdot|BCI|}{2} = \dfrac{2\sqrt{5}\cdot 9}{2} = 9\sqrt{5}\,cm^2$

Yanıt / The Answer is C

6.



$\dfrac{1}{2}\cdot 4\cdot(6+x)\cdot\sin\alpha = 2\cdot\dfrac{1}{2}\cdot 6\cdot 6\cdot\sin\alpha$

$6 + x = 18$

$x = 12$

Yanıt / The Answer is A

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $\frac{a}{a+4}=\frac{1}{3}$

$3a = a+4$

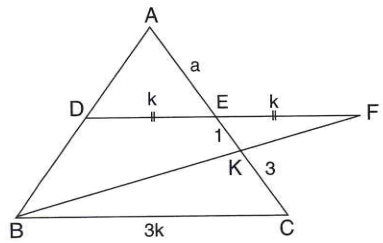
$2a = 4$

$a = 2$

$|AC| = a+4$

$= 2+4$

$= 6\,cm$



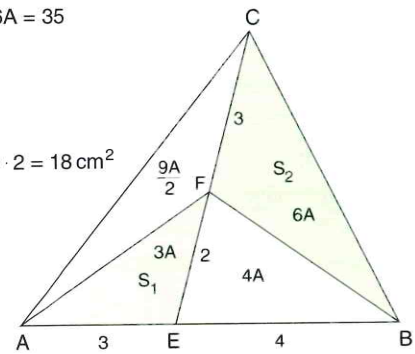
Yanıt / The Answer is C

8. $\frac{9A}{2}+3A+4A+6A=35$

$\frac{35A}{2}=35$

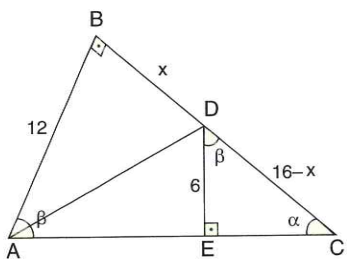
$\Rightarrow A = 2$

$S_1+S_2 = 9A = 9\cdot 2 = 18\,cm^2$



Yanıt / The Answer is C

9.



$\widehat{ABC} \sim \widehat{DEC}$;

$\frac{16-x}{20}=\frac{6}{12}$

$x = 6\,cm$

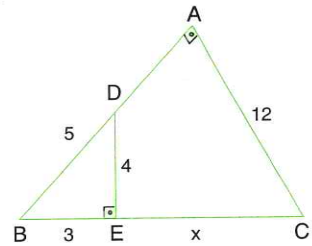
Yanıt / The Answer is A

10. $\frac{4}{12}=\frac{5}{3+x}$

$60 = 12+4x$

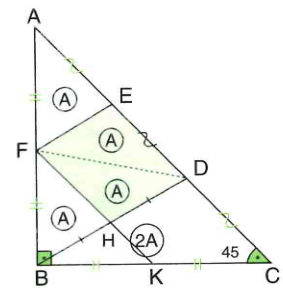
$48 = 4x$

$x = 12$



Yanıt / The Answer is A

11.

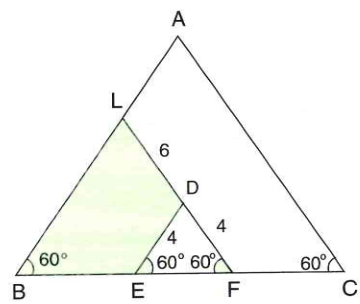


$A(\widehat{EFD}) = A \Rightarrow A(EFHD) = 2A \Rightarrow A(\widehat{ABC}) = 6A$

$\Rightarrow \frac{A(\widehat{ABC})}{A(DEFH)}=\frac{6A}{2A}=3$

Yanıt / The Answer is E

12.



$A(BEDL) = A(\widehat{BFL}) - A(\widehat{DEF})$

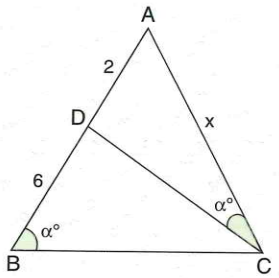
$= \frac{10^2\sqrt{3}}{4}-\frac{4^2\sqrt{3}}{4}$

$= 25\sqrt{3}-4\sqrt{3} = 21\sqrt{3}\,cm^2$

Yanıt / The Answer is A

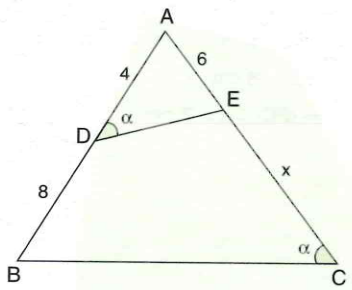
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $m(\widehat{DCA}) = m(\widehat{B}) = \alpha°$,
$|AD| = 2$ cm,
$|DB| = 6$ cm
$\Rightarrow$ **$|AC| = ?$ cm**



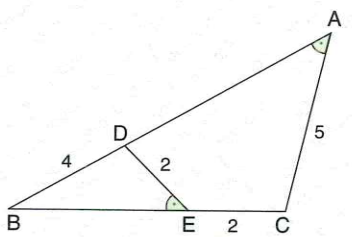
Yanıt / The Answer is 4

2. $m(\widehat{C}) = m(\widehat{ADE}) = \alpha$,
$|AD| = 4$ cm,
$|AE| = 6$ cm,
$|DB| = 8$ cm
$\Rightarrow$ **$|EC| = x = ?$ cm**



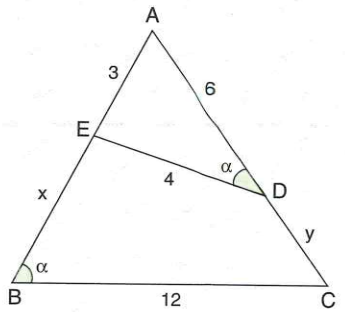
Yanıt / The Answer is 2

3. $m(\widehat{BED}) = m(\widehat{A})$,
$|BD| = 4$ cm,
$|EC| = |DE| = 2$ cm,
$|AC| = 5$ cm
$\Rightarrow$ **$|BE| = ?$ cm**



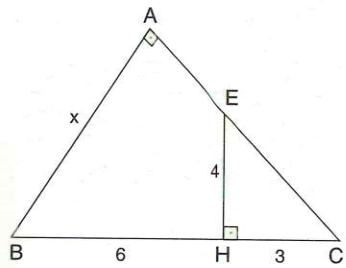
Yanıt / The Answer is 8

4. $m(\widehat{B}) = m(\widehat{EDA}) = \alpha$,
$|AE| = 3$ cm,
$|AD| = 6$ cm,
$|ED| = 4$ cm,
$|BC| = 12$ cm,
$|EB| = x$ cm,
$|DC| = y$ cm
$\Rightarrow \frac{x}{y} = ?$



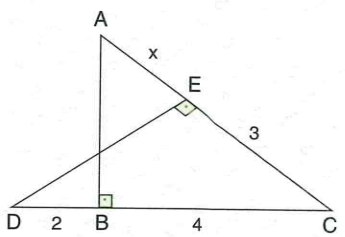
Yanıt / The Answer is 5

5. $[BA] \perp [AC]$,
$[EH] \perp [BC]$,
$|EH| = 4$ cm,
$|HC| = 3$ cm,
$|BH| = 6$ cm
$\Rightarrow$ **$|AB| = x = ?$ cm**



Yanıt / The Answer is $\frac{36}{5}$

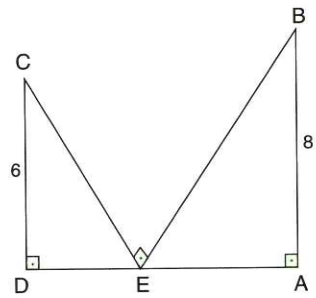
6. $[AB] \perp [DC]$,
$[DE] \perp [AC]$,
$|EC| = 3$ cm,
$|DB| = 2$ cm,
$|BC| = 4$ cm
$\Rightarrow$ **$|AE| = x = ?$ cm**



Yanıt / The Answer is 5

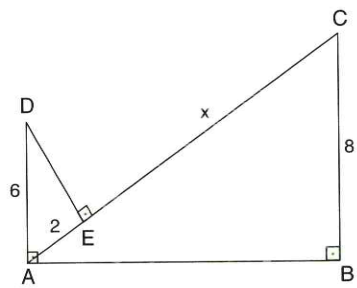
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [BA] ⊥ [AD],
[CD] ⊥ [DA],
[CE] ⊥ [EB],
|CD| = 6 cm,
|BA| = 8 cm,
3·|DE| = |EA|
⇒ **|AD| = ? cm**



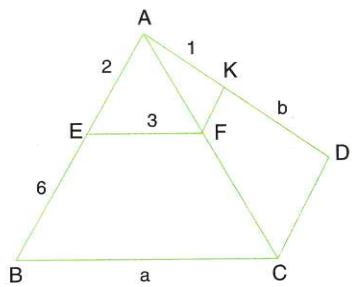
Yanıt / The Answer is 16

8. [DE] ⊥ [CA],
[DA] ⊥ [BA],
[CB] ⊥ [BA],
|DA| = 6 cm,
|AE| = 2 cm,
|CB| = 8 cm
⇒ **|EC| = x = ? cm**



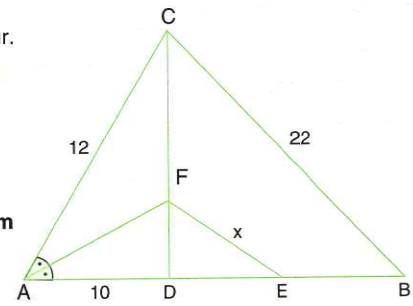
Yanıt / The Answer is 22

9. [EF] // [BC],
[FK] // [CD],
|AE| = 2 cm,
|EB| = 6 cm,
|EF| = 3 cm,
|BC| = a cm,
|AK| = 1 cm,
|KD| = b cm
⇒ **a + b = ? cm**



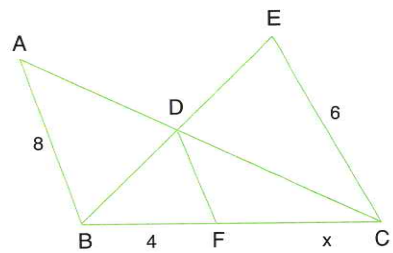
Yanıt / The Answer is 15

10. [FE] // [CB],
[AF] bir açıortaydır.
[AF] is a bisector.
|AC| = 12 cm,
|CB| = 22 cm,
|AD| = 10 cm
⇒ **|EF| = x = ? cm**



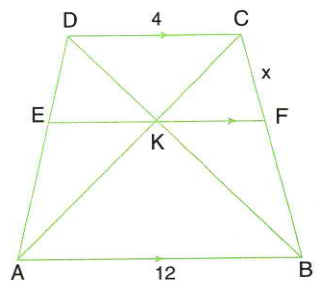
Yanıt / The Answer is 10

11. [AB] // [DF] // [EC],
|AB| = 8 cm,
|BF| = 4 cm,
|EC| = 6 cm
⇒ **|FC| = x = ? cm**



Yanıt / The Answer is 3

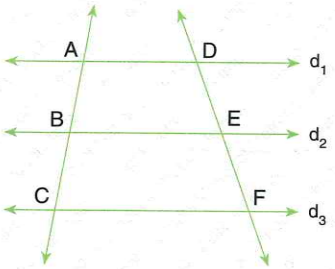
12. [AB] // [EF] // [DC],
|AB| = 12 cm,
|DC| = 4 cm,
|BC| = 20 cm
⇒ **|CF| = x = ? cm**



Yanıt / The Answer is 5

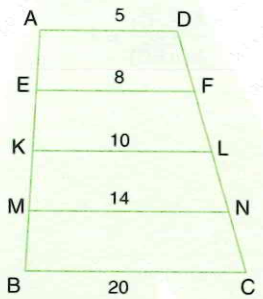
METROPOL YAYINLARI • METROPOL PUBLICATIONS

13. $d_1 // d_2 // d_3$,
$|AB| = 3$ cm,
$|DE| = 6$ cm,
$|BC| = 5$ cm
$\Rightarrow$ **$|EF| = ?$ cm**



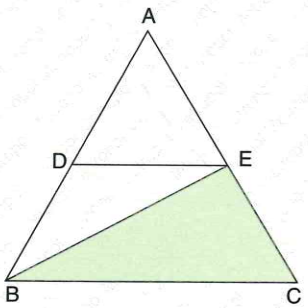
Yanıt / The Answer is 10

14. [AD] // [EF] // [KL] // [MN] // [BC],
$|AD| = 5$ cm,
$|EF| = 8$ cm,
$|KL| = 10$ cm,
$|MN| = 14$ cm,
$|BC| = 20$ cm
$\Rightarrow$ **$\frac{|EK|}{|MB|} = ?$**



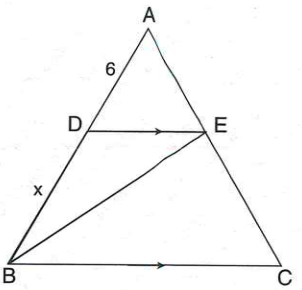
Yanıt / The Answer is $\frac{1}{3}$

15. [DE] // [BC],
$\frac{|AE|}{|EC|} = \frac{2}{5}$,
$A(\widehat{ADE}) = 4$ cm^2
$\Rightarrow$ **$A(\widehat{BEC}) = ?$ cm^2**



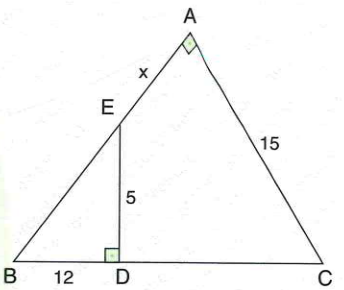
Yanıt / The Answer is 35

16. [DE] // [BC],
$|AD| = 6$ cm,
$\frac{A(\widehat{DEB})}{A(\widehat{EBC})} = \frac{2}{3}$
$\Rightarrow$ **$|AB| = ?$ cm**



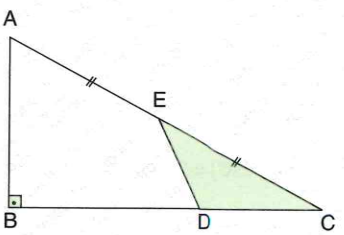
Yanıt / The Answer is 9

17. [BA] $\perp$ [AC],
[ED] $\perp$ [BC],
$|BD| = 12$ cm,
$|ED| = 5$ cm,
$|AC| = 15$ cm,
$|EA| = x$ cm
$\Rightarrow$ **$|AE| = x = ?$ cm**



Yanıt / The Answer is 23

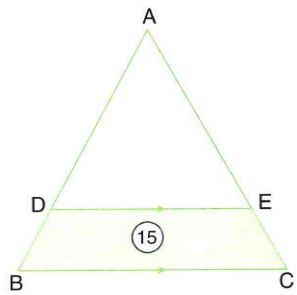
18. [AB] $\perp$ [BC],
$|AE| = |EC|$,
$|AB| = 12$ cm,
$|DC| = 7$ cm
$\Rightarrow$ **$A(\widehat{EDC}) = ?$ cm^2**



Yanıt / The Answer is 21

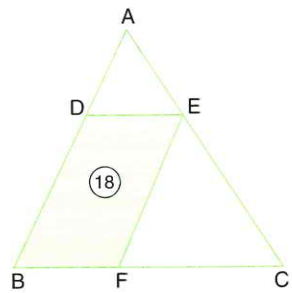
METROPOL YAYINLARI • METROPOL PUBLICATIONS

19. [DE] // [BC],
|AD| = 2|BD|,
A(DBCE) = 15 cm²
⇒ **A(ABC) = ? cm²**



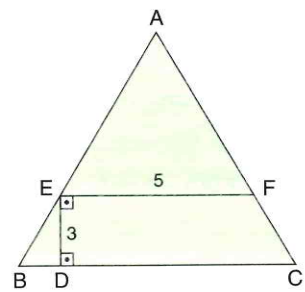
Yanıt / The Answer is 27

20. DBFE bir paralelkenardır.
DBFE is a paralellogram.
|AB| = 4·|AD| ,
A(BDEF) = 18 cm²
⇒ **A(ABC) = ? cm²**



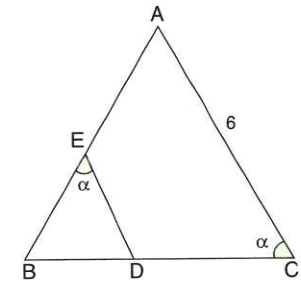
Yanıt / The Answer is 48

21. [DE] ⊥ [EF],
[ED] ⊥ [BC],
3·|AE| = 5·|EB|
|EF| = 5 cm,
|ED| = 3 cm
⇒ **A(ABC) = ? cm²**



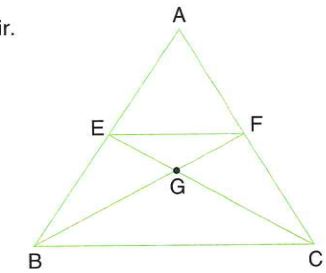
Yanıt / The Answer is 32

22. m(BED) = m(C) = α,
$A(\widehat{EBD}) = \frac{4}{5} \cdot A(AEDC)$,
|AC| = 6 cm
⇒ **|ED| = ? cm**



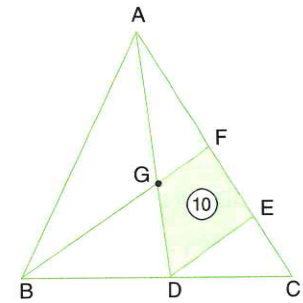
Yanıt / The Answer is 4

23. G noktası ağırlık merkezidir.
G is center of the gravity.
$\Rightarrow \frac{A(\widehat{EFG})}{A(\widehat{ABC})} = ?$



Yanıt / The Answer is $\frac{1}{12}$

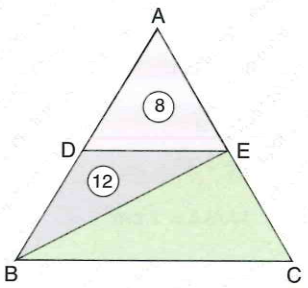
24. G noktası ağırlık merkezidir.
G is center of the gravity.
[DE] // [BF],
A(DEFG) = 10 cm²
⇒ **A(ABC) = ? cm²**



Yanıt / The Answer is 48

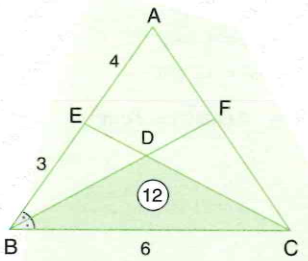
METROPOL YAYINLARI • METROPOL PUBLICATIONS

25. [DE] // [BC],
$A(\widehat{ADE}) = 8\,cm^2$,
$A(\widehat{DBE}) = 12\,cm^2$
$\Rightarrow$ **$A(\widehat{EBC}) = ?\,cm^2$**



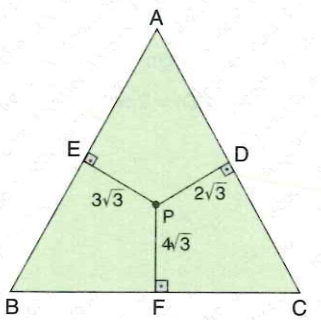
Yanıt / The Answer is 30

26. [BF] bir açıortaydır.
[BF] is a bisector.
$|BE| = 3$ cm,
$|AE| = 4$ cm,
$|BC| = 6$ cm,
$A(\widehat{BDC}) = 12\,cm^2$
$\Rightarrow$ **$A(\widehat{ABC}) = ?\,cm^2$**



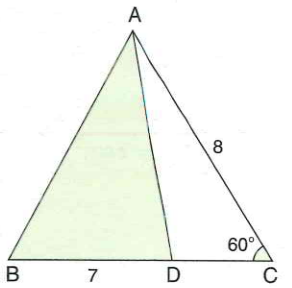
Yanıt / The Answer is 42

27. $|AB| = |AC| = |BC|$,
[EP] $\perp$ [AB],
[PF] $\perp$ [BC],
[PD] $\perp$ [AC],
$|EP| = 3\sqrt{3}$ cm,
$|PD| = 2\sqrt{3}$ cm,
$|PF| = 4\sqrt{3}$ cm
$\Rightarrow$ **$A(\widehat{ABC}) = ?\,cm^2$**



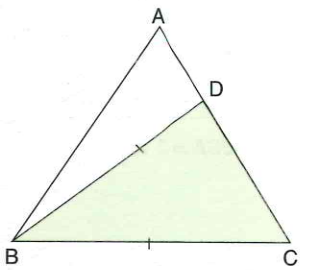
Yanıt / The Answer is $81\sqrt{3}$

28. $m(\widehat{ACB}) = 60°$,
$|BD| = 7$ cm,
$|AC| = 8$ cm
$\Rightarrow$ **$A(\widehat{ABD}) = ?\,cm^2$**



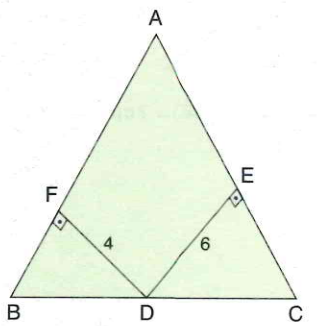
Yanıt / The Answer is $14\sqrt{3}$

29. $|AB| = |AC| = 24$ cm,
$|DC| = 6$ cm,
$|BD| = |BC|$
$\Rightarrow$ **$A(\widehat{BDC}) = ?\,cm^2$**



Yanıt / The Answer is $9\sqrt{15}$

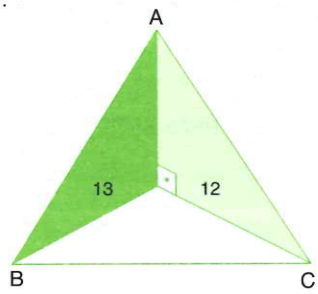
30. [DF] $\perp$ [AB],
[DE] $\perp$ [AC],
$|FD| = 4$ cm,
$|ED| = 6$ cm,
$|AB| = |AC| = 10$ cm
$\Rightarrow$ **$A(\widehat{ABC}) = ?\,cm^2$**



Yanıt / The Answer is 50

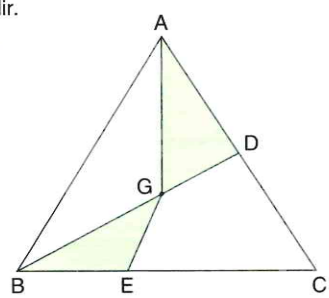
METROPOL YAYINLARI • METROPOL PUBLICATIONS

31. G noktası ağırlık merkezidir.
G is center of the gravity.
$|BG| = 13$ cm,
$|GC| = 12$ cm
$\Rightarrow$ **$A(\widehat{ABC}) = ?\ cm^2$**



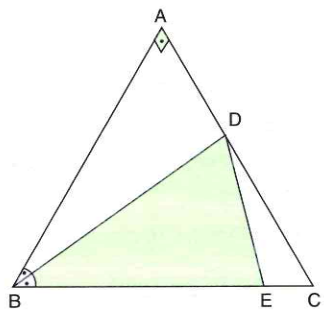
Yanıt / The Answer is 90

32. G noktası ağırlık merkezidir.
G is center of the gravity.
$3 \cdot |BE| = |EC|$,
$A(\widehat{ABC}) = 36\ cm^2$
$\Rightarrow$ **TA/SA = ? cm^2**



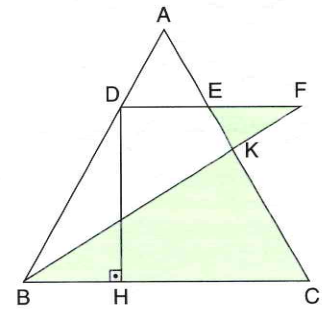
Yanıt / The Answer is 9

33. $[BA] \perp [AC]$,
$m(\widehat{ABD}) = m(\widehat{DBE})$,
$|BE| = 4|EC|$,
$|AD| = 6$ cm,
$|DC| = 10$ cm
$\Rightarrow$ **$A(\widehat{DBE}) = ?\ cm^2$**



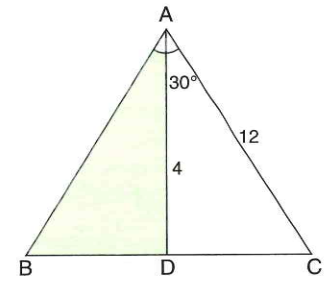
Yanıt / The Answer is 48

34. $[DH] \perp [BC]$,
$[DF] \,//\, [BC]$,
$|DH| = 6$ cm,
$\frac{|EK|}{|KC|} = \frac{1}{2}$,
$|EF| = 3$ cm
$\Rightarrow$ **TA/SA = ? cm^2**



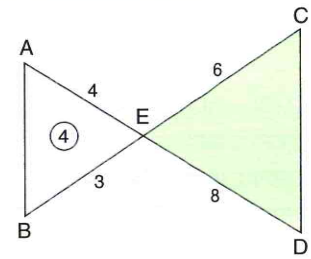
Yanıt / The Answer is 15

35. $m(\widehat{DAC}) = 30°$,
$|BD| = |DC|$,
$|AD| = 4$ cm,
$|AC| = 12$ cm
$\Rightarrow$ **$A(\widehat{ABD}) = ?\ cm^2$**



Yanıt / The Answer is 12

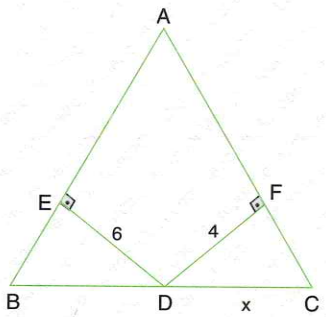
36. $|AE| = 4$ cm,
$|BE| = 3$ cm,
$|EC| = 6$ cm,
$|ED| = 8$ cm,
$A(\widehat{ABE}) = 4\ cm^2$
$\Rightarrow$ **$A(\widehat{ECD}) = ?\ cm^2$**



Yanıt / The Answer is 16

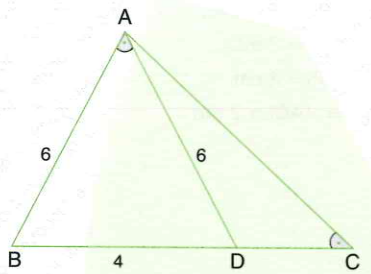
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $[DE] \perp [AB]$,
$[DF] \perp [AC]$,
$|AB| = |AC|$,
$|ED| = 6$ cm,
$|DF| = 4$ cm,
$|BC| = 30$ cm
$\Rightarrow$ **$|DC| = x = ?$ cm**



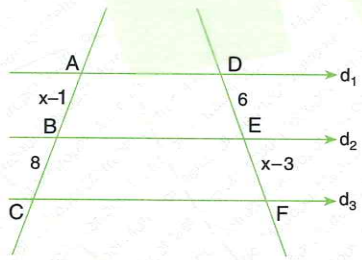
A) 10 B) 12 C) 15 D) 18 E) 20

2. $m(\widehat{BAD}) = m(\widehat{ACB})$,
$|AB| = |AD| = 6$ cm,
$|BD| = 4$ cm
$\Rightarrow$ **$|DC| = ?$ cm**



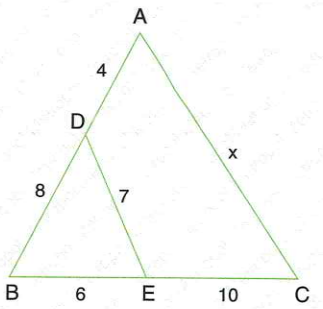
A) 3 B) 4 C) 5 D) 6 E) 8

3. $d_1 // d_2 // d_3$,
$|AB| = (x - 1)$ cm,
$|BC| = 8$ cm,
$|DE| = 6$ cm,
$|EF| = (x - 3)$ cm
$\Rightarrow$ **$|AB| = ?$ cm**



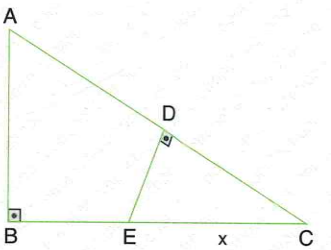
A) 5 B) 6 C) 7 D) 8 E) 9

4. $|AD| = 4$ cm,
$|DB| = 8$ cm,
$|BE| = 6$ cm,
$|EC| = 10$ cm,
$|DE| = 7$ cm
$\Rightarrow$ **$|AC| = x = ?$ cm**



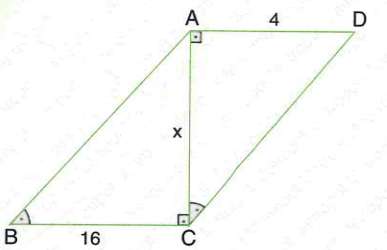
A) 9 B) 10 C) 12 D) 14 E) 15

5. $[AB] \perp [BC]$,
$[DE] \perp [AC]$,
$\frac{|AB|}{|DE|} = \frac{3}{2}$,
$|AC| = 12$ cm
$\Rightarrow$ **$|EC| = x = ?$ cm**



A) 8 B) 10 C) 12 D) 14 E) 16

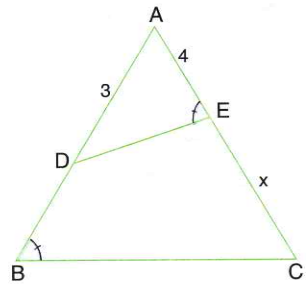
6. $[AD] \perp [AC]$,
$[AC] \perp [BC]$,
$m(\widehat{ABC}) = m(\widehat{ACD})$,
$|BC| = 16$ cm,
$|AD| = 4$ cm
$\Rightarrow$ **$|AC| = x = ?$ cm**



A) 6 B) 7 C) 8 D) 9 E) 10

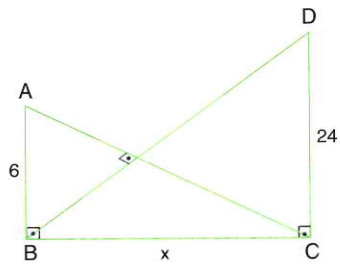
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $m(\widehat{AED}) = m(\widehat{ABC})$,
$|AB| = 8$ cm,
$|AD| = 3$ cm,
$|AE| = 4$ cm
$\Rightarrow$ **$|EC| = x = ?$ cm**



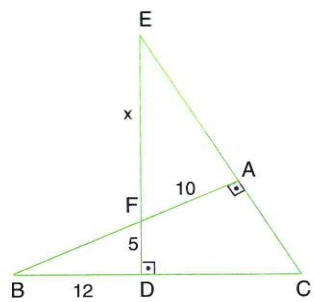
A) 1 B) 2 C) 3
D) 4 E) 5

8. $[AB] \perp [BC]$,
$[DC] \perp [BC]$,
$[AC] \perp [DB]$,
$|AB| = 6$ cm,
$|DC| = 24$ cm
$\Rightarrow$ **$|BC| = x = ?$ cm**



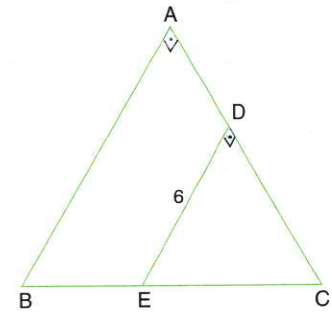
A) 12 B) 15 C) 16
D) 18 E) 20

9. $[ED] \perp [BC]$,
$[BA] \perp [EC]$,
$|FD| = 5$ cm,
$|BD| = 12$ cm,
$|FA| = 10$ cm
$\Rightarrow$ **$|EF| = x = ?$ cm**



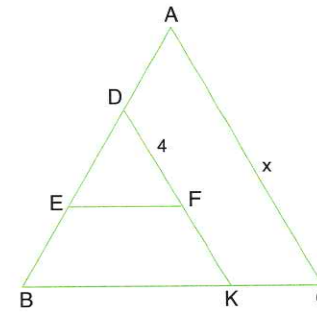
A) 16 B) 18 C) 22
D) 26 E) 36

10. $[ED] \perp [AC]$,
$[AB] \perp [AC]$,
$\frac{|BE|}{|BC|} = \frac{3}{5}$,
$|DE| = 6$ cm,
$|AC| = 20$ cm
$\Rightarrow$ **$|BE| = x = ?$ cm**



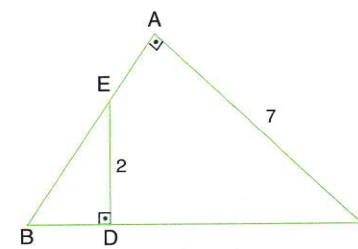
A) 10 B) 12 C) 15
D) 16 E) 18

11. $[EF] // [BK]$,
$[DK] // [AC]$,
$5 \cdot |EF| = 2 \cdot |BK|$,
$|BK| = 2 \cdot |KC|$,
$|DF| = 4$ cm
$\Rightarrow$ **$|AC| = ?$ cm**



A) 9 B) 10 C) 12
D) 15 E) 18

12. BAC ve EDB dik üçgendir.
BAC and EDB are right triangles.
$|ED| = 2$ cm,
$|AC| = 7$ cm
$\Rightarrow$ $\frac{\mathbf{A(AEDC)}}{\mathbf{A(\widehat{ABC})}} = ?$



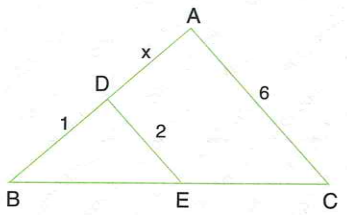
A) $\frac{2}{7}$ B) $\frac{5}{7}$ C) $\frac{25}{49}$
D) $\frac{45}{49}$ E) $\frac{47}{49}$

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
B	C	D	D	A	C	B	A	D	C	D	D

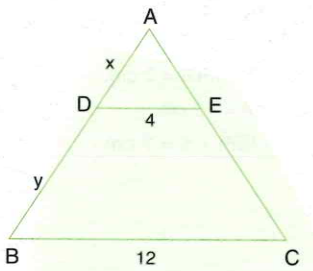
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. [DE] // [AC],
|DB| = 1 cm,
|DE| = 2 cm,
|AC| = 6 cm
⇒ **|DA| = x = ? cm**



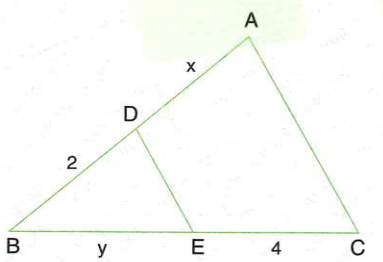
A) 1 B) 2 C) 3 D) 4 E) 5

2. [DE] // [BC],
|DE| = 4 cm,
|BC| = 12 cm,
|AD| = x cm,
|DB| = y cm
⇒ $\frac{x}{y}$ = ?



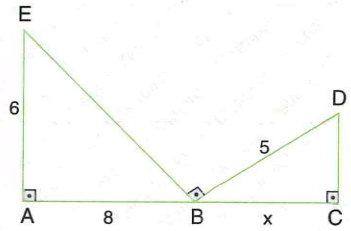
A) $\frac{1}{2}$ B) 2 C) $\frac{1}{3}$ D) 3 E) 4

3. [DE] // [AC],
|DB| = 2 cm,
|EC| = 4 cm,
|AD| = x cm,
|BE| = y cm
⇒ **x·y = ?**



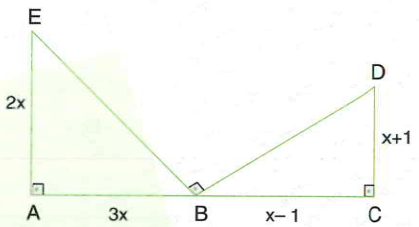
A) 2 B) 4 C) 6 D) 8 E) 10

4. [EB] ⊥ [DB],
[EA] ⊥ [AC],
[DC] ⊥ [AC],
|AE| = 6 cm,
|AB| = 8 cm,
|DB| = 5 cm
⇒ **|BC| = x = ? cm**



A) 3 B) 4 C) 5 D) 6 E) 7

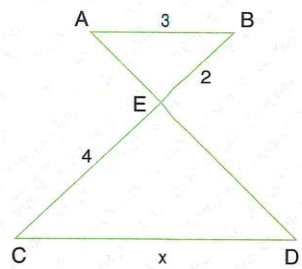
5.



[EA] ⊥ [AC], [DC] ⊥ [AC], [EB] ⊥ [DB], |EA| = 2x cm,
|AB| = 3x cm, |BC| = x – 1 cm, |DC| = x +1 cm
⇒ **x = ? cm**

A) 5 B) 6 C) 7 D) 8 E) 9

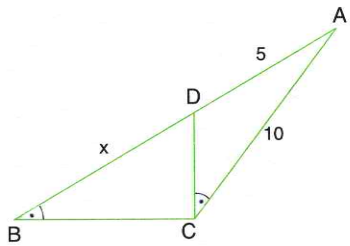
6. [AB] // [CD],
|AB| = 3 cm,
|BE| = 2 cm,
|EC| = 4 cm
⇒ **|CD| = x = ? cm**



A) 4 B) 5 C) 6 D) 7 E) 8

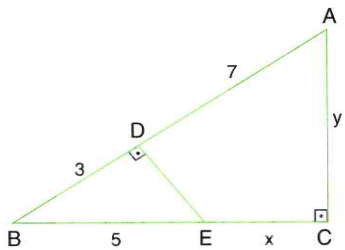
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $m(\widehat{ABC}) = m(\widehat{ACD})$,
$|AC| = 10$ cm,
$|AD| = 5$ cm
$\Rightarrow$ **$|DB| = x =$? cm**



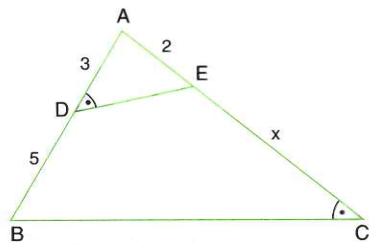
A) 5 B) 10 C) 15
D) 20 E) 25

8. $m(\widehat{BDE}) = m(\widehat{ACB}) = 90°$,
$|DB| = 3$ cm,
$|AD| = 7$ cm,
$|BE| = 5$ cm
$\Rightarrow$ **$x + y =$? cm**



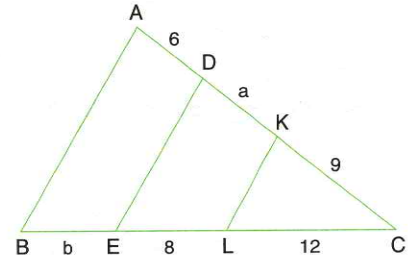
A) 6 B) 7 C) 8
D) 9 E) 10

9. $m(\widehat{ADE}) = m(\widehat{ACB})$,
$|AE| = 2$ cm,
$|AD| = 3$ cm,
$|DB| = 5$ cm
$\Rightarrow$ **$|EC| = x =$? cm**



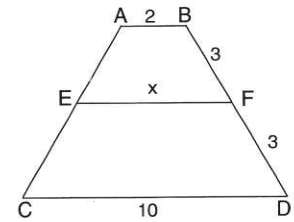
A) 6 B) 8 C) 10
D) 12 E) 16

10. $[AB] // [DE] // [KL]$,
$|AD| = 6$ cm,
$|KC| = 9$ cm,
$|EL| = 8$ cm,
$|LC| = 12$ cm,
$|DK| = a$ cm,
$|BE| = b$ cm
$\Rightarrow$ **$b - a =$? cm**



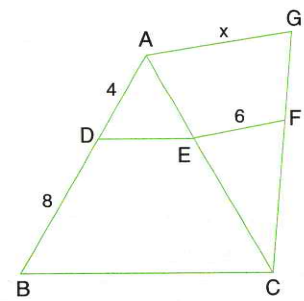
A) 1 B) 2 C) 3
D) 4 E) 5

11. $[AB] // [EF] // [CD]$,
$|AB| = 2$ cm,
$|BF| = |FD| = 3$ cm,
$|CD| = 10$ cm
$\Rightarrow$ **$|EF| = x =$? cm**



A) 4 B) 5 C) 6
D) 7 E) 8

12. $[EF] // [AG]$,
$[DE] // [BC]$,
$|AD| = 4$ cm,
$|DB| = 8$ cm,
$|EF| = 6$ cm
$\Rightarrow$ **$|AG| = x =$? cm**



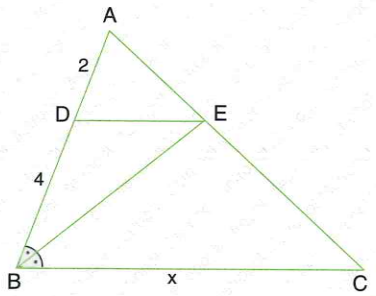
A) 6,5 B) 7,5 C) 8
D) 9 E) 10

METROPOL YAYINLARI • METROPOL PUBLICATIONS

YANITLAR / ANSWERS

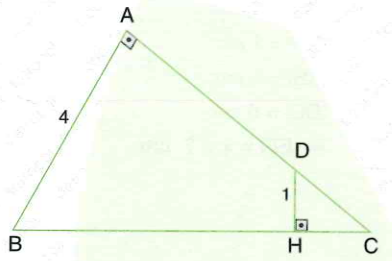
1	2	3	4	5	6	7	8	9	10	11	12
B	A	D	A	A	C	C	D	C	B	C	D

1. $m(\widehat{ABE}) = m(\widehat{CBE})$,
$|AD| = 2$ cm,
$|DB| = 4$ cm,
$[DE] \parallel [BC]$
$\Rightarrow$ **$|BC| = x = ?$ cm**



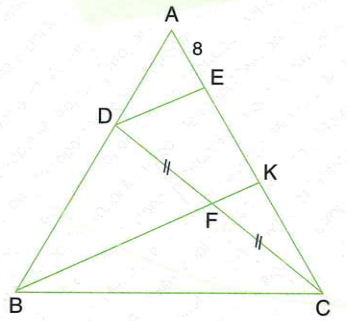
A) 6 B) 8 C) 10 D) 12 E) 14

2. $[AB] \perp [AC]$,
$[DH] \perp [BC]$
$|AB| = 4$ cm,
$|AC| = 3$ cm,
$|DH| = 1$ cm
$\Rightarrow$ **$|CH| = ?$ cm**



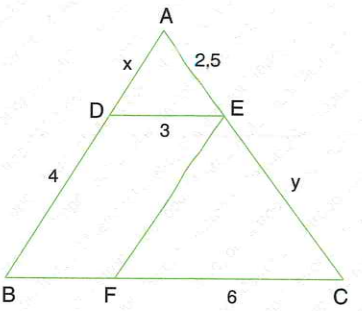
A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{3}{4}$ D) 2 E) 3

3. $[DE] \parallel [BK]$,
$3 \cdot |AD| = 2 \cdot |BD|$,
$|DF| = |FC|$,
$|AE| = 8$ cm
$\Rightarrow$ **$|KC| = ?$ cm**



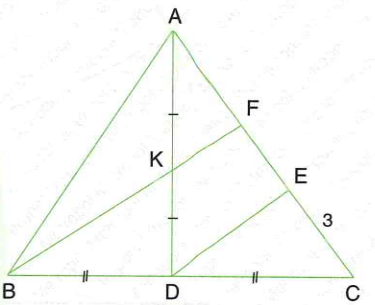
A) 8 B) 10 C) 12 D) 14 E) 16

4. $[DE] \parallel [BC]$,
$[EF] \parallel [AB]$,
$|AE| = 2{,}5$ cm,
$|DE| = 3$ cm,
$|DB| = 4$ cm,
$|FC| = 6$ cm,
$|EC| = y$ cm,
$|AD| = x$ cm
$\Rightarrow$ **$x + y = ?$ cm**



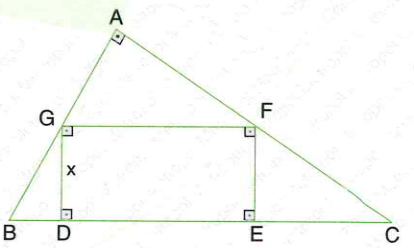
A) 5 B) 6 C) 7 D) 8 E) 9

5. $[BF] \parallel [DE]$,
$|BD| = |DC|$,
$|AK| = |KD|$,
$|EC| = 3$ cm
$\Rightarrow$ **$|AE| = ?$ cm**



A) 3 B) 6 C) 12 D) 15 E) 19

6.

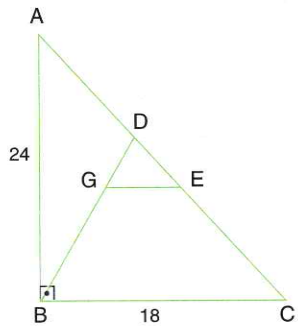


$m(\widehat{A}) = 90°$, $|BD| = 9$ cm, $|EC| = 16$ cm
$\Rightarrow$ **$|GD| = x = ?$ cm**

A) 12 B) 11 C) 10 D) 9 E) 8

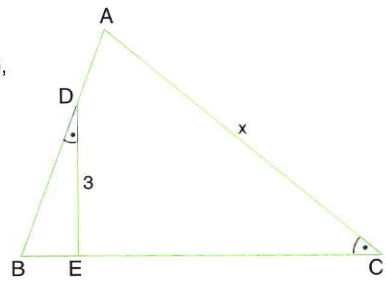
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. G ağırlık merkezidir.
G is center of the gravity.
[GE] // [BC],
[AB] ⊥ [BC],
|AB| = 24 cm,
|BC| = 18 cm
⇒ **|DE| = ? cm**



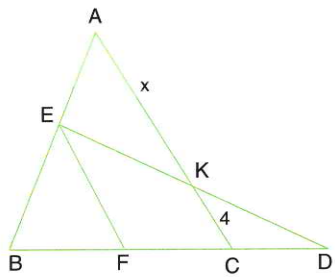
A) 8 B) 7 C) 6
D) 5 E) 4

8. $m(\widehat{ACB}) = m(\widehat{BDE})$,
$A(ADEC) = 3 \cdot A(\widehat{BDE})$,
|DE| = 3 cm
⇒ **|AC| = ? cm**



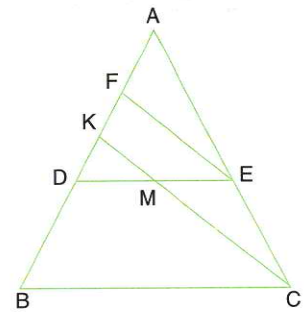
A) 4 B) 5 C) 6
D) 7 E) 8

9. [EF] // [AC],
$|BF| = |FC| = \frac{|CD|}{2}$,
|KC| = 4 cm
⇒ **|AK| = x = ? cm**



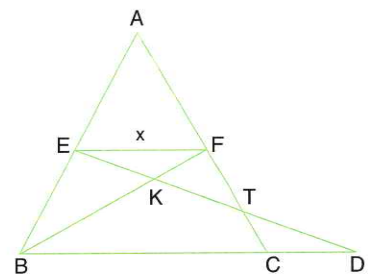
A) 4 B) 5 C) 6
D) 7 E) 8

10. [EF] // [KC],
[DE] // [BC],
|AF| = 2|FK| = 2|KD|,
|AE| = 12 cm,
|KM| = 3 cm
⇒ **|CM| + |EC| = ? cm**



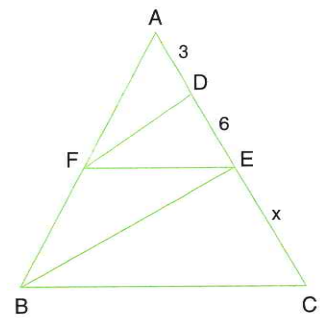
A) 12 B) 15 C) 16
D) 18 E) 20

11. 2|AE| = |BE|,
2|AF| = |FC|,
|KF| = 1 cm,
|KB| = 5 cm,
|DC| = 6 cm
⇒ **|EF| = x = ? cm**



A) 1 B) 3 C) 4
D) 5 E) 6

12. [FD] // [EB],
[FE] // [BC],
|AD| = 3 cm,
|DE| = 6 cm
⇒ **|EC| = x = ? cm**



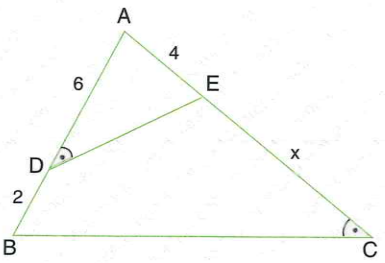
A) 6 B) 12 C) 18
D) 24 E) 30

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	C	C	C	B	A	D	C	E	A	B	C

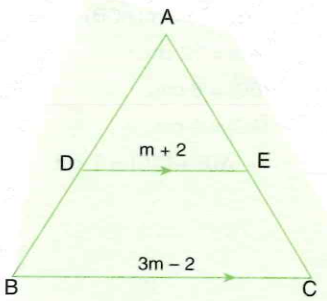
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $m(\widehat{ADE}) = m(\widehat{ACB})$,
$|AD| = 6$ cm,
$|BD| = 2$ cm,
$|AE| = 4$ cm
$\Rightarrow$ **$|EC| = x = ?$ cm**



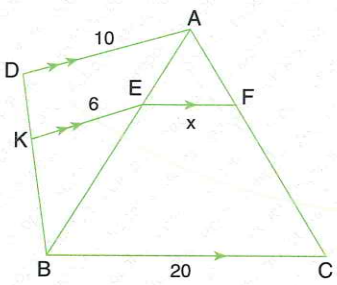
A) 4 B) 6 C) 8
D) 9 E) 10

2. [DE] // [BC],
$\frac{|DA|}{|DB|} = \frac{3}{2}$,
$|DE| = (m + 2)$ cm,
$|BC| = (3m - 2)$ cm
$\Rightarrow$ **$|BC| = ?$ cm**



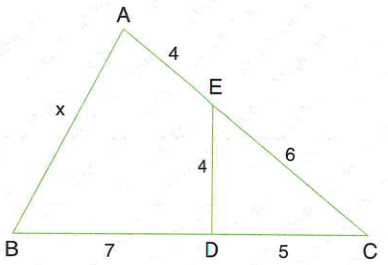
A) 4 B) 7 C) 10
D) 13 E) 16

3. [DA] // [KE],
[EF] // [BC],
$|DA| = 10$ cm,
$|KE| = 6$ cm,
$|BC| = 20$ cm
$\Rightarrow$ **$|EF| = x = ?$ cm**



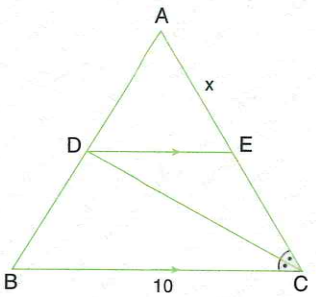
A) 6 B) 7 C) 8
D) 9 E) 10

4. $|AE| = 4$ cm,
$|EC| = 6$ cm,
$|BD| = 7$ cm,
$|DC| = 5$ cm,
$|ED| = 4$ cm
$\Rightarrow$ **$|AB| = x = ?$ cm**



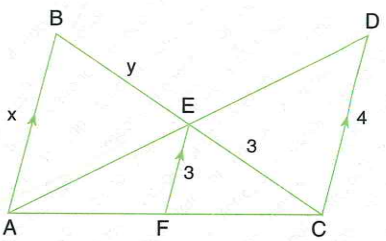
A) 6 B) $\frac{20}{3}$ C) 7
D) 8 E) $\frac{25}{3}$

5. [CD] bir açıortaydır.
[CD] is a bisector.
[DE] // [BC],
$|AC| = 15$ cm,
$|BC| = 10$ cm
$\Rightarrow$ **$|AE| = x = ?$ cm**



A) 6 B) 7 C) 8
D) 9 E) 10

6.

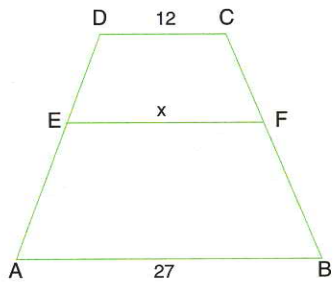


[AB] // [CD] // [FE], $|EF| = |EC| = 3$ cm,
$|CD| = 4$ cm, $|AB| = x$ cm, $|BE| = y$ cm
$\Rightarrow$ **$x + y = ?$ cm**

A) 15 B) 16 C) 18
D) 19 E) 21

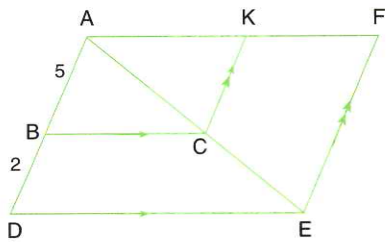
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [AB] // [DC] // [EF],
2·|AE| = 3·|ED|,
|AB| = 27 cm,
|DC| = 12 cm
⇒ **|EF| = x = ? cm**



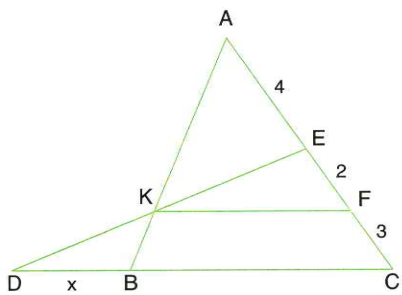
A) 16 B) 18 C) 21
D) 23 E) 24

8. [BC] // [DE],
[CK] // [EF],
|AB| = 5 cm,
|BD| = 2 cm,
|FE| = |AD|
⇒ **|CK| = ? cm**



A) 2 B) 3,5 C) 4
D) 5 E) 5,5

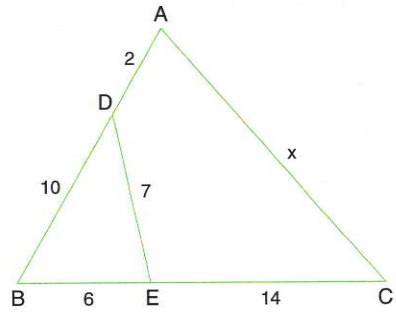
9.



[KF] // [BC], |AE| = 4 cm, |EF| = 2 cm, |FC| = 3 cm,
|DC| = 15 cm ⇒ **|BD| = x = ? cm**

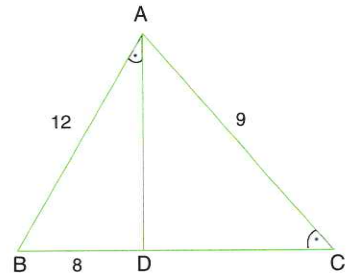
A) 3 B) 4 C) 5
D) 6 E) 9

10. |AD| = 2 cm,
|DB| = 10 cm,
|BE| = 6 cm,
|EC| = 14 cm,
|DE| = 7 cm
⇒ **|AC| = x = ? cm**



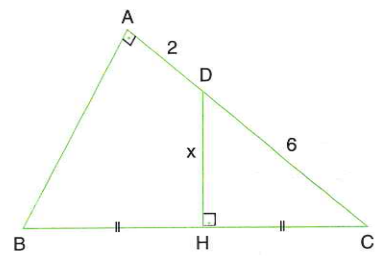
A) 14 B) 15 C) 16
D) 21 E) 28

11. $m(\widehat{BAD}) = m(\widehat{ACB})$,
|AB| = 12 cm,
|BD| = 8 cm,
|AC| = 9 cm
⇒ **|AD| + |DC| = ? cm**



A) 12 B) 14 C) 16
D) 18 E) 19

12. $m(\widehat{BAC}) = 90°$,
[DH] ⊥ [BC],
|AD| = 2 cm,
|DC| = 6 cm
⇒ **|DH| = x = ? cm**



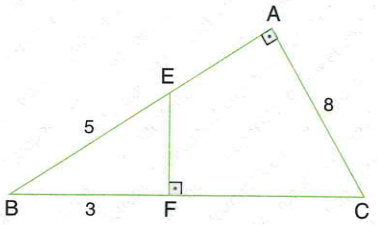
A) 1 B) $\frac{3}{2}$ C) $\sqrt{3}$
D) $2\sqrt{3}$ E) 3

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	C	C	D	D	E	B	D	D	A	C	D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

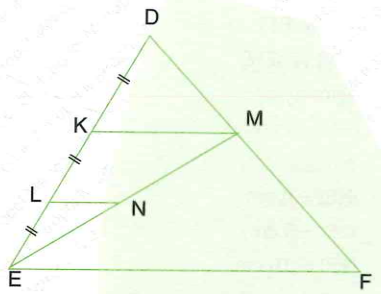
1.



$m(\widehat{A}) = m(\widehat{F}) = 90°$, $|AC| = 8$ cm, $|BF| = 3$ cm,
$|BE| = 5$ cm $\Rightarrow$ **$|FC| = ?$ cm**

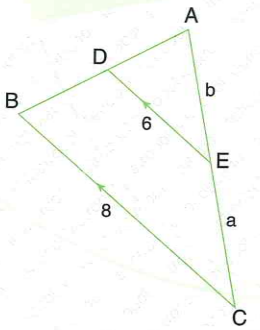
A) 5 B) 6 C) 7
D) 8 E) 9

2. $[KM] // [LN] // [EF]$,
$|DK| = |KL| = |LE|$,
$|EF| = 16$ cm
$\Rightarrow$ **$|LN| = ?$ cm**



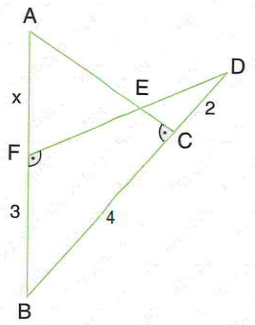
A) $\frac{3}{4}$ B) 1 C) $\frac{1}{2}$
D) $\frac{8}{3}$ E) $\frac{7}{4}$

3. $[DE] // [BC]$,
$|DE| = 6$ cm,
$|BC| = 8$ cm,
$|AE| = b$ cm,
$|EC| = a$ cm
$\Rightarrow$ **$\frac{a}{b} = ?$**



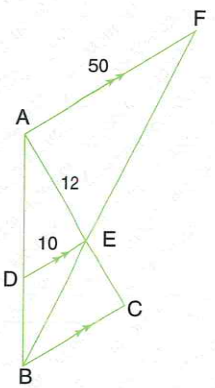
A) $\frac{1}{6}$ B) $\frac{1}{3}$ C) $\frac{1}{4}$
D) $\frac{2}{5}$ E) 1

4. $m(\widehat{BFD}) = m(\widehat{ACB})$,
$|BF| = 3$ cm,
$|BC| = 4$ cm,
$|CD| = 2$ cm
$\Rightarrow$ **$|AF| = x = ?$ cm**



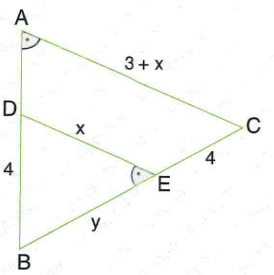
A) 6 B) 5 C) 4
D) 3 E) 2

5. $[AF] // [ED] // [BC]$,
$|AF| = 50$ cm,
$|ED| = 10$ cm,
$|AE| = 12$ cm
$\Rightarrow$ **$|EC| = ?$ cm**



A) 6 B) 4 C) 3
D) 2 E) 1

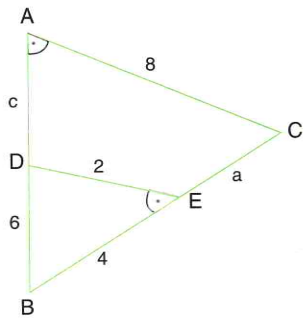
6. $m(\widehat{BAC}) = m(\widehat{DEB})$,
$|AC| = (3 + x)$ cm,
$|CE| = |DB| = 4$ cm,
$|ED| = x$ cm,
$|EB| = y$ cm
$\Rightarrow$ **$x \cdot y = ?$**



A) 11 B) 12 C) 13
D) 14 E) 15

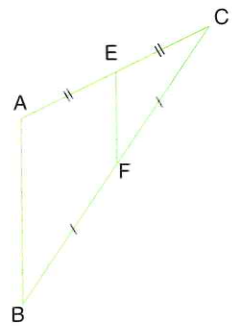
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $m(\widehat{BED}) = m(\widehat{BAC})$,
$|DE| = 2$ cm,
$|EC| = a$ cm,
$|AD| = c$ cm,
$|DB| = 6$ cm,
$|AC| = 8$ cm,
$|BE| = 4$ cm
$\Rightarrow$ **a + c = ? cm**



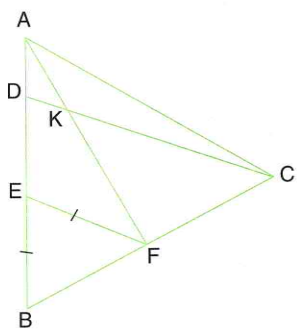
A) 24 B) 27 C) 30
D) 32 E) 35

8. $|CE| = |EA|$,
$|CF| = |FB|$,
$|EF| = (3a + 5)$ cm,
$|AB| = (2a + 12)$ cm
$\Rightarrow$ **a = ? cm**



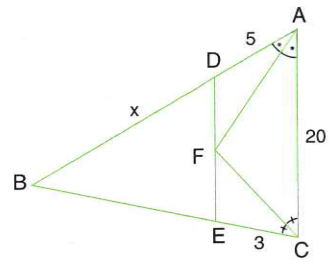
A) $\frac{3}{2}$ B) $\frac{1}{2}$ C) $\frac{5}{3}$
D) $\frac{2}{3}$ E) $\frac{6}{7}$

9. $[CD] // [FE]$,
$|KC| = 2|DK|$,
$|FE| = |EB|$,
$|CD| = 6$ cm,
$|ED| = 2$ cm
$\Rightarrow$ **AD| = ? cm**



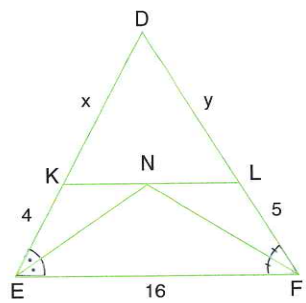
A) 6 B) 5 C) 4
D) 3 E) 2

10. [CF| ve [AF] açıortaydır.
[CF| and [AF] are bisectors.
$[ED] // [CA]$,
$|CE| = 3$ cm,
$|AD| = 5$ cm,
$|CA| = 20$ cm
$\Rightarrow$ **|BD| = x = ? cm**



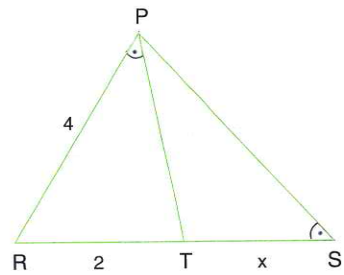
A) $\frac{5}{3}$ B) $\frac{3}{10}$ C) $\frac{10}{3}$
D) $\frac{1}{2}$ E) $\frac{2}{7}$

11. $|KL| // |EF|$,
[EN] ve [FN] açıortaydır.
[EN] and [FN] are bisectors.
$|KE| = 4$ cm
$|LF| = 5$ cm,
$|EF| = 16$ cm
$\Rightarrow$ **|DL| + |DK| = x+y =? cm**



A) $\frac{70}{8}$ B) $\frac{80}{9}$ C) $\frac{81}{7}$
D) $\frac{53}{4}$ E) $\frac{83}{7}$

12. $m(\widehat{RPT}) = m(\widehat{TSP})$,
$|PR| = 4$ cm,
$|RT| = 2$ cm
$\Rightarrow$ **|TS| = x = ? cm**



A) 7 B) 6 C) 5
D) 4 E) 3

YANITLAR / ANSWERS

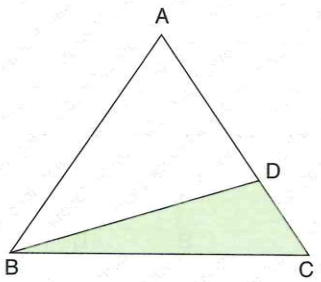
1	2	3	4	5	6	7	8	9	10	11	12
C	D	B	B	C	B	C	B	E	C	C	B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $A(\widehat{ABC}) = 42\,cm^2$,

$\frac{|AD|}{|AC|} = \frac{5}{7}$

$\Rightarrow$ **$A(\widehat{BDC}) = ?\,cm^2$**



A) 10 B) 12 C) 16

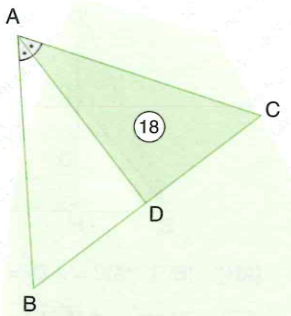
D) 20 E) 21

2. $m(\widehat{CAD}) = m(\widehat{BAD})$,

$2 \cdot |AB| = 3 \cdot |AC|$,

$A(\widehat{ADC}) = 18\,cm^2$

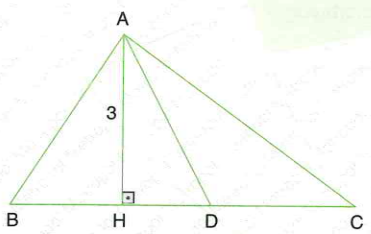
$\Rightarrow$ **$A(\widehat{ABC}) = ?\,cm^2$**



A) 30 B) 32 C) 35

D) 40 E) 45

3.



$|AH| = 3\,cm$, $|BC| = 10\,cm$, $|BD| = 4\,cm$,

$[AH] \perp [BC] \Rightarrow$ **$A(\widehat{ABC}) - A(\widehat{ADC}) = ?\,cm^2$**

A) 4 B) 5 C) 6

D) 9 E) 10

4. [CN] açıortaydır.

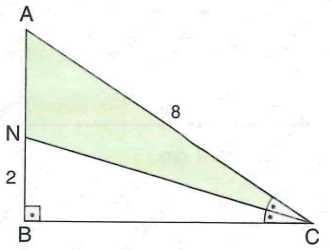
[CN] is a bisector.

$m(\widehat{B}) = 90°$,

$|AC| = 8\,cm$,

$|NB| = 2\,cm$

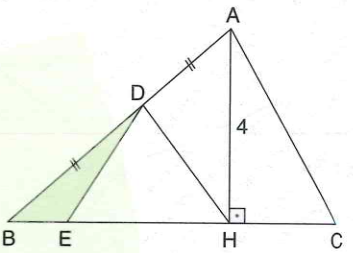
$\Rightarrow$ **$A(\widehat{ANC}) = ?\,cm^2$**



A) 8 B) 10 C) 12

D) 14 E) 16

5.



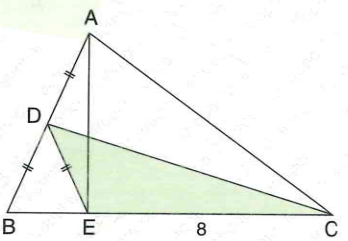
$[AH] \perp [BC]$, $|AH| = 4\,cm$, $|BH| = 6\,cm$,

$|BD| = |AD|$, $\frac{|BE|}{|BH|} = \frac{1}{3} \Rightarrow$ **$A(\widehat{BDE}) = ?\,cm^2$**

A) 2 B) 3 C) $\frac{7}{2}$

D) 4 E) $\frac{9}{2}$

6.



$|AD| = |BD| = |DE|$, $|EC| = 8\,cm$,

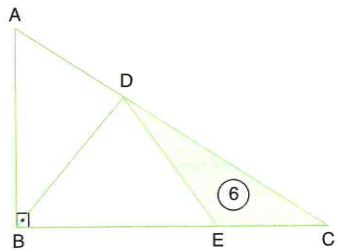
$|AE| = 4\,cm \Rightarrow$ **$A(\widehat{AEC}) = ?\,cm^2$**

A) 6 B) 8 C) 10

D) 12 E) 16

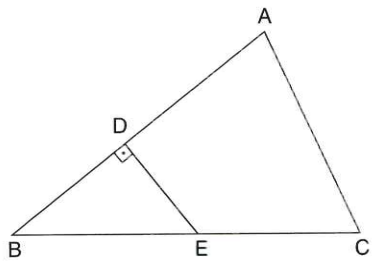
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $A(\widehat{DEC}) = 6\ cm^2$,
$2 \cdot |EC| = |BE|$,
$\frac{|AD|}{|DC|} = \frac{1}{3}$,
$|AB| = 6$ cm
$\Rightarrow$ **$|BC| = ?$ cm**



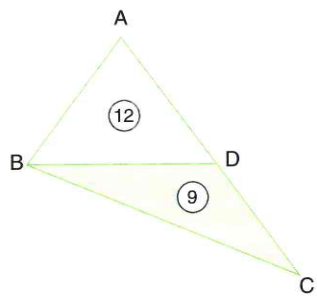
A) 6 B) 8 C) 10
D) 12 E) 14

8. $|DE| = 2$ cm,
$|AB| = 10$ cm,
$[DE] \perp [BA]$,
$5 \cdot |BE| = 2 \cdot |BC|$
$\Rightarrow$ **$A(\widehat{ABC}) = ?\ cm^2$**



A) 15 B) 20 C) 24
D) 25 E) 30

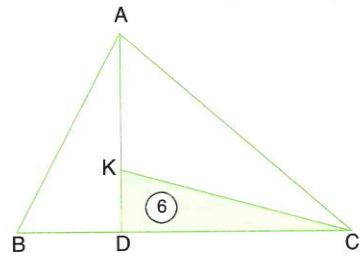
9. $A(\widehat{ABC}) = 21\ cm^2$,
$A(\widehat{BDC}) = 9\ cm^2$
$\Rightarrow$ **$\frac{|AD|}{|AC|} = ?$**



A) $\frac{3}{5}$ B) $\frac{3}{7}$ C) $\frac{4}{7}$
D) $\frac{2}{5}$ E) 2

METROPOL YAYINLARI • METROPOL PUBLICATIONS

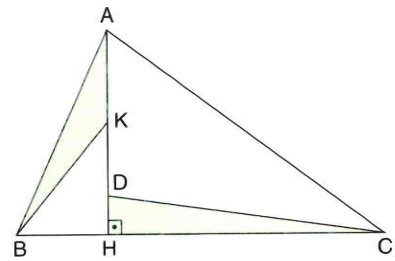
10.



$\frac{|AK|}{|AD|} = \frac{3}{5}$, $\frac{|BD|}{|DC|} = \frac{2}{3}$
$A(\widehat{KDC}) = 6\ cm^2 \Rightarrow$ **$A(\widehat{ABC}) = ?\ cm^2$**

A) 15 B) 20 C) 21
D) 24 E) 25

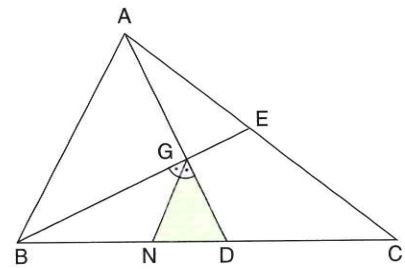
11.



$[AH] \perp [BC]$, $|AK| = |KD| = |DH| = 3$ cm
$|BC| = 12$ cm $\Rightarrow$ **$A(\widehat{ABK}) + A(\widehat{DHC}) = ?\ cm^2$**

A) 9 B) 12 C) 16
D) 18 E) 24

12. [GN] bir açıortaydır.
[GN] is a bisector.
$|AE| = |EC|$,
$|BD| = |DC|$,
$|AD| = 15$ cm,
$|BE| = 9$ cm
$A(\widehat{ABC}) = 96\ cm^2$
$\Rightarrow$ **$A(\widehat{GND}) = ?\ cm^2$**



A) 5 B) 6 C) $\frac{45}{2}$
D) $\frac{80}{11}$ E) 8

YANITLAR / ANSWERS

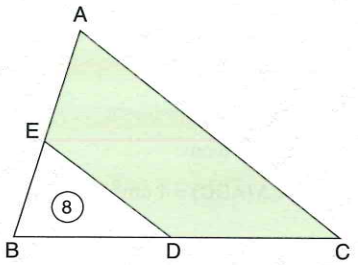
1	2	3	4	5	6	7	8	9	10	11	12
B	E	C	A	A	B	B	D	C	E	D	D

1. $|AE| = \frac{1}{2} \cdot |EB|$,

$|BD| = |DC|$,

$A(\widehat{EBD}) = 8\,cm^2$

$\Rightarrow$ **$A(\widehat{AEDC}) = ?\,cm^2$**



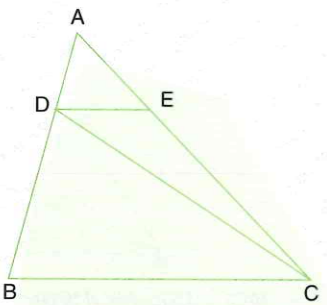
A) 32 B) 30 C) 24

D) 16 E) 14

2. $|AB| = 4 \cdot |AD|$,

$|AC| = 5 \cdot |AE|$

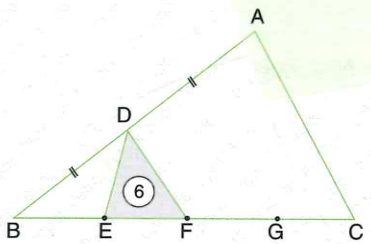
$\Rightarrow \dfrac{A(\widehat{ABC})}{A(\widehat{DEC})} = ?$



A) 7 B) 6 C) 5

D) 4 E) 3

3.



$|BD| = |DA|$, $|BE| = |EF| = |FG| = |GC|$,

$A(\widehat{DEF}) = 6\,cm^2 \Rightarrow$ **$A(\widehat{ABC}) = cm^2$**

A) 48 B) 54 C) 60

D) 66 E) 72

4. $|AD| = \frac{1}{5}|AC|$,

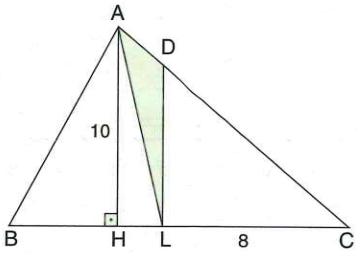
$|BL| = |LC|$,

$[AH] \perp [BC]$,

$|AH| = 10\,cm$,

$|LC| = 8\,cm$

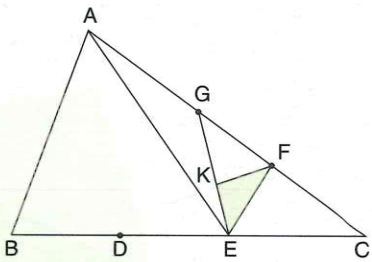
$\Rightarrow$ **$A(\widehat{ALD}) = ?\,cm^2$**



A) 7 B) 8 C) 9

D) 10 E) 12

5.



$|BD| = |DE| = |EC|$, $|AG| = |GF| = |FC|$,

$|GK| = |KE|$, $A(\widehat{ABC}) = 180\,cm^2 \Rightarrow$ **$A(\widehat{FEK}) = ?\,cm^2$**

A) 30 B) 25 C) 20

D) 15 E) 10

6. $|BH| = |HD|$, $|BK| = |KE|$,

$|AD| = \frac{1}{3}|AB|$,

$|BE| = \frac{2}{3}|BC|$,

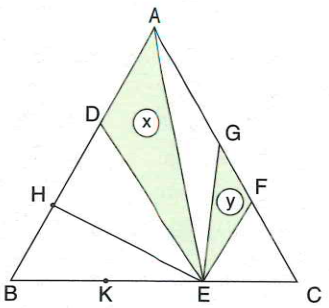
$|FG| = \frac{1}{3}|AC|$,

$A(\widehat{ABC}) = 120\,cm^2$,

$A(\widehat{AED}) = x\,cm^2$,

$A(\widehat{GEF}) = y\,cm^2$

$\Rightarrow$ **$x + y = ?\,cm^2$**

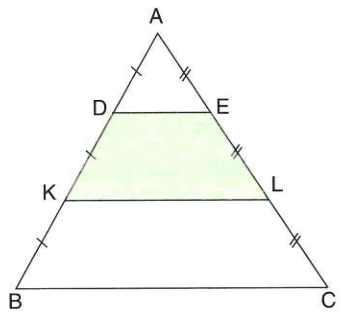


A) 80 B) 75 C) 60

D) 50 E) 40

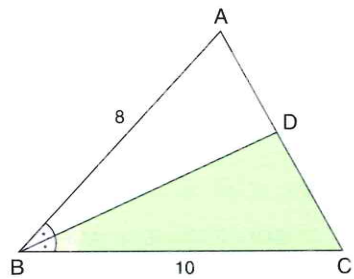
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [DE] // [KL] // [BC],
|AD| = |DK| = |KB|,
|AE| = |EL| = |LC|,
$A(\widehat{ABC}) = 45\,cm^2$
$\Rightarrow$ **$A(\widehat{DELK}) = ?\,cm^2$**



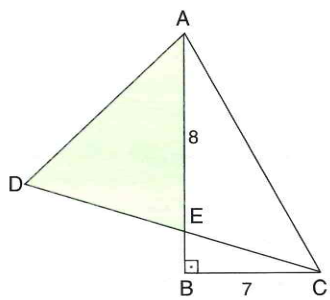
A) 15 B) 20 C) 25
D) 30 E) 35

8. $m(\widehat{ABD}) = m(\widehat{DBC})$,
|AB| = 8 cm,
|BC| = 10 cm
$\Rightarrow$ **$\frac{A(\widehat{BDC})}{A(\widehat{ABC})} = ?$**



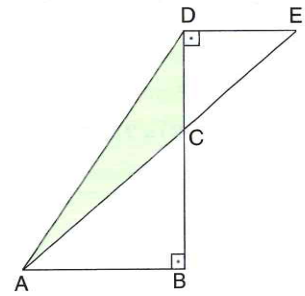
A) $\frac{1}{3}$ B) $\frac{4}{9}$ C) $\frac{2}{3}$
D) $\frac{5}{9}$ E) $\frac{7}{9}$

9. [AB] $\perp$ [BC],
4·|DE| = 3·|EC|,
|AE| = 8 cm,
|BC| = 7 cm
$\Rightarrow$ **$A(\widehat{ADE}) = ?\,cm^2$**



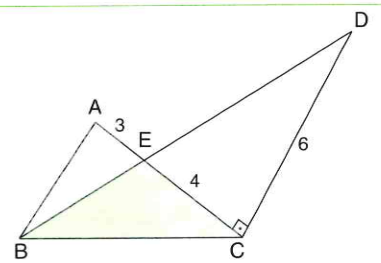
A) 14 B) 17,5 C) 21
D) 24,5 E) 28

10. $4 \cdot A(\widehat{ABC}) = 9 \cdot A(\widehat{EDC})$,
[AB] $\perp$ [BD],
[BD] $\perp$ [DE],
|AB| = 5 cm,
|BC| = 6 cm
$\Rightarrow$ **$A(\widehat{ADC}) = ?\,cm^2$**



A) 8 B) 9 C) 10
D) 12 E) 14

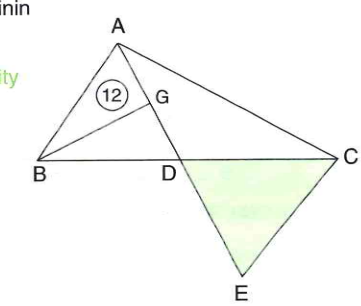
11.



[AC] $\perp$ [CD], [AB] // [CD], |DC| = 6 cm,
|AE| = 3 cm, |EC| = 4 cm $\Rightarrow$ **$A(\widehat{BEC}) = ?\,cm^2$**

A) 6 B) 9 C) 12
D) 15 E) 18

12. G noktası, ABC üçgeninin ağırlık merkezidir.
G is center the of gravity of the triangle ABC.
|DE| = 3·|GD|,
$A(\widehat{ABG}) = 12\,cm^2$
$\Rightarrow$ **$A(\widehat{CDE}) = ?\,cm^2$**



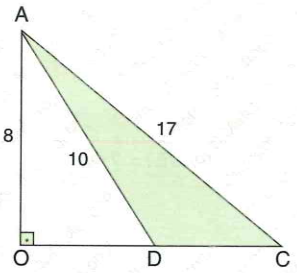
A) 12 B) 15 C) 18
D) 21 E) 24

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	C	A	B	E	E	A	D	C	C	B	C

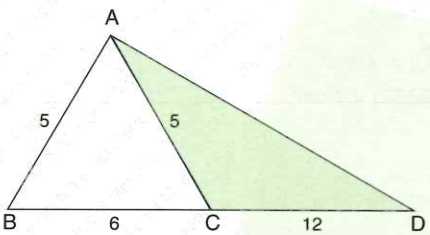
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $[AO] \perp [OC]$,
$|AO| = 8$ cm,
$|AD| = 10$ cm,
$|AC| = 17$ cm
$\Rightarrow$ **A($\widehat{ADC}$) = ? cm²**



A) 18 B) 32 C) 36
D) 40 E) 42

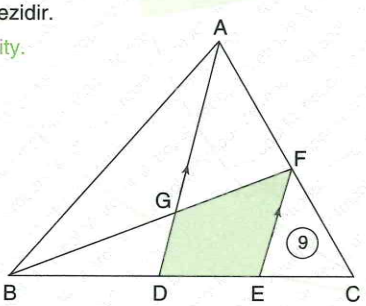
2.



$|AB| = |AC| = 5$ cm, $|BC| = 6$ cm, $|CD| = 12$ cm
$\Rightarrow$ **A($\widehat{ACD}$) = ? cm²**

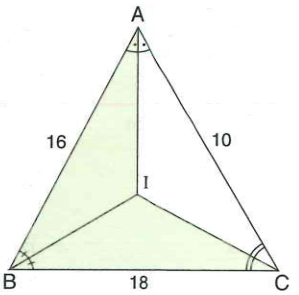
A) 18 B) 20 C) 24
D) 28 E) 30

3. G noktası ağırlık merkezidir.
G is the center of gravity.
$[GD] \parallel [EF]$,
$A(\overset{\triangle}{ECF}) = 9$ cm²
$\Rightarrow$ **A(GDEF) = ? cm²**



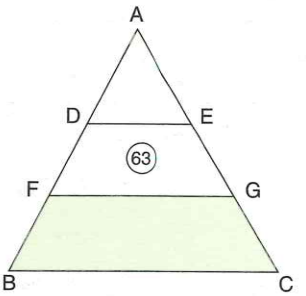
A) 12 B) 15 C) 18
D) 21 E) 25

4. [AI], [CI] ve [BI] açıortaydır.
[AI], [CI] and [BI] are bisectors.
$|AB| = 16$ cm,
$|AC| = 10$ cm,
$|BC| = 18$ cm
$\Rightarrow \dfrac{\text{A(ABCI)}}{\text{A}(\widehat{ABC})} = ?$



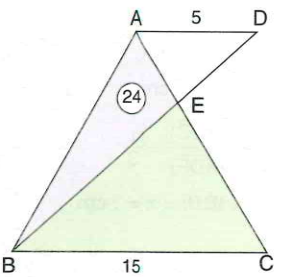
A) $\frac{13}{22}$ B) $\frac{15}{22}$ C) $\frac{17}{22}$
D) $\frac{19}{22}$ E) $\frac{21}{22}$

5. $[DE] \parallel [FG] \parallel [BC]$,
$3 \cdot |AE| = 2 \cdot |EG| = 6 \cdot |GC|$,
$A(DFGE) = 63$ cm²
$\Rightarrow$ **A(FBCG) = ? cm²**



A) 21 B) 28 C) 33
D) 35 E) 42

6. $[AD] \parallel [BC]$,
$|AD| = 5$ cm,
$|BC| = 15$ cm,
$A(\overset{\triangle}{ABE}) = 24$ cm²
$\Rightarrow$ **A($\widehat{BEC}$)–A($\widehat{AED}$) = ? cm²**



A) 35 B) 48 C) 52
D) 60 E) 64

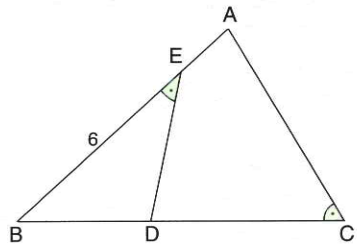
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $m(\widehat{BED}) = m(\widehat{ACB})$,

$\dfrac{A(\widehat{BED})}{A(\widehat{ABC})} = \dfrac{1}{4}$,

$|BE| = 6$ cm

$\Rightarrow$ **$|BC| = ?$ cm**



A) 8 B) 10 C) 12

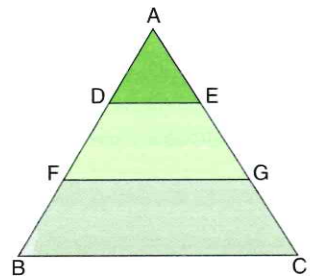
D) 14 E) 16

8. $[DE] // [FG] // [BC]$,

$A(DFGE) = 32\ cm^2$,

$|AD| = |FB| = \dfrac{|FD|}{2}$

$\Rightarrow$ **$A(\widehat{ABC}) = ?\ cm^2$**



A) 48 B) 52 C) 60

D) 64 E) 72

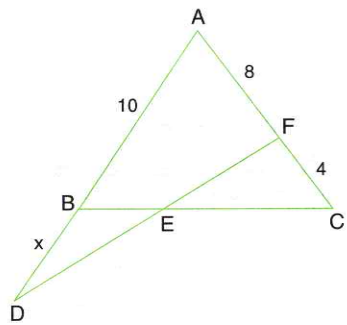
9. $|AB| = 10$ cm,

$|AF| = 8$ cm,

$|FC| = 4$ cm,

$\dfrac{A(\widehat{ABC})}{A(\widehat{ADF})} = \dfrac{1}{3}$

$\Rightarrow$ **$|BD| = x = ?$ cm**



A) 5 B) 12 C) 18

D) 20 E) 35

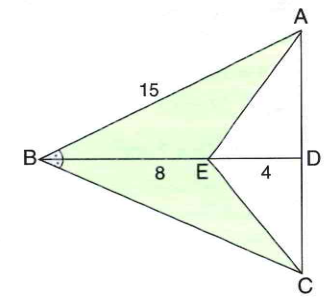
10. $m(\widehat{ABD}) = m(\widehat{DBC})$,

$|AB| = |BC| = 15$ cm,

$|BE| = 8$ cm,

$|ED| = 4$ cm

$\Rightarrow$ **$A(ABCE) = ?\ cm^2$**



A) 36 B) 48 C) 54

D) 66 E) 72

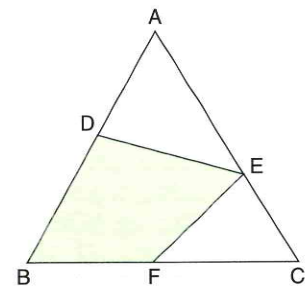
11. $3 \cdot |AD| = |DB|$,

$3 \cdot |AE| = 2 \cdot |EC|$,

$5 \cdot |FC| = |BF|$,

$A(\widehat{ABC}) = 80\ cm^2$

$\Rightarrow$ **$A(DBFE) = ?\ cm^2$**



A) 32 B) 48 C) 52

D) 60 E) 64

12. $[AF]$ kenarortay;

$[BD]$ açıortaydır.

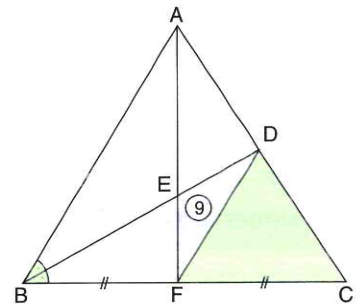
$[AF]$ is a median;

$[BD]$ is a bisector.

$2 \cdot |AD| = 3 \cdot |DC|$

$A(\widehat{DEF}) = 9\ cm^2$

$\Rightarrow$ **$A(\widehat{DFC}) = ?\ cm^2$**



A) 24 B) 32 C) 36

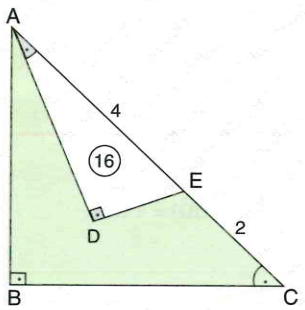
D) 54 E) 72

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	C	B	C	C	E	C	D	E	E	E	A

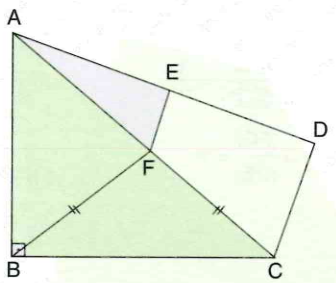
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $[AD] \perp [DE]$,
$[AB] \perp [BC]$,
$|AE| = 4$ cm,
$|EC| = 2$ cm,
$m(\widehat{DAE}) = m(\widehat{ACB})$,
$A(\widehat{ADE}) = 16\,cm^2$
$\Rightarrow$ **Taralı alan = ? cm^2**
The shaded area = ? cm^2



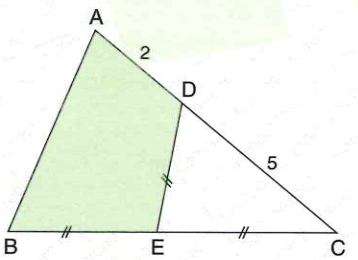
A) 18 B) 20 C) 24
D) 30 E) 36

2. $[AB] \perp [BC]$,
$[EF] // [DC]$,
$|BF| = |FC|$,
$A(\widehat{BFC}) = A(EFCD)$
$\Rightarrow \dfrac{A(\widehat{ABC})}{A(\widehat{AFE})} = ?$



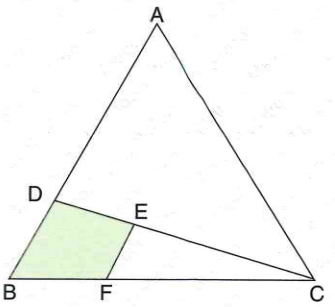
A) 2 B) 3 C) 4
D) 5 E) 6

3. $|BE| = |EC| = |DE|$,
$|AD| = 2$ cm,
$|DC| = 5$ cm,
$|BC| = 13$ cm
$\Rightarrow$ **A(ABED) = ? cm^2**



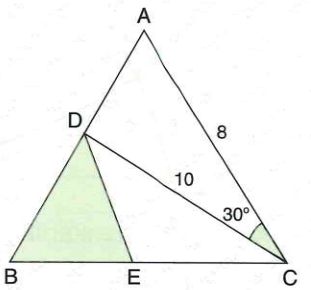
A) 20 B) 24 C) 27
D) 30 E) 42

4. $[EF] // [AB]$,
$|DB| = \dfrac{|AB|}{3}$,
$|ED| = \dfrac{|DC|}{3}$,
$A(\widehat{ABC}) = 54\,cm^2$
$\Rightarrow$ **$A(\widehat{BFED}) = ?\,cm^2$**



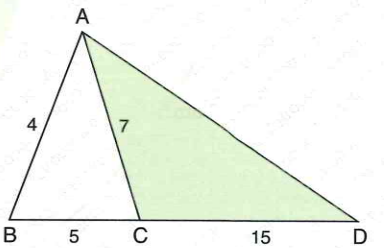
A) 9 B) 10 C) 15
D) 27 E) 30

5. $|BD| = 2 \cdot |AD|$,
$|EC| = 3 \cdot |BE|$,
$|AC| = 8$ cm,
$|DC| = 10$ cm,
$m(\widehat{ACD}) = 30°$
$\Rightarrow$ **$A(\widehat{BDE}) = ?\,cm^2$**



A) 5 B) 10 C) 15
D) 20 E) 25

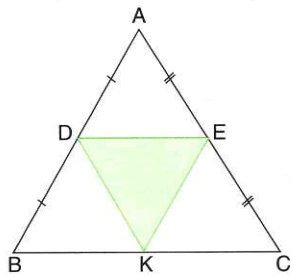
6. $|AB| = 4$ cm,
$|AC| = 7$ cm,
$|BC| = 5$ cm,
$|CD| = 15$ cm
$\Rightarrow$ **$A(\widehat{ACD}) = ?\,cm^2$**



A) $4\sqrt{6}$ B) $8\sqrt{6}$ C) $12\sqrt{6}$
D) $16\sqrt{6}$ E) $20\sqrt{6}$

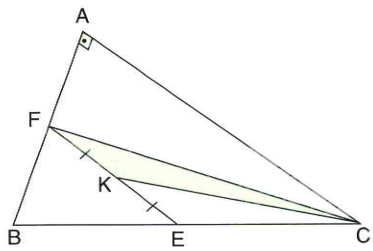
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $|AD| = |DB|$,
$|AE| = |EC|$,
$A(\widehat{ABC}) = 36\ cm^2$
$\Rightarrow$ **$A(\widehat{DEK}) = ?\ cm^2$**



A) 4 B) 6 C) 9
D) 12 E) 18

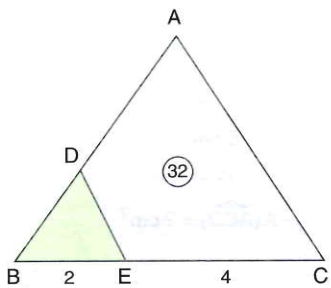
8.



$[AC] \perp [AB]$, $|FK| = |KE|$, $|BE| = 2|EC|$,
$|AC| = 8$ cm, $|FB| = 6$ cm $\Rightarrow$ **$A(\widehat{FKC}) = ?\ cm^2$**

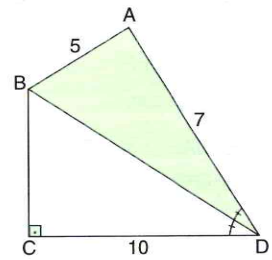
A) 1 B) 2 C) 3
D) 4 E) 5

9. $[DE] // [AC]$,
$|BE| = 2$ cm,
$|EC| = 4$ cm,
$A(DECA) = 32\ cm^2$
$\Rightarrow$ **$A(\widehat{BDE}) = ?\ cm^2$**



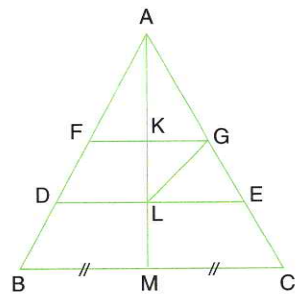
A) 2 B) 4 C) 6
D) 8 E) 10

10. $[DB]$ bir açıortaydır.
$[DB]$ is a bisector.
$[BC] \perp [DC]$,
$|AB| = 5$ cm,
$|AD| = 7$ cm,
$|CD| = 10$ cm
$\Rightarrow$ **$A(\widehat{ABD}) = ?\ cm^2$**



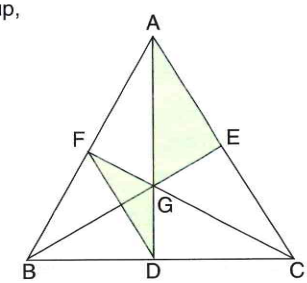
A) 14 B) 15 C) 16
D) 18 E) 20

11. $[FG] // [DE] // [BC]$,
$|BM| = |MC|$,
$\frac{A(\widehat{KGL})}{A(\widehat{GLE})} = \frac{3}{5}$
$\Rightarrow \frac{|FG|}{|DE|} = ?$



A) $\frac{2}{3}$ B) $\frac{3}{5}$ C) $\frac{4}{9}$
D) $\frac{9}{16}$ E) $\frac{9}{25}$

12. G noktası ağırlık merkezi olup, taralı alanların toplamı $18\ cm^2$ dir.
G is center of the gravity, and the sum of the shaded areas is $18\ cm^2$.
$\Rightarrow$ **$A(\widehat{ABC}) = ?\ cm^2$**



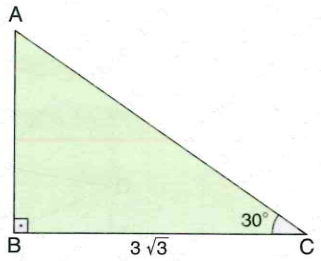
A) 18 B) 36 C) 54
D) 72 E) 90

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
B	E	C	B	B	C	C	D	B	A	B	D

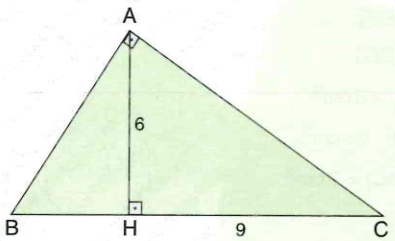
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $[AB] \perp [BC]$,
$m(\widehat{BCA}) = 30°$,
$|BC| = 3\sqrt{3}$ cm
$\Rightarrow$ **A($\overset{\triangle}{ABC}$) = ? cm²**



A) $2\sqrt{3}$ B) $\frac{3\sqrt{3}}{2}$ C) $9\sqrt{3}$
D) $\frac{9\sqrt{3}}{2}$ E) 3

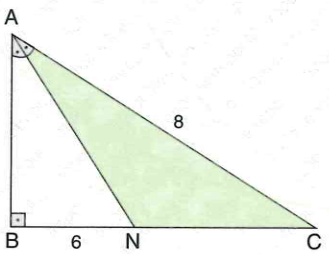
2.



$m(\widehat{BAC}) = 90°$, $[AH] \perp [BC]$, $|AH| = 6$ cm,
$|HC| = 9$ cm $\Rightarrow$ **A($\widehat{ABC}$) = ? cm²**

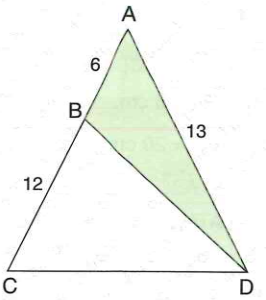
A) 24 B) 28 C) 32
D) 34 E) 39

3. [AN] bir açıortaydır.
[AN] is a bisector.
$|AC| = 8$ cm
$|BN| = 6$ cm,
$\Rightarrow$ **A($\widehat{ANC}$) = ? cm²**



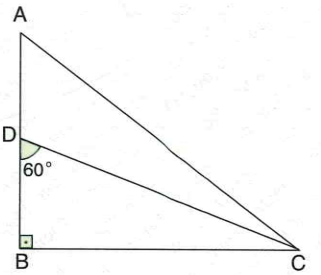
A) 48 B) 24 C) 20
D) 12 E) 6

4. $|BD| = |CD|$,
$|AB| = 6$ cm,
$|BC| = 12$ cm,
$|AD| = 13$ cm
$\Rightarrow$ **A($\widehat{ABD}$) = ? cm²**



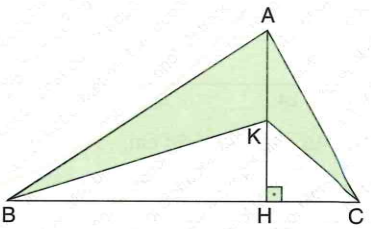
A) 24 B) 20 C) 18
D) 15 E) 12

5. $[AB] \perp [BC]$,
$m(\widehat{BDC}) = 60°$,
$|AB| = |BC|$
$\Rightarrow \frac{\text{A}(\widehat{ABC})}{\text{A}(\widehat{BDC})} = ?$



A) $\sqrt{2}$ B) $\sqrt{3}$ C) $\frac{3}{2}$
D) $\frac{4}{3}$ E) 2

6.

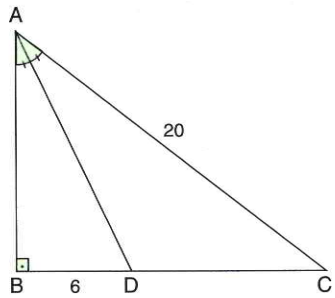


$[AH] \perp [BC]$, $|AK| = 4$ cm,
$|BC| = 16$ cm $\Rightarrow$ **A(ABKC) = ? cm²**

A) 16 B) 24 C) 30
D) 32 E) 40

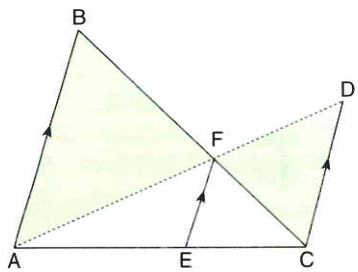
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [AD] bir açıortaydır.
[AD] is a bisector.
[AB] ⊥ [BC],
|BD| = 6 cm,
|AC| = 20 cm,
$\frac{A(\widehat{ABC})}{A(\widehat{ADC})} = \frac{8}{5}$
$\Rightarrow$ **|AB| = ? cm**



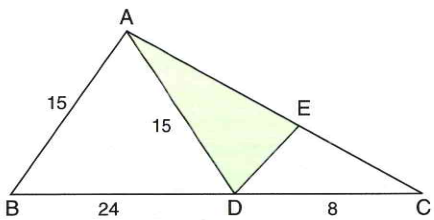
A) 6 B) 8 C) 10
D) 12 E) 16

8. [AB] // [EF] // [CD],
|AB| = 3·|EF|
$\Rightarrow \frac{A(\widehat{ABF})}{A(\widehat{CFD})} = ?$



A) 2 B) 2,5 C) 3
D) 3,5 E) 4

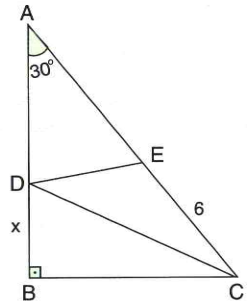
9.



|AB| = |AD| = 15 cm, |BD| = 24 cm,
|DC| = 8 cm, $\frac{|EC|}{|AE|} = \frac{1}{3} \Rightarrow$ **$A(\widehat{ADE}) = ?\ cm^2$**

A) 18 B) 21 C) 24
D) 27 E) 32

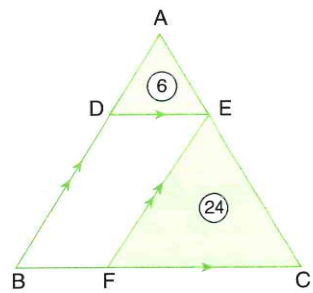
10.



$m(\widehat{B}) = 90°$, $m(\widehat{A}) = 30°$, |EC| = 6 cm,
$A(\widehat{ADE}) = A(\widehat{DEC}) = A(\widehat{DBC}) \Rightarrow$ **|BD| = x = ? cm**

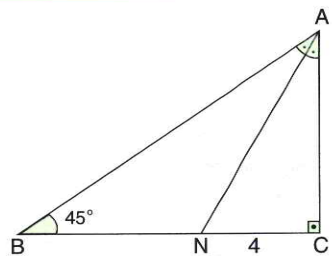
A) 1 B) $2\sqrt{2}$ C) $2\sqrt{3}$
D) $3\sqrt{3}$ E) $4\sqrt{3}$

11. [AB] // [EF],
[DE] // [BC],
$A(\widehat{ADE}) = 6\ cm^2$
$A(\widehat{EFC}) = 24\ cm^2$
$\Rightarrow$ **$A(\widehat{ABC}) = ?\ cm^2$**



A) 54 B) 56 C) 60
D) 64 E) 72

12. [AN] açıortaydır.
[AN] is a bisector.
|NC| = 4 cm
$\Rightarrow$ **$A(\widehat{ABN}) - A(\widehat{ANC}) = ?$**



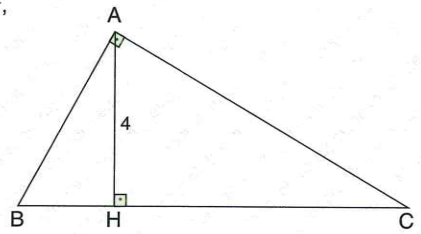
A) $\sqrt{2}$ B) 4 C) $2\sqrt{2}$
D) $4\sqrt{2}$ E) 8

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	E	B	D	B	D	D	E	D	C	A	E

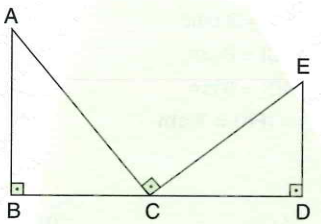
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $A(\widehat{ABC}) = 20\,cm^2$,
$|AH| = 4$ cm
$\Rightarrow$ **$|BC| = ?$ cm**



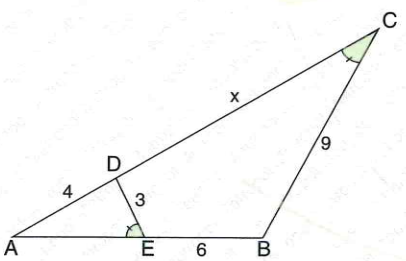
A) 8 B) 10 C) 12
D) 16 E) 17

2. $m(\widehat{B}) = m(\widehat{D}) = 90°$,
$[AC] \perp [CE]$,
$\frac{|CD|}{|AB|} = \frac{1}{2}$
$\Rightarrow$ **$\frac{A(\widehat{ABC})}{A(\widehat{DEC})} = ?$**



A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) 1
D) 2 E) 4

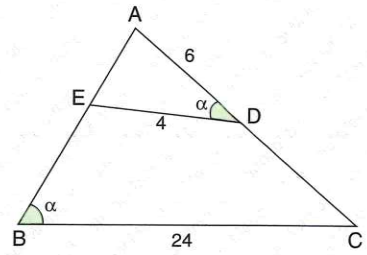
3.



$m(\widehat{AED}) = m(\widehat{ACB})$, $|EB| = 6$ cm, $|AD| = 4$ cm,
$|CB| = 9$ cm, $|DE| = 3$ cm $\Rightarrow$ **$|CD| = x = ?$ cm**

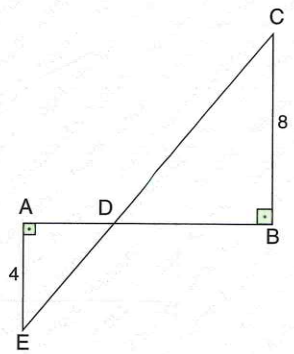
A) 12 B) 14 C) 17
D) 18 E) 19

4. $|AD| = 6$ cm,
$|ED| = 4$ cm,
$|BC| = 24$ cm,
$m(\widehat{ADE}) = m(\widehat{ABC})$
$\Rightarrow$ **$|AB| = ?$ cm**



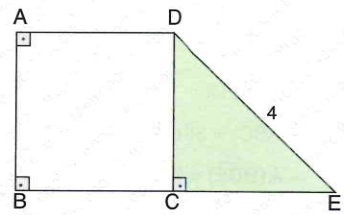
A) 24 B) 30 C) 32
D) 34 E) 36

5. $[AB] \perp [BC]$,
$[AB] \perp [AE]$,
$|BC| = 8$ cm,
$|AB| = 12$ cm,
$|AE| = 4$ cm
$\Rightarrow$ **$|EC| = ?$ cm**



A) 12 B) $12\sqrt{2}$ C) $12\sqrt{3}$
D) 8 E) $8\sqrt{2}$

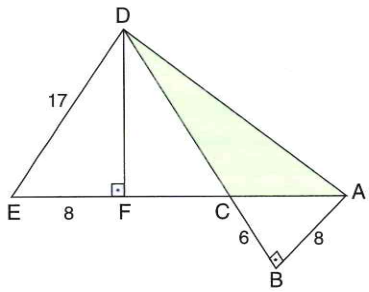
6. $m(\widehat{ADE}) = 120°$,
$|DE| = 4$ cm,
$[DC] \perp [BE]$,
$m(\widehat{ABE}) = m(\widehat{DAB}) = 90°$
$\Rightarrow$ **$A(\widehat{DEC}) = ?\,cm^2$**



A) $2\sqrt{3}$ B) $4\sqrt{3}$ C) $\frac{2\sqrt{3}}{2}$
D) $\frac{3\sqrt{3}}{2}$ E) 4

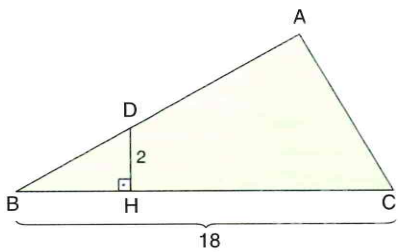
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [DF] ⊥ [EA],
[DB] ⊥ [BA],
|DE| = 17 cm,
|EF| = 8 cm,
|CB| = 6 cm,
|BA| = 8 cm
⇒ **A(DCA) = ? cm²**



A) 45 B) 54 C) 60
D) 75 E) 90

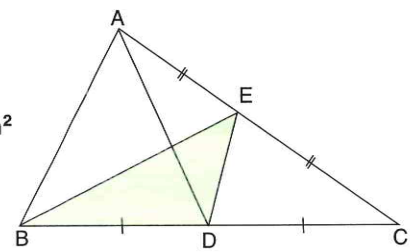
8.



[DH] ⊥ [BC], |DH| = 2 cm, |BC| = 18 cm, $|BD| = \frac{1}{4}|DA|$
⇒ **A(ABC) = ? cm²**

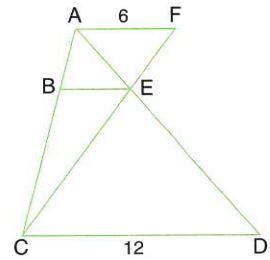
A) 45 B) 60 C) 90
D) 120 E) 180

9. |BD| = |DC|,
|AE| = |EC|,
A(ABC) = 36 cm²
⇒ **A(BDE) = ? cm²**



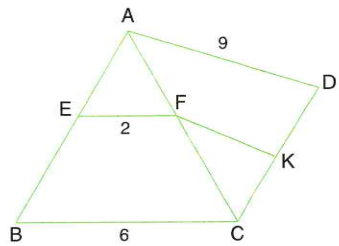
A) 6 B) 8 C) 9
D) 10 E) 12

10. [AF] // [BE] // [CD],
|AF| = 6 cm,
|CD| = 12 cm
⇒ **|BE| = ? cm**



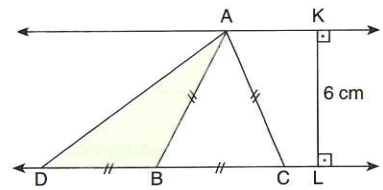
A) 1 B) 2 C) 3
D) 4 E) 6

11. [EF] // [BC],
[FK] // [AD],
|EF| = 2 cm,
|BC| = 6 cm,
|AD| = 9 cm
⇒ **|FK| = ? cm**



A) 7 B) 6,75 C) 6
D) 4 E) 3

12.



m(K) = m(L) = 90°,
|AB| = |BC| = |AC| = |DB|,
|KL| = 6 cm ⇒ **A(ADB) = ? cm²**

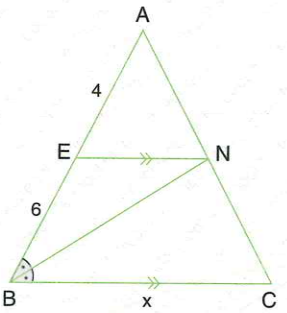
A) $6\sqrt{3}$ B) $12\sqrt{3}$ C) 13
D) $15\sqrt{3}$ E) 18

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
B	E	B	E	B	A	D	C	C	D	C	B

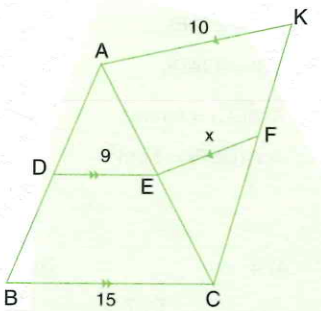
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $m(\widehat{ABN}) = m(\widehat{NBC})$,
$[EN] // [BC]$,
$|AE| = 4$ cm,
$|EB| = 6$ cm
$\Rightarrow$ **$|BC| = x =$? cm**



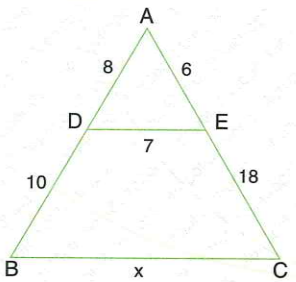
A) 8 B) 9 C) 12
D) 15 E) 16

2. $[DE] // [BC]$,
$[EF] // [AK]$,
$|BC| = 15$ cm,
$|DE| = 9$ cm,
$|AK| = 10$ cm
$\Rightarrow$ **$|EF| = x =$? cm**



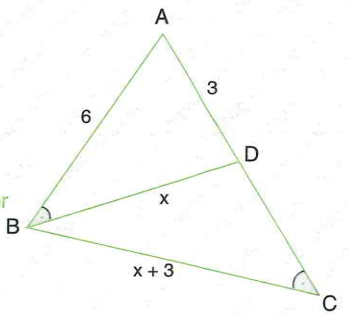
A) 3 B) 4 C) $\frac{9}{2}$
D) $\frac{11}{2}$ E) 6

3. $|AD| = 8$ cm,
$|DB| = 10$ cm,
$|AE| = 6$ cm,
$|EC| = 18$ cm,
$|DE| = 7$ cm.
$\Rightarrow$ **$|BC| =$? cm**



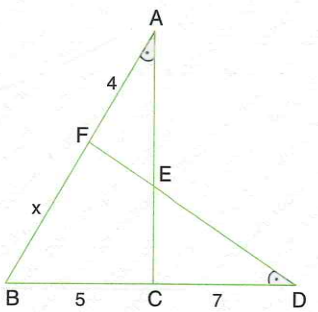
A) 12 B) 15 C) 18
D) 21 E) $\frac{45}{2}$

4. $m(\widehat{ABD}) = m(\widehat{ACB})$
$|AB| = 6$ cm,
$|AD| = 3$ cm,
$|BD| = x$ cm,
$|BC| = (x + 3)$ cm
$\Rightarrow$ **Çevre /** The Perimeter
$(\widehat{BDC}) =$?cm



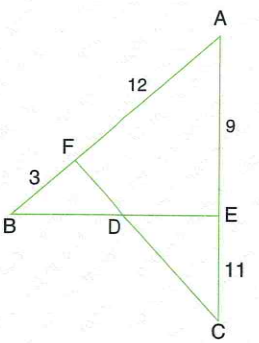
A) 12 B) 15 C) 18
D) 21 E) $\frac{45}{2}$

5. $|AF| = 4$ cm,
$|FB| = x$ cm,
$|BC| = 5$ cm,
$|CD| = 7$ cm,
$m(\widehat{BAC}) = m(\widehat{BDF})$
$\Rightarrow$ **$|BF| = x =$? cm**



A) 3 B) $\frac{7}{2}$ C) 5
D) $\frac{11}{2}$ E) 6

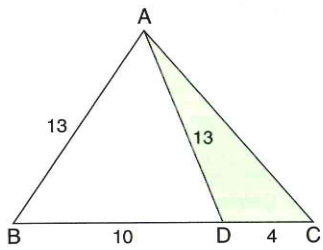
6. $|AB| = 15$ cm,
$|AC| = 20$ cm,
$|AE| = 9$ cm,
$|AF| = 12$ cm,
$|CF| = 20$ cm
$\Rightarrow$ **$|BE| =$? cm**



A) 12 B) 14 C) 15
D) $\frac{33}{2}$ E) $\frac{45}{2}$

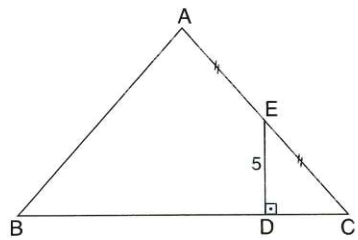
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. |AB| = |AD| = 13 cm,
|BD| = 10 cm,
|DC| = 4 cm
⇒ **A(ADC) = ? cm²**



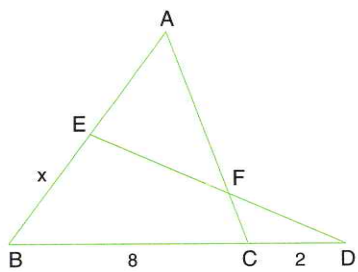
A) 12 B) 16 C) 18
D) 24 E) 32

8. |AE| = |EC|,
|ED| = 5 cm,
|BC| = 12 cm
⇒ **A(ABC) = ? cm²**



A) 40 B) 42 C) 52
D) 60 E) 62

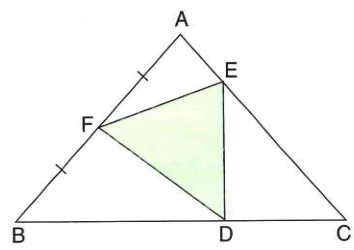
9.



|BC| = 8 cm, |CD| = 2 cm, |AB| = 5 cm,
A(BDE) = A(ABC) ⇒ **|BE| = x = ? cm**

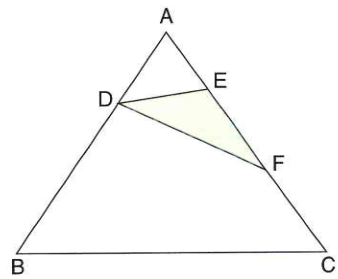
A) 2 B) 3 C) 4
D) 4,2 E) 4,8

10. A(ABC) = 72 cm²,
|AF| = |FB|,
|EC| = 2·|AE|,
|BD| = 3·|DC|
⇒ **A(FDE) = ? cm²**



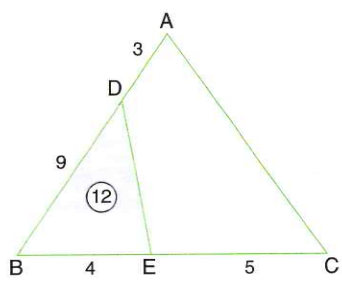
A) 18 B) 21 C) 28
D) 34 E) 43

11. |EF| = 3·|AE|,
|FC| = 2·|AE|,
|AB| = 4·|AD|,
A(ABC) = 48 cm²
⇒ **A(DEF) = ? cm²**



A) 4 B) 5 C) 6
D) 7 E) 8

12. A(DEB) = 12 cm²,
|BD| = 9 cm,
|DA| = 3 cm,
|BE| = 4 cm,
|EC| = 5 cm
⇒ **A(ABC) = ? cm²**



A) 25 B) 30 C) 36
D) 45 E) 60

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	B	D	C	E	C	D	D	C	B	C	C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

BÖLÜM CHAPTER 6

TARİHSEL NOT / HISTORICAL NOTE

İskenderiyeli Menelaus [70 – 140]

Yunan matematikçi ve gök bilimcidir. "Sphaerica'nın Arapça çevirisi" Menelaus'un günümüze kalan tek yapıtıdır. Üç kitaptan oluşan bu çalışma, kürenin geometrisi ve gök bilimsel hesaplamalarda kullanımını konu almaktadır. Kitap, küresel üçgen kavramına giriş yapmakta ve Menelaus teoreminin kanıtına yer vermektedir.

Greek mathematician and astronomer. "Sphaerica's Arabic translation" is Menelaus's only preserved work. This work, which consists of three books, deals with the use of sphere geometry and its use in astronomical calculations. The book introduces the concept of spheral triangle and places it as the evidence of the Menelaus theorem.

ÜÇGENDE AÇI – KENAR BAĞINTILARI
ANGLE – SIDE RELATIONS in TRIANGLE

Bu bölüm, 18 çözümlü örnek, 12 çözümlü test sorusu, 6 çözümlü YÖS sorusu, 12 alıştırma sorusu, 24 test sorusu içermektedir.

This chapter includes 18 examples with solutions, 12 test questions with solutions, 6 YÖS questions with solutions, 12 exercise questions and 24 test questions.

BÖLÜM / CHAPTER 6 ..... 217 - 238

ÜÇGENDE AÇI – KENAR BAĞINTILARI / ANGLES – SIDE RELATIONS in TRIANGLE

- Üçgende Açı – Kenar Bağıntıları / Angle – Side Relations in Triangle ..... 219 - 226
- Çözümlü Test / Test With Solutions ..... 227 - 230
- YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 231 - 232
- Alıştırmalar / Exercises ..... 233 - 234
- Konu Testleri / Practice Tests ..... 235 - 238

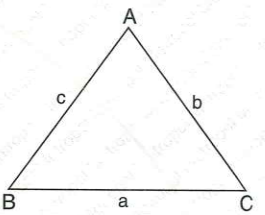
BÖLÜM 03 CHAPTER

ÜÇGENDE AÇI – KENAR BAĞINTILARI
ANGLE – SIDE RELATIONS in TRIANGLE

ÜÇGENDE AÇI – KENAR BAĞINTILARI / ANGLE – SIDE RELATIONS in TRIANGLE

Özellik 1 / Property 1

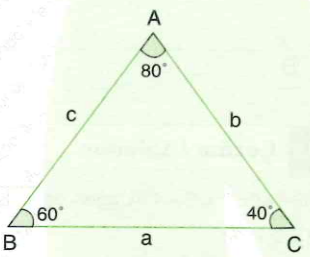
Bir üçgende, büyük açı karşısında uzun kenar, küçük açı karşısında kısa kenar bulunur.
In a triangle, the large side is opposite the large angle and the small side is opposite the small angle.



$m(\widehat{A}) > m(\widehat{B}) > m(\widehat{C}) \Leftrightarrow a > b > c$

Örnek / Example 1

$m(\widehat{ABC}) = 60°$,
$m(\widehat{BAC}) = 80°$,
$m(\widehat{BCA}) = 40°$
$\Rightarrow ? < ? < ?$



A) $a < b < c$ B) $c < b < a$ C) $c < a < b$
D) $b < a < c$ E) $a < c < b$

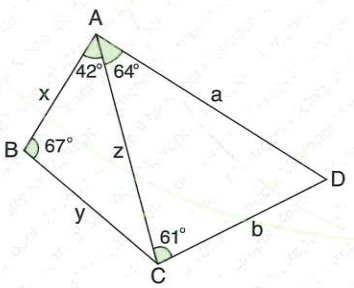
Çözüm / Solution

Yanıt / Answer **B**

$40° < 60° < 80° \Leftrightarrow c < b < a$

Örnek / Example 2

$m(\widehat{CAD}) = 64°$,
$m(\widehat{ABC}) = 67°$,
$m(\widehat{BAC}) = 42°$,
$m(\widehat{ACD}) = 61°$,
⇒ En kısa kenar hangisidir?
Which side is the shortest?



A) x B) y C) z
D) a E) b

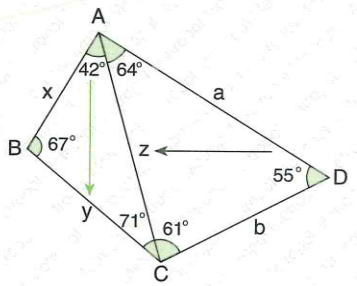
Çözüm / Solution

Yanıt / Answer **B**

$\widehat{ABC}: 42° < 67° < 71° \Leftrightarrow y < z < x$
$\widehat{ADC}: 55° < 61° < 64° \Leftrightarrow z < a < b$

$y < z < x$
$z < a < b$
$\Rightarrow y$: En kısa kenar / The shortest side

veya (or)



[Ok yöntemi / Arrow method]

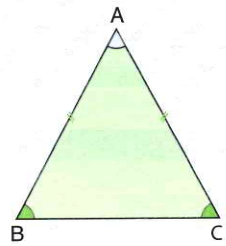
Özellik 2 / Property 2

İkizkenar üçgende olduğu gibi eşit açıların karşısındaki kenarların uzunlukları da eşittir. / The length of sides oposite equal angles are equal as in isosceles triangle.

$m(\widehat{B}) = m(\widehat{C}) \Leftrightarrow |AB| = |AC|$

$m(\widehat{A}) < m(\widehat{B}) = m(\widehat{C}) \Leftrightarrow |BC| < |AB| = |AC|$

$m(\widehat{B}) = m(\widehat{C}) < m(\widehat{A}) \Leftrightarrow |AB| = |AC| < |BC|$



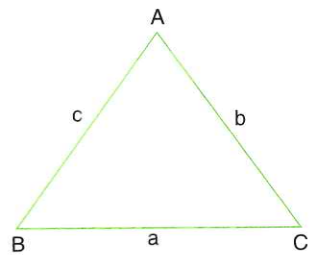
Özellik 3 / Property 3

Üçgen Eşitsizliği / Triangle Inequality:

$|b - c| < a < b + c$

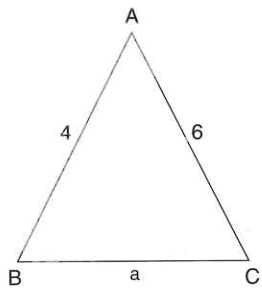
$|a - c| < b < a + c$ ...$[a, b, c \in R^+]$

$|b - a| < c < a + b$



Örnek / Example 3

$a \in Z$,
$|AB| = 4$ cm,
$|AC| = 6$ cm
$\Rightarrow$ ÇK(SS) = ?



A) {3,5} B) {3,4,5,6} C) {3,4,5,6,7,8}
D) {3,5,7,9} E) {3,4,5,6,7,8,9}

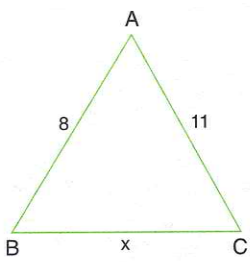
Çözüm / Solution

Yanıt / Answer **E**

$|6 - 4| < a < 6 + 4$ [Üçgen eşitsizliği / Triangle Inequality]
$2 < a < 10$
$a \in Z, a = \{3,4,5,6,7,8,9\}$

Örnek / Example 4

$x \in Z$,
$|AB| = 8$ cm,
$|AC| = 11$ cm
$\Rightarrow \sum x = ?$ cm



A) 150 B) 155 C) 165
D) 170 E) 175

Çözüm / Solution

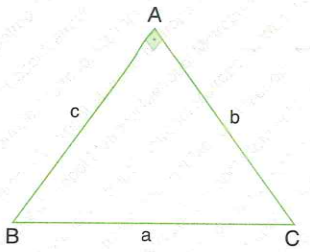
Yanıt / Answer **C**

$|8 - 11| < x < 8 + 11$
$|-3| < x < 19$
$3 < x < 19$
$x \in Z, x = \{4,5,...,18\}$
$\Rightarrow \sum x = 4 + 5 + ... + 18 = 165$ cm

Özellik 4 / Property 4

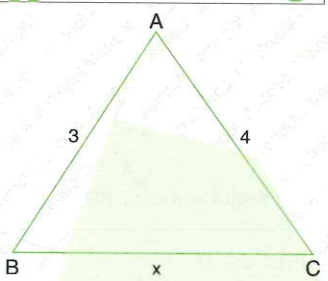
Bir dik üçgenin kenarları arasında aşağıdaki ilişki vardır. Sides of a right triangle have the relationship below.

$m(\widehat{A}) = 90^\circ \Leftrightarrow a^2 = b^2 + c^2$ [Pisagor bağıntısı / Pythagoras Theorem]



Örnek / Example 5

$m(\widehat{BAC}) = 90^\circ$,
$|AB| = 3\,br\,(u)$,
$|AC| = 4\,br\,(u)$
$\Rightarrow |BC| = x = ?\,br\,(u)$



A) 5 B) 6 C) 8 D) 10 E) 12

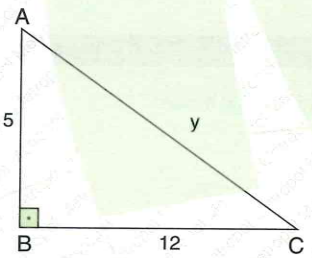
Çözüm / Solution

Yanıt / Answer **A**

$m(\widehat{BAC}) = 90^\circ \Leftrightarrow x^2 = 3^2 + 4^2$
$x^2 = 9 + 16$
$x^2 = 25$
$x = 5\,br\,(u)$

Örnek / Example 6

$m(\widehat{ABC}) = 90^\circ$,
$|AB| = 5\,br\,(u)$,
$|BC| = 12\,br\,(u)$
$\Rightarrow |AC| = y = ?\,br\,(u)$



A) 6 B) 13 C) 15 D) 24 E) 25

Çözüm / Solution

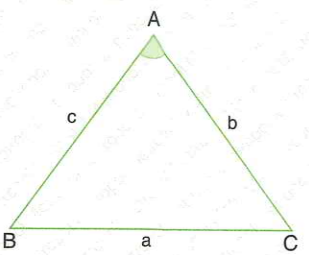
Yanıt / Answer **B**

$m(\widehat{ABC}) = 90^\circ \Leftrightarrow y^2 = 5^2 + 12^2$
$y^2 = 25 + 144$
$y^2 = 169$
$y = 13\,br\,(u)$

Özellik 5 / Property 5

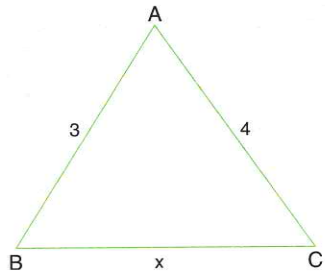
A açısı geniş açı ise aşağıdaki ilişki vardır. If A is an obtuse angle, the relationship below exists.

$m(\widehat{A}) > 90^\circ \Leftrightarrow a^2 > b^2 + c^2$



Örnek / Example 7

$x \in Z$,
$|AB| = 3$ cm,
$|AC| = 4$ cm,
$m(\widehat{BAC}) > 90°$
$\Rightarrow$ **x = ? cm**



A) 5 B) 6 C) 7 D) 8 E) 9

Çözüm / Solution Yanıt / Answer **B**

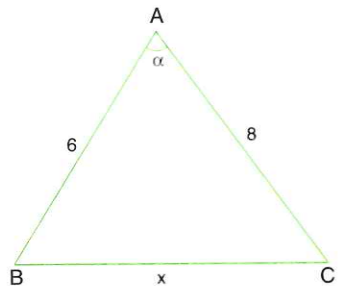
$1 < x < 7$ [Üçgen eşitsizliği / Triangle inequality]

$m(\widehat{BAC}) > 90° \Leftrightarrow x^2 > 3^2 + 4^2$
$x^2 > 9 + 16$
$x^2 > 25$
$x > 5$

$5 < x < 7, x \in Z \Rightarrow x = 6$ cm

Örnek / Example 8

$x \in Z$,
$|AB| = 6$ cm,
$|AC| = 8$ cm,
$m(\widehat{A}) = \alpha > 90°$
$\Rightarrow$ **min(x) = ? cm**



A) 9 B) 10 C) 11 D) 12 E) 13

Çözüm / Solution Yanıt / Answer **C**

$2 < x < 14$ [Üçgen eşitsizliği / Triangle inequality]

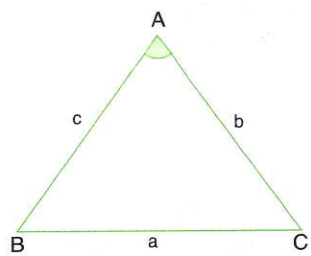
$m(\widehat{A}) = \alpha > 90° \Rightarrow x^2 > 6^2 + 8^2$
$\Rightarrow x^2 > 100 \Rightarrow x > 10$

$10 < x < 14 \Rightarrow x \in Z$, $\min(x) = 11$ cm

Özellik 6 / Property 6

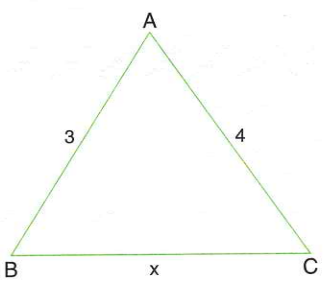
A açısı dar açı ise aşağıdaki ilişki vardır. If A is an acute angle, the relationship below exists.

$$m(\widehat{A}) < 90° \Leftrightarrow a^2 < b^2 + c^2$$



Örnek / Example 9

$x \in Z$,
$|AB| = 3$ cm,
$|AC| = 4$ cm,
$m(\widehat{BAC}) < 90°$
$\Rightarrow \sum$ **x = ? cm**



A) 7 B) 8 C) 9 D) 10 E) 12

Çözüm / Solution Yanıt / Answer **C**

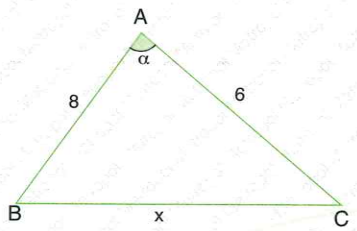
$1 < x < 7$ [Üçgen eşitsizliği / Triangle inequality]

$m(\widehat{BAC}) < 90° \Rightarrow x^2 < 3^2 + 4^2$
$x^2 < 9 + 16$
$x^2 < 25$
$x < 5 \ldots (2)$

$1 < x < 5, x \in Z \Rightarrow \sum x = 2 + 3 + 4 = 9$ cm

Örnek / Example 10

$x \in Z$,
$|AB| = 8$ cm,
$|AC| = 6$ cm,
$m(\widehat{A}) = \alpha < 90°$
$\Rightarrow$ **max(x) = ? cm**



A) 9 B) 8 C) 7
D) 6 E) 5

Çözüm / Solution — Yanıt / Answer A

$2 < x < 14$ [Üçgen eşitsizliği / Triangle inequality]

$\alpha < 90° \Rightarrow x^2 < 6^2 + 8^2$

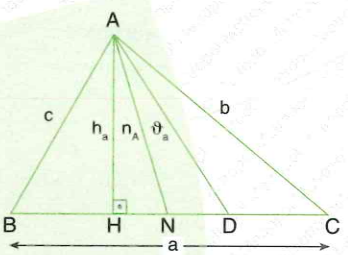
$\Rightarrow x^2 < 100 \Rightarrow x < 10$

$2 < x < 10, x \in Z \Rightarrow \max(x) = 9$ cm

Özellik 7 / Property 7

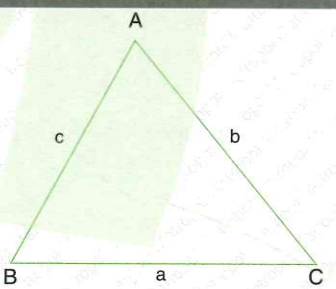
[AH] : Yükseklik / Height
[AN] : Açıortay / Bisector
[AD] : Kenarortay / Median

$\Rightarrow h_a \le n_A \le \vartheta_a$
$h_b \le n_B \le \vartheta_b$
$h_c \le n_C \le \vartheta_c$



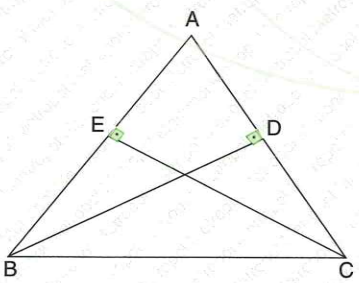
Özellik 8 / Property 8

$a \ge b \ge c \Leftrightarrow$ $h_a \le h_b \le h_c$, $n_A \le n_B \le n_C$, $\vartheta_a \le \vartheta_b \le \vartheta_c$



Örnek / Example 11

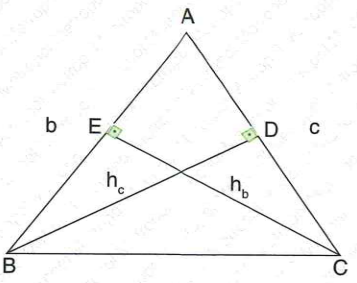
$[BD] \perp [AC]$,
$[EC] \perp [AB]$,
$|AB| = |AC| = 4$ br(u)
$|BD| = 5$ br(u)
$\Rightarrow$ **|EC| = ?**



A) 3 B) 4 C) 5
D) 6 E) 7

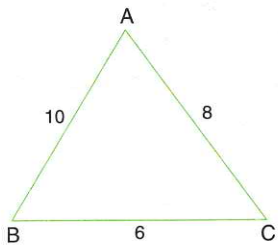
Çözüm / Solution — Yanıt / Answer C

$b = c \Leftrightarrow h_b = h_c$
$|BD| = 5 = h_c$
$|EC| = h_b$
$\Rightarrow h_b = h_c = 5$ br(u)



Örnek / Example 12

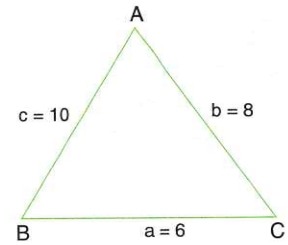
$|AB| = 10$ cm
$|AC| = 8$ cm
$|BC| = 6$ cm
$\Rightarrow ? < ? < ?$



A) $h_a < h_b < h_c$ B) $n_A < n_C < n_B$ C) $\vartheta_c < \vartheta_b < \vartheta_a$
D) $\vartheta_a < \vartheta_b < \vartheta_c$ E) $n_A < n_B < n_C$

Çözüm / Solution Yanıt / Answer **C**

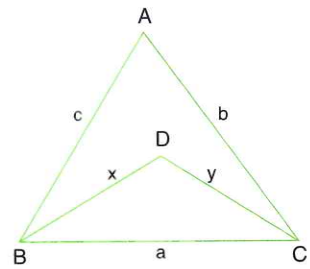
$6 < 8 < 10 \Rightarrow a < b < c \Leftrightarrow$
$h_a > h_b > h_c$
$n_A > n_B > n_C$
$\vartheta_a > \vartheta_b > \vartheta_c$
$\Rightarrow \vartheta_c < \vartheta_b < \vartheta_a$



Özellik 9 / Property 9

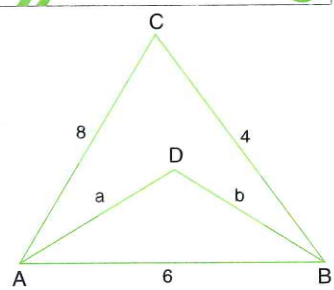
İç İçe Geçmiş Üçgenlerde Kenarlar Arasındaki İlişki / The Relationship Between The Sides of The Nested Trian:

$a < x + y < b + c$



Örnek / Example 13

$(a+b) \in Z$,
$|AB| = 6$ cm,
$|AC| = 8$ cm,
$|BC| = 4$ cm,
$|AD| = a$ cm,
$|BD| = b$ cm
$\Rightarrow \min(a+b) + \max(a+b)$
$= ?$ cm



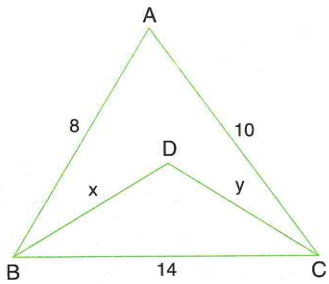
A) 15 B) 18 C) 21
D) 24 E) 27

Çözüm / Solution Yanıt / Answer **B**

$6 < a + b < 12$
$(a+b) \in Z \Rightarrow \min(a+b) = 7$
$\Rightarrow \max(a+b) = 11$
$+$
18 cm

Örnek / Example 14

$(x+y) \in Z$,
$|AB| = 8$ cm,
$|AC| = 10$ cm,
$|BC| = 14$ cm,
$|AD| = x$ cm,
$|BD| = y$ cm
$\Rightarrow \sum(x+y) = ?$ cm



A) 40 B) 44 C) 48
D) 52 E) 56

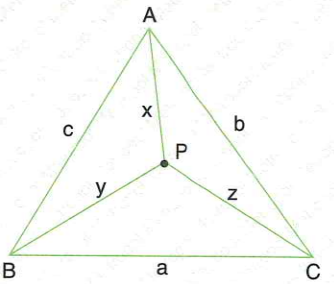
Çözüm / Solution Yanıt / Answer **C**

$14 < x + y < 18$
$(x+y) \in Z, \sum(x+y) = 15 + 16 + 17$
$= 48$ cm

Özellik 10 / Property 10

Üçgenin içindeki bir noktadan üçgenin köşe noktalarına çizilen doğrular ile kenar uzunlukları arasındaki ilişki

The relation between length of the lines that drown from any point inside the triangle to the corners and length of the sides



$a, b, c \in R^+$,

Çevre / The perimeter (ABC) = a + b + c,

$\frac{a+b+c}{2} < x+y+z < a+b+c$

$a, b, c \in Z^+$,

Çevre / The perimeter (ABC) = a + b + c,

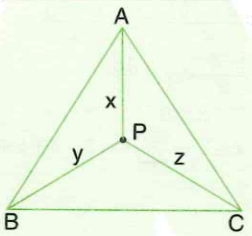
$\frac{a+b+c}{2} < x+y+z <$ **En uzun iki kenarın toplamı / The sum of two longest sides**

Örnek / Example 15

$|AP| = x, |BP| = y, |CP| = 2\,cm$

Çevre / The perimeter (ABC) = 24 cm

$\Rightarrow (x+y+z) \in Z, \sum (x+y+z) = ?\,cm$



A) 190 B) 194 C) 198 D) 200 E) 204

Çözüm / Solution

Yanıt / Answer **C**

$\frac{24}{2} < x+y+z < 24$

$12 < x+y+z < 24$

$(x+y+z) \in Z \Rightarrow \sum (x+y+z) = 13 + ... + 23 = 198$ cm

Örnek / Example 16

$(x+y+z) \in Z$,

$|AB| = 5\,cm$,

$|AC| = 12\,cm$,

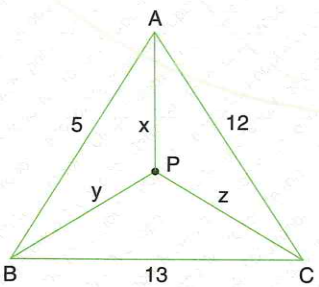
$|BC| = 13\,cm$,

$|AP| = x\,cm$,

$|BP| = y\,cm$,

$|CP| = z\,cm$

$\Rightarrow \max(x+y+z) = ?$



A) 29 B) 28 C) 27 D) 25 E) 24

Çözüm / Solution

Yanıt / Answer **E**

Çevre / The perimeter (ABC) = 5 + 12 + 13 = 30 cm

$\frac{30}{2} < x+y+z < 12+13$ (En uzun iki kenar / Two longest sides)

$15 < x+y+z < 25$

$\Rightarrow \max(x+y+z) = 24\,cm$

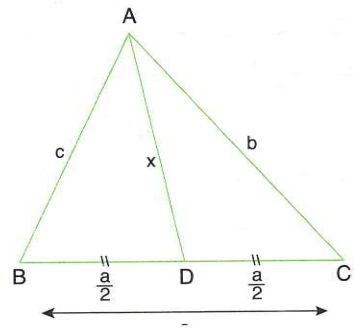
Özellik 11 / Property 11

Üçgende kenarortay uzunluğunun kenar uzunlukları ile ilişkisi

The relation between length of median and lengths of sides of a triangle.

[AD]: kenarortay / median, $|AD| = x$

$$\frac{|b-c|}{2} < x < \frac{b+c}{2}$$



Örnek / Example 17

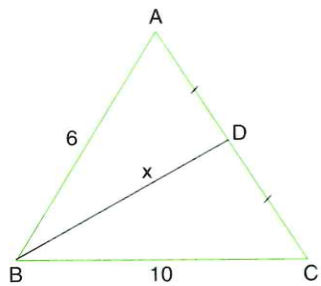
$x \in Z$,

$|AB| = 6$ cm,

$|BC| = 10$ cm,

$|AD| = |DC|$

$\Rightarrow \sum x = ?$ cm



A) 15 B) 20 C) 25

D) 30 E) 35

Çözüm / Solution

Yanıt / Answer **C**

$$\frac{|6-10|}{2} < x < \frac{6+10}{2}$$

$$\frac{|-4|}{2} < x < \frac{16}{2}$$

$2 < x < 8$

$x \in Z \Rightarrow \sum x = 3+4+5+6+7 = 25$ cm

Örnek / Example 18

$x \in Z$,

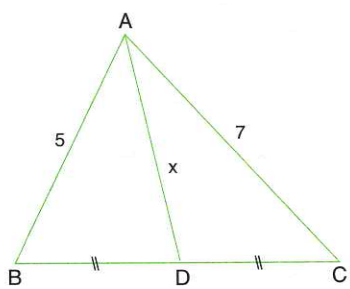
$|BD| = |DC|$,

$|AB| = 5$ cm,

$|AC| = 7$ cm,

$|AD| = x$ cm

$\Rightarrow \sum x = ?$ cm



A) 9 B) 10 C) 11

D) 12 E) 14

Çözüm / Solution

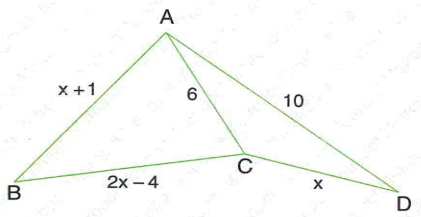
Yanıt / Answer **E**

$$\frac{|5-7|}{2} < x < \frac{5+7}{2}$$

$1 < x < 6$

$x \in Z, \sum x = 2+3+4+5 = 14$ cm

1.

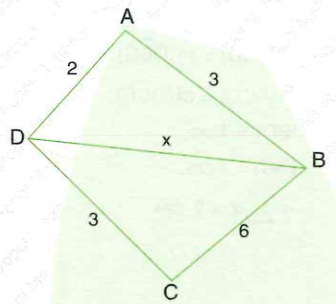


$x \in Z \Rightarrow$ **max(x) = ? cm**

A) 12 B) 10 C) 8

D) 4 E) 3

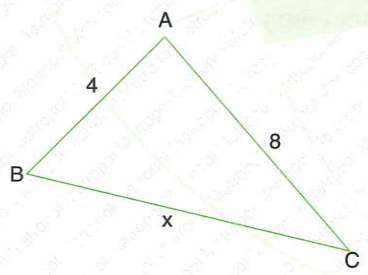
2. $x \in Z$,
$|AD| = 2$ cm,
$|AB| = |DC| = 3$ cm,
$|CB| = 6$ cm
$\Rightarrow$ **|DB| = x = ? cm**



A) 2 B) 3 C) 4

D) 5 E) 6

3.

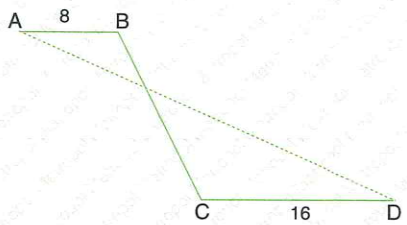


$x \in Z$, $|AB| = 4$ cm, $|AC| = 8$ cm ve (and)
$m(\widehat{BAC}) < 90° \Rightarrow$ **max(x) = ? cm**

A) 7 B) 8 C) 9

D) 10 E) 11

4.

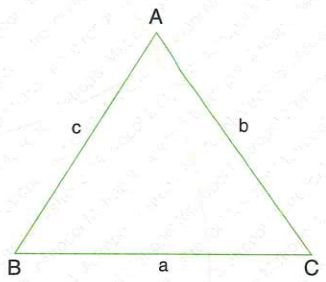


$|AD| \in Z$, $[AB] \,//\, [CD]$, $|AB| = 8$ cm, $|CD| = 16$ cm, $|BC| = 10$ cm,
$m(\widehat{ABC}) > 90° \Rightarrow$ **min(|AD|) = ? cm**

A) 26 B) 27 C) 28

D) 29 E) 30

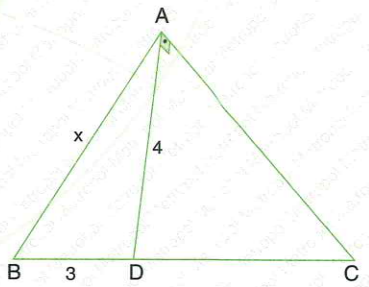
5. $a, b, c \in Z$,
$a + b + c = 37$ cm,
$a > b > c$
$\Rightarrow$ **max(a) = ? cm**



A) 16 B) 17 C) 18

D) 19 E) 20

6. $x \in Z$,
$[AD] \perp [AC]$,
$|AD| = 4$ cm,
$|BD| = 3$ cm
$\Rightarrow$ **|AB| = x = ? cm**

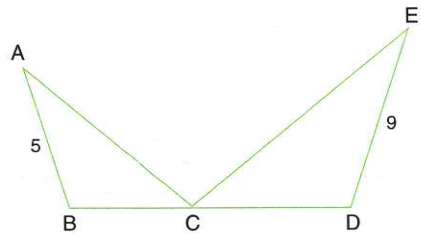


A) 5 B) 6 C) 9

D) 11 E) 13

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



$(|AC| + |CE|) \in Z$,

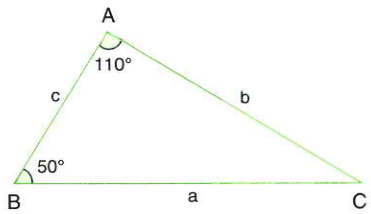
$|AB| = 5$ cm, $|ED| = 9$ cm,

$|BD| = 12$ cm $\Rightarrow$ **max($|AC| + |CE|$) = ? cm**

A) 25 B) 26 C) 27

D) 28 E) 29

8.



$|AB| = c$ cm, $|BC| = a$ cm, $|CA| = b$ cm, $m(\widehat{BAC}) = 110°$,

$m(\widehat{ABC}) = 50° \Rightarrow$ **$|b|-|a|-|c|-|a|$ = ?**

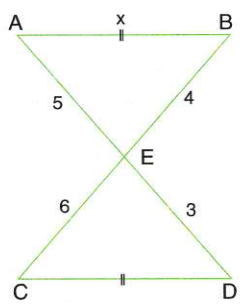
A) b – a B) c – b C) b + c

D) 2a – b + c E) 2a – b – c

9. $x \in Z$,

$|AB| = |CD| = x$

$\Rightarrow \sum$ **x = ? cm**



A) 28 B) 29 C) 30

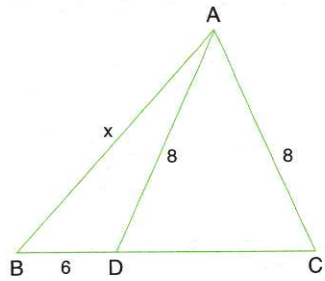
D) 31 E) 32

10. $x \in Z$,

$|AD| = |AC| = 8$ cm,

$|BD| = 6$ cm

$\Rightarrow$ **min(x) = ? cm**



A) 10 B) 11 C) 12

D) 13 E) 14

11. $x \in Z$,

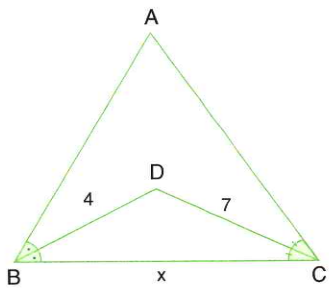
$m(\widehat{ABD}) = m(\widehat{DBC})$,

$m(\widehat{ACD}) = m(\widehat{DCB})$,

$|BD| = 4$ cm,

$|DC| = 7$ cm

$\Rightarrow \sum$ **x = ? cm**

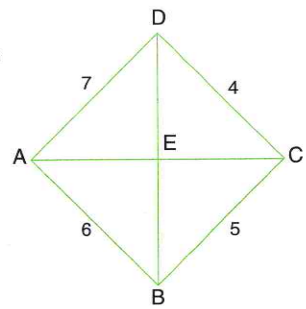


A) 19 B) 18 C) 17

D) 16 E) 15

12. $(|AC| + |BD|) \in Z$

$\Rightarrow$ **max($|AC| + |BD|$) = ? cm**



A) 17 B) 18 C) 19

D) 20 E) 21

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
B	B	C	B	C	B	A	B	C	B	A	C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $|10-6| < x < 10+6$

$\Rightarrow 4 < x < 16$ ..... (1)

$|(2x-4)-(x+1)| < 6 < 2x-4+x+1$

$x-5 < 6 < 3x-3$

$\Rightarrow x < 11, \quad x > 3$

$\Rightarrow 3 < x < 11$ ..... (2)

(1) & (2) $\Rightarrow 4 < x < 11 \Rightarrow \max(x) = 10$ cm

Yanıt / The Answer is B

2. $|3-2| < x < 2+3$

$1 < x < 5$ ..... (1)

$|6-3| < x < 6+3$

$3 < x < 9$ ..... (2)

(1) & (2) den

$3 < x < 5$

$\Rightarrow x = 4$ cm

Yanıt / The Answer is C

3. $|8-4| < |BC| < 8+4$

$4 < |BC| < 12$ ..... (1)

$4^2 + 8^2 > |BC|^2$

$16 + 64 > |BC|^2$

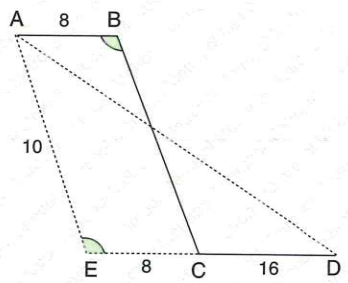
$80 > |BC|^2$

$\sqrt{80} > |BC|$ ..... (2)

(1) & (2) $4 < |BC| < \sqrt{80} < \sqrt{81} = 9 \Rightarrow \max(|BC|) = 8$ cm

Yanıt / The Answer is B

4.



$m(\widehat{ABC}) > 90° \Rightarrow m(\widehat{AEC}) > 90°$

$m(\widehat{AEC}) > 90° \Rightarrow |AD|^2 > 10^2 + 24^2 \Rightarrow |AD|^2 > 676$

$\Rightarrow |AD| > 26$

$\Rightarrow \min(|AD|) = 27$ cm

Yanıt / The Answer is B

5. $|b-c| < a < b+c$

$\max(a) = (b+c) - 1$

$a + b + c = b + c + b + c - 1 = 37$

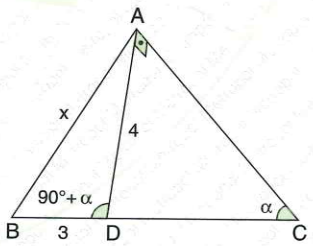
$2(b+c) - 1 = 37$

$b + c = 19$

$\Rightarrow \max(a) = 18$ cm

Yanıt / The Answer is C

6.



$m(\widehat{BDA}) > 90° \Rightarrow x^2 > 3^2 + 4^2$

$x^2 > 5^2$

$x > 5$ ..... (1)

$1 < x < 7$ [üçgen eşitsizliği / triangle inequality] ... (2)

(1) & (2): $5 < x < 7 \Rightarrow x = 6$ cm

Yanıt / The Answer is B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $|5 - |BC|| < |AC| < 5 + |BC|$ ... (1)

$|9 - |CD|| < |CE| < 9 + |CD|$ ... (2)

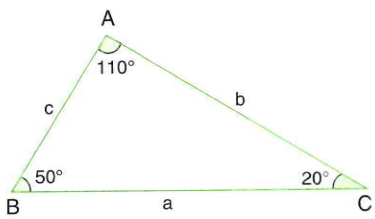
$|AC| + |CE| < 14 + |BC| + |CD|$, $[|BC| + |CD| = |BD| = 12\,cm]$

$\Rightarrow |AC| + |CE| < 26$

$\Rightarrow \max(|AC| + |CE|) = 25$ cm

Yanıt / The Answer is A

8.



$m(\widehat{A}) > m(\widehat{B}) > m(\widehat{C}) \Rightarrow a > b > c$

$|b-a| - |c-a| = -b + a + c - a$

$= c - b$

Yanıt / The Answer is B

9. $\widehat{ABE}$:

$|5 - 4| < x < 5 + 4 \Rightarrow 1 < x < 9$..... (1)

$|6 - 3| < x < 6 + 3 \Rightarrow 3 < x < 9$..... (2)

(1) & (2) $\Rightarrow 3 < x < 9 \Rightarrow \sum x = 4 + 5 + 6 + 7 + 8 = 30$ cm

Yanıt / The Answer is C

10. $|AD| = |AC| \Rightarrow m(\widehat{ADC}) = m(\widehat{ACD}) < 90°$

$m(\widehat{ADC}) < 90° \Rightarrow m(\widehat{ADB}) > 90°$

$m(\widehat{ADB}) > 90° \Rightarrow x^2 > 6^2 + 8^2$

$\Rightarrow x > 10$

$2 < x < 14$ [Üçgen eşitsizliği / Triangle inequality]

$10 < x$

$\Rightarrow 10 < x < 14 \Rightarrow \min(x) = 11$cm

Yanıt / The Answer is B

11. $3 < x < 11$ [Üçgen eşitsizliği / Triangle inequality] ..... (1)

$m(\widehat{BDC}) = 90° + \frac{m(\widehat{A})}{2} \Rightarrow m(\widehat{BDC}) > 90°$

$m(\widehat{BDC}) > 90° \Rightarrow x^2 > 4^2 + 7^2$

$\Rightarrow x > \sqrt{65}$ ..... (2)

(1) & (2): $\sqrt{65} < x < 11$

$x \in Z \Rightarrow \sum x = 9 + 10 = 19$ cm

Yanıt / The Answer is A

12. $\left.\begin{matrix} 3 < |AC| < 11 \\ 1 < |AC| < 11 \end{matrix}\right\} \Rightarrow 3 < |AC| < 11$ ... (1)

$\left.\begin{matrix} 1 < |BD| < 9 \\ 1 < |BD| < 13 \end{matrix}\right\} \Rightarrow 1 < |BD| < 9$ ... (2)

(1) & (2) :

$3 < |AC| < 11$

$1 < |BD| < 9$

$+$

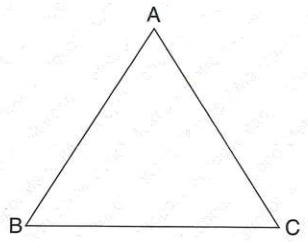
$4 < |AC| + |BD| < 20$

$\Rightarrow \max(|AC| + |BD|) = 19$ cm

Yanıt / The Answer is C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



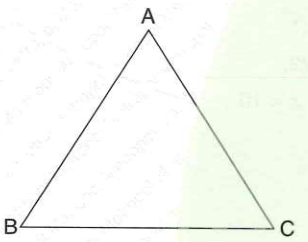
ABC üçgeninde |AB| = 7 cm olduğuna göre Çevre (ABC)'nin en küçük tamsayı değeri kaç cm'dir?

In triangle ABC, if |AB| = 7 cm, then what is the least integer value of the perimeter?

A) 13 B) 14 C) 15 D) 16 E) 17

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2018]

2.



ABC üçgeninde, $m(\widehat{A}) > 90°$ ve

|BC| = a cm, |AC| = b cm, |AB| = c cm olmak üzere,

aşağıdakilerden hangisi her zaman doğrudur?

In the triangle ABC, $m(\widehat{A}) > 90°$ and

|BC| = a cm, |AC| = b cm, |AB| = c cm, **which one of the followings is always true?**

A) $a^2 < b^2 < c^2$ B) $\frac{a}{2} > b + c$ C) $a > 1, b > 0, c > 0$

D) $b > c$ E) $\frac{b + c}{2} < a$

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2018]

3. $[AB] \perp [BC]$

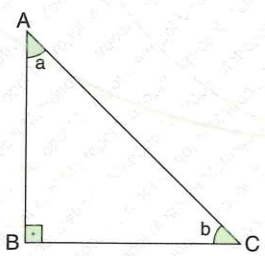
$m(\widehat{CAB}) = a°$

$m(\widehat{ACB}) = b°$

$x \le b \le y$

$20 \le b - a \le 30$

$\Rightarrow$ x = ?, y = ?



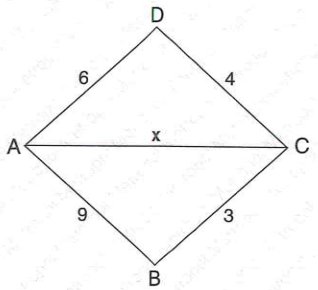
A) 35, 65 B) 45, 55 C) 50, 60

D) 55, 60 E) 55, 65

[ERCİYES ÜNİVERSİTESİ – YÖS 2017]

METROPOL YAYINLARI • METROPOL PUBLICATIONS

4. **? < x < ?**

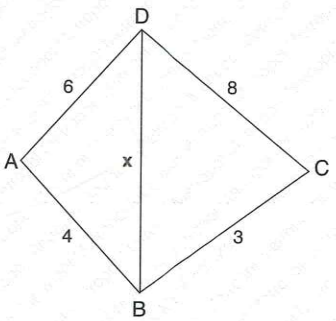


A) $5 < x < 9$ B) $6 < x < 10$ C) $7 < x < 11$

D) $8 < x < 12$ E) $9 < x < 11$

[YÖS 2006]

5. **? < x < ?**

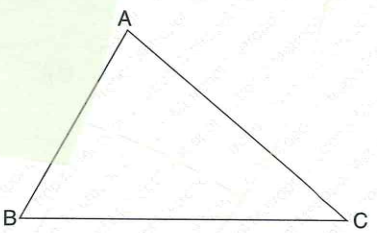


A) $5 < x < 11$ B) $2 < x < 5$ C) $5 < x < 10$

D) $2 < x < 10$ E) $2 < x < 11$

[YÖS 1991]

6.



$\left.\begin{array}{l} |AC| > |AB| \\ m(\widehat{BAC}) > m(\widehat{ABC}) \end{array}\right\} \Rightarrow$ **?; ?**

Bu üçgen için aşağıdakilerden hangisi doğrudur?

Which of the followings is correct for triangle above?

A) $|BC| > |AB|; m(\widehat{ACB}) > m(\widehat{BAC})$

B) $|AB| > |BC|; m(\widehat{ABC}) > m(\widehat{ACB})$

C) $|BC| > |AC|; m(\widehat{ACB}) > m(\widehat{ABC})$

D) $|AC| > |BC|; m(\widehat{BAC}) > m(\widehat{ACB})$

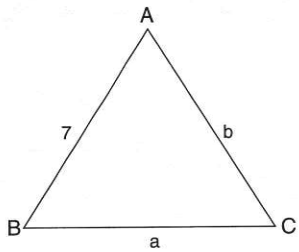
E) $|BC| > |AC|; m(\widehat{ABC}) > m(\widehat{ACB})$

[YÖS 1981]

YANITLAR / ANSWERS

1	2	3	4	5	6
C	E	D	B	C	E

1.



$7 < a + b$ [üçgen eşitsizliği / triangle inequality]

Çevre / The perimeter (ABC) = $7 + a + b$

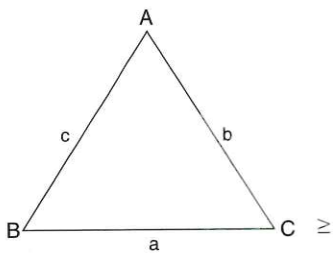
$\min(a + b) = 8$ cm

$\Rightarrow \min$(Çevre / The perimeter (ABC)) $= 7 + 8$

$= 15$ cm

Yanıt / The Answer is C

2.



$\min(\widehat{A}) > 90° \Rightarrow a^2 > b^2 > c^2$

$a < b + c$ [üçgen eşitsizliği / triangle inequality] ... (1)

E şıkkı / choise : $\frac{b + c}{2} < a$

$\Rightarrow b + c < 2a$

$\Rightarrow b + c < 2\cdot(b + c)$ ... (1)

Yanıt / The Answer is E

3. $a° + b° = 90 \Rightarrow b° = 90° - a$

$x \le b \le y$ ... (1)

$20 \le b - a \le 30$ ... (2)

$x \le 90° - a \le y$ ... (1)

$20 \le 90° - a - a \le 30 \Rightarrow 35 \ge a \ge 30$ ... (2)

(1): $x \le 90° - a \le y$

$x - 90° \le -a \le y - 90$

$90 - y \le a \le 90° - x$

$\downarrow \qquad \downarrow$

(2): $30° \le a \le 35°$

$90° - y = 30°$ ve (and) $90° - x = 35°$

$60° = y \qquad 55° = x$

Yanıt / The Answer is D

4. $2 < x < 10$ ... (1)

$6 < x < 12$ ... (2)

(1) & (2) : $6 < x < 10$

Yanıt / The Answer is B

5. $2 < x < 10$ ... (1)

$5 < x < 11$ ... (2)

(1) & (2) : $5 < x < 10$

Yanıt / The Answer is C

6. $|AC| > |AB| \Leftrightarrow m(\widehat{ABC}) > m(\widehat{ACB})$...(1)

$\Rightarrow m(\widehat{BAC}) > m(\widehat{ABC})$...(2)

(1) & (2):

$m(\widehat{BAC}) > m(\widehat{ACB}) \Rightarrow |BC| > |AB|$

$m(\widehat{BAC}) > m(\widehat{ABC}) > m(\widehat{ACB})$

$\Rightarrow |BC| > |AC| > |AB|$

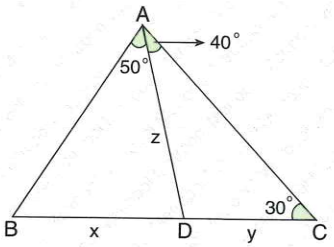
$\Rightarrow |BC| > |AC|$...(2)

(1) & (2): $|BC| > |AC|$; $m(\widehat{ABC}) > m(\widehat{ACB})$

Yanıt / The Answer is B

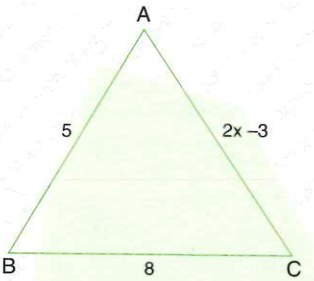
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $m(\widehat{BAD}) = 50°$,
$m(\widehat{DAC}) = 40°$,
$m(\widehat{BCA}) = 30°$,
$|AD| = z$ cm,
$|BD| = x$ cm,
$|AD| = y$ cm
$\Rightarrow$ **? < ? < ?**



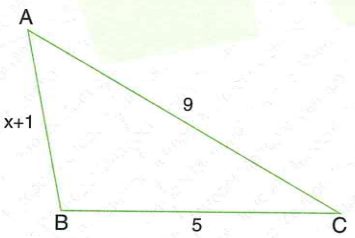
Yanıt / The Answer is **x < z < y**

2. $x \in Z$,
$|AB| = 5$ cm,
$|BC| = 8$ cm ,
$|AC| = 2x - 3$ cm
$\Rightarrow \sum x =$ **? cm**



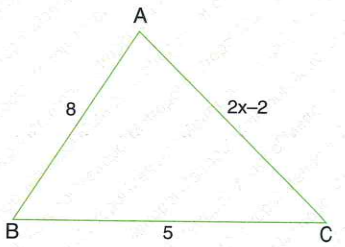
Yanıt / The Answer is **22**

3. $|AC| = 9$ cm,
$|AB| = (x+1)$ cm,
$|BC| = 5$ cm,
$m(\widehat{A}) < m(\widehat{C}) < m(\widehat{B})$
$\Rightarrow$ **? < x < ?**



Yanıt / The Answer is **4 < x <8**

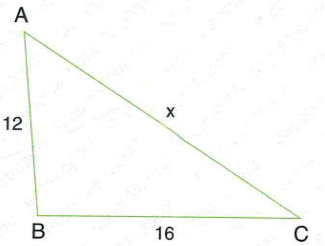
4.



$(\text{Çevre}(\widehat{ABC})) \in Z$, $|AB| = 8$ cm,
$|BC| = 5$ cm, $|AC| = 2x-2$ cm
$\Rightarrow$ **max(Çevre / The perimeter $(\widehat{ABC})$) = ?**

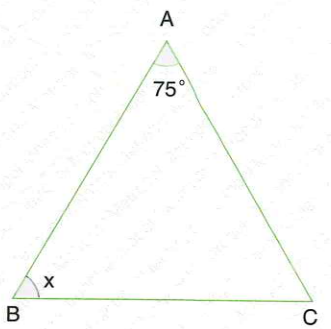
Yanıt / The Answer is **25**

5. $x \in Z$,
$|AB| = 12$ cm,
$|BC| = 16$ cm,
$m(\widehat{B}) > 90°$
$\Rightarrow$ **min(x) = ? cm**



Yanıt / The Answer is **21**

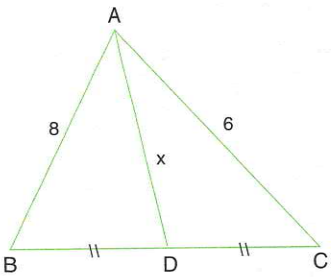
6. $x \in Z$,
$m(\widehat{BAC}) = 75°$
$|AC| < |AB|$
$\Rightarrow$ **max($m(\widehat{B})$) = ?**



Yanıt / The Answer is **52**

METROPOL YAYINLARI • METROPOL PUBLICATIONS

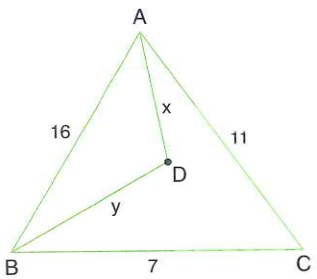
7.



$x \in Z$, $m(\widehat{BAC}) < 90°$, $|AB| = 8$ cm, $|AC| = 6$ cm,
$|BD| = |DC| \Rightarrow$ **$|AD| = x = ?$ cm**

Yanıt / The Answer is 6

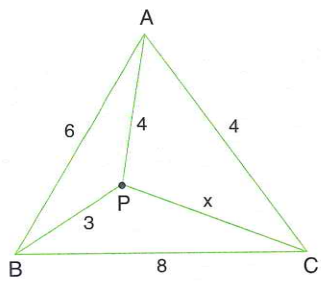
8.



$(x + y) \in Z$, $|AB| = 16$ cm, $|AC| = 11$ cm, $|BC| = 7$ cm,
$|AD| = x$ cm, $|BD| = y$ cm $\Rightarrow$ **$x + y = ?$ cm**

Yanıt / The Answer is 17

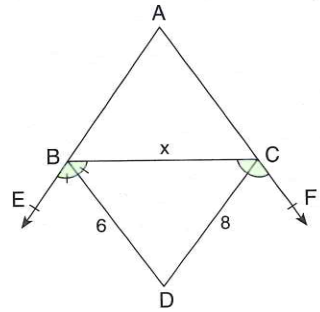
9.



$x \in Z$, $|AB| = 6$ cm, $|AC| = |AP| = 4$ cm, $|BC| = 8$ cm,
$|BP| = 3$ cm, $|PC| = x$ cm $\Rightarrow$ **$\max(x) + \min(x) = ?$ cm**

Yanıt / The Answer is 9

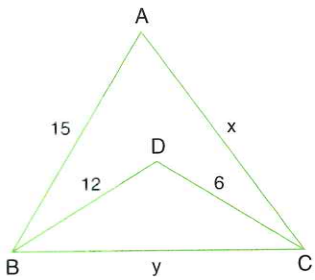
10.



$x \in Z$, $m(\widehat{EBD}) = m(\widehat{DBC})$, $m(\widehat{BCD}) = m(\widehat{DCF})$, $|BD| = 6$ cm,
$|DC| = 8$ cm, $|BC| = x$ cm $\Rightarrow$ **$\max(x) = ?$ cm**

Yanıt / The Answer is 9

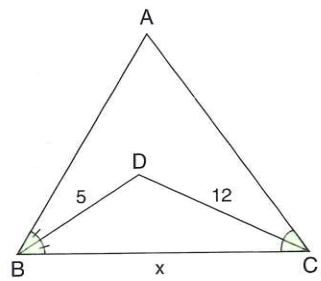
11.



$x \in Z$,
$|AB| = 15$ cm, $|BD| = 12$ cm, $|DC| = 6$ cm,
$|AC| = x$ cm, $|BC| = y$ cm $\Rightarrow$ **$\max(x) = ?$ cm**

Yanıt / The Answer is 32

12.

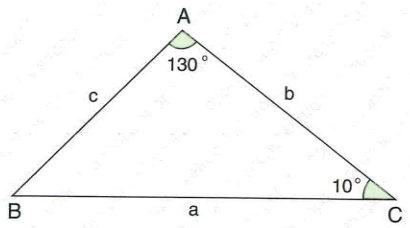


$x \in Z$, $m(\widehat{ABD}) = m(\widehat{DBC})$, $m(\widehat{ACD}) = m(\widehat{DCB})$
$|BD| = 5$ cm, $|DC| = 12$ cm, $|BC| = x$ cm $\Rightarrow$ **$\sum x = ?$ cm**

Yanıt / The Answer is 45

METROPOL YAYINLARI • METROPOL PUBLICATIONS

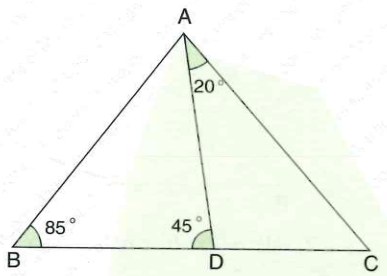
1. **? < ? < ?**



A) b < a < c B) c < a < b C) b < c < a

D) c < b < a E) a < c < b

2. $m(\widehat{ABD}) = 85°$,
$m(\widehat{ADB}) = 45°$,
$m(\widehat{DAC}) = 20°$
$\Rightarrow$ **? < ?**

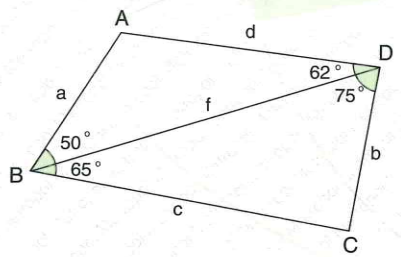


A) |AD| < |BD| B) |AC| > |AB|

C) |BD| < |AB| D) |DC| > |AD|

E) |AC| < |AB|

3.



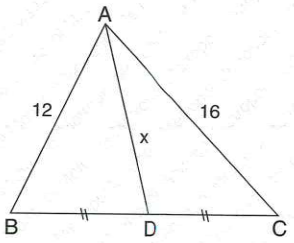
$\Rightarrow$ **? < ? < ? < ? < ?**

A) d < a < f < b < c B) a < d < b < f < c

C) d < a < c < f < b D) a < d < f < b < c

E) a < d < c < f < b

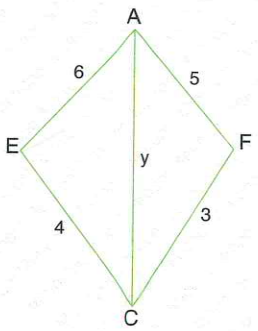
4. $m(\widehat{BAC}) < 90°$,
|BD| = |DC|,
|AB| = 12 cm,
|AC| = 16 cm,
|AD| = x cm
$\Rightarrow \sum$ **x = ? cm**



A) 38 B) 36 C) 34

D) 32 E) 30

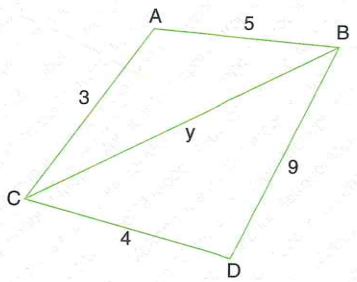
5. $y \in Z$,
|AE| = 6 cm,
|AF| = 5 cm,
|EC| = 4 cm,
|FC| = 3 cm
$\Rightarrow$ **max(|AC|) = y = ? cm**



A) 4 B) 5 C) 6

D) 7 E) 8

6. $y \in Z$
|AC| = 3 cm,
|AB| = 5 cm,
|CD| = 4 cm,
|BD| = 9 cm
$\Rightarrow \sum$ **y = ? cm**

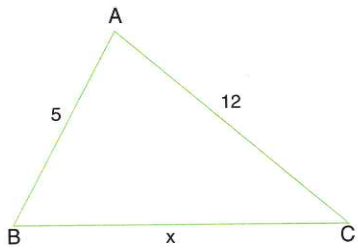


A) 20 B) 22 C) 15

D) 13 E) 12

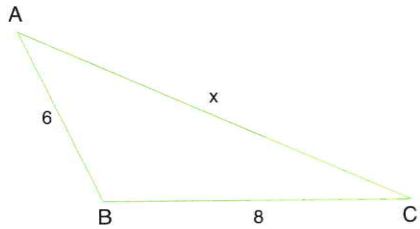
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $x \in Z$
$m(\widehat{A}) > 90°$,
$|AB| = 5\,cm$,
$|AC| = 12\,cm$
$\Rightarrow \sum x = ?\,cm$



A) 30 B) 40 C) 45
D) 50 E) 55

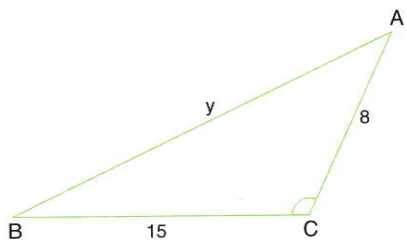
8.



$x \in Z$, $m(\widehat{B}) > 90° \Rightarrow \min(x) = ?\,cm$

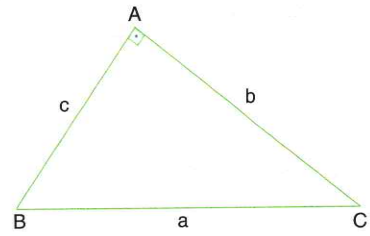
A) 14 B) 13 C) 11
D) 5 E) 4

9. $y \in Z$
$|BC| = 15\,cm$,
$|AC| = 8\,cm$,
$m(\widehat{C}) > 90°$
$\Rightarrow \sum y = ?\,cm$



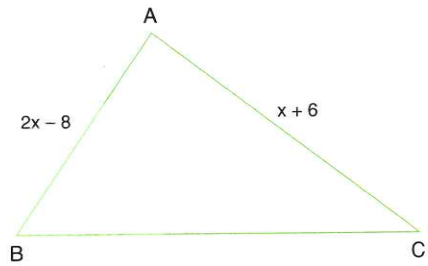
A) 80 B) 100 C) 120
D) 140 E) 160

10. $m(\widehat{BAC}) = 90°$,
$a^2 + b^2 + c^2 = 288$
$\Rightarrow a = ?\,cm$



A) 10 B) 12 C) 14
D) 16 E) 18

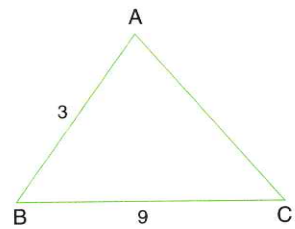
11.



$x \in Z$, $|AB| = (2x - 8)\,cm$, $|AC| = (x + 6)\,cm$,
$m(\widehat{B}) > m(\widehat{C}) \Rightarrow \max(x) = ?\,cm$

A) 11 B) 12 C) 13
D) 14 E) 15

12.



$(\text{Çevre / The perimeter } (\widehat{ABC})) \in Z$,
$|AB| = 3\,cm$, $|BC| = 9\,cm$, $m(\widehat{C}) < m(\widehat{B}) < m(\widehat{A})$
$\Rightarrow \max(\text{Çevre / The perimeter } (\widehat{ABC})) = ?\,cm$

A) 15 B) 18 C) 20 D) 22 E) 24

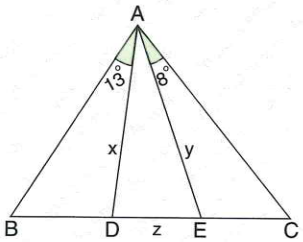
YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	B	A	B	D	D	C	C	B	B	C	C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

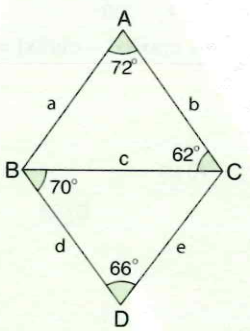
1. ABC bir eşkenar üçgendir.
ABC is an equilateral triangle.

$m(\widehat{BAD}) = 13°$,
$m(\widehat{EAC}) = 8°$,
$|AD| = x$ cm,
$|AE| = y$ cm,
$|DE| = z$ cm
$\Rightarrow ? < ? < ?$



A) $z < y < x$ B) $x < z < y$ C) $y < z < x$
D) $z < x < y$ E) $x < y < z$

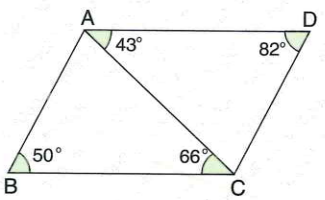
2. $m(\widehat{BAC}) = 72°$,
$m(\widehat{ACB}) = 62°$,
$m(\widehat{CBD}) = 70°$,
$m(\widehat{BDC}) = 66°$
$\Rightarrow$ **En uzun kenar hangisidir?**
Which side is the longest?



A) a B) b C) c
D) d E) e

3. $m(\widehat{ABC}) = 50°$,
$m(\widehat{ACB}) = 66°$,
$m(\widehat{CAD}) = 43°$,
$m(\widehat{ADC}) = 82°$

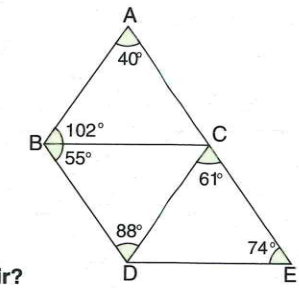
$\Rightarrow$ **En kısa kenar hangisidir?**
Which side is the shortest?



A) [DC] B) [AD] C) [AC]
D) [BC] E) [AB]

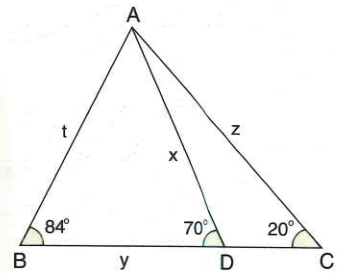
4. $m(\widehat{BAC}) = 40°$,
$m(\widehat{ABC}) = 102°$,
$m(\widehat{CBD}) = 55°$,
$m(\widehat{CDB}) = 88°$,
$m(\widehat{DCE}) = 61°$,
$m(\widehat{CED}) = 74°$

$\Rightarrow$ **En uzun kenar hangisidir?**
Which side is the longest?



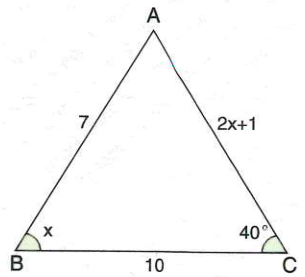
A) [AB] B) [AC] C) [CD]
D) [DE] E) [BD]

5. $m(\widehat{ABD}) = 84°$,
$m(\widehat{ADB}) = 70°$,
$m(\widehat{ACD}) = 20°$,
$|AB| = t$ cm,
$|AD| = x$ cm,
$|BD| = y$ cm,
$|AC| = z$ cm
$\Rightarrow ? < ? < ?$



A) $x < y < z < t$ B) $y < x < t < z$
C) $y < z < x < t$ D) $t < z < y < x$
E) $y < t < x < z$

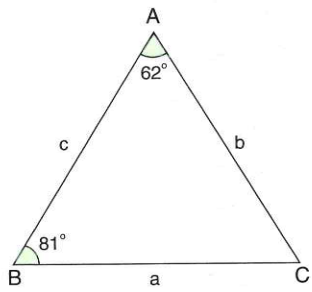
6. $x \in Z$,
$m(\widehat{ACB}) = 40°$,
$m(\widehat{ABC}) = x$,
$|AC| < |BC|$
$\Rightarrow$ **max(x) = ? cm**



A) 67 B) 68 C) 69
D) 70 E) 71

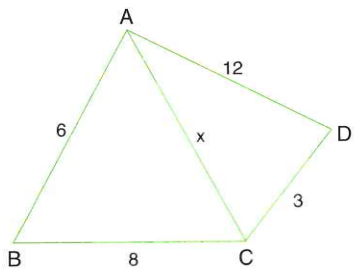
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $m(\widehat{A}) = 62°$,
$m(\widehat{B}) = 81°$
$\Rightarrow$ **|b–a| + |a–c| + |c–b| = ?**



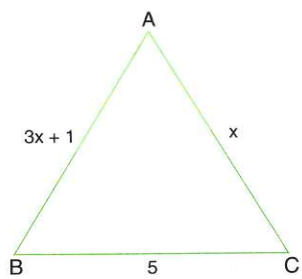
A) 2 (b – c) B) 2 (b – a) C) 2a
D) 2b E) 2c

8. |AB| = 6 cm,
|BC| = 8 cm,
|AD| = 12 cm,
|DC| = 3 cm,
|AC| = x cm
$\Rightarrow$ **ÇK(SS) = ?**



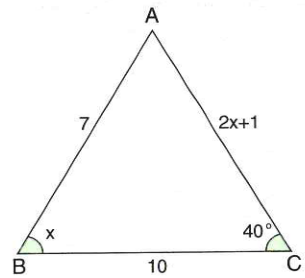
A) (3, 15) B) (2, 14) C) (2, 15)
D) (9, 14) E) (9, 15)

9. |AB| = (3x + 1) cm,
|AC| = x cm,
|BC| = 5 cm
$\Rightarrow$ **ÇK(SS) = ?**



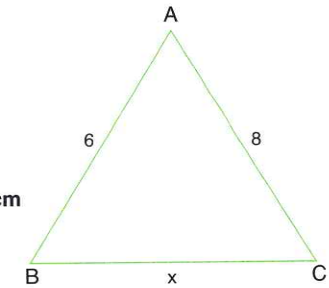
A) (1, 2) B) (1, 5) C) (2, 4)
D) (3, 5) E) (3, 7)

10. |AC| = (2x + 1) cm,
|AB| = 7 cm,
|BC| = 10 cm
$\Rightarrow$ **ÇK(SS) = ?**



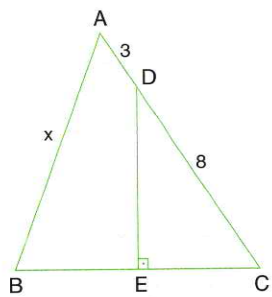
A) (1, 5) B) (2, 10) C) (1, 8)
D) (3, 7) E) (3, 4)

11. $x \in Z$,
|AB| = 6 cm,
|AC| = 8 cm,
|BC| = x cm,
$m(\widehat{A}) > 90°$
$\Rightarrow$ **max (x) + min(x) = ? cm**



A) 21 B) 22 C) 23
D) 24 E) 25

12. $x \in Z$,
$[DE] \perp [BC]$,
|BE| = |EC|,
|AD| = 3 cm,
|DC| = 8 cm,
|AB| = x cm
$\Rightarrow$ **min (x) = ? cm**



A) 4 B) 5 C) 6
D) 7 E) 8

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	E	A	B	E	C	A	D	A	C	D	C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

BÖLÜM CHAPTER 7

TARİHSEL NOT / HISTORICAL NOTE

Gottfried Wilhelm Leibniz [1646 – 1716]

Alman matematikçi ve filozoftur. Matematik tarihi ve felsefe tarihinde önemli bir yer tutar. Matematiksel fonksiyon kavramının onun zamanında trigonometik ve logaritmik tablolarda kapalı olmasına rağmen, Leibniz 1692 ve 1694 yılları arasında eğriden türetilen apsis, ordinat, teğet, kiriş ve diklik geometrik kavramlarını kapalı olarak benimseyip, belirten ilk kişidir. 18. Yüzyılda "fonksiyon" bu geometrik birlikteliğini yitirmiştir. Leibniz lineer denklemlerdeki sistemin katsayılarının şu an matris olarak adlandırdığımız bir düzene göre ayarlanarak sistemin sonucunun bulunabileceğini gören ilk insan olmuştur.

German mathematician and philosopher. he has an important rule in the history of mathematics and philosophy. Although the concept of mathematical function is closed in trigonometrically and logarithmic tables at his time, Leibniz is the first person to adopt the geometric concepts of abscissa, ordinate, tangent, beam and perpendicularity, which are derived from arc between 1692 and 1694. In the 18th century, "function" has lost this geometric unity. Leibniz has been the first person to see that the system's coefficients in linear equations can be adjusted to a scheme we now call matrices and therefore the result of the system can be found.

ÇOKGENLER ve DÖRTGENLER
POLYGONS and QUADRANGLES

Bu bölüm, 15 çözümlü örnek, 6 çözümlü test sorusu, 6 çözümlü YÖS sorusu, 12 alıştırma sorusu, 24 test sorusu içermektedir.

This chapter includes 15 examples with solutions, 6 test questions with solutions, 6 YÖS questions with solutions, 12 exercise questions and 24 test questions.

BÖLÜM / CHAPTER 7 ..... 239 - 262

ÇOKGENLER ve DÖRTGENLER / POLYGONS and QUADRANGLES

- Çokgenler / Polygons ..... 241 - 248
  - Konveks Çokgenin Özellikleri / Properties of Convex Polygon ..... 242 - 244
  - Düzgün Çokgen / Regular Polygon ..... 245 - 248
- Dörtgenler / Quadrangles ..... 248 - 252
  - Dörtgenlerin Özellikleri / Properties of Quadrangles ..... 248 - 252
- Çözümlü Test / Test With Solutions ..... 253 - 254
- YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 255 - 256
- Alıştırmalar / Exercises ..... 257 - 258
- Konu Testleri / Practice Tests ..... 259 - 262

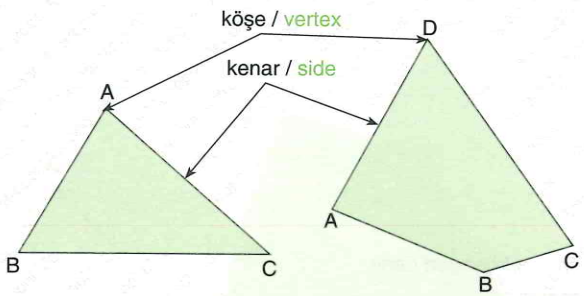
BÖLÜM
07
CHAPTER

ÇOKGENLER ve DÖRTGENLER
POLYGONS and QUADRANGLES

ÇOKGENLER / POLYGONS

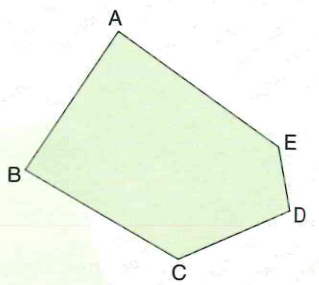
Tanım: Düzlemde, doğru parçalarının bitim noktalarının birleşiminden oluşan kapalı şekle **çokgen** denir. Doğru parçalarına çokgenin **kenarları**, iki kenarın birleştiği noktalara çokgenin **köşeleri** denir.

Definition: A polygon is a closed figure in a plane that is composed of line segments that meet only at their endpoints. The line segments are called **sides of the polygon**, and a point where two sides meet is called a **vertex** (plural vertices) of the polygon.



$\widehat{ABC}$ = [AB]∪[BC]∪[CA]

ABCD = [AB]∪[BC]∪[CD]∪[DA]



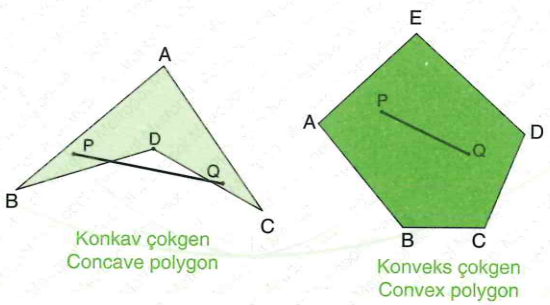
ABCDE = [AB]∪[BC]∪...∪[EA]

Çokgenler, kenar sayılarına göre adlandırılır: 3 kenarlı çokgen **üçgen,** 4 kenarlı çokgen **dörtgen**, beş kenarlı çokgen **beşgen**, 6 kenarlı çokgen **altıgen**. n-gen, n kenarlı çokgen şeklinde tanımlanır. Çokgenlerde açıların sayısı, kenarların sayısına eşittir. Bu nedenle, bir altıgen, 6 açıya sahiptir.

Polygons are named according to the number of their sides: A three-sided polygon is called a **triangle**; a four-sided polygon is a **quadrangle**; a polygon with five angles is a **pentagon**; a polygon with six angles is a **hexagon**. The term n-gon refers to a polygon with n sides. The number of angles is always equal to the number of sides in a polygon, so a six-sided polygon, which has six angles.

Bir çokgenin iç bölgesindeki herhangi iki nokta birleştirildiğinde meydana gelen doğru parçası daima çokgenin iç bölgesinde kalıyorsa bu tür çokgenlere **konveks (dışbükey) çokgen**, konveks olmayan çokgenlere ise **konkav (içbükey) çokgen** denir.

If a line segment formed by connecting any two points in a polygon lies entirely inside the polygon, this type of polygon is called **a konveks polygon**. The polygons which are not convex are called **conkav polygons**.



Konkav çokgen
Concave polygon

Konveks çokgen
Convex polygon

ÖNEMLİ / IMPORTANT

Sorularda kullanılacak çokgen türü genellikle konveks (dış bükey) çokgendir. Bu yüzden çokgen denildiğinde konveks (dış bükey) çokgen anlaşılmaktadır.

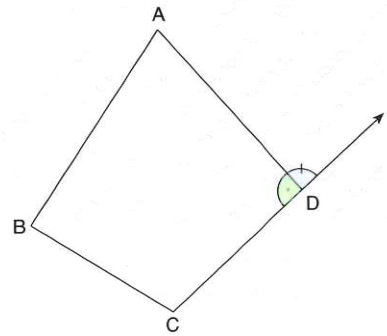
The kind of polygon which is used in questions is mostly convex polygon. So when the word "polygon" is said, convex polygon should be taken into consideration.

İç açı: Bir çokgenin iki ardışık kenarı arasında kalan açıya **iç açı** denir.

Interior angle: The angle formed by two consecutive sides of the polygon is called interior angle.

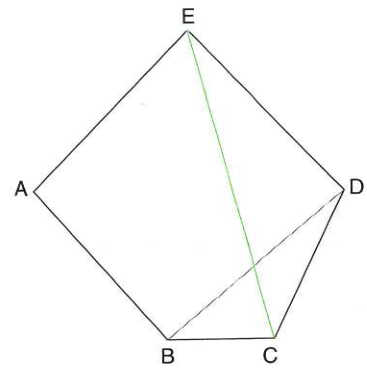
Dış açı: Bir iç açının komşu bütünleri olan açıdır.

Exterior angle: Is the adjacent supplemantary of the interior angle.



Köşegen: Bir çokgende ardışık olmayan iki köşeyi birleştiren doğru parçasına **köşegen** denir.

Diagonal: Straight line segment joining any two nonadjacent vertices in a polygon is called a **diagonal.**



Şekilde, [EC] ve [BD] birer köşegendir.

In the figure, [EC] and [BD] is a diagonal.

KONVEKS ÇOKGENİN ÖZELLİKLERİ / PROPERTIES of CONVEX POLYGON

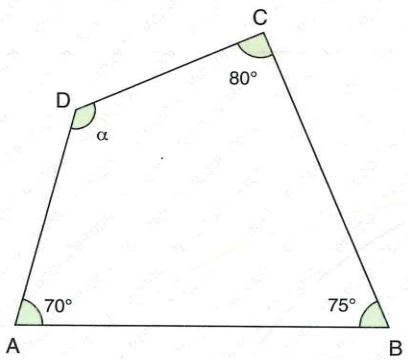
Özellik 1 / Property 1

n kenarlı konveks bir çokgenin iç açılarının ölçüleri toplamı $(n-2)\cdot 180^\circ$ dir.

The sum of the measures of the interior angles of a n-sided polygon is $(n-2)\cdot 180^\circ$.

Örnek / Example 1

$m(\widehat{D}) = \alpha = ?$



A) 115° B) 120° C) 125° D) 130° E) 135°

Çözüm / Solution Yanıt / Answer **E**

$n = 4 \Rightarrow \alpha + 80^\circ + 70^\circ + 75^\circ = (4-2)\cdot 180^\circ$

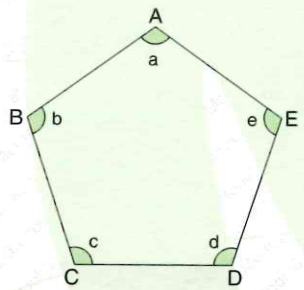
$\Rightarrow \alpha + 225^\circ = 2 \cdot 180^\circ$

$\Rightarrow \alpha + 360^\circ - 225^\circ$

$\Rightarrow \alpha = 135^\circ$

Örnek / Example 2

$a + b + c + d + e = ?$



A) 360° B) 480° C) 540° D) 600° E) 720°

Çözüm / Solution Yanıt / Answer **C**

$n \Rightarrow 5$

$a + b + ç + d + e = (n-2)\cdot 180^\circ$

$= (5-2)\cdot 180^\circ$

$= 540^\circ$

Özellik 2 / Property 2

Her konveks çokgenin dış açılarının ölçüleri toplamı ***360°*** dir.

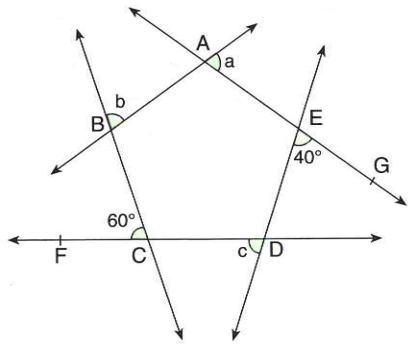
The sum of the measures of the exterior angles of any convex polygon is ***360°***.

Örnek / Example 3

$m(\widehat{BCF}) = 60°$

$m(\widehat{DEG}) = 40°$

$\Rightarrow a + b + c = ?$



A) 200° B) 260° C) 300°

D) 360° E) 400°

Çözüm / Solution Yanıt / Answer **B**

$a + b + c + 60° + 40° = 360°$

$\Rightarrow a + b + c = 260°$

Özellik 3 / Property 3

n kenarlı konveks bir çokgenin tüm köşegenlerinin sayısı: $\binom{n}{2} - n = \frac{n \cdot (n-3)}{2}$

The number of all diagonals of an n-sided polygon is: $\binom{n}{2} - n = \frac{n \cdot (n-3)}{2}$

Özellik 4 / Property 4

n kenarlı konveks bir çokgenin bir köşesinden (n – 3) tane köşegen çizilir. Bu köşegenler çokgeni, ***(n – 2)*** tane üçgensel bölgeye ayırır.

For an n-sided polygon, we can draw at most (n – 3) diagonals from one vertex and these diagonals split the polygon into (n – 2) triangles.

Özellik 5 / Property 5

Çokgenin çevresi, kenarlarının uzunluklarının toplamına eşittir. / The perimeter of the polygon is the sum of the lengths of the sides of it.

DÜZGÜN ÇOKGEN / REGULAR POLYGON

Tanım: Kenar uzunlukları aynı, iç açı ölçüleri ve dolayısıyla dış açı ölçüleri eşit olan çokgenlere **düzgün çokgen** denir.

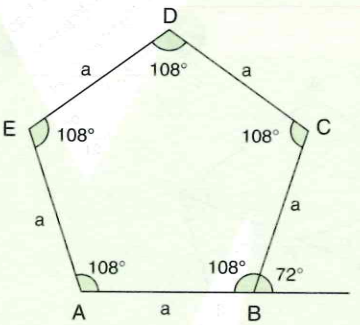
Definition: If the sides of a polygon are all equal in length and if all the interior angles and therefore exterior angles of a polygon are equal, the polygon is called **regular polygon.**

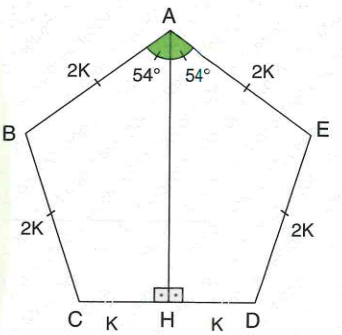
- n: kenar sayısı / the number of sides
- Bir dış açının ölçüsü / The measure of an exterior angle is: $\frac{360^\circ}{n}$
- Bir iç açının ölçüsü / The measure of an interior angle is: $180^\circ - \frac{360^\circ}{n}$ veya (or) $\frac{(n-2)\cdot 180^\circ}{n}$

Düzgün Beşgen / Regular Pentagon

- n = 5 (kenar sayısı / the number of sides)
- $\frac{360^\circ}{5} = 72^\circ$ (dış açı / exterior angle)
- $180^\circ - 72^\circ = 108^\circ$ (iç açı / interior angle)
- Tüm köşegen uzunlukları birbirine eşittir.

  All diagonal lengths are equal to each other.



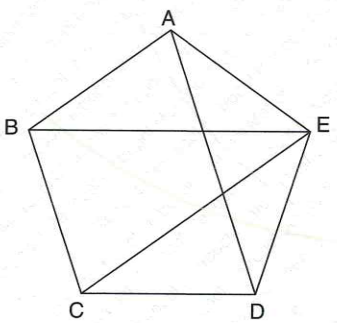


Örnek / Example 5

$|AB| = |BC| = |CD| = |DE| = |EA|$,

$|BE| = 5$ cm

$\Rightarrow |EC| + |AD| = ?$ cm



A) 5 B) 6 C) 7 D) 8 E) 10

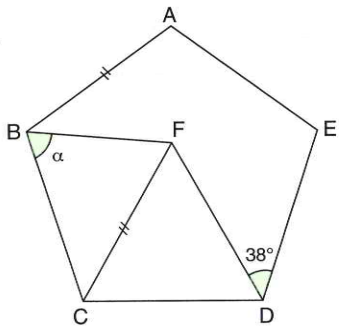
Çözüm / Solution Yanıt / Answer **E**

$|AD| = |EC| = |BE| = 5$ cm

$\Rightarrow |EC| + |AD| = 5 + 5 = 10$ cm

Örnek / Example 6

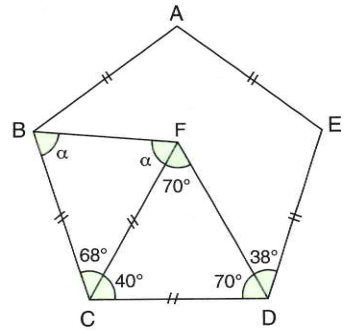
$|AB| = |BC| = |CD| = |DE| = |AE|$,
$|AB| = |FC|$, $m(\widehat{FDE}) = 38°$
$\Rightarrow \alpha = ?$



A) 40° B) 42° C) 48° D) 56° E) 60°

Çözüm / Solution

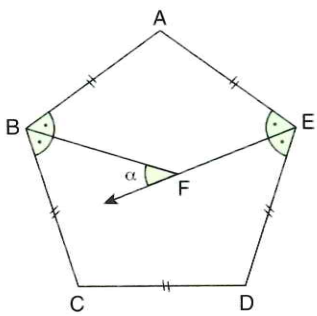
Yanıt / Answer **D**



$m(\widehat{CDE}) = 108°$
$\Rightarrow m(\widehat{CDF}) = 108° - 38° = 70°$
$m(\widehat{BCF}) = 108° - 40° = 68°$
$68 + 2\alpha = 180° \Rightarrow \alpha = 56°$

Örnek / Example 7

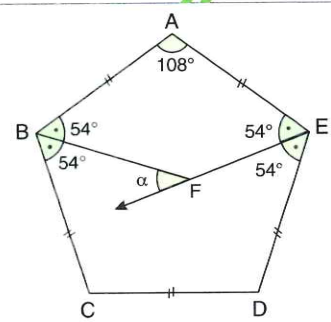
[BF] ve [EF açıortaylar
[BF] and [EF are bisectors
$\Rightarrow \alpha = ?$



A) 26° B) 28° C) 32° D) 36° E) 48°

Çözüm / Solution

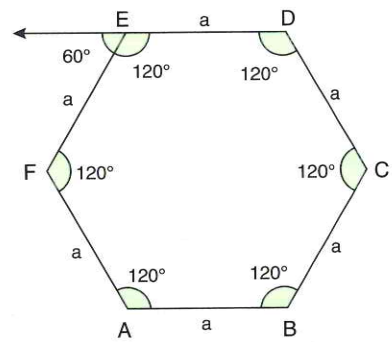
Yanıt / Answer **D**

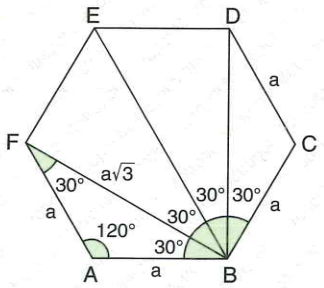


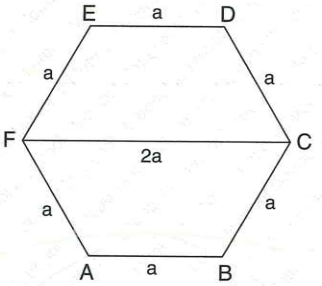
ABFE $\Rightarrow$ n = 4 (kenar sayısı / the number of sides)
$\Rightarrow 108° + 54° + 54° + 180° - \alpha = 360°$
$\Rightarrow \alpha = 36°$

Düzgün Altıgen / Regular Hexagen

- n = 6 (kenar sayısı / the number of sides)
- $\frac{360°}{6} = 60°$ (dış açı / exterior angle)
- $180° - 60° = 120°$ (iç açı / interior angle)

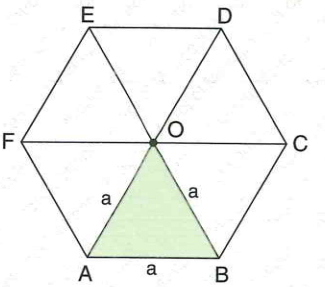






$|FC| = |EB| = |AD| = 2a$

[En uzun köşegenler / The longest diagonals]



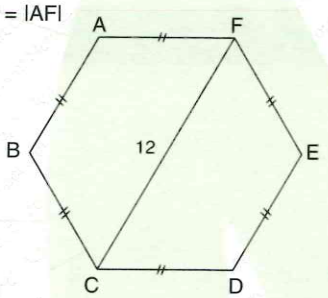
$A(ABCDEF) = 6 \cdot \frac{a^2\sqrt{3}}{4}$

Örnek / Example 8

$|AB| = |BC| = |CD| = |DE| = |EF| = |AF|$

$|CF| = 12$ cm

$\Rightarrow$ **Ç(ABCDEF) = ? cm**



A) 24 B) 30 C) 36 D) 42 E) 48

Çözüm / Solution — Yanıt / Answer C

[CF] : en uzun köşegen / the longest diagonal

$|AB| = |BC| = |CD| = |DE| = |EF| = |AF| = a$

$\Rightarrow |CF| = 2a = 12$ cm

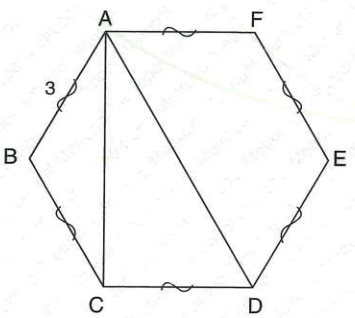
$\Rightarrow a = 6$ cm

Ç(ABCDEF) = 6·6 = 36 cm

Örnek / Example 9

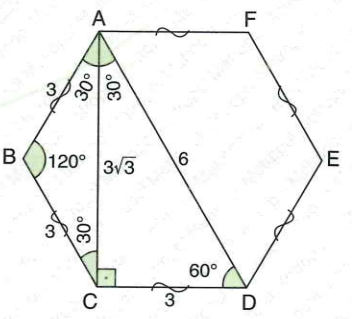
$|AB| = |BC| = |CD| = |DE| = |EF| = |AF| = 3$ cm

$\Rightarrow$ **$|AC| + |AD|$ = ? cm**



A) $3(\sqrt{3}+1)$ B) $3\sqrt{3}$ C) $3(\sqrt{3}+2)$ D) $3(\sqrt{3}-1)$ E) $3(\sqrt{3}+6)$

Çözüm / Solution — Yanıt / Answer C

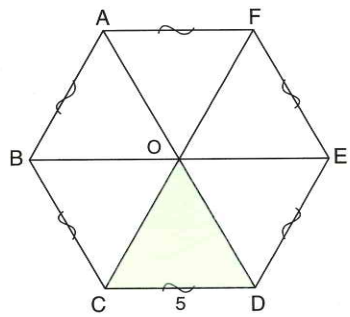


$\left.\begin{array}{l} |AC| = 3\sqrt{3}\text{ cm} \\ |AD| = 6\text{ cm} \end{array}\right\} \Rightarrow |AC| + |AD| = 3\sqrt{3} + 6\text{ cm} = 3(\sqrt{3}+2)\text{ cm}$

Örnek / Example 10

|AB| = |BC| = |CD| = |DE| = |EF| = |AF| = 5 cm

$\Rightarrow \frac{A(\widehat{OCD})}{A(ABCDEF)} = ?$



A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{1}{4}$ D) $\frac{1}{5}$ E) $\frac{1}{6}$

Çözüm / Solution Yanıt / Answer **E**

$A(\widehat{OCD}) = A(\widehat{ODE}) = A(\widehat{OEF}) = A(\widehat{OFA}) = A(\widehat{OAB}) = A(\widehat{OBC}) = S$

A(ABCDEF) = 6S

$\Rightarrow \frac{A(\widehat{OCD})}{A(ABCDEF)} = \frac{S}{6S} = \frac{1}{6}$

DÖRTGENLER / QUADRANGLES

Tanım: Dörtgen; dört kenarlı bir çokgendir.

Definition: A quadrangle is a polygon with four sides.

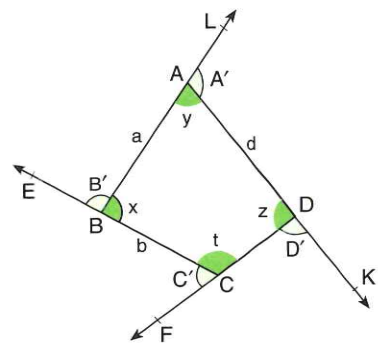
ABCD = [AB] ∪ [BC] ∪ [CD] ∪ [DA]

$\widehat{BAD} = y, \widehat{ABC} = x, \widehat{BCD} = t$ ve $\widehat{CDA} = z$ açıları şekildeki dörtgenin iç açılarıdır.

$\widehat{BAD} = y, \widehat{ABC} = x, \widehat{BCD} = t$ and $\widehat{CDA} = z$ are the interior angles of the quadrangle in the figure.

$\widehat{LAD} = A', \widehat{LBE} = B', \widehat{FCE} = C', \widehat{KDF} = D'$ açıları şekildeki dörtgenin dış açılarıdır.

$\widehat{LAD} = A', \widehat{LBE} = B', \widehat{FCE} = C', \widehat{KDF} = D'$ are the exterior angles of the quadrilateral in the figure.



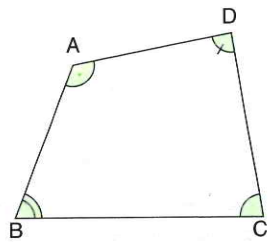
DÖRTGENLERİN ÖZELLİKLERİ / PROPERTIES of QUADRANGLES

Özellik 1 / Property 1

Bir konveks dörtgenin, iç açılarının ölçüleri toplamı 360° dir.

The sum of the measures of the interior angles of a convex quadrangle is 360°.

$m(\widehat{A}) + m(\widehat{B}) + m(\widehat{C}) + m(\widehat{D}) = 360°$

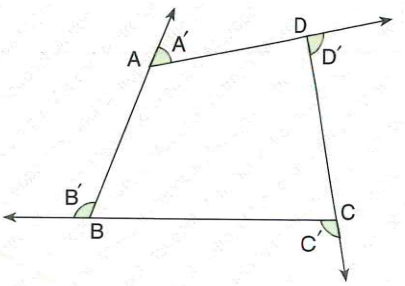


Özellik 2 / Property 2

Bir konveks dörtgenin, dış açılarının ölçüleri toplamı 360° dir.

The sum of the measures of the exterior angles of a convex quadrangle is 360°.

$m(\widehat{A'}) + m(\widehat{B'}) + m(\widehat{C'}) + m(\widehat{D'}) = 360°$

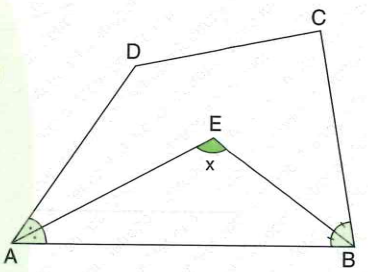


Özellik 3 / Property 3

Bir konveks dörtgende bir kenara ait iki iç açının iç açıortaylarının belirttiği açının ölçüsü, diğer iki iç açının ölçüleri toplamının yarısına eşittir.

The measure of angle staded by the bisectors of two interior angles of a convex quadrangle related to one side is equal to half of the sum of remaining two interior angles.

$$m(\widehat{AEB}) = x = \frac{m(\widehat{C}) + m(\widehat{D})}{2}$$



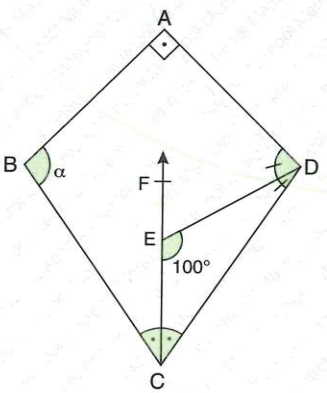
Örnek / Example 11

[CF ve [DE] açıortaylar,

[CF and [DE] are bisectors,

$m(\widehat{BAD}) = 90°, m(\widehat{CED}) = 100°$

$\Rightarrow m(\widehat{ABC}) = \alpha = ?$



A) 100° B) 105° C) 110° D) 115° E) 120°

Çözüm / Solution

Yanıt / Answer **C**

[CF ve [DE] açıortaylar

[CF and [DE] are bisectors

$\Rightarrow m(\widehat{CED}) = \frac{m(\widehat{A}) + m(\widehat{B})}{2}$

$\Rightarrow 100° = \frac{90° + \alpha}{2}$

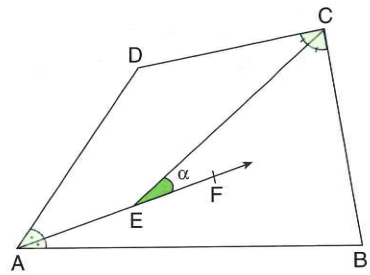
$\Rightarrow 200° = 90° + \alpha \Rightarrow 110° = \alpha$

Özellik 4 / Property 4

Bir konveks dörtgende karşılıklı iki açının açıortayları arasında oluşan dar açının ölçüsü, diğer iki açının ölçüleri farkının mutlak değerinin yarısına eşittir.

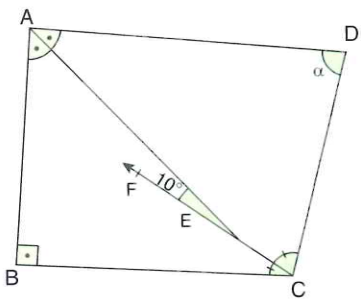
The measure of acute angle staded by two reciprocal interior angle bisectors in a convex quadrangle is equal to half of absolute value of difference of remaining two interior angles.

$$m(\widehat{CEF}) = \alpha = \frac{|m(\widehat{D}) - m(\widehat{B})|}{2}$$



Örnek / Example 12

[AE] ve [CF açıortaylar,
[AE] and [CF are bisectors,
[AB] ⊥ [BC],
$m(\widehat{AEF}) = 10°$
$\Rightarrow m(\widehat{D}) = \alpha = ?$



A) 70° B) 80° C) 100° D) 110° E) 120°

Çözüm / Solution

Yanıt / Answer **D**

[AE] ve [CF açıortaylar,
[AE] and [CF are bisectors,

$$\Rightarrow m(\widehat{AEF}) = \frac{|m(\widehat{B}) - m(\widehat{D})|}{2}$$

$$\Rightarrow 10° = \frac{|\alpha - 90°|}{2}$$

$$\Rightarrow 20° = |\alpha - 90°|$$

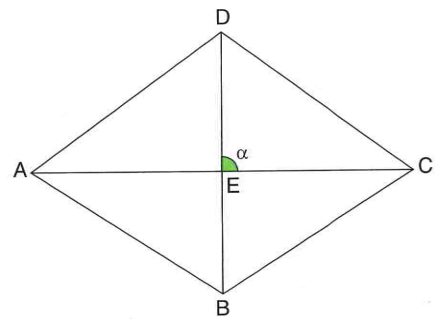
$$\Rightarrow 20° = \alpha - 90° \Rightarrow 110° = \alpha$$

Özellik 5 / Property 5

Konveks dörtgenin alanı, köşegenin uzunlukları ile köşegen uzunlukları arasında kalan açının sinüsünün çarpımının yarısına eşittir.

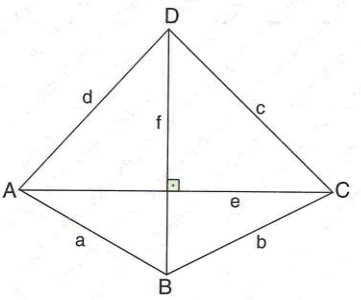
The area of a convex quadrangle is half the product of its diagonals and the sine of the angle formed by the diagonals.

$$\left.\begin{array}{l} |AC| = e \\ |BD| = f \end{array}\right\} \Rightarrow A(ABCD) = \frac{1}{2} \cdot e \cdot f \cdot \sin\alpha$$



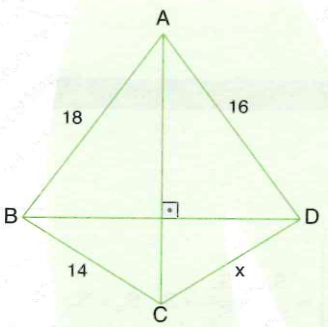
Özellik 6 / Property 6

$[AC] \perp [BD]$, $|AC| = e$, $|BD| = f$ $\Rightarrow$ i. $a^2 + c^2 = b^2 + d^2$ ii. $A(ABCD) = \frac{e \cdot f}{2}$



Örnek / Example 13

$[AC] \perp [BD]$,
$|AB| = 18$ cm,
$|AD| = 16$ cm,
$|BC| = 14$ cm,
$|CD| = x$ cm
$\Rightarrow$ **x = ? cm**



A) $8\sqrt{2}$ B) $10\sqrt{2}$ C) $12\sqrt{2}$ D) $16\sqrt{2}$ E) $22\sqrt{2}$

Çözüm / Solution

Yanıt / Answer **A**

$|AB|^2 + |CD|^2 = |BC|^2 + |AD|^2$

$18^2 + x^2 = 14^2 + 16^2$

$324 + x^2 = 196 + 256$

$x^2 = 452 - 324$ cm^2

$x^2 = 128$ cm^2 $\Rightarrow x = 8\sqrt{2}$ cm

Özellik 7 / Property 7

P, Q, R, T şekildeki konveks dörtgenin kenarlarının orta noktalarıdır.

P, Q, R, T are the middle points of sides of the convex quadrangle in the figure.

i. PQRT dörtgeni paralelkenardır. / The quadrangle PQRT is a parallelogram.

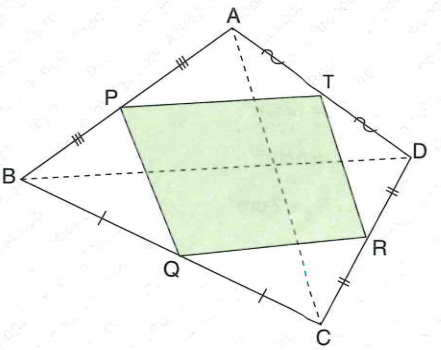
ii. Alan (Area)$(PQRT) = \frac{A(ABCD)}{2}$, Çevre (Perimeter)$(PQRT) = |AC| + |BD|$

iii. ABCD dörtgeninde köşegenler dik ise, PQRT dikdörtgendir.

If the diagonals of the quadrangle ABCD are perpendicular then PQRT is a rectangle.

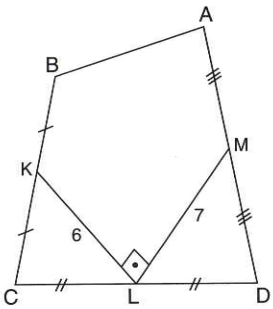
iv. ABCD eşkenar dörtgen veya köşegen uzunlukları eşit ise, PQRT karedir.

If ABCD is an equilateral quadrangle or have equal diagonals, then PQRT is a square.



Örnek / Example 14

[KL] ⊥ [LM],
|KL| = 6 cm,
|LM| = 7 cm,
⇒ **A(ABCD) = ? cm²**



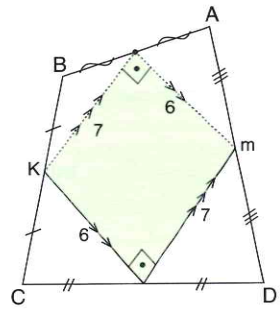
A) 72 B) 84 C) 88 D) 102 E) 116

Çözüm / Solution Yanıt / Answer **B**

KLMN bir dikdörtgendir.
KLMN is a quadrangle.

$$\frac{A(ABCD)}{2} = A(KLMN)$$

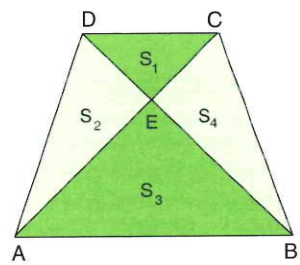
$$\Rightarrow A(ABCD) = 2 \cdot 7 \cdot 6 = 84\,cm^2$$



Özellik 8 / Property 8

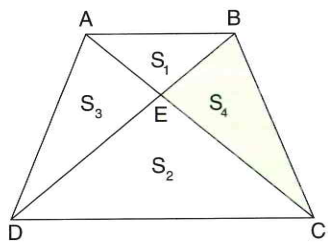
Şekildeki S_1, S_2, S_3, S_4 alanları arasındaki ilişki yanda verilmiştir.
The ralation between the areas S_1, S_2, S_3, S_4 in the figure is given beside.

$$\left.\begin{array}{l} A(\widehat{DEC}) = S_1 \\ A(\widehat{BEC}) = S_4 \\ A(\widehat{ADE}) = S_2 \\ A(\widehat{ABE}) = S_3 \end{array}\right\} \Rightarrow \left.\begin{array}{l} \frac{S_1}{S_4} = \frac{|ED|}{|EB|} \\ \frac{S_2}{S_3} = \frac{|ED|}{|EB|} \end{array}\right\} \Rightarrow \frac{S_1}{S_4} = \frac{S_2}{S_3} \Rightarrow S_1 \cdot S_3 = S_2 \cdot S_4$$



Örnek / Example 15

$A(\widehat{AEB}) = S_1 = 8\,cm^2$
$A(\widehat{DEC}) = S_2 = 12\,cm^2$
$A(\widehat{ADE}) = S_3 = 6\,cm^2$
⇒ **$A(\widehat{BEC}) = S_4 = ?\,cm^2$**

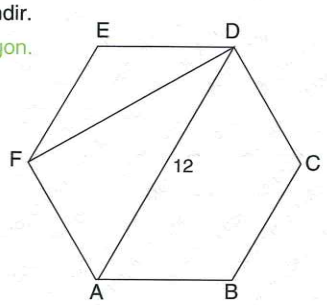


A) 4 B) 8 C) 16 D) 32 E) 64

Çözüm / Solution Yanıt / Answer **C**

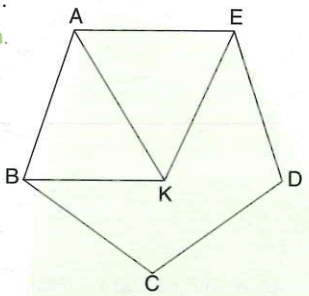
$S_1 \cdot S_2 = S_3 \cdot S_4$
$8 \cdot 12 = 6 \cdot S_4$
$S_4 = \frac{12 \cdot 8}{6}$
$S_4 = 16\ cm^2$

1. ABCDEF bir düzgün altıgendir.
ABCDEF is a regular hexagon.
$|AD| = 12$ cm
$\Rightarrow$ **$|FD| = ?$ cm**



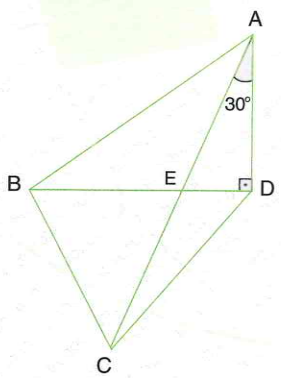
A) $3\sqrt{3}$ B) 6 C) $6\sqrt{3}$
D) 9 E) $9\sqrt{3}$

2. ABCDE bir düzgün beşgendir.
ABCDE is a regular pentagon.
$|AE| = |KE| = |AK|$
$\Rightarrow$ **$m(\widehat{AKB}) = ?$**



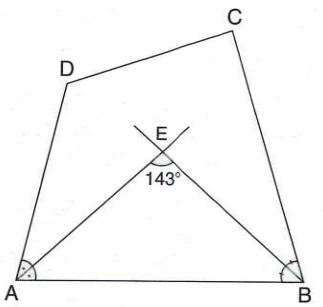
A) 56° B) 60° C) 64°
D) 66° E) 70°

3. $[BD] \perp [DA]$,
$m(\widehat{EAD}) = 30°$,
$|AE| = 8$ cm,
$|EC| = |BE| = 6$ cm
$\Rightarrow$ **$A(ABCD) = ?$ cm^2**



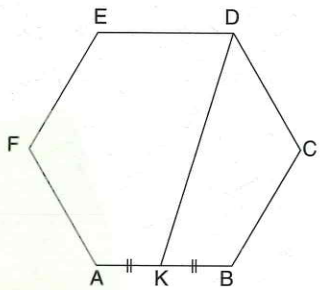
A) $35\sqrt{3}$ B) $40\sqrt{3}$ C) 45
D) $50\sqrt{3}$ E) 55

4. $m(\widehat{DAE}) = m(\widehat{EAB})$,
$m(\widehat{EBC}) = m(\widehat{EBA})$,
$m(\widehat{AEB}) = 143°$
$\Rightarrow$ **$m(\widehat{DAB}) + m(\widehat{ABC}) = ?$**



A) 67° B) 74° C) 81°
D) 88° E) 95°

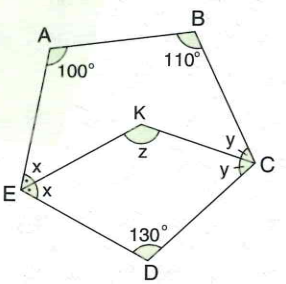
5.



$|AB| = |BC| = |CD| = |DE| = |EF| = |FA| = 6$ cm
$\Rightarrow$ **$|DK| = ?$**

A) $\sqrt{13}$ B) $3\sqrt{3}$ C) $6\sqrt{3}$
D) $3\sqrt{13}$ E) $6\sqrt{13}$

6.



$m(\widehat{A}) = 100°$, $m(\widehat{B}) = 110°$, $m(\widehat{D}) = 130°$,
$m(\widehat{AEK}) = m(\widehat{KED}) = x$,
$m(\widehat{DCK}) = m(\widehat{KCB}) = y$
$\Rightarrow$ **$m(\widehat{EKC}) = z = ?$**

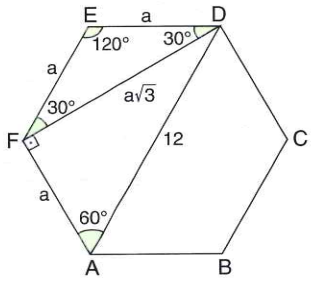
A) 100° B) 110° C) 120°
D) 130° E) 140°

YANITLAR / ANSWERS

1	2	3	4	5	6
C	D	A	B	D	D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



$|AF| = |EF| = |ED| = a$ cm,

$|AF|^2 + |FD|^2 = |AD|^2 \Rightarrow a^2 + (a\sqrt{3})^2 = 12^2$

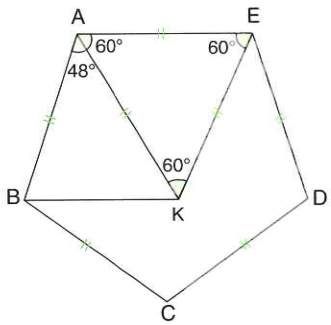
$a^2 + 3a^2 = 144$

$a^2 = 36 \Rightarrow a = 6$ cm

$|EF| = |ED| = 6$ cm $\Rightarrow |FD| = 6\sqrt{3}$ cm

Yanıt / The Answer is C

2.



$m(\widehat{A}) = m(\widehat{B}) = m(\widehat{C}) = m(\widehat{D}) = m(\widehat{E}) = \dfrac{3 \cdot 180^\circ}{5} = 108^\circ$

$|AK| = |KE| = |AE| \Rightarrow m(\widehat{EAK}) = 60^\circ$

$m(\widehat{A}) = 108^\circ \Rightarrow m(\widehat{BAK}) = 108^\circ - 60^\circ = 48^\circ$

$|AE| = |AK| \Rightarrow |AK| = |AB|$

$m(\widehat{BAK}) = 48^\circ \Rightarrow m(\widehat{AKB}) = \dfrac{180^\circ - 48^\circ}{2} = 66^\circ$

Yanıt / The Answer is D

3. $m(\widehat{AED}) = 60^\circ$

$A(ABCD) = \dfrac{|AC| \cdot |BD| \cdot \sin 60^\circ}{2}$

$\widehat{AED}$ bir 30°–60°–90° üçgenidir. / 30°–60°–90° triangle.

$|AE| = 8$ cm $\Rightarrow |ED| = 4$ cm,

$|ED| = 4$ cm $\Rightarrow |BD| = 10$ cm

$|AC| = 14$ cm, $|BD| = 10$ cm

$A(ABCD) = \dfrac{10 \cdot 14 \cdot \sin 60^\circ}{2} = \dfrac{10 \cdot 14 \cdot \frac{\sqrt{3}}{2}}{2} = 35\sqrt{3}\,\text{cm}^2$

Yanıt / The Answer is A

4. $m(\widehat{DAE}) = m(\widehat{EAB}),\ m(\widehat{EBC}) = m(\widehat{EBA}) \Rightarrow m(\widehat{AEB}) = \dfrac{m(\widehat{C}) + m(\widehat{D})}{2}$

$143^\circ = \dfrac{m(\widehat{C}) + m(\widehat{D})}{2}$

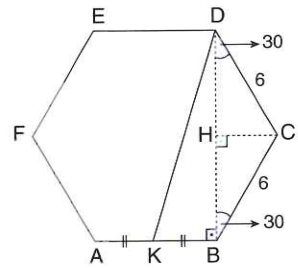
$286^\circ = m(\widehat{C}) + m(\widehat{D})$

$m(\widehat{A}) + m(\widehat{B}) + m(\widehat{C}) + m(\widehat{D}) = 360^\circ$

$m(\widehat{A}) + m(\widehat{B}) = m(\widehat{DAB}) + m(\widehat{ABC}) = 360^\circ - 286^\circ = 74^\circ$

Yanıt / The Answer is B

5.



$\widehat{BCH}$ $(30^\circ, 60^\circ, 90^\circ) \Rightarrow |HC| = 3$ cm

$\Rightarrow |DB| = 6\sqrt{3}$ cm

$\widehat{DBK}$:

$|DK|^2 = |DB|^2 + |KB|^2$ [Pisagor teoremi / Pythagorean Theorem]

$|DK|^2 = (6\sqrt{3})^2 + 3^2$

$|DK|^2 = 117 \Rightarrow |DK| = 3\sqrt{13}$

Yanıt / The Answer is D

6. ABCDE;

$100^\circ + 110^\circ + 2x + 2y + 130^\circ = 540^\circ$

$2x + 2y = 200^\circ$

$x + y = 100^\circ$

EKCD;

$m(\widehat{EKC}) + y + 130^\circ + x = 360^\circ$

$z = m(\widehat{EKC}) = 130^\circ$

Yanıt / The Answer is D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

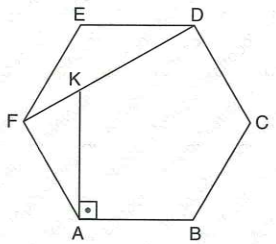
1. ABCDEF düzgün bir altıgen,

ABCDEF is a regular hexagon

$[KA] \perp [AB]$

$|AB| = 3$

$\Rightarrow |AK| = ?$



A) $\frac{3\sqrt{3}}{4}$ B) $\sqrt{3}$ C) $\frac{3\sqrt{3}}{2}$

D) $2\sqrt{3}$ E) 3

[İSTANBUL ÜNİVERSİTESİ – YÖS 2018]

2. ABCD bir dörtgen,

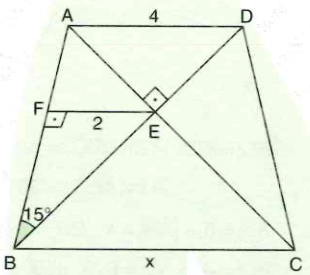
ABCD is a quadrangle,

$AC \perp BD$, $AB \perp FE$

$|FE| = 2$, $|AD| = 4$,

$3|AB| = 4|CD|$, $m(\widehat{FBE}) = 15°$

$\Rightarrow |BC| = x = ?$



A) $2\sqrt{5}$ B) $\sqrt{21}$ C) $2\sqrt{21}$

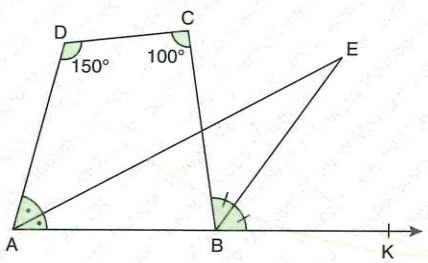
D) 10 E) 12

[İSTANBUL ÜNİVERSİTESİ – YÖS 2018]

3. $m(\widehat{DAE}) = m(\widehat{EAB})$,

$m(\widehat{CBE}) = m(\widehat{EBK})$

$\Rightarrow m(\widehat{AEB}) = ?$



A) 15° B) 20° C) 25°

D) 30° E) 35°

[İSTANBUL ÜNİVERSİTESİ – YÖS 2018]

METROPOL YAYINLARI • METROPOL PUBLICATIONS

4. ABCD bir dörtgen,

ABCD is a quadrangle,

E, F, G, H orta noktalar,

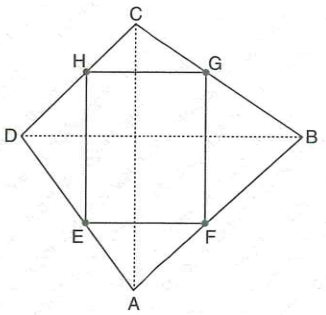
E, F, G, H are midpoints,

$|AC| = 17$ cm,

$|DB| = 13$ cm

$\Rightarrow$ Çevre / The Perimeter

(EFGH) = ? cm



A) 15 B) 20 C) 24

D) 30 E) 32

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2018]

5. ABCD bir dörtgen,

ABCD is a quadrangle,

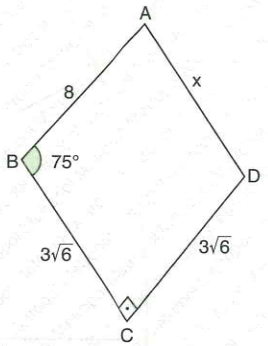
$[BC] \perp [CD]$,

$|AB| = 8$ cm,

$|BC| = |CD| = 3\sqrt{6}$ cm

$m(\widehat{ABC}) = 75°$

$\Rightarrow |AD| = x = ?$



A) 10 B) $2\sqrt{13}$ C) $2\sqrt{7}$

D) $3\sqrt{7}$ E) $2\sqrt{5}$

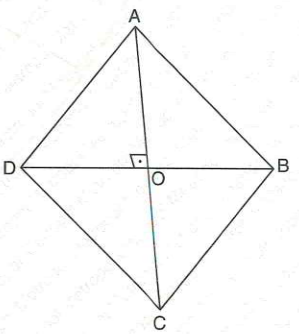
[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2017]

6. $|AD| = 12$,

$|BC| = 4$

$|DC| = 2|AB|$

$AC \perp BD \Rightarrow |AB| = ?$



A) $2\sqrt{2}$ B) 4 C) $4\sqrt{2}$

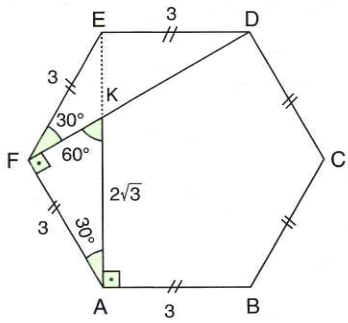
D) 6 E) $8\sqrt{2}$

[İSTANBUL ÜNİVERSİTESİ – YÖS 2014]

YANITLAR / ANSWERS

1	2	3	4	5	6
D	C	E	D	C	C

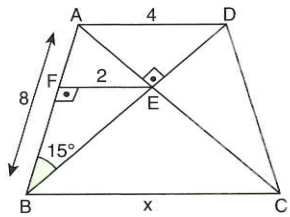
1.



$\widehat{AKF}$: $|AF| = 3 \Rightarrow |AK| = 2\sqrt{3}$ cm

Yanıt / The Answer is D

2.



$\widehat{AEB}$: 15° – 75° – 90° üçgeni / triangle

$\Rightarrow |EF| = 2$ cm, $|AB| = 2 \cdot 4 = 8$ cm

$[AC] \perp |BD|$: $|AD|^2 + |BC|^2 = |AB|^2 + |DC|^2$

$4^2 + x^2 = 8^2 + |DC|^2$

$\left[3|AB| = 4|CD| \Rightarrow 3 \cdot 8 = 4 \cdot |CD| \right.$

$\left. 6 = |CD| \right]$

$4^2 + x^2 = 8^2 + 6^2$

$16 + x^2 = 64 + 36$

$x^2 = 100 - 16 = 84$

$x = \sqrt{84} = 2\sqrt{21}$ cm

Yanıt / The Answer is C

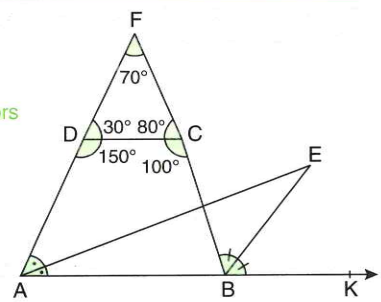
3. $m(\widehat{AFB}) = 70°$

[AE] ve [BE] açıortaylar,

[AE] and [BE] are bisectors

$\Rightarrow m(\widehat{AEB}) = \dfrac{m(\widehat{AFB})}{2}$

$m(\widehat{AEB}) = \dfrac{70°}{2} = 35°$



Yanıt / The Answer is E

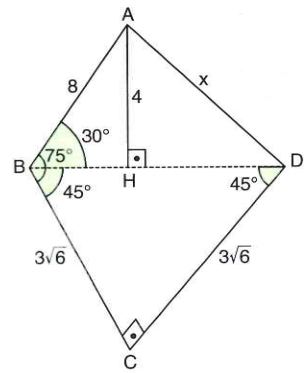
4. Çevre / The Perimeter (EFGH) = |AC| + |DB|

[Özellik 7 / Property 7]

⇒ Çevre / The Perimeter (EFGH) = 17 + 13 = 30 cm

Yanıt / The Answer is D

5.



$|BC| = |CD| \Rightarrow m(\widehat{DBC}) = m(\widehat{DCB}) = 45°$

$\Rightarrow m(\widehat{ABD}) = 30°$

$|AB| = 8 \Rightarrow |AH| = 4$, $|BH| = 4\sqrt{3}$

$|BD| = 3\sqrt{6} \cdot \sqrt{2} = 6\sqrt{3}$, $|HD| = 6\sqrt{3} - 4\sqrt{3} = 2\sqrt{3}$ cm

$x^2 = 4^2 + (2\sqrt{3})^2 = 16 + 12 = 28 \Rightarrow x = 2\sqrt{7}$ cm

Yanıt / The Answer is C

6. $|AD| = 12$

$|BC| = 4$

$|AB| = t \Rightarrow |DC| = 2t$

$AC \perp BD \Leftrightarrow 12^2 + 4^2 = t^2 + (2t)^2$

$144 + 16 = t^2 + 4t^2$

$160 = 5t^2$

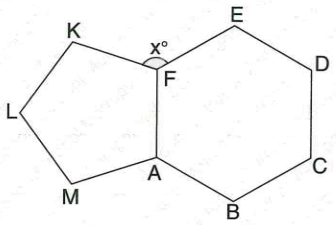
$32 = t^2$

$4\sqrt{2} = t = |AC|$

Yanıt / The Answer is C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

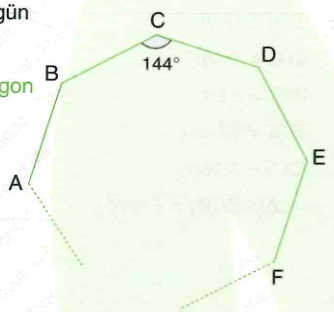
1.



ABCDEF düzgün bir altıgen, KLMAF düzgün bir beşgendir.
ABCDEF is a regular hexagon and KLMAF is a regular pentagon. ⇒ **$m(\widehat{KFE}) = x = ?$**

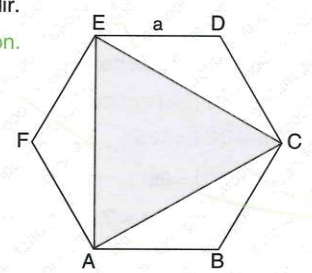
Yanıt / The Answer is 132°

2. ABCDEF ... n kenarlı düzgün çokgendir.
ABCDEF is a regular polygon with n sides.
$m(\widehat{BCD}) = 144° \Rightarrow$ **n = ?**



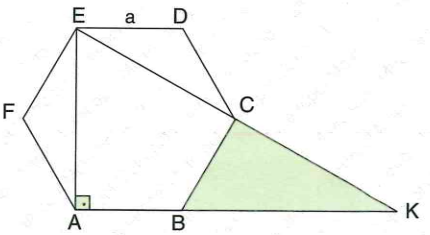
Yanıt / The Answer is 10

3. ABCDEF düzgün bir altıgendir.
ABCDEF is a regular hexagon.
$a = 2\sqrt{3}$ cm
⇒ **$A(\widehat{ACE}) = ?\,cm^2$**



Yanıt / The Answer is $9\sqrt{3}$

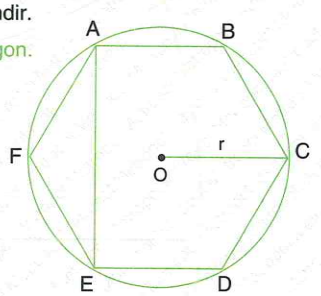
4.



ABCDEF düzgün bir altıgen, EAK bir üçgendir.
ABCDEF is a regular hexagon, EAK is a triangle.
$[EA] \perp [AK]$, $C \in [EK]$, a = 6 cm ⇒ **$A(\widehat{CBK}) = ?\,cm^2$**

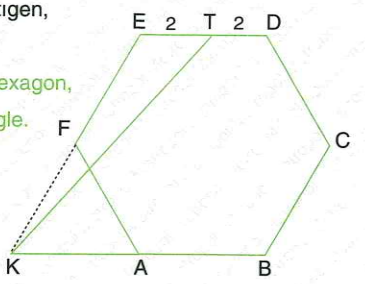
Yanıt / The Answer is $18\sqrt{3}$

5. ABCDEF düzgün bir altıgendir.
ABCDEF is a regular hexagon.
$|OC| = r = 6\sqrt{3}$ cm
⇒ **|AE| = ? cm**



Yanıt / The Answer is 18

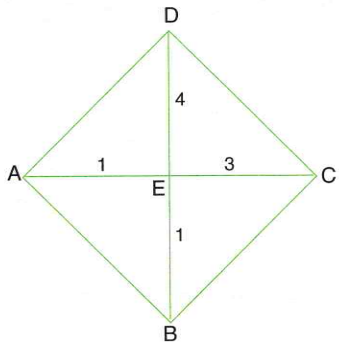
6. ABCDEF düzgün bir altıgen, FKA eşkenar üçgendir.
ABCDEF is a regular hexagon, FKA is equilateral triangle.
|ET| = |TD| = 2 cm
⇒ **|KT| = ? cm**



Yanıt / The Answer is $2\sqrt{21}$

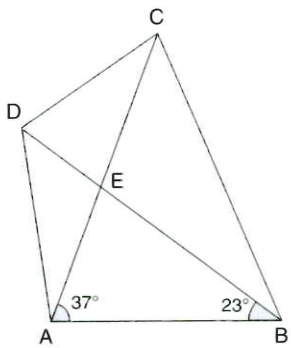
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCD bir dörtgendir.
ABCD is a quadrangle.
|AE| = |EB| = 1 cm,
|DE| = 4 cm,
|EC| = 3 cm,
A(ABCD) = k cm^2,
$k \cdot A(\widehat{ABE}) = \frac{1}{4} \Rightarrow$ **k = ?**



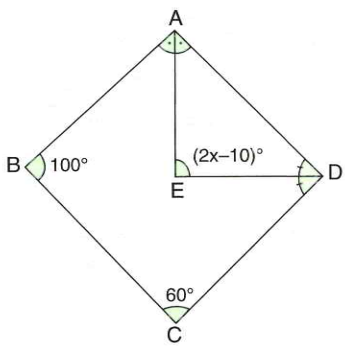
Yanıt / The Answer is $\sqrt{5}$

8. ABCD bir dörtgendir.
ABCD is a quadrangle.
$m(\widehat{CAB}) = 37°$,
$m(\widehat{DBA}) = 23°$,
|AC| = 10 cm,
|BD| = 8 cm
$\Rightarrow$ **A(ABCD) = ? cm^2**



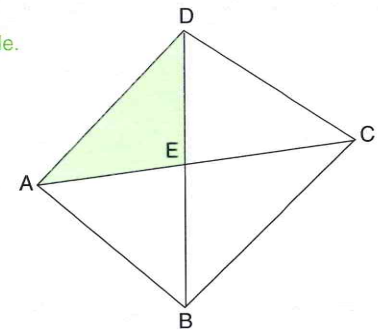
Yanıt / The Answer is $20\sqrt{3}$

9. ABCD bir dörtgendir.
ABCD is a quadrangle.
$m(\widehat{AED}) = 2x–10°$,
$m(\widehat{B}) = 100°$,
$m(\widehat{C}) = 60°$
$\Rightarrow$ **x = ?**



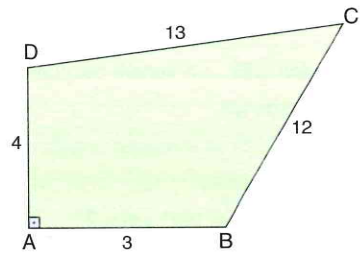
Yanıt / The Answer is 45

10. ABCD bir dörtgendir.
ABCD is a quadrangle.
$A(\widehat{AEB}) = 25\,cm^2$,
$A(\widehat{DEC}) = 18\,cm^2$,
$A(\widehat{BEC}) = 30\,cm^2$
$\Rightarrow$ **$A(\widehat{AED})$ = ? cm**



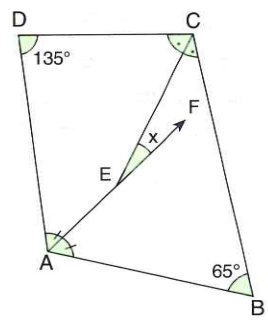
Yanıt / The Answer is 15

11. ABCD bir dörtgendir.
ABCD is a quadrangle.
[DA] ⊥ [AB],
|DA| = 4 cm,
|AB| = 3 cm,
|BC| = 12 cm,
|DC| = 13 cm
$\Rightarrow$ **A(ABCD) = ? cm^2**



Yanıt / The Answer is 36

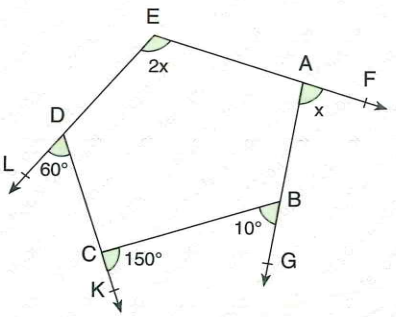
12. ABCD bir dörtgendir.
ABCD is a quadrangle.
[AF ve [CE] açıortaylar
[AF and [CE] are bisectors
$m(\widehat{ADC}) = 135°$,
$m(\widehat{ABC}) = 65°$
$\Rightarrow$ **$m(\widehat{CEF}) = x$ = ?**



Yanıt / The Answer is 35°

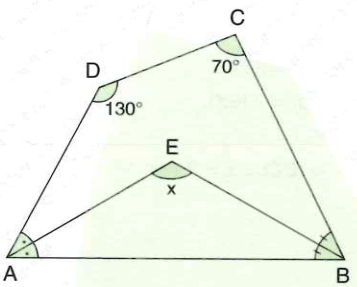
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $m(\widehat{GBC}) = 10°$,
$m(\widehat{BCK}) = 150°$,
$m(\widehat{LDC}) = 60°$
$\Rightarrow$ **$m(\widehat{FAB}) = x = ?$**



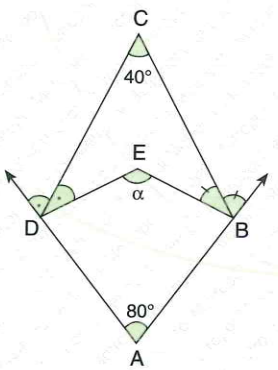
A) 10° B) 20° C) 30°
D) 40° E) 50°

2. [AE] ve [BE] birer açıortaydır.
[AE] and [BE] are bisectors.
$m(\widehat{ADC}) = 130°$,
$m(\widehat{BCD}) = 70°$
$\Rightarrow$ **$m(\widehat{AEB}) = x = ?$**



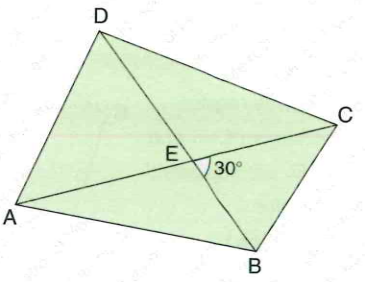
A) 80° B) 90° C) 100°
D) 110° E) 120°

3. [DC] ve [BC] birer açıortaydır.
[CD] and [BC] are bisectors.
$m(\widehat{DCB}) = 40°$,
$m(\widehat{DAB}) = 80°$
$\Rightarrow$ **$m(DEB) = \alpha = ?$**



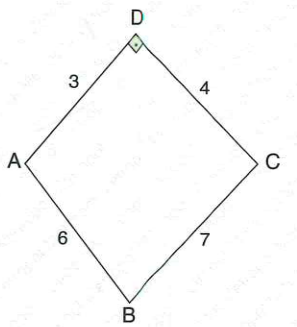
A) 170° B) 160° C) 150°
D) 140° E) 130°

4. $|AC| = 12$ cm,
$|DB| = 8$ cm,
$m(\widehat{CEB}) = 30°$
$\Rightarrow$ **$A(ABCD) = ?\ cm^2$**



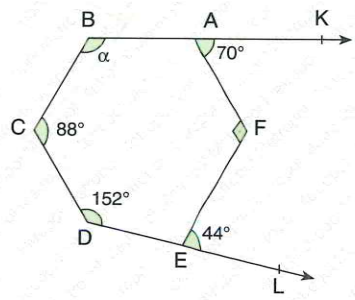
A) 24 B) 27 C) 30
D) 36 E) 40

5. $[AD] \perp [DC]$,
$|AD| = 3$ cm,
$|DC| = 4$ cm,
$|CB| = 7$ cm,
$|BA| = 6$ cm
$\Rightarrow$ **$A(ABCD) = ?\ cm^2$**



A) $2 + 2\sqrt{2}$ B) $3 + 3\sqrt{3}$ C) $4 + 4\sqrt{4}$
D) $5 + 5\sqrt{5}$ E) $6 + 6\sqrt{6}$

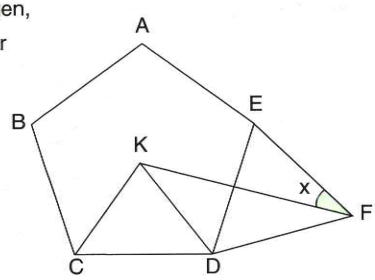
6. $[AF] \perp [FE]$,
$m(\widehat{KAF}) = 70°$,
$m(\widehat{FEL}) = 44°$,
$m(\widehat{EDC}) = 152°$,
$m(\widehat{DCB}) = 88°$
$\Rightarrow$ **$\alpha = ?$**



A) 134° B) 138° C) 142°
D) 144° E) 148°

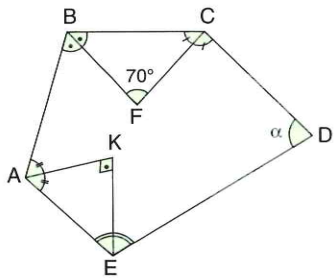
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCDE düzgün beşgen, CDK ve EFD eşkenar üçgendir.
ABCD is regular pentagon, CDK and EFD are equilateral triangles.
$\Rightarrow m(\widehat{KFE}) = x = ?$



A) 24° B) 34° C) 35°
D) 36° E) 37°

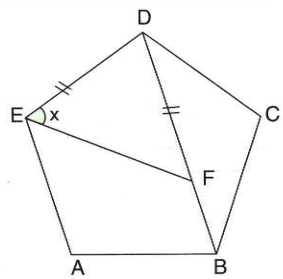
8.



[BF], [CF], [AK] ve [EK] birer açıortaydır.
[BF], [CF], [AK] and [EK] are bisectors.
$m(\widehat{BFC}) = 70°$, $[AK] \perp [KE]$
$\Rightarrow m(\widehat{CDE}) = \alpha = ?$

A) 110° B) 120° C) 130°
D) 140° E) 150°

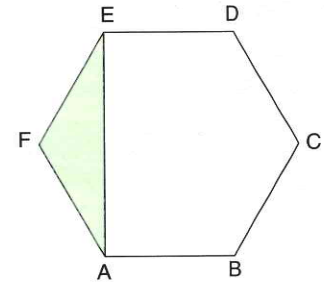
9. ABCDE düzgün bir beşgendir.
ABCDE is a regular pentagon.
IEDI = IDFI
$\Rightarrow m(\widehat{DEF}) = x = ?$



A) 52° B) 54° C) 56°
D) 58° E) 60°

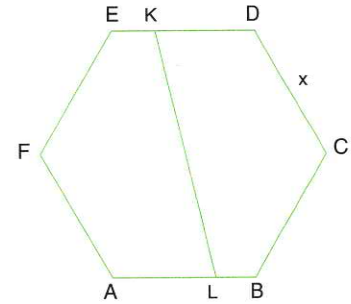
METROPOL YAYINLARI • METROPOL PUBLICATIONS

10. ABCDEF düzgün bir altıgendir.
ABCDEF is a regular hexagon.
IDCI = 8 cm
$\Rightarrow A(\widehat{AFE}) = ?\ cm^2$



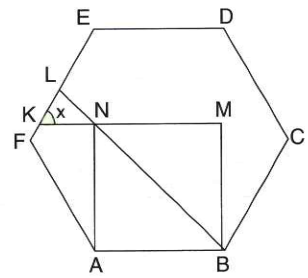
A) $8\sqrt{3}$ B) $12\sqrt{3}$ C) $16\sqrt{3}$
D) $20\sqrt{3}$ E) $24\sqrt{3}$

11. ABCDEF düzgün bir altıgendir.
ABCDEF is regular hexagon.
IEKI = ILBI,
IKDI = 2·IEKI,
IKLI = $2\sqrt{7}$ cm
$\Rightarrow$ **IDCI = x = ? cm**



A) 1 B) 2 C) 3
D) 4 E) 5

12. ABCDEF düzgün bir altıgen, ABMN karedir.
ABCDEF is a regular hexagon, ABMN is square.
$\Rightarrow m(\widehat{EKN}) = x = ?$

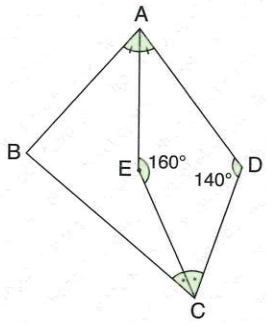


A) 60° B) 55° C) 45°
D) 40° E) 30°

YANITLAR / ANSWERS

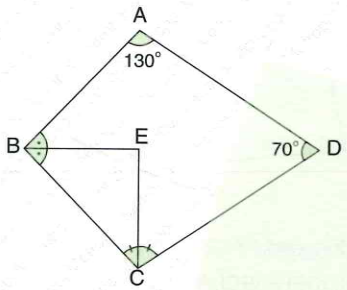
1	2	3	4	5	6	7	8	9	10	11	12
D	C	B	A	E	D	A	D	B	C	C	A

1. ABCD bir dörtgen,
[AE] ve [CE] birer açıortaydır.
ABCD is a quadrangle,
[AE] and [CE] are bisectors.
$m(\widehat{AEC}) = 160°$,
$m(\widehat{ADC}) = 140°$
$\Rightarrow$ **$m(\widehat{ABC}) = ?$**



A) 70° B) 80° C) 90°
D) 100° E) 110°

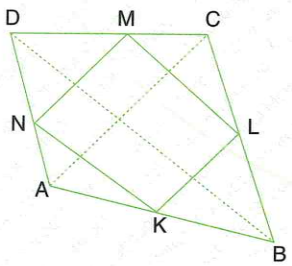
2.



ABCD bir dörtgen, [BE] ve [CE] birer açıortaydır.
ABCD is a quadrangle, [BE] and [CE] are bisectors.
$m(\widehat{BAD}) = 130°$, $m(\widehat{CDA}) = 70° \Rightarrow$ **$m(\widehat{BEC}) = ?$**

A) 130° B) 120° C) 110
D) 100° E) 90°

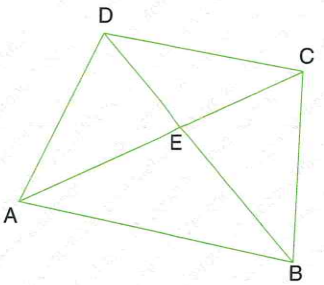
3.



ABCD bir dörtgendir. / ABCD is a quadrangle.
$|DN| = |NA|$, $|AK| = |KB|$, $|BL| = |LC|$, $|CM| = |MD|$,
$|AC| = 8$ cm , $|BD| = 10$ cm
$\Rightarrow$ **Çevre / The Perimeter (KLMN) = ? cm**

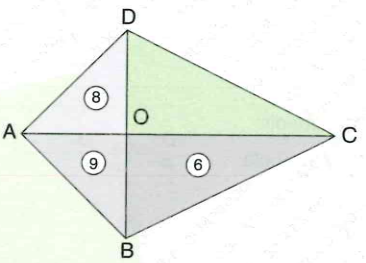
A) 10 B) 12 C) 14
D) 16 E) 18

4. ABCD bir dörtgendir.
ABCD is a quadrangle.
$m(\widehat{DEC}) = 120°$,
$|AC| = 12$ cm,
$|BD| = 8$ cm
$\Rightarrow$ **A(ABCD) = ? cm²**



A) $12\sqrt{3}$ B) $18\sqrt{3}$ C) $24\sqrt{3}$
D) $36\sqrt{3}$ E) $48\sqrt{3}$

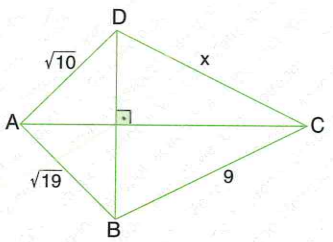
5.



ABCD bir dörtgendir. / ABCD is a quadrangle.
$A(\widehat{AOD}) = 8\,cm^2$, $A(\widehat{AOB}) = 9\,cm^2$,
$A(\widehat{BOC}) = 6\,cm^2 \Rightarrow$ **$A(\widehat{DOC}) = ?\,cm^2$**

A) $\frac{14}{3}$ B) 5 C) $\frac{16}{3}$
D) $\frac{17}{3}$ E) 6

6.

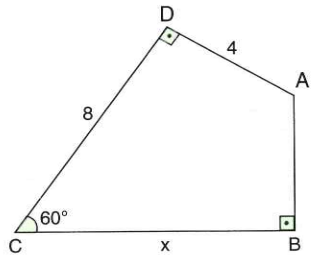


ABCD bir dörtgendir. / ABCD is a quadrangle.
$[AC] \perp [BD]$, $|AD| = \sqrt{10}$ cm, $|AB| = \sqrt{19}$ cm,
$|BC| = 9$ cm $\Rightarrow$ **$|DC| = x = ?$ cm**

A) $3\sqrt{6}$ B) $2\sqrt{17}$ C) $6\sqrt{2}$
D) $4\sqrt{10}$ E) $6\sqrt{3}$

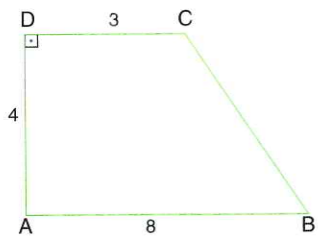
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCD bir dörtgendir.
ABCD is a quadrangle.
[AB] ⊥ [BC],
[CD] ⊥ [AD],
|DC| = 8 cm,
|AD| = 4 cm
⇒ **|BC| = x = ? cm**



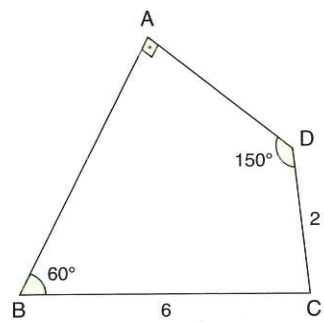
A) $2+\sqrt{3}$ B) $2(2+\sqrt{3})$ C) $4(2+\sqrt{3})$
D) $2-\sqrt{3}$ E) $4(2-\sqrt{3})$

8. ABCD bir dörtgendir.
ABCD is a quadrangle.
[AD] ⊥ [DC],
|AD| = 4 cm,
|DC| = 3 cm,
|AB| = 8 cm
⇒ **A(ABCD) = ? cm²**



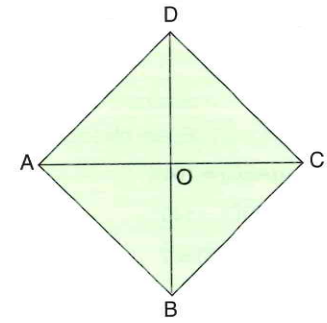
A) 22 B) 24 C) 26
D) 30 E) 36

9. [BA] ⊥ [AD],
$m(\widehat{ABC}) = 60°$,
$m(\widehat{ADC}) = 150°$,
|DC| = 2 cm,
|BC| = 6 cm
⇒ **A(ABCD) = ? cm²**



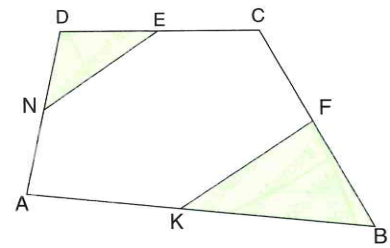
A) $6\sqrt{3}$ B) $7\sqrt{3}$ C) $9\sqrt{3}$
D) $8\sqrt{2}$ E) $7\sqrt{2}$

10. |DO| = 4 · |OB|,
$A(\widehat{ADC}) = 36\,cm^2$
⇒ **A(ABCD) = ? cm²**



A) 42 B) 45 C) 48
D) 51 E) 54

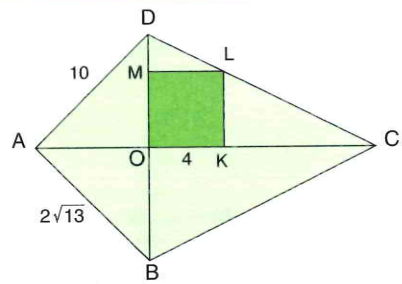
11.



ABCD bir dörtgendir. / ABCD is a quadrangle.
|AN| = |ND|, |DE| = |EC|, |CF| = |FB|, |AK| = |KB|,
$A(\widehat{NDE}) + A(\widehat{KBF}) = 17\,cm^2$ ⇒ **A(ABCD) = ? cm²**

A) 51 B) 54 C) 60 D) 68 E) 77

12.



ABCD bir dörtgen, OKLM bir karedir.
ABCD is a quadrangle, OKLM is a square.
|DL| = |LC|, |OK| = 4 cm, |AD| = 10 cm,
|AB| = $2\sqrt{13}$ cm ⇒ **|BC| = ? cm**

A) $2\sqrt{5}$ B) $4\sqrt{5}$ C) $6\sqrt{5}$
D) $7\sqrt{5}$ E) $8\sqrt{5}$

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	D	E	C	C	C	B	A	B	B	D	B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

BÖLÜM CHAPTER 8

TARİHSEL NOT / HISTORICAL NOTE

Gerolamo Cardano [1501 – 1576]

İtalyan Rönesans matematikçi, fizikçi, astrolog ve hekimdir. Cardano, Milano'da (1539) Practica Arithmetica'yı basıma hazırladı. Cardano, Tartaglia'yı davet etti ve birçok ısrardan sonra ondan 3. dereceden denklemin sonucunu nasıl çözülebileceğini öğrendi. Tartaglia, Cardano'ya 3. dereceden denklemleri nasıl çözeceğini gösterdikten sonra Cardano kendi öğrencisi olan Lodovico Ferrari'yi 4. dereceden denklemleri çözmesi için cesaretlendirdi.

Italian Renaissance mathematician, physicist, astronomer and physician. Cardano, in Milano (1539), prepared Practica Arithmetica for printing. Cardano invited Tartaglia and after many insistences learned how to solve the 3rd degree equations. After Tartaglia showed Cardano how to solve the 3rd degree equations, Cardano encouraged Lodovico Ferrari, his student, to solve the 4th degree equations.

PARALELKENAR ve EŞKENAR DÖRTGEN
PARALLELOGRAM and EQUILATERAL QUADRANGLE

Bu bölüm, 13 çözümlü örnek, 12 çözümlü test sorusu, 12 çözümlü YÖS sorusu, 24 alıştırma sorusu, 108 test sorusu içermektedir.

This chapter includes 13 examples with solutions, 12 test questions with solutions, 12 YÖS questions with solutions, 24 exercise questions and 108 test questions.

BÖLÜM / CHAPTER 8 ..... 263 - 304

PARALELKENAR ve EŞKENAR DÖRTGEN / PARALLELOGRAM and EQUILATERAL QUADRANGLE

- Paralelkenar / Parallelogram ..... 265 - 273
  - Paralelkenarın Özellikleri / Properties of a Parallelogram ..... 265 - 269
  - Bir Paralelkenarın Alanı / The Area of a Parallelogram ..... 269 - 273
- Eşkenar Dörtgen / Equilateral Quadrangle ..... 273 - 274
  - Eşkenar Dörtgenin Özellikleri / Properties of Equilateral Quadrangle 274
- Çözümlü Test / Test With Solutions ..... 275 - 278
- YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 279 - 282
- Alıştırmalar / Exercises ..... 283 - 286
- Konu Testleri / Practice Tests ..... 287 - 304

BÖLÜM
08
CHAPTER

PARALELKENAR ve EŞKENAR DÖRTGEN
PARALLELOGRAM and EQUILATERAL QUADRANGLE

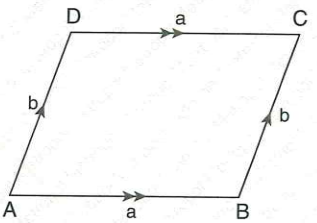
PARALELKENAR / PARALLELOGRAM

Tanım: Karşılıklı kenarları paralel olan dörtgene **paralelkenar** denir.

Definition: A quadrangle which its oposite sides are parallel is called a **parallelogram**.

[AB] // [DC]

[AD] // [BC]



PARALELKENARIN ÖZELLİKLERİ / PROPERTIES of a PARALLELOGRAM

Özellik 1 / Property 1

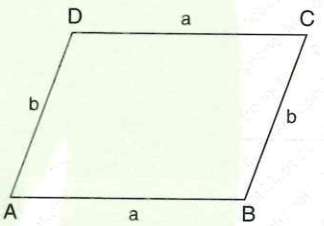
Paralelkenarın karşılıklı kenarları birbirine eşittir.

Opposite sides of a parallelogram are equal.

|AB| = |DC|

|AD| = |BC|

Çevre / The perimeter (ABCD) = 2·(a + b)



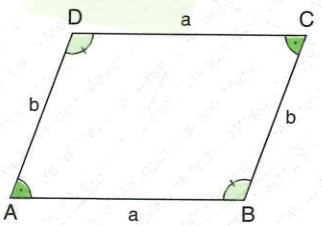
Özellik 2 / Property 2

Paralelkenarın karşılıklı açıları birbirine eşittir.

Opposite angles of a parallelogram are equal.

$m(\widehat{A}) = m(\widehat{C})$

$m(\widehat{B}) = m(\widehat{D})$



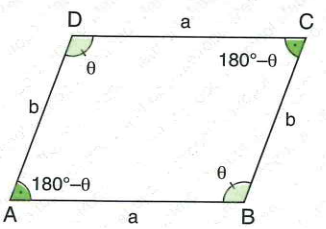
Özellik 3 / Property 3

Paralelkenarda komşu açılar, birbirini 180° ye tamamlar.

In a parallelogram the adjacent angles add up to 180°.

$m(\widehat{A}) + m(\widehat{B}) = m(\widehat{B}) + m(\widehat{C}) = 180°$

$m(\widehat{C}) + m(\widehat{D}) = m(\widehat{D}) + m(\widehat{A}) = 180°$



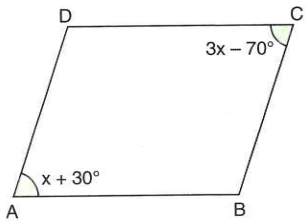
Örnek / Example 1

ABCD paralelkenar / parallelogram

$m(\widehat{A}) = x + 30°$,

$m(\widehat{C}) = 3x - 70°$,

$\Rightarrow m(\widehat{ADC}) = ?$



A) 50° B) 80° C) 100° D) 120° E) 130°

Çözüm / Solution Yanıt / Answer **C**

$\left.\begin{matrix} m(\widehat{A}) = m(\widehat{C}) \\ m(\widehat{B}) = m(\widehat{D}) \end{matrix}\right\}$ [Özellik 2 / Property 2]

$x + 30° = 3x - 70°$

$100° = 2x$

$50° = x$

$m(\widehat{A}) = 50° + 30° = 80°$

$m(\widehat{A}) + m(\widehat{D}) = 180°$ [Özellik 3 / Property 3]

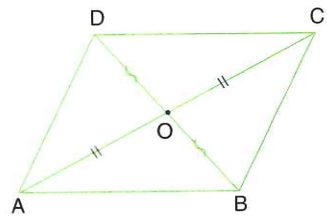
$80° + m(\widehat{D}) = 180°$

$m(\widehat{D}) = 100°$

Özellik 4 / Property 4

$|AO| = |OC|$

$|BO| = |OD|$



Örnek / Example 2

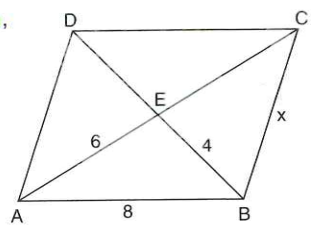
ABCD paralelkenar / parallelogram,

$|AB| = 8$ cm,

$|EB| = 4$ cm,

$|AE| = 6$ cm

$\Rightarrow |BC| = x = ?$ cm



A) $4\sqrt{3}$ B) $2\sqrt{13}$ C) 9 D) $2\sqrt{10}$ E) 10

Çözüm / Solution Yanıt / Answer **D**

$|AE| = |EC|$ [Özellik 4 / Property 4]

$\widehat{ABC}$:

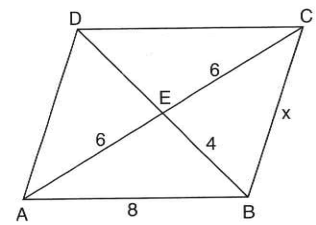
[EB] kenarortay / median

$2 \cdot 4^2 = 8^2 + x^2 - \frac{12^2}{2}$

$\Rightarrow 32 = 64 + x^2 - 72$

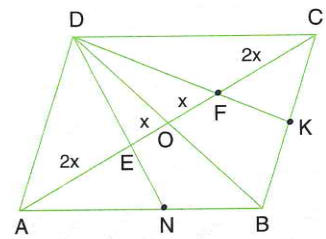
$40 = x^2$

$2\sqrt{10} = x$



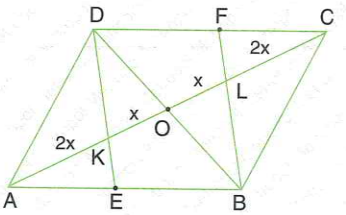
Özellik 5 / Property 5

$\left.\begin{matrix} |AN| = |NB| \\ |BK| = |KC| \end{matrix}\right\} \Rightarrow |AE| = |EF| = |FC|$ ve (and) $|EO| = |OF|$



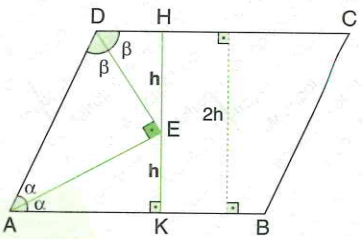
Özellik 6 / Property 6

$|AE| = |EB|$, $|DF| = |FC|$ $\Rightarrow$ ***|AK| = |KL| = |LC| ve (and) |KO| = |OL|***



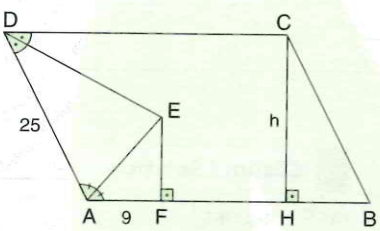
Özellik 7 / Property 7

$2 \cdot \alpha + 2 \cdot \beta = 180^\circ \Rightarrow \alpha + \beta = 90^\circ \Rightarrow$ ***|HE| = |EK|***



Örnek / Example 3

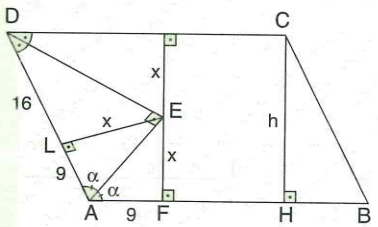
ABCD bir paralelkenar,
[AE] ve [DE] birer açıortaydır.
ABCD is a parallelogram,
[AE] and [DE] are bisectors.
[EF] ⊥ [AB], [CH] ⊥ [AB],
|AF| = 9 cm, |AD| = 25 cm
$\Rightarrow$ **|CH| = h = ? cm**



A) 12 B) 16 C) 18 D) 20 E) 24

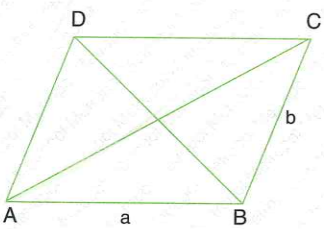
Çözüm / Solution — Yanıt / Answer E

|EL| = |EF| = x
$m(\widehat{DEA}) = 90^\circ$
$\Rightarrow \widehat{ELA} \cong \widehat{EFA}$
|LA| = |AF| = 9 cm
$\Rightarrow$ |DL| = 25 − 9 = 16 cm
$x^2 = 9 \cdot 16 \Rightarrow x = 12$ cm
$h = 2x \Rightarrow h = 24$ cm

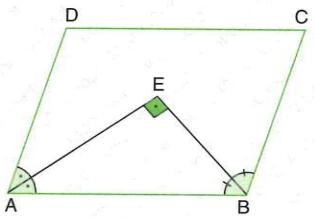


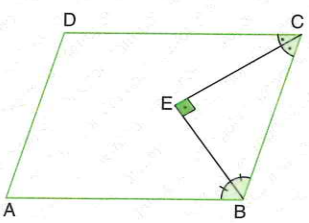
Özellik 8 / Property 8

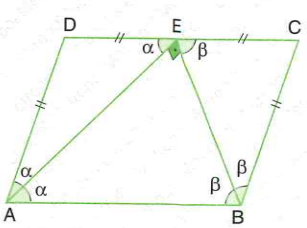
|AC| = e, |BD| = f
|AB| = a, |BC| = b
$\Rightarrow$ ***$e^2 + f^2 = 2 \cdot (a^2 + b^2)$***



Özellik 9 / Property 9

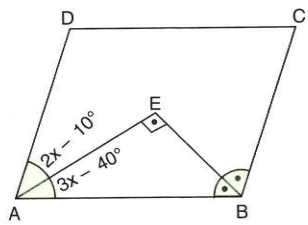






Örnek / Example 4

ABCD paralelkenar / parallelogram,
[EB] açıortay / bisector,
$m(\widehat{DAE}) = 2x - 10°$,
$m(\widehat{EAB}) = 3x - 40° \Rightarrow$ **x = ?**



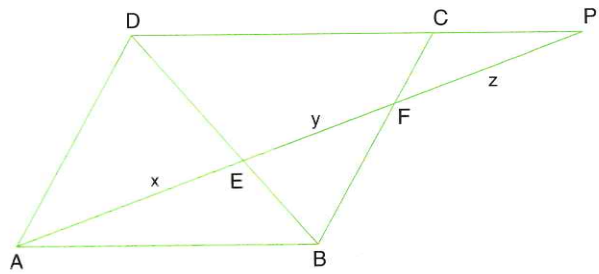
A) 10° B) 20° C) 30° D) 40° E) 50°

Çözüm / Solution Yanıt / Answer **C**

[EB] açıortay / bisector
$m(\widehat{AEB}) = 90°$ } [Özellik 9 / Property 9]
$\Rightarrow m(\widehat{DAE}) = m(\widehat{EAB})$
$2x - 10° = 3x - 40°$
$30° = x$

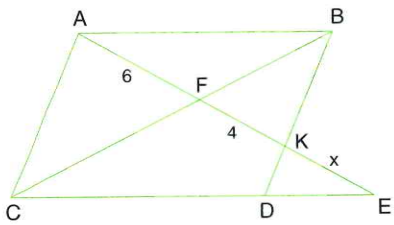
Özellik 10 / Property 10

$\widehat{AEB} \sim \widehat{PED}$, $\widehat{BEF} \sim \widehat{DEA} \Rightarrow$ ***IAEI*^{2} = *IEFI* · *IEPI*** $\Leftrightarrow$ $x^2 = y \cdot (y + z)$



Örnek / Example 5

[AB] // [DC],
[AC] // [BD],
IAFI = 6 cm,
IFKI = 4 cm,
IKEI = x cm
$\Rightarrow$ **x = ? cm**



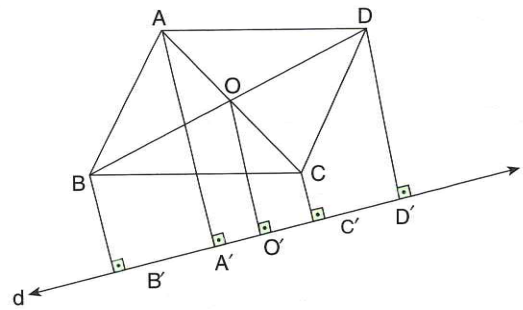
A) 3 B) 4 C) 5 D) 6 E) 7

Çözüm / Solution Yanıt / Answer **C**

$IAFI^2 = IFKI \cdot IFEI$,
$6^2 = 4 \cdot (4 + x)$
$36 = 4 \cdot (4 + x) \Rightarrow 4 + x = 9$
$x = 5$ cm

Özellik 11 / Property 11

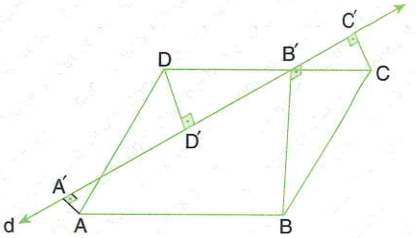
ABCD paralelkenar / parallelogram
IAA′I + ICC′I = IBB′I + IDD′I = 2IOO′I



Özellik 12 / Property 12

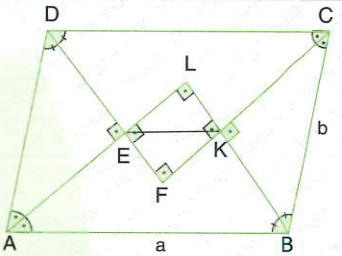
ABCD paralelkenar / parallelogram

|AA'| + |CC'| = |BB'| – |DD'|



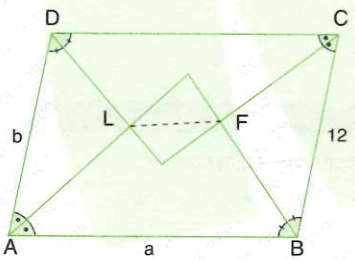
Özellik 13 / Property 13

|EK| = a – b



Örnek / Example 6

ABCD bir paralelkenardır.
ABCD is a parallelogram.
|BC| = 12 cm, |LF| = 4 cm
⇒ **Çevre / The perimeter (ABCD) = ? cm**



A) 48 B) 52 C) 56 D) 60 E) 64

Çözüm / Solution

Yanıt / Answer **C**

|LF| = a – b ⇒ a – 12 = 4

a = 16 cm

Çevre / The perimeter (ABCD) = 2(a + b)

= 2(12+16)

= 2·28 = 56 cm

BİR PARALELKENARIN ALANI / THE AREA of a PARALLELOGRAM

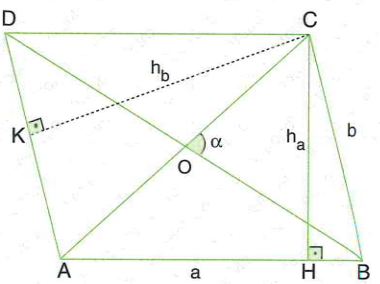
ABCD bir paralelkenardır. / ABCD is a parallelogram.

$A(ABCD) = a \cdot h_a = b \cdot h_b$

|AC| = f ve (and) |BD| = e

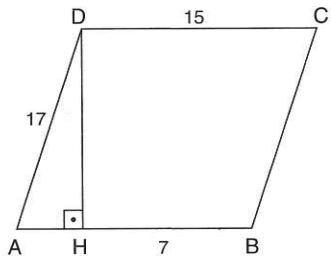
$A(ABCD) = \frac{1}{2} \cdot e \cdot f \cdot \sin\alpha$

$A(ABCD) = a \cdot b \cdot \sin(\widehat{A}) = a \cdot b \cdot \sin(\widehat{D})$ $[m(\widehat{A}) + m(\widehat{D}) = 180°]$



Örnek / Example 7

ABCD paralelkenar / parallelogram,
$[DH] \perp [AB]$, $|DC| = 15$ cm,
$|AD| = 17$ cm, $|BH| = 7$ cm
$\Rightarrow$ **A(ABCD) = ? cm²**



A) 200 B) 210 C) 225 D) 289 E) 300

Çözüm / Solution Yanıt / Answer **C**

$|AB| = |DC| \Rightarrow |AH| = 8$ cm

$[DH] \perp [AB] \Leftrightarrow |AD|^2 = |DH|^2 + |AH|^2$

$17^2 = |DH|^2 + 8^2$

$289 = |DH|^2 + 64$

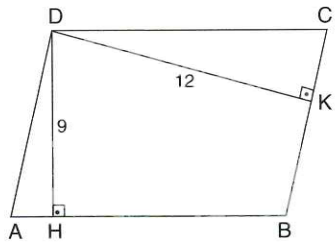
$225 = |DH|^2$

$15 = |DH|$

$A(ABCD) = |DH| \cdot |AB| = 15 \cdot 15 = 225$ cm²

Örnek / Example 8

ABCD bir paralelkenardır.
ABCD is a parallelogram.
$[DH] \perp [AB]$, $[DK] \perp [BC]$,
$|DK| = 12$ cm,
$|DH| = 9$ cm,
$|AB| + |AD| = 28$ cm
$\Rightarrow$ **A(ABCD) = ? cm²**



A) 72 B) 96 C) 108 D) 112 E) 144

Çözüm / Solution Yanıt / Answer **E**

$A(ABCD) = |DH| \cdot |AB| = |DK| \cdot |BC|$

$12 \cdot |BC| = 9 \cdot |AB| \Rightarrow 4 \cdot |BC| = 3 \cdot |AB|$

$|BC| = 3k$, $|AB| = 4k$

$|AB| + |AD| = 28$ cm

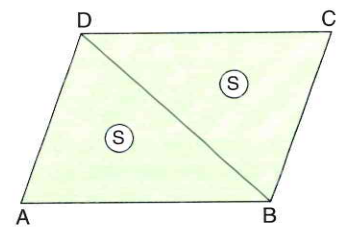
$7k = 28 \Rightarrow k = 4 \Rightarrow |AB| = 16$ cm, $|BC| = 12$ cm

$A(ABCD) = 16 \cdot 9 = 12 \cdot 12 = 144$ cm²

Sonuç 1 / Conclusion 1

Bir paralelkenarın köşegenlerinden biri, paralelkenarı, alanları eşit iki üçgensel bölgeye ayırır.
A diagonal divides the parallelogram into two triangular parts which have same area and shape.

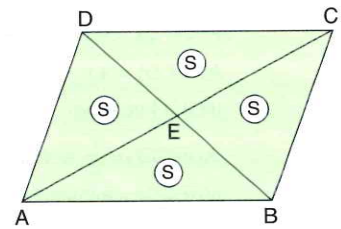
$$A(\widehat{ABD}) = A(\widehat{BCD}) = S$$



Sonuç 2 / Conclusion 2

Köşegenler, paralelkenarı alanları eşit dört üçgensel bölgeye ayırır.
The diagonals of a parallelogram divide the parallelogram into four triangular parts with equal area.

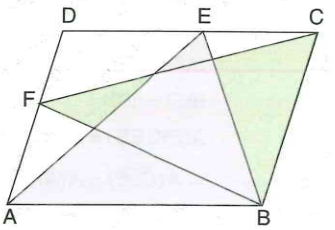
$$A(\widehat{AED}) = A(\widehat{AEB}) = S$$
$$A(\widehat{EBC}) = A(\widehat{ECD}) = S$$



Sonuç 3 / Conclusion 3

ABCD parelelkenarı için aşağıdaki eşitlikler yazılabilir.
For the parallelogram ABCD we can write following equalities.

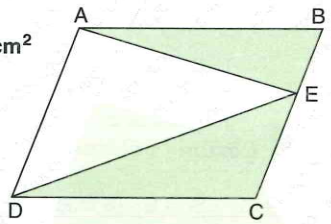
$$E \in [DC],\ F \in [AD] \Rightarrow A(\widehat{EAB}) = A(\widehat{FCB}) = \frac{A(ABCD)}{2}$$



Örnek / Example 9

[AB] // [DC], [AD] // [BC],

$A(\widehat{AED}) = 18\,cm^2 \Rightarrow$ **TA(SA) = ? cm²**



A) 9 B) 12 C) 16 D) 18 E) 27

Çözüm / Solution — Yanıt / Answer D

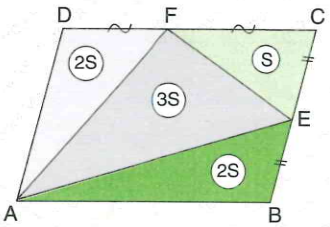
$A(\widehat{AED}) = \frac{A(ABCD)}{2}$ [Sonuç 3 / Conclusion 3]

$TA(SA) = A(ABCD) - A(\widehat{AED})$

$36 - 18 = 18\,cm^2$

Sonuç 4 / Conclusion 4

|BE| = |EC|,
|DF| = |FC|,
$A(\widehat{CEF}) = S \Rightarrow$ ***A(AEF) = 3S, A(ADF) = A(ABE) = 2S***



Örnek / Example 10

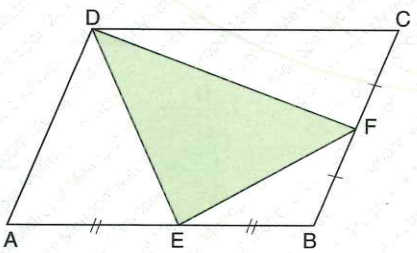
ABCD bir paralelkenardır.
ABCD is a parallelogram.

$A(\widehat{DEF}) = 18\ cm^2$,

|AE| = |EB|,

|BF| = |FC|

$\Rightarrow$ **A(ABCD) = ? cm²**



A) 36 B) 48 C) 54 D) 72 E) 96

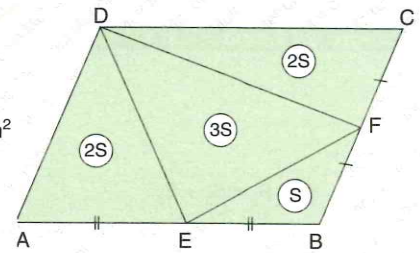
Çözüm / Solution — Yanıt / Answer B

$A(\widehat{DEF}) = 3S = 18$

$\Rightarrow S = 6$

$A(ABCD) = 8S$

$\Rightarrow 8 \cdot 6 = 48\ cm^2$



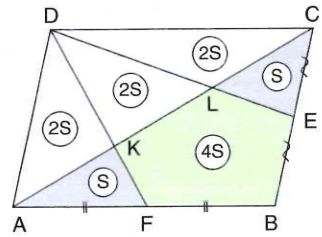
Sonuç 5 / Conclusion 5

IAFI = IFBI,

IBEI = IECI,

A(FKLEB) = 4S

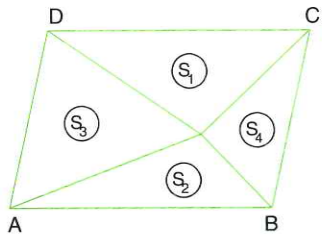
$\Rightarrow$ ***A(CLE) = A(AKF) = S , A(DAK) = 2S , A(DKL) = A(DLC) = 2S***



Örnek / Example 11

$S_3 + S_4 = 15\ cm^2$

$\Rightarrow$ **A(ABCD) = ? cm^2**



A) 20 B) 25 C) 30 D) 35 E) 40

Çözüm / Solution

Yanıt / Answer **C**

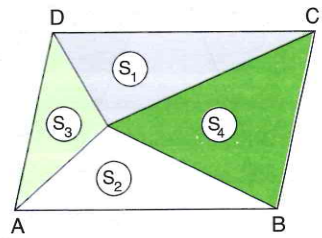
$S_1 + S_2 = S_3 + S_4$ [Sonuç 6 / Conclusion 6]

$S_1 + S_2 = 15\ cm^2$

$A(ABCD) = S_1 + S_2 + S_3 + S_4 = 15 + 15 = 30\ cm^2$

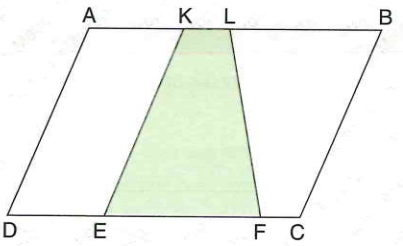
Sonuç 6 / Conclusion 6

$S_1 + S_2 = S_3 + S_4$



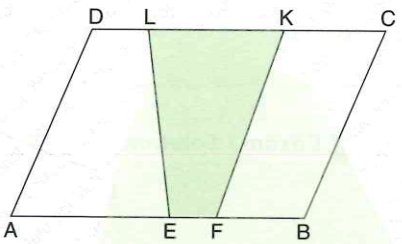
Sonuç 7 / Conclusion 7

$$[AB] // [DC],\ [AD] // [BC] \Rightarrow \frac{A(EFLK)}{A(ABCD)} = \frac{|KL| + |EF|}{2 \cdot |AB|}$$



Örnek / Example 12

ABCD bir paralelkenardır.
ABCD is a parallelogram.



$|DL| = \frac{|KL|}{4} = \frac{|LC|}{5}$,

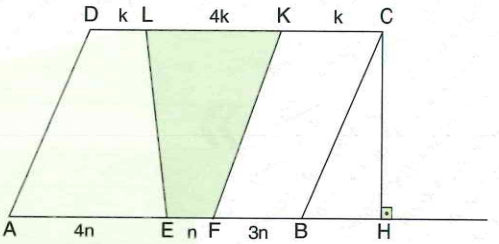
$|EF| = \frac{|FB|}{3} = \frac{|AE|}{4}$,

$A(EFKL) = 38\ cm^2$

$\Rightarrow$ **$A(ABCD) = ?\ cm^2$**

A) 96 B) 72 C) 66 D) 64 E) 54

Çözüm / Solution — Yanıt / Answer A



$|DL| = k$, $|KL| = 4k$, $|LC| = 5k$, $|KC| = k$

$|EF| = n$, $|FB| = 3n$, $|AE| = 4n$

$8n = 6k \Rightarrow n = \frac{3}{4}k$

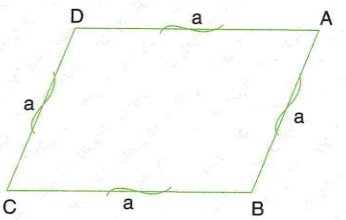
$$\frac{A(EFKL)}{A(ABCD)} = \frac{4k + n}{2 \cdot (6k)} = \frac{4k + \frac{3}{4}k}{12k} = \frac{19}{48}$$

$$\Rightarrow \frac{38}{A(ABCD)} = \frac{19}{48} \Rightarrow A(ABCD) = 96\ cm^2$$

EŞKENAR DÖRTGEN / EQUILATERAL QUADRANGLE

Tanım: Kenar uzunlukları eşit olan paralelkenara **eşkenar dörtgen** denir. Paralelkenarın tüm özelliklerini taşır.

Definition: A parallelogram with sides of equal length is called an **equilateral quadrangle**. It holds all of the properties of a parallelogram.



[AB] // [CD]

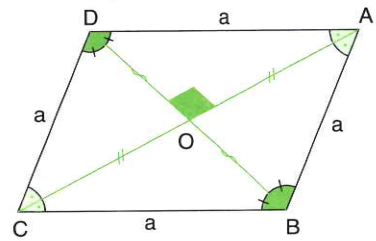
[BC] // [AD]

EŞKENAR DÖRTGENİN ÖZELLİKLERİ / PROPERTIES OF EQUILATERAL QUADRANGLE

Özellik 1 / Property 1

Eşkenar dörtgende, köşegenler birbirini dik ortalar. Eşkenar dörtgende, köşegenler karşılıklı açıların açıortaylarıdır.

The diagonals of an equilateral quadrangle cuts each other in half, perpendicularly. The diagonals of an equilateral quadrangle are the bisectors of the opposite angles.



$[AC] \perp [BD]$, $|OA| = |OC|$, $|OB| = |OD|$

$m(\widehat{DAC}) = m(\widehat{BAC}) = m(\widehat{DCA}) = m(\widehat{ACB})$

$m(\widehat{ADB}) = m(\widehat{CDB}) = m(\widehat{ABD}) = m(\widehat{CBD})$

Örnek / Example 13

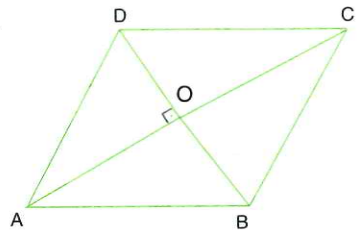
ABCD bir eşkenar dörtgendir.

ABCD is an equilateral quadrangle.

$|AC| = 24$ cm,

$|BD| = 18$ cm,

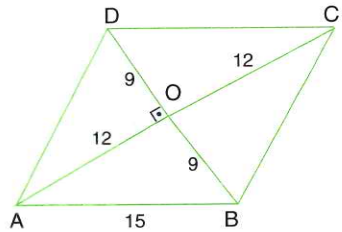
$\Rightarrow$ **$|AB| = ?$ cm**



A) 12 B) 14 C) 15 D) 16 E) 17

Çözüm / Solution

Yanıt / Answer **C**



$|AO| = |OC| = \frac{24}{2} = 12\,cm$ $\Rightarrow [AC] \perp [BD]$

$|DO| = |OB| = \frac{18}{2} = 9\,cm$ $\Rightarrow |AB| = 15\,cm$

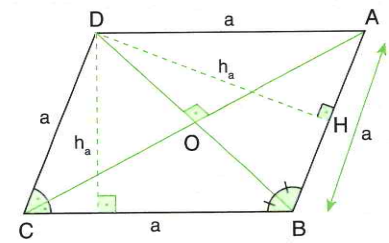
Özellik 2 / Property 2

Bir Eşkenar Dörtgenin Alanı / Area of an Equilateral Quadrangle:

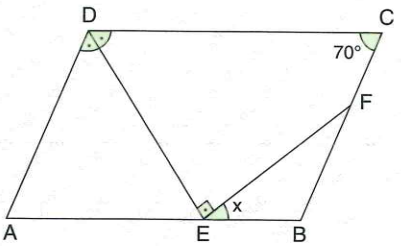
$|AB| = |BC| = |CD| = |AD| = a$

$|AC| = e,\ |BD| = f,\ |DH| = h_a$

$\Rightarrow A(ABCD) = a \cdot h_a = \frac{e \cdot f}{2} = a^2 \cdot \sin(\widehat{DAB})$



1.



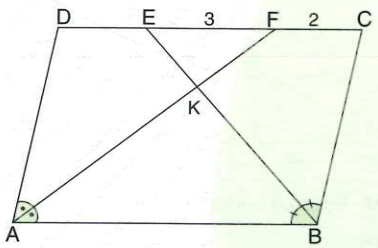
ABCD bir paralelkenardır. / ABCD is a parallelogram.

$m(\widehat{ADE}) = m(\widehat{EDC}), m(\widehat{C}) = 70°,$

$m(\widehat{DEF}) = 90°, \Rightarrow$ **$m(\widehat{FEB}) = x = ?$**

A) 55° B) 45° C) 35° D) 30° E) 25°

2.



ABCD bir paralelkenardır. / ABCD is a parallelogram.

$m(\widehat{DAF}) = m(\widehat{FAB})$, $m(\widehat{EBA}) = m(\widehat{EBC})$,

$|EF| = 3$ cm, $|FC| = 2$ cm

$\Rightarrow$ **Çevre / The perimeter (ABCD) = ? cm**

A) 20 B) 22 C) 24 D) 26 E) 28

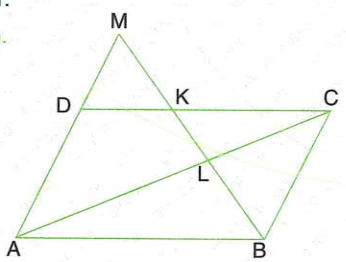
3. ABCD bir paralelkenardır.

ABCD is a parallelogram.

$|BL| = 6$ cm,

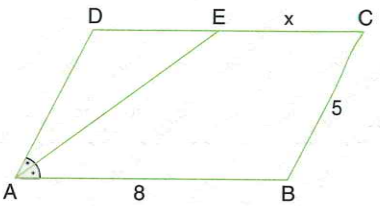
$|ML| = 9$ cm

$\Rightarrow$ **$|MK| = x = ?$ cm**



A) 2 B) 3 C) 4 D) 5 E) 6

4.



ABCD bir paralelkenar olup, [AE] bir açıortaydır.

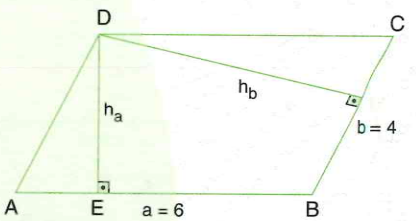
ABCD is a parallelogram, [AE] is a bisector.

$|AB| = 8$ cm, $|BC| = 5$ cm

$\Rightarrow$ **$|EC| = x = ?$ cm**

A) 1 B) 2 C) 3 D) 4 E) 5

5.

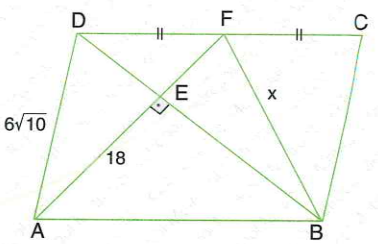


ABCD bir paralelkenardır. / ABCD is a parallelogram.

$h_a + h_b = 20$ cm, $a = 6$ cm, $b = 4$ cm $\Rightarrow$ **$h_a = ?$ cm**

A) 4 B) 6 C) 8 D) 10 E) 12

6.



ABCD bir paralelkenardır. / ABCD is a parallelogram.

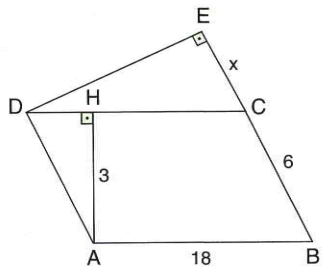
$[AF] \perp [DB]$, $|DF| = |FC|$,

$|AD| = 6\sqrt{10}$ cm, $|AE| = 18$ cm $\Rightarrow$ **$|BF| = x = ?$ cm**

A) 9 B) 12 C) 15 D) $9\sqrt{3}$ E) $12\sqrt{3}$

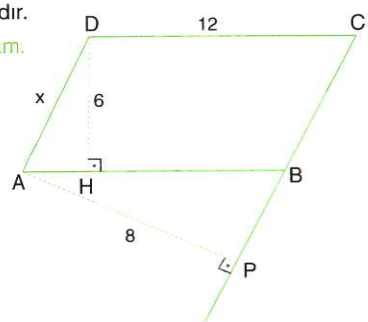
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCD bir paralelkenardır.
ABCD is a parallelogram.
[DE] ⊥ [BE],
[AH] ⊥ [DC],
|AB| =18 cm,
|AH| = 3 cm,
|BC| = 6 cm
⇒ **|EC| = x = ? cm**



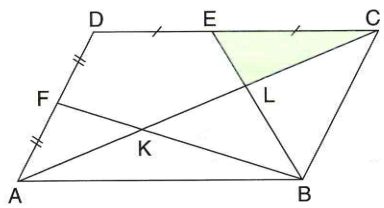
A) 6 B) $9\sqrt{3}$ C) $12\sqrt{3}$
D) 9 E) 12

8. ABCD bir paralelkenardır.
ABCD is a parallelogram.
[DH] ⊥ [AB],
[AP] ⊥ [CP],
|DC| = 12 cm,
|AP| = 8 cm,
|DH| = 6 cm
⇒ **|AD| = x = ? cm**



A) 12 B) 10 C) 9
D) 8 E) 6

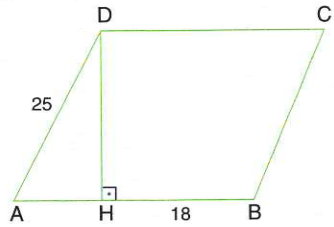
9.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
|DE| = |EC| , |DF| = |FA|, A(DFKLE) = 72 cm^2
⇒ **A($\widehat{ELC}$) = ? cm^2**

A) 36 B) 24 C) 20
D) 18 E) 12

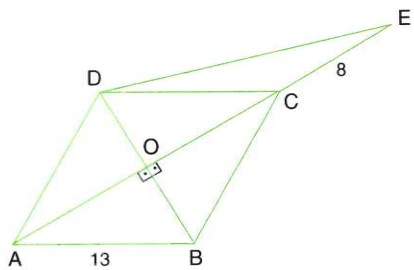
10.



ABCD bir eşkenar dörtgendir. / ABCD is an equilateral quadrangle.
[DH] ⊥ [AB], |AD| = 25 cm, |HB| = 18 cm ⇒ **A(ABCD) = ? cm^2**

A) 496 B) 500 C) 508
D) 600 E) 520

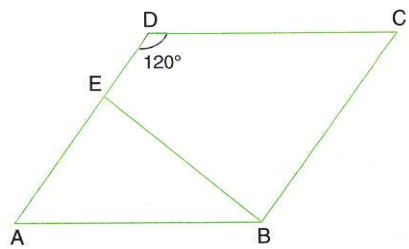
11.



ABCD bir eşkenar dörtgendir. / ABCD is an equilateral quadrangle.
|AC| = 24 cm, |CE| = 8 cm, |AB| = 13 cm ⇒ **A($\widehat{DCE}$) = ? cm^2**

A) 5 B) 10 C) 15
D) 20 E) 25

12.



ABCD bir eşkenar dörtgendir. / ABCD is an equilateral quadrangle.
m($\widehat{ADC}$) = 120°, |AE| = 2·|ED|, |BE| = $2\sqrt{7}$ cm
⇒ **A(ABCD) = ? cm^2**

A) $20\sqrt{3}$ B) $15\sqrt{3}$ C) $16\sqrt{3}$
D) $8\sqrt{15}$ E) $18\sqrt{3}$

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	C	D	C	C	C	B	C	D	D	D	E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $m(\widehat{D}) + m(\widehat{C}) = 180° \Rightarrow m(\widehat{D}) + 70° = 180°$

$m(\widehat{D}) = 110°$

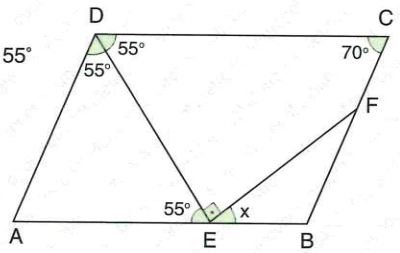
$m(\widehat{ADE}) = m(\widehat{EDC}) = 55°$

$[DC] // [AB]$

$\Rightarrow m(\widehat{AED}) = 55°$

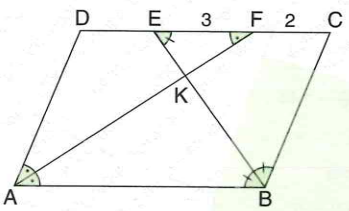
$55° + 90° + x = 180°$

$x = 180° - 145° = 35°$



Yanıt / The Answer is C

2.



$[DC] // [AB] \Rightarrow m(\widehat{CBE}) = m(\widehat{CEB})$

$\Rightarrow |EC| = |CB| = 5\,cm \Rightarrow |AD| = 5\,cm$

$m(DAF) = m(\widehat{FAB})$

$\Rightarrow |AD| = |DF| \Rightarrow |DE| = 2\,cm$

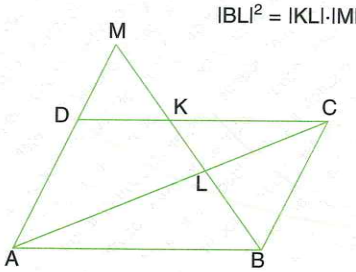
$|BC| = |AD| = 5\,cm$
$|AB| = |DC| = 7\,cm$ $\Rightarrow$ Çevre / The perimeter (ABCD) = 24 cm

Yanıt / The Answer is C

3. $|BL|^2 = |KL| \cdot |ML|$

$36 = (9 - x) \cdot 9$

$4 = 9 - x \Rightarrow x = 5\,cm$



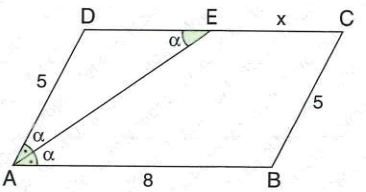
Yanıt / The Answer is D

4. $|DE| = |AD| = 5\,cm$,

$|DC| = |AB|$

$|EC| = |DC| - |DE|$

$= 8 - 5 = 3\,cm$



Yanıt / The Answer is C

5. $A(ABCD) = a \cdot h_a = b \cdot h_b$

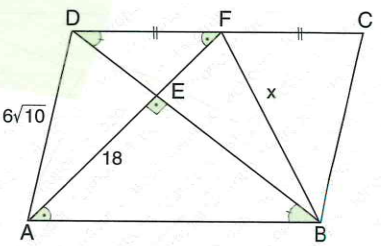
$6 \cdot h_a = 4 \cdot h_b \Rightarrow h_b = \frac{3 \cdot h_a}{2}$

$h_a + h_b = 20 \Rightarrow h_a + \frac{3 \cdot h_a}{2} = 20$

$h_a = 8\,cm$

Yanıt / The Answer is C

6.



$\widehat{AEB} \sim \widehat{FED}$ (A.A.A.)

Benzerlik oranı / The ratio of similarity : $k = \frac{1}{2}$

$|EF| = \frac{18}{2} = 9\,cm$

$|DE|^2 = (6\sqrt{10})^2 - 18^2 \Rightarrow |DE|^2 = 360 - 324$

$|DE|^2 = 36 \Rightarrow |DE| = 6\,cm$, $|EB| = 12\,cm$,

$x^2 = |EF|^2 + |EB|^2 \Rightarrow x^2 = 9^2 + 12^2 \Rightarrow x^2 = 225$

$|BF| = x = 15\,cm$

Yanıt / The Answer is C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $m(\widehat{ECD}) = m(\widehat{EBA}) = m(\widehat{ADC})$

$m(\widehat{DEC}) = m(\widehat{DHA}) = 90°$

$\widehat{DEC} \sim \widehat{AHD}$ (A.A.A)

$\frac{|DE|}{|AH|} = \frac{|DC|}{|AD|} \Rightarrow \frac{|DE|}{3} = \frac{18}{6} \Rightarrow |DE| = 9\,cm$

$x^2 = |DC|^2 - |DE|^2 = 18^2 - 9^2$

$x^2 = 9 \cdot 27 \Rightarrow x = 9\sqrt{3}$ cm

Yanıt / The Answer is B

8. $|DH| \cdot |AB| = |AP| \cdot |BC|$

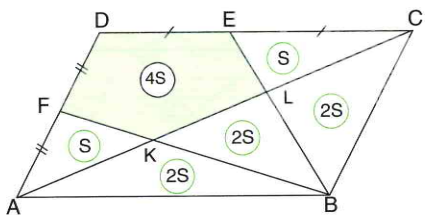
$\Rightarrow 6 \cdot 12 = 8 \cdot |BC|$

$|BC| = 9$ cm

$|BC| = |AD| \Rightarrow x = 9$ cm

Yanıt / The Answer is C

9.



$72 = \frac{A(ABCD)}{3}$, $A(\widehat{ELC}) = \frac{A(ABCD)}{12}$

$A(ABCD) = 216\,cm^2 \Rightarrow A(\widehat{ELC}) = \frac{216}{12} = 18\,cm^2$

Yanıt / The Answer is D

10. $|AB| = |AD| = 25$ cm

$|AH| = 25 - 18$

$|AH| = 7$ cm

$|AD|^2 = |DH|^2 + |AH|^2$

$25^2 = |DH|^2 + 7^2$

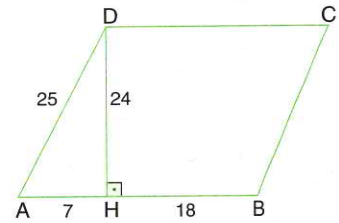
$|DH|^2 = 625 - 49$

$|DH|^2 = 576$

$|DH|^2 = 24^2 \Rightarrow |DH| = 24$ cm

$A(ABCD) = 25 \cdot 24$

$A(ABCD) = 600\,cm^2$



Yanıt / The Answer is D

11. $|AO| = |OC| = \frac{24}{2} = 12\,cm$,

$|AB|^2 = |AO|^2 + |OB|^2$

$13^2 = 12^2 + |OB|^2$

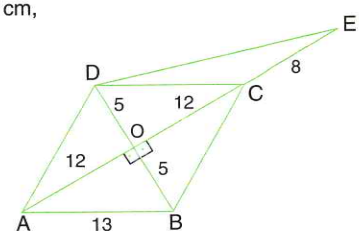
$|OB|^2 = 169 - 144$

$|OB|^2 = 25$

$|OB| = 5$ cm

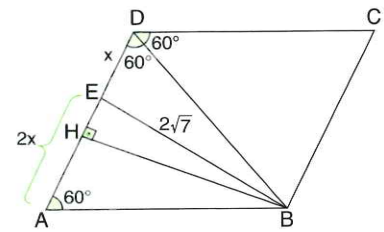
$|BO| = |OD| = 5$

$A(\widehat{DCE}) = \frac{|CE| \cdot |DO|}{2} = \frac{8 \cdot 5}{2} = 20\,cm^2$



Yanıt / The Answer is D

12.



$m(\widehat{ADB}) = m(\widehat{DAB}) = m(\widehat{DBA}) = 60° \Rightarrow$ ABD eşkenar üçgendir / ABD is a equilateral triangle.

$|BH| = \frac{3x\sqrt{3}}{2}$

$|EH| = \frac{3x}{2} - x = \frac{x}{2}$

$|EB|^2 = |EH|^2 + |HB|^2$

$(2\sqrt{7})^2 = \left(\frac{x}{2}\right)^2 + \left(\frac{3x\sqrt{3}}{2}\right)^2$

$28 = \frac{x^2}{4} + \frac{27x^2}{4}$

$28 = 7x^2$

$x^2 = 4$

$x = 2$ cm

$|AD| = 3x = 3 \cdot 2 = 6$ cm

$A(\widehat{ABD}) = \frac{6^2 \cdot \sqrt{3}}{4} = 9\sqrt{3}$

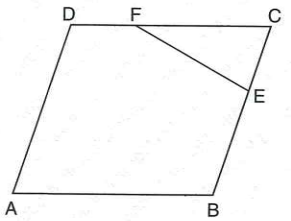
$A(ABCD) = 2 \cdot A(\widehat{ABD})$

$= 2 \cdot 9\sqrt{3} = 18\sqrt{3}\,cm^2$

Yanıt / The Answer is E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

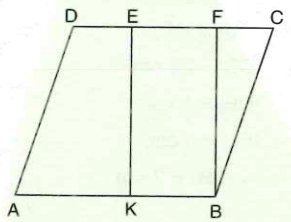
1. ABCD paralelkenar,
ABCD parallelogram,
$5 \cdot |DC| = 6 \cdot |FC|$,
$3 \cdot |EC| = 2 \cdot |BE|$
$\Rightarrow \frac{A(\widehat{EFC})}{A(ABCD)} = ?$



A) $\frac{1}{6}$ B) $\frac{1}{4}$ C) $\frac{1}{3}$ D) $\frac{2}{5}$ E) $\frac{3}{4}$

[İSTANBUL ÜNİVERSİTESİ – YÖS 2018]

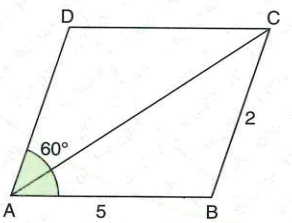
2. [AB] // [DC]
[AD] // [BC]
$|DE| = |EF| = |FC|$
$|AK| = |KB|$
$A(KBFE) = 20$ br^2
$\Rightarrow$ **A(ABCD) = ?**



A) 25 B) 30 C) 36 D) 40 E) 48

[DUMLUPINAR ÜNİVERSİTESİ – YÖS 2018]

3. ABCD paralelkenardır.
ABCD is a parallelogram.
$|AB| = 5$, $|BC| = 2$
$m(\widehat{BAD}) = 60°$
$\Rightarrow$ **|AC| = ?**

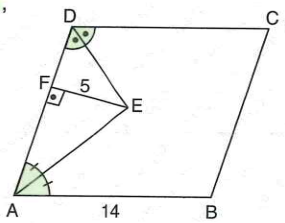


A) $\frac{7}{2}$ B) $\frac{\sqrt{29}}{2}$ C) $\sqrt{39}$ D) $\sqrt{19}$ E) $2\sqrt{19}$

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2017]

METROPOL YAYINLARI • METROPOL PUBLICATIONS

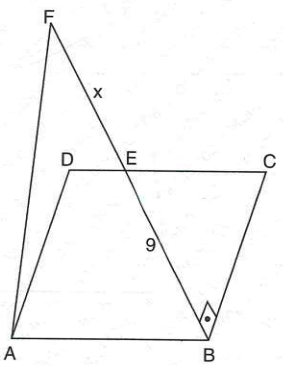
4. ABCD paralelkenar / parallelogram,
[DE] ve [AE] açıortay,
[DE] and [AE] are bisectors,
$|EF| = 5$ cm,
$|AB| = 14$ cm
$\Rightarrow$ **A(ABCD) = ? cm^2**



A) 35 B) 70 C) 85 D) 105 E) 140

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2017]

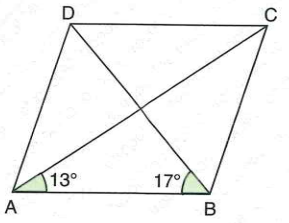
5. [AB] // [DC]
[AD] // [BC]
[FB] $\perp$ [BC]
$|AF| = |DC|$
$3 \cdot |DE| = 2 \cdot |EC|$
$|BE| = 9$
$\Rightarrow$ **|EF| = x = ?**



A) 15 B) 18 C) 20 D) 21 E) 22

[İSTANBUL ÜNİVERSİTESİ – YÖS 2017]

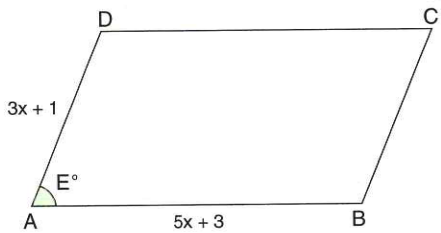
6. ABCD bir paralelkenardır.
ABCD is a parallelogram.
$|AC| = 8$ cm, $|BD| = 6$ cm
$\Rightarrow$ **A(ABCD) = ? cm^2**



A) 6 B) 8 C) 10 D) 12 E) 18

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2016]

7.

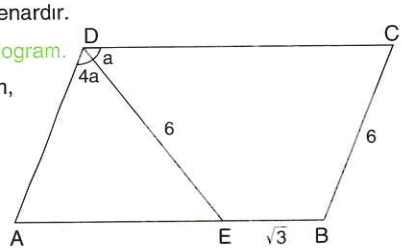


ABCD, çevresi 56 cm ve alanı 90 cm^2 olan bir paralelkenardır.
The parallelogram ABCD has perimeter of 56 cm and area of 90 cm^2.
IADI = 3x + 1, IABI = 5x + 3, $m(\widehat{DAB}) = E°$ ⇒ **sinE = ?**

A) 0,5 B) 0,75 C) 1 D) 1,5 E) 2

[İSTANBUL ÜNİVERSİTESİ – YÖS 2014]

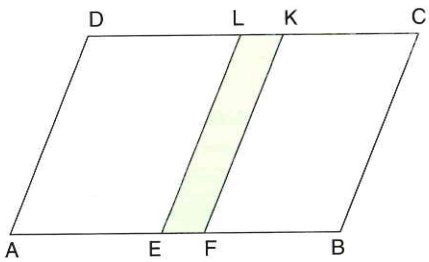
8 ABCD bir paralelkenardır.
ABCD is a parallelogram.
IDEI = IBCI = 6 cm,
IEBI = $\sqrt{3}$ cm,
$m(\widehat{ADE}) = 4a$,
$m(\widehat{EDC}) = a$
⇒ **A(ABCD) = ?**



A) $21\sqrt{3}$ B) $18\sqrt{3}$ C) $15\sqrt{3}$
D) $12\sqrt{3}$ E) $9\sqrt{3}$

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2014]

9.

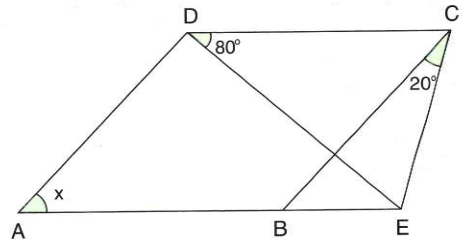


ABCD bir paralelkenardır. / ABCD is a parallelogram.
IDCI = 3·ILKI ve (and) IABI = 4·IEFI ⇒ $\frac{\mathbf{A(EFKL)}}{\mathbf{A(ABCD)}} = ?$

A) $\frac{5}{12}$ B) $\frac{1}{6}$ C) $\frac{5}{24}$
D) $\frac{1}{4}$ E) $\frac{7}{24}$

[AKDENİZ ÜNİVERSİTESİ – YÖS 2014]

10.

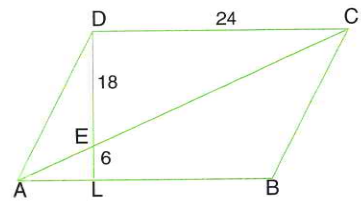


ABCD bir paralelkenardır. / ABCD is a parallelogram.
IABI = IDEI, $m(\widehat{CDE}) = 80°$, $m(\widehat{BCE}) = 20°$ ⇒ **$m(\widehat{DAE}) = x = ?$**

A) 20° B) 30° C) 40° D) 50° D) 60°

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2013]

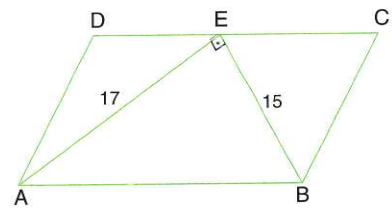
11. [AD] // [BC],
[DC] // [AB],
IDCI = 24 cm,
IDEI = 18 cm,
IELI = 6 cm
⇒ **ILBI = ? cm**



A) 24 B) 22 C) 20
D) 16 E) 12

[YÖS 2002]

12. [AE] ⊥ [BE],
[AD] // [BC],
IAEI = 17 cm,
IEBI = 15 cm
⇒ **A(ABCD) = ? cm^2**



A) 205 B) 215 C) 255
D) 275 E) 315

[YÖS 2001]

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
A	E	C	E	D	D	A	A	E	B	D	C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $|DC| = 6k$, $|FC| = 5k$

$|EC| = 2t$, $|BE| = 3t$

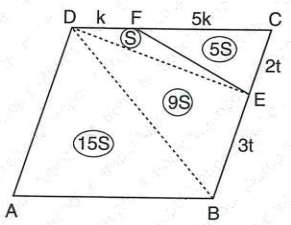
$A(\widehat{DFE}) = S \Rightarrow A(\widehat{CFE}) = 5S$

$A(\widehat{DEC}) = 6S \Rightarrow A(\widehat{BDE}) = 9S$

$A(ABCD) = A(\widehat{ABD}) + A(\widehat{DBC})$

$= 15S + 15S = 30S$

$\dfrac{A(\widehat{EFC})}{A(ABCD)} = \dfrac{5S}{30S} = \dfrac{1}{6}$



Yanıt / The Answer is A

2. $|DE| = |EF| = |FC| = 2k \Rightarrow |DC| = k$

$|AK| = |KB| = 3k \Rightarrow |AB| = 6k$

$\dfrac{A(KBFE)}{A(ABCD)} = \dfrac{|EF|+|KB|}{2\cdot|AB|}$

$\Rightarrow \dfrac{2k+3k}{2\cdot 6k} = \dfrac{20}{A(ABCD)}$

$\Rightarrow \dfrac{5}{12} = \dfrac{20}{A(ABCD)}$

$\Rightarrow A(ABCD) = 48\ br^2$

Yanıt / The Answer is E

3. $m(\widehat{BAD}) = 60° \Rightarrow m(\widehat{ADC}) = 120° \Rightarrow m(\widehat{HDC}) = 60°$

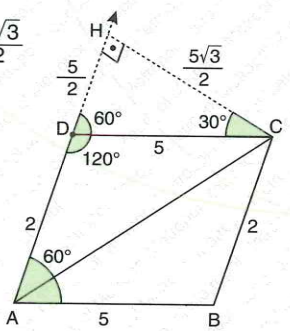
$[CH] \perp [AD:$

$|DC| = 5 \Rightarrow |HD| = \dfrac{5}{2}$, $|HC| = \dfrac{5\sqrt{3}}{2}$

$|AC|^2 = |HC|^2 + |AH|^2$

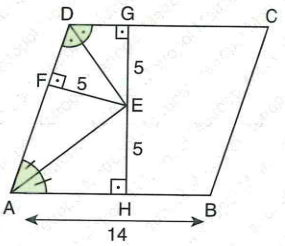
$|AC|^2 = \dfrac{75}{4} + \dfrac{81}{4} = \dfrac{156}{4} = 39$

$\Rightarrow |AC| = \sqrt{39}$ cm



Yanıt / The Answer is C

4.



[AE] ve [DE] açıortay / [AE] and [DE] are bisectors } $|EF| = |EG| = |EH|$, $|GH| = 10$ cm

$A(ABCD) = 10\cdot 14 = 140\ cm^2$

Yanıt / The Answer is E

5. $|AF| = |DC| = |AB| \Rightarrow |AF| = |AB|$

$\widehat{AFB}$ ikizkenar üçgen / isosceles triangle

$|DE| = 2t$, $|EC| = 3t$

$[AD] \,//\, [BC] \Rightarrow m(\widehat{AHB}) = 90°$

$\dfrac{|EC|}{|DE|} = \dfrac{|BE|}{|EH|} \Rightarrow \dfrac{3}{2} = \dfrac{9}{|EH|}$

$\Rightarrow |EH| = 6$ cm

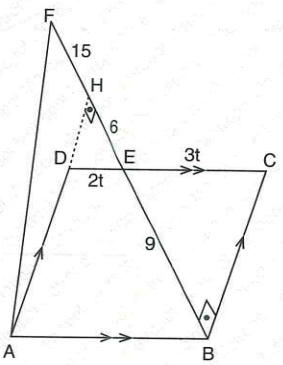
$\widehat{AFB}$ ikizkenar / isosceles

$\Rightarrow |BH| = |HF|$

$\Rightarrow 15 = |HF|$

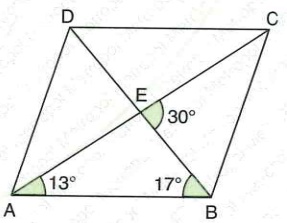
$|EF| = x = |FH| + |HE|$

$= 15 + 6 = 21$ cm



Yanıt / The Answer is D

6.



$[AC] \cap [BD] = \{E\}$

$m(\widehat{BEC}) = m(\widehat{BAE}) + m(\widehat{ABE})$

$= 13° + 17° = 30°$

$\Rightarrow A(ABCD) = \dfrac{1}{2}\cdot|AC|\cdot|BD|\cdot\sin 30°$

$= \dfrac{1}{2}\cdot 8\cdot 6\cdot\dfrac{1}{2} = 12\,cm^2$

Yanıt / The Answer is D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. Çevre(The perimeter) ABCD = 2·(|AD| + |AB|)

Çevre(The perimeter) ABCD = 2(3x + 1 + 5x + 3)

$56 = 2(8x + 4)$

$28 = 8x + 4$

$x = 3$ cm

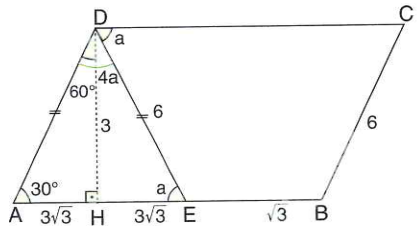
$A(ABCD) = |AD|\cdot|AB|\cdot\sin E°$

$90 = 10\cdot 18\cdot \sin E°$

$\sin E° = \frac{1}{2} \Rightarrow \sin E° = 0{,}5$

Yanıt / The Answer is A

8.



$4a + a + a = 180°$

$6a = 180°$

$a = 30°$

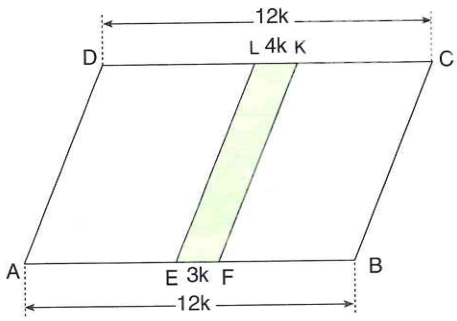
$m(\widehat{A}) = 30°$, $m(\widehat{ADH}) = 60°$

$A(ABCD) = |AB|\cdot|DH|$

$= 7\sqrt{3}\cdot 3 = 21\sqrt{3}$ cm²

Yanıt / The Answer is A

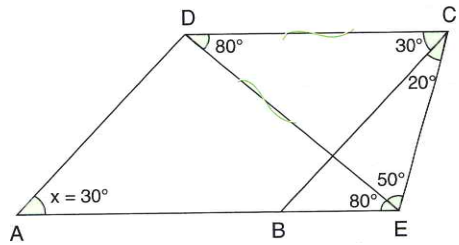
9.



$$\frac{A(EFKL)}{A(ABCD)} = \frac{\frac{h\cdot(4k+3k)}{2}}{h\cdot 12k} = \frac{7}{24}$$

Yanıt / The Answer is E

10.



$\left.\begin{matrix}|AB| = |DE| \\ |AB| = |DC|\end{matrix}\right\} \Rightarrow |DE| = |DC|$

Yanıt / The Answer is B

11. $\widehat{ALE} \sim \widehat{CDE}$,

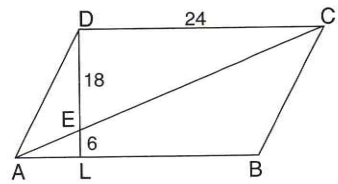
$\frac{|AL|}{|CD|} = \frac{|LE|}{|DE|}$,

$\frac{|AL|}{24} = \frac{6}{18}$

$\Rightarrow |AL| = 8$ cm,

$|LB| = |AB| - |AL|$

$= 24 - 8 = 16$ cm



Yanıt / The Answer is D

12. $A(\widehat{AEB}) = \frac{17\cdot 15}{2}$

$A(ABCD) = 2\cdot A(\widehat{AEB})$

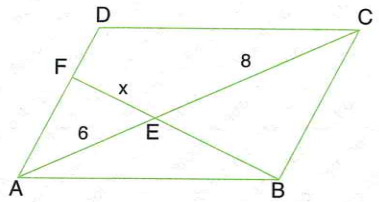
$= 2\cdot\frac{17\cdot 15}{2}$

$= 255\,\text{cm}^2$

Yanıt / The Answer is C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.

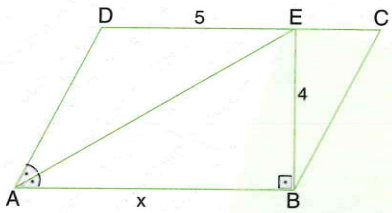


ABCD bir paralelkenardır. / ABCD is a parallelogram.

$|AE| = 6$ cm, $|EC| = 8$ cm, $|FB| = 7$ cm ⇒ **$|EF| = ?$ cm**

Yanıt / The Answer is **3**

2.



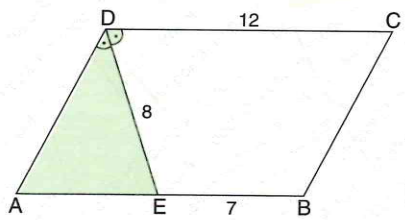
ABCD bir paralelkenar; [AE], bir açıortaydır.

ABCD is a parallelogram; [AE] is a bisector.

$[EB] \perp [BA]$, $|DE| = 5$ cm, $|EB| = 4$ cm ⇒ **$|AB| = x = ?$ cm**

Yanıt / The Answer is **8**

3.



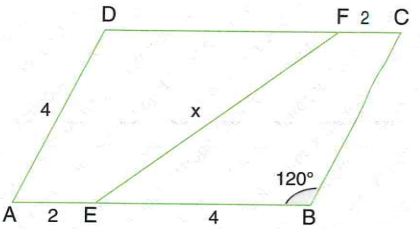
ABCD bir paralelkenar; [DE], bir açıortaydır.

ABCD is a parallelogram; [DE] is a bisector.

$|DE| = 8$ cm, $|EB| = 7$ cm, $|DC| = 12$ cm ⇒ **$A(\hat{ADE}) = ?$ cm²**

Yanıt / The Answer is **12**

4.



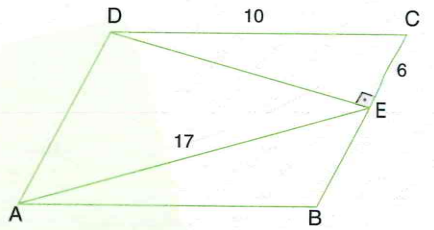
ABCD bir paralelkenardır. / ABCD is a parallelogram.

$|AE| = |FC| = 2$ cm, $|AD| = |EB| = 4$ cm,

$m(\hat{B}) = 120°$ ⇒ **$|EF| = ?$ cm**

Yanıt / The Answer is **$2\sqrt{7}$**

5.



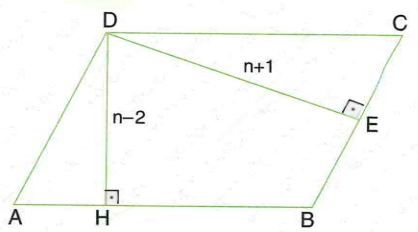
ABCD bir paralelkenardır. / ABCD is a parallelogram.

$[DE] \perp [BC]$, $|DC| = 10$ cm, $|AE| = 17$ cm,

$|EC| = 6$ cm ⇒ **$|BE| = ?$ cm**

Yanıt / The Answer is **9**

6.



ABCD bir paralelkenardır. / ABCD is a parallelogram.

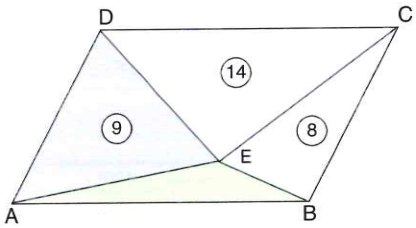
$|AB| = 10$ cm, $|BC| = 8$ cm, $[DH] \perp [AB]$, $[DE] \perp [BC]$,

$|DH| = (n - 2)$ cm, $|DE| = (n + 1)$ cm ⇒ **$A(ABCD) = ?$ cm²**

Yanıt / The Answer is **120**

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



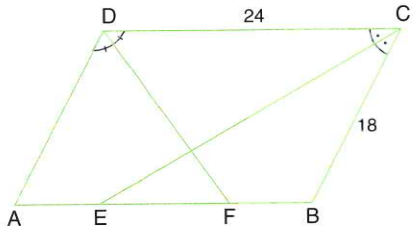
ABCD bir paralelkenardır. / ABCD is a parallelogram.

$A(\widehat{DEA}) = 9\,cm^2$, $A(\widehat{DEC}) = 14\,cm^2$, $A(\widehat{EBC}) = 8\,cm^2$

$\Rightarrow$ **$A(\widehat{EAB}) = ?\,cm^2$**

Yanıt / The Answer is 3

8.

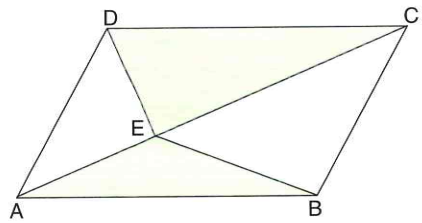


ABCD bir paralelkenar, [DF] ve [CE] birer açıortaydır.
ABCD is a parallelogram, [DF] and [CE] are bisectors.

$|DC| = 24$ cm, $|BC| = 18$ cm $\Rightarrow$ **$|EF| = ?$ cm**

Yanıt / The Answer is **12**

9.

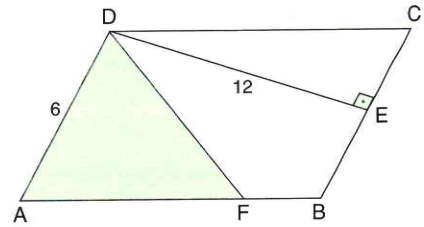


ABCD bir paralelkenardır. / ABCD is a parallelogram.

$A(ABCD) = 48\,cm^2 \Rightarrow$ **$A(\widehat{AEB}) + A(\widehat{DEC}) = ?\,cm^2$**

Yanıt / The Answer is **24**

10.



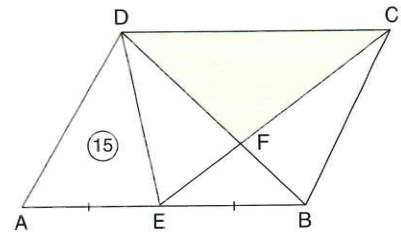
ABCD bir paralelkenardır. / ABCD is a parallelogram.

$|AB| = 4 \cdot |FB|$, $[DE] \perp [BC]$, $|DE| = 12$ cm,

$|AD| = 6$ cm $\Rightarrow$ **$A(\widehat{ADF}) = ?\,cm^2$**

Yanıt / The Answer is 27

11.

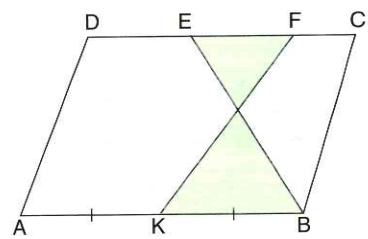


ABCD bir paralelkenardır. / ABCD is a parallelogram.

$|AE| = |EB|$, $A(\widehat{ADE}) = 15\,cm^2 \Rightarrow$ **$A(\widehat{DFC}) = ?\,cm^2$**

Yanıt / The Answer is **20**

12.



ABCD bir paralelkenardır. / ABCD is a parallelogram.

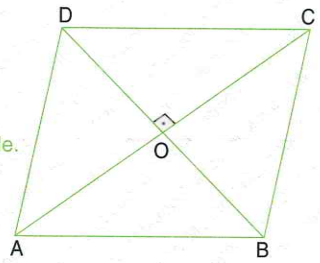
$|AK| = |KB|$, $|DE| = |EF| = |FC|$, $A(ABCD) = 300\,cm^2$

$\Rightarrow$ **Taralı Alan / The shaded Area $= ?\,cm^2$**

Yanıt / The Answer is **65**

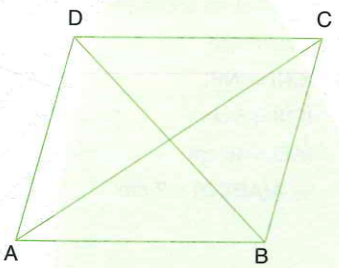
METROPOL YAYINLARI • METROPOL PUBLICATIONS

13. ABCD bir eşkenar dörtgen,
ABD bir eşkenar üçgendir.
ABCD is an equilateral quadrangle,
ABD is an equilateral triangle.
IABI = 4 cm
⇒ **A(ABCD) = ? cm²**



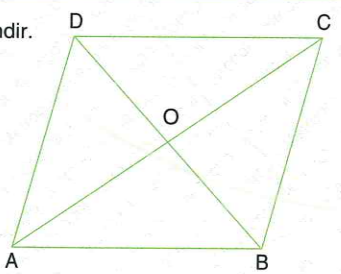
Yanıt / The Answer is $8\sqrt{3}$

14. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
IACI = f,
IDBI = e,
IABI = 6 cm,
e + f = 16 cm
⇒ **e · f = ? cm²**



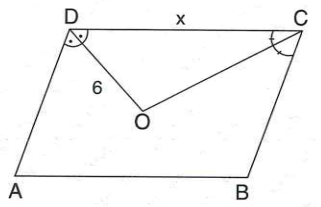
Yanıt / The Answer is 56

15. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
IOBI = $4\sqrt{3}$ cm,
IABI = $8\sqrt{3}$ cm
⇒ **A(ABCD) = ? cm²**



Yanıt / The Answer is $96\sqrt{3}$

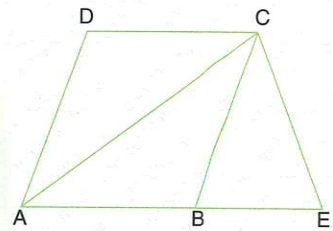
16.



ABCD bir eşkenar dörtgen,
[DO], [CO] açıortaylar,
ABCD is an equilateral quadrangle,
[DO] and [CO] are bisectors,
IDOI = 6 cm, A(ABCD) = 96 cm² ⇒ **IDCI = x = ? cm**

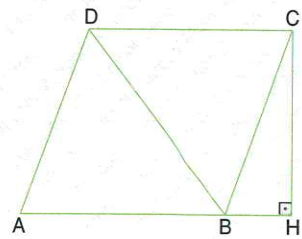
Yanıt / The Answer is 10

17. ABCD bir eşkenar dörtgen,
BCE bir eşkenar üçgendir.
ABCD is an equilateral quadrangle.
BCE is an equilateral triangle.
IACI = $12\sqrt{3}$ cm
⇒ **IBEI = ? cm**



Yanıt / The Answer is 12

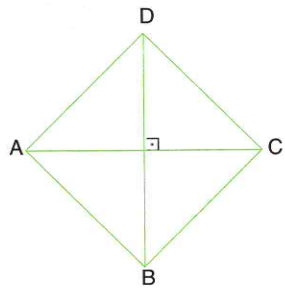
18. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
[CH] ⊥ [HB],
ICHI = 4 cm,
IHBI = 3 cm
⇒ **IBDI = ? cm**



Yanıt / The Answer is $2\sqrt{5}$

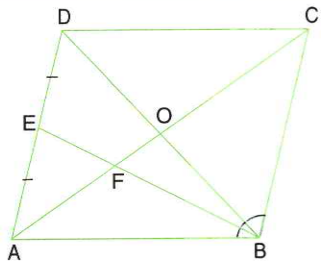
METROPOL YAYINLARI • METROPOL PUBLICATIONS

19. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
A(ABCD) = 48 cm^2,
$\frac{|BD|}{|AC|} = \frac{2}{3}$
⇒ **Çevre / The perimeter (ABCD) = ? cm**



Yanıt / The Answer is $8\sqrt{13}$

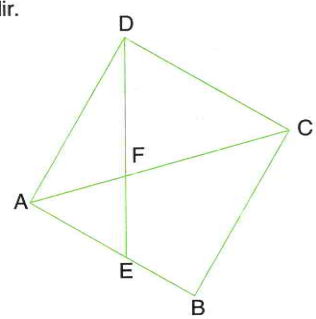
20.



ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
|EA| = |ED|, |OF| = 4 cm, |BD| = 10 cm
⇒ **Çevre / The perimeter (ABCD) = ? cm**

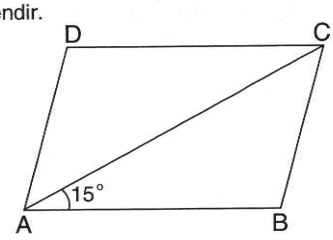
Yanıt / The Answer is 52

21. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
|AE| = 2 · |EB|,
|DF| = 15 cm
⇒ **|FE| = ? cm**



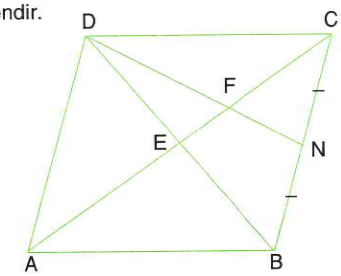
Yanıt / The Answer is 10

22. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
Çevre / (The Perimeter)
(ABCD) = 16 cm,
m($\widehat{BAC}$) = 15°
⇒ **A(ABCD) = ? cm^2**



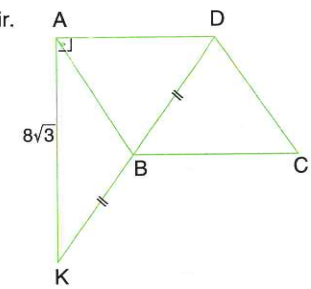
Yanıt / The Answer is 8

23. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
|CN| = |NB|,
|FN| = 5 cm,
|AE| = 18 cm
⇒ **A(ABCD) = ? cm^2**



Yanıt / The Answer is 288

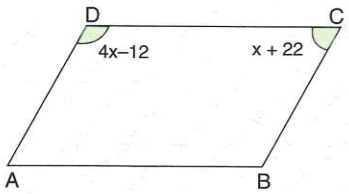
24. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
|KB| = |DB|,
|AK| = $8\sqrt{3}$ cm
⇒ **Çevre / The perimeter (ABCD) = ? cm**



Yanıt / The Answer is 32

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



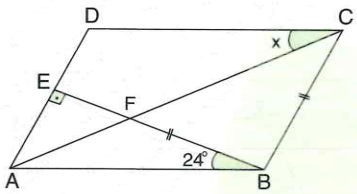
ABCD bir paralelkenardır. / ABCD is a parallelogram.

$m(\widehat{ADC}) = 4x-12°$, $m(\widehat{BCD}) = x+22° \Rightarrow$ **$m(\widehat{BAD}) = ?$**

A) 50° B) 52° C) 54°

D) 56° E) 60°

2.



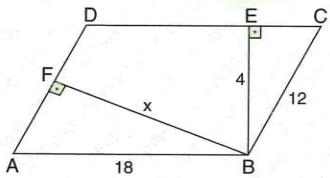
ABCD bir paralelkenardır. / ABCD is a parallelogram.

$[EB] \perp [AD]$, $|BF| = |BC|$, $m(\widehat{ABE}) = 24° \Rightarrow$ **$m(\widehat{ACD}) = x = ?$**

A) 20° B) 21° C) 24°

D) 25° E) 27°

3.



ABCD bir paralelkenardır. / ABCD is a parallelogram.

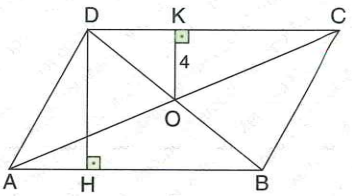
$[BE] \perp [DC]$, $[BF] \perp [AD]$, $|AB| = 18$ cm, $|BC| = 12$ cm,

$|EB| = 4$ cm $\Rightarrow$ **$|BF| = x = ?$ cm**

A) 4 B) 5 C) 6

D) 8 E) 12

4.



ABCD bir paralelkenardır. / ABCD is a parallelogram.

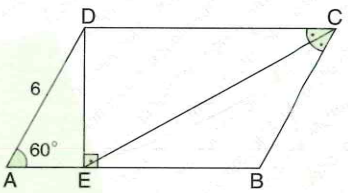
$[DH] \perp [AB]$, $[OK] \perp [DC]$, $|OK| = 4$ cm,

$A(\widehat{AHD}) = 24$ cm$^2 \Rightarrow$ **$|AH| = ?$ cm**

A) 3 B) 4 C) 5

D) 6 E) 8

5.



ABCD bir paralelkenar, [EC], bir açıortaydır.

ABCD is a parallelogram. [EC] is a bisector.

$[DE] \perp [AB]$, $m(\widehat{DAB}) = 60°$, $|AD| = 6$ cm

$\Rightarrow$ **$A(ABCD) = ?$ cm^2**

A) $18\sqrt{3}$ B) $24\sqrt{3}$ C) $27\sqrt{3}$

D) $30\sqrt{3}$ E) $36\sqrt{3}$

6. ABCD bir paralelkenardır.

ABCD is a parallelogram.

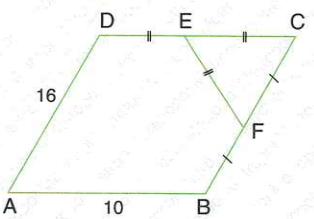
$|BF| = |FC|$,

$|DE| = |EC| = |EF|$,

$|AD| = 16$ cm,

$|AB| = 10$ cm

$\Rightarrow$ **$A(ABCD) = ?$ cm^2**

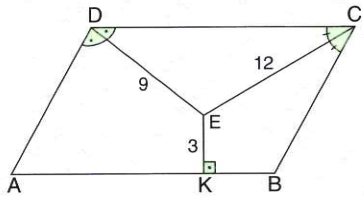


A) 72 B) 80 C) 88

D) 96 E) 104

METROPOL YAYINLARI • METROPOL PUBLICATIONS

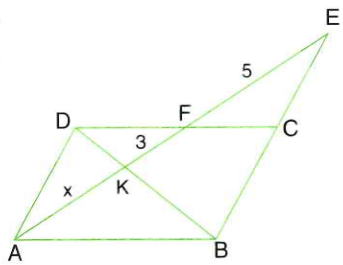
7.



ABCD bir paralelkenar, [DE] ve [EC] birer açıortaydır.
ABCD is a parallelogram, [DE] and [EC] are bisectors.
[EK] ⊥ [AB], |DE| = 9 cm, |EC| = 12 cm, |EK| = 3 cm
⇒ **A(ABCD) = ? cm²**

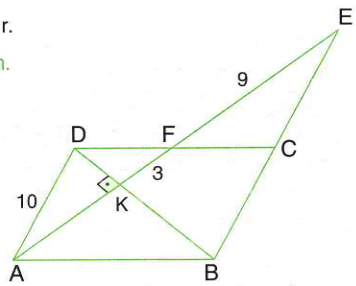
A) 153 B) 155 C) 163
D) 172 E) 178

8. ABCD bir paralelkenardır.
ABCD is a parallelogram.
|KF| = 3 cm,
|FE| = 5 cm
⇒ **|AK| = x = ? cm**



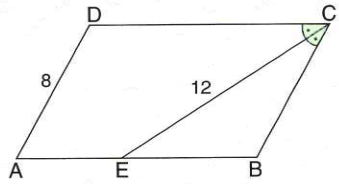
A) $3\sqrt{5}$ B) $2\sqrt{6}$ C) $2\sqrt{5}$
D) $3\sqrt{2}$ E) $2\sqrt{3}$

9. ABCD bir paralelkenardır.
ABCD is a parallelogram.
[BD] ⊥ [AF],
|AD| = 10 cm,
|KF| = 3 cm,
|EF| = 9 cm
⇒ **A(ABCD) = ? cm²**



A) 112 B) 120 C) 128
D) 136 E) 144

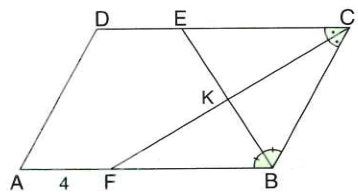
10.



ABCD bir paralelkenar; [CE], bir açıortaydır.
ABCD is a parallelogram; [CE] is a bisector.
|EB| = 3|AE|, |AD| = 8 cm
|EC| = 12 cm ⇒ **A(ABCD) = ? cm²**

A) $24\sqrt{7}$ B) $28\sqrt{7}$ C) $32\sqrt{7}$
D) $36\sqrt{7}$ E) $40\sqrt{7}$

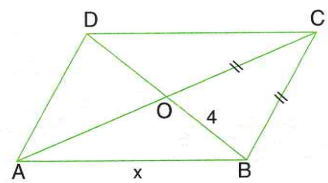
11.



ABCD bir paralelkenar, [BE] ve [CF] birer açıortaydır.
ABCD is a parallelogram, [BE] and [CF] are bisectors.
|AF| = 4 cm, |CF| = 6 cm, $A(\widehat{BKC}) = 6\ cm^2$
⇒ **Çevre / The perimeter (ABCD) = ? cm**

A) 24 B) 28 C) 32
D) 36 E) 40

12.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
|BC| = |CO| = 6 cm, |OB| = 4 cm ⇒ **|AB| = x = ? cm**

A) $2\sqrt{7}$ B) $2\sqrt{11}$ C) $2\sqrt{13}$
D) $2\sqrt{15}$ E) $2\sqrt{17}$

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	B	C	D	C	D	A	B	E	C	B	E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

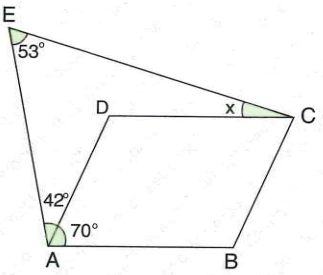
1. ABCD bir paralelkenardır.
ABCD is a parallelogram.

$m(\widehat{CEA}) = 53°$,

$m(\widehat{EAD}) = 42°$

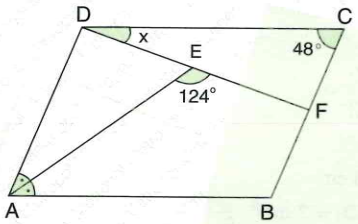
$m(\widehat{DAB}) = 70°$

$\Rightarrow$ **$m(\widehat{ECD}) = x = ?$**



A) 12° B) 13° C) 14°
D) 15° E) 16°

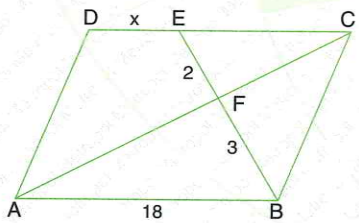
2.



ABCD paralelkenar; [EA], bir açıortaydır.
ABCD is parallelogram; [EA] is a bisector.
$m(\widehat{BCD}) = 48°$, $m(\widehat{FEA}) = 124°$ $\Rightarrow$ **$m(FDC) = x = ?$**

A) 24° B) 26° C) 28°
D) 30° E) 32°

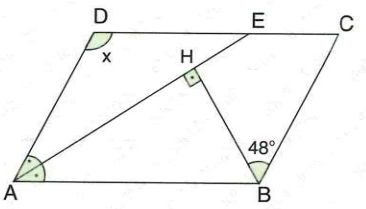
3.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
IABI = 18 cm, IFBI = 3 cm, IEFI = 2 cm
$\Rightarrow$ **IDEI = x = ? cm**

A) 2 B) 3 C) 4
D) 5 E) 6

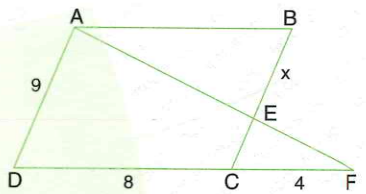
4.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
$m(\widehat{DAE}) = m(\widehat{EAB})$, $[BH] \perp [AE]$,
$m(\widehat{HBC}) = 48° \Rightarrow$ **$m(\widehat{ADC}) = x = ?$**

A) 72° B) 78° C) 82°
D) 84° E) 96°

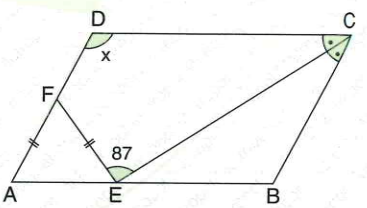
5.



ABCD paralelkenardır. / ABCD is a parallelogram.
IADI = 9 cm, IDCI = 8 cm, ICFI = 4 cm
$\Rightarrow$ **IBEI = x = ? cm**

A) 2 B) 3 C) 4
D) 6 E) 8

6.

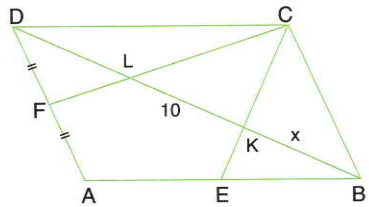


ABCD bir paralelkenardır. / ABCD is a parallelogram.
$m(\widehat{DCE}) = m(\widehat{ECB})$, IFAI = IFEI, $m(\widehat{FEC}) = 87°$
$\Rightarrow$ **$m(\widehat{ADC}) = x = ?$**

A) 108° B) 112° C) 114°
D) 116° E) 118°

METROPOL YAYINLARI • METROPOL PUBLICATIONS

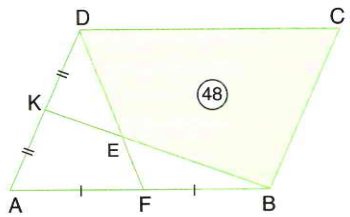
7.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
2·|EB| = |AE|, |AF| = |FD|, |LK| = 10 cm
⇒ **|BK| = x = ? cm**

A) 3 B) 4 C) 5
D) 6 E) 7

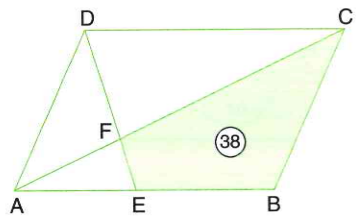
8.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
|DK| = |KA|, |AF| = |FB|, A(DEBC) = 48 cm²
⇒ **A(ABCD) = ? cm²**

A) 64 B) 68 C) 70
D) 72 E) 80

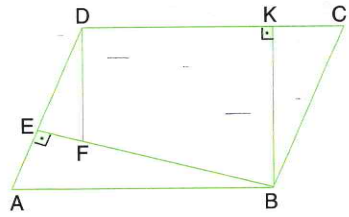
9.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
|BE| = 3|AE|, A(FEBC) = 38 cm² ⇒ **A(ABCD) = ? cm²**

A) 76 B) 80 C) 82
D) 84 E) 88

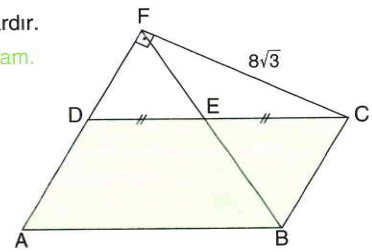
10.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
[EB] ⊥ [AD], [BK] ⊥ [DC], [DF] // [BK], 3|EF| = |FB|,
|DE| = 4 cm, |EA| = 2 cm ⇒ **|BK| = ? cm**

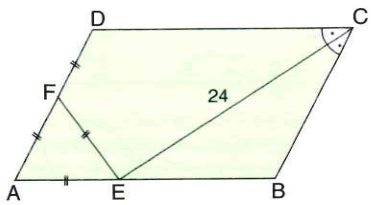
A) $2\sqrt{2}$ B) $3\sqrt{2}$ C) $4\sqrt{2}$
D) $5\sqrt{2}$ E) $6\sqrt{2}$

11. ABCD bir paralelkenardır.
ABCD is a parallelogram.
[AF] ⊥ [FC],
|DE| = |EC|,
|AB| = 2|AD|,
|FC| = $8\sqrt{3}$ cm
⇒ **A(ABCD) = ? cm²**



A) $64\sqrt{3}$ B) $72\sqrt{3}$ C) 96
D) 124 E) 196

12.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
m(DCE) = m(ECB), |AE| = |AF| = |EF| = |DF|,
|CE| = 24 cm ⇒ **A(ABCD) = ? cm²**

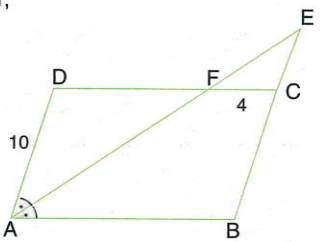
A) $144\sqrt{3}$ B) $196\sqrt{3}$ C) $216\sqrt{3}$
D) 288 E) 324

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	E	E	E	D	E	D	D	B	C	A	A

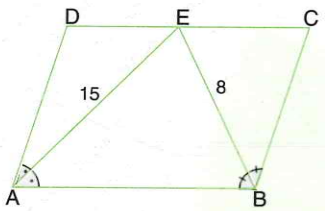
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. ABCD bir paralelkenar,
[AE] bir açıortaydır.
ABCD is a parallelogram.
[AE] is a bisector.
$|FC| = 4$ cm,
$|AD| = 10$ cm
$\Rightarrow$ **$|EC| = ?$ cm**



A) 5 B) 4,8 C) 4
D) 3,6 E) 3

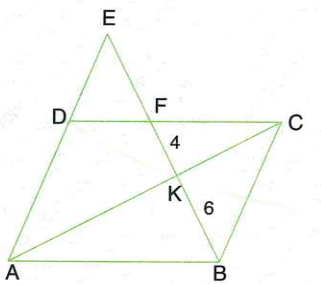
2.



ABCD bir paralelkenar, [AE] ve [BE] birer açıortaydır.
ABCD is a parallelogram, [AE] and [BE] are bisectors.
$|AE| = 15$ cm, $|BE| = 8$ cm
$\Rightarrow$ **Çevre / The perimeter (ABCD) = ? cm**

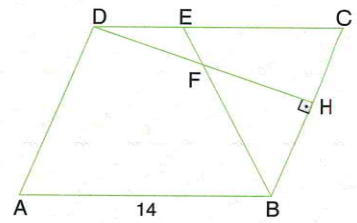
A) 24 B) 46 C) 51
D) 54 E) 69

3. ABCD bir paralelkenardır.
ABCD is a parallelogram.
$|FK| = 4$ cm,
$|KB| = 6$ cm
$\Rightarrow$ **$|EF| = ?$ cm**



A) 7 B) 6,5 C) 6
D) 5,6 E) 5

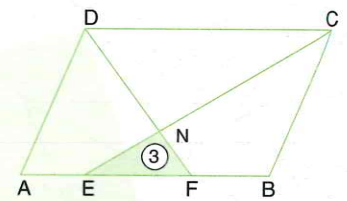
4.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
$[DH] \perp [BC]$, $|AB| = 14$ cm, $|EB| = 10$ cm,
$|DE| = |EF| \Rightarrow$ **$|FB| = ?$ cm**

A) 4 B) 5 C) 6
D) 7 E) 8

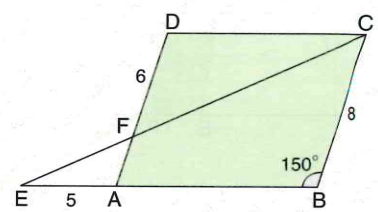
5.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
$|DC| = 4 \cdot |EF|$, $A(\widehat{NEF}) = 3$ cm^2 $\Rightarrow$ **A(ABCD) = ? cm^2**

A) 120 B) 108 C) 96
D) 84 E) 72

6.

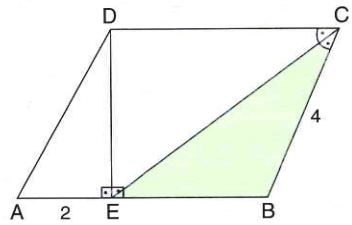


ABCD bir paralelkenardır. / ABCD is a parallelogram.
$m(\widehat{B}) = 150°$, $|CB| = 8$ cm, $|DF| = 6$ cm,
$|EA| = 5$ cm $\Rightarrow$ **A(ABCD) = ? cm^2**

A) 50 B) 56 C) 60
D) 75 E) 90

METROPOL YAYINLARI • METROPOL PUBLICATIONS

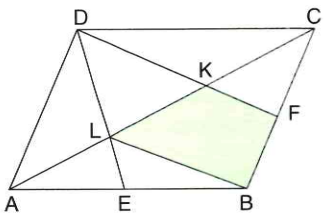
7.



ABCD bir paralelkenar, [CE] bir açıortaydır.
ABCD is a parallelogram, [CE] is a bisector.
[DE] ⊥ [AB], |AE| = 2 cm,
|CB| = 4 cm ⇒ **A($\widehat{CEB}$) = ? cm²**

A) $2\sqrt{3}$ B) $4\sqrt{3}$ C) 8
D) $8\sqrt{3}$ E) 12

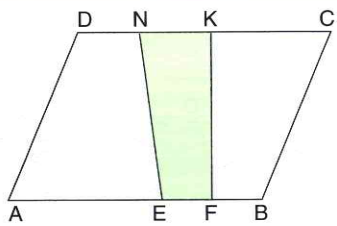
8.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
A(ABCD) = 72 cm², |EA| = |EB|, |FB| = |FC|
⇒ **A(BFKL) = ? cm²**

A) 28 B) 25 C) 18
D) 16 E) 12

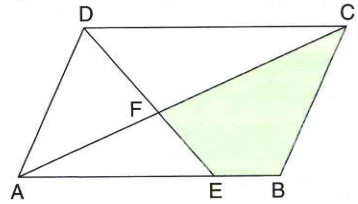
9.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
A(ABCD) = 96 cm², 4·|EF| = |AB|, 3·|NK| = |CD|
⇒ **A(EFKN) = ? cm²**

A) 28 B) 32 C) 36
D) 48 E) 54

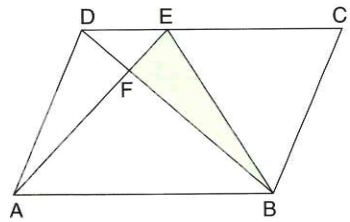
10.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
|AE| = 2|EB|, A(ABCD) = 60 cm² ⇒ **A(EBCF) = ? cm²**

A) 30 B) 28 C) 26
D) 22 E) 20

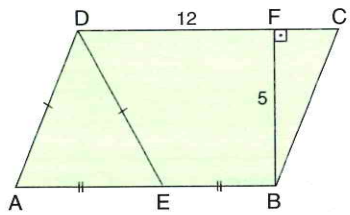
11



ABCD bir paralelkenardır. / ABCD is a parallelogram.
|EC| = 2·|DE|, A(ABCD) = 96 cm² ⇒ **A($\widehat{FEB}$) = ? cm²**

A) 25 B) 20 C) 16
D) 12 E) 10

12.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
[BF] ⊥ [DC], |AD| = |DE|, |AE| = |EB|,
|FB| = 5 cm, |DF| = 12 cm ⇒ **A(ABCD) = ? cm²**

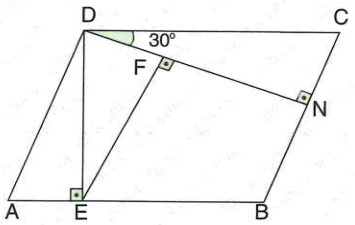
A) 60 B) 70 C) 75
D) 80 E) 120

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	C	E	C	A	C	B	C	A	D	D	D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

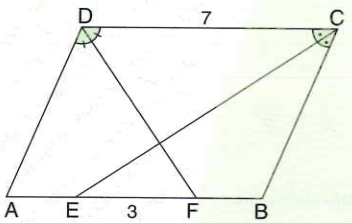
1.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
[DN] ⊥ [BC], [DE] ⊥ [AB], [EF] ⊥ [DN],
$m(\widehat{CDN}) = 30°$, |AE| = 2 cm ⇒ **|EF| = ? cm**

A) 5 B) 4,5 C) 3,5 D) 3 E) 2,5

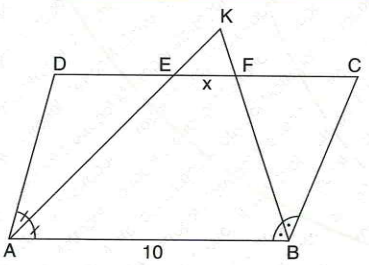
2.



ABCD bir paralelkenar; [DF] ve [CE] birer açıortaydır.
ABCD is a parallelogram; [DF] and [CE] are bisectors.
|DC| = 7 cm, |EF| = 3 cm ⇒ **|BC| = ? cm**

A) 7 B) 6,5 C) 6 D) 5,5 E) 5

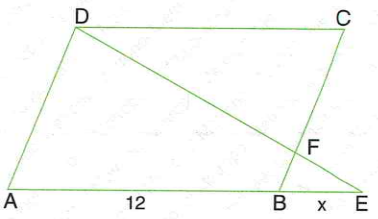
3.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
[AK] ve [BK] açıortaydır. / [AK] and [BK] are bisectors.
|AB| = 10 cm, Çevre / The perimeter (ABCD) = 28 cm
⇒ **|EF| = x = ? cm**

A) 2 B) 3 C) 4 D) 5 E) 6

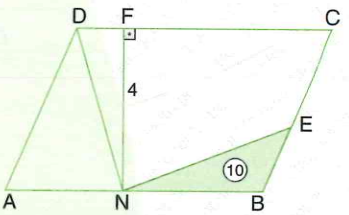
4.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
|FC| = 2·|FB|, |AB| = 12 cm ⇒ **|BE| = x = ? cm**

A) 5 B) 6 C) 7 D) 8 E) 9

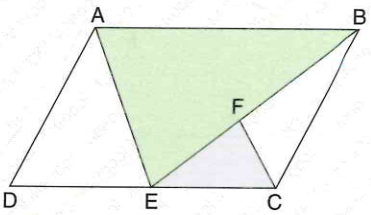
5.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
[NF] ⊥ [DC], |CE| = |EB|,
$A(\widehat{NEB}) = 10\,cm^2$, $A(NECD) = 50\,cm^2$,
|NF| = 4 cm ⇒ **|AB| = ? cm**

A) 20 B) 18 C) 16 D) 14 E) 12

6.



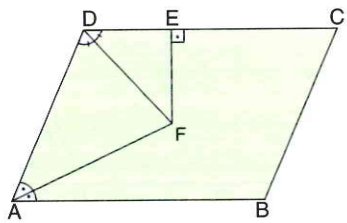
ABCD bir paralelkenardır. / ABCD is a parallelogram.
3·|EF| = 2·|FB|, |DE| = |EC|

⇒ $\dfrac{\mathbf{A(\widehat{FEC})}}{\mathbf{A(\widehat{AEB})}} = ?$

A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{1}{4}$ D) $\frac{1}{5}$ E) $\frac{1}{6}$

METROPOL YAYINLARI • METROPOL PUBLICATIONS

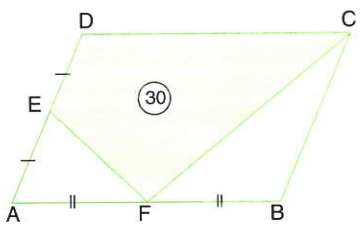
7.



Şekildeki ABCD paralelkenarında; F, açıortayların kesim noktasıdır.
F is the intersection point of the bisectors in the parallelogram ABCD in the figure.
$|EF| = 6$ cm, $[FE] \perp [DC]$, $|AB| = 18$ cm $\Rightarrow$ **A(ABCD) = ? cm²**

A) 216 B) 196 C) 144 D) 124 E) 108

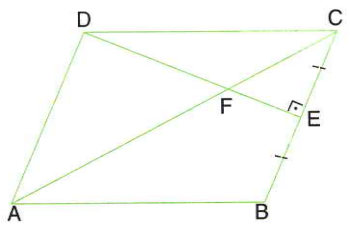
8.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
$|AE| = |ED|$, $|AF| = |FB|$, $A(EFCD) = 30$ cm²
$\Rightarrow$ **A(ABCD) = ? cm²**

A) 60 B) 54 C) 48 D) 42 E) 36

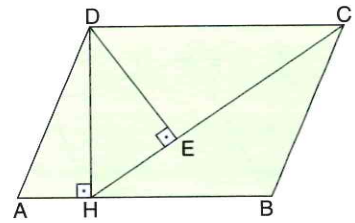
9.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
$[DE] \perp [BC]$, $|BE| = |EC| = 5$ cm, $|FC| = \sqrt{41}$ cm
$\Rightarrow$ **Çevre / The perimeter (ABCD) = ? cm**

A) 52 B) 50 C) 48 D) 46 E) 44

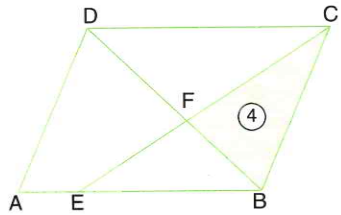
10.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
$[DH] \perp [AB]$, $[DE] \perp [HC]$, $|DH| = 2\sqrt{13}$ cm,
$|EC| = 9$ cm $\Rightarrow$ **A(ABCD) = ? cm²**

A) 78 B) 70 C) 58 D) 39 E) 36

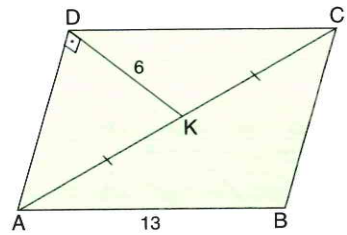
11.



ABCD bir paralelkenar,
ABCD is a parallelogram,
$\frac{|AE|}{|EB|} = \frac{1}{2}$, $A(\widehat{FBC}) = 4$ cm² $\Rightarrow$ **A(ABCD) = ? cm²**

A) 32 B) 28 C) 25 D) 20 E) 18

12.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
$|AK| = |KC|$, $m(\widehat{ADK}) = 90°$, $|DK| = 6$ cm, $|AB| = 13$ cm
$\Rightarrow$ **A(ABCD) = ? cm²**

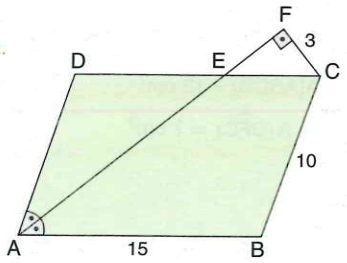
A) 68 B) 60 C) 58 D) 52 E) 48

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	E	A	B	A	D	A	C	D	A	D	B

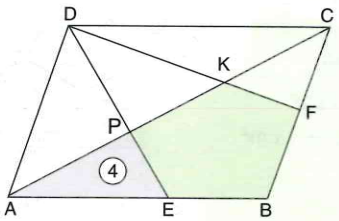
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. ABCD bir paralelkenar,
[AF], bir açıortaydır.
ABCD is a parallelogram.
[AF] is a bisector.
|CF| ⊥ [FA]
|CF| = 3 cm,
|BC| = 10 cm,
|AB| = 15 cm
⇒ **A(ABCD) = ? cm²**



A) 72 B) 90 C) 121
D) 144 E) 196

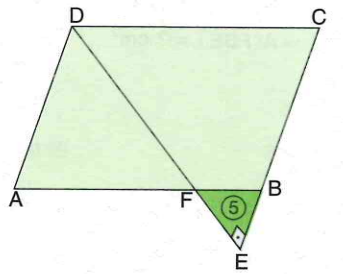
2.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
|AE| = |EB|, |BF| = |FC|,
$A(\widehat{APE}) = 4\ cm^2$ ⇒ **A(EBFKP) = ? cm²**

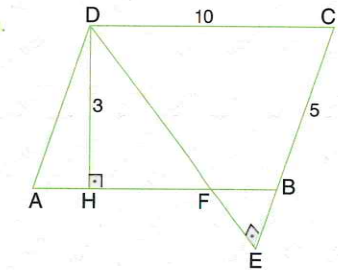
A) 12 B) 16 C) 18
D) 20 E) 24

3. ABCD bir paralelkenardır.
ABCD is a parallelogram.
3·|EB| = 4·|FE|,
|DF| = 2·|FE|,
$A(\widehat{FEB}) = 5\ cm^2$
⇒ **A(ABCD) = ? cm²**



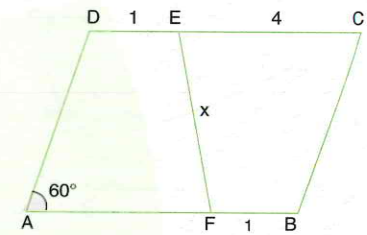
A) 60 B) 54 C) 48
D) 36 E) 30

4. ABCD bir paralelkenardır.
ABCD is a parallelogram.
[DE] ⊥ [EC],
[DH] ⊥ [AB],
|DC| = 10 cm,
|BC| = 5 cm,
|DH| = 3 cm
⇒ **|EB| = ? cm**



A) 4 B) $2\sqrt{3}$ C) 2
D) $2\sqrt{2}$ E) 3

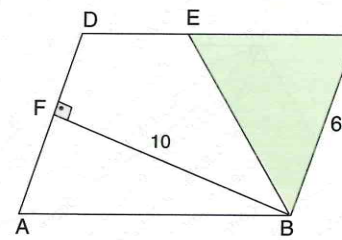
5.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
|DE| = |FB| = 1 cm, |EC| = 4 cm, m(Â) = 60°
⇒ **|EF| = x = ? cm**

A) 5 B) 4 C) 3
D) 2 E) 1

6.

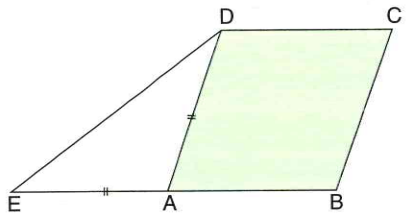


ABCD bir paralelkenardır. / ABCD is a parallelogram.
[BF] ⊥ [AD], |AB| = 3 · |DE|, |BC| = 6 cm,
|BF| = 10 cm ⇒ **$A(\widehat{BEC})$ = ? cm²**

A) 10 B) 20 C) 30
D) 40 E) 50

METROPOL YAYINLARI • METROPOL PUBLICATIONS

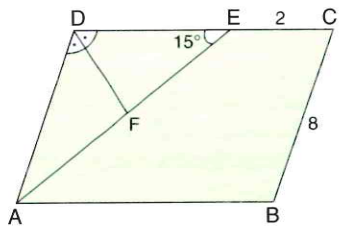
7.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
$|EA| = |AD|$, $m(\widehat{DEA}) = 30°$, $|AB| = 5$ cm,
$|BC| = 6$ cm $\Rightarrow$ **A(ABCD) = ? cm²**

A) $60\sqrt{3}$ B) $45\sqrt{3}$ C) $30\sqrt{3}$
D) $20\sqrt{3}$ E) $15\sqrt{3}$

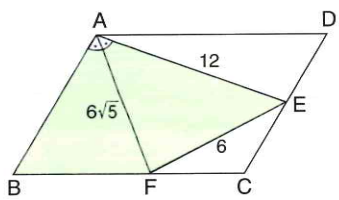
8.



ABCD bir paralelkenar; [DF] bir açıortaydır.
ABCD is a parallelogram; [DF] is a bisector.
$|AF| = |FE|$, $m(\widehat{DEA}) = 15°$, $|EC| = 2$ cm,
$|BC| = 8$ cm $\Rightarrow$ **A(ABCD) = ? cm²**

A) 40 B) 48 C) 60
D) 72 E) 80

9.

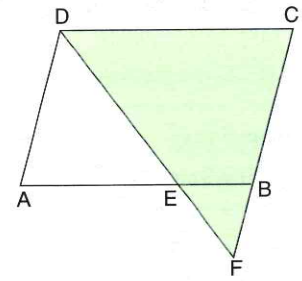


ABCD bir paralelkenar; [AF] bir açıortaydır.
ABCD is a parallelogram; [AF] is a bisector.
$|AE| = 12$ cm, $|FE| = 6$ cm,
$|AF| = 6\sqrt{5}$ cm, $|DC| = 14$ cm
$\Rightarrow$ **A(ABFE) = ? cm²**

A) 60 B) 66 C) 78 D) 96 E) 108

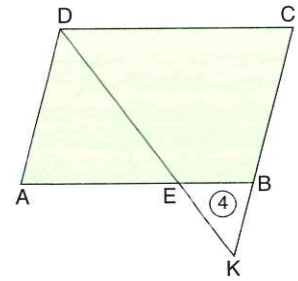
METROPOL YAYINLARI • METROPOL PUBLICATIONS

10. ABCD bir paralelkenardır.
ABCD is a parallelogram.
$|DE| = 2 \cdot |EF|$,
$A(ABCD) = 12$ cm²
$\Rightarrow$ **$A(\widehat{DFC})$ = ? cm²**



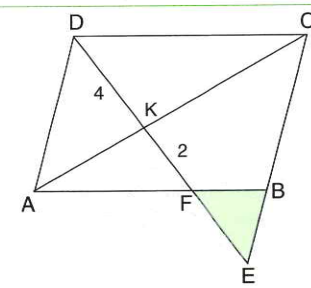
A) 12 B) 10 C) 9
D) 8 E) 6

11. ABCD bir paralelkenardır.
ABCD is a parallelogram.
$|BC| = 2 \cdot |BK|$,
$A(\widehat{BEK}) = 4$ cm²
$\Rightarrow$ **A(ABCD) = ? cm²**



A) 24 B) 32 C) 36
D) 42 E) 48

12. ABCD bir paralelkenardır.
ABCD is a parallelogram.
$|DK| = 4$ cm,
$|KF| = 2$ cm
$A(ABCD) = 48$ cm²
$\Rightarrow$ **$A(\widehat{FBE})$ = ? cm²**

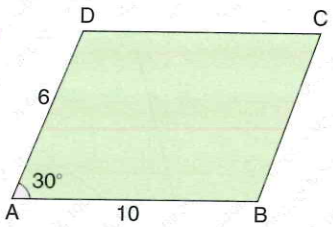


A) 6 B) 8 C) 10
D) 12 E) 14

YANITLAR / ANSWERS

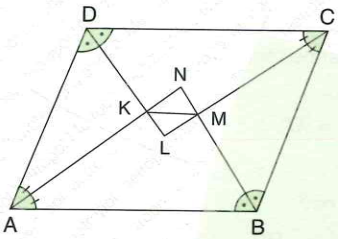
1	2	3	4	5	6	7	8	9	10	11	12
D	B	A	E	C	B	E	A	C	C	E	D

1. ABCD bir paralelkenardır.
ABCD is a parallelogram.
$m(\widehat{DAB}) = 30°$,
$|AB| = 10$ cm,
$|AD| = 6$ cm
$\Rightarrow$ **A(ABCD) = ? cm²**



A) 15 B) 25 C) 30
D) $30\sqrt{3}$ E) 60

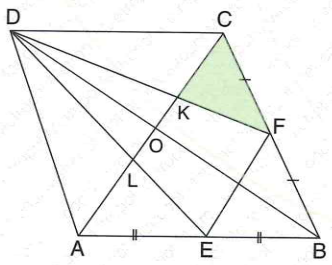
2.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
$|BC| = 9$ cm, $|KM| = 3$ cm
$\Rightarrow$ **Çevre / The perimeter (ABCD) = ? cm**

A) 54 B) 52 C) 48
D) 46 E) 42

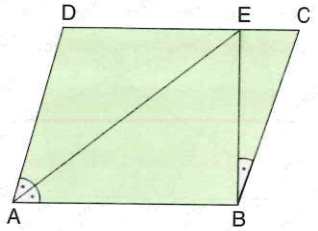
3.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
$|BF| = |FC|$, $|AE| = |EB|$,
$A(\widehat{CKF}) = 6\,cm^2 \Rightarrow$ **$A(\widehat{DEF}) = ?\,cm^2$**

A) 18 B) 24 C) 27
D) 36 E) 42

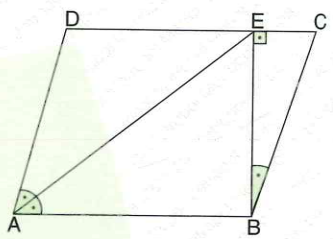
4.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
$m(\widehat{DAE}) = m(\widehat{EAB}) = m(\widehat{EBC})$, $[BE] \perp [DC]$, $|AD| = 6$ cm
$\Rightarrow$ **A(ABCD) = ? cm²**

A) $27\sqrt{3}$ B) $36\sqrt{3}$ C) 54
D) 72 E) $36\sqrt{2}$

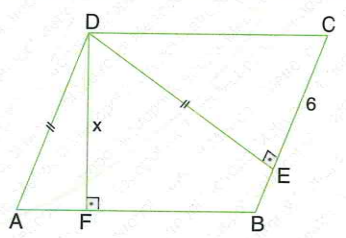
5.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
$m(\widehat{DAE}) = m(\widehat{EAB}) = m(\widehat{EBC})$, $[BE] \perp [DC]$,
$A(ABCD) = 27\sqrt{3}$ cm²
$\Rightarrow$ **Çevre / The perimeter (ABCD) = ? cm**

A) 24 B) 28 C) 30
D) 32 E) 36

6.

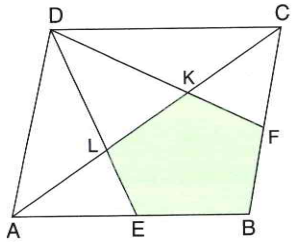


ABCD bir paralelkenardır. / ABCD is a parallelogram.
$[DE] \perp [BC]$, $[DF] \perp [AB]$,
$|AD| = |DE|$, $|CE| = 6$ cm,
$|AB| = 10$ cm $\Rightarrow$ **$|DF| = x = ?$ cm**

A) 3,6 B) 4,8 C) 6
D) 6,4 E) 7,2

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



ABCD bir paralelkenardır. / ABCD is a parallelogram.

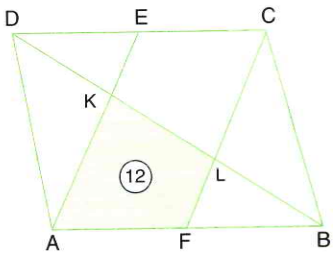
$|AE| = |EB|$, $|BF| = |FC|$, $A(ABCD) = 96\,cm^2$

⇒ **A(EBFKL) = ? cm^2**

A) 24 B) 32 C) 36

D) 48 E) 54

8.



ABCD bir paralelkenardır. / ABCD is a parallelogram.

$|AF| = |FB|$, $|DE| = |EC|$, $A(AKLF) = 12\,cm^2$

⇒ **A(ABCD) = ? cm^2**

A) 48 B) 54 C) 66

D) 72 E) 84

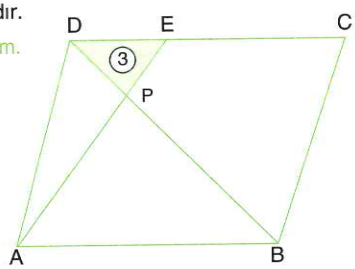
9. ABCD bir paralelkenardır.
ABCD is a parallelogram.

$[AE] \cap [BD] = \{P\}$,

$|AP| = 3 \cdot |PE|$,

$A(\widehat{DPE}) = 3\,cm^2$

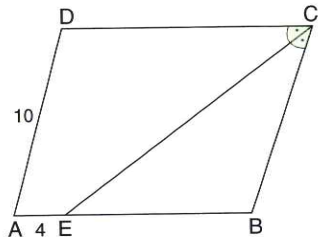
⇒ **A(ABCD) = ? cm^2**



A) 42 B) 54 C) 66

D) 72 E) 96

10.



ABCD bir paralelkenardır. / ABCD is a parallelogram.

$m(\widehat{DCE}) = m(\widehat{ECB})$, $|AD| = 10$ cm, $|AE| = 4$ cm

⇒ **Çevre / The perimeter (ABCD) = ? cm**

A) 32 B) 36 C) 38

D) 42 E) 48

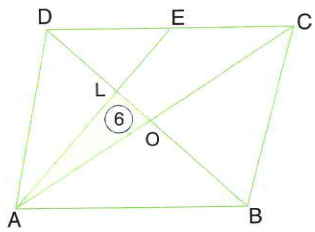
11. ABCD bir paralelkenardır.
ABCD is a parallelogram.

$[AC] \perp [BD] = \{O\}$,

$|DE| = |EC|$,

$A(\widehat{ALO}) = 6\,cm^2$

⇒ **A(ABCD) = ? cm^2**



A) 18 B) 36 C) 54

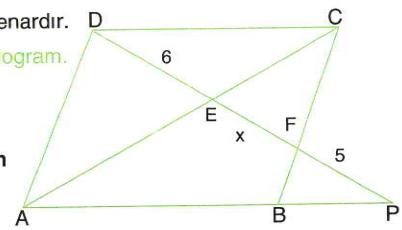
D) 72 E) 108

12. ABCD bir paralelkenardır.
ABCD is a parallelogram.

$|DE| = 6$ cm,

$|FP| = 5$ cm

⇒ **$|EF| = x$ = ? cm**



A) 2 B) $\frac{5}{2}$ C) 3

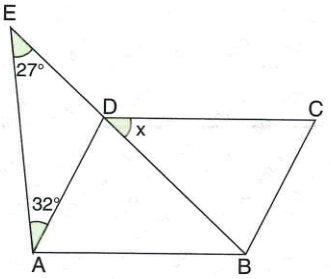
D) $\frac{7}{2}$ E) 4

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	E	C	A	C	D	B	A	D	E	D	E

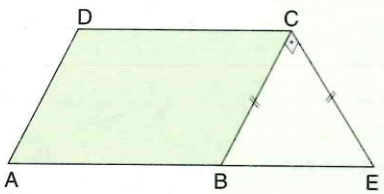
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. ABCD eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$m(\widehat{AED}) = 27°$,
$m(\widehat{EAD}) = 32°$
$\Rightarrow$ **$m(\widehat{BDC}) = x = ?$**



A) 59° B) 60° C) 61°
D) 62° E) 63°

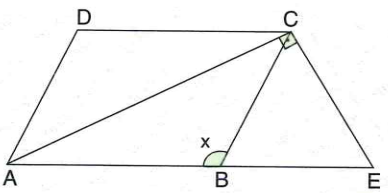
2.



ABCD eşkenar dörtgendir. / ABCD is an equilateral quadrangle.
[BC] $\perp$ [CE], IBCI = IECI, IBEI = $8\sqrt{2}$ cm $\Rightarrow$ **A(ABCD) = ? cm^2**

A) $26\sqrt{2}$ B) $28\sqrt{2}$ C) $30\sqrt{2}$
D) $32\sqrt{2}$ E) $34\sqrt{2}$

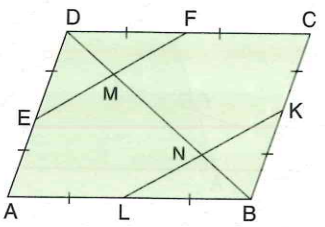
3.



ABCD eşkenar dörtgendir. / ABCD is an equilateral quadrangle.
[AC] $\perp$ [CE], IADI = ICEI $\Rightarrow$ **$m(\widehat{ABC}) = x = ?$**

A) 90° B) 100° C) 110°
D) 120° E) 135°

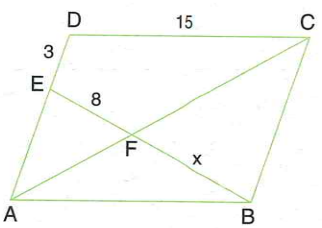
4.



ABCD eşkenar dörtgen; E,F,K,L orta noktalardır.
ABCD is an equilateral quadrangle; E,F,K,L are the midpoints.
IMNI = 20 cm, IMFI = 6 cm $\Rightarrow$ **A(ABCD) = ? cm^2**

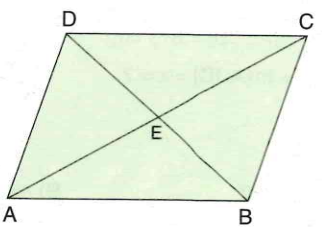
A) 400 B) 480 C) 500
D) 540 E) 600

5. ABCD eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
IDCI = 15 cm,
IDEI = 3 cm,
IEFI = 8 cm
$\Rightarrow$ **IFBI = x = ? cm**



A) 9 B) 10 C) 12
D) 14 E) 15

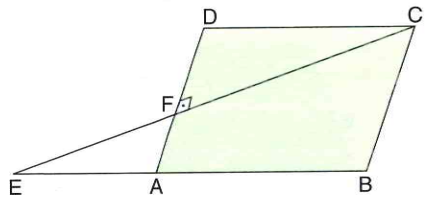
6. ABCD eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
IDEI = 12 cm,
ICBI = 20 cm
$\Rightarrow$ **A(ABCD) = ? cm^2**



A) 348 B) 360 C) 372
D) 384 E) 396

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



ABCD eşkenar dörtgendir. / ABCD is an equilateral quadrangle.

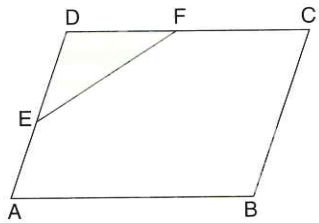
[DF] ⊥ [EC], |EA| = |AB|, |CB| = 4 cm

⇒ **A(ABCD) = ? cm²**

A) $3\sqrt{3}$ B) $4\sqrt{3}$ C) $5\sqrt{3}$

D) $6\sqrt{3}$ E) $8\sqrt{3}$

8. ABCD eşkenar dörtgendir.
ABCD is an equilateral quadrangle.



|DF| = 2|FC|,

3|DE| = |EA|,

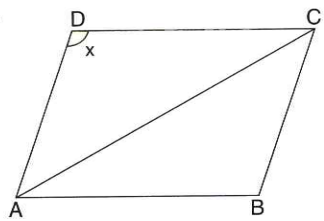
A(ABCD) = 60 cm²

⇒ **A($\widehat{DEF}$) = ? cm²**

A) 1 B) 2 C) 3

D) 5 E) 10

9. ABCD eşkenar dörtgendir.
ABCD is an equilateral quadrangle.



|AC| = 4 cm,

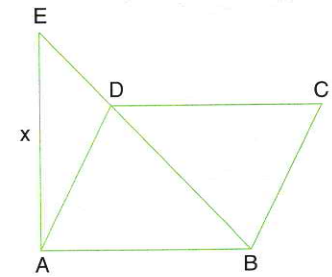
A(ABCD) = $8\sqrt{3}$ cm²

⇒ **m($\widehat{ADC}$) = x = ?**

A) 30° B) 45° C) 60°

D) 90° E) 120°

10. ABCD eşkenar dörtgendir.
ABCD is an equilateral quadrangle.



2·|AD| = |BE|,

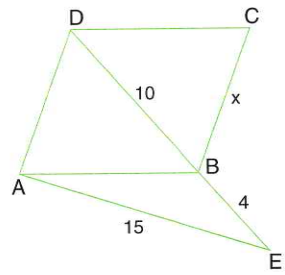
|BD| = |DC| = 3 cm

⇒ **|AE| = x = ? cm**

A) 3 B) $3\sqrt{3}$ C) 6

D) $6\sqrt{3}$ E) 9

11. ABCD eşkenar dörtgendir.
ABCD is an equilateral quadrangle.



|AE| = 15 cm,

|DB| = 10 cm,

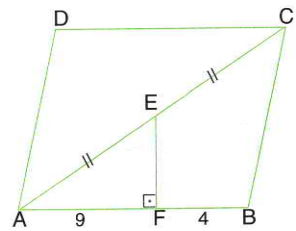
|BE| = 4 cm

⇒ **|CB| = x = ? cm**

A) 10 B) 11 C) 12

D) 13 E) 14

12. ABCD eşkenar dörtgendir.
ABCD is an equilateral quadrangle.



[EF] ⊥ [AB],

|AE| = |EC|,

|AF| = 9 cm,

|FB| = 4 cm

⇒ **A(ABCD) = ? cm²**

A) 116 B) 124 C) 132

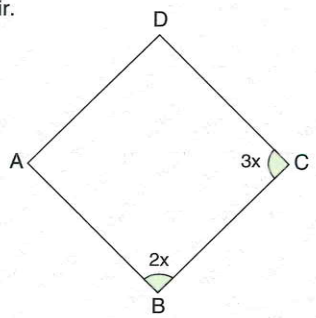
D) 140 E) 156

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
A	D	D	B	B	D	E	D	C	B	D	E

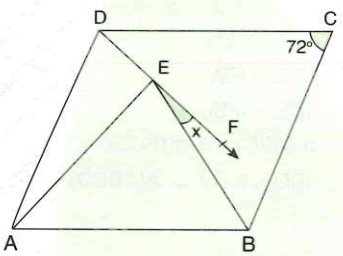
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$m(\widehat{B}) = 2x$
$m(\widehat{C}) = 3x$
$\Rightarrow$ **$m(\widehat{A}) = ?$**



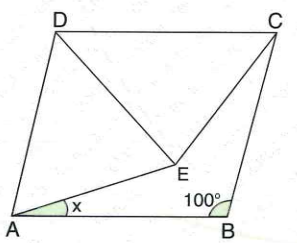
A) 60 B) 72 C) 90
D) 108 E) 120

2. ABCD eşkenar dörtgen; ABE eşkenar üçgendir.
ABCD is an equilateral quadrangle; ABE is an equilateral triangle.
$m(\widehat{DCB}) = 72°$
$\Rightarrow$ **$m(\widehat{BEF}) = x = ?$**



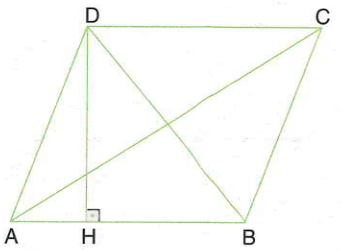
A) 30 B) 35 C) 36
D) 38 E) 40

3. ABCD eşkenar dörtgen; DEC eşkenar üçgendir.
ABCD is an equilateral quadrangle; DEC is an equilateral triangle.
$m(\widehat{B}) = 100°$
$\Rightarrow$ **$m(\widehat{EAB}) = x = ?$**



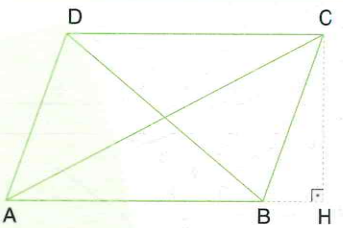
A) 5 B) 10 C) 15
D) 20 E) 30

4. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$[DH] \perp [AB]$,
$|DB| = 18$ cm,
$|AC| = 24$ cm
$\Rightarrow$ **$|DH| = ?$ cm**



A) 12,4 B) 14,4 C) 14,8
D) 16 E) 16,4

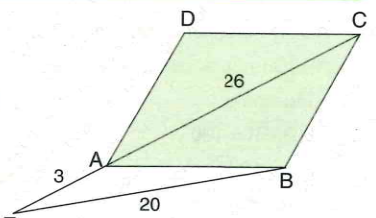
5.



ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$[CH] \perp [AB]$, $|AC| = 16$ cm, $|DB| = 12$ cm $\Rightarrow$ **$|CH| = ?$ cm**

A) 5,6 B) 6 C) 7,2
D) 8 E) 9,6

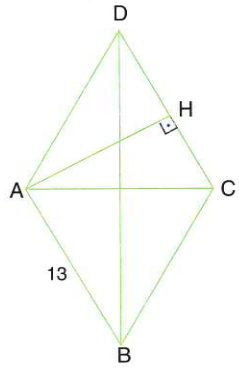
6. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$|EB| = 20$ cm,
$|EA| = 3$ cm,
$|AC| = 26$ cm
$\Rightarrow$ **$A(ABCD) = ?\ cm^2$**



A) 216 B) 256 C) 280
D) 312 E) 320

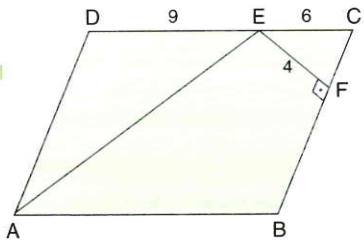
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$[AH] \perp [DC]$,
$\frac{|AC|}{|BD|} = \frac{2}{3}$,
$|AB| = 13$ cm
$\Rightarrow$ **$|AH|$ = ? cm**



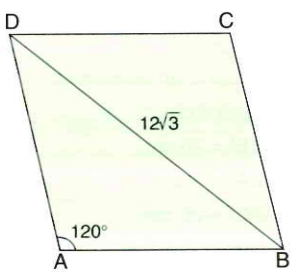
A) 12 B) 11 C) 10
D) 9 E) 8

8. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$[EF] \perp [BC]$,
$|DE| = 9$ cm,
$|EC| = 6$ cm,
$|EF| = 4$ cm
$\Rightarrow$ **A(ABCD) = ? cm²**



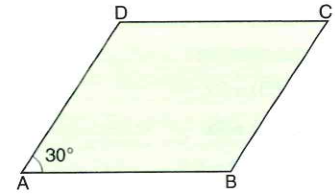
A) 120 B) 135 C) 140
D) 144 E) 150

9. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$m(\widehat{DAB}) = 120°$,
$|DB| = 12\sqrt{3}$ cm
$\Rightarrow$ **A(ABCD) = ? cm²**



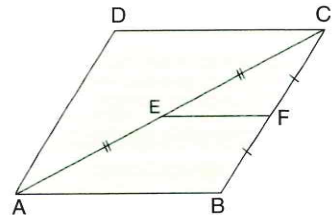
A) 72 B) $72\sqrt{3}$ C) 90
D) $90\sqrt{2}$ E) 144

10. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$|AB| = a$,
$m(\widehat{DAB}) = 30°$
$\Rightarrow$ **A(ABCD) = ? cm²**



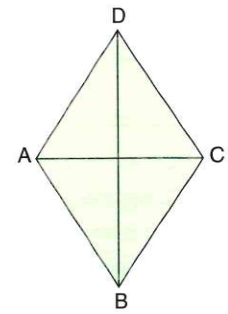
A) a^2 B) $2a^2$ C) $\frac{a^2}{2}$
D) $\frac{a^2}{4}$ E) $\frac{a^2\sqrt{3}}{4}$

11. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$|CE| = |EA|$,
$|CF| = |FB|$,
$m(\widehat{ABC}) = 2 \cdot m(\widehat{BCD})$,
$|EF| = 3$ cm $\Rightarrow$ **A(ABCD) = ? cm²**



A) $8\sqrt{3}$ B) $9\sqrt{3}$ C) $12\sqrt{3}$
D) $18\sqrt{3}$ E) $24\sqrt{3}$

12. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$|AB| + |BC| + |DC| + |AD| = 2p$
$|AC| + |BD| = m$
$\Rightarrow$ **A(ABCD) = ? cm²**



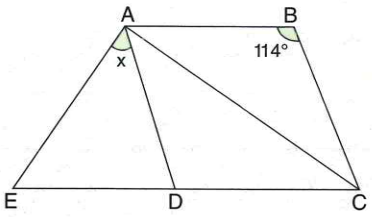
A) p^2+m^2 B) $\frac{m^2-p^2}{4}$ C) $\frac{p^2-m^2}{2}$
D) $\frac{p^2+m^2}{4}$ E) $\frac{p^2+m^2}{16}$

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	C	B	B	E	D	A	E	B	C	D	B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

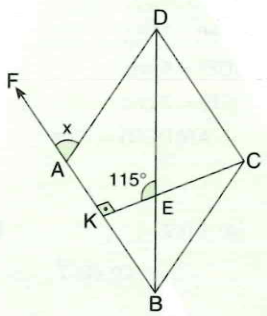
1.



ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$|AE| = |AC|$, $m(\widehat{ABC}) = 114° \Rightarrow$ **$m(\widehat{EAD}) = x = ?$**

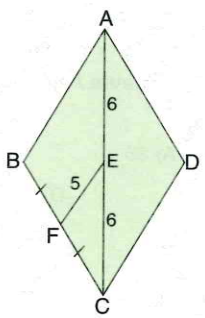
A) 81 B) 79 C) 77
D) 73 E) 69

2. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$[CK] \perp [AB]$,
$m(\widehat{DEK}) = 115°$
$\Rightarrow$ **$m(\widehat{FAD}) = x = ?$**



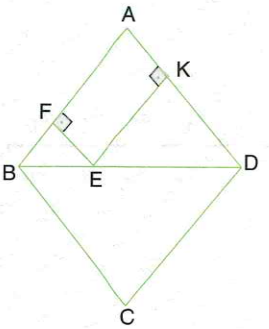
A) 30 B) 45 C) 50
D) 60 E) 65

3. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$|AE| = |EC| = 6$ cm,
$|FE| = 5$ cm,
$|BF| = |FC|$
$\Rightarrow$ **$A(ABCD) = ?$ cm^2**



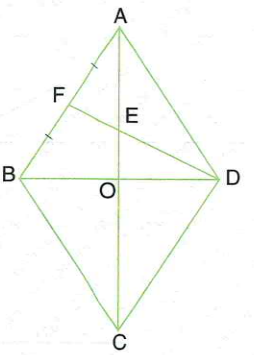
A) 36 B) 48 C) 64
D) 72 E) 96

4. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$[EF] \perp [AB]$,
$[EK] \perp [AD]$,
$|BC| = 10$ cm,
$|BD| = 16$ cm
$\Rightarrow$ **$|EF| + |EK| = ?$ cm**



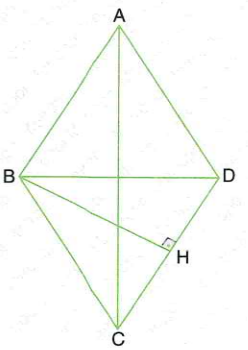
A) 8 B) 8,8 C) 9,6
D) 10 E) 12,4

5. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$|AF| = |BF|$,
$|DF| = 9$ cm,
$|OE| = 3$ cm
$\Rightarrow$ **$|CD| = ?$ cm**



A) 6 B) 9 C) $6\sqrt{3}$
D) $9\sqrt{3}$ E) 12

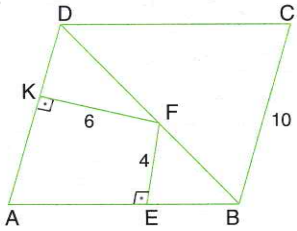
6. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
$[BH] \perp [CD]$,
$|BH| = 6$ cm,
$|AB| = 10$ cm,
$|AC| > |BD|$
$\Rightarrow$ **$|AC| = ?$ cm**



A) $4\sqrt{5}$ B) $6\sqrt{5}$ C) $6\sqrt{10}$
D) $8\sqrt{5}$ E) $8\sqrt{10}$

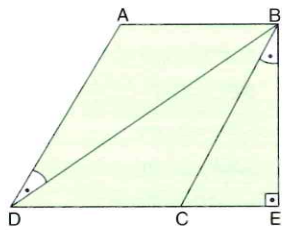
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
[FK] ⊥ [AD], [FE] ⊥ [AB],
|FK| = 6 cm, |FE| = 4 cm
⇒ **A(ABCD) = ? cm²**



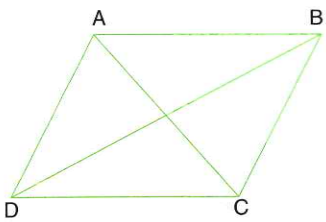
A) 70 B) 75 C) 85 D) 90 E) 100

8. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
[DE] ⊥ [BE],
$m(\widehat{ADB}) = m(\widehat{CBE})$,
|CE| = 6 cm
⇒ **A(ABCD) = ? cm²**



A) $36\sqrt{3}$ B) $48\sqrt{3}$ C) $60\sqrt{3}$
D) $72\sqrt{3}$ E) $84\sqrt{3}$

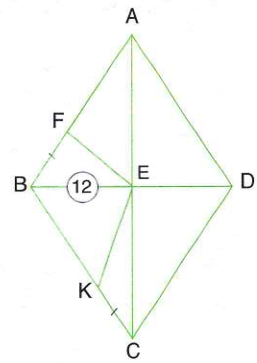
9.



ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
|AB| = 7 cm, A(ABCD) = 32 cm² ⇒ **|AC| + |BD| = ? cm**

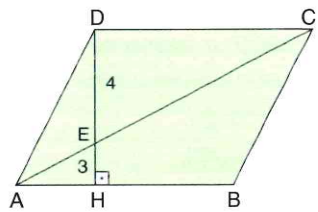
A) 16 B) 18 C) 20
D) 22 E) 24

10. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
|BF| = |KC|,
A(BKEF) = 12 cm²
⇒ **A(ABCD) = ? cm²**



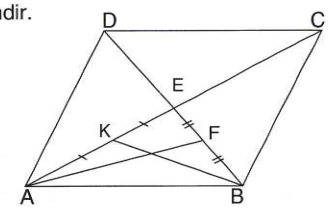
A) 24 B) 36 C) 48
D) 60 E) 72

11. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
[DH] ⊥ [AB],
|DE| = 4 cm,
|EH| = 3 cm
⇒ **A(ABCD) = ? cm²**



A) $14\sqrt{7}$ B) $21\sqrt{7}$ C) $28\sqrt{7}$
D) $42\sqrt{7}$ E) $49\sqrt{7}$

12. ABCD bir eşkenar dörtgendir.
ABCD is an equilateral quadrangle.
|AK| = |KE|,
|EF| = |FB|,
|AF| = $\sqrt{222}$ cm,
|BK| = $\sqrt{183}$ cm
⇒ **Çevre / The perimeter (ABCD) = ? cm**



A) 36 B) 54 C) 64
D) 72 E) 80

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
A	C	E	C	C	C	E	D	B	C	C	D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

BÖLÜM CHAPTER 9

TARİHSEL NOT / HISTORICAL NOTE

John Horton Conway [1937 –]

Sınırlı grupların teorilerinde, düğüm teorisinde, sayı teorisinde, kombinasyonal oyun teorisinde ve kodlama teorisinde katkısı bulunan matematikçidir. Conway Princeton Üniversitesinde şu anda matematik profesörüdür. Cambridge Harold Davenport altında araştırmaya başlamıştır. Erdös sayısından birine sahiptir

Productive and active mathematician in the fields of limited groups theory, nodal theory, number theory, combinational game theory and coding theory. Conway is currently a professor of mathematics at Princeton University. He began the investigative study supervised by Harold Davenport in Cambridge. He has one of the Erdos numbers.

DİKDÖRTGEN ve KARE
RECTANGLE and SQUARE

Bu bölüm, 10 çözümlü örnek, 12 çözümlü test sorusu, 6 çözümlü YÖS sorusu, 24 alıştırma sorusu, 96 test sorusu içermektedir.

This chapter includes 10 examples with solutions, 12 test questions with solutions, 6 YÖS questions with solutions, 24 exercise questions and 96 test questions.

BÖLÜM / CHAPTER 9 ..... 305 - 338

DİKDÖRTGEN ve KARE / RECTANGLE and SQUARE

- Dikdörtgen / Rectangle ..... 307 - 310
  - Dikdörtgenin Çevresi ve Alanı / The Perimeter and Area of a Rectangle ..... 307 - 308
  - Dikdörtgenin Köşegen Uzunlukları / The Length of The Diagonals of a Rectangle ..... 308 - 310
- Kare / Square ..... 310 - 312
  - Karenin Çevresi ve Alanı / The Perimeter and Area of a Square ..... 310 - 311
  - Karenin Köşegen Uzunlukları / The Length of The Diagonal in a Square ..... 311 - 312
- Çözümlü Test / Test With Solutions ..... 313 - 316
- YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 317 - 318
- Alıştırmalar / Exercises ..... 319 - 322
- Konu Testleri / Practice Tests ..... 323 - 338

BÖLÜM
09
CHAPTER

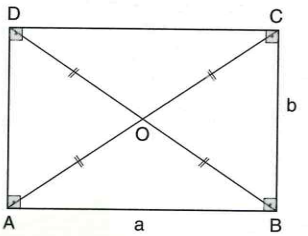
DİKDÖRTGEN ve KARE
RECTANGLE and SQUARE

DİKDÖRTGEN / RECTANGLE

Tanım: Dört açısı dik ve karşılıklı kenarları eşit uzunlukta olan paralelkenara **dikdörtgen** denir. Paralelkenarın bütün özelliklerini taşır.

Definition: A parallelogram is called a **rectangle** if all of its angles are right and its opposite sides have equal lengths. It holds all properties of a paralellogram.

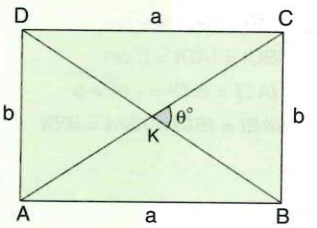
|AB| = a
|BC| = b
|AC| = |BD| = e



DİKDÖRTGENİN ÇEVRESİ ve ALANI / THE PERIMETER and AREA of a RECTANGLE

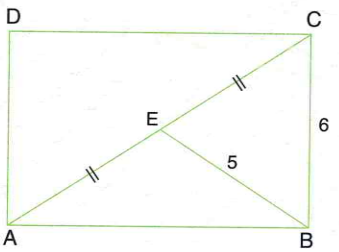
|AB| = |CD| = a cm
|AD| = |BC| = b cm
$m(\widehat{CKB}) = \theta^o$
Çevre / The Perimeter (ABCD) = 2·(a + b)

$$A(ABCD) = a \cdot b = \frac{|AC| \cdot |BD| \cdot \sin\theta}{2}$$



Örnek / Example 1

ABCD dikdörtgendir.
ABCD is a rectangle.
|AE| = |EC|,
|EB| = 5 cm,
|BC| = 6 cm
⇒ **Çevre / The perimeter (ABCD) = ? cm**



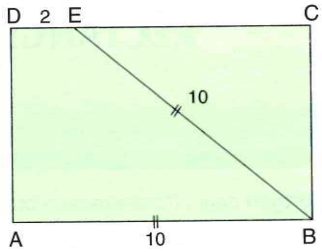
A) 28 B) 30 C) 32 D) 34 E) 36

Çözüm / Solution Yanıt / Answer **A**

[BC] ⊥ [AB] ⇒ |AE| = |EC| = |EB| = 5 cm
|AE| = |EC| = 5 cm ⇒ |AC| = 10 cm
$|AB|^2 = |AC|^2 - |BC|^2$
$= 10^2 - 6^2$
$= 100 - 36 = 64$
|AB| = 8 cm
Çevre / The perimeter (ABCD) = 2(6 + 8) = 28 cm

Örnek / Example 2

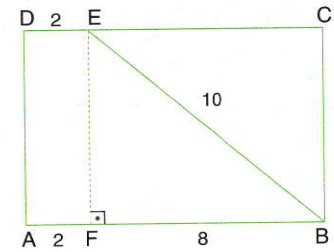
ABCD dikdörtgendir.
ABCD is a rectangle.
|AB| = |EB| = 10 cm,
|DE| = 2 cm
⇒ **A(ABCD) = ? cm²**



A) 45 B) 50 C) 55 D) 60 E) 65

Çözüm / Solution Yanıt / Answer **D**

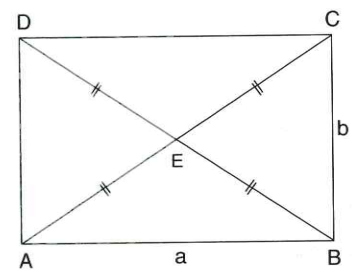
[EF] ⊥ [AB]
⇒ |DE| = |AF| = 2 cm
|AF| = 2 cm
⇒ |FB| = 10 – 2 = 8 cm
$|EF|^2 + |FB|^2 = |EB|^2$
$|EF|^2 + 64 = 100$
⇒ |EF| = 6 cm
A(ABCD) = 6·10 = 60 cm²



DİKDÖRTGENİN KÖŞEGEN UZUNLUKLARI / THE LENGTH of the DIAGONALS of a RECTANGLE

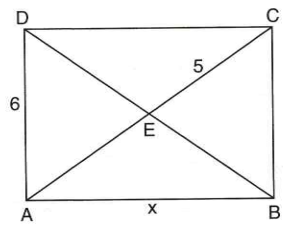
Özellik 1 / Property 1

|AB| = |DC| = a cm
|BC| = |AD| = b cm
|AC| = |BD| = $\sqrt{a^2 + b^2}$
|AE| = |EC| = |EB| = |ED|



Örnek / Example 3

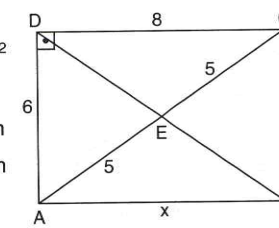
ABCD dikdörtgen,
ABCD is a rectangle,
|EC| = 5 cm,
|AD| = 6 cm
⇒ **|AB| = x = ? cm**



A) 5 B) 6 C) 7 D) 8 E) 9

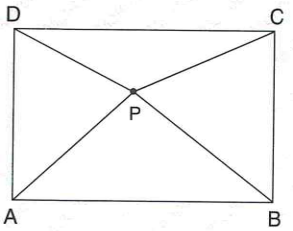
Çözüm / Solution Yanıt / Answer **D**

|AE| = |EC| ⇒ |AE| = 5 cm
m(D̂) = 90° ⇒ $|AD|^2 + |DC|^2 = |AC|^2$
$\Rightarrow 6^2 + |DC|^2 = 10^2$
$\Rightarrow |DC|^2 = 64 \Rightarrow$ |DC| = 8 cm
|DC| = |AB| = x = 8 cm



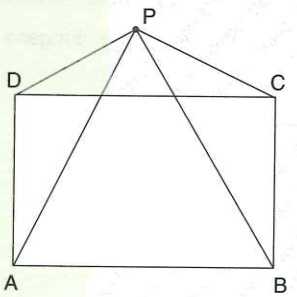
Özellik 2 / Property 2

P noktası ABCD dikdörtgenin içinden alınan herhangi bir nokta ise;
If P is any point selected from the inner area of the rectangle;
$|PA|^2 + |PC|^2 = |PB|^2 + |PD|^2$ elde edilir. / is obtained.



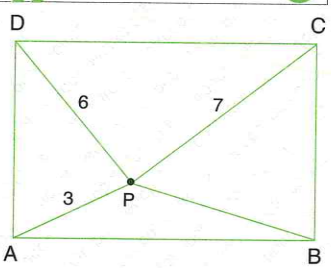
Özellik 3 / Property 3

Eğer P noktası dikdörtgenin dışında seçilmişse;
If P is selected from the outside of the rectangle;
$|PD|^2 + |PB|^2 = |PC|^2 + |PA|^2$ elde edilir. / is obtained.



Örnek / Example 4

ABCD dikdörtgendir.
ABCD is a rectangle.
$|PD| = 6$ cm,
$|PA| = 3$ cm,
$|PC| = 7$ cm
$\Rightarrow$ **$|PB| = ?$ cm**



A) $\sqrt{11}$ B) $2\sqrt{11}$ C) $3\sqrt{11}$ D) $\sqrt{22}$ E) $2\sqrt{22}$

Çözüm / Solution

Yanıt / Answer **D**

$|PA|^2 + |PC|^2 = |PB|^2 + |PD|^2$

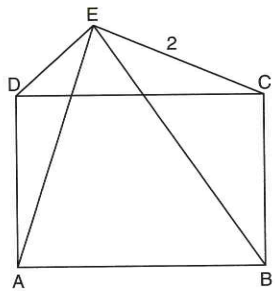
$3^2 + 7^2 = |PB|^2 + 6^2$

$58 = |PB|^2 + 36$

$|PB| = \sqrt{22}$ cm

Örnek / Example 5

ABCD dikdörtgen,
ABCD is a rectangle,
$|AE| = 5$ cm,
$|BE| = \sqrt{13}$ cm,
$|EC| = 2$ cm
$\Rightarrow$ **$|DE| = ?$ cm**



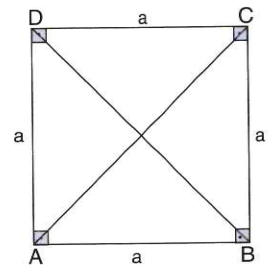
A) 2 B) 3 C) 4 D) 5 E) 6

Çözüm / Solution Yanıt / Answer **C**

$|DE|^2 + |BE|^2 = |AE|^2 + |EC|^2$
$|DE|^2 + (\sqrt{13})^2 = 5^2 + 2^2$
$|DE|^2 + 13 = 25 + 4$
$|DE|^2 = 29 - 13$
$|DE|^2 = 16$
$|DE| = 4$

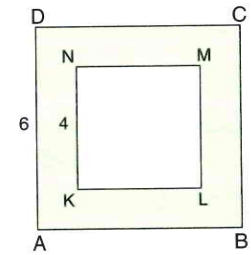
KARE / SQUARE

Tanım: Dört kenarı birbirine eşit olan dikdörtgene **kare** denir. Dikdörtgenin bütün özelliklerini taşır.
Definition: A rectangle in which its all four sides have the same length is called a **square**. It holds all the properties of the rectangle.



KARENİN ÇEVRESİ ve ALANI / THE PERIMETER and AREA of a SQUARE

$|AB| = |BC| = |CD| = |DA| = a$
Çevre / Perimeter (ABCD) = 4a
A(ABCD) = a^2



Örnek / Example 6

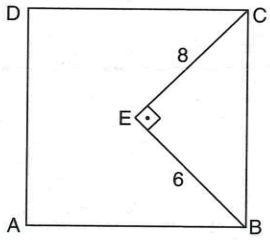
ABCD karedir.

ABCD is a square.

|BE| = 6 cm,

|CE| = 8 cm

⇒ **Çevre / The perimeter (ABCD) = ? cm**



A) 20 B) 30 C) 40 D) 60 E) 80

Çözüm / Solution Yanıt / Answer **C**

$m(\widehat{BEC}) = 90° \Rightarrow |BC|^2 = |EB|^2 + |EC|^2$

$|BC|^2 = 6^2 + 8^2$

$|BC|^2 = 36 + 64$

$|BC|^2 = 100$

$|BC| = 10$ cm

$|AB| = |BC| = |CD| = |AD| = 10$ cm

$Ç(ABCD) = 4 \cdot 10 = 40$ cm

Örnek / Example 7

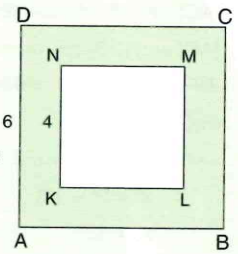
ABCD ve KLMN birer karedir.

ABCD and KLMN are square.

|AB| = 6 cm,

|NK| = 4 cm

⇒ **Taralı alan / The shaded area = ? cm²**



A) 10 B) 12 C) 15 D) 18 E) 20

Çözüm / Solution Yanıt / Answer **E**

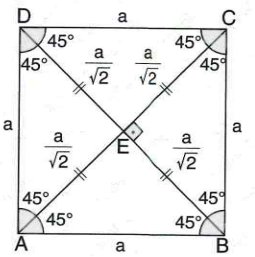
$|AB| = 6$ cm $\Rightarrow A(ABCD) = 6^2 = 36$ cm²

$|NK| = 4$ cm $\Rightarrow A(KLMN) = 4^2 = 16$ cm²

Taralı alan / The shaded area = $36 - 16 = 20$ cm²

KARENİN KÖŞEGEN UZUNLUKLARI / THE LENGTH of THE DIAGONAL in a SQUARE

1. Karenin köşegenleri birbirini dik ortalar.
   The diagonals of square are perpendicular and intersect in their midpoints.
2. Köşegenler, karedeki karşılıklı açıların açıortayıdır.
   Each diagonal is bisector of the two opposite angels of the square.
3. Bir kenarının uzunluğu a olan karede köşegen uzunluğu,
   If the length of any side is a, the length of diagonal is
   |AC| = |BD| = a√2 dir.



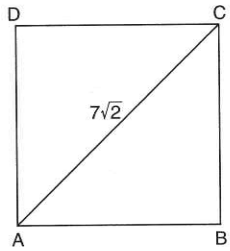
Örnek / Example 8

ABCD bir karedir.

ABCD is a square.

$|AC| = 7\sqrt{2}$ cm

$\Rightarrow$ **A(ABCD) = ? cm²**

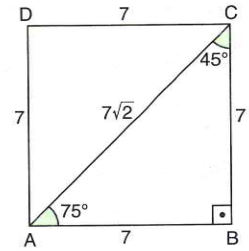


A) 14 B) 28 C) 35 D) 49 E) 64

Çözüm / Solution — Yanıt / Answer D

$|AB| = 7 = |BC|$

$A(ABCD) = 7^2 = 49$ cm²



Örnek / Example 9

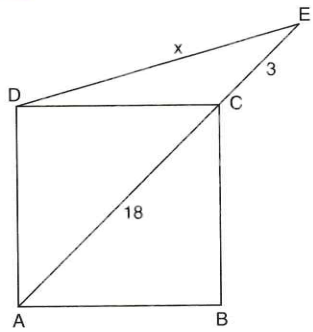
ABCD bir karedir.

ABCD is a square.

$|AC| = 18$ br (u),

$|EC| = 3$ br (u)

$\Rightarrow$ **$|DE| = x$ = ? br(u)**



A) 11 B) 12 C) 13 D) 14 E) 15

Çözüm / Solution — Yanıt / Answer E

[AC] ve [DB] köşegenler

[AC] and [DB] are diagonals

$|DF| = |AF| = |FC| = 9$ br (u)

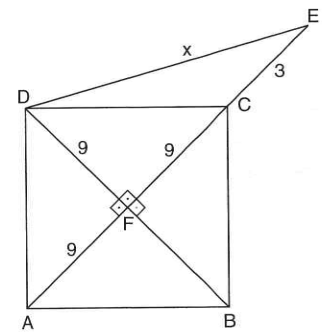
$m(\widehat{DFC}) = 90°$

$\Rightarrow |DE|^2 = |DF|^2 + |FE|^2$

$x^2 = 9^2 + 12^2$

$x^2 = 225$

$x = 15$ br (u)



Örnek / Example 10

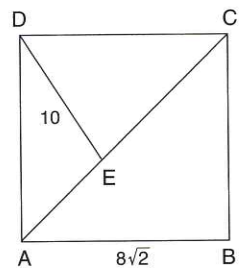
ABCD bir karedir.

ABCD is a square.

$|AB| = 8\sqrt{2}$ cm,

$|DE| = 10$ cm

$\Rightarrow$ **$|EC|$ = ? cm**



A) 12 B) 14 C) 16 D) 18 E) 20

Çözüm / Solution — Yanıt / Answer B

$|AB| = 8\sqrt{2}$ cm

$\Rightarrow |AC| = 8\sqrt{2} \cdot \sqrt{2} = 16$ cm

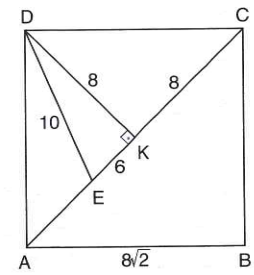
$|CK| = |AK| = 8$ cm $\Rightarrow |DK| = 8$ cm

$|DE|^2 = |DK|^2 + |EK|^2$

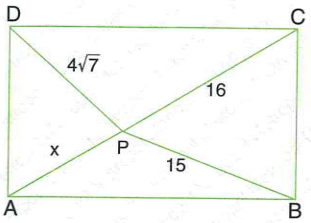
$100 = 64 + |EK|$

$|EK| = 6$ cm

$|EC| = 8 + 6 = 14$ cm



1.



ABCD bir dikdörtgendir. / ABCD is a rectangle.

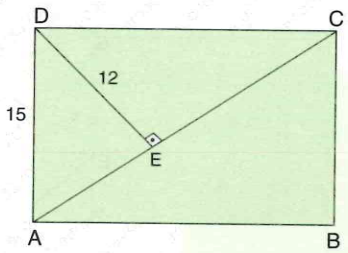
$|PA| = x$, $|PD| = 4\sqrt{7}$ cm,

$|PC| = 16$ cm, $|PB| = 15$ cm $\Rightarrow$ **$|PA| = x = ?$ cm**

A) 9 B) $7\sqrt{2}$ C) $6\sqrt{3}$

D) $4\sqrt{7}$ E) 12

2.



ABCD dikdörtgendir. / ABCD is a rectangle.

$[DE] \perp [AC]$, $|AD| = 15$ cm,

$|DE| = 12$ cm $\Rightarrow$ **$A(ABCD) = ?$ cm^2**

A) 225 B) 250 C) 270

D) 285 E) 300

3. ABCD bir dikdörtgendir.

ABCD is a rectangle.

$[BH] \perp [AC]$,

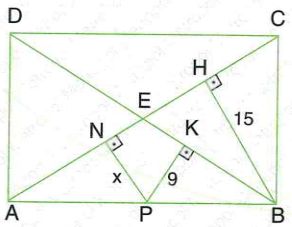
$[PN] \perp [AC]$,

$[PK] \perp [DB]$,

$|BH| = 15$ cm,

$|PK| = 9$ cm

$\Rightarrow$ **$|PN| = x = ?$ cm**



A) 4 B) 5 C) 6

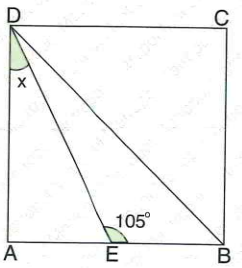
D) 7 E) 7, 5

4. ABCD bir karedir.

ABCD is a square.

$m(\widehat{DEB}) = 105°$

$\Rightarrow$ **$m(\widehat{EDA}) = x = ?$**



A) 15° B) 20° C) 25°

D) 30° E) 35°

5. ABCD bir karedir.

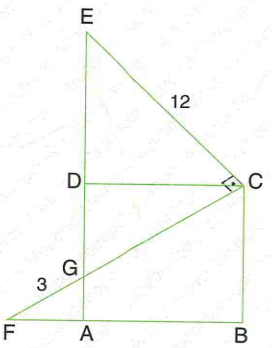
ABCD is a square.

$[EC] \perp [FC]$,

$|EC| = 12$ cm,

$|FG| = 3$ cm

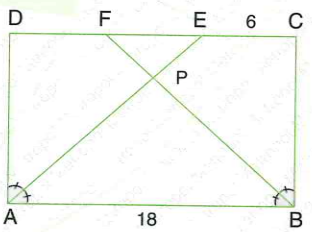
$\Rightarrow$ **$|AB| = ?$ cm**



A) 7 B) 7,2 C) 7,6

D) 8 E) 9,6

6.



ABCD bir dikdörtgen; [AE] ve [BF] açıortaydır.

ABCD is a rectangle; [AE] and [BF] are bisectors.

$|AB| = 18$ cm, $|EC| = 6$ cm

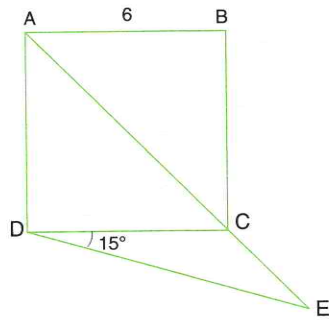
$\Rightarrow$ **Çevre / The perimeter (ABCD) = ? cm**

A) 44 B) 52 C) 54

D) 56 E) 60

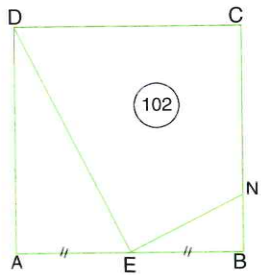
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCD bir karedir.
ABCD is a square.
$m(\widehat{CDE}) = 15°$,
$|AB| = 6$ cm
$\Rightarrow$ **$|DE| = ?$ cm**



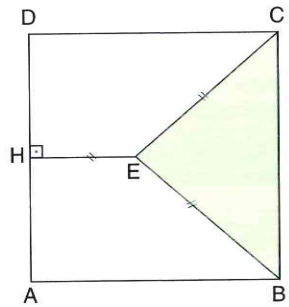
A) 8 B) $8\sqrt{2}$ C) $6\sqrt{2}$
D) $\frac{9\sqrt{2}}{2}$ E) $3\sqrt{2}$

8. ABCD bir karedir.
ABCD is a square.
$|AE| = |EB|$,
$|CN| = 5 \cdot |NB|$,
$A(ENCD) = 102$ cm^2
$\Rightarrow$ **$A(ABCD) = ?$ cm^2**



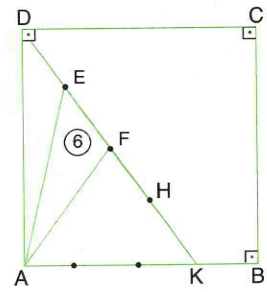
A) 144 B) 169 C) 196
D) 256 E) 324

9. ABCD bir karedir.
ABCD is a square.
$[EH] \perp [AD]$,
$|HE| = |EB| = |EC|$
$|AD| = 16$ cm
$\Rightarrow$ **$A(\widehat{BEC}) = ?$ cm^2**



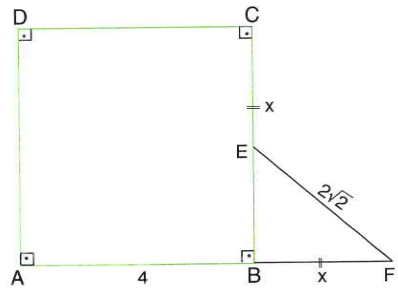
A) 24 B) 36 C) 48
D) 60 E) 72

10. ABCD kare, [DK] ve [AB] dört eş parçaya bölünmüş doğru parçalarıdır.
ABCD is a square.
[DK] and [AB] are divided into four equal pieces.
$A(\triangle AEF) = 6$ cm^2
$\Rightarrow$ **$|AB| = ?$ cm**



A) 6 B) 8 C) 10
D) 12 E) 16

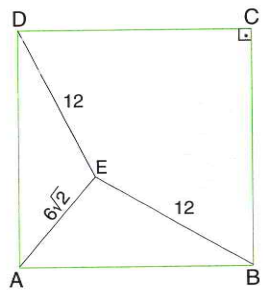
11.



ABCD kare / square,
$|AB| = 4$ cm,
$|EF| = 2\sqrt{2}$ cm,
$|EC| = |BF| = x$
$\Rightarrow$ **$x = ?$ cm**

A) 1 B) $\sqrt{2}$ C) $\sqrt{3}$
D) 2 E) $\sqrt{6}$

12. ABCD kare / square,
$|AE| = 6\sqrt{2}$ cm,
$|EB| = |DE| = 12$ cm
$\Rightarrow$ **$m(\widehat{DEB}) = ?$**



A) 105° B) 120° C) 130°
D) 135° E) 150°

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
A	E	C	A	B	E	C	A	C	B	D	E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $|PA|^2 + |PC|^2 = |PB|^2 + |PD|^2$

$x^2 + 16^2 = (4\sqrt{7})^2 + 15^2$

$x^2 + 256 = 112 + 225$

$x^2 = 81 \Rightarrow x = 9$ cm

Yanıt / The Answer is A

2. $|AD|^2 = |AE|^2 + |DE|^2$

$225 = |AE|^2 + 144 \Rightarrow |AE| = 9$ cm

$\left.\begin{array}{l}[DE] \perp [AC] \\ [AD] \perp [DC] \\ |AE| = 9\,\text{cm} \\ |DE| = 12\,\text{cm}\end{array}\right\} \Rightarrow |DE|^2 = |AE| \cdot |EC|$

$144 = 9 \cdot |EC|$

$|EC| = 16$

$2 \cdot A(\widehat{ADC}) = A(ABCD)$

$2 \cdot \frac{12 \cdot (9+16)}{2} = 300\,\text{cm}^2$

Yanıt / The Answer is E

3. $|AE| = |EC| = |DE| = |EB| = y$

$A(\widehat{BEC}) = A(\widehat{AEB})$,

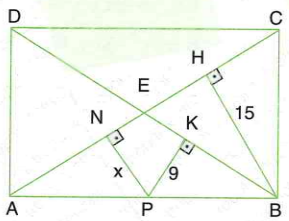
$A(\widehat{AEB}) = A(\widehat{AEP}) + A(\widehat{EBP})$

$\frac{|AE| \cdot 15}{2} = \frac{|AE| \cdot x}{2} + \frac{|EB| \cdot 9}{2}$

$\frac{y \cdot 15}{2} = \frac{y \cdot x}{2} + \frac{y \cdot 9}{2}$

$\frac{15}{2} = \frac{x}{2} + \frac{9}{2}$

$\frac{6}{2} = \frac{x}{2} \Rightarrow x = 6$ cm



Yanıt / The Answer is C

4. $\widehat{ADE}$;

$m(\widehat{DAE}) + m(\widehat{ADE}) = m(\widehat{DEB})$

$90° + x = 105°$

$x = 15°$

Yanıt / The Answer is A

5. $\widehat{FBC} \sim \widehat{EDC}$

$\frac{|FB|}{|ED|} = \frac{|FC|}{|EC|} = \frac{|BC|}{|CD|} = 1$

$\widehat{FBC} \cong \widehat{EDC} \Rightarrow |FC| = |EC| = 12$ cm

$|GC| = 12 - 3 = 9$ cm

$\widehat{FAG} \sim \widehat{CDG}$

$k = \frac{|FG|}{|CG|} = \frac{3}{9} = \frac{1}{3}$

$|AG| = n$, $|DG| = 3n$, $|DC| = 4n$

$(3n)^2 + (4n)^2 = 9^2$

$25n^2 = 81 \Rightarrow n = \frac{9}{5}$

$|DC| = |AB| = 4 \cdot n = \frac{36}{5} = 7{,}2$ cm

Yanıt / The Answer is B

6. Dikdörtgen bir paralelkenar olduğundan,

As a rectangle is also a paralellogram then,

$[AB] // [CD]$

$m(\widehat{CFB}) = m(\widehat{FBC}) \Rightarrow |BC| = |FC|$,

$m(\widehat{DAE}) = m(\widehat{DEA}) \Rightarrow |AD| = |DE|$

$|CF| = |BC| = |FE| + |EC|$, $|DE| = |AD| = |FE| + |DF|$

$|AD| = |BC| \Rightarrow |EC| = |DF| = 6$ cm $\Rightarrow |AB| = 18$ cm, $|EF| = 6$ cm

$|AD| = |BC| = 12$ cm

Çevre / The perimeter (ABCD) $= 2 \cdot (18 + 12) = 60$ cm

Yanıt / The Answer is E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $[AC] \perp [BD]$

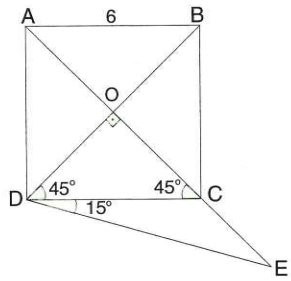
$\Rightarrow m(\widehat{AED}) = 30°$

$|DE| = 2|DO| = |BD|,$

$|BD| = 6\sqrt{2}$ cm,

$|DO| = 3\sqrt{2}$ cm,

$|DE| = 6\sqrt{2}$ cm



Yanıt / The Answer is C

8. $A(ENCD) = A(ABCD) - \left[A(\widehat{DAE}) + A(\widehat{EBN})\right]$

$|BN| = k \Rightarrow |AB| = 6k$

$A(ENCD) = 36k^2 - \left(9k^2 + \frac{3k^2}{2}\right)$

$102 = \frac{51k^2}{2} \Rightarrow k^2 = 4$

$A(ABCD) = 36 \cdot k^2$

$A(ABCD) = 36 \cdot 4$

$= 144\,cm^2$

Yanıt / The Answer is A

9. $[HE] \perp [BC]$

$|CK| = \frac{|BC|}{2} = \frac{16}{2} = 8$ cm

$|HE| = |EC| = |EB| = x$

$|EK| = 16 - x$

$x^2 = 8^2 + (16 - x)^2$

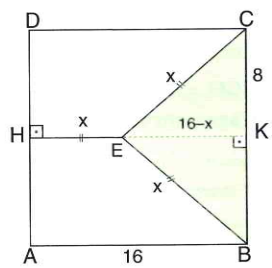
$x^2 = 64 + 256 - 32x + x^2$

$32x = 320$

$x = 10$ cm

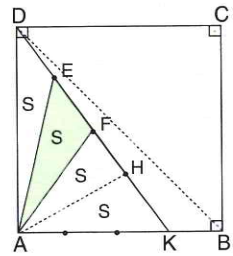
$|EK| = 6$ cm

$A(\widehat{BEC}) = \frac{16 \cdot 6}{2} = 48\,cm^2$



Yanıt / The Answer is C

10.



$|AB| = |DC| = |CB| = |AD| = a$

$\Rightarrow A(\widehat{AEF}) = S,\ A(\widehat{ADK}) = 4 \cdot S,\ A(\widehat{DKB}) = \frac{4 \cdot S}{3}$

$\Rightarrow A(\widehat{DAB}) = \frac{4 \cdot S}{3} + 4S = \frac{16 \cdot S}{3}$

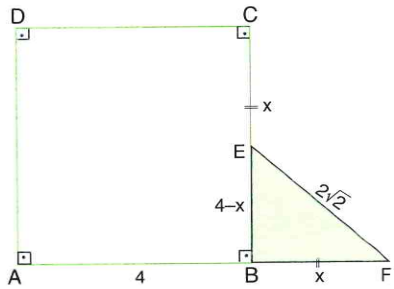
$\Rightarrow A(ABCD) = 2 \cdot A(\widehat{DAB}) = \frac{32 \cdot S}{3}$

$\Rightarrow A(\widehat{AEF}) = 6 \Rightarrow \frac{32 \cdot 6}{3} = 64\,cm^2$

$a^2 = 64 \Rightarrow a = 8$ cm

Yanıt / The Answer is B

11.



$(2\sqrt{2})^2 = (4-x)^2 + x^2$

$8 = 16 - 8x + x^2 + x^2$

$8 = 2x^2 - 8x + 16$

$0 = x^2 - 4x + 4$

$0 = (x-2)^2$

$2 = x$

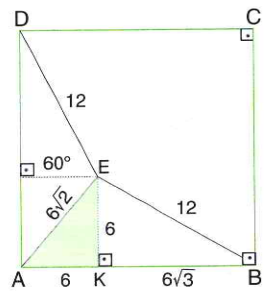
Yanıt / The Answer is D

12. $\widehat{AKE}$ de $|AK| = |EK|$

$|AK| = 6$ cm

$\widehat{EKB}$ de $|KB| = 6\sqrt{3}$ cm

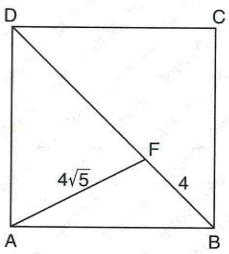
$\Rightarrow m(\widehat{DEB}) = 150°$



Yanıt / The Answer is E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

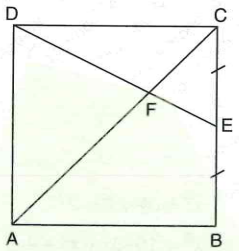
1. ABCD kare,
ABCD square,
$|AF| = 4\sqrt{5}$
$|FB| = 4$
$\Rightarrow$ **Alan(ABCD) = ?**
Area(ABCD) = ?



A) $64\sqrt{2}$ B) 120 C) 128
D) 144 E) $128\sqrt{2}$

[İSTANBUL ÜNİVERSİTESİ – YÖS 2018]

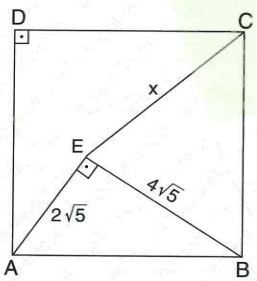
2. ABCD kare / square,
$A(CFE) = 4\ cm^2$
$\Rightarrow$ **A(ABCD) = ?**



A) 24 B) 32 C) 36
D) 42 E) 48

[DUMLUPINAR ÜNİVERSİTESİ – YÖS 2018]

3.

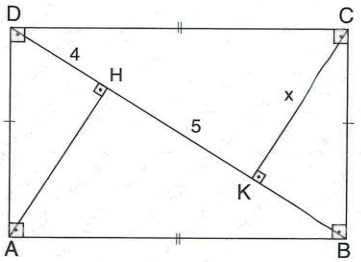


$[CD] \perp [AD]$
$|CDI = |CBI = |ADI = |ABI$
$|AEI = 2\sqrt{5}$ cm
$|BEI = 4\sqrt{5}$ cm
$[BE] \perp [AE]$
$|ECI = x \Rightarrow$ **x = ? cm**

A) 45 B) 10 C) 12
D) 15 E) 18

[ANADOLU ÜNİVERSİTESİ – YÖS 2017]

4.

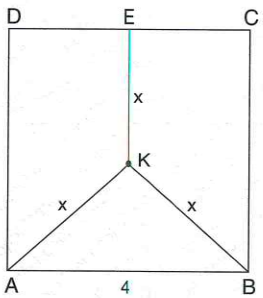


$m(\widehat{A}) = m(\widehat{B}) = m(\widehat{C}) = m(\widehat{D})$,
$|DH| = 4$, $|HK| = 5$
$\Rightarrow$ **|CK| = x = ?**

A) 4 B) 5 C) 6
D) 7 E) 8

[İSTANBUL ÜNİVERSİTESİ – YÖS 2014]

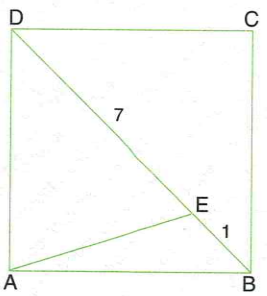
5. ABCD bir karedir.
ABCD is a square.
$[KE] \perp [DC]$,
$|AK| = |KB| = |KE| = x$,
$|AB| = 4$ cm $\Rightarrow$ **x = ? cm**



A) 2 B) $\frac{2}{5}$ C) $\frac{5}{2}$
D) $\frac{7}{2}$ E) 3

[AKDENİZ ÜNİVERSİTESİ – YÖS 2014]

6. ABCD bir karedir.
ABCD is a square.
$|BE| = 1$ birim (unit)
$|DE| = 7$ birim (unit)
$\Rightarrow$ **|AE| = ?**



A) 4 B) $3\sqrt{2}$ C) $2\sqrt{5}$
D) 5 E) $2\sqrt{7}$

[SÜLEYMAN DEMİREL ÜNİVERSİTESİ – YÖS 2014]

YANITLAR / ANSWERS

1	2	3	4	5	6
C	E	B	C	C	D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $m(\widehat{ABD}) = 45°$

$\Rightarrow |EB| = 2\sqrt{2}, |EF| = 2\sqrt{2}$

$|AF|^2 = |EF|^2 + |AE|^2$

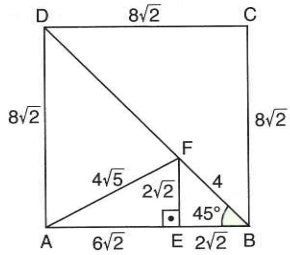
$\Rightarrow (4\sqrt{5})^2 = (2\sqrt{2})^2 + |AE|^2$

$\Rightarrow 80 = 8 + |AE|^2$

$\Rightarrow 72 = |AE|^2 \Rightarrow |AE| = 6\sqrt{2}$ cm

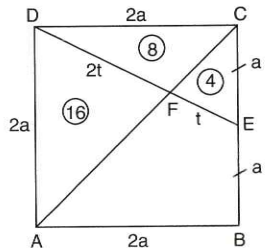
$|AB| = 8\sqrt{2}$

$\Rightarrow A(ABCD) = (8\sqrt{2})^2 = 128$



Yanıt / The Answer is C

2.



$|BE| = |CE| = a \Rightarrow |AB| = 2a = |AD| = |CD|$

$\widehat{CEF} \sim \widehat{ADF} \Rightarrow \frac{|CE|}{|AD|} = \frac{a}{2a} = \frac{1}{2} = k$

$\frac{A(\widehat{CEF})}{A(\widehat{ADF})} = k^2 \Rightarrow \frac{1}{4} = \frac{4}{A(\widehat{ADF})}$

$\Rightarrow A(\widehat{ADF}) = 16\ cm^2$

$A(\widehat{ADC}) = \frac{A(ABCD)}{2} \Rightarrow 2 \cdot 24 = A(ABCD) \Rightarrow 48 = A(ABCD)$

Yanıt / The Answer is E

3. $|AB|^2 = |AE|^2 + |EB|^2$

$|AB|^2 = (2\sqrt{5})^2 + (4\sqrt{5})^2$

$|AB|^2 = 20 + 80 \Rightarrow |AB| = 10$ cm

$A(\widehat{AEB})$

$\frac{2\sqrt{5} \cdot 4\sqrt{5}}{2} = \frac{h \cdot 10}{2} \Rightarrow h = 4$ cm

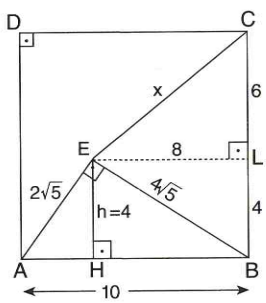
$(EB)^2 = |EL|^2 + |LB|^2$

$(4\sqrt{5})^2 = |EL|^2 + (4)^2$

$80 = |EL|^2 + 16 \Rightarrow |EL| = 8$ cm

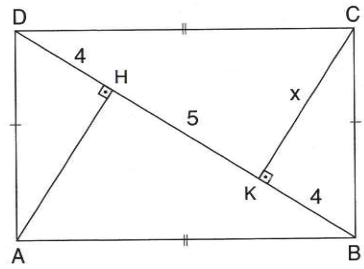
$\Rightarrow x^2 = 6^2 + 8^2$

$x = 10$ cm



Yanıt / The Answer is C

4.



$|DH| = |KB| = 4$ cm,

DBC üçgenine Öklit teoremi uygulanırsa,

If we apply Euclidean Teorem to the $\widehat{ABC}$

$x^2 = 9 \cdot 4$

$x^2 = 36$

$x = 6$ cm

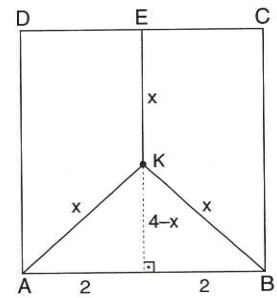
Yanıt / The Answer is C

5. $x^2 = (4-x)^2 + 2^2$

$x^2 = 16 - 8x + x^2 + 4$

$x^2 = x^2 - 8x + 20$

$8x = 20 \Rightarrow x = \frac{5}{2}$



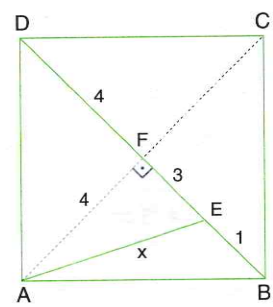
Yanıt / The Answer C

6. $\widehat{AEF}$

$|AE|^2 = 4^2 + 3^2$

$|AE|^2 = 16 + 9 = 25$

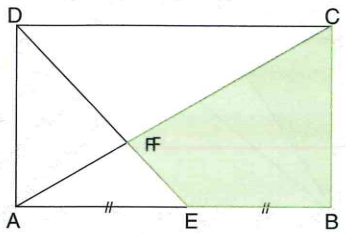
$|AE| = 5$ cm



Yanıt / The Answer is D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.

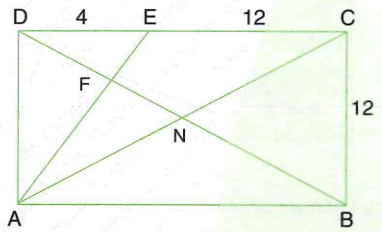


ABCD bir dikdörtgendir. / ABCD is a rectangle.

|AE| = |EB|, TA(SA) = 15 cm² ⇒ **A(ABCD) = ? cm²**

Yanıt / The Answer is 36

2.

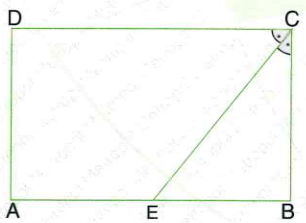


ABCD bir dikdörtgendir. / ABCD is a rectangle.

|BC| = |CE| = 12 cm, |DE| = 4 cm ⇒ **|FN| = ? cm**

Yanıt / The Answer is 6

3.



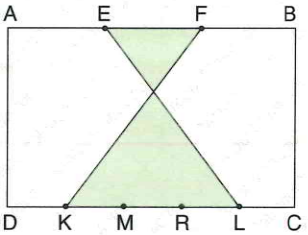
ABCD bir dikdörtgendir. / ABCD is a rectangle.

$m(\widehat{DCE}) = m(\widehat{ECB})$, $|CE| = 2\sqrt{2}$ cm, $A(AECD) = 18\,cm^2$

⇒ **Çevre / The perimeter (ABCD) = ? cm**

Yanıt / The Answer is 24

4.



ABCD bir dikdörtgendir. / ABCD is a rectangle.

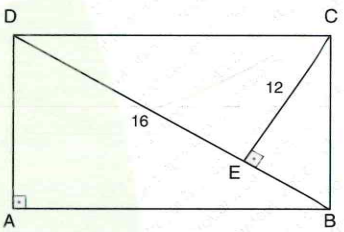
|AE| = |EF| = |FB|, |DK| = |KM| = |MR| = |RL| = |LC|,

A(ABCD) = 840 cm²

⇒ **Taralı alan (The shaded are) = ? cm²**

Yanıt / The Answer is 212

5.



ABCD bir dikdörtgendir. / ABCD is a rectangle.

[CE] ⊥ [BD], |EC| = 12 cm, |DE| = 16 cm

⇒ **|AB| + |DA| = ? cm**

Yanıt / The Answer is 35

6. ABCD bir dikdörtgendir.

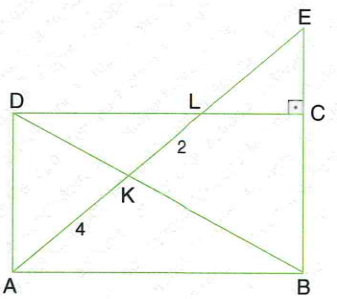
ABCD is a rectangle.

[EC] ⊥ [DC],

|AK| = 4 cm,

|KL| = 2 cm

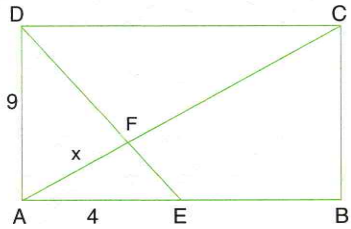
⇒ **|AE| = ? cm**



Yanıt / The Answer is 12

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.

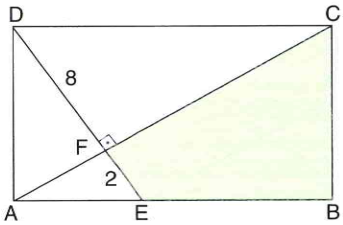


ABCD bir dikdörtgendir. / ABCD is a rectangle.

|AB| = 12 cm, |AD| = 9 cm, |AE| = 4 cm ⇒ **|AF| = x = ? cm**

Yanıt / The Answer is $\frac{15}{4}$

8.

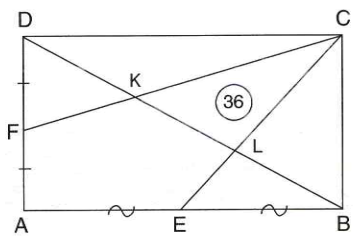


ABCD bir dikdörtgendir. / ABCD is a rectangle.

[DE] ⊥ [AC], |FE| = 2 cm, |DF| = 8 cm ⇒ **A(EBCF) = ? cm²**

Yanıt / The Answer is 76

9.



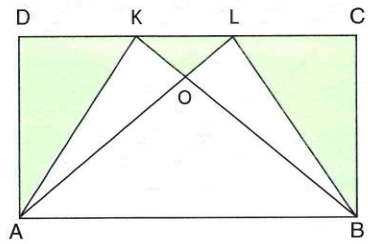
ABCD bir dikdörtgendir. / ABCD is a rectangle.

|DF| = |AF|, |AE| = |EB|,

$A(\widehat{CKL}) = 36\ cm^2$ ⇒ **A(ABCD) = ? cm²**

Yanıt / The Answer is 216

10.



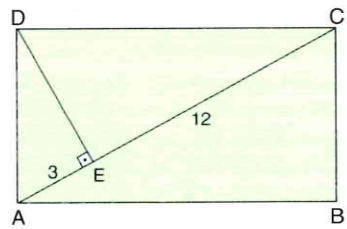
ABCD bir dikdörtgendir. / ABCD is a rectangle.

TA(SA) = 18 cm², A(ABCD) = 50 cm²

⇒ **$A(\widehat{AKO})$ = ? cm²**

Yanıt / The Answer is 7

11.

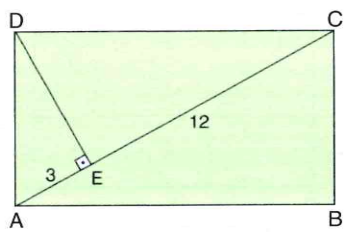


ABCD bir dikdörtgendir. / ABCD is a rectangle.

$m(\widehat{CAB}) = 15°$, |AC| = 12 cm ⇒ **A(ABCD) = ? cm²**

Yanıt / The Answer is 36

12.



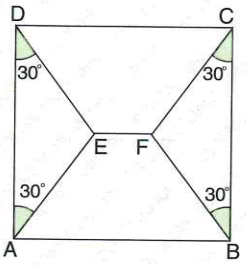
ABCD bir dikdörtgendir. / ABCD is a rectangle.

[DE] ⊥ [AC], |AE| = 3 cm, |EC| = 12 cm ⇒ **A(ABCD) = ? cm²**

Yanıt / The Answer is 90

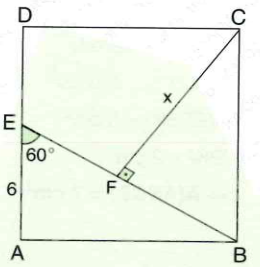
METROPOL YAYINLARI • METROPOL PUBLICATIONS

13. ABCD bir karedir.
ABCD is a square.
$|DC| = 6$ cm
$\Rightarrow$ **$|EF| = ?$ cm**



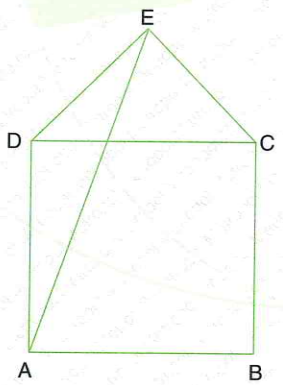
Yanıt / The Answer is $(6 - 2\sqrt{3})$

14. ABCD bir karedir.
ABCD is a square.
$[CF] \perp [EB]$,
$m(\widehat{AEB}) = 60°$,
$|EA| = 6$ cm
$\Rightarrow$ **$|CF| = x = ?$ cm**



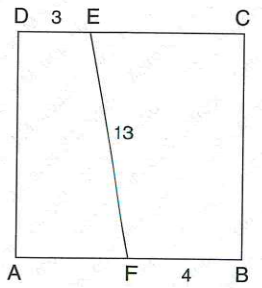
Yanıt / The Answer is 9

15. ABCD bir kare; EDC bir eşkenar üçgendir.
ABCD is a square;
EDC is an equilateral triangle.
$A(\widehat{DAE}) = 9\,cm^2$
$\Rightarrow$ **$|AB| + |EC| = ?$ cm**



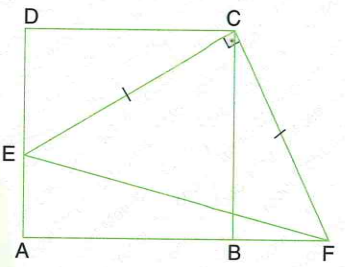
Yanıt / The Answer is 12

16. ABCD bir karedir.
ABCD is a square.
$|DE| = 3$ cm,
$|FB| = 4$ cm,
$|EF| = 13$ cm
$\Rightarrow$ **$|AB| = ?$ cm**



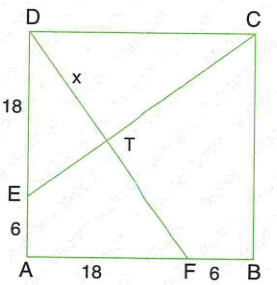
Yanıt / The Answer is 12

17. ABCD bir karedir.
ABCD is a square.
$[EC] \perp [CF]$,
$|CE| = |CF|$,
$|EF| = 5\sqrt{2}$ cm,
$|DC| = 4$ cm
$\Rightarrow$ **$|AF| = ?$ cm**



Yanıt / The Answer is 7

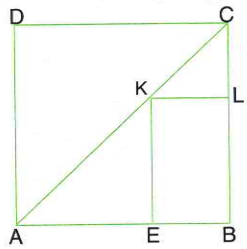
18. ABCD bir karedir.
ABCD is a square.
$|DE| = |AF| = 18$ cm,
$|EA| = |BF| = 6$ cm
$\Rightarrow$ **$|DT| = x = ?$ cm**



Yanıt / The Answer is $\frac{72}{5}$

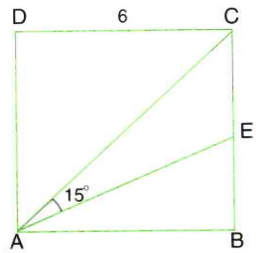
METROPOL YAYINLARI • METROPOL PUBLICATIONS

19. ABCD bir karedir.
ABCD is a square.
[KL] // [AB],
|AC| = $6\sqrt{2}$ cm
⇒ **|EB| + |BL| = ? cm**



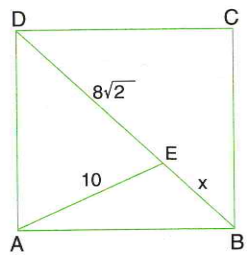
Yanıt / The Answer is 6

20. ABCD bir karedir.
ABCD is a square.
m($\widehat{CAE}$) = 15°,
|DC| = 6 cm
⇒ **|EC| = ? cm**



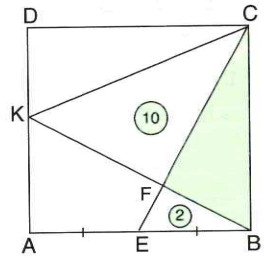
Yanıt / The Answer is $6 - 2\sqrt{3}$

21. ABCD bir karedir.
ABCD is a square.
|DE| = $8\sqrt{2}$ cm,
|AE| = 10 cm
⇒ **|EB| = x = ? cm**



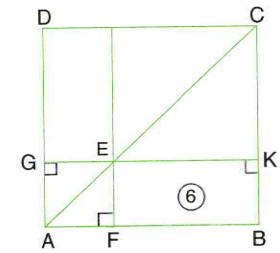
Yanıt / The Answer is $6\sqrt{2}$

22. ABCD bir karedir.
ABCD is a square.
|AE| = |EB|, |DK| = |KA|,
A($\widehat{KFC}$) = 10 cm^2,
A($\widehat{FEB}$) = 2 cm^2
⇒ **A($\widehat{CFB}$) = ? cm^2**



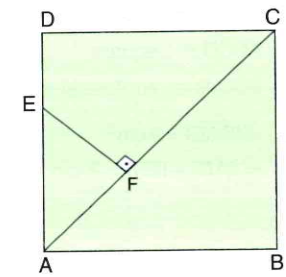
Yanıt / The Answer is 6

23. ABCD bir karedir.
ABCD is a square.
A(EFBK) = 6 cm^2,
|BK| = 2 cm
⇒ **A(ABCD) = ? cm^2**



Yanıt / The Answer is 25

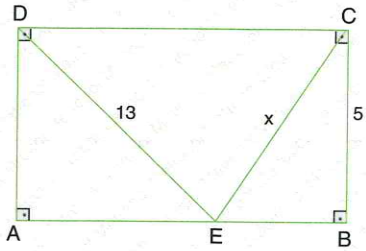
24. ABCD bir karedir.
ABCD is a square.
|EA| = 2|DE|,
[EF] ⊥ [AC],
|EF| = 2 cm.
⇒ **A(ABCD) = ? cm^2**



Yanıt / The Answer is 18

METROPOL YAYINLARI • METROPOL PUBLICATIONS

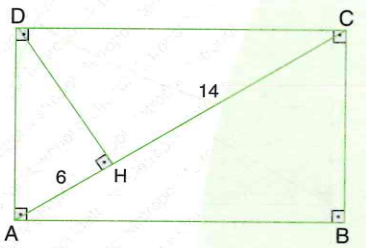
1.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
|DE| = 13 cm, |BC| = 5 cm, |DE| = |DC|
⇒ **|CE| = x = ? cm**

A) $\sqrt{26}$ B) $3\sqrt{3}$ C) $\sqrt{29}$
D) 30 E) $\sqrt{6}$

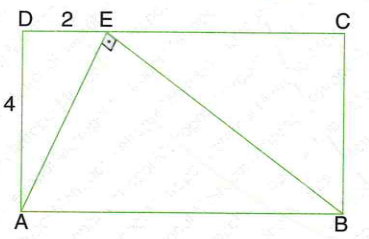
2.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
[DH] ⊥ [AC], |AH| = 6 cm, |HC| = 14 cm ⇒ **|AB| = ? cm**

A) $6\sqrt{6}$ B) $4\sqrt{15}$ C) $5\sqrt{10}$
D) $2\sqrt{70}$ E) $3\sqrt{30}$

3.

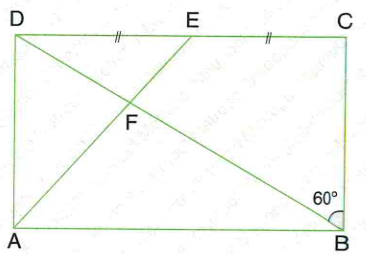


ABCD bir dikdörtgendir. / ABCD is a rectangle.
|AD| = 4 cm, |DE| = 2 cm, m(AEB) = 90°
⇒ **Çevre / The perimeter (ABCD) = ? cm**

A) 26 B) 28 C) 30
D) 32 E) 36

METROPOL YAYINLARI • METROPOL PUBLICATIONS

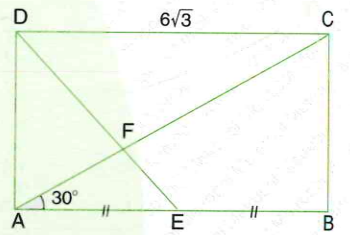
4.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
|BD| = 12 cm, |DE| = |EC|,
m(DBC) = 60° ⇒ **|EF| = ? cm**

A) $3\sqrt{7}$ B) $3\sqrt{7} - 1$ C) $3\sqrt{7} - 2$
D) $\sqrt{7}$ E) $\sqrt{3}$

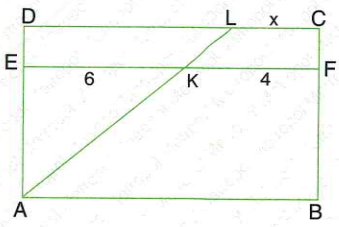
5.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
|DC| = $6\sqrt{3}$, |AE| = |EB|,
m(BAC) = 30° ⇒ **|AF| = ? cm**

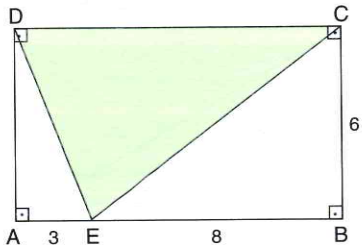
A) 2 B) 3 C) $2\sqrt{3}$
D) 3,5 E) 4

6. ABCD bir dikdörtgendir.
ABCD is a rectangle.
[EF] // [AB],
$|DE| = \frac{|AE|}{3}$,
|EK| = 6 cm,
|KF| = 4 cm
⇒ **|LC| = x = ? cm**



A) 1 B) 2 C) $\frac{3}{2}$
D) $\frac{5}{3}$ E) $\frac{7}{4}$

7.



ABCD bir dikdörtgendir. / ABCD is a rectangle.

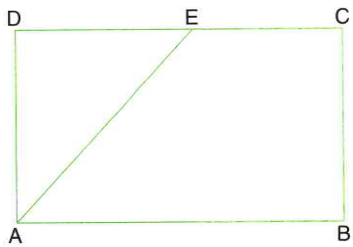
|AE| = 3 cm, |EB| = 8 cm, |BC| = 6 cm

⇒ **$A(\triangle DEC) = ?\,cm^2$**

A) 20 B) 25 C) 30

D) 33 E) 36

8.



ABCD bir dikdörtgendir. / ABCD is a rectangle.

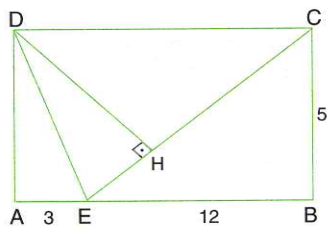
$A(ABCD) = 32\ cm^2$, $A(\triangle ADE) = 10\ cm^2$,

|EC| = 3 cm ⇒ **|AB| = ? cm**

A) 4 B) 5 C) 6

D) 7 E) 8

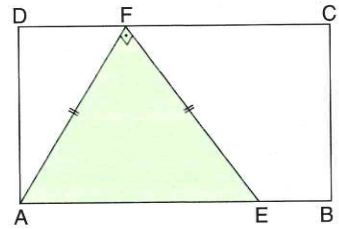
9. ABCD bir dikdörtgendir.
ABCD is a rectangle.
[DH] ⊥ [EC]
|AE| = 3 cm,
|EB| = 12 cm,
|BC| = 5 cm
⇒ **|DH| = ? cm**



A) $\frac{60}{7}$ B) $\frac{30}{7}$ C) $\frac{75}{13}$

D) 6 E) 7

10.



ABCD bir dikdörtgendir. / ABCD is a rectangle.

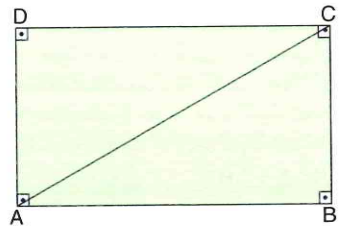
|AF| = |FE|, $m(\widehat{AFE}) = 90°$, |EB| = 1 cm,

|AB| + |BC| + |CD| + |DA| = 20 cm ⇒ **$A(\widehat{AFE}) = ?\ cm^2$**

A) 6 B) 7 C) 8

D) 9 E) 10

11.



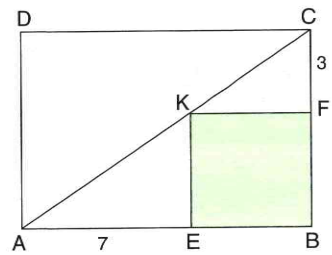
ABCD bir dikdörtgendir. / ABCD is a rectangle.

|AB| = 2·|BC|, |AC| = 5 cm ⇒ **$A(ABCD) = ?\ cm^2$**

A) 10 B) 12 C) 14

D) 16 E) 18

12. ABCD dikdörtgen;
KEBF karedir.
ABCD is a rectangle;
KEBF is a square.
|CF| = 3 cm,
|AE| = 7 cm
⇒ **$A(KEBF) = ?\ cm^2$**



A) 10 B) 14 C) 18

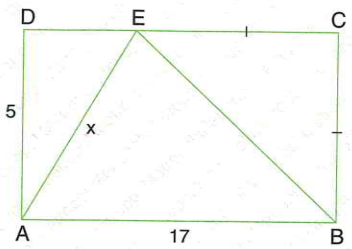
D) 21 E) 24

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
A	D	B	D	E	B	D	E	C	D	A	D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

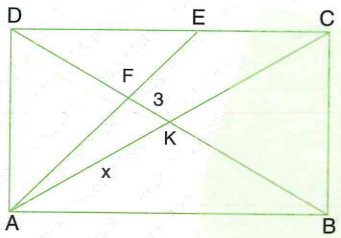
1.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
|BC| = |EC|, |AB| =17 cm, |AD| = 5 cm
⇒ **|AE| = x = ? cm**

A) 7 B) 9 C) 11
D) 13 E) 15

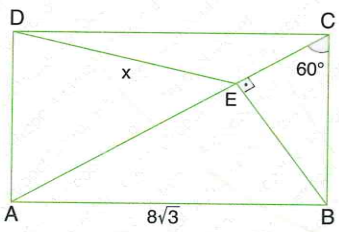
2.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
|DE| = |EC|, |KF| = 3 cm ⇒ **|AK| = x = ? cm**

A) 9 B) 8 C) 6
D) 5 E) 4

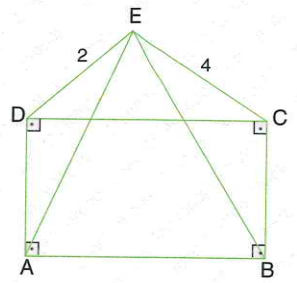
3.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
[BE] ⊥ [AC], |AB| = $8\sqrt{3}$ cm, m($\widehat{ACB}$) = 60°
⇒ **|DE| = x = ? cm**

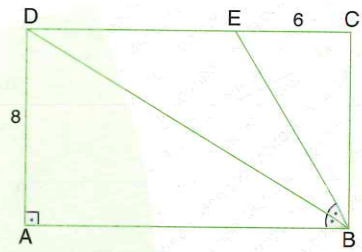
A) $8\sqrt{2}$ B) $4\sqrt{7}$ C) $4\sqrt{3}$
D) $4\sqrt{2}$ E) $2\sqrt{7}$

4. ABCD bir dikdörtgendir.
ABCD is a rectangle.
|DE| = 2 cm,
|EB| = 6 cm,
|EC| = 4 cm
⇒ **|AE| = ? cm**



A) 6 B) 5 C) $2\sqrt{6}$
D) $\sqrt{21}$ E) $\sqrt{23}$

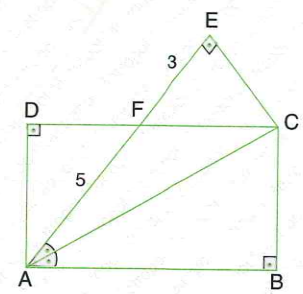
5.



ABCD bir dikdörtgen; [BD], bir açıortaydır.
ABCD is a rectangle; [BD] is a bisector.
|AD| = 8 cm, |EC| = 6 cm ⇒ **|DE| = ? cm**

A) 10 B) 9 C) 8
D) 7 E) 6

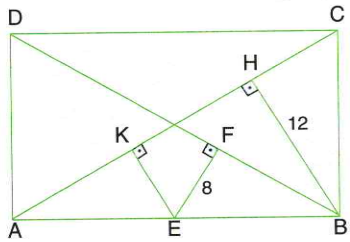
6. ABCD bir dikdörtgen;
[AC], bir açıortaydır.
ABCD is a rectangle;
[AC] is a bisector.
[CE] ⊥ [EA],
|AF| = 5 cm,
|EF| = 3 cm
⇒ **|BC| = ? cm**



A) 3 B) 4 C) $4\sqrt{2}$
D) $5\sqrt{3}$ E) 6

METROPOL YAYINLARI • METROPOL PUBLICATIONS

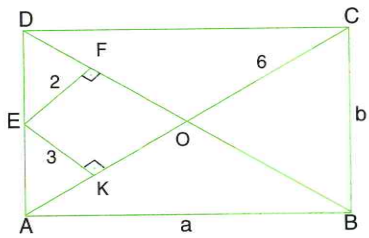
7.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
$[BH] \perp [AC]$, $[EF] \perp [BD]$, $[EK] \perp [AC]$,
$|BH| = 12$ cm, $|EF| = 8$ cm $\Rightarrow$ **$|EK| = ?$ cm**

A) 6 B) 5 C) 4
D) 3 E) 2

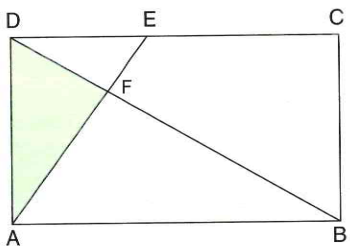
8.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
$[EF] \perp [DB]$, $[EK] \perp [AC]$, $|OC| = 6$ cm,
$|EF| = 2$ cm, $|EK| = 3$ cm $\Rightarrow$ **$a \cdot b = ?$ cm**

A) 36 B) 42 C) 48
D) 54 E) 60

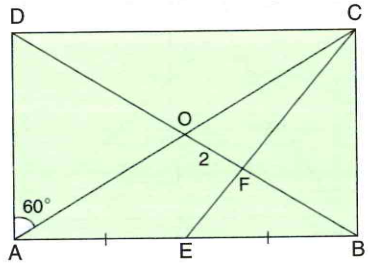
9.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
$|EC| = 2|DE|$, $A(ABCD) = 48$ cm^2 $\Rightarrow$ **$A(\widehat{ADF}) = ?$cm^2**

A) 12 B) 10 C) 8
D) 6 E) 4

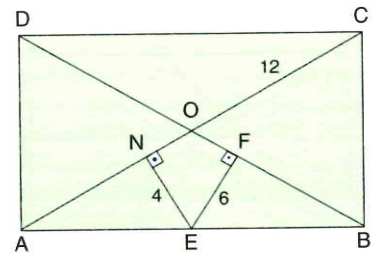
10.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
$m(\widehat{DAC}) = 60°$, $|AE| = |EB|$, $|OF| = 2$ cm
$\Rightarrow$ **$A(ABCD) = ?$ cm^2**

A) $72\sqrt{3}$ B) $48\sqrt{3}$ C) $36\sqrt{3}$
D) $32\sqrt{3}$ E) $24\sqrt{3}$

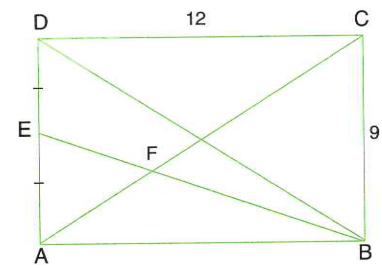
11.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
$[EF] \perp [BD]$, $[EN] \perp [AC]$, $|OC| = 12$ cm,
$|EF| = 6$ cm, $|EN| = 4$ cm $\Rightarrow$ **$A(ABCD) = ?$ cm^2**

A) 240 B) 220 C) 180
D) 160 E) 120

12.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
$|EA| = |ED|$, $|BC| = 9$ cm, $|DC| = 12$ cm $\Rightarrow$ **$|AF| = ?$ cm**

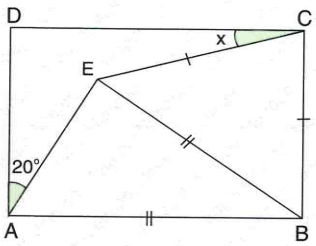
A) 7,5 B) 7 C) 6
D) 5,5 E) 5

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	A	B	C	A	B	C	E	D	C	A	E

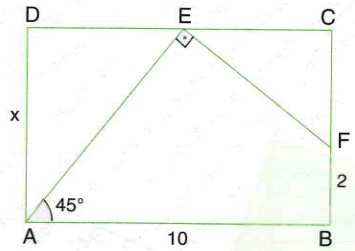
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. ABCD bir dikdörtgendir.
ABCD is a rectangle.
IABI = IBEI,
ICEI = ICBI,
$m(\widehat{DAE}) = 20°$
$\Rightarrow$ **$m(\widehat{DCE}) = x = ?$**



A) 10° B) 20° C) 30°
D) 40° E) 50°

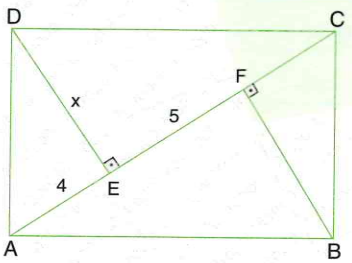
2.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
[AE] $\perp$ [EF], IFBI = 2 cm, IABI = 10 cm,
$m(\widehat{EAB}) = 45° \Rightarrow$ **IDAI = x = ? cm**

A) 2 B) 4 C) 6
D) 8 E) 9

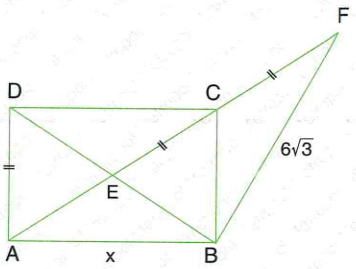
3.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
[DE] $\perp$ [AC], [BF] $\perp$ [AC], IAEI = 4 cm,
IEFI = 5 cm $\Rightarrow$ **IDEI = x = ? cm**

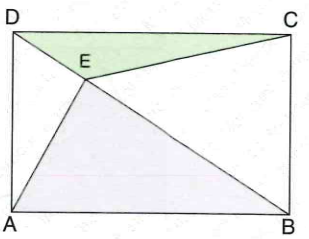
A) 3 B) 4 C) 5
D) 6 E) 7

4.



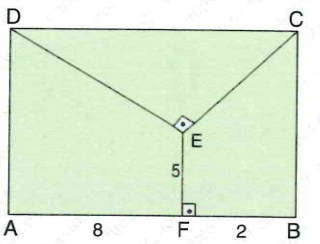
ABCD bir dikdörtgendir. / ABCD is a rectangle.
IDAI = IECI = ICFI, IBFI = $6\sqrt{3}$ cm $\Rightarrow$ **IABI = x = ? cm**
A) 3 B) 6 C) $6\sqrt{3}$
D) 12 E) $12\sqrt{3}$

5. ABCD bir dikdörtgendir.
ABCD is a rectangle.
3·IDEI = 2·IEBI
$\Rightarrow$ **$\frac{A(\triangle DEC)}{A(\triangle EAB)} = ?$**



A) $\frac{2}{3}$ B) $\frac{2}{5}$ C) $\frac{3}{5}$
D) $\frac{4}{9}$ E) $\frac{4}{25}$

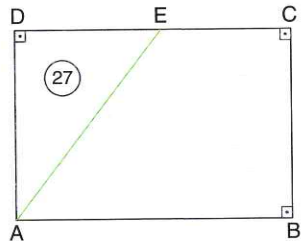
6. ABCD bir dikdörtgendir.
ABCD is a rectangle.
[EF] $\perp$ [AB],
[DE] $\perp$ [EC],
IAFI = 8 cm,
IFBI = 2 cm,
IEFI = 5 cm
$\Rightarrow$ **A(ABCD) = ? cm²**



A) 50 B) 60 C) 70
D) 80 E) 90

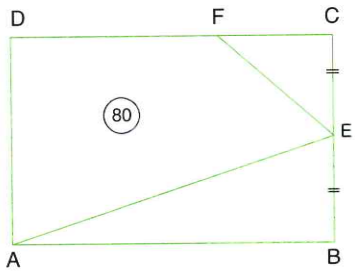
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCD bir dikdörtgendir.
ABCD is a rectangle.
[AD] ⊥ [DC],
[DC] ⊥ [CB],
[AB] ⊥ [BC],
$\frac{|EC|}{|ED|} = \frac{2}{3}$,
$A(\widehat{AED}) = 27\,cm^2$
⇒ **$A(ABCD) = ?\,cm^2$**



A) 70 B) 72 C) 78
D) 84 E) 90

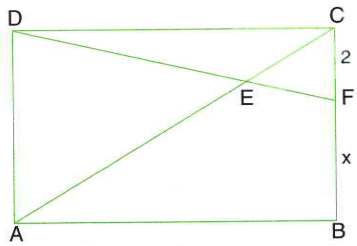
8.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
|CE| = |EB|, 2·|FC| = |DF|, $A(AEFD) = 80\,cm^2$
⇒ **$A(ABCD) = ?\,cm^2$**

A) 80 B) 90 C) 100
D) 110 E) 120

9.

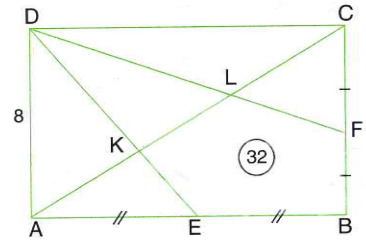


ABCD bir dikdörtgendir. / ABCD is a rectangle.
$A(\widehat{CEF}) = 4\,cm^2$, $A(\widehat{DEC}) = 12\,cm^2$,
|CF| = 2 cm ⇒ **|FB| = x = ? cm**

A) 2 B) 3 C) 4
D) 5 E) 6

METROPOL YAYINLARI • METROPOL PUBLICATIONS

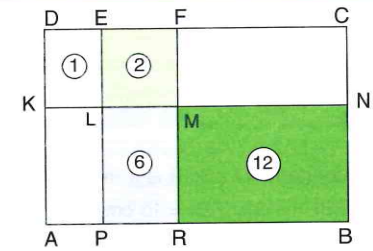
10.



ABCD bir dikdörtgendir. / ABCD is a rectangle.
|AE| = |EB|, |BF| = |FC|, |AD| = 8 cm, $A(EBFLK) = 32\,cm^2$
⇒ **|DC| = ? cm**

A) 12 B) 15 C) 16
D) 18 E) 24

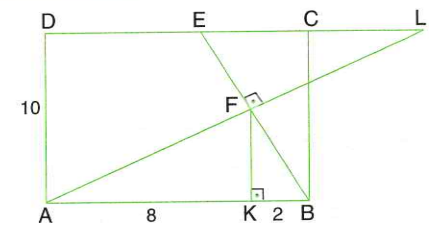
11.



ABCD bir dikdörtgendir. ABCD is a rectangle.
[KN] // [AB], [EP] // [FR] // [CB],
$A(DELK) = 1\,cm^2$, $A(EFML) = 2\,cm^2$,
$A(LMRP) = 6\,cm^2$, $A(MNBR) = 12\,cm^2$ ⇒ **$A(ABCD) = ?\,cm^2$**

A) 27 B) 28 C) 29
D) 30 E) 31

12.



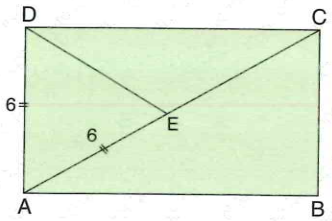
ABCD bir dikdörtgendir. / ABCD is a rectangle.
[EF] ⊥ [AL], [FK] ⊥ [AB], |AD| = 10 cm,
|AK| = 8 cm, |KB| = 2 cm ⇒ **|EL| = ? cm**

A) 6 B) 8 C) 9
D) 12 E) 15

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
A	C	D	C	A	E	E	E	C	A	B	E

1.



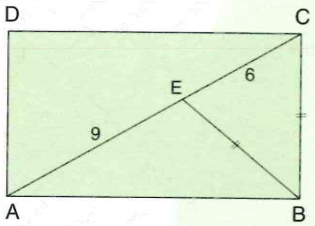
ABCD bir dikdörtgendir. / ABCD is a rectangle.

$|AD| = |AE| = 6$ cm, $|AB| = 8$ cm

$\Rightarrow \dfrac{A(\widehat{DEC})}{A(ABCD)} = ?$

A) $\frac{1}{5}$ B) $\frac{2}{5}$ C) $\frac{3}{5}$ D) $\frac{2}{7}$ E) $\frac{4}{7}$

2.



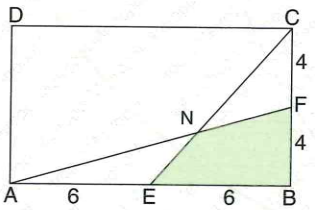
ABCD bir dikdörtgendir. / ABCD is a rectangle.

$|EB| = |BC|$, $|EC| = 6$ cm, $|EA| = 9$ cm

$\Rightarrow$ **A(ABCD) = ? cm²**

A) 100 B) 96 C) 90 D) 80 E) 72

3.



ABCD bir dikdörtgendir. / ABCD is a rectangle.

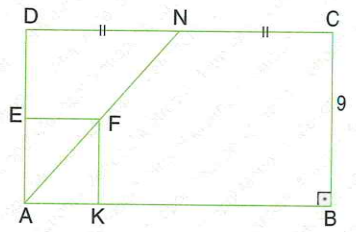
$|AE| = |EB| = 6$ cm, $|CF| = |FB| = 4$ cm

$\Rightarrow$ **A(EBFN) = ? cm²**

A) 12 B) 16 C) 20 D) 24 E) 32

METROPOL YAYINLARI • METROPOL PUBLICATIONS

4.



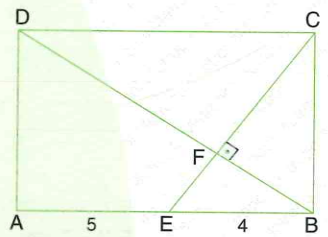
ABCD bir dikdörtgen; AKFE bir karedir.

ABCD is a rectangle; AKFE is a square.

$\dfrac{|FN|}{|AF|} = \frac{1}{2}$, $|BC| = 9$ cm $\Rightarrow$ **|KB| = ? cm**

A) 12 B) 11 C) 10 D) 9 E) 8

5.

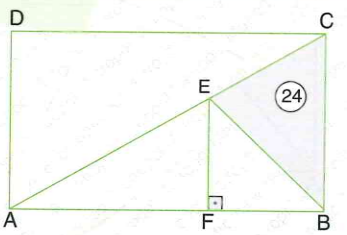


ABCD bir dikdörtgendir. / ABCD is a rectangle.

$[CF] \perp [BD]$, $|AE| = 5$ cm, $|EB| = 4$ cm $\Rightarrow$ **|AD| = ? cm**

A) 6,4 B) 6 C) 5,4 D) 5 E) 4,8

6.



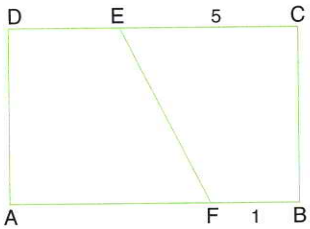
ABCD bir dikdörtgendir. / ABCD is a rectangle.

$[EF] \perp [AB]$, $A(\widehat{EBC}) = 24$ cm², $|DC| = 4|FB|$

$\Rightarrow$ **A(ABCD) = ? cm²**

A) 150 B) 164 C) 176 D) 180 E) 192

7.



ABCD bir dikdörtgendir. / ABCD is a rectangle.

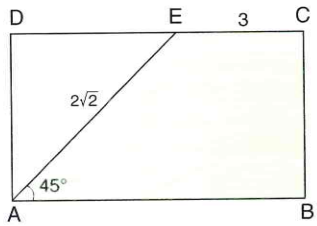
$|FB| = 1$ cm, $|EC| = 5$ cm, $\frac{A(AFED)}{A(FBCE)} = \frac{3}{2}$

$\Rightarrow$ **$|AF| = ?$ cm**

A) 3 B) 4,5 C) 6

D) 6,5 E) 7

8.



ABCD bir dikdörtgendir. / ABCD is a rectangle.

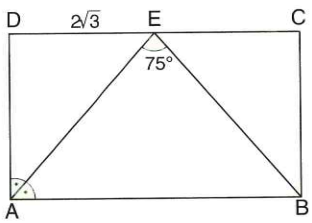
$m(\widehat{EAB}) = 45°$, $|AE| = 2\sqrt{2}$ cm, $|EC| = 3$ cm

$\Rightarrow$ **$A(ABCE) = ?$ cm^2**

A) 10 B) 8 C) 7

D) 6 E) 4

9.



ABCD bir dikdörtgen; [AE], bir açıortaydır.

ABCD is a rectangle; [AE] is a bisector.

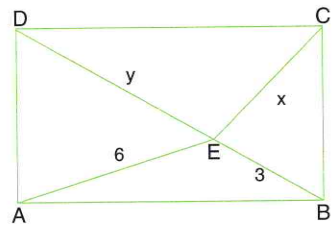
$m(\widehat{AEB}) = 75°$, $|DE| = 2\sqrt{3}$ cm

$\Rightarrow$ **Çevre / The Perimeter (ABCD) = ? cm**

A) $4 + 8\sqrt{3}$ B) $2 + 8\sqrt{3}$ C) $8\sqrt{3}$

D) $4 + 4\sqrt{3}$ E) $4 + 6\sqrt{3}$

10.



ABCD bir dikdörtgendir. / ABCD is a rectangle.

$|EA| = 6$ cm, $|EB| = 3$ cm, $|EC| = x$ cm,

$|ED| = y$ cm, $x + y = 9$ cm $\Rightarrow$ **$y = ?$ cm**

A) 2 B) 3 C) 4

D) 6 E) 7

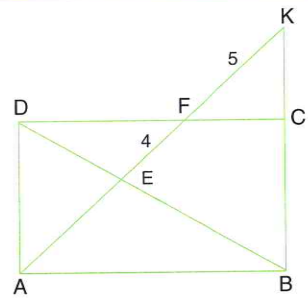
11. ABCD bir dikdörtgendir.

ABCD is a rectangle.

$|EF| = 4$ cm,

$|FK| = 5$ cm

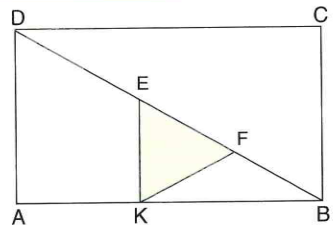
$\Rightarrow$ **$|AE| = ?$ cm**



A) 4 B) 5 C) 6

D) 7 E) 8

12.



ABCD bir dikdörtgendir. / ABCD is a rectangle.

$|AK| = |KB|$, $|DE| = |FB| = |EF|$, $|AB| = 20$ cm,

$|BC| = 9$ cm $\Rightarrow$ **$A(\widehat{KEF}) = ?$ cm^2**

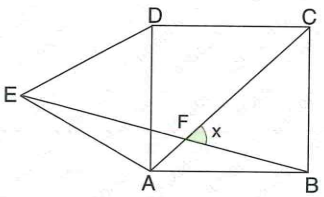
A) 24 B) 20 C) 15 D) 14 E) 12

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
A	C	B	A	B	E	D	B	A	D	C	C

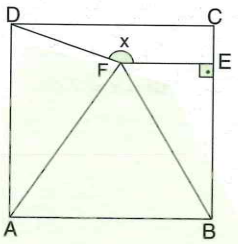
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. ABCD bir kare; EAD eşkenar üçgendir.
ABCD is a square;
EAD is a equilateral triangle.
$\Rightarrow m(\widehat{CFB}) = x = ?$



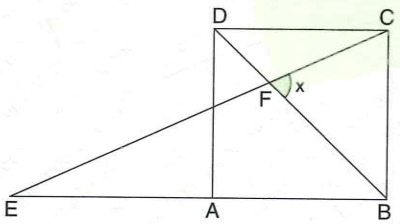
A) 45° B) 50° C) 55° D) 60° E) 75°

2. ABCD bir kare; FAB eşkenar üçgendir.
ABCD is a square;
FAB is a equilateral triangle.
[FE] ⊥ [BC]
$\Rightarrow m(\widehat{DFE}) = x = ?$



A) 145° B) 150° C) 155° D) 160° E) 165°

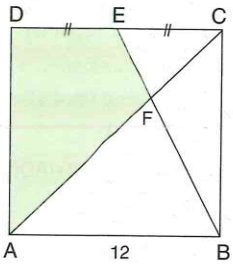
3.



ABCD bir karedir. / ABCD is a square.
|DB| = |EA| $\Rightarrow m(\widehat{CFB}) = ?$

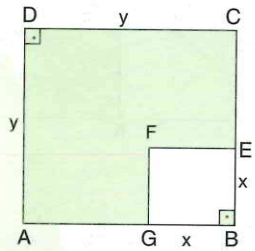
A) 75° B) 67,5° C) 45° D) 30° E) 22,5°

4. ABCD bir karedir.
ABCD is a square.
|DE| = |EC|,
|AB| = 12 cm
$\Rightarrow$ **A(AFED) = ? cm²**



A) 48 B) 56 C) 60 D) 66 E) 72

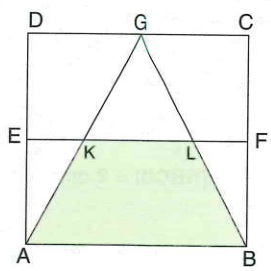
5.



ABCD ve GBEF karedir. / ABCD and GBEF are squares.
Taralı alan / The shaded area = 112 cm²,
Çevre/ The perimeter(ABCD) = 44 cm $\Rightarrow$ **x = ? cm**

A) 3 B) 4 C) 5 D) 6 E) 7

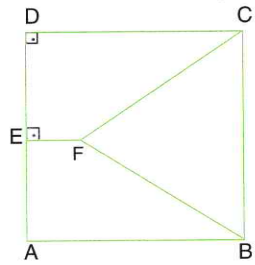
6. ABCD bir karedir.
ABCD is a square.
|EK| = 3 cm,
|AE| = |ED|,
|DG| = |GC|
$\Rightarrow$ **A(ABLK) = ? cm²**



A) 40 B) 48 C) 54 D) 60 E) 68

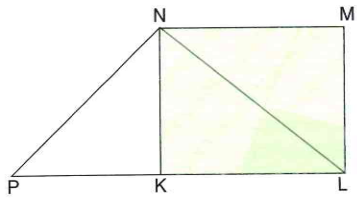
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCD bir kare; FBC bir eşkenar üçgendir.
ABCD is a square;
FBC is a equilateral triangle.
[EF] ⊥ [DA],
|AB|+|BC|+|DC|+|AD| = 32 cm
⇒ **|EF| = ? cm**



A) $8\sqrt{3}$ B) $8 - 4\sqrt{3}$ C) $4 + \sqrt{3}$
D) $8 - \sqrt{3}$ E) $2 + 2\sqrt{3}$

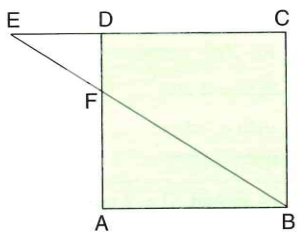
8.



ABC ikizkenar dik üçgen; GFED dörtgeni bir karedir.
ABC is right isosceles triangle; GFED is a square.
|AB| = 12 cm ⇒ **Çevre / The perimeter (GFED) = ? cm**

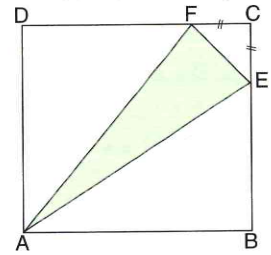
A) 10 B) 12 C) 14
D) 16 E) 18

9. ABCD bir karedir.
ABCD is a square.
|FB| = 3|EF|,
$|EF| = \frac{5}{2}$ cm
⇒ **A(ABCD) = ? cm²**



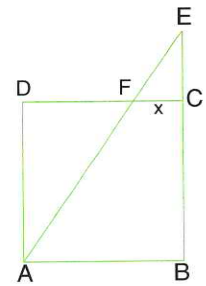
A) 9 B) 16 C) 25
D) 36 E) 49

10. ABCD bir karedir.
ABCD is a square.
A(ABCD) = 81 cm²,
$A(\widehat{FCE}) = 8$ cm²,
|FC| = |CE|
⇒ **TA(SA) = ? cm²**



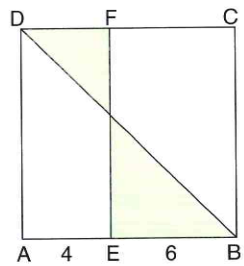
A) 24 B) 28 C) 30
D) 32 E) 34

11. ABCD bir karedir.
ABCD is a square.
|AE| = 15 cm,
A(ABCD) = 81 cm²
⇒ **|FC| = x = ? cm**



A) $\frac{9}{4}$ B) $\frac{5}{2}$ C) $\frac{11}{4}$
D) 3 E) 4

12. ABCD bir karedir.
ABCD is a square.
|AE| = 4,
|EB| = 6 cm
⇒ **$\sum$(TA(SA)) = ? cm²**



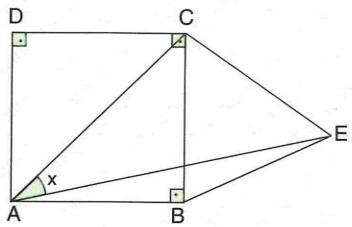
A) 18 B) 20 C) 26
D) 32 E) 40

METROPOL YAYINLARI • METROPOL PUBLICATIONS

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	E	B	C	A	C	B	D	D	B	A	C

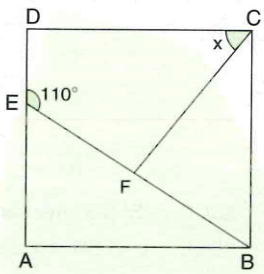
1.



ABCD bir kare; BEC bir eşkenar üçgendir.
ABCD is a square; BEC is a equilateral triangle.
⇒ **$m(\widehat{CAE}) = x = ?$**

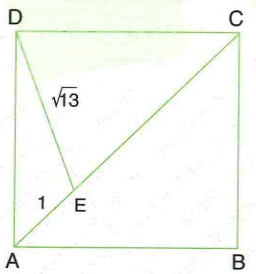
A) 15° B) 20° C) 25°
D) 30° E) 35°

2. ABCD bir karedir.
ABCD is a square.
$m(\widehat{DEB}) = 110°$,
$|BF| = |CF|$
⇒ **$m(DCF) = x = ?$**



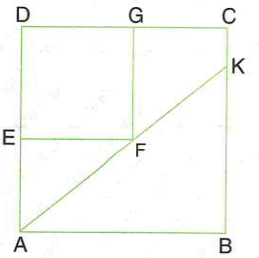
A) 5° B) 10° C) 20°
D) 25° E) 30°

3. ABCD bir karedir.
ABCD is a square.
$|AE| = 1$ cm,
$|DE| = \sqrt{13}$ cm
⇒ **$|AD| = ?$ cm**



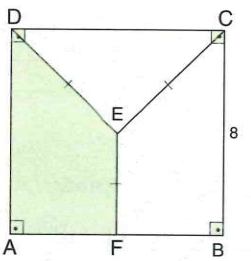
A) $3\sqrt{2}$ B) $3\sqrt{3}$ C) $4\sqrt{2}$
D) 6 E) $6\sqrt{2}$

4. ABCD ve DEFG karedir.
ABCD and DEFG are squares.
$|DE| = 12$ cm,
$|AE| = 9$ cm
⇒ **$|CK| = ?$ cm**



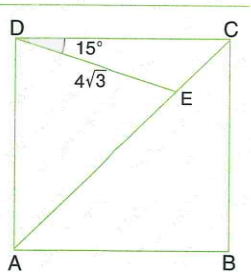
A) $\frac{15}{4}$ B) $\frac{19}{4}$ C) $\frac{21}{4}$
D) $\frac{23}{4}$ E) $\frac{27}{4}$

5. ABCD bir karedir.
ABCD is a square.
$|CB| = 8$ cm,
$|CE| = |DE| = |EF|$
⇒ **$A(AFED) = ?$ cm²**



A) $8 + 4\sqrt{3}$ B) 24 C) 26
D) 30 E) $16 + 8\sqrt{3}$

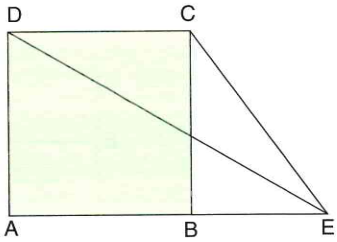
6. ABCD bir karedir.
ABCD is a square.
$m(\widehat{CDE}) = 15°$
$|DE| = 4\sqrt{3}$ cm
⇒ **$A(ABCD) = ?$ cm²**



A) 18 B) 36 C) $36\sqrt{3}$
D) 48 E) 72

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



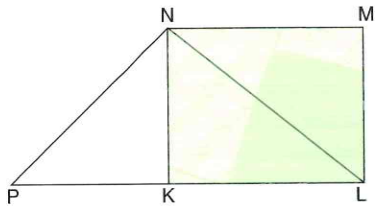
ABCD bir karedir. / ABCD is a square.

$A(\overset{\triangle}{CDE}) = 72\ cm^2 \Rightarrow$ **A(ABCD) = ? cm²**

A) 48 B) 72 C) 96

D) 128 E) 144

8.



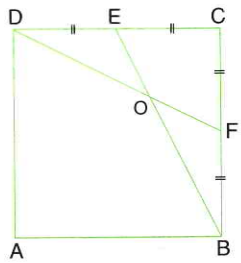
KLMN bir karedir. / KLMN is a square.

$|PN| = |NL|$, $A(\overset{\frown}{PLN}) = 32\ cm^2 \Rightarrow$ **A(KLMN) = ? cm²**

A) 12 B) $11\sqrt{2}$ C) 18

D) $18\sqrt{2}$ E) 32

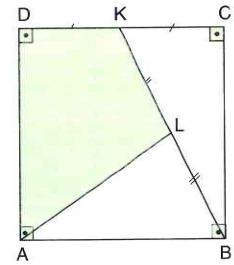
9. ABCD bir karedir.
ABCD is a square.
$|DE| = |EC| = |CF| = |FB|$
$\Rightarrow \mathbf{\frac{A(EOFC)}{A(ABCD)} = ?}$



A) $\frac{1}{3}$ B) $\frac{2}{5}$ C) $\frac{1}{4}$

D) $\frac{1}{6}$ E) $\frac{1}{12}$

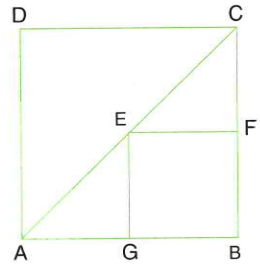
10. ABCD bir karedir.
ABCD is a square.
$|KL| = |LB|$,
$|DK| = |KC| = 4$ cm
$\Rightarrow$ **A(ALKD) = ? cm²**



A) 16 B) 24 C) 32

D) 40 E) 48

11.

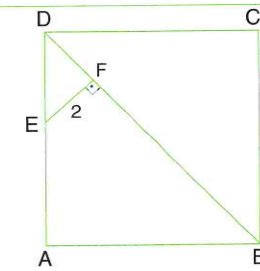


ABCD ve EFBG birer karedir.
ABCD and EFBG are squares.
$A(ABCD) = 36\ cm^2$
$\Rightarrow$ **Çevre / The perimeter (EFBG) = ? cm**

A) 8 B) 10 C) 12

D) 16 E) 18

12. ABCD bir karedir.
ABCD is a square.
$|AE| = 2|DE|$,
$[EF] \perp [DB]$,
$|EF| = 2$ cm
$\Rightarrow$ **|FB| = ? cm**



A) 9 B) $9 + 6\sqrt{2}$ C) $12 - 6\sqrt{2}$

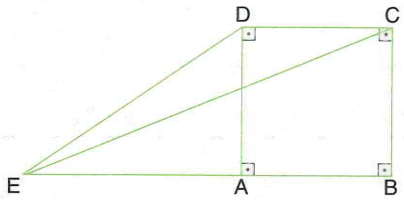
D) 10 E) $8 + 6\sqrt{2}$

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	C	A	C	C	E	E	E	D	C	C	D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



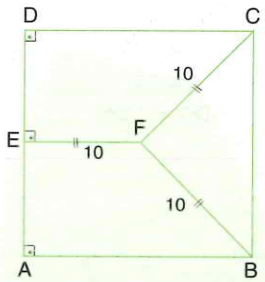
ABCD bir karedir. / ABCD is a square.

$A(ABCD) = A(\widehat{AED}) = 4\ cm^2 \Rightarrow$ **|EC| = ? cm**

A) $2\sqrt{6}$ B) $2\sqrt{10}$ C) $2\sqrt{11}$

D) $4\sqrt{3}$ E) $2\sqrt{13}$

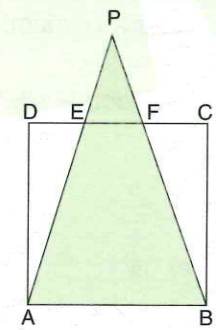
2. ABCD bir karedir.
ABCD is a square.
[FE] ⊥ [AD],
|EF| = |FC| = |FB| = 10 cm
⇒ **|AB| = ? cm**



A) 14 B) $\frac{29}{2}$ C) 15

D) $\frac{31}{2}$ E) 16

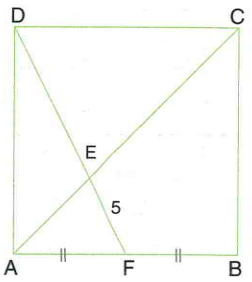
3. ABCD bir karedir.
ABCD is a square.
|DE| = |EF| = |FC| = 4 cm
⇒ **$A(\widehat{APB})$ = ? cm^2**



A) 108 B) 112 C) 126

D) 164 E) 200

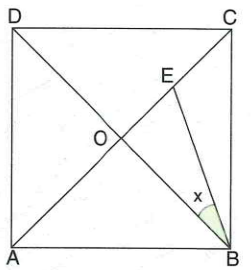
4. ABCD bir karedir.
ABCD is a square.
|AF| = |FB|,
|EF| = 5 cm
⇒ **|AB| = ? cm**



A) $2\sqrt{5}$ B) $3\sqrt{5}$ C) $4\sqrt{5}$

D) $5\sqrt{5}$ E) $6\sqrt{5}$

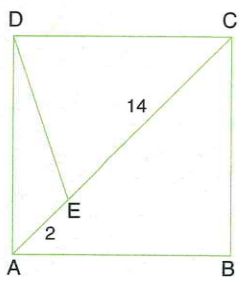
5. ABCD bir karedir.
ABCD is a square.
|AB| = |AE|
⇒ **$m(\widehat{DBE})$ = x = ?**



A) 15° B) 17,5° C) 20°

D) 22,5° E) 27,5°

6. ABCD bir karedir.
ABCD is a square.
|AE| = 2 cm,
|EC| = 14 cm
⇒ **|DE| = ? cm**

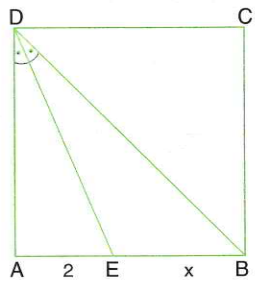


A) $8\sqrt{2}$ B) 10 C) 8

D) 6 E) $\sqrt{14}$

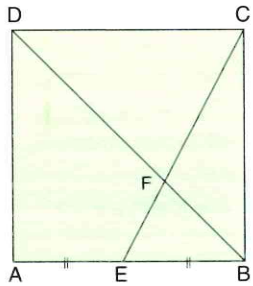
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCD bir karedir.
ABCD is a square.
$m(\widehat{ADE}) = m(\widehat{EDB})$,
$|AE| = 2$ cm,
$|EB| = x$ cm
$\Rightarrow$ **x = ? cm**



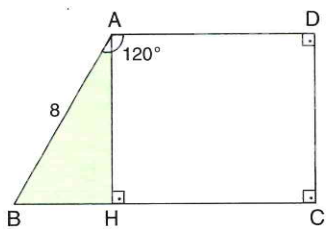
A) 2 B) $2\sqrt{2}$ C) $2\sqrt{3}$
D) 3 E) $4\sqrt{2}$

8. ABCD bir karedir.
ABCD is a square.
$|AE| = |EB|$,
$A(\widehat{FDC}) = 12\,cm^2$
$\Rightarrow$ **A(ABCD) = ? cm²**



A) 16 B) 25 C) 36
D) 40 E) 49

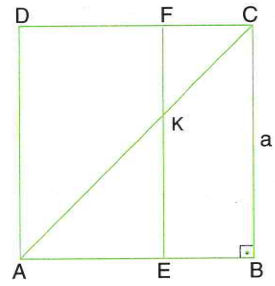
9.



$[AH] \perp [BC]$, $m(\widehat{BAD}) = 120°$, $m(\widehat{BCD}) = m(\widehat{ADC}) = 90°$,
$|AB| = 8$ cm $\Rightarrow$ **$A(\widehat{ABH})$ = ? cm²**

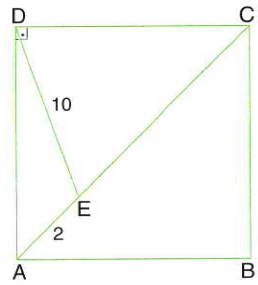
A) $\frac{13\sqrt{3}}{2}$ B) $\frac{9\sqrt{3}}{2}$ C) $4\sqrt{3}$
D) $\frac{7\sqrt{3}}{2}$ E) $8\sqrt{3}$

10. ABCD bir karedir.
ABCD is a square.
$\frac{A(\widehat{CFK})}{A(\widehat{AEK})} = \frac{1}{4}$,
[EF] // [BC],
$|BC| = a$ cm
$\Rightarrow$ **|EB| = ? cm**



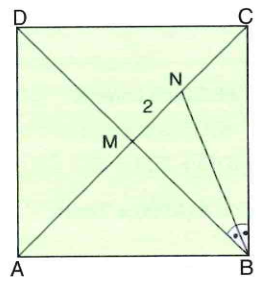
A) $\frac{a}{4}$ B) $\frac{a}{3}$ C) $\frac{9}{2}$
D) $\frac{2a}{3}$ E) $\frac{3a}{4}$

11. ABCD bir karedir.
ABCD is a square.
$|DE| = 10$ cm,
$|AE| = 2$ cm
$\Rightarrow$ **|DC| = ? cm**



A) $8\sqrt{2}$ B) 10 C) 8
D) $6\sqrt{2}$ E) $2\sqrt{14}$

12. ABCD bir karedir.
ABCD is a square.
$m(\widehat{MBN}) = m(\widehat{NBC})$,
$|MN| = 2$ cm
$\Rightarrow$ **$A(\widehat{ABCD})$ = ? cm²**



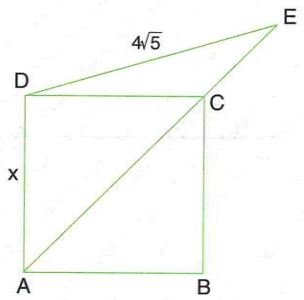
A) 16 B) 18 C) $16 + 8\sqrt{2}$
D) $12 + 8\sqrt{2}$ E) $24 + 16\sqrt{2}$

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
B	E	A	E	D	B	B	C	E	B	A	E

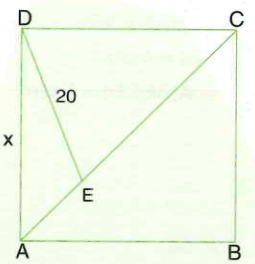
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. ABCD bir karedir.
ABCD is a square.
2·ICEI = IACI,
IDEI = $4\sqrt{5}$ cm
⇒ **IADI = x = ? cm**



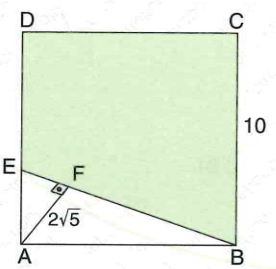
A) $2\sqrt{2}$ B) $3\sqrt{2}$ C) $4\sqrt{2}$
D) $5\sqrt{2}$ E) $6\sqrt{2}$

2. ABCD bir karedir.
ABCD is a square.
ICEI = 7·IAEI,
IDEI = 20 cm
⇒ **IADI = x = ? cm**



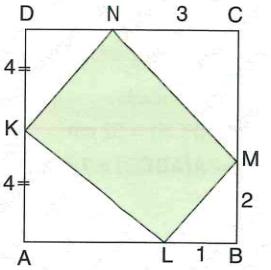
A) $9\sqrt{2}$ B) $12\sqrt{2}$ C) $15\sqrt{2}$
D) $16\sqrt{2}$ E) $20\sqrt{2}$

3. ABCD bir karedir.
ABCD is a square.
[AF] ⊥ [EB],
ICBI = 10 cm,
IAFI = $2\sqrt{5}$ cm
⇒ **A(EBCD) = ? cm²**



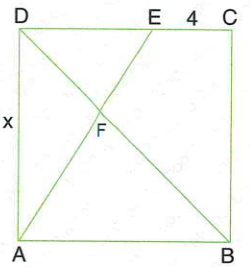
A) 55 B) 60 C) 65
D) 75 E) 80

4. ABCD bir karedir.
ABCD is a square.
IAKI = IKDI = 4 cm,
INCI = 3 cm,
IMBI = 2 cm,
ILBI = 1 cm
⇒ **A(KLMN) = ? cm²**



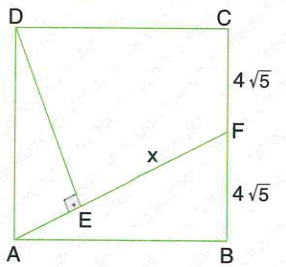
A) 10 B) 20 C) 30
D) 40 E) 50

5. ABCD bir karedir.
ABCD is a square.
5·IEFI = 3·IAFI,
IECI = 4 cm
⇒ **IADI = x = ? cm**



A) 10 B) 12 C) 14
D) 15 E) 16

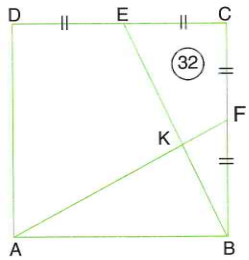
6. ABCD bir karedir.
ABCD is a square.
[DE] ⊥ [EF],
ICFI = IFBI = $4\sqrt{5}$ cm
⇒ **IEFI = x = ? cm**



A) 12 B) 15 C) 16
D) 18 E) 20

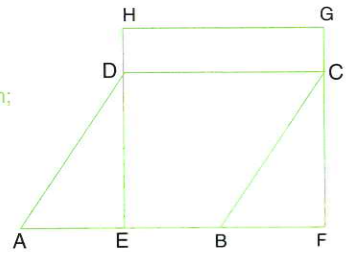
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCD bir karedir.
ABCD is a square.
|CF| = |FB|,
|EC| = |ED|,
A(KFCE) = 32 cm²
⇒ **A(ABCD) = ? cm²**



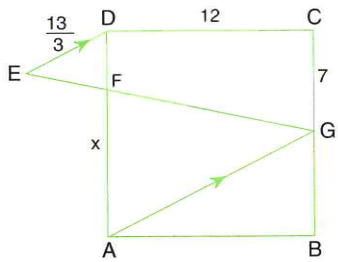
A) 120 B) 130 C) 140
D) 150 E) 160

8. ABCD paralelkenar;
EFGH bir karedir.
ABCD is a parallelogram;
EFGH is a square.
$\frac{A(ABCD)}{A(EFGH)} = \frac{2}{3}$
⇒ $\frac{|HD|}{|DE|}$ = ?



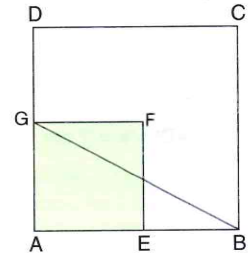
A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{2}{3}$
D) $\frac{2}{5}$ E) $\frac{3}{5}$

9. ABCD bir karedir.
ABCD is a square.
[DE] // [AG],
|DC| = 12 cm,
|CG| = 7 cm
$|DE| = \frac{13}{3}$
⇒ **|AF| = x = ? cm**



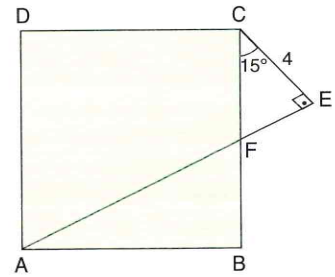
A) 5 B) 6 C) 7
D) 8 E) 9

10. ABCD ve AEFG karedir.
ABCD and AEFG are squares.
|GB| = 12 cm
⇒ **A(ABCD) + A(AEFG) = ? cm²**



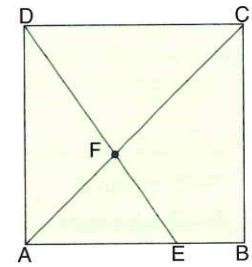
A) 100 B) 144 C) 169
D) 196 E) 225

11. ABCD bir karedir.
ABCD is a square.
[CE] ⊥ [AE],
$m(\widehat{ECB}) = 15°$,
|CE| = 4 cm
⇒ **A(ABCD) = ? cm²**



A) 24 B) 25 C) 27
D) 32 E) 36

12. ABCD bir karedir.
ABCD is a square.
|AE| = 4|EB|,
$A(\widehat{DFC}) = 30\,cm^2$
⇒ **A(ABCD) = ? cm²**



A) 81 B) 90 C) 96
D) 108 E) 120

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	D	D	C	A	A	E	A	E	B	D	D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

BÖLÜM CHAPTER 10

TARİHSEL NOT / HISTORICAL NOTE

Grigori Yakovlevich Perelman [1966 –]

Matematikte çözülemeyen en büyük problemlerden biri olan Poincaré sanısını çözen Rus matematikçi. St. Petersburg'daki Steklov Enstitüsü'ndeki görevinden istifa ederek kayıplara karışan Perelman'ın, psikolojik olarak zor bir dönemde olduğu matematikle ilişkisini kestiği belirtiliyordu. Perelman'ın, uzmanlar tarafından bile zor anlaşılan, Poincaré önermesine çözümü resmen 2006'da kabul edilmiştir. 2010'da düzenlenen bir yarışmada dünyanın en zor matematik problemlerinden birini çözdüğü için milenyum ödülü verilmiş, ödülü almayacağını açıklamıştır.

He is a Russian mathematician who solved Poincaré problem, one of the biggest unsolved problems in mathematics. Perelman, who had resigned from his position at the Steklov Institute in St. Petersburg and fell of the face of the earth, was reported to have stopped associating himself with mathematics, as he was in a psychologically difficult period for him. Perelman's solution proposal for Poincaré, which is hardly understood even by experts, was formally adopted in 2006. In a contest held in 2010, the one million award was awarded to him for solving one of the world's most difficult mathematical problems, but he announced that he would not take the award.

YAMUK ve DELTOİD
TRAPEZOID and DELTOID

Bu bölüm, 16 çözümlü örnek, 12 çözümlü test sorusu, 6 çözümlü YÖS sorusu, 24 alıştırma sorusu, 60 test sorusu içermektedir.

This chapter includes 16 examples with solutions, 12 test questions with solutions, 6 YÖS questions with solutions, 24 exercise questions and 60 test questions.

BÖLÜM / CHAPTER 10 ..... 341 - 370

YAMUK ve DELTOİD / TRAPEZOID and DELTOID

- Yamuk / Trapezoid ..... 341 - 349
  - Yamuğun Özellikleri / Proporties of a Trapezoid ..... 342 - 344
  - İkizkenar Yamuk / Isosceles Trapezoid ..... 344 - 346
  - Dik Yamuk / Right Trapezoid ..... 346 - 347
  - Yamuğun Alanı ile İlgili Özellikler / Properties Related to Area of a Trapezoid ..... 347 - 349
- Deltoid / Diltoid (Kite) ..... 349 - 350
- ▲ Çözümlü Test / Test With Solutions ..... 351 - 354
- ▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 355 - 356
- ▲ Alıştırmalar / Exercises ..... 357 - 360
- ▲ Konu Testleri / Practice Tests ..... 361 - 370

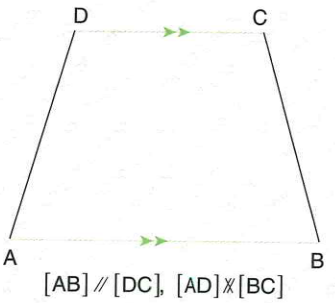
BÖLÜM 10 CHAPTER

YAMUK ve DELTOİD
TRAPEZOID and DELTOID

YAMUK / TRAPEZOID

Tanım: Karşılıklı iki kenarı paralel olan dörtgene **yamuk** denir.

Definition: A quadrilateral in which exactly one pair of sides are parallel is called a **trapezoid.**



[AB] // [DC], [AD] ⁄⁄ [BC]

Yamukta paralel olan kenarlara **yamuğun tabanları**, paralel olmayan kenarlara ise, **yamuğun yan kenarları** denir.

In a trapezoid, the parallel sides are called **bases** and the nonparallel sides are called the **legs.**

[AB] // [DC] olduğundan [AB] ve [DC] tabanlardır.

[AD] ⁄⁄ [BC] olduğundan [AD] ve [BC] yanal kenarlardır.

Since [AB] // [DC], [AB] and [DC] are the bases.

Since, [AD] ⁄⁄ [BC], [AD] and [BC] are legs.

Bir yamukta yanal kenarların orta noktalarını birleştiren doğru parçasına **orta taban** denir.

|AE| = |ED| ve |BF| = |FC| ise [EF] orta tabandır.

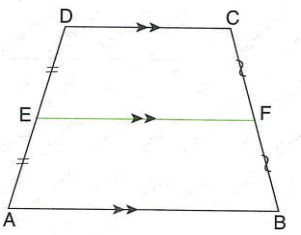
In a trapezoid, the line segment joining midpoints of the legs is called the **midbase** of that trapezoid.

If |AE| = |ED| and |BF| = |FC|, then [EF] is the midbase.

I. Orta taban, tabanlara paraleldir.

The midbase is parallel to the bases.

[EF] // [AB] // [DC]



II. Orta taban uzunluğu, alt ve üst taban uzunluklarının toplamının yarısına eşittir.

The length of the midbase is equal to half the sum of the lengths of the two bases

$$|EF| = \frac{|AB| + |DC|}{2}$$

Örnek / Example 1

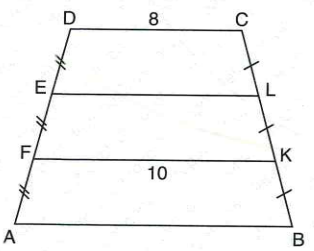
ABCD yamuk / trapezoid,

|AF| = |FE| = |ED|,

|BK| = |KL| = |LC|,

|DC| = 8 cm, |FK| = 10 cm

⇒ **|AB| = ? cm**



A) 10 B) 11 C) 12 D) 13 E) 15

Çözüm / Solution

Yanıt / Answer **B**

[AB] // [FK] // [EL] // [DC]:

$$|EL| = \frac{|DC|+|FK|}{2}$$

$$|EL| = \frac{8+10}{2} = 9 \text{ cm}$$

$$|FK| = \frac{|EL|+|AB|}{2} = \frac{9+|AB|}{2} = 10$$

$9 + |AB| = 20$

$|AB| = 11$ cm

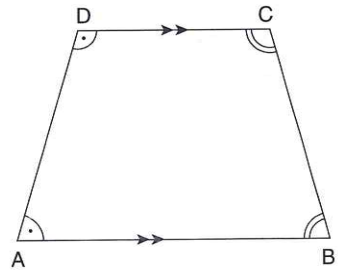
YAMUĞUN ÖZELLİKLERİ / PROPERTIES of a TRAPEZOID

Özellik 1 / Property 1

[AB] // [CD],

$m(\widehat{A}) + m(\widehat{D}) = 180^\circ$

$m(\widehat{B}) + m(\widehat{C}) = 180^\circ$



Örnek / Example 2

ABCD bir yamuktur.

ABCD is a trapezoid.

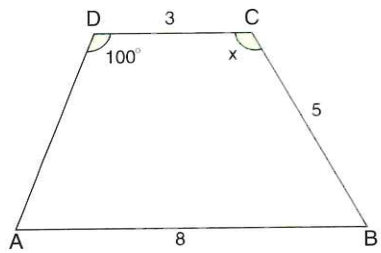
|AB| = 8 cm,

|BC| = 5 cm,

|DC| = 3 cm,

$m(\widehat{ADC}) = 100^\circ$

$\Rightarrow$ **$m(\widehat{DCB}) = x = ?$**



A) 145° B) 150° C) 155° D) 160° E) 165°

Çözüm / Solution — Yanıt / Answer D

[CE] // [DA] çizilirse,

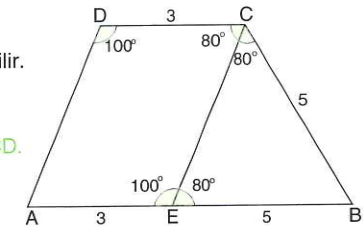
AECD paralelkenarı elde edilir.

By drawing [CE] // [DA]

we obtain parallelogram AECD.

|AE| = |DC| = 3 cm,

|BE| = 8 – 3 = 5 cm



$m(\widehat{AEC}) = m(\widehat{ADC}) = 100^\circ \Rightarrow m(\widehat{DCE}) = 80^\circ$

$m(\widehat{CEB}) = 180^\circ - 100^\circ = 80^\circ$

$|BE| = |BC| \Rightarrow m(\widehat{ECB}) = m(\widehat{CEB}) = 80^\circ$

$m(\widehat{DCB}) = 80^\circ + 80^\circ = 160^\circ$

Örnek / Example 3

ABCD bir yamuktur.

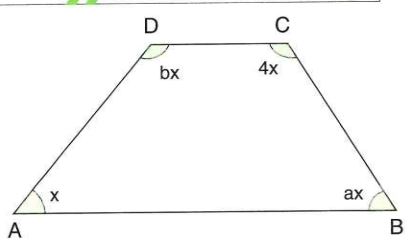
ABCD is a trapezoid.

$m(\widehat{DAB}) = x$,

$m(\widehat{ADC}) = bx$,

$m(\widehat{ABC}) = ax$,

$m(\widehat{DCB}) = 4x \Rightarrow$ **$b - a = ?$**



A) 1 B) 2 C) 3 D) 4 E) 5

Çözüm / Solution — Yanıt / Answer C

$-1/ \quad x + bx = 180$

$\quad ax + 4x = 180$

$-x - bx = -180$

$\quad ax + 4x = 180$

$+$

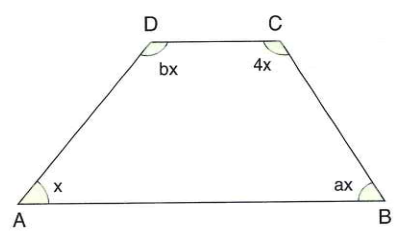
$ax - bx + 3x = 0$

$x(a - b) = -3x$

$3x = bx - ax$

$\frac{3x}{x} = \frac{(b-a)x}{x}$

$3 = b - a$

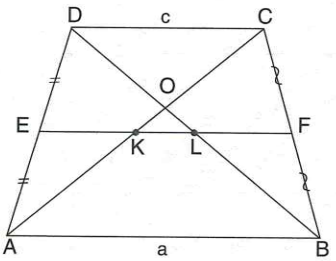


Özellik 2 / Property 2

$[AB] // [CD] \Rightarrow$ $|EK| = |LF| = \frac{c}{2}$

$|EL| = |FK| = \frac{a}{2}$

$|KL| = \frac{|a-c|}{2}$



Örnek / Example 4

ABCD bir yamuktur.

ABCD is a trapezoid.

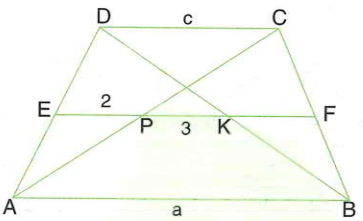
[EF] orta tabandır.

[EF] is the midbase.

$|EP| = 2$ cm,

$|PK| = 3$ cm

$\Rightarrow a \cdot c = ?$



A) 36 B) 40 C) 42 D) 44 E) 48

Çözüm / Solution

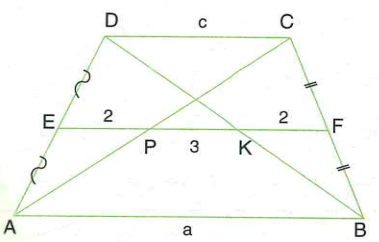
Yanıt / Answer **B**

$|EP| = |KF| = 2$ cm

$\frac{c}{2} = 2 \Rightarrow c = 4$ cm

$|EK| = |PF| = 5 = \frac{a}{2}$

$\Rightarrow a = 10 \Rightarrow a \cdot c = 40$

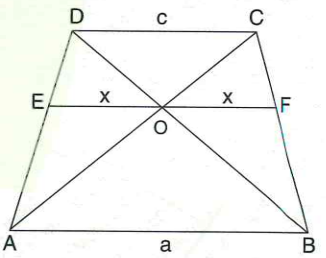


Özellik 3 / Property 3

$[EF] // [AB] // [DC] \Rightarrow |EO| = |OF|$

$\frac{1}{x} = \frac{1}{a} + \frac{1}{c}$

$x = \frac{a.c}{a+c}$



Örnek / Example 5

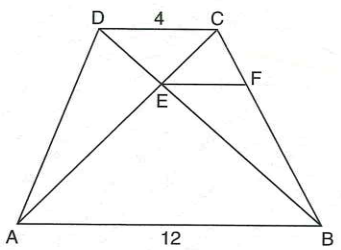
ABCD yamuk / trapezoid,

[AB] // [EF] // [DC],

$|AB| = 12$ br (u),

$|CD| = 4$ br (u)

$\Rightarrow |EF| = ?$ br (u)



A) 2 B) 3 C) $\frac{3}{2}$ D) $\frac{7}{2}$ E) $\frac{7}{4}$

Çözüm / Solution

Yanıt / Answer **B**

$|EF| = x$

$\frac{1}{x} = \underset{(3)}{\frac{1}{4}} + \frac{1}{12}$ [Özellik 3 / Property 3]

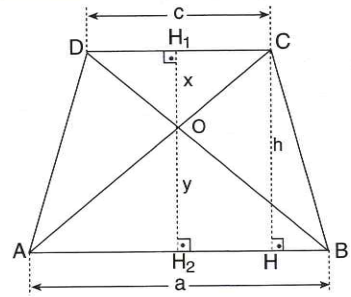
$\frac{1}{x} = \frac{3}{12} + \frac{1}{12}$

$\frac{1}{x} = \frac{4}{12} \Rightarrow x = 3$ br (u)

Özellik 4 / Property 4

$$|H_1O| = x = \frac{c \cdot h}{a + c}$$

$$|OH_2| = y = \frac{a \cdot h}{a + c}$$



Örnek / Example 6

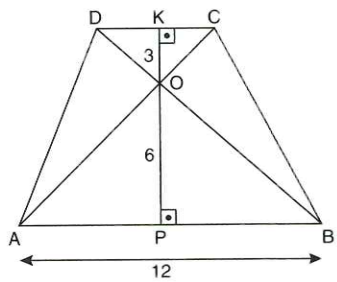
ABCD yamuk / trapezoid,

|OK| = 3 cm,

|OP| = 6 cm,

|AB| = 12 cm

⇒ **|DC| = ? cm**



A) 5 B) 6 C) 7 D) 8 E) 9

Çözüm / Solution

Yanıt / Answer **B**

$$\frac{|OK|}{|OP|} = \frac{|DC|}{12}$$

$$\frac{3}{6} = \frac{|DC|}{12}$$

$$\frac{1}{2} = \frac{|DC|}{12}$$

⇒ |DC| = 6 cm

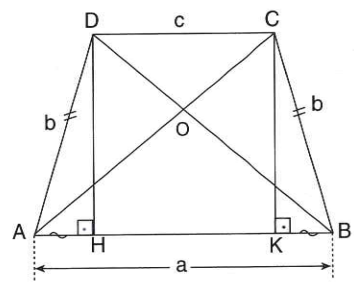
İKİZKENAR YAMUK / ISOSCELES TRAPEZOID

Tanım: Yan kenar uzunlukları eşit olan yamuğa **ikizkenar yamuk** denir.

Şekildeki ABCD yamuğunda, |AD| = |BC| ve [AD] ∦ [BC] ise, ABCD ikizkenar yamuk olup yamuğun tüm özelliklerini taşır.

Definition: A trapezoid is called an isosceles trapezoid if its legs have the same length.

In the trapezoid ABCD, if |AD| = |BC| and ,**[AD]** ∦ **[BC]** in the trapezoid ABCD, then ABCD is an isosceles trapezoid. An isosceles trapezoid holds all of the properties of a trapezoid.



- $m(\widehat{A}) = m(\widehat{B}),\ m(\widehat{C}) = m(\widehat{D})$
- |AC| = |BD|
- $|AH| = |BK| = \frac{a-c}{2}$ ve (and) $|AK| = |BH| = \frac{a+c}{2}$
- [AC] ∩ [BD] = {O} ⇒ **|AO| = |OB| ve (and) |OC| = |OD|**

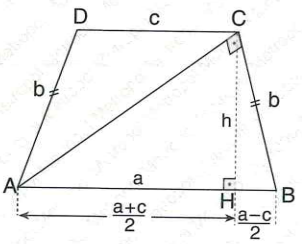
Özellik 1 / Property 1

$[AC] \perp [BC]$,

$[CH] \perp [AB]$,

$\Rightarrow h^2 = \left(\frac{a+c}{2}\right)\cdot\left(\frac{a-c}{2}\right)$

$\Rightarrow h = \frac{\sqrt{a^2-c^2}}{2}$



Örnek / Example 7

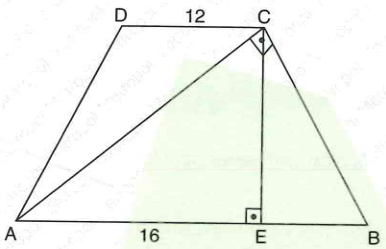
ABCD ikizkenar yamuk,

isosceles trapezoid,

$|DC| = 12$ br (u),

$|AE| = 16$ br (u)

$\Rightarrow$ **$|CE| = ?$ br (u)**



A) 5 B) 6 C) 8 D) 9 E) 10

Çözüm / Solution

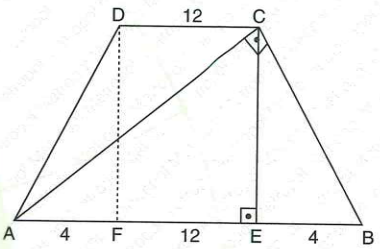
Yanıt / Answer **C**

$|AF| = |EB|$

$\Rightarrow |CE|^2 = |AE|\cdot|EB|$

$\Rightarrow |CE|^2 = 16\cdot 4 = 64$

$\Rightarrow |CE| = 8$ br (u)



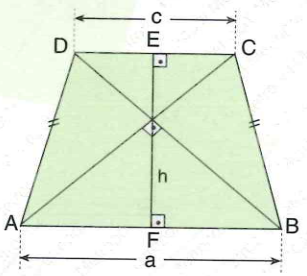
Özellik 2 / Property 2

$[AC] \perp [BD]$,

$|EF| = h = \frac{a+c}{2}$

$A(ABCD) = \left(\frac{a+c}{2}\right)^2$

$A(ABCD) = h^2$



Örnek / Example 8

ABCD bir ikizkenar yamuktur.

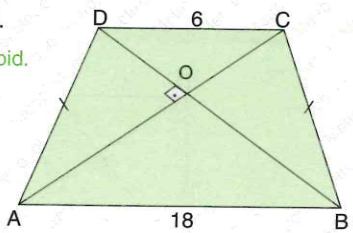
ABCD is an isosceles trapezoid.

$[AC] \perp [DB]$,

$|DC| = 6$ cm,

$|AB| = 18$ cm

$\Rightarrow$ **$A(ABCD) = ?$ cm^2**



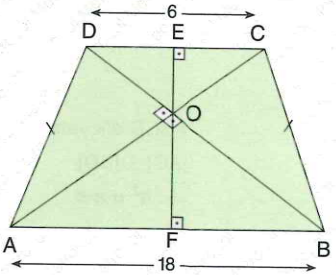
A) 144 B) 132 C) 120 D) 108 E) 96

Çözüm / Solution

Yanıt / Answer **A**

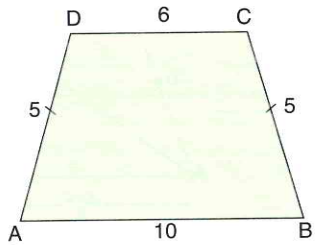
$|EF| = h = \frac{6+18}{2} = 12$ cm

$A(ABCD) = h^2 = 144$ cm^2



Örnek / Example 9

ABCD bir yamuktur.
ABCD is a trapezoid.
|AD| = |BC| = 5 cm,
|DC| = 6 cm,
|AB| = 10 cm
⇒ **A(ABCD) = ? cm²**



A) $6\sqrt{21}$ B) $16\sqrt{5}$ C) $8\sqrt{21}$ D) $12\sqrt{5}$ E) $9\sqrt{22}$

Çözüm / Solution — Yanıt / Answer C

[DH] ⊥ [AB], [CK] ⊥ [AB]
|DC| = |HK| = 6 cm

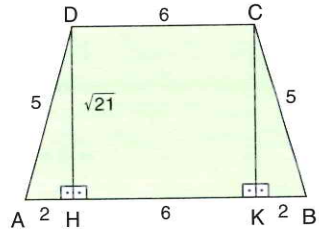
$|AH| = |KB| = \frac{4}{2} = 2\,cm$

$|AD|^2 = |AH|^2 + |HD|^2$

$\Rightarrow 5^2 = 2^2 + |HD|^2$

$21 = |HD|^2$

$|HD| = \sqrt{21}$ cm

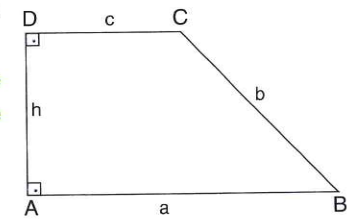


$$A(ABCD) = \frac{(|AB| + |DC|)\cdot |DH|}{2} = \frac{(10+6)\sqrt{21}}{2} = 8\sqrt{21}\ cm^2$$

DİK YAMUK / RIGHT TRAPEZOID

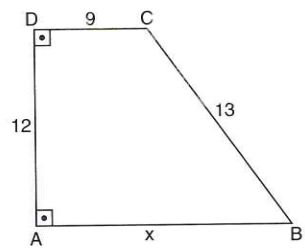
Tanım: Yan kenarlarından biri tabanlara dik olan yamuktur. Dik yamukta, tabanlara dik olan yan kenar uzunluğu aynı zamanda yükseklik uzunluğudur. Dik yamuk, yamuğun tüm özelliklerini taşır.

Definition: It is a trapezoid, one of the legs of which is perpendicular to both bases. In a right trapezoid the length of the leg where perpendicular to the bases is equal to the height. A right trapezoid holds all the properties of a trapezoid.



Örnek / Example 10

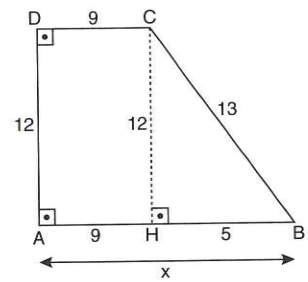
ABCD dik yamuk / right trapezoid,
|DC| = 9 cm,
|AD| = 12 cm,
|BC| = 13 cm
⇒ **|AB| = x = ? br (u)**



A) 12 B) 14 C) 16 D) 18 E) 20

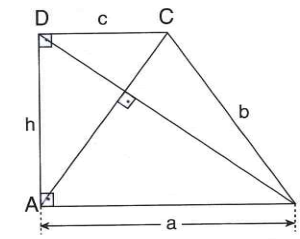
Çözüm / Solution — Yanıt / Answer B

|DC| = |AH| = 9 cm,
$m(\widehat{BHC}) = 90° \Rightarrow |HB| = 5$ cm
|AB| = x
⇒ |AH| + |HB| = 9 + 5 = 14 cm



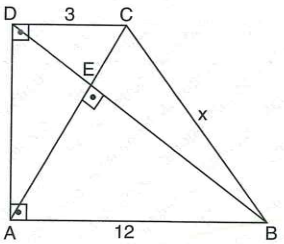
ÖNEMLİ/ IMPORTANT

ABCD dik yamuk / right trapezoid
[AC] ⊥ [BD]
⇒ $h^2 = a\cdot c$



Örnek / Example 11

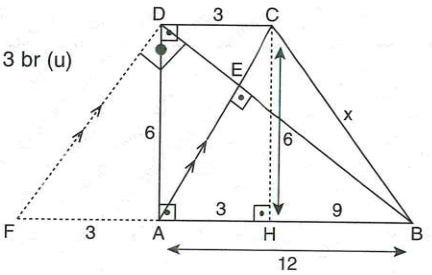
ABCD dik yamuk / right trapezoid,
|DC| = 3 br (u),
|AB| = 12 br (u)
⇒ **|BC| = x = ? br (u)**



A) $3\sqrt{3}$ B) $3\sqrt{5}$ C) $3\sqrt{7}$ D) $3\sqrt{11}$ E) $3\sqrt{13}$

Çözüm / Solution Yanıt / Answer **E**

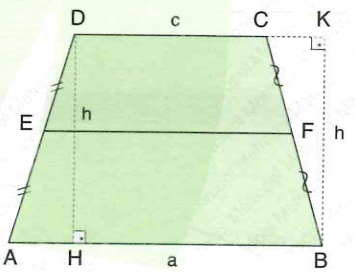
[DF] // [AC]
[DC] // [FB ⇒ |AF| = 3 br (u)
$m(\widehat{FDB}) = 90°$
⇒ $|AD|^2 = |FA| \cdot |AB|$
$|AD|^2 = 3 \cdot 12$
$|AD| = 6$ br (u)
[CH] ⊥ [AB]
⇒ $x^2 = 6^2 + 9^2$
$x^2 = 36 + 81$
$x^2 = 117$
$x = 3\sqrt{13}$ br (u)



YAMUĞUN ALANI İLE İLGİLİ ÖZELLİKLER / PROPERTIES RELATED to AREA of a TROPEZOID

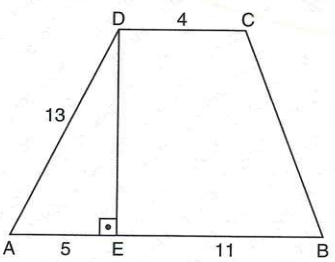
Özellik 1 / Property 1

$$A(ABCD) = \frac{a+c}{2} \cdot h = |EF| \cdot h$$



Örnek / Example 12

ABCD bir dik yamuk /
right trapezoid,
|CD| = 4 cm,
|EB| = 11 cm,
|AE| = 5 cm,
|AD| = 13 cm
⇒ **A(ABCD) = ? cm²**



A) 80 B) 90 C) 100 D) 110 E) 120

Çözüm / Solution Yanıt / Answer **E**

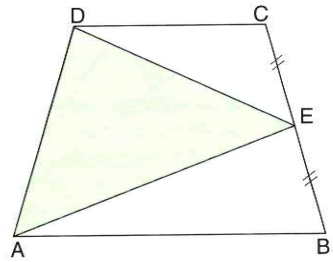
$m(\widehat{AED}) = 90° \Rightarrow |DE| = 12$ cm = h

$$A(ABCD) = \frac{(|AB|+|DC|)}{2} \cdot h$$
$$= \frac{(16+4)}{2} \cdot 12$$
$$= 120 \text{ cm}^2$$

Özellik 2 / Property 2

|CE| = |EB|

⇒ ***A(ABCD) = 2 · A(ÊAD)***



Örnek / Example 13

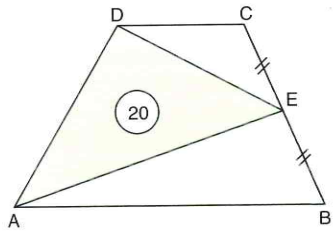
ABCD bir yamuktur.

ABCD is a trapezoid.

|EB| = |EC|,

$A(\widehat{ADE}) = 20\ br^2\ (u^2)$

⇒ **$A(ABCD) = ?\ br^2\ (u^2)$**



A) 25 B) 30 C) 35 D) 40 E) 50

Çözüm / Solution

Yanıt / Answer **D**

$2 \cdot A(\widehat{ADE}) = A(ABCD)$ [Özellik 2 / Property 2]

$2 \cdot 20 = A(ABCD)$

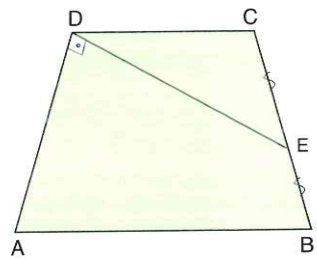
$40 = A(ABCD)$

Özellik 3 / Property 3

|CE| = |EB|,

[ED] ⊥ [AD]

⇒ ***A(ABCD) = \|ED\|·\|AD\|***



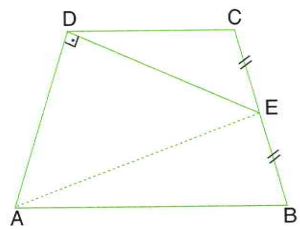
ÖNEMLİ / IMPORTANT

$$A(\widehat{ADE}) = \frac{|AD| \cdot |DE|}{2}$$

$$A(ABCD) = 2 \cdot A(\widehat{ADE})$$

$$A(ABCD) = 2 \cdot \frac{|AD| \cdot |DE|}{2}$$

$$= |AD| \cdot |DE|$$



Örnek / Example 14

ABCD bir yamuktur.

ABCD is a trapezoid.

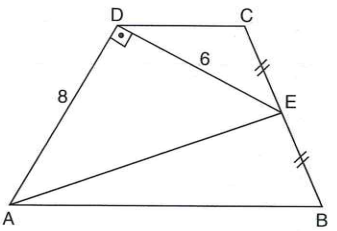
|BE| = |EC|,

[AD] ⊥ [DE],

|ED|= 6 cm,

|AD| = 8 cm

⇒ **A(ABCD) = ? cm²**



A) 24 B) 36 C) 48 D) 64 E) 72

Çözüm / Solution Yanıt / Answer **C**

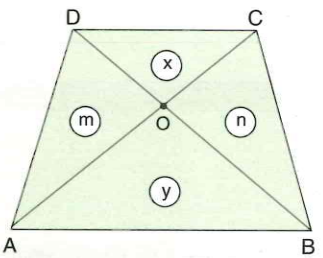
[AD] ⊥ [DE]
ABCD yamuk
ABCD trapezoid
} A(ABCD) = |AD|·|DE| [Özellik 3 / Property 3]

A(ABCD) = |AD|·|DE|

= 8·6 = 48 cm²

Özellik 4 / Property 4

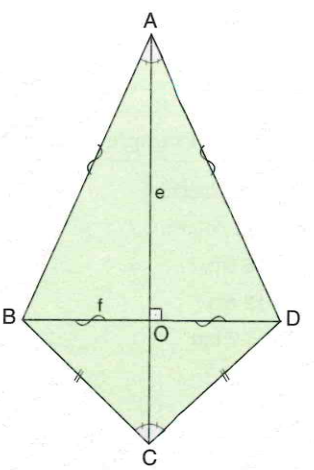
[AC] ∩ [BD] = {O}
A(DOC) = x
A(AOB) = y
A(AOD) = m
A(COB) = n
} ⇒ I. $m = n$ II. $m \cdot n = x \cdot y$



DELTOİD / DELTOID (KITE)

Tanım: Tabanları ortak, iki ikizkenar üçgenden oluşan konveks dörtgene **deltoid** denir.

Definition: A convex quadrilateral which is formed by two isosceles triangles that have their bases in common is called a **deltoid(kite).**



- |AB| = |AD|,
  |BC| = |CD|
- Köşegenler birbirine diktir. / Diagonals are perpendicular to each other.
  [AC] ⊥ [BD]
- İkizkenar üçgenlerin tepe noktalarını birleştiren köşegen açıortaydır.
  The diagonal which connects the vertices of the isosceles triangles is the bisector of these angles.
  m(BAC) = m(DAC)
  m(BCA) = m(ACD)
- A(ABC) = A(ADC)
- $A(ABCD) = \frac{|AC| \cdot |BD|}{2} = \frac{e \cdot f}{2}$

Örnek / Example 15

ABCD bir deltoiddir.

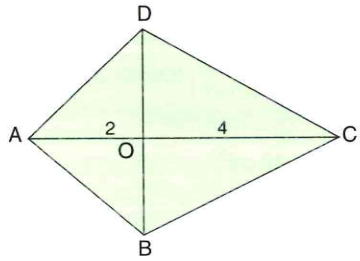
ABCD is a deltoid.

$m(\widehat{BCD}) = 60°$,

$|AO| = 2$ cm,

$|OC| = 4$ cm

$\Rightarrow$ **A(ABCD) = ? cm²**



A) 12 B) $4\sqrt{10}$ C) $9\sqrt{2}$ D) $8\sqrt{3}$ E) $10\sqrt{2}$

Çözüm / Solution

Yanıt / Answer **D**

$m(\widehat{ODC}) = 60°$

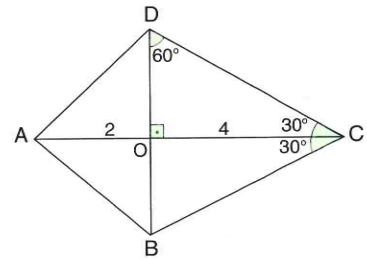
$\Rightarrow |OD| = \frac{4}{\sqrt{3}}$ cm

$A(\widehat{ADC}) = \frac{|OD| \cdot |AC|}{2}$

$= \frac{\frac{4}{\sqrt{3}} \cdot 6}{2} = \frac{12}{\sqrt{3}}$

$A(\widehat{ADC}) = \frac{A(ABCD)}{2} = \frac{12}{\sqrt{3}}$

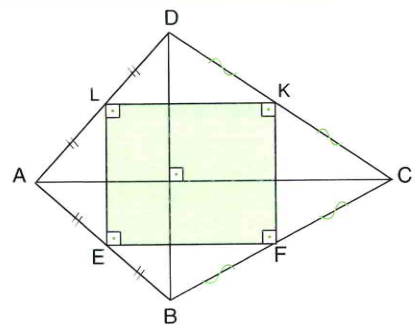
$A(ABCD) = \frac{24}{\sqrt{3}} = 8\sqrt{3}$ cm²



ÖNEMLİ / IMPORTANT

Kenarların orta noktaları bir dikdörtgenin köşeleridir.

The midpoints of the sides are corners of a rectangle.



Örnek / Example 16

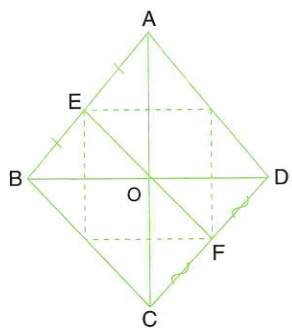
ABCD bir deltoiddir.

ABCD is a deltoid.

$|AC| = 16$ cm,

$|BD| = 12$ cm

$\Rightarrow$ **|EF| = ? cm**



A) 9 B) 10 C) 11 D) 12 E) 13

Çözüm / Solution

Yanıt / Answer **B**

$|EK| = \frac{|BD|}{2} = \frac{12}{2} = 6$ cm,

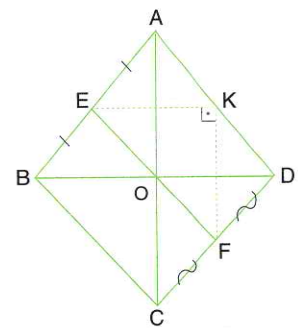
$|FK| = \frac{|AC|}{2} = \frac{16}{2} = 8$ cm

$m(\widehat{EKF}) = 90$

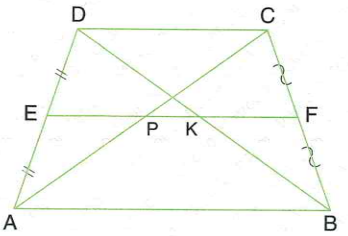
$|EF|^2 = 6^2 + 8^2$

$|EF|^2 = 100$

$|EF| = 10$ cm

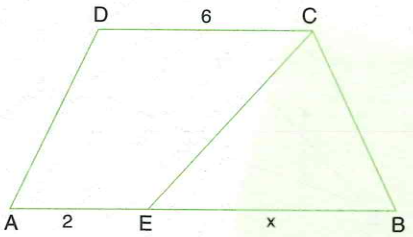


1. ABCD bir yamuktur.
ABCD is a trapezoid.
$|DE| = |EA|$,
$|CF| = |FB|$,
$|AB| = 16$ cm,
$|DC| = 6$ cm
$\Rightarrow$ **$|PK| = ?$ cm**



A) 2 B) 3 C) 4
D) 5 E) 6

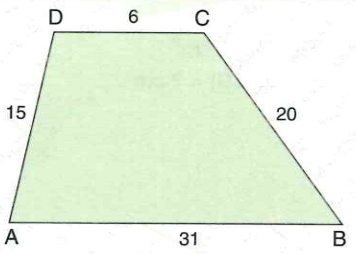
2.



ABCD bir yamuktur. / ABCD is a trapezoid.
$A(AECD) = A(\widehat{CEB})$, $|DC| = 6$ cm, $|AE| = 2$ cm
$\Rightarrow$ **$|EB| = x = ?$ cm**

A) 6 B) 7 C) 8
D) 9 E) 10

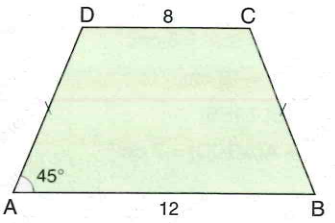
3. ABCD bir yamuktur.
ABCD is a trapezoid.
$|AB| = 31$ cm,
$|BC| = 20$ cm,
$|AD| = 15$ cm,
$|DC| = 6$ cm
$\Rightarrow$ **$A(ABCD) = ?$ cm^2**



A) 220 B) 222 C) 224
D) 226 E) 232

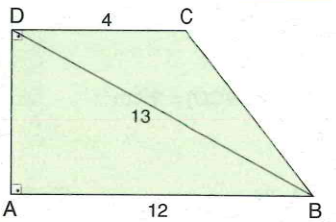
METROPOL YAYINLARI • METROPOL PUBLICATIONS

4. ABCD bir ikizkenar yamuktur.
ABCD is a isosceles trapezoid.
$m(\widehat{DAB}) = 45°$,
$|DC| = 8$ cm,
$|AB| = 12$ cm
$\Rightarrow$ **$A(ABCD) = ?$ cm^2**



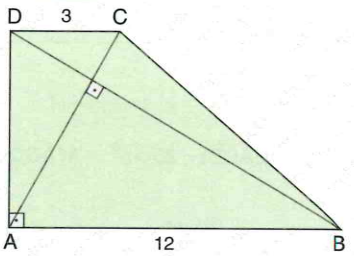
A) 18 B) 20 C) 24
D) 28 E) 30

5. ABCD dik yamuktur.
ABCD is a right trapezoid.
$|AB| = 12$ cm,
$|DB| = 13$ cm,
$|DC| = 4$ cm
$\Rightarrow$ **$A(ABCD) = ?$ cm^2**



A) 20 B) 30 C) 40
D) 60 E) 80

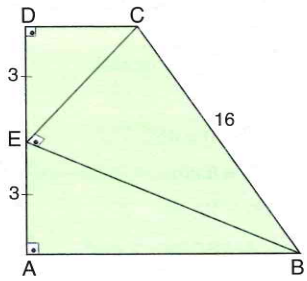
6.



ABCD bir dik yamuktur. / ABCD is a right trapezoid.
$[AC] \perp [DB]$, $|DC| = 3$ cm, $|AB| = 12$ cm
$\Rightarrow$ **$A(ABCD) = ?$ cm^2**

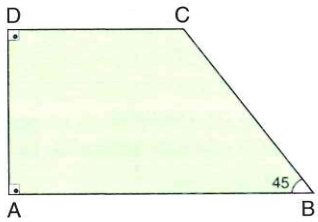
A) 30 B) 33 C) 39
D) 42 E) 45

7. ABCD bir dik yamuktur.
ABCD is a right trapezoid.
$|DE| = |EA| = 3$ cm,
$|BC| = 16$ cm,
$[CE] \perp [EB]$
$\Rightarrow$ **A(ABCD) = ? cm²**



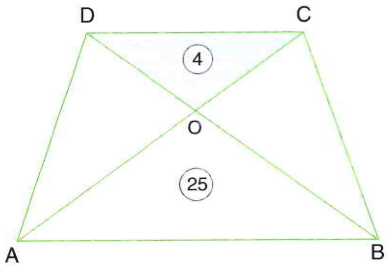
A) 32 B) 40 C) 44
D) 48 E) 56

8. ABCD dik yamuktur.
ABCD is a right trapezoid.
$|AD| = |DC|$,
$|BC| = 8$ cm,
$m(\widehat{B}) = 45°$
$\Rightarrow$ **A(ABCD) = ? cm²**



A) 24 B) 36 C) 48
D) 64 E) 72

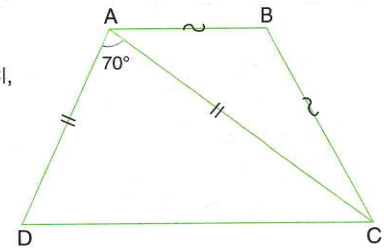
9.



ABCD bir yamuktur. / ABCD is a trapezoid.
$A(\widehat{DOC}) = 4\,cm^2$, $A(\widehat{AOB}) = 25\,cm^2 \Rightarrow$ **A(ABCD) = ? cm²**

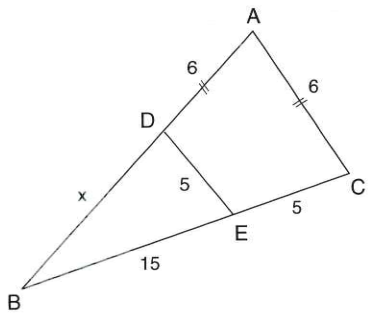
A) 36 B) 40 C) 49
D) 64 E) 81

10. ABCD bir yamuktur.
ABCD is a trapezoid.
$|AD| = |AC|$, $|AB| = |BC|$,
$m(\widehat{DAC}) = 70°$
$\Rightarrow$ **$m(\widehat{ABC})$ = ?**



A) 55° B) 60° C) 65°
D) 70° E) 75°

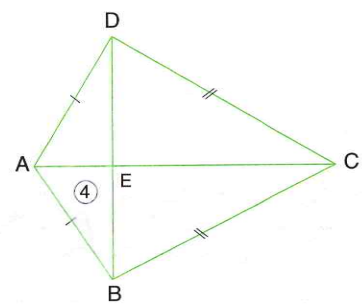
11.



$|AD| = |AC| = 6$ cm,
$|DE| = |EC| = 5$ cm,
$|BE| = 15$ cm $\Rightarrow$ **$|BD| = x$ = ? cm**

A) 18 B) 16 C) 12 D) 8 E) 6

12. $|AB| = |AD|$,
$|CD| = |CB|$,
$|AC| = 4 \cdot |AE|$
$A(\widehat{AEB}) = 4\,cm^2$
$\Rightarrow$ **A(ABCD) = ? cm²**



A) 24 B) 28 C) 32 D) 36 E) 40

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	C	B	B	C	E	D	C	C	D	C	C

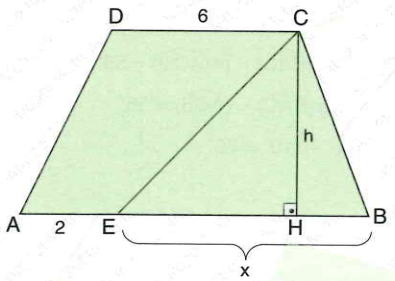
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $|PK| = \dfrac{|AB| - |DC|}{2}$

$= \dfrac{16-6}{6} = 5\,cm$

Yanıt / The Answer is D

2.



$[CH] \perp [AB] \Rightarrow A(AECD) = A(\widehat{CEB})$

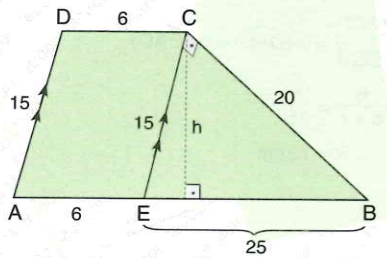
$|CH| = h$

$\Rightarrow \dfrac{(2+6)\cdot h}{2} = \dfrac{x \cdot h}{2}$

$8 \cdot h = x \cdot h \Rightarrow x = 8\ cm$

Yanıt / The Answer is C

3.



$[CE] \,//\, [AD] \Rightarrow |CE| = 15\ cm,$

$|AE| = 6\ cm \Rightarrow |EB| = 25\ cm,$

$|CB| = 20\ cm$

$\left.\begin{matrix}|CE| = 15\,cm \\ |EB| = 25\,cm \\ |CB| = 20\,cm\end{matrix}\right\} \Rightarrow m(\widehat{ECB}) = 90°$

$A(\widehat{CEB}) = \dfrac{25 \cdot h}{2} = \dfrac{20 \cdot 15}{2} \Rightarrow h = 12\,cm$

$A(ABCD) = \dfrac{(6+31)}{2} \cdot 12 = 222\,cm^2$

Yanıt / The Answer is B

4. $[DH] \perp [AB],$

$[CK] \perp [AB] \Rightarrow$

$|HK| = |DC| = 8\ cm$

$|AH| = |KB| = \dfrac{4}{2}$

$= 2\,cm$

$m(\widehat{ADH})$

$= 180° - (45° + 90°) = 45°$

$\Rightarrow |AH| = |DH| = 2\,cm$

$A(ABCD) = \dfrac{(|AB| + |DC|) \cdot |DH|}{2}$

$= \dfrac{(12+8)\cdot 2}{2} = 20\,cm^2$

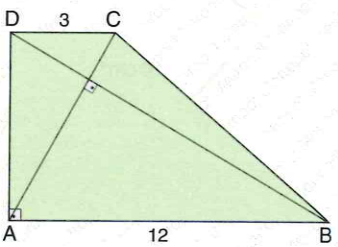
Yanıt / The Answer is B

5. $|AD| = \sqrt{13^2 - 12^2} = 5\,cm$

$A(ABCD) = \dfrac{(4+12)}{2} \cdot 5 = 40\,cm^2$

Yanıt / The Answer is C

6.



$[AC] \perp [BD] \Rightarrow |AD|^2 = h^2 = 3 \cdot 12 \Rightarrow h^2 = 36$

$h = 6\ cm$

$A(ABCD) = \dfrac{6 \cdot (12+3)}{2} = 45\,cm^2$

Yanıt / The Answer is E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [EF] // [AB],

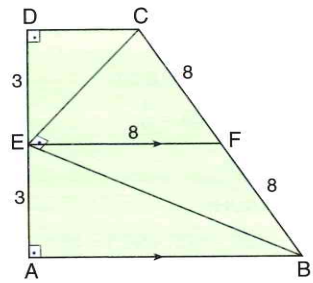
$|DE| = |EA| = 3$

$\Rightarrow |CF| = |FB| = 8$ cm

$|EF| = \frac{|CB|}{2} = 8$ cm

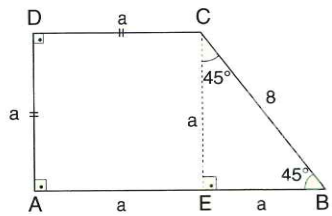
$A(ABCD) = |EF| \cdot |DA|$

$= 8 \cdot 6 = 48$ cm^2



Yanıt / The Answer is D

8.



$[CE] \perp [AB]$, $m(\widehat{ECB}) = 45°$

$\Rightarrow 2a^2 = 64 \Rightarrow a^2 = 32$

$a = 4\sqrt{2}$,

$|AB| = 8\sqrt{2}$

$A(ABCD) = \frac{|AB| + |DC|}{2} \cdot |AD|$

$= \frac{8\sqrt{2} + 4\sqrt{2}}{2} \cdot 4\sqrt{2} = 48$ cm^2

Yanıt / The Answer is C

9. $A(\widehat{AOD}) = A(\widehat{BOC}) = \sqrt{4.25} = 10$ cm^2

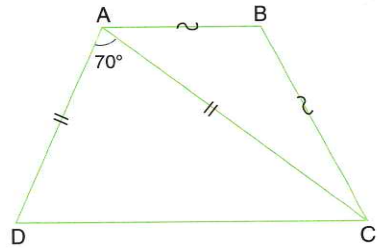
$A(ABCD) = 2 \cdot 10 + 4 + 25$

$= 49$ cm^2

Yanıt / The Answer is C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

10.



$m(\widehat{DAC}) = 70°$, $|AD| = |AC|$ $\Rightarrow m(\widehat{ADC}) = m(\widehat{ACD}) = 55°$

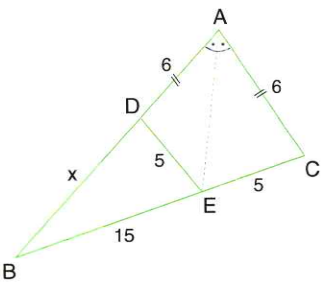
$[AB] // [DC] \Rightarrow m(\widehat{BAC}) = m(\widehat{ACD}) = 55°$

$|AB| = |BC| \Rightarrow m(\widehat{BAC}) = (\widehat{ACB}) = 55°$

$m(\widehat{ABC}) = 180° - 110° = 70°$

Yanıt / The Answer is D

11.



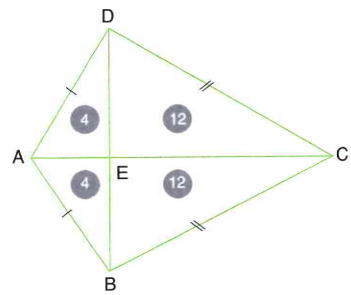
$|AD| = |AC|$, $|ED| = |EC|$ $\Rightarrow m(\widehat{DAE}) = m(\widehat{EAC})$

$\frac{6}{6+x} = \frac{5}{15}$

$x = 12$ cm

Yanıt / The Answer is C

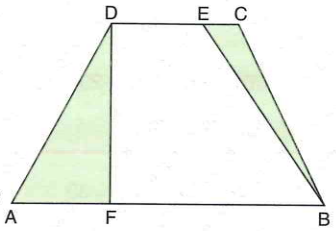
12.



$A(ABCD) = 4 + 4 + 12 + 12 = 32$ cm^2

Yanıt / The Answer is C

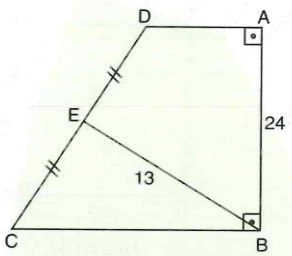
1. [AB] // [DC],
2|DE| = 3|EC|,
2|FB| = 3|AF|,
Alan(ABCD) = 70
Area(ABCD) = 70
Alan($\widehat{AFD}$) + Alan($\widehat{BCE}$) = ?



A) 20 B) 24 C) 25
D) 28 E) 35

[İSTANBUL ÜNİVERSİTESİ – YÖS 2018]

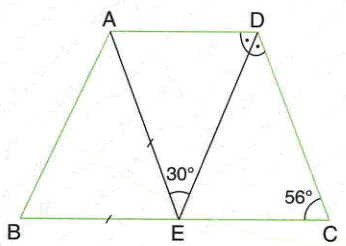
2. ABCD yamuk / trapezoid,
[AD] // [BC],
[AB] ⊥ [BC],
|DE| = |EC|,
|AB| = 24 cm, |EB| = 13 cm
⇒ A(ABCD) = ? = cm²



A) 100 B) 120 C) 130
D) 140 E) 156

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2017]

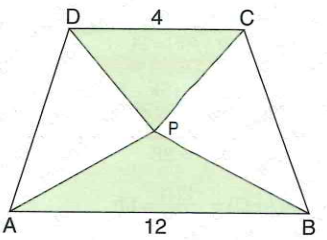
3. [AD] // [BC],
|AE| = |BE|,
m($\widehat{ADE}$) = m($\widehat{EDC}$),
m($\widehat{AED}$) = 30°
m($\widehat{DCE}$) = 56°
⇒ m($\widehat{ABE}$) = ?



A) 40 B) 44 C) 46
D) 56 E) 64

[İSTANBUL ÜNİVERSİTESİ – YÖS 2017]

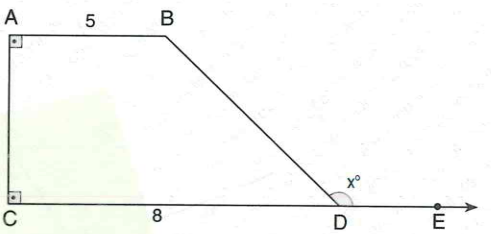
4. [AB] // [DC]
|AB| = 12 cm
|DC| = 4 cm
A($\widehat{DPC}$) = 20 cm²
A($\widehat{ABP}$) = 30 cm²
⇒ A(ABCD) = ? cm²



A) 100 B) 110 C) 120
D) 150 E) 160

[EGE ÜNİVERSİTESİ – YÖS 2016]

5.

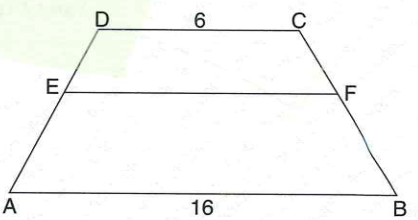


ABCD bir yamuktur. / ABCD is a trapezoid.
|AB| = 5 cm, |CD| = 8 cm,
A(ABCD) = $\frac{39}{2}\sqrt{3}$ cm² ⇒ **m($\widehat{BDE}$) = ?**

A) 120° B) 135° C) 150°
D) 155° E) 160°

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2015]

6.



ABCD bir yamuktur. / ABCD is a trapezoid.
[DC] // [EF] // [AB], 3·|FC| = 2·|FB|
⇒ |EF| = ?

A) 8 B) 9 C) 10
D) 11 E) 12

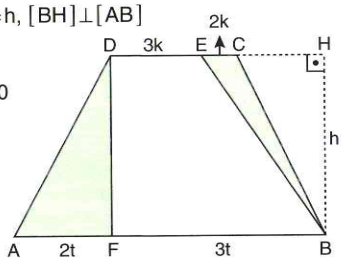
[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2014]

YANITLAR / ANSWERS

1	2	3	4	5	6
D	B	C	C	A	C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $\left.\begin{matrix}|DE|=3k, |EC|=2k \\ |FB|=3t, |AF|=2t\end{matrix}\right\} |BH|=h,\ [BH]\perp[AB]$



$A(ABCD) = \dfrac{(5k+5t)}{2}\cdot h = 70$

$\Rightarrow (k+t)\cdot h = 28$

$A(\widehat{AFD}) = \dfrac{2t\cdot h}{2} = t\cdot h$

$A(\widehat{BCE}) = \dfrac{h\cdot 2k}{2} = h\cdot k$

$h(t+k) = 28$

Yanıt / The Answer D

2. $|DE| = |EC| \Rightarrow |EF| = |EB|$

$\Rightarrow |BF| = 26$ cm

$|AD| = a$, $|BC| = c$, $|FD| = c$

$|AF| = a + c$

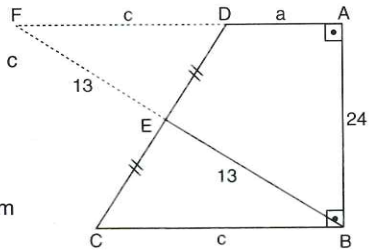
$\Rightarrow |BF| = 13\cdot 2 = 26$

$|AB| = 12\cdot 2 = 24$

$a + c = |AF| = 5\cdot 2 = 10$ cm

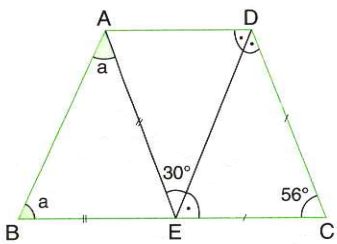
$A(ABCD) = \left(\dfrac{a+c}{2}\right)\cdot h$

$= \left(\dfrac{10}{2}\right)\cdot 24 = 120\ cm^2$



Yanıt / The Answer B

3.



$\widehat{DEC}$:

$180° - 56° = 124°$

$\dfrac{124°}{2} = m(\widehat{DEC})$

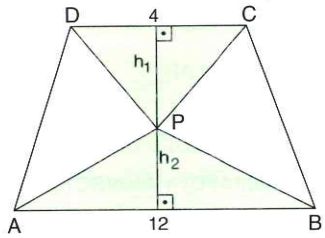
$62° = m(\widehat{DEC})$

$2a = 92°$

$m(\widehat{ABE}) = a = 46°$

Yanıt / The Answer is C

4.



$A(\widehat{DPC}) \Rightarrow \dfrac{h_1\cdot 4}{2} = 20$

$h_1 = 10$ cm

$A(\widehat{PAB}) \Rightarrow \dfrac{h_2\cdot 12}{2} = 30$

$h_2 = 5$ cm

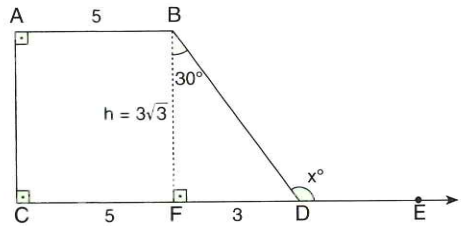
$A(ABCD) = \dfrac{(|AB| + |DC|)\cdot(h_1 + h_2)}{2}$

$= \dfrac{(12+4)\cdot(10+5)}{2}$

$= \dfrac{16\cdot 5}{2} = 120\ cm^2$

Yanıt / The Answer C

5.



$A(CDAB) = \dfrac{(8+5)\cdot h}{2}$

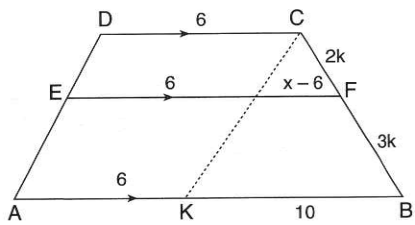
$\dfrac{39}{2}\sqrt{3} = \dfrac{13\cdot h}{2}$

$3\sqrt{3} = h \Rightarrow m(\widehat{BDC}) = 60°$

$x = 120°$

Yanıt / The Answer A

6.



$\dfrac{2k}{5k} = \dfrac{x-6}{10}$

$5x - 30 = 20$

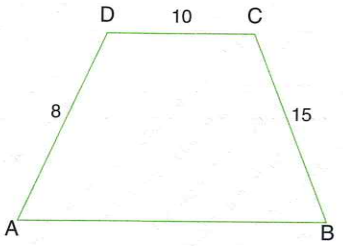
$5x = 50$

$x = 10\ br\,(u)$

Yanıt / The Answer is C

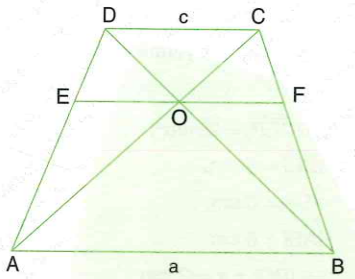
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. ABCD bir yamuktur.
ABCD is a trapezoid.
IDAI = 8 cm,
IDCI = 10 cm,
ICBI = 15 cm,
$m(\widehat{A}) + m(\widehat{B}) = 90°$
⇒ **IABI = ? cm**



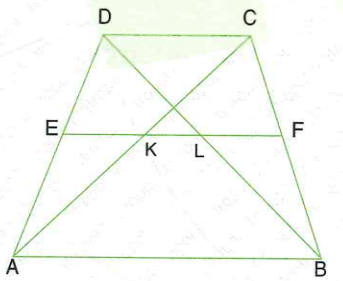
Yanıt / The Answer is 27

2. ABCD bir yamuktur.
ABCD is a trapezoid.
[EF] // [AB],
IABI = a,
IDCI = c,
IEOI = 2 cm,
a · c = 12 cm
⇒ **a + c = ? cm**



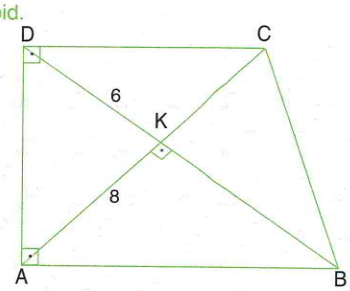
Yanıt / The Answer is 6

3. ABCD bir yamuk;
[EF], orta tabandır.
ABCD is a trapezoid;
[EF] is the midbase.
IABI = 4x cm,
IDCI = (x + 5) cm,
IKLI = (x – 1) cm
⇒ **IEFI = ? cm**



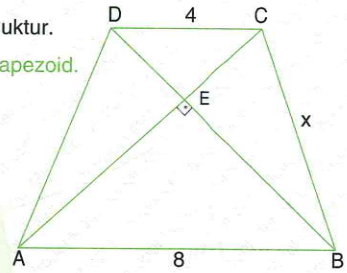
Yanıt / The Answer is 10

4. ABCD bir dik yamuktur.
ABCD is a right trapezoid.
[AC] ⊥ [BD],
IKDI = 6 cm,
IKAI = 8 cm
⇒ **IKCI = ? cm**



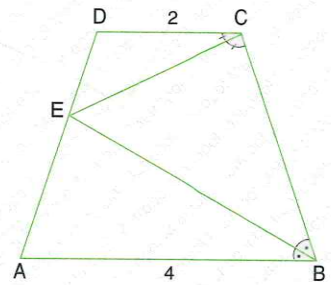
Yanıt / The Answer is $\frac{9}{2}$

5. ABCD bir ikizkenar yamuktur.
ABCD is an isosceles trapezoid.
[AC] ⊥ [BD],
IABI = 8 cm,
IDCI = 4 cm
⇒ **IBCI = x = ? cm**



Yanıt / The Answer is $2\sqrt{10}$

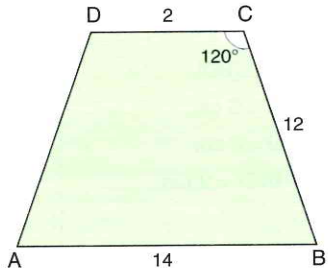
6. ABCD bir yamuk; [CE] ve [BE] birer açıortaydır.
ABCD is trapezoid; [CE] and [BE] are bisectors.
IDEI = IEAI,
IABI = 4 cm,
IDCI = 2 cm
⇒ **IBCI = ? cm**



Yanıt / The Answer is 6

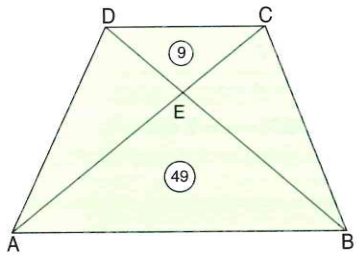
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCD bir yamuktur.
ABCD is a trapezoid.
$m(\widehat{C}) = 120°$,
$|DC| = 2$ cm,
$|CB| = 12$ cm,
$|AB| = 14$ cm
$\Rightarrow$ **A(ABCD) = ? cm²**



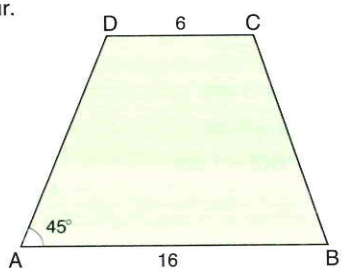
Yanıt / The Answer is 48√3

8. ABCD bir yamuktur.
ABCD is a trapezoid.
$A(\widehat{DEC}) = 9\,cm^2$,
$A(\widehat{AEB}) = 49\,cm^2$
$\Rightarrow$ **A(ABCD) = ? cm²**



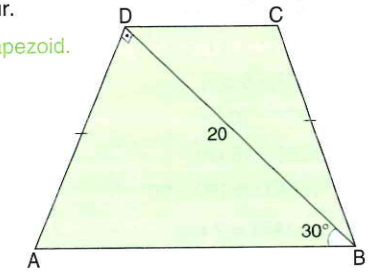
Yanıt / The Answer is 100

9. ABCD ikizkenar yamuktur.
ABCD is an isosceles trapezoid.
$m(\widehat{A}) = 45°$,
$|DC| = 6$ cm,
$|AB| = 16$ cm
$\Rightarrow$ **A(ABCD) = ? cm²**



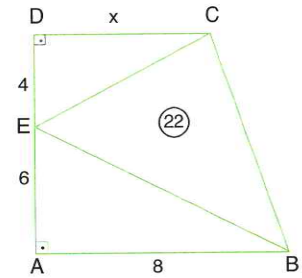
Yanıt / The Answer is 55

10. ABCD ikizkenar yamuktur.
ABCD is an isosceles trapezoid.
$[AD] \perp [DB]$,
$|AD| = |CB|$,
$m(\widehat{ABD}) = 30°$,
$|BD| = 20$ cm
$\Rightarrow$ **A(ABCD) = ? cm²**



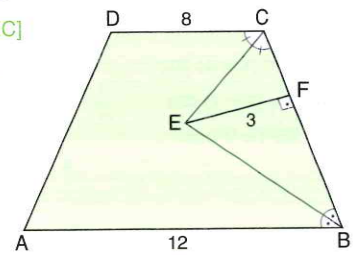
Yanıt / The Answer is **100√3**

11. ABCD bir dik yamuktur.
ABCD is a right trapezoid.
$A(\widehat{CEB}) = 22\,cm^2$,
$|DE| = 4$ cm,
$|EA| = 6$ cm,
$|AB| = 8$ cm
$\Rightarrow$ **|DC| = x = ? cm**



Yanıt / The Answer is 2

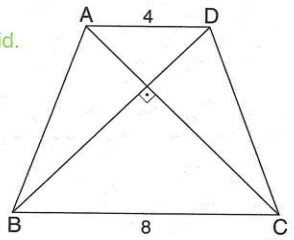
12. ABCD bir yamuk; [EC] ve [EB] birer açıortaydır.
ABCD is a trapezoid; [EC] and [EB] are bisectors.
$[EF] \perp [BC]$,
$|AB| = 12$ cm,
$|DC| = 8$ cm,
$|EF| = 3$ cm
$\Rightarrow$ **A(ABCD) = ? cm²**



Yanıt / The Answer is **60**

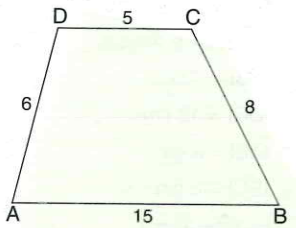
METROPOL YAYINLARI • METROPOL PUBLICATIONS

13. ABCD ikizkenar yamuktur.
ABCD is an isosceles trapezoid.
[AC] ⊥ [BD],
IABI = IDCI,
IADI = 4 cm,
IBCI = 8 cm
⇒ **A(ABCD) = ? cm²**



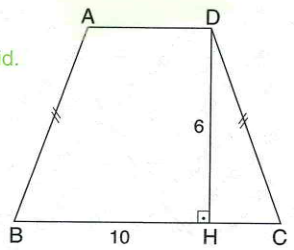
Yanıt / The Answer is 36

14. ABCD bir yamuktur.
ABCD is a trapezoid.
IADI = 6 cm,
IBCI = 8 cm,
IDCI = 5 cm,
IABI = 15 cm
⇒ **A(ABCD) = ? cm²**



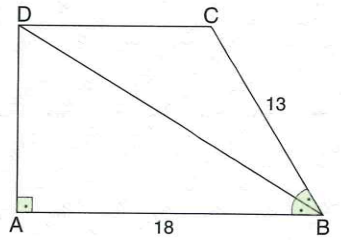
Yanıt / The Answer is 48

15. ABCD ikizkenar yamuktur.
ABCD is an isosceles trapezoid.
[DH] ⊥ [BC],
IABI = IDCI,
IDHI = 6 cm,
IBHI = 10 cm
⇒ **A(ABCD) = ? cm²**



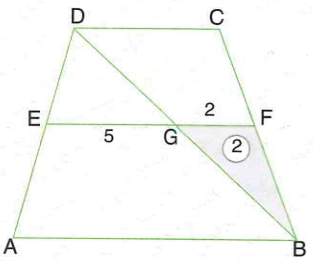
Yanıt / The Answer is 60

16. ABCD bir yamuk;
[BD] bir açıortaydır.
ABCD is a trapezoid;
[BD] is a bisectors.
[DA] ⊥ [AB],
IABI = 18 cm,
IBCI = 13
⇒ **A(ABCD) = ? cm²**



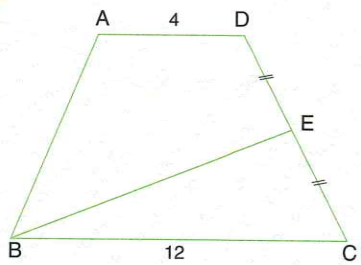
Yanıt / The Answer is 186

17. ABCD bir yamuktur.
ABCD is a trapezoid.
IDEI = IEAI,
[EF] // [AB],
IEGI = 5 cm,
IGFI = 2 cm,
$A(\widehat{BGF}) = 2\,cm^2$
⇒ **A(ABCD) = ? cm²**



Yanıt / The Answer is 28

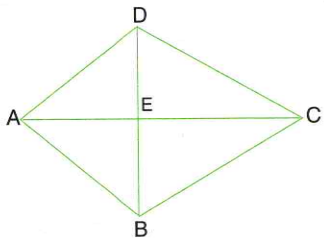
18. ABCD bir yamuktur.
ABCD is a trapezoid.
IDEI = IECI,
IADI = 4 cm,
IBCI = 12 cm
⇒ $\frac{\mathbf{A(ABED)}}{\mathbf{A(\widehat{BCE})}} = ?$



Yanıt / The Answer is $\frac{5}{3}$

METROPOL YAYINLARI • METROPOL PUBLICATIONS

19.



ABCD bir deltoiddir. / ABCD is a deltoid.

$m(\widehat{D}) = m(\widehat{B})$, $m(\widehat{EAB}) = 45°$,

$m(\widehat{ECD}) = 30°$, $|DE| = 3\,cm$

⇒ **Çevre / The perimeter (ABCD) = ? cm**

Yanıt / The Answer is $6\cdot(2+\sqrt{2})$

20. ABCD bir deltoiddir.

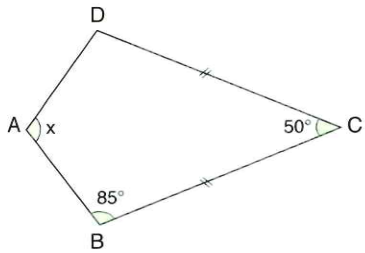
ABCD is a deltoid.

$|BC| = |DC|$,

$m(\widehat{C}) = 50°$,

$m(\widehat{ABC}) = 85°$

⇒ **$m(\widehat{BAD})$ = ?**



Yanıt / The Answer is 140°

21. ABCD bir deltoiddir.

ABCD is a deltoid.

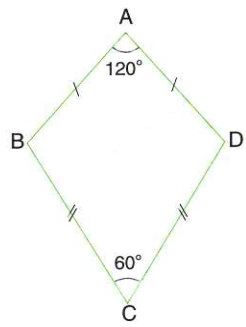
$|BC| = |CD|$,

$|AB| = |AD|$,

$m(\widehat{BAD}) = 120°$,

$m(\widehat{BCD}) = 60°$

⇒ $\frac{|AB|}{|BC|}$ = ?



Yanıt / The Answer is $\frac{\sqrt{3}}{3}$

22. ABCD bir deltoiddir.

ABCD is a deltoid.

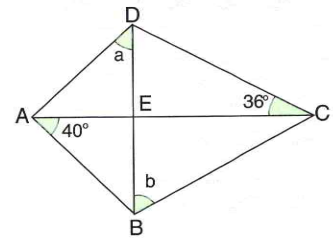
$m(\widehat{CAB}) = 40°$,

$m(\widehat{DCA}) = 36°$,

$m(\widehat{ADB}) = a$,

$m(\widehat{DBC}) = b$

⇒ **b − a = ?**



Yanıt / The Answer is 4°

23. ABCD bir deltoiddir.

ABCD is a deltoid.

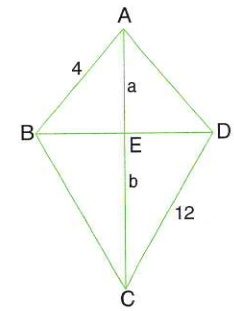
$|AB| = 4$ cm,

$|DC| = 12$ cm,

$|AE| = a$ cm

$|EC| = b$ cm

⇒ **$b^2 - a^2$ = ?**



Yanıt / The Answer is 128

24. ABCD bir dörtgendir.

ABCD is a quadrilateral.

$[AB] \perp [BC]$,

$|AD| = |DC|$,

$|AB| = |BC| = 4$ cm,

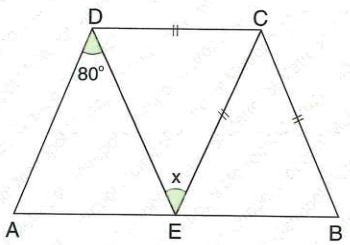
$|BD| = 6$ cm

⇒ **A(ABCD) = ? cm^2**

Yanıt / The Answer is $12\sqrt{2}$

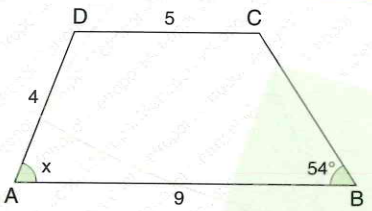
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. ABCD bir ikizkenar yamuktur.
ABCD is an isosceles trapezoid.
ICBI = ICEI = ICDI,
$m(\widehat{ADE}) = 80°$
$\Rightarrow$ **$m(\widehat{CED}) = x = ?$**



A) 50° B) 60° C) 70°
D) 80° E) 90°

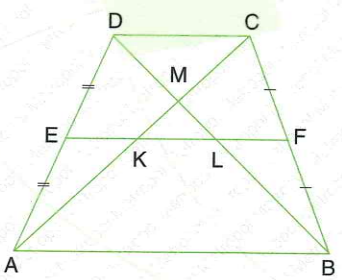
2.



ABCD bir yamuktur. / ABCD is a trapezoid.
IDCI = 5 cm, IADI = 4 cm, IABI = 9 cm,
$m(\widehat{CBA}) = 54° \Rightarrow$ **$m(\widehat{DAB}) = ?$**

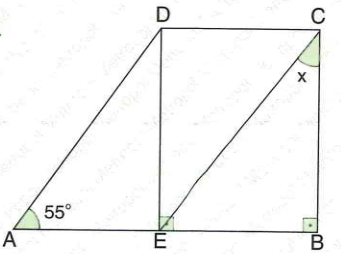
A) 70° B) 71° C) 72°
D) 73° E) 74°

3. ABCD bir yamuktur.
ABCD is a trapezoid.
IDEI = IEAI,
ICFI = IFBI,
IABI = (2x + 3) cm,
IDCI = (x – 2) cm,
IKLI = 5 cm
$\Rightarrow$ **IEFI = ? cm**



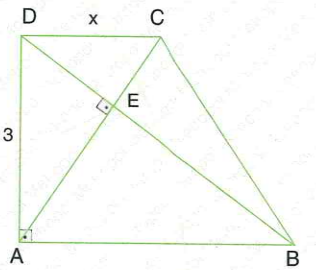
A) 8 B) 10 C) 12
D) 14 E) 16

4. ABCD bir dik yamuktur.
ABCD is a right trapezoid.
[DE] ⊥ [AB],
IAEI = IDCI,
$m(\widehat{DAE}) = 55°$
$\Rightarrow$ **$m(\widehat{ECB}) = ?$**



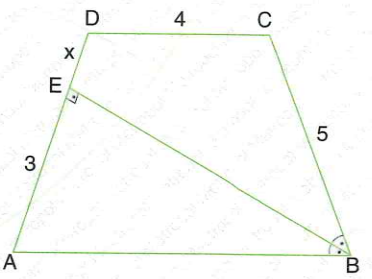
A) 35° B) 45° C) 50°
D) 55° E) 60°

5. ABCD bir dik yamuktur.
ABCD is a right trapezoid.
[DB] ⊥ [AC],
9·IDEI = IEBI,
IADI = 3 cm
$\Rightarrow$ **IDCI = x = ? cm**



A) 1 B) $\sqrt{2}$ C) 2
D) $\sqrt{3}$ E) 3

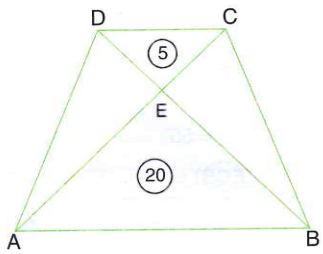
6. ABCD bir yamuk;
[BE] bir açıortaydır.
ABCD is a trapezoid;
[BE] is a bisector.
[BE] ⊥ [AD],
IDCI = 4 cm,
ICBI = 5 cm,
IEAI = 3 cm
$\Rightarrow$ **IDEI = x = ? cm**



A) $\frac{1}{3}$ B) $\frac{2}{3}$ C) 1
D) 2 E) 3

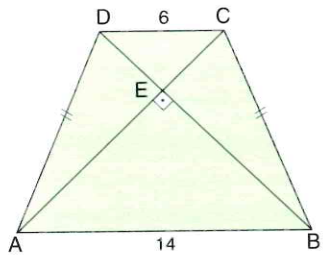
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCD bir yamuktur.
ABCD is a trapezoid.
$A(\widehat{DEC}) = 5\,cm^2$,
$A(\widehat{AEB}) = 20\,cm^2$
$\Rightarrow \frac{|DE|}{|EB|} = ?$



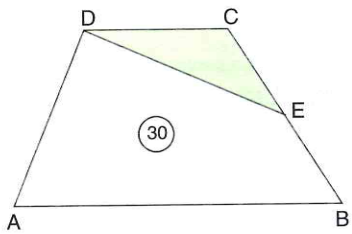
A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{1}{4}$ D) $\frac{1}{5}$ E) $\frac{1}{6}$

8. ABCD bir ikizkenar yamuktur.
ABCD is an isosceles trapezoid.
$[AC] \perp [DB]$,
$|DC| = 6$ cm,
$|AB| = 14$ cm
$\Rightarrow$ **A(ABCD) = ? cm²**



A) 82 B) 84 C) 92 D) 100 E) 108

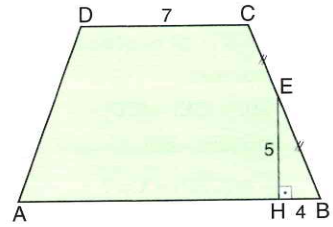
9. ABCD bir yamuktur.
ABCD is a trapezoid.
$|CE| = |EB|$,
$|AB| = 2|DC|$,
$A(ABED) = 30\,cm^2$
$\Rightarrow$ **$A(\widehat{DCE}) = ?\,cm^2$**



A) 2 B) 3 C) 4 D) 5 E) 6

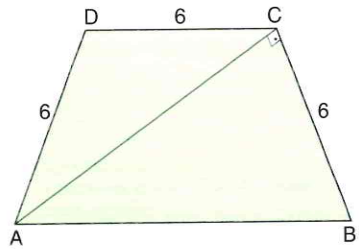
METROPOL YAYINLARI • METROPOL PUBLICATIONS

10. ABCD bir ikizkenar yamuktur.
ABCD is an isosceles trapezoid.
$|AD| = |BC|$,
$[EH] \perp [AB]$,
$|BE| = |CE|$,
$|DC| = 7$ cm,
$|EH| = 5$ cm, $|HB| = 4$ cm $\Rightarrow$ **A(ABCD) = ? cm²**



A) 120 B) 130 C) 140 D) 150 E) 160

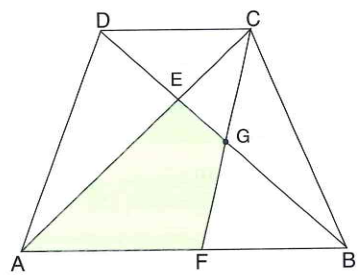
11.



ABCD bir ikizkenar yamuktur.
ABCD is an isosceles trapezoid.
$|AD| = |DC| = |CB| = 6$ cm $\Rightarrow$ **A(ABCD) = ? cm²**

A) $18\sqrt{3}$ B) $20\sqrt{3}$ C) $27\sqrt{3}$ D) $30\sqrt{3}$ E) $36\sqrt{3}$

12. ABCD yamuk;
G, ABC üçgeninin ağırlık merkezidir.
ABCD is a trapezoid;
G is center of gravity of ABC triangle.
$|DC| = |AF|$,
$A(ABCD) = 27\,cm^2$
$\Rightarrow$ **A(AFGE) = ? cm²**

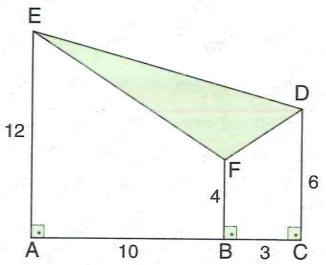


A) 3 B) 6 C) 9 D) 12 E) 15

YANITLAR / ANSWERS

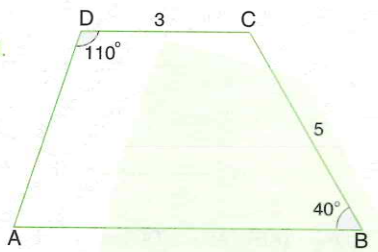
1	2	3	4	5	6	7	8	9	10	11	12
D	C	A	A	A	A	A	D	E	D	C	B

1. $[EA] \perp [AC]$,
$[FB] \perp [AC]$,
$[DC] \perp [AC]$,
$|EA| = 12$ cm,
$|FB| = 4$ cm,
$|DC| = 6$ cm,
$|AB| = 10$ cm,
$|BC| = 3$ cm
$\Rightarrow$ **A($\widehat{EFD}$) = ? cm²**



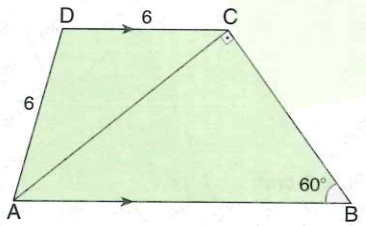
A) 20 B) 21 C) 22
D) 23 E) 24

2. ABCD bir yamuktur.
ABCD is a trapezoid.
$|BC| = 5$ cm,
$|CD| = 3$ cm,
$m(\widehat{B}) = 40°$,
$m(\widehat{D}) = 110°$,
$\Rightarrow$ **|AB| = ? cm**



A) 7 B) 8 C) 9
D) 10 E) 11

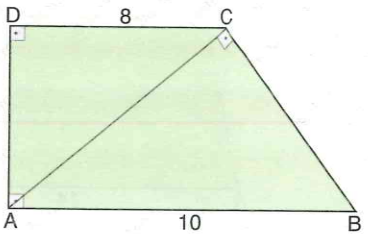
3.



ABCD bir yamuktur. / ABCD is a trapezoid.
$|DC| = |AD| = 6$ cm, $m(\widehat{ACB}) = 90°$, $m(\widehat{B}) = 60°$, $[AC] \perp [CB]$
$\Rightarrow$ **A(ABCD) = ? cm²**

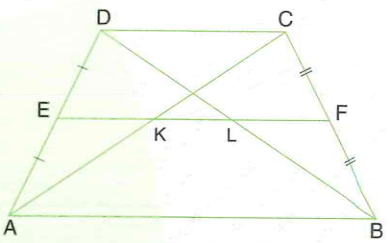
A) $12\sqrt{3}$ B) $18\sqrt{3}$ C) $25\sqrt{3}$
D) $27\sqrt{3}$ E) $33\sqrt{3}$

4. $|DC| = 8$ cm,
$|AB| = 10$ cm,
$m(\widehat{ACB}) = 90°$
$\Rightarrow$ **A(ABCD) = ? cm²**



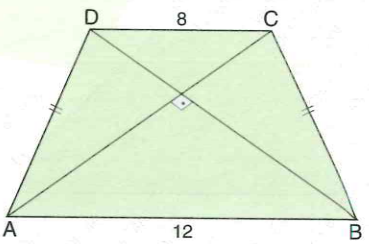
A) 36 B) 40 C) 48
D) 51 E) 60

5.



ABCD bir yamuktur. / ABCD is a trapezoid.
$|AB| = (5x + 4)$ cm, $|CD| = (3x - 2)$ cm,
$|KL| = 5$ cm $\Rightarrow$ **|EF| = ? cm**
A) 6 B) 7 C) 8
D) 9 E) 10

6.

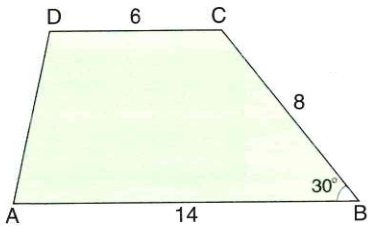


ABCD bir ikizkenar yamuktur. / ABCD is a isosceles trapezoid.
$[AC] \perp [DB]$, $|AB| = 12$ cm, $|CD| = 8$ cm $\Rightarrow$ **A(ABCD) = ? cm²**

A) 100 B) 110 C) 120
D) 130 E) 140

METROPOL YAYINLARI • METROPOL PUBLICATIONS

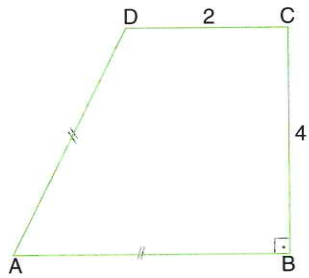
7.



[DC] // [AB], $m(\widehat{CBA}) = 30°$, |DC| = 6 cm,
|BC| = 8 cm, |AB| = 14 cm ⇒ **A(ABCD) = ? cm²**

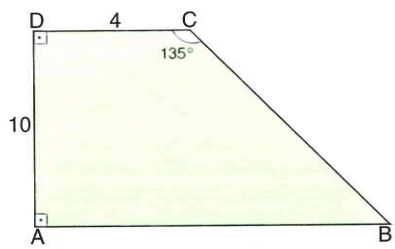
A) 18 B) 26 C) 32
D) 40 E) 42

8. [DC] // [AB],
[BC] ⊥ [AB],
|DC| = 2 cm,
|BC| = 4 cm,
|DA| = |AB|
⇒ **|AB| = ? cm**



A) 5 B) $5\sqrt{2}$ C) 6
D) $6\sqrt{2}$ E) 8

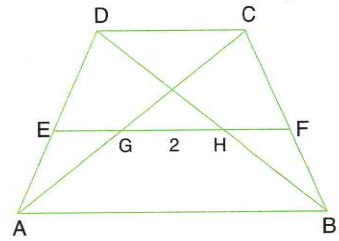
9.



[DC] // [AB], [DA] ⊥ [AB], |AD| = 10 cm,
|DC| = 4 cm, $m(\widehat{DCB}) = 135°$ ⇒ **A(ABCD) = ? cm²**

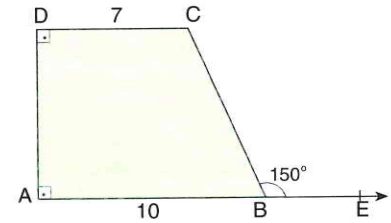
A) 85 B) 90 C) 95
D) 100 E) 120

10. [DC] // [AB],
|DE| = |EA|,
|CF| = |FB|,
|EF| = 12 cm,
|GH| = 2 cm
⇒ **|DC| = ? cm**



A) 8 B) 9 C) 10
D) 11 E) 12

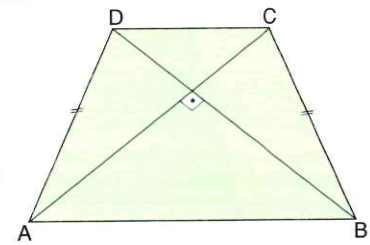
11.



[DA] ⊥ [AE], [AD] ⊥ [DC], |DC| = 7 cm
|AB| = 10 cm, $m(\widehat{CBE}) = 150°$ ⇒ **A(ABCD) = ? cm²**

A) $4\sqrt{3}$ B) $\frac{15\sqrt{3}}{2}$ C) $8\sqrt{3}$
D) $\frac{17\sqrt{3}}{2}$ E) $9\sqrt{3}$

12. [DC] // [AB],
[AC] ⊥ [BD],
$\frac{|DC|}{|AB|} = \frac{3}{4}$,
|AB| = 8 cm
⇒ **A(ABCD) = ? cm²**



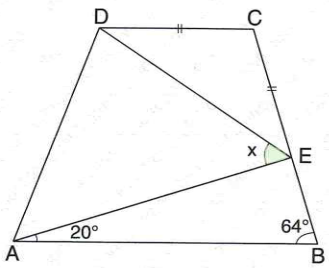
A) 48 B) 49 C) 50
D) 56 E) 60

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	B	D	A	D	A	D	A	B	C	D	B

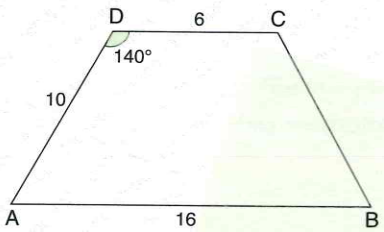
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. ABCD bir yamuktur.
ABCD is a trapezoid.
$|DC| = |CE|$,
$m(\widehat{ABC}) = 64°$,
$m(\widehat{EAB}) = 20°$
$\Rightarrow$ **$m(\widehat{AED}) = ?$**



A) 32° B) 40° C) 42°
D) 50° E) 52°

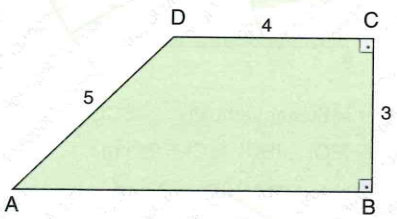
2.



ABCD bir yamuktur. / ABCD is a trapezoid.
$|AB| = 16$ cm, $|DC| = 6$ cm, $|AD| = 10$ cm,
$m(\widehat{ADC}) = 140° \Rightarrow$ **$m(BCD) = ?$**

A) 80° B) 90° C) 100°
D) 110° E) 120°

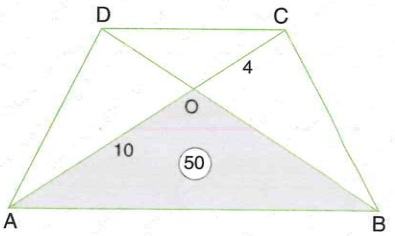
3.



ABCD bir dik yamuktur. / ABCD is a right trapezoid.
$|BC| = 3$ cm , $|CD| = 4$ cm, $|AD| = 5$ cm
$\Rightarrow$ **$A(ABCD) = ?\ cm^2$**

A) 12 B) 16 C) 18
D) 24 E) 26

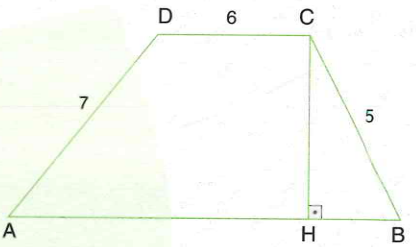
4.



ABCD bir yamuktur. / ABCD is a trapezoid.
$|OC| = 4$ cm, $|OA| = 10$ cm,
$A(\widehat{AOB}) = 50\ cm^2 \Rightarrow$ **$A(ABCD) = ?\ cm^2$**

A) 80 B) 92 C) 98
D) 110 E) 120

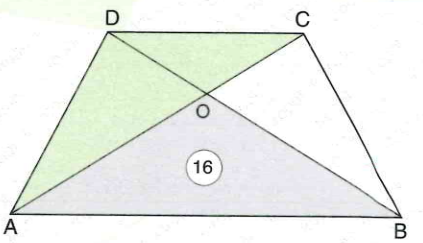
5.



ABCD bir yamuktur. / ABCD is a trapezoid.
$|AB| = 12$ cm, $|BC| = 5$ cm, $|CD| = 6$ cm,
$|AD| = 7$ cm $\Rightarrow$ **$|CH| = ?$ cm**

A) $2\sqrt{6}$ B) $2\sqrt{5}$ C) $3\sqrt{2}$
D) 4 E) 3

6.

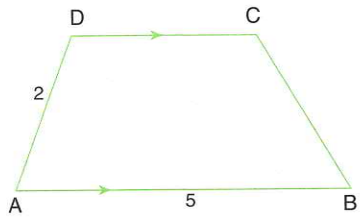


ABCD bir yamuktur. / ABCD is a trapezoid.
$4|DC| = 3|AB|$, $A(\widehat{AOB}) = 16\ cm^2$
$\Rightarrow$ **$A(\widehat{ACD}) = ?\ cm^2$**

A) 18 B) 21 C) 22
D) 24 E) 27

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



ABCD bir yamuktur. / ABCD is a trapezoid.

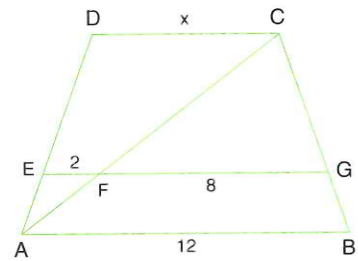
$m(\widehat{C}) = 2 \cdot m(\widehat{A})$, $|AD| = 2$ cm, $|AB| = 5$ cm

⇒ **Çevre / The perimeter (ABCD) = ? cm**

A) 12 B) 14 C) 15

D) 16 E) 18

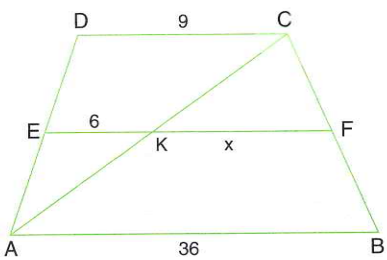
8. ABCD bir yamuktur.
ABCD is a trapezoid.
[AB] // [EG],
$|EF| = 2$ cm,
$|FG| = 8$ cm,
$|AB| = 12$ cm
⇒ **$|DC| = x$ = ? cm**



A) 7 B) 6 C) 5

D) 4 E) 3

9.

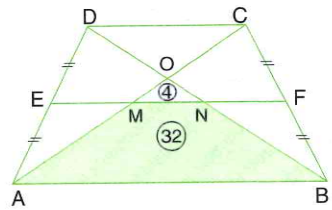


ABCD bir yamuktur. / ABCD is a trapezoid.
[EF] // [AB], $|EK| = 6$ cm, $|DC| = 9$ cm,
$|AB| = 36$ cm ⇒ **$|KF| = x$ = ? cm**

A) 6 B) 9 C) 12

D) 16 E) 20

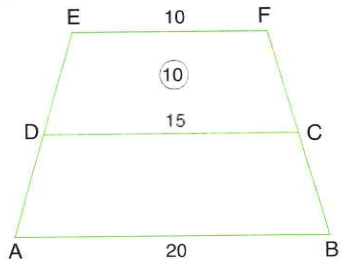
10. ABCD bir yamuktur.
ABCD is a trapezoid.
$A(\widehat{OMN}) = 4\,cm^2$,
$A(ABNM) = 32\,cm^2$,
$|BD| = 24$ cm
⇒ **$|OD| + |NB|$ = ? cm**



A) 14 B) 15 C) 18

D) 20 E) 22

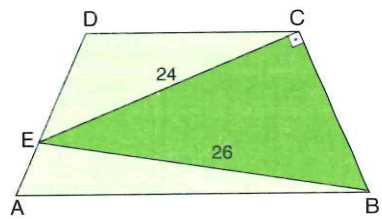
11. [EF] // [DC] // [AB],
$|EF| = 10$ cm,
$|DC| = 15$ cm,
$|AB| = 20$ cm,
$A(EDCF) = 10\,cm^2$
⇒ **$A(ABCD)$ = ? cm^2**



A) 7 B) 10 C) 12

D) 14 E) 15

12.



ABCD bir ikizkenar yamuktur. / ABCD is an isosceles trapezoid.
$E \in [AD]$, $[EC] \perp [BC]$, $|EC| = 24$ cm,
$|EB| = 26$ cm ⇒ **$A(ABCD)$ = ? cm^2**

A) $120\sqrt{3}$ B) $144\sqrt{2}$ C) 72

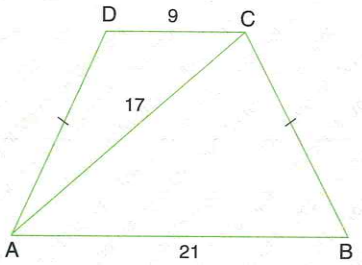
D) 120 E) 240

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
E	D	C	C	A	B	A	B	C	C	D	E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



ABCD bir ikizkenar yamuktur.

ABCD is an isosceles trapezoid.

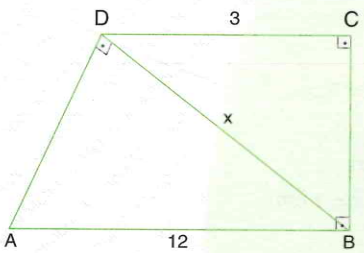
$|AB| = 21$ cm, $|AC| = 17$ cm, $|DC| = 9$ cm

$\Rightarrow$ **Çevre / The perimeter (ABCD) = ? cm**

A) 66 B) 64 C) 60

D) 50 E) 48

2.



ABCD bir dik yamuktur. / ABCD is a right trapezoid.

$[BD] \perp [DA]$, $|DC| = 3$ cm, $|AB| = 12$ cm

$\Rightarrow$ **$|DB| = x$ = ? cm**

A) 10 B) 9 C) 8

D) 7 E) 6

3. ABCD bir dik yamuktur.

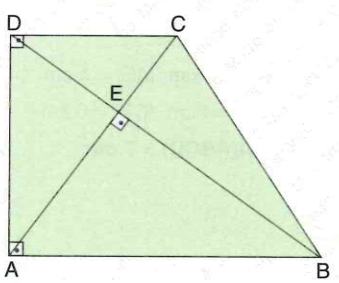
ABCD is a right trapezoid.

$[AC] \perp [BD]$,

$|AD| = 6$ cm,

$|AE| = 4 \cdot |EC|$

$\Rightarrow$ **$A(ABCD) = ?$ cm^2**



A) 75 B) 60 C) 45

D) 30 E) 15

4. ABCD bir yamuktur.

ABCD is a trapezoid.

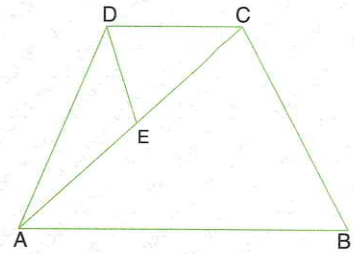
$[DE] \,//\, [CB]$,

$|DC| = \frac{27}{4}$,

$|AC| = 14$ cm,

$|AB| = 18$ cm

$\Rightarrow$ **$|EC| = ?$ cm**



A) $\frac{16}{3}$ B) $\frac{21}{4}$ C) $\frac{15}{4}$

D) $\frac{14}{3}$ E) 4

5. ABCD bir yamuktur.

ABCD is a trapezoid.

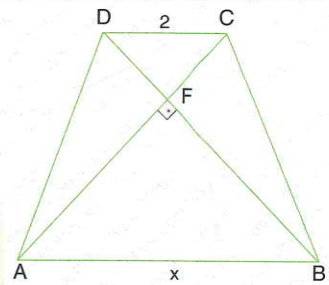
$[AC] \perp [BD]$,

$|DC| = 2$ cm,

$|BD| = 8$ cm,

$|AC| = 6$ cm

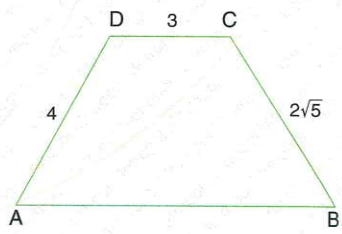
$\Rightarrow$ **$|AB| = x$ = ? cm**



A) 6 B) 7 C) 8

D) 9 E) 12

6.



ABCD bir yamuktur. / ABCD is a trapezoid.

$m(\widehat{A}) + m(\widehat{B}) = 90°$, $|AD| = 4$ cm, $|DC| = 3$ cm,

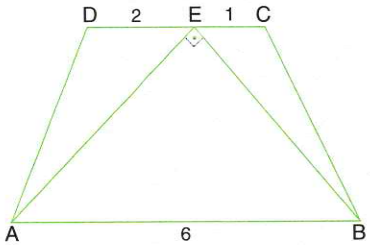
$|CB| = 2\sqrt{5}$ cm $\Rightarrow$ **$|AB| = ?$ cm**

A) 8 B) 9 C) 10

D) 12 E) 15

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.

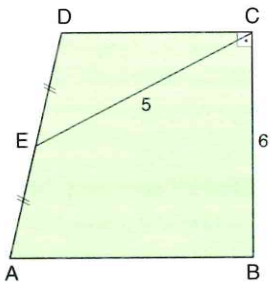


ABCD yamuk; EAB ikizkenar dik üçgendir.
ABCD is trapezoid; EAB is right isosceles triangle.
|DE| = 2 cm, |EC| = 1 cm, |AB| = 6 cm
⇒ **A(ABCD) = ? cm²**

A) $\frac{23}{2}$ B) $\frac{25}{2}$ C) 3 12

D) 13 E) $\frac{27}{2}$

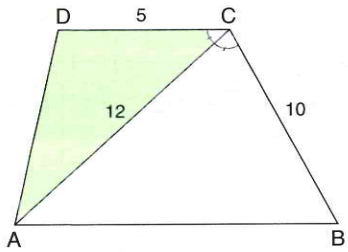
8. ABCD bir yamuktur.
ABCD is a trapezoid.
|DE| = |EA|,
[DC] ⊥ [CB],
[DC] // [AB],
|EC| = 5 cm,
|BC| = 6 cm
⇒ **A(ABCD) = ? cm²**



A) 32 B) 28 C) 24

D) 20 E) 16

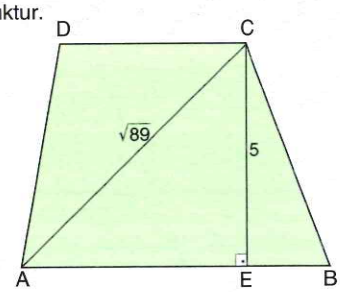
9. ABCD bir yamuk;
[CA] açıortaydır.
ABCD is a trapezoid;
[CA] is bisector.
|DC| = 5 cm,
|CB| = 10 cm,
|AC| = 12 cm
⇒ **A(ADC) = ? cm²**



A) 18 B) 20 C) 24

D) 32 E) 48

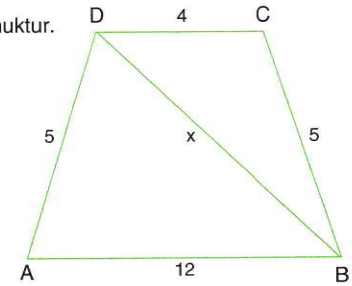
10. ABCD bir ikizkenar yamuktur.
ABCD is an isosceles trapezoid.
[CE] ⊥ [AB],
|AC| = $\sqrt{89}$ cm,
|CE| = 5 cm
⇒ **A(ABCD) = ? cm²**



A) 24 B) 28 C) 36

D) 40 E) 48

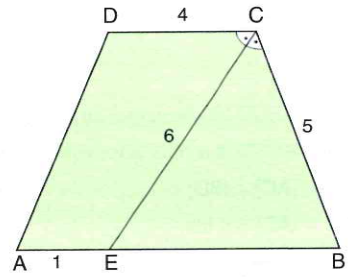
11. ABCD bir ikizkenar yamuktur.
ABCD is an isosceles trapezoid.
|BC|=|DA| = 5 cm,
|AB| = 12 cm,
|DC| = 4 cm
⇒ **|DB| = x = ? cm**



A) $\sqrt{47}$ B) $\sqrt{61}$ C) $\sqrt{73}$

D) $\sqrt{87}$ E) $\sqrt{91}$

12. ABCD bir yamuk;
[CE] bir açıortaydır.
ABCD is a trapezoid;
[CE] is a bisector.
|CB| = 5 cm, |AE| = 1 cm,
|DC| = 4 cm, |CE| = 6 cm
⇒ **A(ABCD) = ? cm²**



A) 6 B) 12 C) 16

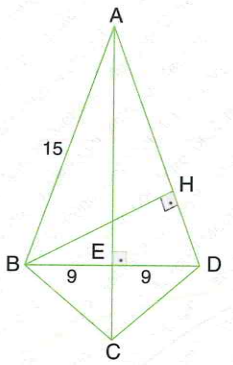
D) 20 E) 24

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	E	C	B	C	B	E	C	C	D	C	E

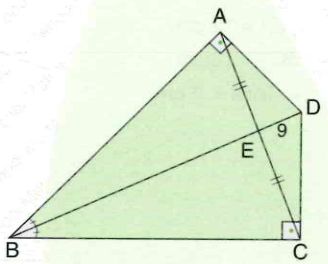
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. ABCD bir deltoiddir.
ABCD is a deltoid.
$[AC] \perp [BD]$,
$|BE| = |ED| = 9$ cm,
$|AB| = |AD|$
$|AB| = 15$ cm,
$[BH] \perp [AD]$
$\Rightarrow$ **$|BD| = ?$ cm**



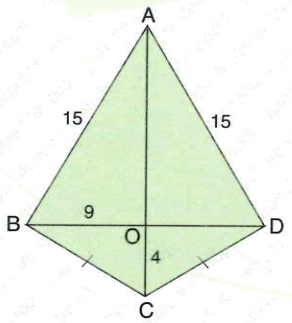
A) 8 B) 7,6 C) 7,2
D) 14 E) 14,4

2. $[BA] \perp [AD]$,
$m(ABD) = m(DBC)$,
$|AE| = |EC|$,
$|AB| = |BC|$,
$4 \cdot |AE| = 3 \cdot |BE|$,
$|ED| = 9$ cm
$\Rightarrow$ **$A(ABCD) = ?$ cm^2**



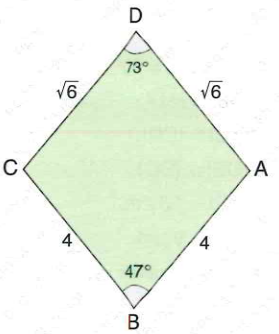
A) 475 B) 375 C) 350
D) 300 E) 275

3. ABCD bir deltoiddir.
ABCD is a deltoid.
$|AB| = |AD| = 15$ cm,
$|BC| = |CD|$,
$|BO| = 9$ cm,
$|OC| = 4$ cm
$\Rightarrow$ **$A(ABCD) = ?$ cm^2**



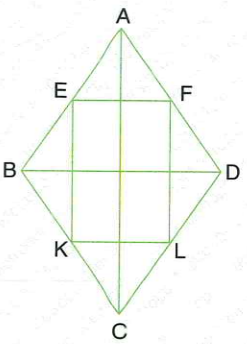
A) 108 B) 144 C) 192
D) 196 E) 216

4. ABCD bir deltoiddir.
ABCD is a deltoid.
$m(\widehat{ABC}) = 47°$,
$m(\widehat{ADC}) = 73°$,
$|AD| = |DC| = \sqrt{6}$ cm,
$|AB| = |BC| = 4$ cm
$\Rightarrow$ **$A(ABCD) = ?$ cm^2**



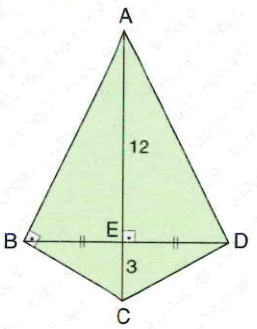
A) $4\sqrt{6}$ B) $6\sqrt{3}$ C) $6\sqrt{2}$
D) $12\sqrt{2}$ E) $8\sqrt{6}$

5. ABCD bir deltoiddir.
ABCD is a deltoid.
$|AB| = |AD|$,
$|BC| = |CD|$,
$A(EKLF) = 36$ cm^2
$\Rightarrow$ **$A(ABCD) = ?$ cm^2**



A) 48 B) 54 C) 66
D) 68 E) 72

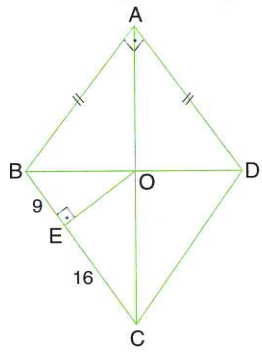
6. ABCD bir deltoiddir.
ABCD is a deltoid.
$m(ABC) = 90°$,
$[AC] \perp [BD]$,
$|BE| = |ED|$,
$|AB| = |AD|$,
$|EC| = 3$ cm,
$|AE| = 12$ cm
$\Rightarrow$ **$A(ABCD) = ?$ cm^2**



A) 72 B) 84 C) 90
D) 96 E) 104

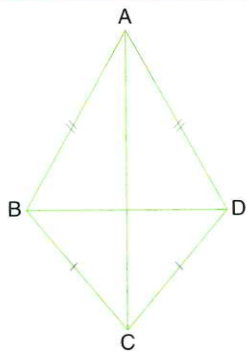
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCD bir deltoiddir.
ABCD is a deltoid.
$m(\widehat{BAD}) = 90°$,
$|AB| = |AD|$,
$|BC| = |CD|$,
$[OE] \perp [BC]$,
$|EC| = 16$ cm,
$|BE| = 9$ cm
$\Rightarrow$ **$|AC| \cdot |BD| = ?$**



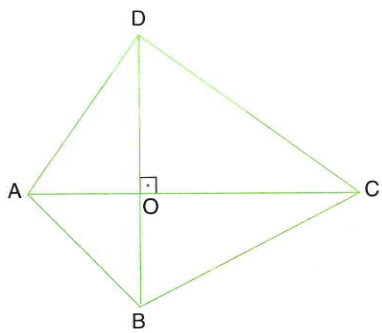
A) 960 B) 986 C) 1040 D) 1050 E) 1200

8. ABCD bir deltoiddir.
ABCD is a deltoid.
$|AC| = (3x + 4)$ cm,
$|BD| = (2x + 1)$ cm,
$A(ABCD) = 72$ cm^2
$\Rightarrow$ **$|AC| + |BD| = ?$ cm**



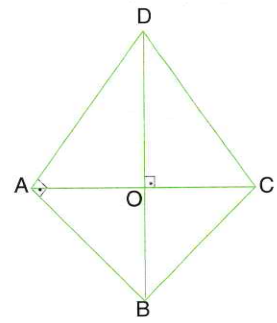
A) 18 B) 21 C) 24 D) 25 E) 28

9. ABCD bir deltoiddir.
ABCD is a deltoid.
$[AC] \perp [BD]$,
$|DO| = |OB| = |OC|$,
$|OA| = 3$ cm,
$A(ABCD) = 88$ cm^2
$\Rightarrow$ **$|BD| = ?$ cm**



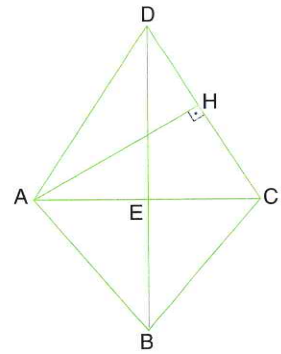
A) 12 B) 14 C) 16 D) 19 E) 20

10. ABCD bir deltoiddir.
ABCD is a deltoid.
$[DA] \perp [AB]$,
$|AD| = |DC|$,
$|AB| = |AC| = 12\sqrt{3}$ cm
$\Rightarrow$ **$|OD| = ?$ cm**



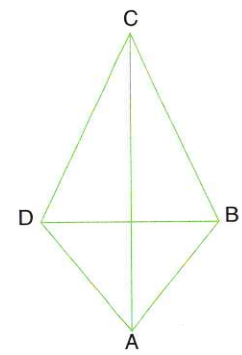
A) 5 B) 6 C) 8 D) 9 E) 12

11. ABCD bir deltoiddir.
ABCD is a deltoid.
$|BE| = |ED|$,
$|AC| = 12$ cm,
$|BD| = 16$ cm
$\Rightarrow$ **$|AH| = ?$ cm**



A) 9,6 B)9 C) 7,2 D) 4,8 E) 3,6

12. ABCD bir deltoiddir.
ABCD is a deltoid.
$|CD| = 18$ cm, $|BD| = 18$ cm,
$|DA| = 15$ cm $\Rightarrow$ **$|AC| = ?$ cm**



A) $4(3 + 3\sqrt{3})$ B) $3(4 + 3\sqrt{3})$ C) $2(6 + 3\sqrt{3})$ D) $5(6 + 3\sqrt{3})$ E) $4(6 + 2\sqrt{3})$

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
E	D	B	C	E	C	D	D	C	B	A	B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

BÖLÜM 11 CHAPTER

TARİHSEL NOT / HISTORICAL NOTE

Terence Tao [1975 –]

Matematiğin çeşitli alanlarında çalışmaları bulunan bir Avustralyalı-Amerikalı matematikçidir. Tao, 9 yaşında üniversite düzeyinde matematik derslerine devam eden, erken yaşlardan itibaren olağanüstü matematiksel yetenekler sergiledi. Tao, ilk on yaşında yarışan Uluslararası Matematik Olimpiyatları'nda bugüne kadarki en genç katılımcıydı; 1986, 1987 ve 1988'de bronz, gümüş ve altın madalya kazandı. Olympiat'ın tarihindeki üç madalyanın her birinin en genç kazananı oldu ve on üçüncü doğum gününden kısa bir süre sonra altın madalya kazandı. Matematik alanında, Tao, Oxford Üniversitesi'nden Ben J. Green ile yaptığı işbirliği ile bilinir; birlikte Green-Tao teoremini kanıtladılar. Onun işbirlikçi zihniyetiyle tanınan Tao, 2006 yılına kadar keşiflerinde 30'dan fazla kişi ile çalışmıştı. Tao tarafından 2016 yılında yaklaşık 300 araştırma yazısı ve 17 kitap yayınlanmıştır. 2 numaralı bir Erdös sayısına sahiptir.

He is an Australian-American mathematician who has worked in various areas of mathematics. Tao exhibited extraordinary mathematical abilities from an early age, attending university-level mathematics courses at the age of 9. Tao was the youngest participant to date in the International Mathematical Olympiad, first competing at the age of ten; in 1986, 1987, and 1988, he won a bronze, silver, and gold medal. He remains the youngest winner of each of the three medals in the Olympiad's history, winning the gold medal shortly after his thirteenth birthday. Within the field of mathematics, Tao is known for his collaboration with Ben J. Green of Oxford University; together they proved the Green–Tao theorem. Known for his collaborative mindset, by 2006 Tao had worked with over 30 others in his discoveries. By 2016 Tao had published about 300 research papers and 17 books. He has an Erdős number of 2.

ÇEMBERDE UZUNLUK ve AÇI
LENGTH and ANGLE in CIRCLE

Bu bölüm, 22 çözümlü örnek, 12 çözümlü test sorusu, 12 çözümlü YÖS sorusu, 24 alıştırma sorusu, 48 test sorusu içermektedir.

This chapter includes 22 examples with solutions, 12 test questions with solutions, 12 YÖS questions with solutions, 24 exercise questions and 48 test questions.

BÖLÜM / CHAPTER 11 ..... 371 - 408

ÇEMBERDE UZUNLUK ve AÇI / LENGTH and ANGLE in CIRCLE

- Çember / The Circle ..... 373 - 379
  - Çemberin Elemanları / Elements of a Circle ..... 373 - 374
  - Çemberde Teğet ve Kiriş ile İlgili Özellikler / Properties Related to Targent and Secant in Circles ..... 374 - 377
  - Teğetler Dörtgeni / Circumscribed Quadrilateral ..... 378 - 379
- İki Çemberin Birbirine Göre Durumu ile İlgili Özellikler / Properties Related to Position of Two Circles Relative to Each Other . 380 - 383
  - İki Çemberin Ortak Teğetleri / Common Tangets of Two Circles ..... 381 - 383
- Çemberde Açı / Angle in a Circle ..... 380 - 388
  - Çemberde Açı Çeşitleri / Angle Types in Circle ..... 380 - 387
  - Kirişler Dörtgeni / The Inscribed Quadrilateral 388
- Çözümlü Test / Test With Solutions ..... 389 - 392
- YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 393 - 396
- Alıştırmalar / Exercises ..... 397 - 400
- Konu Testleri / Practice Tests ..... 401 - 408

BÖLÜM 11 CHAPTER

ÇEMBERDE UZUNLUK ve AÇI
LENGTH and ANGLE in CIRCLE

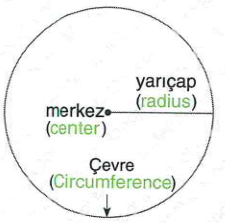
ÇEMBER / THE CIRCLE

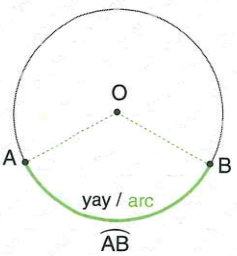
Bir çemberin üzerindeki her nokta, çemberin merkezine eşit uzaklıktadır. Çember sözcüğü bazen, bir eğrinin içinde kalan uzay bölgesini ifade edecek şekilde kullanılır. Bu durumda sözü edilen eğri çemberin çevresidir. r, çemberin yarıçapı olmak üzere, çevresinin uzunluğu $2\pi r$ ile verilir. Burada $\pi = 3.1415...$ dir.

Bir çemberin çevre uzunluğunun herhangi bir parçasına **yay** denir.

Every point on a circle is the same distance from its center.

Sometimes we use the word **circle** to include the space inside the curve. When we do this we call the curve itself the **circumference** of the **circle.** The circumference is given by $2\pi r$, where r units is the radius of the circle and, $\pi = 3.1415...$ Any part of the circumference is called an **arc**.





Örnek / Example 1

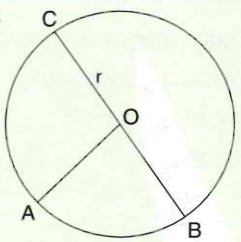
O naktası, şekildeki çemberin merkezidir.

The point O is center is of the circle in the figure.

$|OA| = (5x + 2)$ cm,

$|OB| = (3x + 6)$ cm

$\Rightarrow$ **r = ? cm**



A) 10 B) 12 C) 13 D) 14 E) 15

Çözüm / Solution Yanıt / Answer **B**

$|OA| = |OB| = r$ [yarıçap / radinus]

$5x + 2 = 3x + 6 = r$

$2x = 4$

$x = 2$ cm

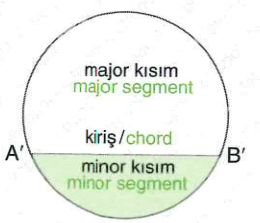
$r = 5 \cdot 2 + 2 = 12$ cm

ÇEMBERİN ELEMANLARI / ELEMENTS of a CIRCLE

Çember üzerinde, herhangi iki noktayı birleştiren doğru parçasına **kiriş** denir. Kiriş çemberi iki bölgeye ayırır. Kirişin böldüğü büyük bölgeye **major kısım**, küçük bölgeye **minor kısım** denir.

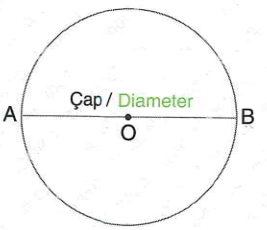
Line segment joining any two points on the circumference is called a **chord**. A chord divides a circle into two regions called segments.

The larger region is called a **major segment** and the smaller region is called a **minor segment.**



Bir çemberin merkezinden geçen **kiriş** çaptır. Çap çemberin yarıçapının iki katına eşittir.

Any chord passing throught the center of a circle is called a **diameter**. The diameter of a circle is twice the radius.

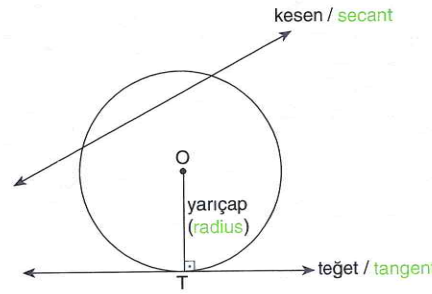


Teğet, çembere tam olarak tek bir noktadan değen doğrudur.

Kesen ise çemberi farklı iki noktada kesen doğrudur.

A tangent is a line that intersects a circle at exactly one point called the point of contat or point of tangency.

A secant is a line that intersects a circle in two distinct points.

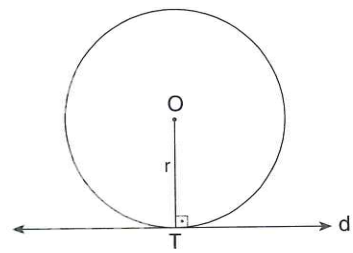


ÇEMBERDE TEĞET ve KİRİŞ İLE İLGİLİ ÖZELLİKLER / PROPERTIES RELATED to TARGENT and SECANT in CIRCLES

Özellik 1 / Property 1

Teğet, değme noktasında yarıçapa diktir.

Tangent is orthogonal to the radius at the point of contact.



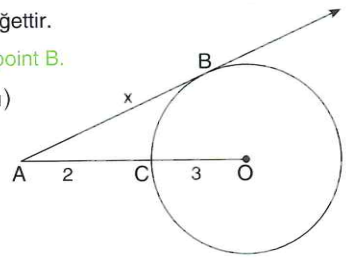
Örnek / Example 2

[AB, çembere B noktasında teğettir.

[AB is tangent to circle at the point B.

|AC| = 2 br (u), |OC| = 3 br (u)

⇒ **|AB| = x = ? br(u)**



A) 3 B) 4 C) 5 D) 6 E) 7

Çözüm / Solution — Yanıt / Answer B

[AB] ⊥ [OB] [Özellik 1 / Property 1]

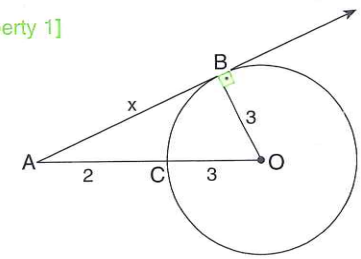
|OC| = |OB| = 3 br (u)

⇒ $5^2 = x^2 + 3^2$

$25 = x^2 + 9$

$16 = x^2$

$4 = x$



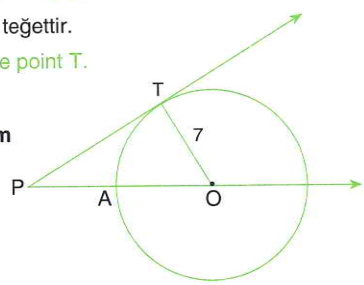
Örnek / Example 3

[PT, çembere T noktasında teğettir.

[PT is tangent to circle at the point T.

|OT| = 7 cm,

|PA| = 18 cm ⇒ **|PT| = ? cm**



A) 16 B) 18 C) 20 D) 22 E) 24

Çözüm / Solution — Yanıt / Answer E

|OT| = 7 cm ⇒ |OA| = 7 cm

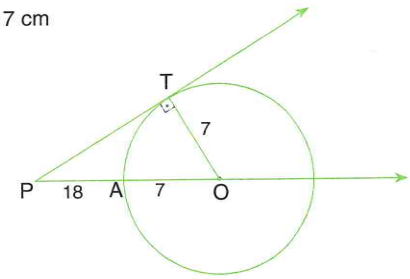
$|PO|^2 = |PT|^2 + |TO|^2$

⇒ $(25)^2 = |PT|^2 + (7)^2$

$625 = |PT|^2 + 49$

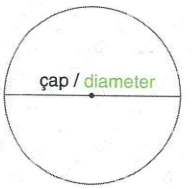
⇒ $|PT|^2 = 576$

$|PT| = 24$ cm



ÖNEMLİ / IMPORTANT

Bir çemberin içinde, çizilebilecek en uzun kiriş çaptır.
The longest chord that can be drawn in a circles is diameter.

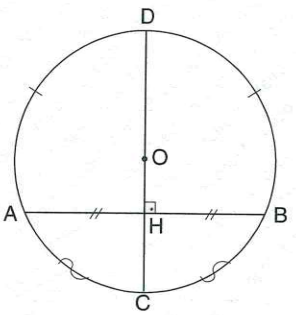


Özellik 2 / Property 2

i. Merkezden kirişe inilen dikme, kirişi ortalar (iki eşit parçaya böler).
The perpendicular drawn to chord from center bisects the chord. (devides to two equal parts)

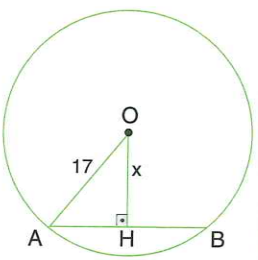
ii. Kirişin orta dikmesi, kirişin çemberden ayırdığı yayları ortalar.
The perpendicular bisector of a chord bisects the arcs which are separetd by the chord.

$\overset{\frown}{|AC|} = \overset{\frown}{|CB|}$ ve (and) $\overset{\frown}{|AD|} = \overset{\frown}{|DB|}$



Örnek / Example 4

|AB| = 16 cm,
|OA| = 17 cm
⇒ **|OH| = x = ? cm**



A) 16 B) 15 C) 14 D) 13 E) 12

Çözüm / Solution

Yanıt / Answer **B**

$|AH| = |HB| = \frac{16}{2} = 8$ cm

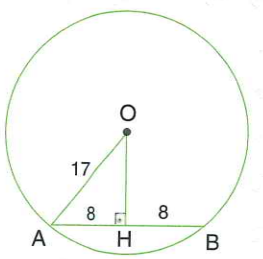
$|OA|^2 = |OH|^2 + |AH|^2$

$17^2 = |OH|^2 + 8^2$

$289 - 64 = |OH|^2$

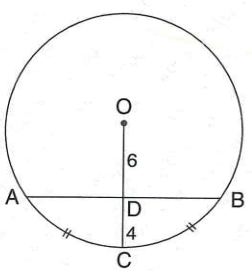
$225 = |OH|^2$

$|OH| = 15$ cm



Örnek / Example 5

O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$\overset{\frown}{|AC|} = \overset{\frown}{|CB|}$,
|OD| = 6 br(u), |DC| = 4 br(u)
⇒ **|AB| = ? br(u)**



A) 12 B) 13 C) 15 D) 16 E) 18

Çözüm / Solution

Yanıt / Answer **D**

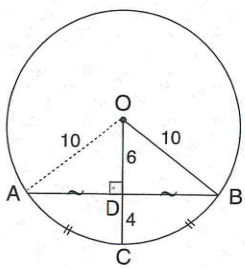
|OC| = |OA| = |OB| = r [yarıçap / radius]

$\overset{\frown}{|AC|} = \overset{\frown}{|CB|} \Rightarrow [OD] \perp [AB]$

$|AD| = |DB| = 8$ br(u)

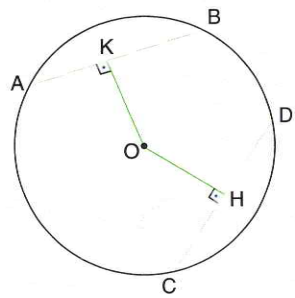
$\Rightarrow |AB| = |AD| + |DB|$

$= 8 + 8 = 16$ br(u)



Özellik 3 / Property 3

[OK] ⊥ [AB], [OH] ⊥ [CD] , ***|AB| = |CD| ⇔ |OK| = |OH|***

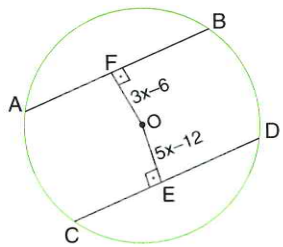


Örnek / Example 6

O noktası, şekildeki çemberin merkezidir.

The point O is center of the circle in the figure.

|AB| = |CD|,
|OF| = (3x – 6)cm,
|OE| = (5x – 12)cm ⇒ **x = ? cm**



A) 1 B) 2 C) 3 D) 4 E) 5

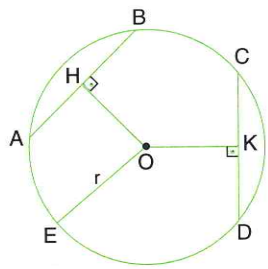
Çözüm / Solution

Yanıt / Answer **C**

|AB| = |CD| ⇔ |OF| = |OE| [Özellik 3 / Property 3]
3x – 6 = 5x–12
6 = 2x
3 = x

Örnek / Example 7

[OH] ⊥ [AB],
[OK] ⊥ [CD],
|AB| = |CD| = 9 cm,
|OK| = (2x – 2) cm,
|OH| = (x + 2) cm
⇒ **r = ? cm**

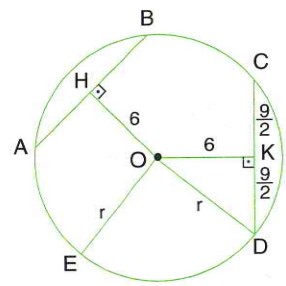


A) 6 B) $\frac{13}{2}$ C) 7 D) $\frac{15}{2}$ E) 8

Çözüm / Solution

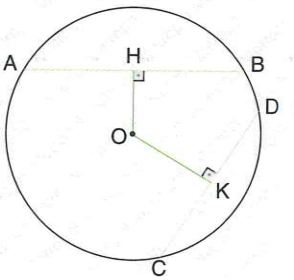
Yanıt / Answer **D**

|AB| = |CD| ⇒ |OH| = |OK| ⇒ 2x – 2 = x + 2
x = 4 cm
|OK| = 2x – 2 = 6 cm
$|OD|^2 = |OK|^2 + |KD|^2$
$|OD|^2 = 6^2 + \left(\frac{9}{2}\right)^2$
$|OD|^2 = 36 + \frac{81}{4}$
$|OD|^2 = \frac{225}{6}$
$|OD| = \frac{15}{2}$



Özellik 4 / Property 4

$[OH] \perp [AB]$, $[OK] \perp [CD] \Rightarrow |OH| < |OK| \Leftrightarrow |AB| > |CD|$

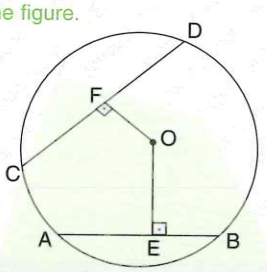


Örnek / Example 8

O noktası, şekildeki çemberin merkezidir.

The point O is center of the circle in the figure.

$|OF| < |OE|$,
$|CD| = (6x+5)$ cm
$|AB| = (7x+1)$ cm
$\Rightarrow$ **$x \in Z$, max(x) = ?**



A) 2 B) 3 C) 4 D) 5 E) 6

Çözüm / Solution

Yanıt / Answer **B**

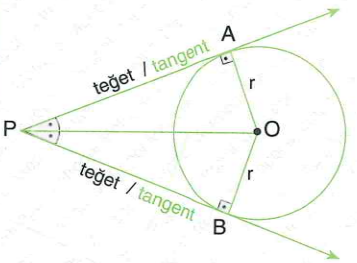
$|OF| < |OE| \Leftrightarrow |CD| > |AB|$
$6x+5 > 7x+1$
$4 > x$
$x \in Z$, $\max(x) = 3$

Özellik 5 / Property 5

Bir çembere, dışındaki bir noktadan iki teğet çizilebilir. Bu teğet parçalarının uzunlukları eşittir.

From a point outside a circle two tangent lines can be drawn. The length of these two tangent segments are equal.

$m(\widehat{APO}) = m(\widehat{OPB})$
$|PA| = |PB|$

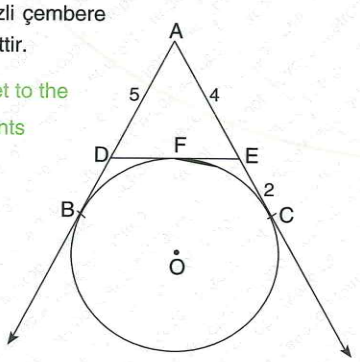


Örnek / Example 9

[AB, [AC ve [DE] O merkezli çembere B, C ve F noktalarında teğettir.

[AB, [AC and [DE are tangnet to the circle with center o at the points B, C and F, respectively.

$|AD| = 5$ cm,
$|AE| = 4$ cm,
$|EC| = 2$ cm
$\Rightarrow$ **$|DE| = ?$**



A) 2 B) 3 C) 4 D) 5 E) 6

Çözüm / Solution

Yanıt / Answer **B**

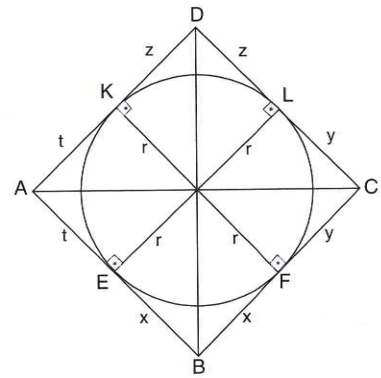
$|AB| = |AC|$ [Özellik 3 / Property 3]
$|BD| = |DF|$
$|EF| = |EC|$
$|DB| = 6 - 5 = 1$ cm
$|BD| = |DF| = 1$ cm
$|EC| = |EF| = 2$ cm
$|DE| = |DF| + |EF| = 1 + 2 = 3$ cm

TEĞETLER DÖRTGENİ / CIRCUMSCRIBED QUADRILATERAL

Tanım: Kenarları bir çembere teğet olan dörtgene **teğetler dörtgeni** denir.

Definition: Circumscribed quadrilateral is a quadrilateral, the sides of which are tangent to a circle.

$$|AB| + |DC| = |AD| + |BC|$$



ÖNEMLİ / IMPORTANT

|AB| = a, |BC| = b, |CD| = c, |DA| = d

$$\frac{a+b+c+d}{2} = u \Rightarrow A(ABCD) = \frac{1}{2}\cdot(a+b+c+d)\cdot r = u\cdot r$$

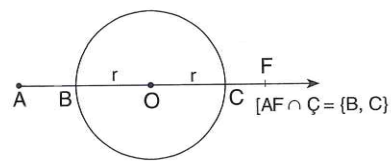
ÖNEMLİ / IMPORTANT

i. Çember ile A noktası arasındaki en kısa mesafe, |AB| = |AO| – r dir.

The shortest distance between the circle and the point A is |AB| = |AO| – r.

ii. Çember ile A noktası arasındaki en uzak mesafe, |AC| = |AO| + r dir.

The longest distance between the circle and the point A is |AC| = |AO| + r.

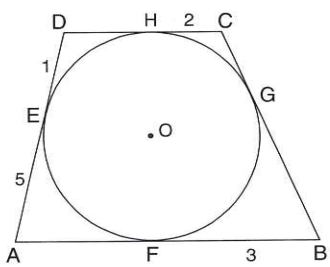


ÖNEMLİ / IMPORTANT

Kare, eşkenar dörtgen ve deltoid birer teğetler dörtgenidir.

The square, the equilateral quadrangle and the deltoid are each is a circumscribed quadrilateral.

Örnek / Example 10



O noktası, şekildeki çemberin merkezidir.

The point O is center of the circle in the figure.

|DE| = 1 br (u), |HC| = 2 br (u), |AE| = 5 br (u), |BF| = 3 br (u)

⇒ **Çevre / The perimeter (ABCD) = ? br (u)**

A) 17 B) 19 C) 22 D) 24 E) 26

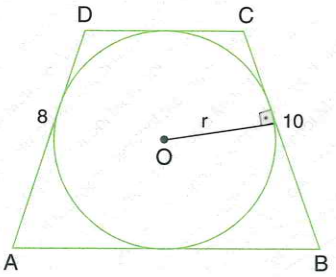
Çözüm / Solution Yanıt / Answer **C**

$$\left.\begin{array}{l}|DE| = |DH| \\ |CH| = |CG| \\ |BG| = |BF| \\ |AE| = |AF|\end{array}\right\} \Rightarrow \begin{array}{l}|DH| = 1 \text{ br (u)} \\ |CG| = 2 \text{ br (u)} \\ |BG| = 3 \text{ br (u)} \\ |AF| = 5 \text{ br (u)}\end{array}$$

⇒ Çevre / The perimeter (ABCD) = 3 + 6 + 8 + 5 = 22 br (u)

Örnek / Example 11

r, O merkezli çemberin yarıçapıdır.
r is the radius of the circle with center O.
r = 3 cm,
|AD| = 8 cm,
|BC| = 10 cm
⇒ **A(ABCD) = ? cm²**



A) 42 B) 48 C) 54 D) 57 E) 60

Çözüm / Solution Yanıt / Answer **C**

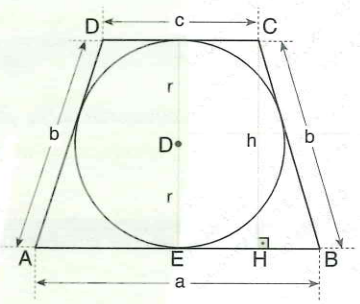
|DC| + |AB| = |AD| + |CB| = 18
2u = 18 + 18
u = 18
A(ABCD) = u·r
= 18·3
= 54 cm²

İkizkenar Yamuğun Teğetler Dörtgeni Olma Durumu
Situation of an Equilateral Trapezoid Being a Circumscribed Quadrangle

1. |AB| + |DC| = |AD| + |BC| ⇒ ***2b = a + c***

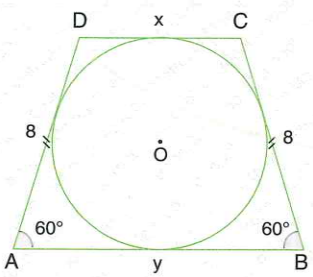
2. [CH] ⊥ [AB] ⇒ ***h = 2r***

3. $b = \frac{a+c}{2}$,
$|HB| = \frac{a-c}{2}$, $\widehat{CHB}$: $h^2 = \left(\frac{a+c}{2}\right)^2 - \left(\frac{a-c}{2}\right)^2$ [Kural 1 / Rule 1]
$h^2 = a \cdot c$
$h = \sqrt{ac}$



Örnek / Example 12

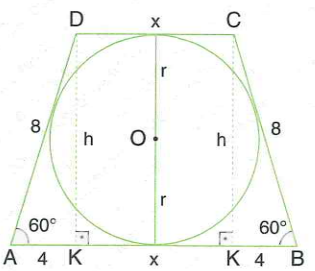
ABCD dörtgeni bir ikizkenar yamuktur.
Quandrangle ABCD is an isosceles trapezoid.
m(DAB) = m(ABC) = 60°,
|AD| = 8 cm,
|CB| = 8 cm
⇒ **x = ? cm**



A) 3 B) 4 C) 5 D) 6 E) 7

Çözüm / Solution Yanıt / Answer **B**

|AD| + |BC| = |AB| + |DC|
⇒ 16 = x + x + 8
2x = 8 cm
x = 4 cm

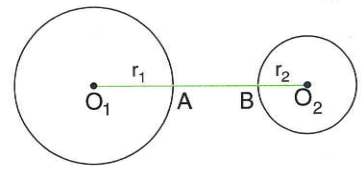


İKİ ÇEMBERİN BİRBİRİNE GÖRE DURUMU İLE İLGİLİ ÖZELLİKLER
PROPERTIES RELATED to POSITION of TWO CIRCLES RELATIVE to EACH OTHER

İki çemberin merkezleri arasındaki uzaklık d olmak üzere,
Let d be the distance between the centers of two circles.

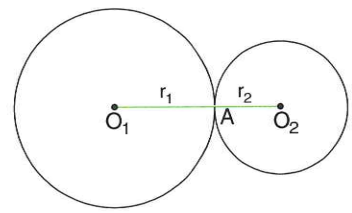
Özellik 1 / Property 1

$d = |O_1O_2|$ ve $r_1 + r_2 < d$ ise çemberler birbirinin dışındadır.
If $d = |O_1O_2|$ and $r_1 + r_2 < d$, then the circles lie outside of each other.



Özellik 2 / Property 2

$d = |O_1O_2| = r_1 + r_2$ ise çemberler birbirine dıştan teğettir.
If $d = |O_1O_2| = r_1 + r_2$, then the circles are externally tangent.

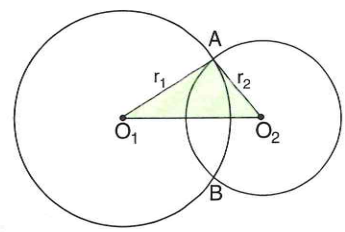


ÖNEMLİ / IMPORTANT

Dıştan teğet iki çemberin; merkezlerini birleştiren doğru parçası, değme noktasından geçer.
The line segment joining the centers of two externally tangent circles passes through the point of contact.

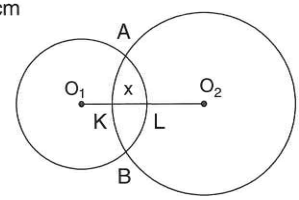
Özellik 3 / Property 3

$|O_1O_2| = d$ ve $|r_1 - r_2| < d < r_1 + r_2$ ise çemberler iki noktada kesişir.
If $|O_1O_2| = d$ and $|r_1 - r_2| < d < r_1 + r_2$, then the circles intersect at two points.



Örnek / Example 13

$|r_1| = 5$ cm, $|r_2| = 7$ cm, $|O_1O_2| = 8$ cm
⇒ **|KL| = x = ? cm**



A) 2 B) 3 C) 4 D) 5 E) 6

Çözüm / Solution

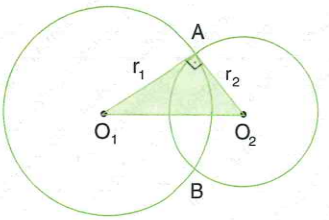
Yanıt / Answer **C**

$|O_1L| = |r_1| = 5$ cm ⇒ $|O_1K| = (5 - x)$ cm
$|O_2K| = |r_2| = 7$ cm ⇒ $|O_2L| = (7 - x)$ cm
$|O_1O_2| = |O_1K| + |KL| + |O_2L| = 8$ cm
⇒ $5 - x + x + 7 - x = 8$ cm
⇒ $12 - x = 8$
⇒ $4 = x$

Özellik 4 / Property 4

$|O_1O_2| = d$ ve $[O_1A] \perp [O_2A]$ ise çemberler dik kesişir.

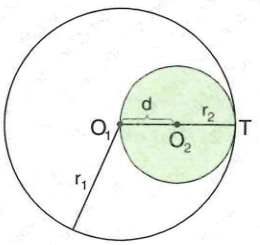
If $|O_1O_2| = d$ and $[O_1A] \perp [O_2A]$, then the circles intersect perpendicular.



Özellik 5 / Property 5

$d = |r_1 - r_2|$ ise, iki çember içten teğettir.

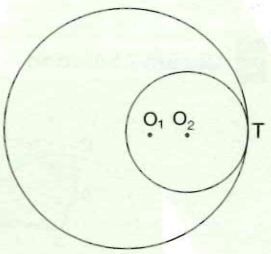
If $d = |r_1 - r_2|$, then the two circles are internally tangent.



Örnek / Example 14

O_1 ve O_2 merkezli çemberler, T noktasında içten teğettirler.

The circles with center O_1 and O_2 are internally tangent at the point T.



$r_1 = 11$ cm,

$r_2 = 6$ cm

$\Rightarrow$ **$|O_1O_2| = ?$ cm**

A) 3 B) 4 C) 5 D) 6 E) 7

Çözüm / Solution

Yanıt / Answer **C**

$|O_1T| = |r_1| = 11$cm,

$|O_2T| = |r_2| = 6$ cm

$|O_1O_2| = |O_1T - |O_2T|$

$= 11 - 6 = 5$ cm

ÖNEMLİ / IMPORTANT

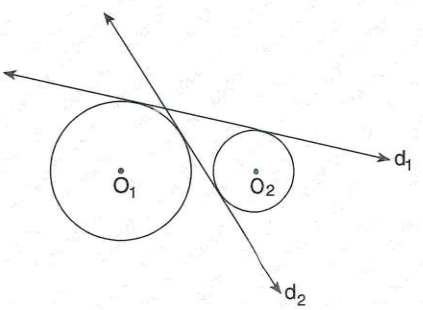
İçten teğet iki çemberin merkezlerini birleştiren doğru, değme noktasından geçer.

The line joining the centers of two internally tangent circles passes through the point of contact.

İKİ ÇEMBERİN ORTAK TEĞETLERİ / COMMON TANGESTS of TWO CIRCLES

Aynı düzlemde bulunan iki çembere teğet olan doğruya, bu çemberlerin **ortak teğeti** denir. Çemberlerin merkezleri ortak teğete göre aynı tarafta ise bu teğete **ortak dış teğet**, çemberlerin merkezi ortak teğete göre farklı taraflarda ise bu teğete **ortak iç teğet** denir.

A line which is tangent to two circles lying in the same plane is called **the common tangent** of these two circles. If the centers of the circles lie on the same side with respect to the common tangent, then this tangent is called **the common external tangent**. If the centers of circles lie on the different sides of the common tangent, then this tangent is called **the common internal tangent**.



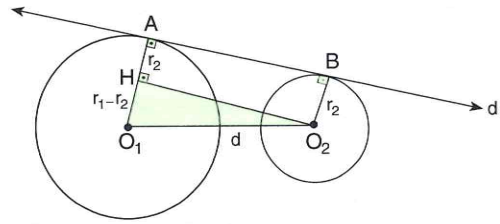
Şekildeki d_1 doğrusu ortak dış teğet, d_2 doğrusu ortak iç teğettir.

d_1 is common external tangent and d_2 is common internal tangent to circles in the figure.

Ortak Dış Teğet Parçasının Uzunluğu / Length of a Common External Tangent Segment

AHO_2B bir dikdörtgendir./ AHO_2B is a rectangle.

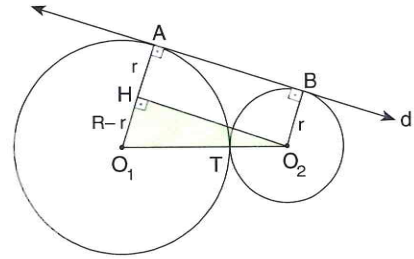
$$\left.\begin{array}{l} |AB| = |O_2H| \\ |O_1H| = r_1 - r_2 \\ |O_1O_2| = d \end{array}\right\} \Rightarrow |O_2H| = \sqrt{d^2 - (r_1 - r_2)^2}$$



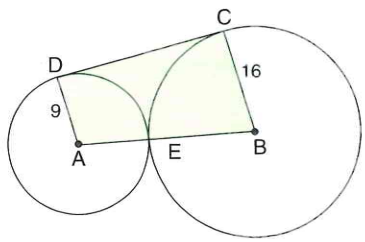
ÖNEMLİ / IMPORTANT

Yarıçapları R ve r olan iki çember dıştan teğet ise bu iki çemberin ortak dış teğet parçasının uzunluğu, $|AB| = 2\sqrt{R \cdot r}$ dir.

If two circles with radiuses r and R are externally tangent, then the length of the common external tangent segment of these two circles can be calculated as the following: $|AB| = 2\sqrt{R \cdot r}$



Örnek / Example 15

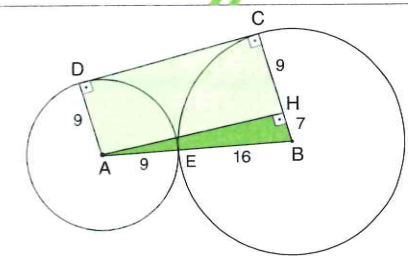


Şekildeki A ve B merkezli çemberler, E noktasında dıştan teğettir.
[DC] iki çemberin ortak dış teğetidir.
The circles with centers A and B as shown in the figure are externally tangent at the point E. [DC] is the common external tangent.
$|DA| = 9$ cm, $|BC| = 16$ cm
$\Rightarrow$ **$|DC| = ?$ cm**

A) 26 B) 25 C) 24 D) 30 E) 32

Çözüm / Solution

Yanıt / Answer **C**



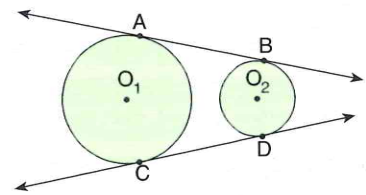
$[AH] \perp [BC] \Rightarrow$
$|AD| = |CH| = 9$ cm,
$|HB| = 16 - 9 = 7$ cm,
$|AB| = 9 + 16 = 25$ cm

$$|AB|^2 = |AH|^2 + |BH|^2$$
$$25^2 = |AH|^2 + 7^2$$
$$625 - 49 = |AH|^2$$
$$|AH|^2 = 576$$
$$|AH| = 24 \text{ cm}$$
$$\Rightarrow |DC| = |AH| = 24 \text{ cm}$$

ÖNEMLİ / IMPORTANT

İki çemberin ortak dış teğet parçalarının uzunlukları eşittir.
The common external tangent segments of two circles have equal lengths.

$$|AB| = |CD|$$



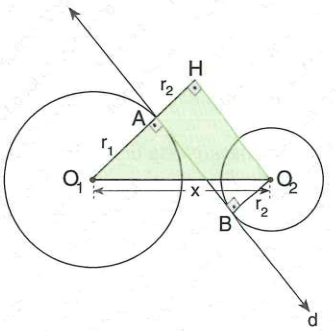
Ortak İç Teğet Parçasının Uzunluğu / Length of a Common Internal Tangent Segment

$|O_1O_2| = x$

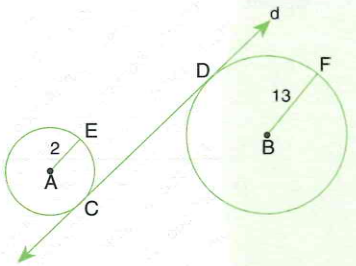
$|O_1H| = r_1 + r_2$

$|AB| = |HO_2|$

$|O_2H| = \sqrt{|O_1O_2|^2 - |O_1H|^2} = \sqrt{x^2 - (r_1 + r_2)^2} \Rightarrow \boldsymbol{|AB| = \sqrt{x^2 - (r_1 + r_2)^2}}$



Örnek / Example 16



Şekildeki d doğrusu, A ve merkezli çemberlerin ortak iç teğet doğrusudur.

The line d in the figure is the common internal tangent line of the two circles with centers A and B.

$|AB| = 17$ cm $\Rightarrow$ **$|CD| = ?$ cm**

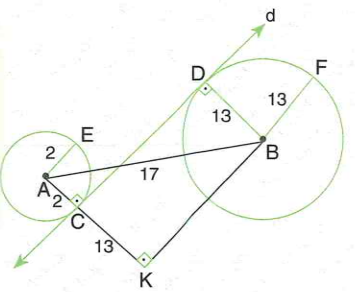
A) 6 B) 8 C) 10 D) 11 E) 12

Çözüm / Solution

Yanıt / Answer **B**

$|KB|^2 = 17^2 - 15^2 = 8^2$

$|KB| = |CD| = 8$ cm

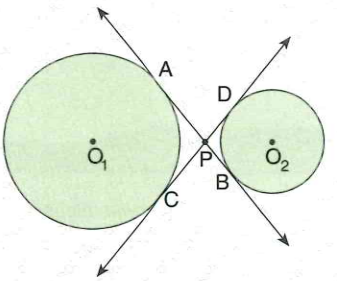


ÖNEMLİ / IMPORTANT

İki çemberin ortak iç teğet parçalarının uzunlukları eşittir.

The common internal tangent segments of two circles have equal lengths.

$$\boldsymbol{|AB| = |CD|}$$



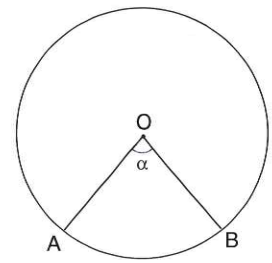
ÇEMBERDE AÇI / ANGLE in a CIRCLE

ÇEMBERDE AÇI ÇEŞİTLERİ / ANGLE TYPES in CIRCLE

Merkez Açı / Central Angle

Köşesi çemberin merkezinde bulunan açıdır. Merkez açının ölçüsü, gördüğü yayın ölçüsüne eşittir.
An angle whose vertex is at the center of a circle is called a central angle, the measure of central angle is equal to the arc it subtend.

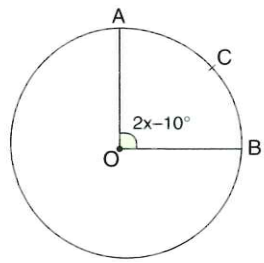
$$m(\widehat{AOB}) = \alpha = m(\widehat{AB})$$



Örnek / Example 17

O merkezli çember,
The circle with center O,

$m(\widehat{AOB}) = 2x - 10°$,
$m(\widehat{ACB}) = 110°$
$\Rightarrow$ **x = ?**



A) 35° B) 40° C) 45° D) 50° E) 60°

Çözüm / Solution Yanıt / Answer **E**

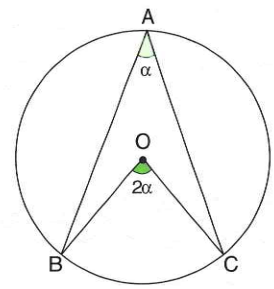
$m(\widehat{ACB}) = m(\widehat{AOB})$ [Merkez Açı / Central Angle]
$110° = 2x - 10°$
$120° = 2x$
$60° = x$

Çevre (Çember) Açı / Inscribed (Circle) Angle

Köşesi çember üzerinde bulunan ve kolları çemberi kesen açıya "**çevre açı**" ya da "**çember açısı**" denir.
An angle of a circle whose vertex is a point on a circle and whose sides are cords is called **inscribed angle**.

$$m(\widehat{BAC}) = \alpha = \frac{m(\widehat{BC})}{2}$$

$$m(\widehat{BOC}) = 2\alpha = m(\widehat{BC})$$



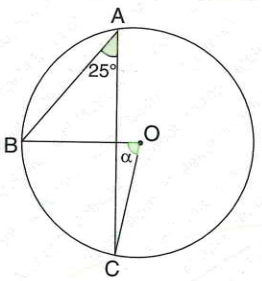
ÖNEMLİ / IMPORTANT

Çapı gören çevre açının ölçüsü 90° dir. / The measure of an inscribed angle subtending the diameter is 90°.

Örnek / Example 18

O merkezli çember,
The circle with center O,

$m(\widehat{BAC}) = 25°$
$\Rightarrow$ $m(\widehat{BOC}) = \alpha = ?$



A) 40° B) 50° C) 60° D) 70° E) 80°

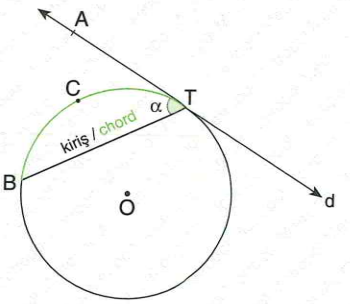
Çözüm / Solution Yanıt / Answer **B**

$m(\widehat{BAC}) = 25° \Rightarrow m(\widehat{BC}) = 50°$ [Çevre Açı / Inscribed Angle]
$m(\widehat{BC}) = m(\widehat{BOC}) \Rightarrow 50° = \alpha$

Teğet - Kiriş Açı / Tangent - Chord Angle

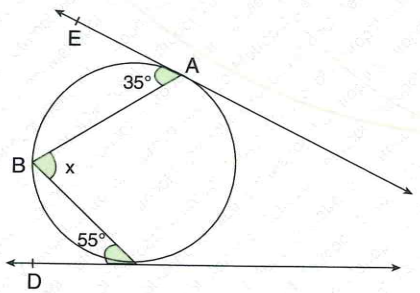
Köşesi çember üzerinde bulunan ve bu köşeden geçen teğet ile kirşin belirttiği açıdır.
It is an angle with a vertex lying on the circle and formed by the tangent and the chord which intersect at vertex.

$m(\widehat{ATB}) = \alpha \Rightarrow m(\widehat{BCT}) = 2\alpha$



Örnek / Example 19

$m(\widehat{EAB}) = 35°$,
$m(\widehat{BCD}) = 55°$
$\Rightarrow$ $m(\widehat{ABC}) = x = ?$



A) 75° B) 80° C) 90° D) 100° E) 120°

Çözüm / Solution Yanıt / Answer **C**

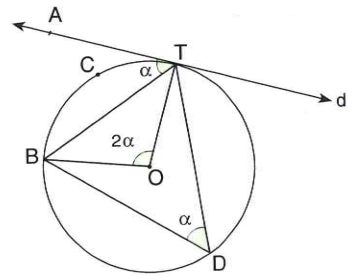
$m(\widehat{AB}) = 2 \cdot m(\widehat{EAB}) = 2 \cdot 35° = 70°$
$m(\widehat{BC}) = 2 \cdot m(\widehat{BCD}) = 2 \cdot 55° = 110°$
[Teğet – Kiriş Açı / Tangent – Chord Angle]

$m(\widehat{AB}) + m(\widehat{BC}) + m(\widehat{AC}) = 360°$
$70° + 110° + m(\widehat{AC}) = 360°$
$m(\widehat{AC}) = 180°$
$2 \cdot m(\widehat{ABC}) = m(\widehat{AC})$
$2x = 180°$
$x = 90°$

ÖNEMLİ / IMPORTANT

- Teğet – kiriş açının ölçüsü, aynı yayı gören çevre açının ölçüsüne eşittir.
  The size of an angle formed by a chord and a tangent equals to the size of inscribed angle which intercepts the same arc.

- Teğet – kiriş açının ölçüsü, aynı yayı gören merkez açının ölçüsünün yarısına eşittir.
  The size of an angle formed by a chord a tangent equals to the half size of central angle which intercepts

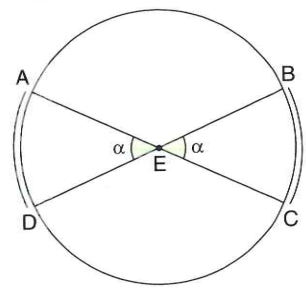


İç Açı / The Interior Angle

Çemberin kesişen iki kirişi arasında kalan açıdır.
The angle between the two intersecting chords of a circle is called an interior angle.

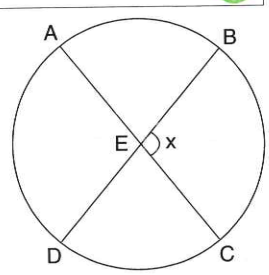
$$m(\widehat{AED}) = m(\widehat{BEC}) = \alpha$$

$$\frac{m(\widehat{AD}) + m(\widehat{BC})}{2} = \alpha$$



Örnek / Example 20

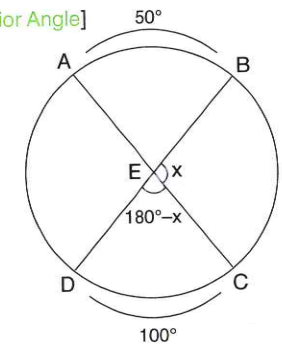
$[AC] \cap [BD] = \{E\}$,
$m(\widehat{AB}) = 50°$
$m(\widehat{DC}) = 100°$
$\Rightarrow$ **$m(\widehat{BEC}) = x = ?$**



A) 95° B) 100° C) 105° D) 110° E) 115°

Çözüm / Solution Yanıt / Answer **C**

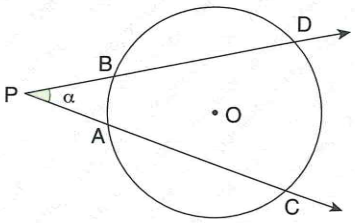
$m(\widehat{DEC}) = 180° - x$ [İç Açı / The Interior Angle]
$180° - x = \frac{50° + 100°}{2}$
$180° - x = 75°$
$105° = x$



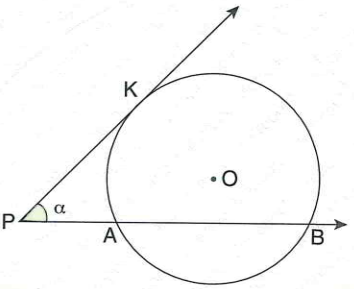
Dış Açı / The Exterior Angle

Köşesi çemberin dış bölgesinde bulunan, kolları veya kollarından biri çemberi kesen, diğeri çembere teğet olan ya da her iki kolu da çembere teğet olan açıdır.

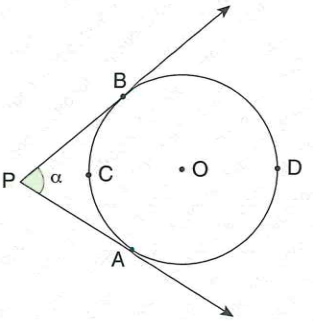
The angle with a vertex lying outside the circle, and the sides of which are both tangent to the circle, or both cutting it, or with one side cutting the circle and the other side tangent to the circle is called an exterior angle.



$$m(\widehat{CPD}) = \alpha = \frac{m(\widehat{CD}) - m(\widehat{AB})}{2}$$



$$m(\widehat{BPK}) = \alpha = \frac{m(\widehat{BK}) - m(\widehat{AK})}{2}$$



$$m(\widehat{BPA}) = \alpha = \frac{m(\widehat{ADB}) - m(\widehat{AB})}{2}$$

ÖNEMLİ / IMPORTANT

Bir dış açının kolları çembere teğet ise,

If the sides of an exterior angle are tangent to the circle.

$m(\widehat{ACB}) = 180 - \alpha$

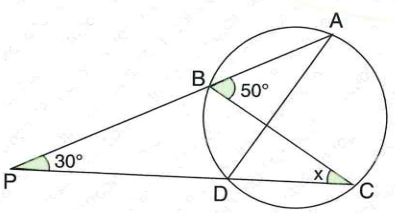
$m(\widehat{ADB}) = 180 + \alpha$

Örnek / Example 21

$m(\widehat{APC}) = 30°$

$m(\widehat{ABC}) = 50°$

$\Rightarrow m(\widehat{BCD}) = x = ?$



A) 10° B) 20° C) 30° D) 40° E) 50°

Çözüm / Solution

Yanıt / Answer **B**

$m(\widehat{AC}) = 2 \cdot m(\widehat{ABC}) = 100°$

$m(\widehat{BD}) = 2 \cdot m(\widehat{BCD}) = 2x$

APC dış açı / the exterior angle

$$30° = \frac{m(\widehat{AC}) - m(\widehat{BD})}{2}$$

$60° = 100° - 2x$

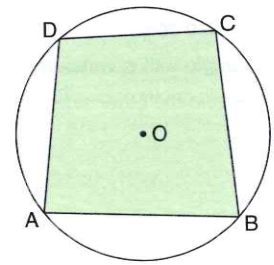
$2x = 40°$

$x = 20°$

KİRİŞLER DÖRTGENİ / THE INSCRIBED QUADRILATERAL

Tanım: Kenarları bir çemberin kirişleri olan dörtgene **kirişler dörtgeni** denir.

Definition: A quadrangle, the sides of which are the chords of a circle is called an inscribed quadrangle.

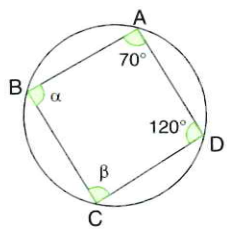


i. $\left.\begin{array}{l} m(\widehat{A})=\dfrac{m(\overset{\frown}{DCB})}{2} \\ m(\widehat{C})=\dfrac{m(\overset{\frown}{DAB})}{2} \end{array}\right\} \Rightarrow m(\widehat{A})+m(\widehat{C})=\dfrac{m(\overset{\frown}{DCB})+m(\overset{\frown}{DAB})}{2} \Rightarrow \boldsymbol{m(\widehat{A})+m(\widehat{C})=\dfrac{360^\circ}{2}=180^\circ}$

ii. $\left.\begin{array}{l} m(\widehat{B})+m(\widehat{D})=\dfrac{m(\overset{\frown}{ADC})+m(\overset{\frown}{ABC})}{2} \\ m(\widehat{B})+m(\widehat{D})=\dfrac{360^\circ}{2}=180^\circ \end{array}\right\} \Rightarrow \boldsymbol{m(\widehat{A})+m(\widehat{C})=m(\widehat{B})+m(\widehat{D})=180^\circ}$

Örnek / Example 22

$m(\overset{\frown}{BAD})=70^\circ$,
$m(\overset{\frown}{ADC})=120^\circ$,
$m(\overset{\frown}{ABC})=\alpha$,
$m(\overset{\frown}{BCD})=\beta$
$\Rightarrow$ **$2(\alpha+\beta)=?$**



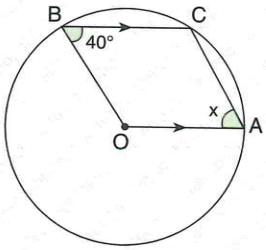
A) 300° B) 300° C) 320° D) 330° E) 340°

Çözüm / Solution

Yanıt / Answer **E**

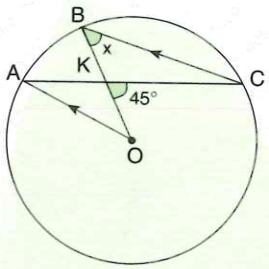
$m(\widehat{A})+m(\widehat{C})=70^\circ+\beta=180^\circ$
$\beta=110^\circ$
$m(\widehat{B})+m(\widehat{D})=\alpha+120^\circ=180^\circ$
$\alpha=60^\circ$
$2\cdot(\alpha+\beta)=2\cdot(60^\circ+110^\circ)=340^\circ$

1. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
[OA] // [BC],
$m(\widehat{CBO}) = 40°$
$\Rightarrow$ **$m(\widehat{CAO}) = x = ?$**



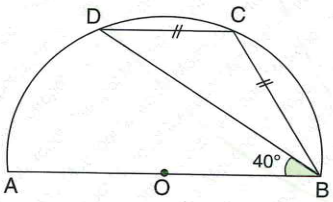
A) 40° B) 50° C) 55° D) 60° E) 70°

2. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
[OA] // [BC],
$m(\widehat{CKO}) = 45°$
$\Rightarrow$ **$m(\widehat{OBC}) = x = ?$**



A) 5° B) 10° C) 15° D) 20° E) 30°

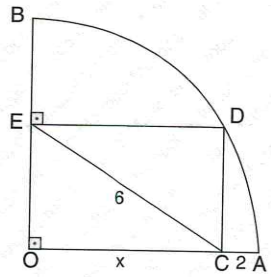
3.



O noktası, şekildeki yarım çemberin merkezidir.
The point O is center of the semicircle in the figure.
$m(\widehat{DBA}) = 40°$, $|DC| = |CB| \Rightarrow$ **$m(\widehat{CBD}) = ?$**

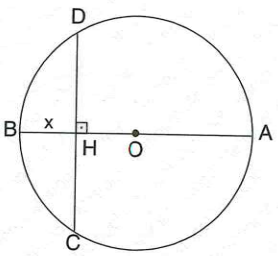
A) 100° B) 50° C) 40° D) 25° E) 15°

4. O noktası, şekildeki çeyrek çemberin merkezidir.
The point O is center of the quarter circle in the figure.
[ED] // [OA],
[EO] // [DC],
$|EC| = 6$ cm,
$|CA| = 2$ cm
$\Rightarrow$ **$|OC| = x = ?$ cm**



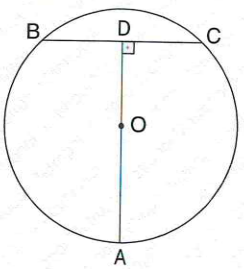
A) 6 B) 5 C) 4 D) 3 E) 2

5. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
[AB] $\perp$ [DC],
$|AB| = 34$ cm,
$|CD| = 30$ cm
$\Rightarrow$ **$|BH| = x = ?$ cm**



A) 9 B) 10 C) 11 D) 12 E) 13

6. O noktası, şekildeki çemberin merkezi, r yarıçaptır.
The point O is center of the circle in the figure, r is radius.
$r = 10$ cm,
$|AD| = 3 \cdot |BD|$,
[AD] $\perp$ [BC]
$\Rightarrow$ **$|AD| = ?$ cm**



A) 19 B) $\frac{37}{2}$ C) 18 D) $\frac{35}{2}$ E) 17

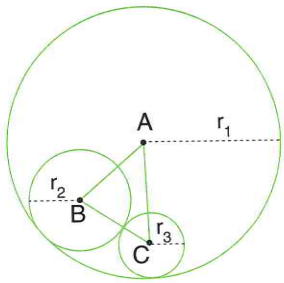
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $r_1 = 24$ cm,

$r_2 = 10$ cm,

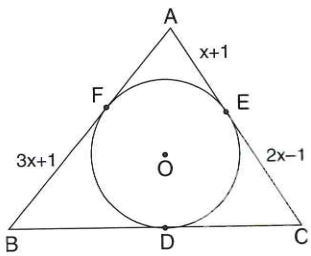
$r_3 = 8$ cm

$\Rightarrow$ **|AB| + |BC| + |AC| = ? cm**



A) 42 B) 44 C) 46 D) 48 E) 50

8.



Şekildeki O merkezli çember, ABC üçgeninin iç teğet çemberidir.

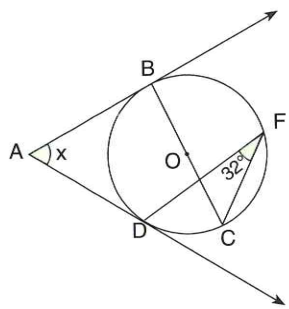
The circle with center O in the figure is the inscribed circle of the triangle ABC.

|AE| = (x + 1) cm, |EC| = (2x – 1) cm, |BF| = (3x + 1) cm,

Çevre / The Perimeter $(\widehat{ABC})$ = 38 cm $\Rightarrow$ **|BC| = ? cm**

A) 15 B) 16 C) $\frac{33}{2}$ D) 17 E) $\frac{35}{2}$

9.



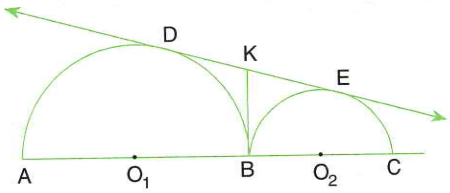
[AB ve [AD merkezli çembere B ve D noktalarında teğettir.

[AB and [AD are tangent to the circle with center O at the points B and D, respectively.

$m(\widehat{DFC}) = 32° \Rightarrow$ **$m(\widehat{BAD}) = x = ?$**

A) 60° B) 61° C) 62° D) 63° E) 64°

10.



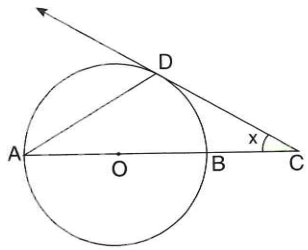
Şekildeki O_1 ve O_2 merkezli yarım çemberler, B noktasında birbirine teğettir. [DE] ve [BK], iki çemberin ortak teğetleridir.

The semicircles in the figure with centers O_1 and O_2 are tangent to one another at the point B. [DE] and [BK] are the common tangents for two circles.

|KB| = 6 cm $\Rightarrow$ **|DE| = ? cm**

A) 10 B) $\frac{21}{2}$ C) 11 D) $\frac{23}{2}$ E) 12

11.



[CD, O merkezli çembere D noktasında teğettir.

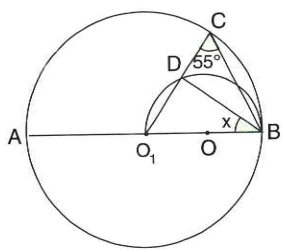
[CD is tangent to the circle with center O in the figure at the point D.

|AO| = |OB| = |BC| $\Rightarrow$ **$m(\widehat{DCA}) = x = ?$**

A) 45° B) 40° C) 35° D) 30° E) 25°

12. Şekildeki O_1 merkezli çember ile O merkezli yarım çember B noktasında teğettir.

The circle with center O_1 and the semicircle with center O in the figure are tangent at the point B.



$m(\widehat{O_1CB}) = 55°$

$\Rightarrow$ **$m(\widehat{O_1BD}) = x = ?$**

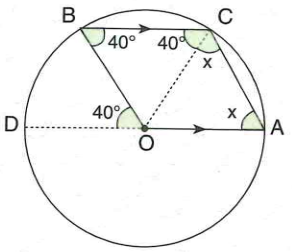
A) 10° B) 15° C) 20° D) 25° E) 30°

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
E	E	D	C	A	C	D	A	E	E	D	C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



$[OA] // [BC] \Rightarrow m(\widehat{BOD}) = 40°$

$|BO| = |OC| \Rightarrow m(\widehat{OCB}) = 40°$

$m(\widehat{OCB}) + m(\widehat{OBC}) + m(\widehat{BOC}) = 180°$

$40° + 40° + m(\widehat{BOC}) = 180° \Rightarrow m(\widehat{BOC}) = 100°$

$2x = 140° \Rightarrow x = 70°$

Yanıt / The Answer is E

2. $[BC] // [OA]$

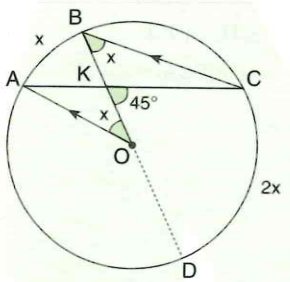
$m(\widehat{BOA}) = m(\widehat{OBC}) = x$

$m(\widehat{AB}) = x$

$m(\widehat{CD}) = 2x$

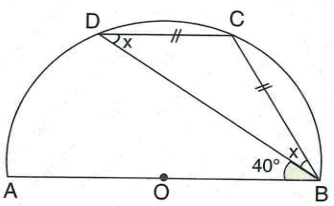
$45° = \frac{x + 2x}{2}$

$\Rightarrow x = 30°$



Yanıt / The Answer is E

3.



$|DC| = |CB| \Rightarrow m(\widehat{CDB}) = m(\widehat{CBD}) = x$

$m(\widehat{AD}) = 2 \cdot 40° = 80°$

$m(\widehat{ABD}) = 40° \Rightarrow m(\widehat{DC}) = m(\widehat{CB}) = 2x$

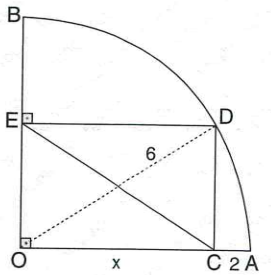
$80° + 2x + 2x = 180° \Rightarrow x = 25°$

Yanıt / The Answer is D

4. $|EC| = |OD| = R = 6$ cm

$|OA| = R \Rightarrow |OC| = x = 6 - 2$

$= 4$ cm



Yanıt / The Answer is C

5. $|AB| = 34$ cm

$\Rightarrow |OA| = |OB| = |OC| = r$

$\Rightarrow r = |OC| = 17$ cm

$|CH| = |HD| = \frac{|DC|}{2} = \frac{30}{2} = 15$

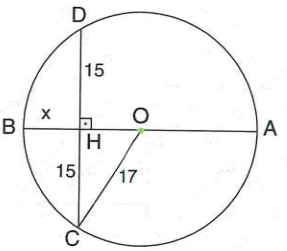
$|OC|^2 = |OH|^2 + |HC|^2$

$17^2 = |OH|^2 + 15^2$

$289 - 225 = |OH|^2$

$64 = |OH|^2 \Rightarrow |OH| = 8$ cm

$|BH| = x = |BO| - |OH| = 17 - 8 = 9$ cm



Yanıt / The Answer is A

6. $r = |BO| = |OA| = 10$ cm

$|BD| = |DC| = x$

$\Rightarrow |AD| = 3x,$

$|OD| = 3x - 10$

$|BO|^2 = |BD|^2 + |DO|^2$

$10^2 = x^2 + (3x - 10)^2$

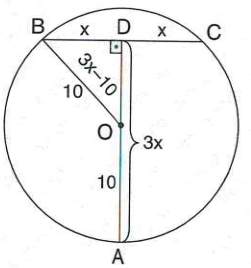
$100 = x^2 + 9x^2 - 60x + 100$

$10x^2 - 60x = 0$

$10x(x - 6) = 0$

$x - 6 = 0 \Rightarrow x = 6$ cm

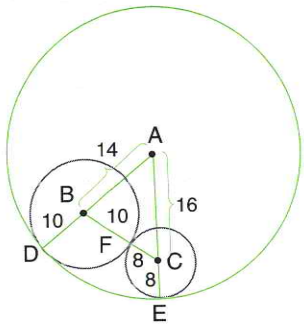
$|AD| = 3 \cdot 6 = 18$ cm



Yanıt / The Answer is: C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



$r_1 = |AD| = |AE| = 24$ cm

$|DB| = 10$ cm,

$r_3 = |CE| = 8$ cm,

$|AB| = |AD| - |BD| = 24 - 10 = 14$ cm,

$|AC| = |AE| - |EC|$

$\Rightarrow |AC| = 24 - 8 = 16$ cm,

$|BC| = |BF| + |FC| = 10 + 8 = 18$ cm

Çevre / The perimeter $(\widehat{ABC}) = |AB| + |BC| + |AC|$

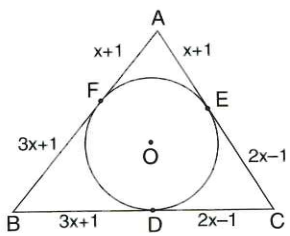
$= 14 + 18 + 16 = 48$ cm

Yanıt / The Answer is D

8. $|AE| = |AF| = x + 1$,

$|BF| = |BD| = 3x + 1$,

$|CD| = |CE| = 2x - 1$



Çevre /The Perimeter $(\widehat{ABC}) = 2(x+1) + 2(3x+1) + 2(2x-1) = 38$ cm

$\Rightarrow 2x + 2 + 6x + 2 + 4x - 2 = 38$ cm

$12x = 36$ cm

$x = 3$ cm

$|BC| = (3x + 1) + (2x - 1) = 5x = 5 \cdot 3 = 15$ cm

Yanıt / The Answer is A

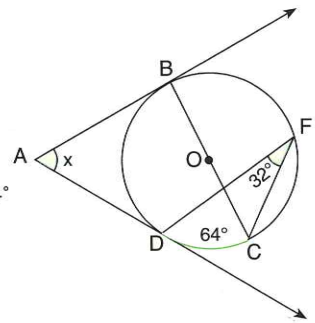
9. $m(\widehat{DFC}) = 32°$

$m(\widehat{DC}) = 2 \cdot 32° = 64°$

$m(\widehat{BDC}) = 180°$

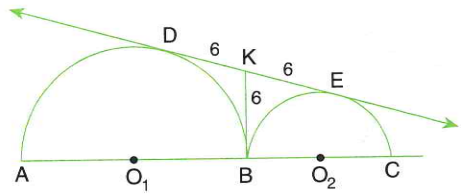
$m(\widehat{BD}) = 180° - 64° = 116°$

$m(\widehat{BAD}) = x = 180° - 116° = 64°$



Yanıt / The Answer is E

10.



$|KD| = |KB| = 6$ cm,

$|KE| = |KB| = 6$ cm,

$|DE| = 6 + 6 = 12$ cm

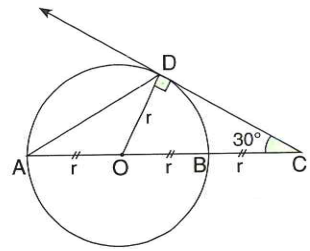
Yanıt / The Answer is E

11. $|AO| = |OB| = |BC| = r$

$|OC| = 2|OD|$

$[OD] \perp [DC]$

$\Rightarrow m(\widehat{DCA}) = x = 30°$



Yanıt / The Answer is D

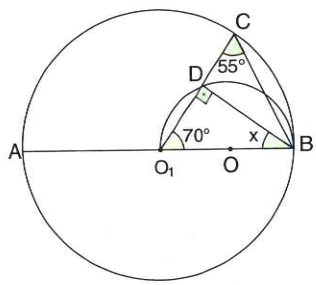
12. $|O_1C| = |O_1B|$

$m(\widehat{O_1BC}) = m(\widehat{O_1CB}) = 55°$

$m(\widehat{CO_1B}) = 70°$

$[BD] \perp [O_1C]$

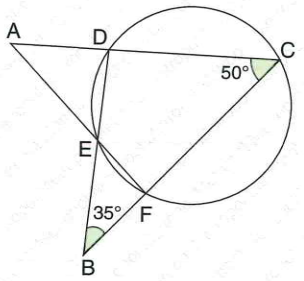
$\Rightarrow m(\widehat{O_1BD}) = x = 20°$



Yanıt / The Answer is C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

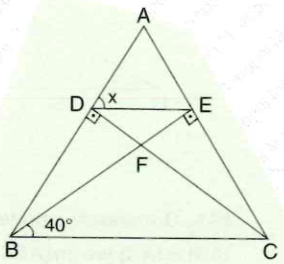
1. $m(\widehat{ACB}) = 50°$,
$m(\widehat{DBC}) = 35°$
$\Rightarrow$ **$m(\widehat{FAC}) = ?$**



A) 30° B) 35° C) 40° D) 45° E) 50°

[İSTANBUL ÜNİVERSİTESİ – YÖS 2018]

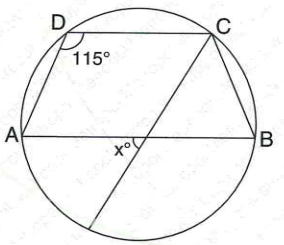
2. $[CD] \perp [AB]$,
$[BE] \perp [AC]$,
$m(\widehat{EBC}) = 40°$
$\Rightarrow$ **$m(\widehat{ADE}) = x = ?$**



A) 20° B) 30° C) 40° D) 50° E) 80°

[DUMLUPINAR ÜNİVERSİTESİ – YÖS 2018]

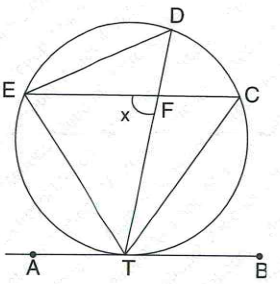
3. O, çemberin merkez noktasıdır.
O is a center point of circle.
$m(\widehat{ADC}) = 115°$
$\Rightarrow$ **$x° = ?$**



A) 20° B) 30° C) 40° D) 50° E) 60°

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2017]

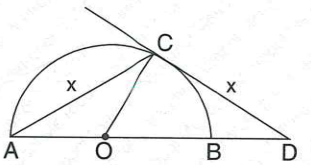
4. $[AB] // [EC]$
$m(\widehat{DEC}) = 20°$
$m(\widehat{ETD}) = 38°$
$\Rightarrow$ **$m(\widehat{EFT}) = ?$**



A) 61° B) 66° C) 72° D) 81° E) 82°

[İSTANBUL ÜNİVERSİTESİ – YÖS 2017]

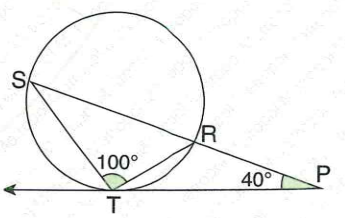
5. $|AO| = |OB| = |OC| = 2$,
$|AC| = |CD| = x$
$\Rightarrow$ **$x = ?$**



A) 2 B) $2\sqrt{2}$ C) 3 D) $2\sqrt{3}$ E) 4

[İSTANBUL ÜNİVERSİTESİ – YÖS 2016]

6. [PT, çembere teğettir.
[PT is tangent to circle.
$m(\widehat{STR}) = 100°$
$m(\widehat{RPT}) = 40°$
$m(\widehat{TSR}) = ?$

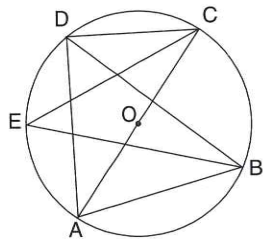


A) 20° B) 30° C) 40° D) 50° E) 60°

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2016]

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



O noktası şekildeki çemberin merkezidir.

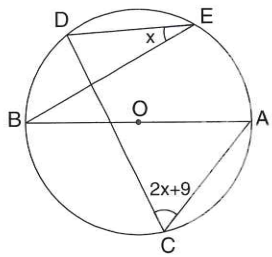
The point O is the center of the circle in the figure.

$m(\widehat{ADB}) = 70° \Rightarrow$ **$m(\widehat{CEB}) + m(\widehat{CAB}) = ?$**

A) 20° B) 40° C) 60° D) 70° E) 80°

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2015]

8.



O noktası şekildeki çemberin merkezidir.

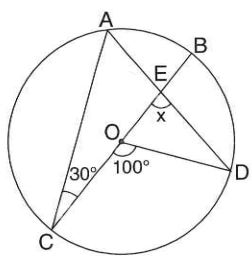
Point O is the center of the circle.

$m(\widehat{ACD}) = 2x + 9 \Rightarrow$ **$m(\widehat{BED}) = x = ?$**

A) 21° B) 27° C) 33° D) 48° E) 54°

[SÜLEYMAN DEMİREL ÜNİVERSİTESİ – YÖS 2014]

9.



O noktası şekildeki çemberin merkezidir.

The point O is the center of the circle in the figure.

$m(\widehat{ACB}) = 30°$, $m(\widehat{COD}) = 100° \Rightarrow$ **$m(\widehat{OED}) = ?$**

A) 40° B) 50° C) 60° D) 70° E) 80°

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2014]

METROPOL YAYINLARI • METROPOL PUBLICATIONS

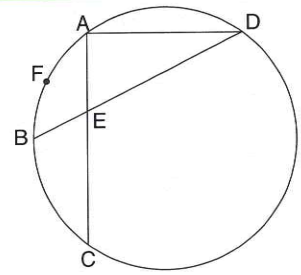
10. $m(\widehat{AFB}) = 60°$,

$m(\widehat{CAD}) = 90°$,

$|EC| = 12$,

$|AC| = |BD|$

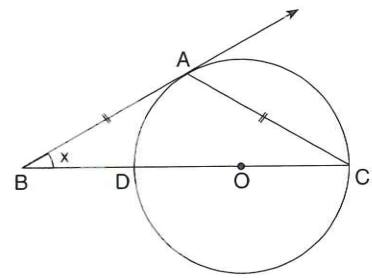
$|AD| = ?$



A) 5 B) 6 C) $4\sqrt{3}$ D) $5\sqrt{3}$ E) $6\sqrt{3}$

[İSTANBUL ÜNİVERSİTESİ – YÖS 2014]

11.



[BA, O merkezli çembere A noktasında teğettir.

$|AB| = |AC|$ ise $m(\widehat{ABC}) = x$ kaç derecedir?

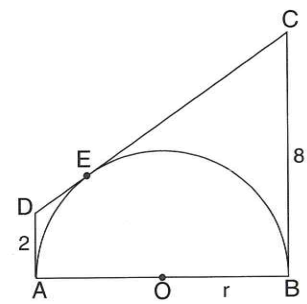
[BA is tangent to the O-centered circle on the point A.

If $|AB| = |AC|$, what is the value of $m(\widehat{ABC}) = x$?

A) 45° B) 40° C) 35° D) 30° E) 25°

[AKDENİZ ÜNİVERSİTESİ – YÖS 2014]

12.



O merkezli yarım çemberde A, B ve E noktaları teğet noktalarıdır.

A, B and E are tangent points of the semicircle with the center O.

$|AD| = 2$ cm, $|BC| = 8$ cm, $|OB| = r \Rightarrow$ **$r = ?$**

A) 3 B) 4 C) 5 D) 6 E) 7

[KARADENİZ TEKNİK ÜNİVERSİTESİ – YÖS 2013]

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	D	D	D	D	A	B	B	E	E	D	B

1. EFCD kirişler dörtgeni / the inscribed quadrangle:

$m(\widehat{DEF}) = 130°$

$m(\widehat{EBF}) + m(\widehat{BFE}) = m(\widehat{DEF})$

$35° + m(\widehat{BFE}) = 130°$

$m(\widehat{BFE}) = 95°$

$m(\widehat{EFC}) = 180° - 95° = 85°$

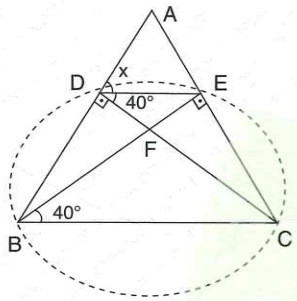
$m(\widehat{FAC}) + m(\widehat{EFC}) + m(\widehat{ACF}) = 180°$

$m(\widehat{FAC}) + 85° + 50° = 180°$

$m(\widehat{FAC}) = 45°$

Yanıt / The Answer is D

2.



$m(\widehat{BDC}) = m(\widehat{BEC}) = 90° \Rightarrow$ [BC] çap / diameter

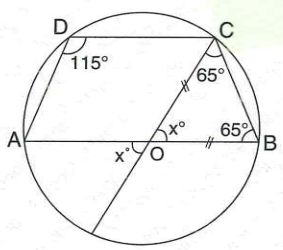
$m(\widehat{EC}) = 2 \cdot m(\widehat{EBC}) = 2 \cdot 40° = 80°$

$m(\widehat{EC}) = 2 \cdot m(\widehat{EDC}) = 80° \Rightarrow m(\widehat{EDC}) = 40°$

$\Rightarrow m(\widehat{ADC}) = 90°, m(\widehat{ADE}) = x = 90° - 40° = 50°$

Yanıt / The Answer is D

3.



$m(\widehat{ADC}) + m(\widehat{ABC}) = 180°$

$115° + m(\widehat{ABC}) = 180°$

$m(\widehat{ABC}) = 65°$

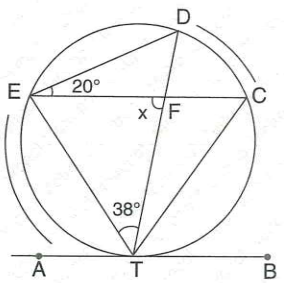
$IOBI = IOCI = r \Rightarrow m(\widehat{OCB}) = 65°$

$\Rightarrow x + 65° + 65° = 180°$

$x = 50°$

Yanıt / The Answer is D

4.



$m(\widehat{DC}) = 2 \cdot 20° = 40°, m(ED) = 2.38° = 76°$

$[AB] // [EC] \Rightarrow m(\widehat{ET}) = m(\widehat{TC})$

$m(\widehat{ET}) + m(\widehat{TC}) + 40° + 76° = 360°$

$2 \cdot m(\widehat{ET}) = 244° \Rightarrow m(\widehat{ET}) = m(\widehat{TC}) = 122°$

$x = \dfrac{m(\widehat{DC}) + m(\widehat{ET})}{2} = \dfrac{40° + 122°}{2} = 81°$

Yanıt / The Answer is D

5. $[OC] \perp [DC, m(\widehat{OCD}) = 90°$

$IAOI = IOCI = IOBI = 2$

$m(\widehat{CAO}) = m(\widehat{OCA}) = m(\widehat{CDB}) = \alpha$

$\widehat{ACD}$:

$\alpha + \alpha + 90° + \alpha = 180°$

$3\alpha = 90°$

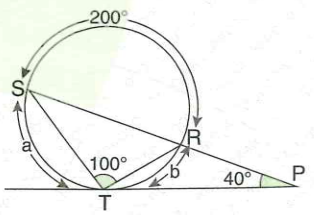
$\alpha = 30°$

$\widehat{AOC}$:

$m(\widehat{AOC}) = 120° \Rightarrow x = 2\sqrt{3}$ cm

Yanıt / The Answer is D

6.



$m(\widehat{ST}) = a, m(\widehat{TR}) = b$

$a + b = 160°$

$\dfrac{a - b}{2} = 40°$

$a + b = 160°$

$+\ a - b = 80°$

$2a = 240°$

$a = 120° \Rightarrow b = 40°$

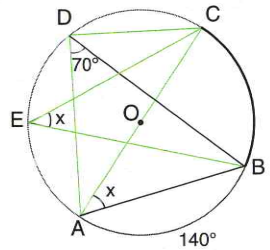
$m(\widehat{TSR}) = \dfrac{m(\widehat{TR})}{2} = \dfrac{b}{2} = \dfrac{40}{2}$

$= 20°$

Yanıt / The Answer is A

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



$m(\widehat{ABC}) = 180° \Rightarrow m(\widehat{BC}) = 180° - 140° = 40°$

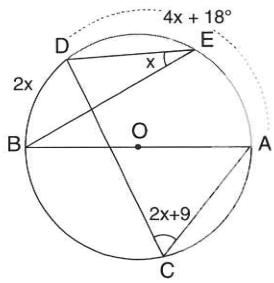
$m(\widehat{BC}) = 2 \cdot m(\widehat{CEB}) = 2 \cdot m(\widehat{BAC})$

$40° = 2 \cdot m(\widehat{CEB}) = 2.m(\widehat{BAC})$

$40° = 2x$

Yanıt / The Answer is B

8.



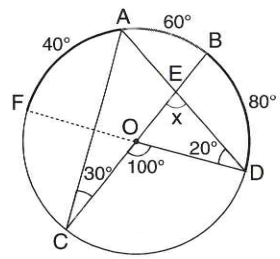
$4x + 18 + 2x = 180°$

$6x = 162°$

$x = 27°$

Yanıt / The Answer is B

9.



$m(\widehat{AB}) = 60°$

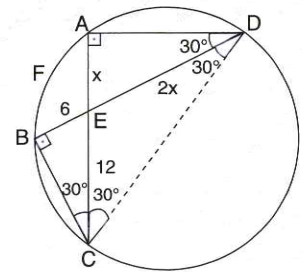
$m(\widehat{DB}) = 80°$

$m(\widehat{AF}) = 180° - 140° = 40°$

$m(\widehat{ADE}) = 20° \Rightarrow m(\widehat{OED}) = x = 80°$

Yanıt / The Answer is E

10.



[CD] çap/ diameter:

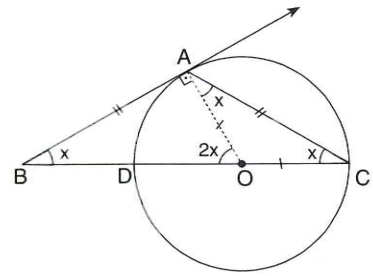
$|AC| = |BD| \Rightarrow |BC| = |AD|$

$\Rightarrow m(\widehat{ECD}) = m(\widehat{EDC}) = 30°$

$|AE| = x \Rightarrow |ED| = 2x = 12 \Rightarrow x = 6, |AD| = 6\sqrt{3}$

Yanıt / The Answer is E

11.



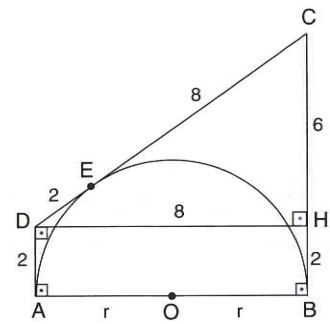
$2x + x = 90°$

$3x = 90°$

$x = 30°$

Yanıt / The Answer is D

12.



$2r = 8 \Rightarrow r = 4$

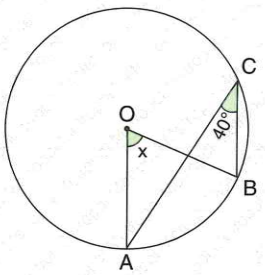
Yanıt / The Answer is B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.

$m(\widehat{ACB}) = 40°$

$\Rightarrow$ **$m(\widehat{AOB}) = x = ?$**

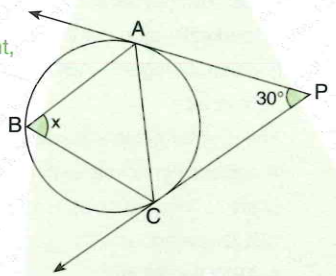


Yanıt / The Answer is: **80°**

2. [PA teğet; [PC teğet,
[PA is tangent; [PC is tangent,

$m(\widehat{APC}) = 30°$

$\Rightarrow$ **$m(\widehat{ABC}) = x = ?$**

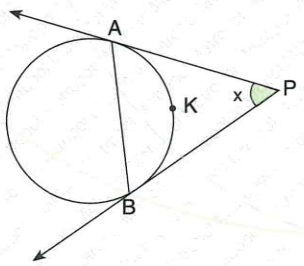


Yanıt / The Answer is: **75°**

3. [PA ve [PB, O merkezli çembere A ve B noktalarında teğettir.
[PA and [PB are tangent to the circle with center O at the points B and D, respectively.

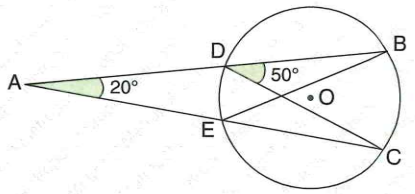
$m(\widehat{AKB}) = 135°$

$\Rightarrow$ **$m(\widehat{APB}) = x = ?$**



Yanıt / The Answer is: **45°**

4.



O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.

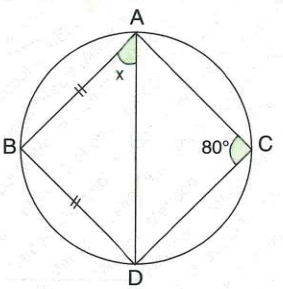
$m(\widehat{BDC}) = 50°$, $m(\widehat{BAC}) = 20°$ $\Rightarrow$ **$m(\widehat{DCA}) = ?$**

Yanıt / The Answer is **30°**

5. $|AB| = |BD|$,

$m(\widehat{C}) = 80°$

$\Rightarrow$ **$m(\widehat{BAD}) = x = ?$**

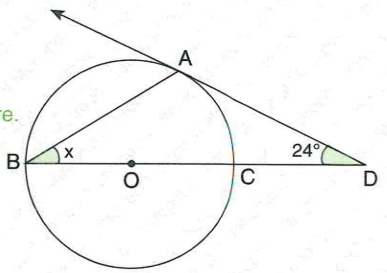


Yanıt / The Answer is: **40°**

6. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
[DA teğettir.
[DA is tangent.

$m(\widehat{ADC}) = 24°$

$\Rightarrow$ **$m(\widehat{ABC}) = x = ?$**



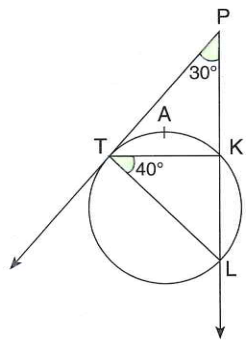
Yanıt / The Answer is: **33°**

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $m(\widehat{TPK}) = 30°$,

$m(\widehat{KTL}) = 40°$

$\Rightarrow$ **$m(\widehat{TAK}) = ?$**

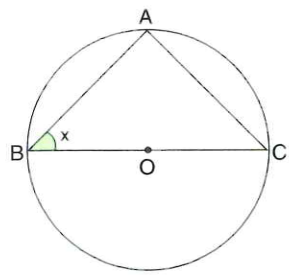


Yanıt / The Answer is: **110°**

8. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.

$2 \cdot |AC| = |BC|$

$\Rightarrow$ **$m(\widehat{B}) = x = ?$**

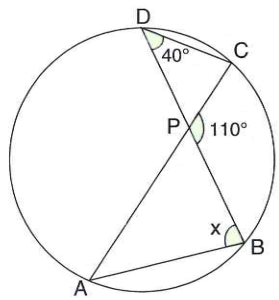


Yanıt / The Answer is: **30°**

9. $m(\widehat{BPC}) = 110°$,

$m(\widehat{BDC}) = 40°$

$\Rightarrow$ **$m(\widehat{ABD}) = x = ?$**



Yanıt / The Answer is: **70°**

10. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.

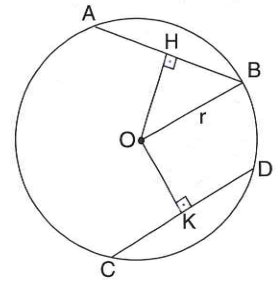
$[OH] \perp [AB]$, $[OK] \perp [DC]$,

$|OH| = |OK| = 5$ cm,

$|AB| = (5x-1)$ cm,

$|CD| = (7x-11)$ cm

$\Rightarrow$ **$|OB| = r = ?$ cm**

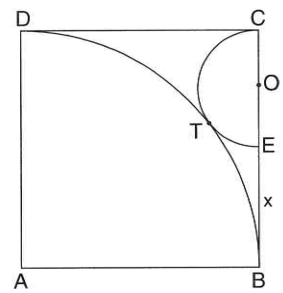


Yanıt / The Answer is: **13**

11. A merkezli çeyrek çember ile O merkezli yarım çember T noktasında teğettir. ABCD bir karedir.
The quarter circle with center A and the semicircle with center O are tangent at point T. ABCD is a square.

$A(ABCD) = 36$ cm^2

$\Rightarrow$ **$|EB| = x = ?$ cm**



Yanıt / The Answer is: **3**

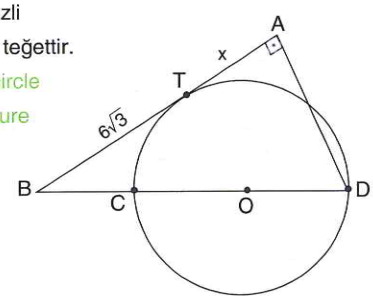
12. [AB] şekildeki O merkezli çembere T noktasında teğettir.
[AB] is tangent to the circle with center O in the figure at the point T.

$|BC| = |CO|$,

$[BA] \perp [DA]$,

$|BT| = 6\sqrt{3}$ cm

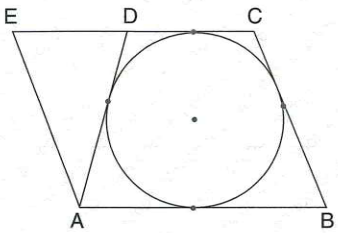
$\Rightarrow$ **$|AT| = ?$ cm**



Yanıt / The Answer is: **$3\sqrt{3}$**

METROPOL YAYINLARI • METROPOL PUBLICATIONS

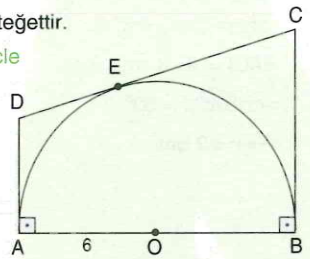
13.



ABCE bir paralelkenar, ABCD yamuğu şekildeki çemberin teğetler dörtgenidir.
ABCE is a paralellogram and the trapezoid ABCD is circumscribed quadrangle of the circle in the figure.
IDEI = IDCI = 9 cm ⇒ **Çevre / The perimeter (ABCD) = ? cm**

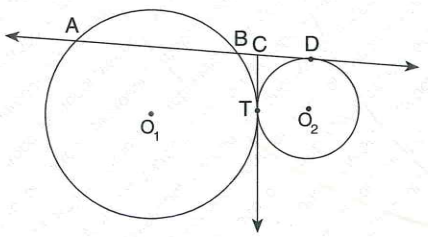
Yanıt / The Answer is: **54**

14. [DC] şekildeki O merkezli yarım çembere E noktasında teğettir.
[DC] is tangent to the semicircle with center O in the figure at the point E.
IBCI = 2IDEI,
IAOI = 6 cm
⇒ **A(ABCD) = ? cm²**



Yanıt / The Answer is: $54\sqrt{2}$

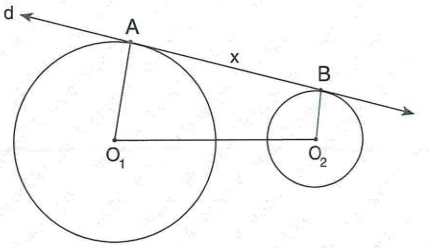
15.



T şekildeki O_1 ve O_2 merkezli çemberlerin değme noktasıdır.
T is the tangent point of the circles O_1 and O_2 in the figure.
IBDI = 12 cm, ICTI = 8 cm ⇒ **IACI = ? cm**

Yanıt / The Answer is : **16**

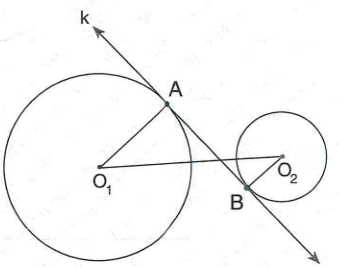
16.



AB şekildeki O_1 ve O_2 merkezli çemberlerin dış teğet doğrusudur.
AB is the external tangent line of the circles with centers O_1 and O_2 in the figure.
$|IO_1AI - IO_2BI| = 10$ cm, $IO_1O_2I = 26$ cm ⇒ **IABI = x = ? cm**

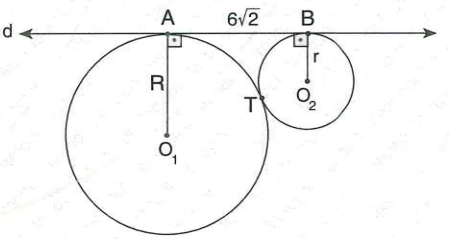
Yanıt / The Answer is: **24**

17. AB şekildeki çemberlerin teğet doğrusudur.
AB is the tangent line of the circles in the figure.
$IO_1AI + IO_2BI = 9$ cm,
IABI = 12 cm
⇒ **IO_1O_2I = ? cm**



Yanıt / The Answer is: **15**

18.

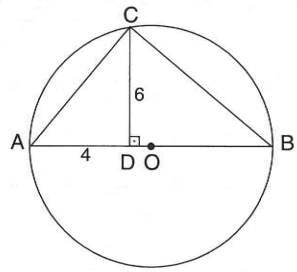


T Şekildeki O_1 ve O_2 merkezli çemberlerin değme noktasıdır.
T is the point of tangency of the circles O_1 and O_2 in the figure.
IABI = $6\sqrt{2}$ cm ⇒ **R · r = ? cm**

Yanıt / The Answer is: **18**

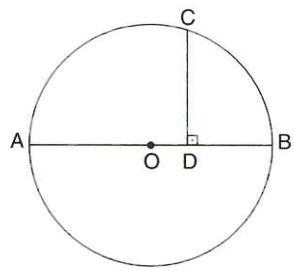
METROPOL YAYINLARI • METROPOL PUBLICATIONS

19. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
[CD] ⊥ [AB],
ICDI = 6 cm
IADI = 4 cm
⇒ **IBCI = ? cm**



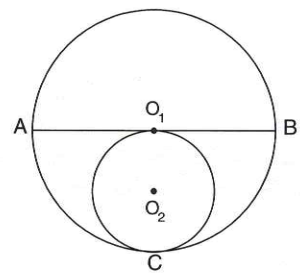
Yanıt / The Answer is: **$3\sqrt{13}$**

20. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
[AB] ⊥ [CD],
IADI = 16 cm
IBDI = 4 cm
⇒ **ICDI = ? cm**



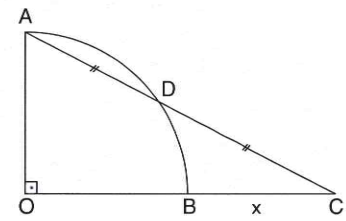
Yanıt / The Answer is: **8**

21. O_1 ve O_2 noktaları, şekildeki çemberlerin merkezidir.
O_1 ve C, değme noktalarıdır.
The points O_1 and O_2 are centers of the circles in the figure. O_1 and C are points of tangency.
⇒ $\frac{IO_1BI}{IO_2CI} = ?$



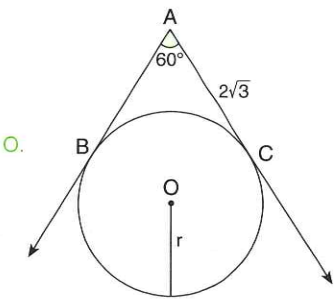
Yanıt / The Answer is: **2**

22. O noktası, şekildeki çeyrek çemberin merkezidir.
The point O is center of the quarter circle in the figure.
IADI = IDCI,
IAOI = 2 cm
⇒ **x = ? cm**



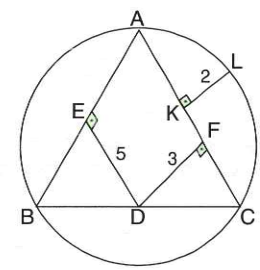
Yanıt / The Answer is: **$2\sqrt{3}-2$**

23. O merkezli şekildeki çemberde, [AB ve [AC teğettir.
[AB and [AC are tangents of the circle with the center O.
IACI = $2\sqrt{3}$ cm,
$m(\widehat{BAC}) = 60°$
⇒ **r = ? cm**



Yanıt / The Answer is: **2**

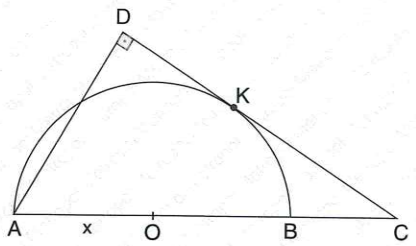
24. Şekildeki çemberin yarıçapı r dir.
r is raduis of the circle in the figure.
[DE] ⊥ [AB],
[DF] ⊥ [AC],
[KL] ⊥ [AC],
IABI = IACI, IAKI = IKCI
IKLI = 2 cm ⇒ **r = ? cm**



Yanıt / The Answer is : **5**

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



O noktası şekildeki yarım çemberin merkezi olup [DC], K noktasında çembere teğettir.

The point O is center of the semicircle and [DC] is tangent to the semicircle at the point K in the figure.

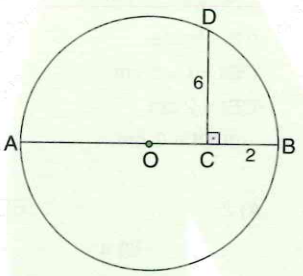
[AD] ⊥ [DC], |AD| = 4 cm, |OC| = 3·|AO| ⇒ **|AO| = x = ? cm**

A) 1 B) 2 C) 3 D) 4 E) 5

2. O noktası, şekildeki çemberin merkezidir.

The point O is center of the circle in the figure.

[DC] ⊥ [AB],
|DC| = 6 cm,
|CB| = 2 cm
⇒ **|AO| = ? cm**

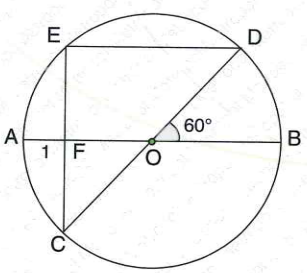


A) 6 B) 7 C) 8 D) 9 E) 10

3. O noktası, şekildeki çemberin merkezidir.

The point O is center of the circle in the figure.

[ED] // [AB],
$m(\widehat{DOB}) = 60°$,
|AF| = 1 cm
⇒ **|OD| = ? cm**

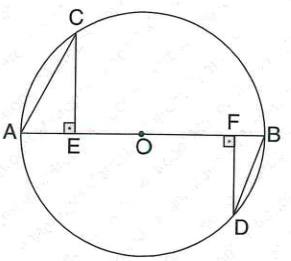


A) 2 B) 3 C) 4 D) 5 E) 6

4. O noktası, şekildeki çemberin merkezidir.

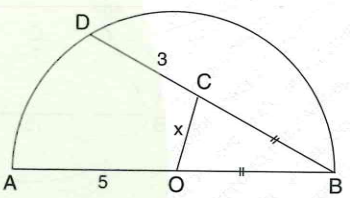
The point O is center of the circle in the figure.

[CE] ⊥ [AB],
[DF] ⊥ [AB],
|AC| = 3·|BD|
⇒ $\frac{|BF|}{|AE|} = ?$



A) $\frac{1}{\sqrt{3}}$ B) $\frac{1}{3}$ C) $\frac{1}{6}$ D) $\frac{1}{9}$ E) $\frac{1}{12}$

5.



O noktası şekildeki yarım çemberin merkezidir.

The point O is center of the semicircle in the figure.

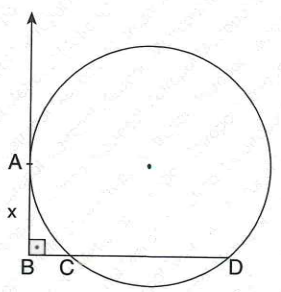
|AO| = 5 cm, |DC| = 3 cm,
|OB| = |BC| ⇒ **|OC| = x = ? cm**

A) $\sqrt{5}$ B) $\sqrt{10}$ C) $2\sqrt{3}$ D) 4 E) $3\sqrt{2}$

6. A, değme noktasıdır.

A is the point of tangency.

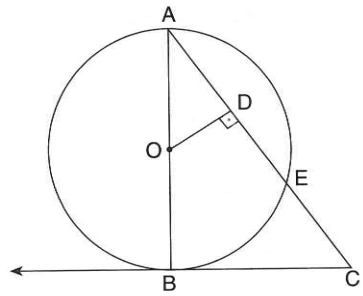
[BA] ⊥ [BD],
r = 10 cm,
|CD| = 16 cm
⇒ **|AB| = x = ? cm**



A) 5 B) 6 C) 7 D) 8 E) 9

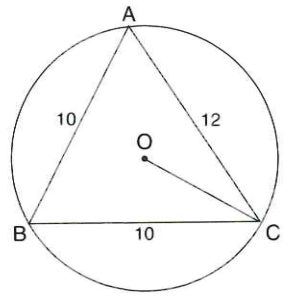
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [CB şekildeki O merkezli çembere teğettir.
[CB is tangent to the circle with center O in the figure.
IAEI = 2IECI,
IADI = 4 cm
⇒ **r = ? cm**



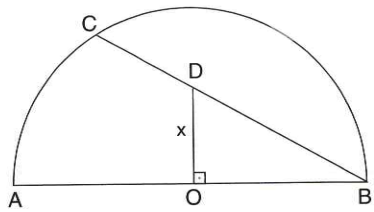
A) $2\sqrt{6}$ B) $3\sqrt{6}$ C) $4\sqrt{6}$ D) $5\sqrt{6}$ E) $6\sqrt{6}$

8. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
IABI = IBCI = 10 cm,
IACI = 12 cm
⇒ **r = ? cm**



A) $\frac{21}{4}$ B) $\frac{11}{2}$ C) 6 D) $\frac{25}{4}$ E) $\frac{27}{4}$

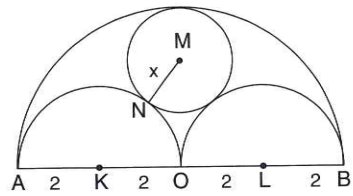
9.



O noktası, şekildeki yarım çemberin merkezidir.
The point O is center of the semicircle in the figure.
[DO] ⊥ [AB], IAOI = 10 cm, IBCI = 16 cm ⇒ **IODI = x = ? cm**

A) 6 B) $\frac{13}{2}$ C) 7 D) $\frac{15}{2}$ E) 8

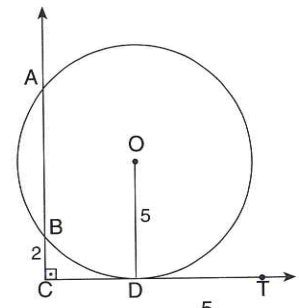
10.



O, K, L ve M noktaları şekildeki çemberlerin merkezleridir.
The points O, K, L and M are centers of the circles in the figure.
IAKI = IKOI = IOLI = ILBI = 2 cm ⇒ **IMNI = x = ? cm**

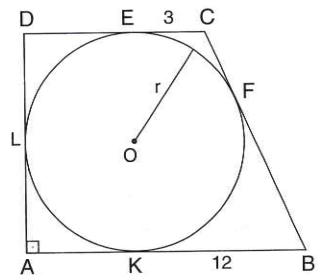
A) $\frac{2}{3}$ B) $\frac{4}{3}$ C) $\frac{5}{3}$ D) $\frac{7}{3}$ E) $\frac{8}{3}$

11. [CD şekildeki O merkezli çembere teğettir.
[CD is tangent to the circle with center O in the figure.
IODI = r = 5 cm,
ICBI = 2 cm
⇒ **ICDI = ? cm**



A) 2 B) 3 C) $\frac{5}{3}$ D) 4 E) $\frac{8}{3}$

12. Şekildeki O merkezli çemberde, L, E, F, K değme noktalarıdır.
L, E, F, K are tangent points of the circle with the center O.
IECI = 3 cm,
IKBI = 12 cm
⇒ **r = ? cm**



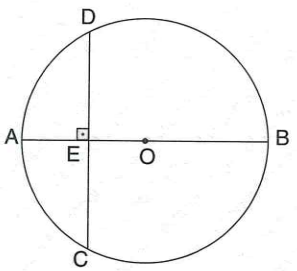
A) $\frac{3}{2}$ B) 3 C) $\frac{9}{2}$ D) 6 E) $\frac{14}{2}$

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	E	A	D	B	B	A	D	D	B	D	D

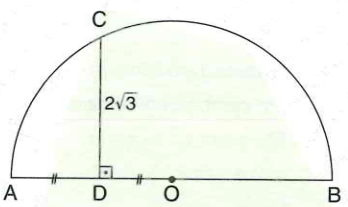
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
[AB] ⊥ [DC],
|AE| = 4 cm,
|DC| = 12 cm
⇒ **|AB| = ? cm**



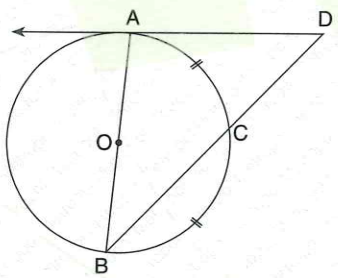
A) 12 B) 13 C) 14 D) 15 E) 16

2. O noktası şekildeki yarım çemberin merkezidir.
The point O is center of the semicircle in the figure.
[CD] ⊥ [AB],
|CD| = $2\sqrt{3}$ cm,
|AD| = |DO|
⇒ **|AD| = ? cm**



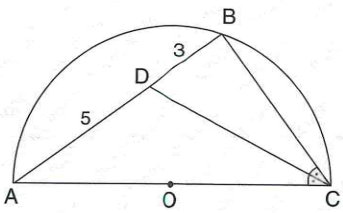
A) 1 B) 2 C) 2,5 D) 3 E) 3,5

3. [DA şekildeki O merkezli çembere teğettir.
[DA is tangent to the circle with center O in the figure.
$m(\widehat{AC}) = m(\widehat{BC})$,
|BD| = $4\sqrt{2}$ cm
⇒ **|AO| = |OB| = ? cm**



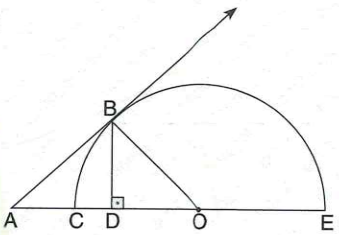
A) 1 B) $\sqrt{2}$ C) 1,8 D) 2 E) $\sqrt{5}$

4. O noktası şekildeki yarım çemberin merkezidir.
The point O is center of the semicircle in the figure.
|DB| = 3 cm,
|DA| = 5 cm
⇒ **|CD| = ? cm**



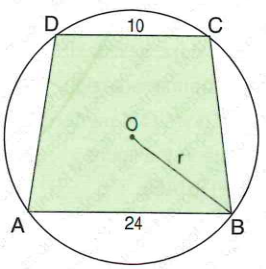
A) $5\sqrt{5}$ B) $4\sqrt{5}$ C) $3\sqrt{5}$ D) $2\sqrt{5}$ E) $\sqrt{5}$

5. [AB şekildeki O merkezli yarım çembere teğettir.
[AB is tangent to the semicircle with center O in the figure.
[BD] ⊥ [AE],
|CD| = 2 cm,
|BD| = $2\sqrt{3}$ cm
⇒ **|AC| = ? cm**



A) 1 B) 2 C) 3 D) 4 E) 5

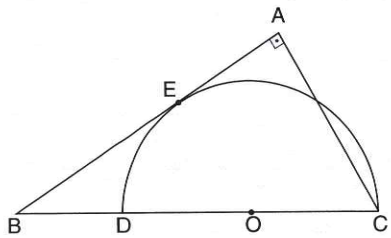
6. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
[AB] // [DC],
|AB| = 24 cm,
|CD| = 10 cm,
r = 13 cm
⇒ **A(ABCD) = ? cm²**



A) 108 B) 121 C) 144 D) 216 E) 289

METROPOL YAYINLARI • METROPOL PUBLICATIONS

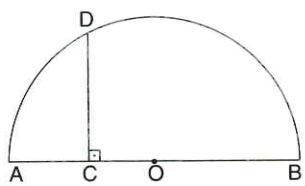
7.



O noktası şekildeki yarım çemberin merkezidir.
The point O is center of the semicircle in the figure.
E değme noktasıdır. / E is the tangent point.
$[BA] \perp [AC]$, $|BD| = |DO| = |OC|$, $|BE| = 4\sqrt{3}$ cm
$\Rightarrow$ **$|AC|$ = ? cm**

A) $2\sqrt{6}$ B) $3\sqrt{3}$ C) 6
D) $2\sqrt{10}$ E) $3\sqrt{5}$

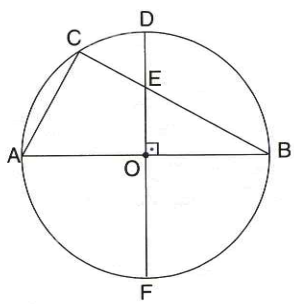
8. O noktası şekildeki yarım çemberin merkezidir.
The point O is center of the semicircle in the figure.



$\frac{|AC|}{|OB|} = \frac{2}{3}$,
$[DC] \perp [AB]$ ve(and) $|DC| = 4\sqrt{2}$ cm $\Rightarrow$ **$|AC|$ = ? cm**

A) 4,8 B) 4 C) 3,6
D) 2,4 E) 2

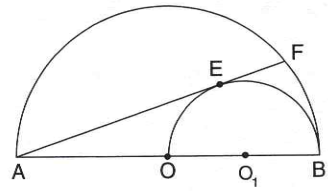
9. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.



$[DF] \perp [AB]$,
$|OF| = 4\sqrt{3}$ cm,
$|EB| = 8$ cm
$\Rightarrow$ **$|CE|$ = ? cm**

A) 4,8 B) 4 C) 3,6
D) 3 E) 2

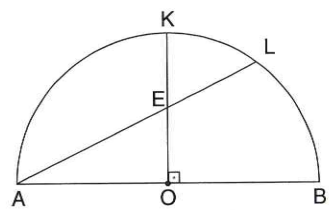
10.



O ve O_1 noktaları şekildeki yarım çemberlerin merkezidir.
The points O and O_1 are centers of the semicircles in the figure.
$|AF| = 16$ cm $\Rightarrow$ **$|EF|$ = ? cm**

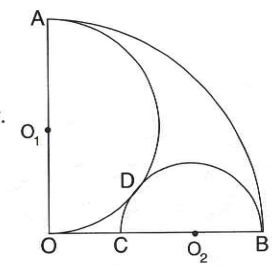
A) 6 B) 5 C) 4,8
D) 4 E) 3

11. O noktası şekildeki yarım çemberin merkezidir.
The point O is center of the semicircle in the figure.
$[KO] \perp [AB]$,
$|OE| = |EL| = 6$ cm
$\Rightarrow$ **$|AO|$ = ? cm**



A) 15 B) $8\sqrt{3}$ C) 12
D) 9 E) $6\sqrt{3}$

12. O noktası şekildeki çeyrek çemberin merkezi olup O_1 ve O_2 merkezli yarım çemberler D noktasında birbirlerine teğettir.
The point O is center of the quarter circle. The semicircles with centers O_1 and O_2 are tangent to each other at point D as shown in the figure.



$|OB| = 6$ cm $\Rightarrow$ **$|OC|$ = ? cm**

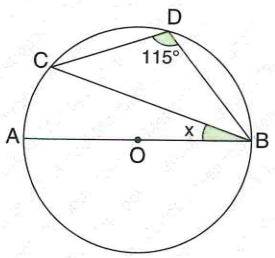
A) 2,5 B) 2 C) 1,5
D) 1 E) 0,5

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
B	B	D	C	D	E	C	B	B	D	E	B

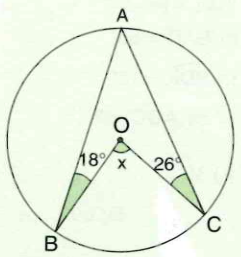
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$m(\widehat{CDB}) = 115°$
$\Rightarrow$ **$m(\widehat{ABC}) = x = ?$**



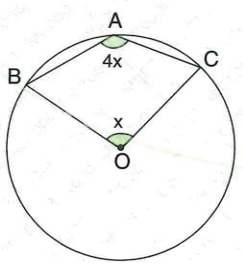
A) 15° B) 20° C) 25° D) 30° E) 35°

2. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$m(\widehat{ABO}) = 18°$
$m(\widehat{ACO}) = 26°$
$\Rightarrow$ **$m(\widehat{BOC}) = x = ?$**



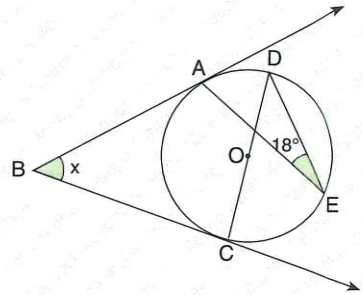
A) 44° B) 66° C) 78° D) 88° E) 96°

3. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$m(\widehat{BAC}) = 4 \cdot m(\widehat{BOC}) = 4x$
$\Rightarrow$ **$m(\widehat{BOC}) = x = ?$**



A) 24° B) 28° C) 32° D) 40° E) 45°

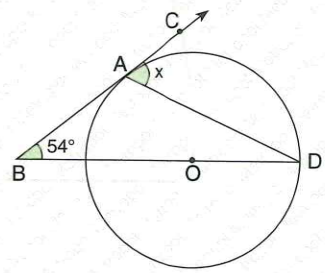
4.



Şekildeki O merkezli çemberde, A ve C noktaları değme noktalarıdır.
A and C are tangent points of tangency of the circle with the center O.
$m(\widehat{AED}) = 18°$ $\Rightarrow$ **$m(\widehat{ABC}) = x = ?$**

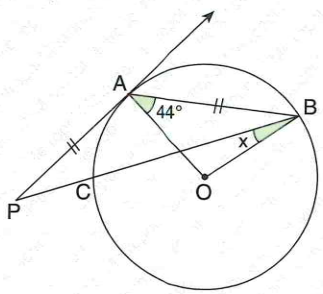
A) 36° B) 40° C) 44° D) 48° E) 54°

5. [BA şekildeki O merkezli çembere teğettir.
[BA is tangent to the circle with center O in the figure.
$m(\widehat{ABD}) = 54°$
$\Rightarrow$ **$m(\widehat{CAD}) = x = ?$**



A) 66° B) 72° C) 78° D) 84° E) 90°

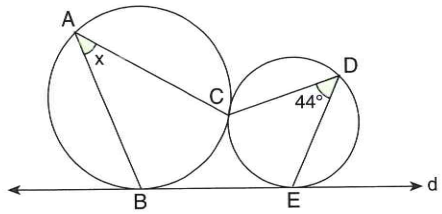
6. [PA şekildeki O merkezli çembere teğettir.
[PA is tangent to the circle with center O in the figure.
$|PA| = |AB|$,
$m(\widehat{OAB}) = 44°$
$\Rightarrow$ **$m(\widehat{PBO}) = x = ?$**



A) 21° B) 22° C) 23° D)24° E) 26°

METROPOL YAYINLARI • METROPOL PUBLICATIONS

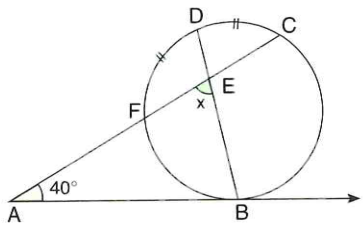
7.



d doğrusu şekildeki çemberlere B ve E noktalarında teğettir.
The line d is tangent to the circles at the points B and E, in the figure.
$m(\widehat{CDE}) = 44^\circ \Rightarrow$ **$m(\widehat{BAC}) = x = ?$**

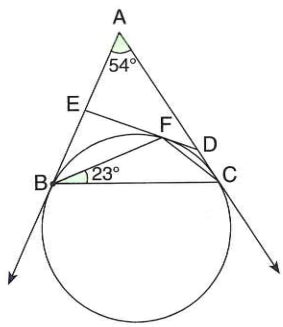
A) 44° B) 46° C) 48°
D) 50° E) 52°

8. [AB şekildeki çembere teğettir.
[AB is tangent to the circle in the figure.
$m(\widehat{FD}) = m(\widehat{DC})$,
$m(\widehat{CAB}) = 40^\circ$
$\Rightarrow$ **$m(\widehat{AEB}) = x = ?$**



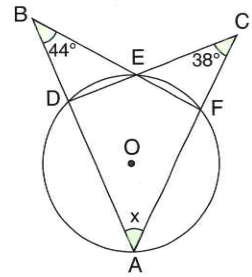
A) 60° B) 65° C) 70°
D) 75° E) 80°

9. B, F, C değme noktalarıdır.
B, F, C are points of tangency.
$m(\widehat{BAC}) = 54^\circ$
$m(\widehat{FBC}) = 23^\circ$
$\Rightarrow$ **$m(\widehat{BCF}) = ?$**



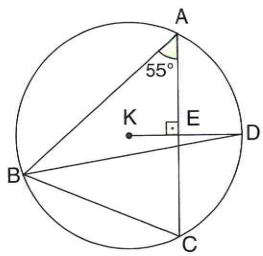
A) 33° B) 35° C) 37°
D) 40° E) 42°

10. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$m(\widehat{ABF}) = 44^\circ$
$m(\widehat{DCA}) = 38^\circ$
$\Rightarrow$ **$m(\widehat{BAC}) = x = ?$**



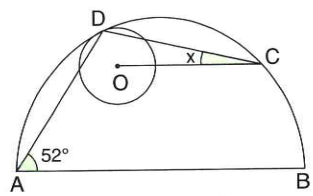
A) 44° B) 47° C) 49°
D) 51° E) 53°

11. K noktası, şekildeki çemberin merkezidir.
The point K is center of the circle in the figure.
$[KD] \perp [AC]$,
$m(\widehat{BAC}) = 55^\circ$
$m(\widehat{BDK}) = 15^\circ$
$\Rightarrow$ **$m(\widehat{ABC}) = ?$**



A) 40° B) 45° C) 50°
D) 60° E) 65°

12. Şekildeki O merkezli çember, [AB] çaplı yarım çembere D noktasında teğettir.
The circle with center O is tangent to the [AB] at the point D as shown in the figure.



[OC] // [AB], |AD| = |DC|, $m(\widehat{DAB}) = 52^\circ \Rightarrow$ **$m(\widehat{OCD}) = x = ?$**

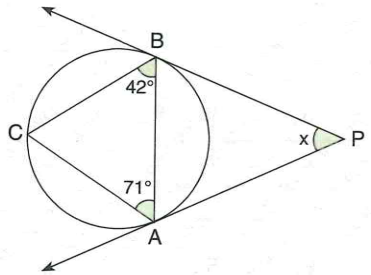
A) 14° B) 20° C) 24°
D) 28° E) 32°

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	D	D	A	B	A	B	C	D	C	A	C

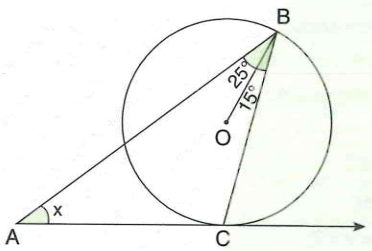
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. A ve B değme noktalarıdır.
A and B are points of tangency.
$m(\widehat{CBA}) = 42°$,
$m(\widehat{BAC}) = 71°$
$\Rightarrow$ **$m(\widehat{BPA}) = ?$**



A) 43° B) 44° C) 45° D) 46° E) 47°

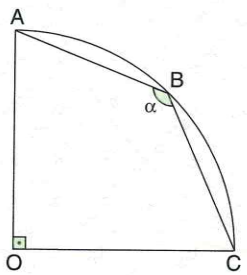
2.



[AC şekildeki O merkezli çembere teğettir.
[AC is tangent to the circle with center O in the figure.
$m(\widehat{ABO}) = 25°$, $m(\widehat{OBC}) = 15°$ $\Rightarrow$ **$m(\widehat{CAB}) = x = ?$**

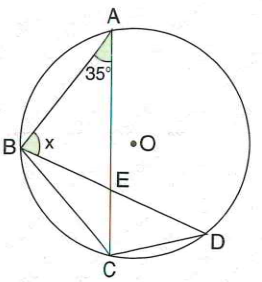
A) 35° B) 40° C) 45° D) 50° E) 55°

3. O noktası şekildeki çeyrek çemberin merkezidir.
The point O is center of quarter circle in the figure.
$[AO] \perp [OC]$
$\Rightarrow$ **$m(\widehat{ABC}) = \alpha = ?$**



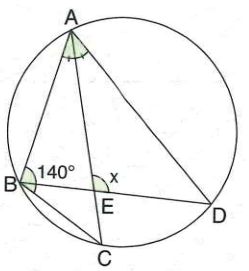
A) 120° B) 135° C) 150° D) 200° E) 270°

4. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
IABI = IBDI,
IBCI = ICDI,
$m(\widehat{BAC}) = 35°$
$\Rightarrow$ **$m(\widehat{ABD}) = x = ?$**



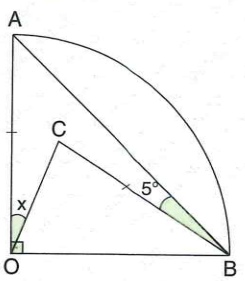
A) 35° B) 40° C) 45° D) 50° E) 55°

5. [AC], bir açıortaydır.
[AC] is a bisector.
$m(\widehat{ABC}) = 140°$
$\Rightarrow$ **$m(\widehat{AED}) = x = ?$**



A) 110° B) 120° C) 130° D) 140° E) 150°

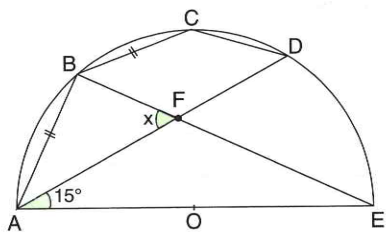
6. O noktası şekildeki çeyrek çemberin merkezidir.
The point O is center of quarter circle in the figure.
$m(\widehat{ABC}) = 5°$,
ICBI = IAOI
$\Rightarrow$ **$m(\widehat{AOC}) = x = ?$**



A) 10° B) 20° C) 30° D) 40° E) 50°

METROPOL YAYINLARI • METROPOL PUBLICATIONS

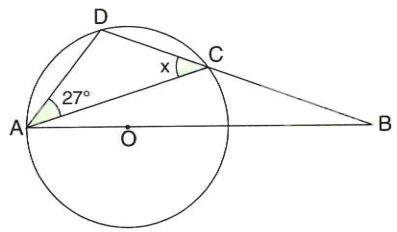
7.



O noktası şekildeki yarım çemberin merkezidir.
The point O is center of the semicircle in the figure.
$|AB| = |BC|$, $[BC] \,//\, [AD]$, $m(\widehat{DAE}) = 15^\circ \Rightarrow$ **$m(\widehat{BFA}) = x = ?$**

A) 15° B) 25° C) 30°
D) 40° E) 55°

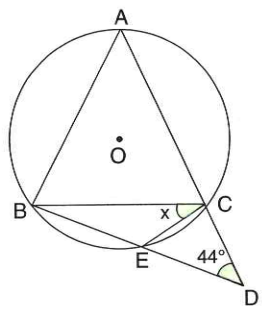
8.



O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$|AC| = |CB|$, $m(\widehat{DAC}) = 27^\circ \Rightarrow$ **$m(\widehat{DCA}) = x = ?$**

A) 40° B) 42° C) 44°
D) 46° E) 48°

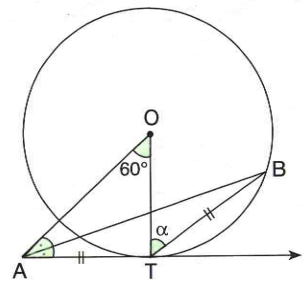
9. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$|AB| = |AC| = |BC|$,
$m(\widehat{ADB}) = 44^\circ$
$\Rightarrow$ **$m(\widehat{BCE}) = x = ?$**



A) 22° B) 32° C) 36°
D) 42° E) 44°

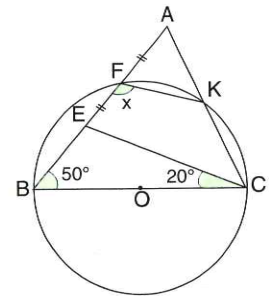
METROPOL YAYINLARI • METROPOL PUBLICATIONS

10. [AT şekildeki O merkezli çembere teğettir.
[AT is tangent to the circle with center O in the figure.
$|AT| = |TB|$,
$m(\widehat{OAB}) = m(\widehat{BAT})$,
$m(\widehat{AOT}) = 60^\circ$
$\Rightarrow$ **$m(\widehat{OTB}) = \alpha = ?$**



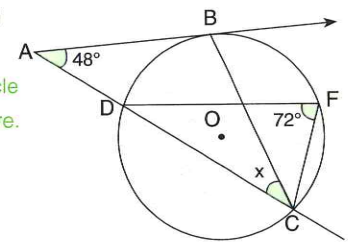
A) 30° B) 40° C) 50°
D) 60° E) 70°

11. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$|AF| = |FE|$,
$m(\widehat{ABC}) = 50^\circ$,
$m(\widehat{ECB}) = 20^\circ$
$\Rightarrow$ **$m(\widehat{KFB}) = x = ?$**



A) 100° B) 110° C) 120°
D) 130° E) 140°

12. [AB şekildeki O merkezli çembere teğettir.
[AB is tangent to the circle with center O in the figure.
$m(\widehat{BAC}) = 48^\circ$,
$m(\widehat{DFC}) = 72^\circ$
$\Rightarrow$ **$m(\widehat{ACB}) = x = ?$**



A) 48° B) 42° C) 36°
D) 32° E) 30°

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	A	B	B	D	B	D	B	E	D	C	E

BÖLÜM CHAPTER 12

TARİHSEL NOT / HISTORICAL NOTE

Carl Friedrich Gauss (Gau€) [1777 – 1855]

Alman matematikçi ve bilim insanı. Katkıda bulunduğu alanlardan bazıları; sayılar kuramı, analiz, diferansiyel geometri, jeodezi, elektrik, manyetizma, astronomi ve optiktir. "Matematikçilerin prensi" ve "antik çağlardan beri yaşamış en büyük matematikçi" olarak da anılan Gauss, matematiğin ve bilimin pek çok alanına etkisini bırakmıştır ve tarihin en nüfuzlu matematikçilerinden biri olarak kabul edilir.

German mathematician and scientist. Some of the areas where he participated are numbers theory, analysis, differential geometry, geodesy, electricity, magnetism, astronomy and optics. Gauss, also known as "the prince of mathematicians" and "the greatest mathematician since antiquity period", has influenced many areas of mathematics and science and is considered one of the most influential mathematicians in history.

ÇEMBERDE KUVVET, ÇEVRE ve ALAN
POWER, CIRCUMFERENCE and AREA in a CIRCLE

Bu bölüm, 11 çözümlü örnek, 12 çözümlü test sorusu, 12 çözümlü YÖS sorusu, 24 alıştırma sorusu, 60 test sorusu içermektedir.

This chapter includes 11 examples with solutions, 12 test questions with solutions, 12 YÖS questions with solutions, 24 exercise questions and 60 test questions.

BÖLÜM / CHAPTER 12 ..... 409 - 442

ÇEMBERDE KUVVET, ÇEVRE ve ALAN / POWER, CIRCUMFERENCE and AREA in a CIRCLE

- Çemberde Kuvvet / Power in Circle ..... 411 - 414
  - Bir Noktanın Bir Çembere Göre Kuvveti / Power of a Point with Respect to a Circle ..... 411 - 412
  - Kuvvet Ekseni / The Axis of Power ..... 413 - 414
- Çemberde Çevre, Alan ve Benzerlik / Circumference, Area and Similarity in Circle ..... 414 - 415
- Daire ve Daire Dilimi / Circle and Circular Sector ..... 414 - 418
  - Darie Diliminin Alanı / Area of Circular Sector ..... 415 - 416
  - Dairenin Alanı / The Area of a Circular Region 416
  - Daire Parçası / Circular Segment ..... 416 - 418
- Çemberlerde Benzerlik ile İlgili Özellikler / Properties According to The Similarity in Circles ..... 418 - 420
- Çözümlü Test / Test With Solutions ..... 421 - 424
- YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 425 - 428
- Alıştırmalar / Exercises ..... 429 - 432
- Konu Testleri / Practice Tests ..... 433 - 442

BÖLÜM 12 CHAPTER

ÇEMBERDE KUVVET, ÇEVRE ve ALAN
POWER, CIRCUMFERENCE and AREA in a CIRCLE

ÇEMBERDE KUVVET / POWER in CIRCLE

BİR NOKTANIN BİR ÇEMBERE GÖRE KUVVETİ
POWER of a POINT with RESPECT to a CIRCLE

Tanım: Çember düzleminde alınan bir P noktasından geçen kiriş veya kesen, çemberi A ve B noktalarında kesiyorsa |PA|·|PB| değerine, P noktasının bu çembere göre kuvveti denir.

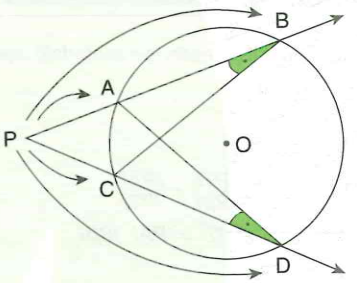
Definition: Let a chord or a secant passing through the point P which is lying in the plane of the circle cut the circle at the points A and B. Then the product |PA|·|PB| is called the power of P with respect to that circle.

Özellik 1 / Property 1

P noktası çember düzleminde ve çemberin dışında bir nokta olmak üzere aşağıdaki eşitlikler yazılır. / If P is a point in the same plane with the circle which lies outside of the circle, the following equations can be obtained.

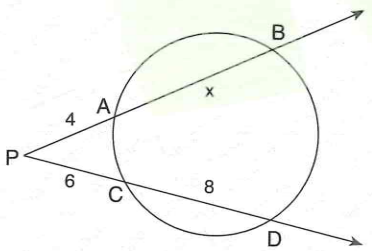
$\widehat{PBC} \sim \widehat{PDA}$ (A.A.) $\Leftrightarrow \frac{|PC|}{|PA|} = \frac{|PB|}{|PD|}$

$\Leftrightarrow |PA| \cdot |PB| = |PC| \cdot |PD|$



Örnek / Example 1

$|PA| = 4$ cm,
$|PC| = 6$ cm,
$|CD| = 8$ cm
$\Rightarrow$ **$|AB| = x = ?$ cm**



A) 13 B) 14 C) 17 D) 19 E) 21

Çözüm / Solution

Yanıt / Answer **C**

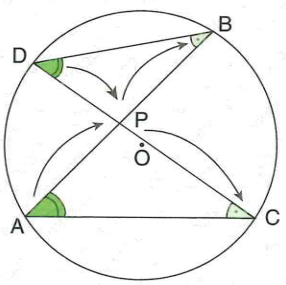
$|PA| \cdot |PB| = |PC| \cdot |PD|$
$\Rightarrow 4(4+x) = 6 \cdot 14$
$4 + x = 21$
$x = 17$ cm

Özellik 2 / Property 2

P noktası, çember düzleminde ve çemberin iç bölgesinde bir nokta olmak üzere aşağıdaki eşitlikler yazılır. / If P is a point in the same plane with the circle and lying inside the circle, the following equations can be obtained.

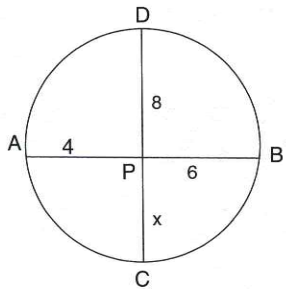
$\widehat{APC} \sim \widehat{DPB}$ (A.A.) $\Leftrightarrow \frac{|PC|}{|PB|} = \frac{|PA|}{|PD|}$

$\Leftrightarrow |PA| \cdot |PB| = |PC| \cdot |PD|$



Örnek / Example 2

|PA| = 4 cm,
|PB| = 6 cm,
|PD| = 8 cm
⇒ **|PC| = x = ? cm**



A) 2 B) 3 C) 4 D) 5 E) 6

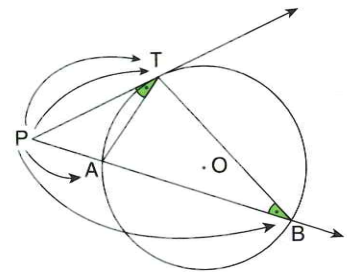
Çözüm / Solution Yanıt / Answer **B**

$|PA| \cdot |PB| = |PC| \cdot |PD|$
$\Rightarrow 4 \cdot 6 = x \cdot 8$
$3 = x$

Özellik 3 / Property 3

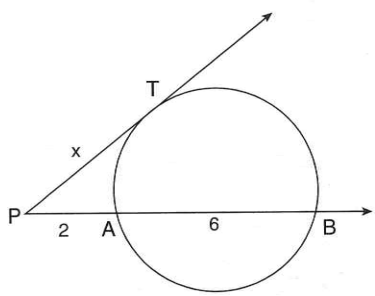
[PT, çembere T noktasında teğet, [PB kesen ise aşağıdaki eşitlikler yazılır. If [PT is tangent to the circle at the point T and [PB is a secant, then

$\widehat{PTA} \sim \widehat{PBT}$ (A.A.) $\Leftrightarrow \frac{|PT|}{|PB|} = \frac{|PA|}{|PT|}$
$\Leftrightarrow |PT|^2 = |PA| \cdot |PB|$



Örnek / Example 3

|PA| = 2 cm,
|AB| = 6 cm
⇒ **|PT| = x = ? cm**



A) 2 B) 4 C) 6 D) 8 E) 10

Çözüm / Solution Yanıt / Answer **B**

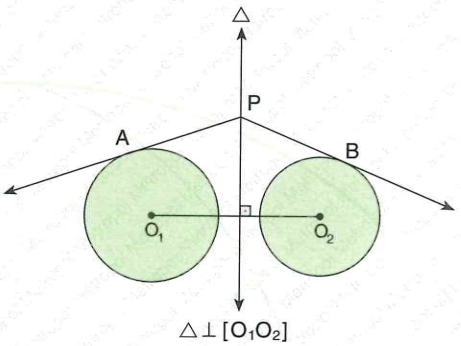
$|PT|^2 = |PA| \cdot |PB|$
$\Rightarrow x^2 = 2 \cdot 8$
$x^2 = 16$
$x = 4$ cm

KUVVET EKSENİ / THE AXIS of POWER

Tanım: İki çembere göre aynı kuvvette olan noktalar kümesine **kuvvet ekseni** denir. Kuvvet ekseni, merkezler doğrusuna dik olup △ ile gösterilir.

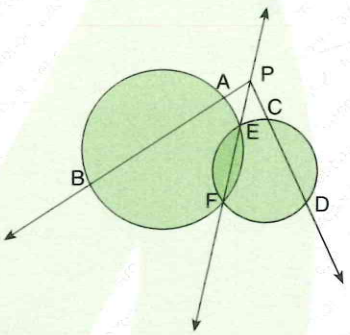
Definition: The set of points which are of the same power with respect to two circles is called the **axis of power.** The axis of power is perpehdicular to line of centers and is represented with △.

$|PA|^2 = |PB|^2 \Rightarrow |PA| = |PB|$



ÖNEMLİ / IMPORTANT

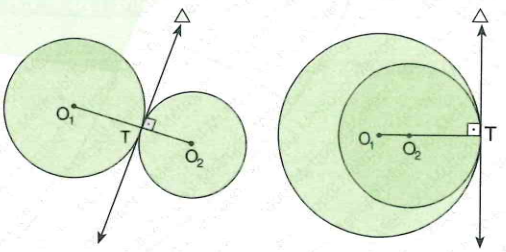
$|PA| \cdot |PB| = |PC| \cdot |PD| = |PE| \cdot |PF|$



ÖNEMLİ / IMPORTANT

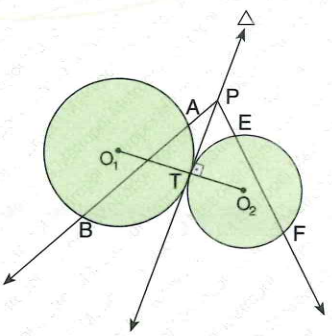
Çemberler bir T noktasında dıştan veya içten teğet iseler, kuvvet ekseni T noktasından çizilen ortak teğet doğrusudur.

If the circles are tangent externally or internally at a point T, then the axis of power is the common tangent line drawn from point T.



ÖNEMLİ / IMPORTANT

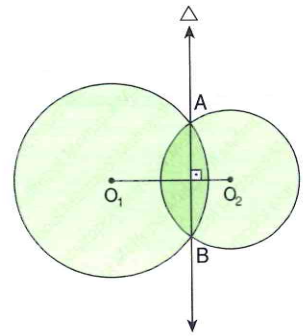
$|PT|^2 = |PA| \cdot |PB| = |PE| \cdot |PF|$



ÖNEMLİ / IMPORTANT

Kesişen iki çemberin kuvvet ekseni, ortak noktalarından geçen doğrudur.

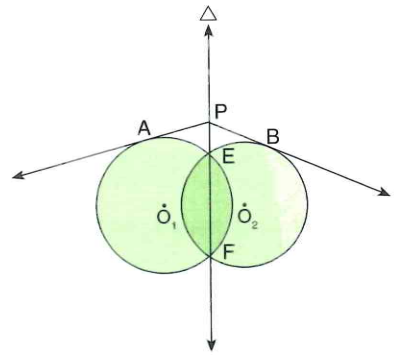
The axis of power of two intersecting circles is the line passing through their common points.



ÖNEMLİ / IMPORTANT

$|PA|^2 = |PB|^2 = |PE| \cdot |PF|$

$\Rightarrow |PA| = |PB|$

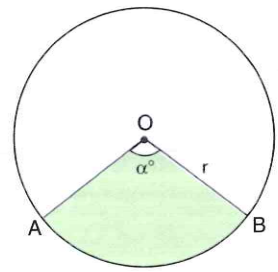


ÇEMBERDE ÇEVRE, ALAN VE BENZERLİK
CIRCUMFERENCE, AREA and SIMILARITY in CIRCLE

Şekildeki çemberde, α derecelik merkez açının gördüğü $\widehat{AB}$'nın uzunluğunun çemberin çevresine oranı, α açısı 360° ye oranına eşittir.

In the circle of the figure, the ratio of the length of $\widehat{AB}$ which is subtending the central angle with size of α to the circumference is equal to the ratio of α to 360°.

$$\frac{|\widehat{AB}|}{2\pi r} = \frac{\alpha^\circ}{360^\circ} \Leftrightarrow |\widehat{AB}| = 2 \cdot \pi \cdot r \cdot \frac{\alpha^\circ}{360^\circ}$$



ÖNEMLİ / IMPORTANT

r yarıçaplı bir çemberin çevresi $2\pi r$'ye eşittir.

Circumference of a circle with radius r is equal to $2\pi r$.

Örnek / Example 4

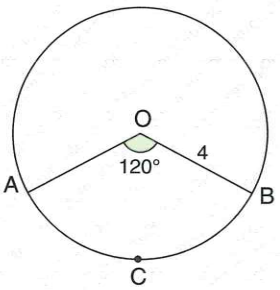
O merkezli çember,

The circle with center O,

$m(\widehat{AOB}) = 120°$

$|OB| = 4$ cm

$\Rightarrow$ $|\widehat{ACB}| = ?\,\pi$ cm



A) 2π B) $\frac{2\pi}{3}$ C) 3π D) $\frac{4\pi}{3}$ E) $\frac{8\pi}{3}$

Çözüm / Solution Yanıt / Answer **E**

$|OB| = |OA| = r = 4$ cm [yarıçap / radius]

$$\frac{|\widehat{ACB}|}{2\pi r} = \frac{120°}{360°}$$

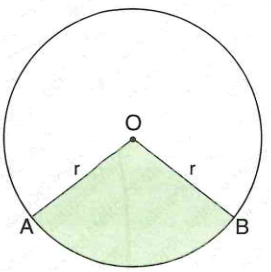
$$\frac{|\widehat{ACB}|}{2 \cdot \pi \cdot 4} = \frac{1}{3}$$

$$|\widehat{ACB}| = \frac{8\pi}{3}$$

DAİRE VE DAİRE DİLİMİ / CIRCLE and CIRCULAR SECTOR

Tanım: Bir çember ile iç bölgesinin birleşimine **daire** denir. [OA] ve [OB] yarıçapları ile $\widehat{AB}$ yayı tarafından sınırlanan bölgeye **daire dilimi** denir.

Definition: The union of a circle and the interior region of it is called a **circular region**. The region bounded by the radiuses [OA], [OB] and the arc $\widehat{AB}$ is called a **circular sector**.

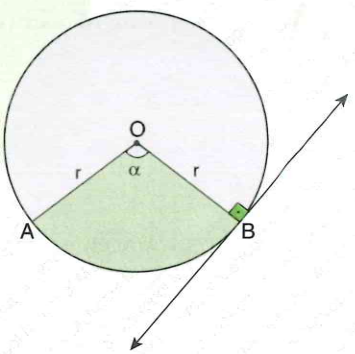


Şekildeki taralı daire dilimi $\overset{\triangledown}{AOB}$ ile gösterilir.

The circular sector in the figure is denoted by $\overset{\triangledown}{AOB}$.

DAİRE DİLİMİNİN ALANI / AREA of a CIRCULAR SECTOR

$$A(\overset{\triangledown}{AOB}) = \frac{1}{2} \cdot |\widehat{AB}| \cdot r \quad \text{veya (or)} \quad A(\overset{\triangledown}{AOB}) = \pi r^2 \cdot \frac{\alpha}{360°}$$

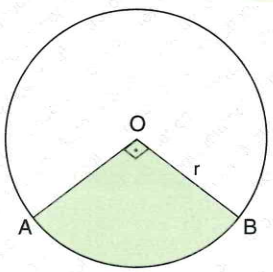


Örnek / Example 5

O merkezli çember,

The circle with center O,

$r = 4$ cm $\Rightarrow$ $A(\overset{\triangledown}{AOB}) = ?\,\pi$ cm^2



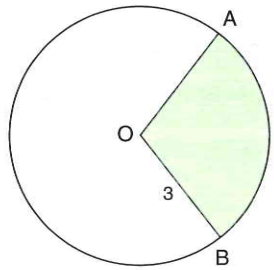
A) 2π B) 4π C) 6π D) 12π E) 16π

Çözüm / Solution Yanıt / Answer **B**

$$A(\overset{\triangledown}{AOB}) = \pi \cdot r^2 \cdot \frac{\alpha}{360°} = \pi \cdot 4^2 \cdot \frac{90°}{360°} = 4\pi \text{ cm}^2$$

Örnek / Example 6

O merkezli çember,
The circle with center O,
$|OB| = 3$ cm,
$|\overset{\frown}{AB}| = 4\pi$ cm
$\Rightarrow$ $A(\overset{\triangledown}{AOB}) = ?\,\pi\ cm^2$



A) 3π B) 4π C) 5π D) 6π E) 7π

Çözüm / Solution Yanıt / Answer **D**

$A(\overset{\triangledown}{AOB}) = \frac{1}{2} \cdot |\overset{\frown}{AB}| \cdot r$

$= \frac{1}{2} \cdot 4\pi \cdot 3$

$= 6\pi$

DAİRENİN ALANI / THE AREA of a CIRCULAR REGİON

$\alpha = 360°$ olarak alınırsa daire diliminin alanı, dairenin alanına eşit olur.
If we substitute $\alpha = 360°$ in the formula related to finding the area of a circular region, then the area equals the area of the circular region.

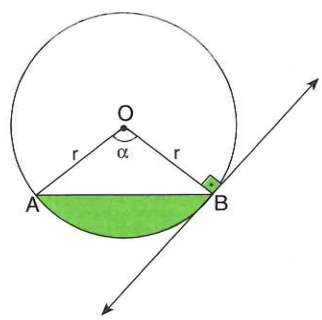
Dairesel bölgenin alanı / The area of circular region $= \frac{\pi r^2 \cdot 360°}{360°} = \pi r^2$

DAİRE PARÇASI / CIRCULAR SEGMENT

Tanım: Dairenin bir kirişi ile dairenin çevresi arasında kalan bölgeye **daire parçası** denir.
Definition: The region between a chord and the boundary of a circular sector is called a **circular segment**.

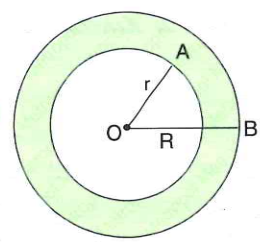
Daire Parçasının Alanı / Area of a Circular Segment

$$A(\overset{\triangledown}{AOB}) - A(\overset{\frown}{AOB}) = \pi \cdot r^2 \cdot \frac{\alpha}{360°} - \frac{1}{2} \cdot r^2 \cdot \sin\alpha$$



Daire Halkasının Alanı / The area of an Annulus

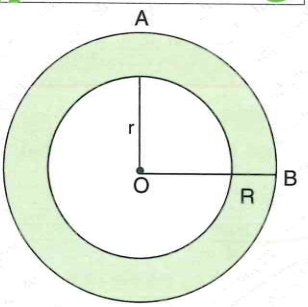
Aynı merkezli r ve R yarıçaplı, iç içe geçmiş iki çemberin sınırladığı daire halkasının alanı $\pi R^2 - \pi r^2 = \pi(R^2 - r^2)$ ifadesine eşittir.
The area of an annulus which is bounded by two contentric circles with radiuses r and R is equal to $\pi R^2 - \pi r^2 = \pi(R^2 - r^2)$



Örnek / Example 7

R = 6 cm, r = 3 cm

⇒ **TA/SA = ? π cm²**



A) 20π B) 25π C) 27π D) 29π E) 30π

Çözüm / Solution Yanıt / Answer **C**

$\pi \cdot R^2 - \pi r^2 = \pi(R^2 - r^2)$

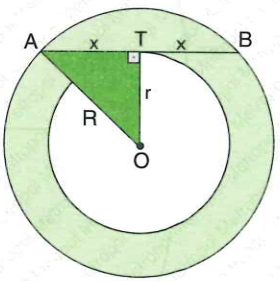
$= \pi(36 - 9)$

$= \pi \cdot 27$

Dairede Alan Özellikleri / Properties of Area in Circles

Özellik 1 / Property 1

Taralı alan / The shaded area = $\pi(R^2 - r^2) = \pi \cdot |AT|^2 = \pi \cdot x^2$ [$\widehat{ATO}$: $|AT|^2 = x^2 = R^2 - r^2$]



Örnek / Example 8

O noktası şekildeki çemberlerin merkezi; T değme noktasıdır.

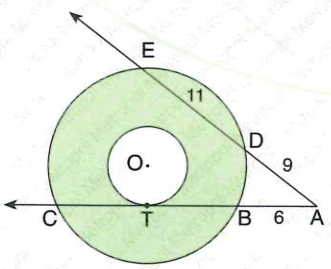
The point O is the center of the circles; T is the point of tangency.

|AB| = 6 cm,

|AD| = 9 cm,

|DE| = 11 cm

⇒ **TA/SA = ? cm²**



A) 72π B) 72√3π C) 108π D) 96√3π E) 144π

Çözüm / Solution Yanıt / Answer **E**

|AB|·|AC| = |AD|·|AE|,

6·(6 + |BC|) = 9·20

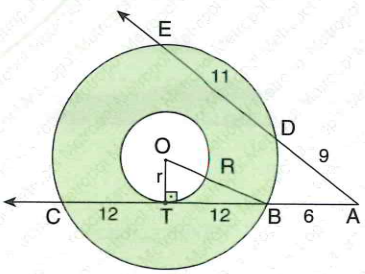
6 + |BC| = 30, |BC| = 24 cm

$|TB| = |TC| = \frac{24}{2} = 12$ cm

$R^2 - r^2 = 144$

$= \pi(R^2 - r^2)$

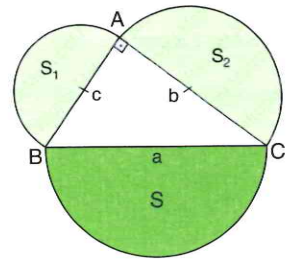
$= 144\pi$ cm²



Özellik 2 / Property 2

Şekildeki ABC üçgeni dik üçgendir. [AB] çaplı yarım dairenin alanı S_1, [AC] çaplı yarım dairenin alanı S_2 ve [BC] çaplı yarım dairenin alanı S olmak üzere aşağıdaki eşitlikler yazılabilir.

The triangle ABC in the figure is a right triangle. Let the areas of the semicircles with diameters [AB], [AC] and [BC] be S_1, S_2 and S, respectively as shown in the figure. Then the equations below can be obtained.



$$\left.\begin{array}{l} S=\frac{\pi a^2}{4},\ S_1=\frac{\pi c^2}{4},\ S_2=\frac{\pi b^2}{4} \\ a^2=b^2+c^2 \quad \text{[Pisagor]} \end{array}\right\} \Rightarrow \boldsymbol{S=S_1+S_2=\pi\cdot\left(\frac{b^2+c^2}{4}\right)=\frac{\pi a^2}{4}}$$

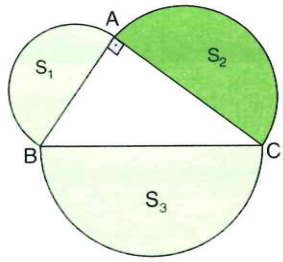
Örnek / Example 9

ABC dik üçgen / right triangle,

$S_1 = 10\,cm^2$,

$S_3 = 24\,cm^2$

$\Rightarrow$ $\mathbf{S_2 = ?\,cm^2}$



A) 10 B) 14 C) 18 D) 24 E) 28

Çözüm / Solution

Yanıt / Answer **B**

$S_1 + S_2 = S_3$ [Özellik 2 / Property 2]

$10 + S_2 = 24$

$S_2 = 14\,cm^2$

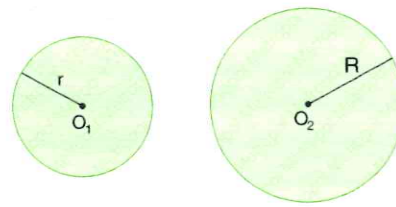
ÇEMBERLERDE BENZERLİK İLE İLGİLİ ÖZELLİKLER / PROPERTIES ACCORDING to THE SIMILARITY in CIRCLES

Özellik 1 / Property 1

Bütün çemberler benzerdir.

All circles are similar.

Benzerlik oranı / The ratio of similarity : $\frac{r}{R}=\frac{2\pi\cdot r}{2\pi\cdot R}=\frac{Ç_1}{Ç_2}=k$

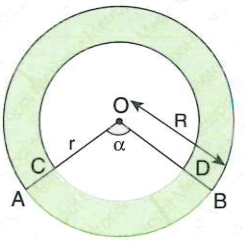


Özellik 2 / Property 2

Alan oranı / The ratio of areas : $\Rightarrow \frac{S_1}{S_2} = \frac{\pi \cdot r^2}{\pi \cdot R^2} = \left(\frac{r}{R}\right)^2 = k^2$

Özellik 3 / Property 3

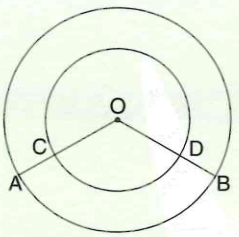
$|OC| = r$, $|OB| = R$ $\Rightarrow \frac{|\overset{\frown}{CD}|}{|\overset{\frown}{AB}|} = \frac{r}{R}$ ve (and) $\frac{A(\overset{\triangledown}{COD})}{A(\overset{\triangledown}{AOB})} = \frac{r^2}{R^2} = \left(\frac{r}{R}\right)^2 = k^2$



Örnek / Example 10

O noktası şekildeki çemberlerin merkezidir.
The point O is center of the circles in the figure.

$|OC| = 21$ cm,
$|OA| = 63$ cm
$|\overset{\frown}{AB}| = 204$ cm
$\Rightarrow |\overset{\frown}{CD}| = ?$ cm



A) 34 B) 51 C) 68 D) 72 E) 84

Çözüm / Solution

Yanıt / Answer **C**

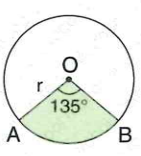
$\frac{|\overset{\frown}{CD}|}{|\overset{\frown}{AB}|} = \frac{|OC|}{|OA|} \Rightarrow \frac{|\overset{\frown}{CD}|}{204} = \frac{21}{63}$

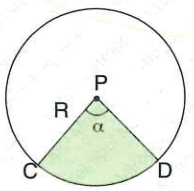
$\frac{|\overset{\frown}{CD}|}{204} = \frac{1}{3} \Rightarrow |CD| = 68$ cm

Örnek / Example 11

O ve P noktaları şekildeki çemberlerin merkezidir.
Points O and P center of the circles in the figure.

$m(\overset{\frown}{AOB}) = 135°$
$m(\overset{\frown}{CPD}) = \alpha$,
$R = 3r$ ve (and) $A(\overset{\triangledown}{AOB}) = A(\overset{\triangledown}{CPD}) \Rightarrow \alpha = ?$





A) 35° B) 30° C) 27,5° D)22,5° E) 15°

Çözüm / Solution

Yanıt / Answer **E**

$A(\overset{\triangledown}{AOB}) = A(\overset{\triangledown}{CPD}) \Rightarrow \frac{\pi \cdot r^2 \cdot 135°}{360°} = \frac{\pi \cdot R^2 \cdot \alpha}{360°}$

$\frac{\pi \cdot r^2 \cdot 135}{360°} = \frac{\pi \cdot 9 \cdot r^2 \cdot \alpha}{360°}$

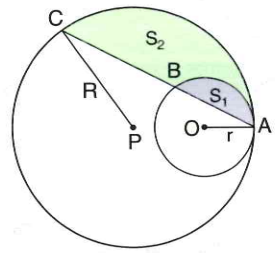
$135 = 9 \cdot \alpha \Rightarrow \alpha = 15°$

Özellik 4 / Property 4

İçten veya dıştan teğet olan çemberlerin, değme noktalarından geçen ortak kirişlerinin ayırdığı daire parça benzerdir.

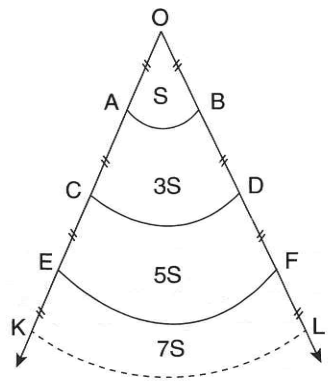
The arcs and the circular segments which are separated by the common chords that pass through the tangency point of tangent circles (externally or intenally), are similar.

$$\frac{|BA|}{|AC|} = \frac{r}{R} \Leftrightarrow \frac{S_1}{S_1+S_2} = \left(\frac{r}{R}\right)^2 = \left(\frac{|BA|}{|AC|}\right)^2$$

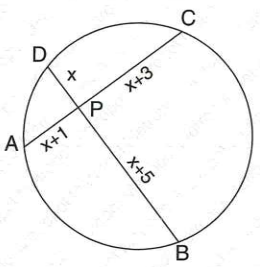


ÖNEMLİ / IMPORTANT

$|OA| = |AC| = |CE| = |EK|$ ⟹

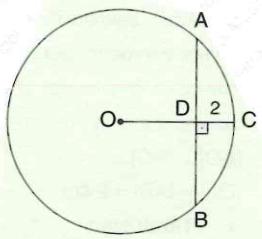


1. $|DP| = x$ cm,
$|PC| = x + 3$ cm,
$|AP| = x + 1$ cm,
$|PB| = x + 5$ cm
$\Rightarrow$ **x = ? cm**



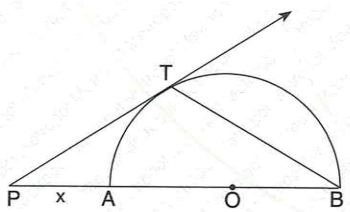
A) 1 B) 2 C) 3
D) 4 E) $\frac{5}{3}$

2. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$[OD] \perp [AB]$,
$|AD| = |DB| = 6$ cm,
$|DC| = 2$ cm $\Rightarrow$ **r = ? cm**



A) 12 B) 10 C) 9
D) 8 E) 6

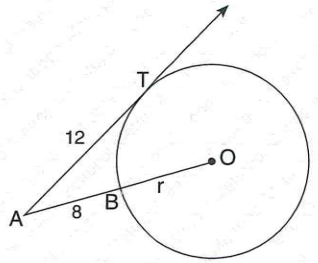
3.



Şekilde; [PT, O merkezli yarım çembere T noktasında teğettir.
[PT is tangent to the semicircle at the point T in the figure.
$|PT| = |TB| = 18$ cm $\Rightarrow$ **|PA| = x = ? cm**

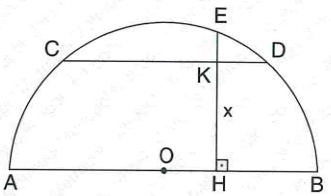
A) 12 B) $6\sqrt{3}$ C) 9
D) $4\sqrt{3}$ E) 8

4. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$|AT| = 12$ cm,
$|AB| = 8$ cm
$\Rightarrow$ **r = ? cm**



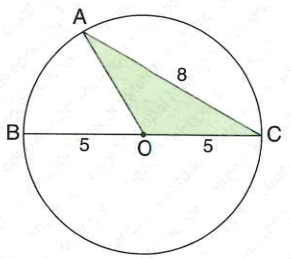
A) 5 B) 6 C) 7
D) 8 E) 9

5. O noktası şekildeki yarım çemberin merkezidir.
The point O is center of the semicircle in the figure.
$[CD] \,//\, [AB]$,
$[EH] \perp [AB]$,
$|KE| = 4$ cm,
$|KD| = 8$ cm,
$|KC| = 11$ cm
$\Rightarrow$ **|KH| = x = ? cm**



A) 9 B) 10 C) 11
D) 12 E) 14

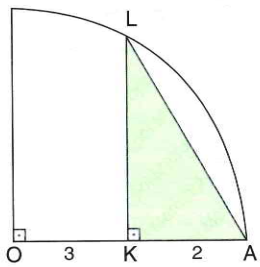
6. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$|AC| = 8$ cm,
$|BO| = |OC| = 5$ cm
$\Rightarrow$ **$A(\widehat{AOC})$ = ? cm²**



A) 24 B) 20 C) 18
D) 12 E) 10

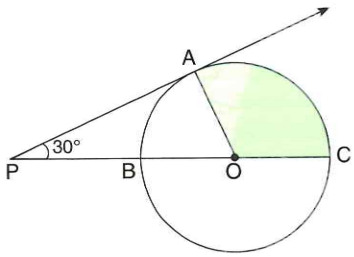
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. O noktası, şekildeki çeyrek çemberin merkezidir.
The point O is center of the quarter circle in the figure.
$[LK] \perp [OA]$,
$|OK| = 3$ cm,
$|KA| = 2$ cm
$\Rightarrow$ **$A(\widehat{LKA}) = ?\ cm^2$**



A) $2\sqrt{3}$ B) $3\sqrt{2}$ C) 5
D) 4 E) 3

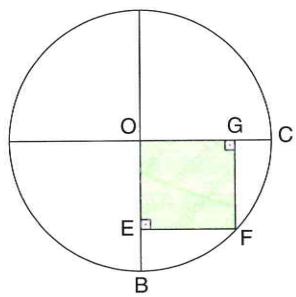
8.



[PA şekildeki O merkezli çembere A noktasında teğettir.
[PA is tangent to the circle with center O in the figure at the point A.
$m(\widehat{APC}) = 30°$, $|PC| = 18$ cm
$\Rightarrow$ **Taralı alan / The shaded area = ? π cm^2**

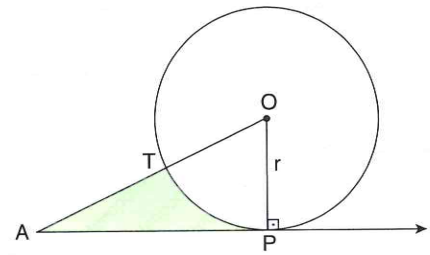
A) 9π B) 12π C) 15π
D) 18π E) 21π

9. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$|EB| = 1$ cm,
$|GC| = 2$ cm
$\Rightarrow$ **$A(OEFG) = ?\ cm^2$**



A) 6 B) 8 C) 9
D) 10 E) 12

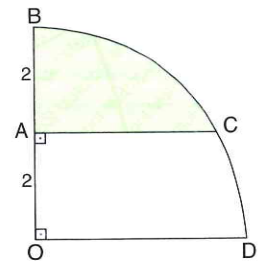
10.



[AP şekildeki O merkezli çembere teğettir.
[AP is tangent to the circle with center O in the figure.
$r = 6$ cm, $|OA| = 12$ cm
$\Rightarrow$ **Taralı alan / The shaded area = ? cm^2**

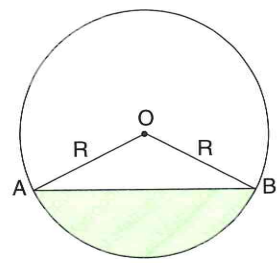
A) $6(3\sqrt{3}-\pi)$ B) $4\pi-\sqrt{3}$ C) $2(\sqrt{3}-\pi)$
D) $\sqrt{3}-\pi$ E) $3(\sqrt{2}-\pi)$

11. O noktası, şekildeki çeyrek çemberin merkezidir.
The point O is center of the quarter circle in the figure.
$[BO] \perp [AC]$,
$|OA| = |AB| = 2$ cm
$\Rightarrow$ **Taralı alan**
The shaded area = ? cm^2



A) $8\pi-\sqrt{3}$ B) $\frac{8\pi}{3}-\sqrt{3}$ C) $8\pi-2\sqrt{3}$
D) $2\left(\frac{4\pi}{3}-2\sqrt{3}\right)$ E) $2\left(\frac{4\pi}{3}-\sqrt{3}\right)$

12.



O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$m(\widehat{AOB}) = 120°$, $R = 6\sqrt{3}$ cm
$\Rightarrow$ **Taralı alan / The shaded area = ? cm^2**

A) $18\pi-9\sqrt{2}$ B) $27-9\sqrt{2}$ C) $27\pi-18\sqrt{2}$
D) $36\pi-12\sqrt{3}$ E) $36\pi-27\sqrt{3}$

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	B	B	A	A	D	D	B	E	A	D	E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $|AP|\cdot|PC| = |DP|\cdot|PB|$

$(x + 1)\cdot(x + 3) = x\cdot(x + 5)$

$x^2 + 4x + 3 = x^2 + 5x$

$x = 3$ cm

Yanıt / The Answer is C

2. $|OE| = r$

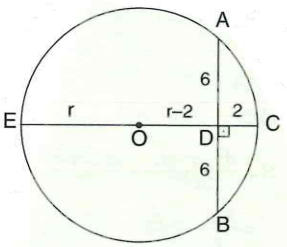
$|ED| = r + r - 2 = 2r - 2$

$|AD|\cdot|DB| = |ED|\cdot|DC|$

$6\cdot6 = (2r - 2)\cdot2$

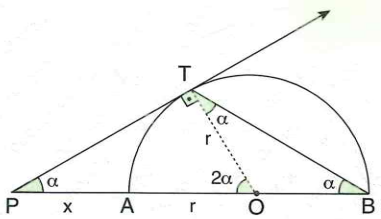
$20 = 2r$

$r = 10$ cm



Yanıt / The Answer is B

3.



$|PT| = |TB| \Rightarrow m(\widehat{TPA}) = m(\widehat{TBO}) = \alpha$

$|TO| = |OB| \Rightarrow m(\widehat{OTB}) = m(\widehat{OBT}) = \alpha \Rightarrow m(\widehat{TOP}) = 2\alpha$

$\widehat{TPO}$ dik üçgeninde / In a right triangle $\widehat{TPO}$;

$90° + \alpha + 2\alpha = 180° \Rightarrow \alpha = 30°$

$|PT| = 18$ cm $\Rightarrow |TO| = 6\sqrt{3}$

$|TO| = 6\sqrt{3} \Rightarrow |AO| = 6\sqrt{3}$

$|PO| = 12\sqrt{3} \Rightarrow |PA| = 6\sqrt{3}$

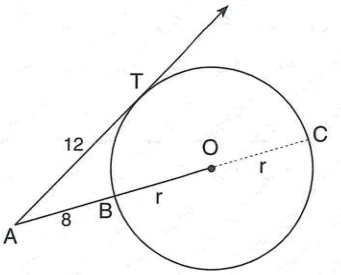
Yanıt / The Answer is B

4. $|AT|^2 = |AB|\cdot|AC|$

$12^2 = 8\cdot(2r + 8)$

$18 = 2r + 8$

$r = 5$ cm



Yanıt / The Answer is A

5. $|EH| = |HF| = x + 4$ cm

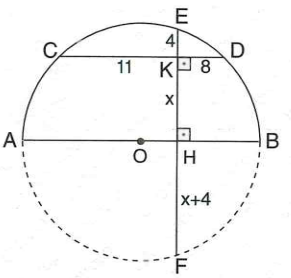
$|KC|\cdot|KD| = |KE|\cdot|KF|$

$11\cdot8 = 4\cdot(2x + 4)$

$22 = 2x + 4$

$2x = 18$

$x = 9$ cm



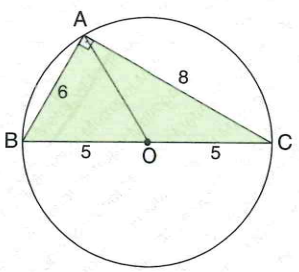
Yanıt / The Answer is A

6. $|AB| = \sqrt{10^2 - 8^2} = 6$ cm

$A(\widehat{AOB}) = \dfrac{A(\widehat{ABC})}{2}$

$= \dfrac{6\cdot8}{2\cdot2}$

$= 12\,cm^2$



Yanıt / The Answer is D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

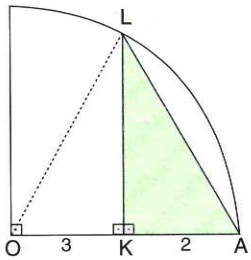
7. $|OL| = |OA| = 3 + 2 = 5$ cm

$|OL|^2 = |KL|^2 + |OK|^2$

$25 = |KL| + 3^2$

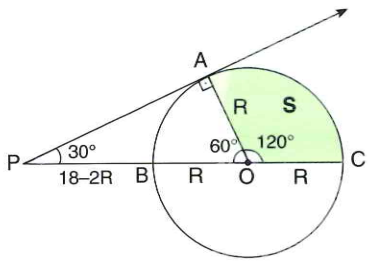
$\Rightarrow |LK| = 4$ cm

$A(\widehat{LKA}) = \frac{4 \cdot 2}{2} = 4\,cm^2$



Yanıt / The Answer is D

8.



$[OA] \perp [PA$, $m(\widehat{AOP}) = 60°$, $m(\widehat{AOC}) = 120°$

$|OP| = 2 \cdot |AO| \Rightarrow 18 - R = 2 \cdot R \Rightarrow R = 6$ cm

$S = \frac{\pi \cdot 6^2 \cdot 120°}{360°} = 12\pi\,cm^2$

Yanıt / The Answer is B

9. $(R-1)^2 + (R-2)^2 = R^2$

$2R^2 - 6R + 5 = R^2$

$R^2 - 6R + 5 = 0$

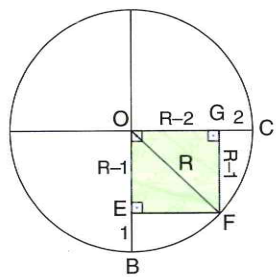
$(R-5)(R-1) = 0$

$R = 5$

$|OE| = R - 1 = 5 - 1 = 4$

$|OG| = R - 2 = 5 - 2 = 3$

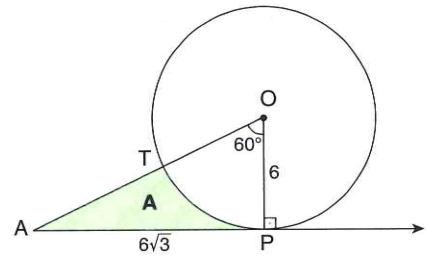
$A(OEFG) = 4 \cdot 3 = 12\,cm^2$



Yanıt / The Answer is E

10. $|OA| = 12$ cm, $|OP| = 6$ cm $\Rightarrow m(\widehat{A}) = 30°$

$m(\widehat{O}) = 60°$



$r = 6$ cm

$A(\overset{\frown}{TOP}) = \frac{\pi \cdot 6^2 \cdot 60°}{360°} = 6\pi\,cm^2$

$A(\widehat{AOP}) = \frac{6 \cdot 6\sqrt{3}}{2} = 18\sqrt{3}\,cm^2$

$A = 18\sqrt{3} - 6\pi = 6(3\sqrt{3} - \pi)\,cm^2$

Yanıt / The Answer is A

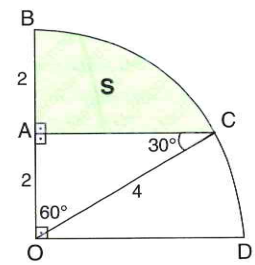
11. $|OC| = 4$

$|AC| = 2\sqrt{3}$ cm

$S = \frac{4^2 \cdot \pi \cdot 60°}{360°} - \frac{2 \cdot 2\sqrt{3}}{2}$

$= \frac{8\pi}{3} - 2\sqrt{3}$

$= 2\left(\frac{4\pi}{3} - \sqrt{3}\right)cm^2$



Yanıt / The Answer is E

12. $[OC] \perp [AB]$

$m(\widehat{AOC}) = m(\widehat{COB}) = 60°$

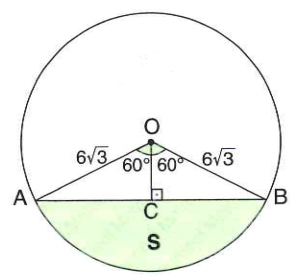
$|AC| = |CB| = 9$,

$|OC| = 3\sqrt{3}$

$|AB| = 18$ cm

$A(\widehat{AOB}) = \frac{18 \cdot 3\sqrt{3}}{2}$

$= 27\sqrt{3}\,cm^2$

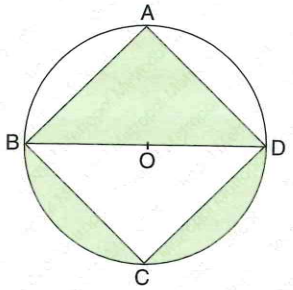


$S = \frac{(6\sqrt{3})^2 \cdot \pi \cdot 120°}{360°} - 27\sqrt{3} = (36\pi - 27\sqrt{3})\,cm^2$

Yanıt / The Answer is E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



O dairenin merkezi; ABCD dikdörtgenin köşeleri dairenin üzerindedir.

O is the center of circle; the vertex of ABC rectangle are on the circle.

IDCI = 12 cm

IADI = 16 cm

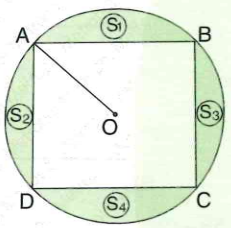
⇒ **Taralı Alan / The shaded area =? cm²**

A) 24π B) 32π C) 50π

D) 56π E) 60π

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2018]

2.



ABCD kare,"O" çemberin merkezi.

ABCD squre, "O" The center of the circle

IOAI = 2 ⇒ $\mathbf{A(S_1+S_2+S_3+S_4)=?}$

A) $4\pi - 8$ B) $4\pi - 4$ C) $4\pi - 2$

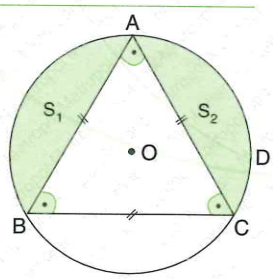
D) 4π E) 8

[DUMLUPINAR ÜNİVERSİTESİ – YÖS 2018]

3.

$S(\widehat{ABC}) = 9\sqrt{3}\,br^2$

IABI = IACI = IBCI ⇒ $\mathbf{S_1+S_2=?}$



A) $6\pi - 4\sqrt{3}$ B) 6π C) $6\pi + 4\sqrt{3}$

D) $8\pi - 6\sqrt{3}$ E) 8π

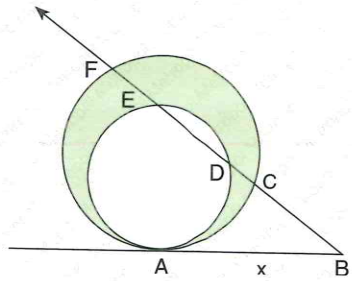
[İSTANBUL ÜNİVERSİTESİ – YÖS 2017]

4. ICBI = 4

IDCI = 2

IFEI = IEDI

IABI = x = ?



A) $4\sqrt{5}$ B) $6\sqrt{2}$ C) 8

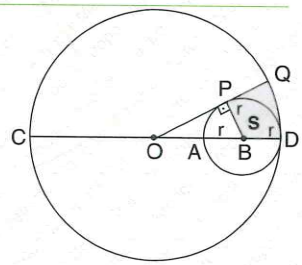
D) $2\sqrt{15}$ E) $2\sqrt{14}$

[İSTANBUL ÜNİVERSİTESİ – YÖS 2017]

5. IOCI = IODI = IOQI = 3r

IOAI = IABI = IBDI = IBPI = r

Alan(S) = Area(S) = ?



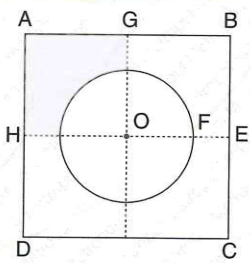
A) $\frac{(3\pi-\sqrt{3})}{2}r^2$ B) $\frac{(3-\pi\sqrt{2})}{4}r^2$

C) $\frac{(3\pi-2\sqrt{3})}{4}r^2$ D) $\frac{(2\sqrt{3}-\pi)}{4}r^2$

E) $\frac{(\pi+\sqrt{3})}{2}r^2$

[İSTANBUL ÜNİVERSİTESİ – YÖS 2015]

6.



O, çemberin merkezidir. / O is the center of circle.

IABI = IBCI = ICDI = IDAI = 12 cm,

IBEI = IECI, IAGI = IGBI, IFEI = 2 cm

Taralı alan / The shaded area = ? cm²

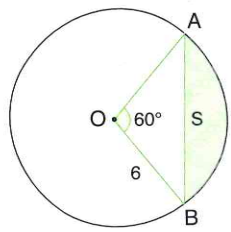
A) $36 - 8\pi$ B) $4(9 - \pi)$ C) $144 - 8\pi$

D) $144 - 22\pi$ E) $18 - 4\pi$

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2015]

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. **S = ?**

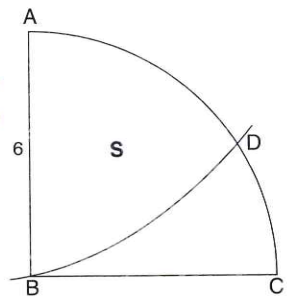


A) 2π B) $2\pi - 9\sqrt{3}$ C) $4\pi + 9\sqrt{3}$

D) $6\pi - 9\sqrt{3}$ E) $6\pi - 9$

[İSTANBUL ÜNİVERSİTESİ – YÖS 2013]

8. B merkezli AC çeyrek çemberi ve A merkezli BD yayı çizilmiştir.
The quarter circle AC with center B and the A centered arc BD are drawn.
IABI = 6 cm
S = ?



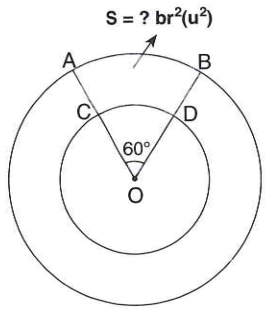
A) $12\pi - 9\sqrt{3}$ B) $12\pi - 8\sqrt{3}$

C) $6\pi - 6\sqrt{3}$ D) $12\pi - 6\sqrt{3}$

E) $12\pi - 3\sqrt{3}$

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2013]

9.



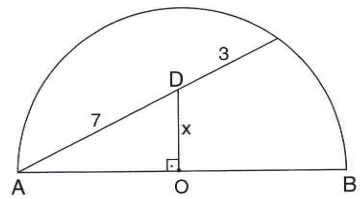
IAOI = 2, ICOI = 1, IOAI = IOBI, ICOI = IDOI,
$m(\widehat{AOB}) = 60^\circ \Rightarrow$ **S = ? br² (u²)**

A) $2 - \pi$ B) $\frac{\pi}{2}$ C) $8 - 4\pi$

D) $\frac{3\pi}{10}$ E) $\frac{2\pi}{5}$

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2012]

10.



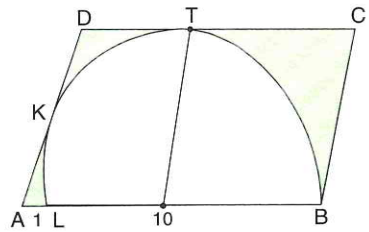
O, yarım çemberin merkezi
The point O is center of the **semi circle**,
[DO] ⊥ [AB],
IADI = 7 cm, IDCI = 3 cm
⇒ **IODI = x = ?**

A) $2\sqrt{3}$ B) $\sqrt{14}$ C) $\sqrt{15}$

D) 4 E) 5

[ONDOKUZ MAYIS ÜNİVERSİTESİ YÖS 2012]

11. ABCD paralelkenar
parallelogram,
[LB] çaplı yarım daire
semicircle with
diameter [LB].
IALI = 1 cm,
ILBI = 10 cm
⇒ **TA/SA = ? cm²**

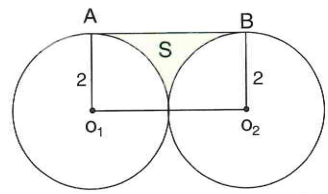


A) $55 - \frac{25\pi}{2}$ B) $55 - 12\pi$ C) 55

D) $58 - 10\pi$ E) 58

[ONDOKUZ MAYIS ÜNİVERSİTESİ YÖS 2012]

12.



S = ? br² (u²)

A) $8 - 2\pi$ B) $8 - \pi$ C) $8 - 4\pi$

D) $2\pi^2$ E) 4π

[YILDIZ TEKNİK ÜNİVERSİTESİ YÖS 2011]

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	A	D	B	C	B	D	A	B	B	A	A

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. ABCD dikdörtgen / rectangle

$\Rightarrow A(\widehat{ABD}) = A(\widehat{BCD})$

$|CD| = 3 \cdot 4 = 12\,cm$

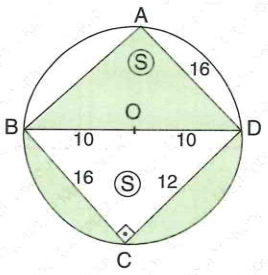
$|BC| = 4 \cdot 4 = 16\,cm$

$|BD| = 5 \cdot 4 = 20\,cm$

$\Rightarrow r = 10\,cm$

Taralı alan / The Shaded area $\frac{\pi \cdot r^2}{2}$

$= \frac{\pi \cdot 10^2}{2} = 50\pi\,cm^2$



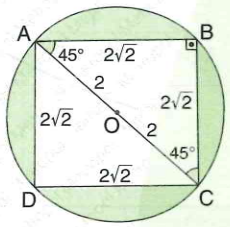
Yanıt / The Answer is C

2. ABCD kare / square,

$r = 2\,cm$

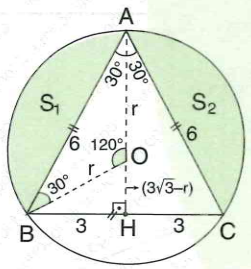
$A(S_1 + S_2 + S_3 + S_4) = \pi \cdot r^2 - A(ABCD)$

$= \pi \cdot 4 - (2\sqrt{2})^2 = 4\pi - 8$



Yanıt / The Answer is A

3.



$S(\hat{ABC}) = 5\sqrt{3}\ br^2$

$|BC| = a \Rightarrow 9\sqrt{3}(\hat{ABC}) = \frac{a^2\sqrt{3}}{4} = 9\sqrt{3}$

$a^2 = 36$

$a = 6\,cm$

$\hat{OHB}: r^2 = 3^2 + (3\sqrt{3} - r)^2$

$r^2 = 9 + 27 - 6\sqrt{3}r + r^2$

$6\sqrt{3}r = 36$

$r = 2\sqrt{3}\,cm$

$S_1 = \frac{\pi \cdot (2\sqrt{3})^2 \cdot 120^\circ}{360^\circ} - A(\hat{ABO})$

$= 4\pi - 3\sqrt{3} = S_2$

$S_1 + S_2 = 2(4\pi - 3\sqrt{3})$

$= 8\pi - 6\sqrt{3}$

Yanıt / The Answer is D

4. $|FE| = |ED| = k$,

$|AB|^2 = |BD| \cdot |BE| \ldots (1)$

$|AB|^2 = |BC| \cdot |BF| \ldots (2)$

$x^2 = 6 \cdot (6 + k) \ldots (1)$

$x^2 = 4 \cdot (6 + 2k) \ldots (2)$

$(1) = (2)$:

$6 \cdot (6 + k) = 4 \cdot (6 + 2k)$

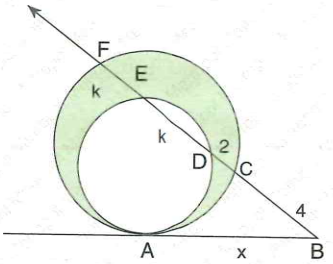
$36 + 6k = 24 + 8k$

$12 = 2k$

$6 = k$

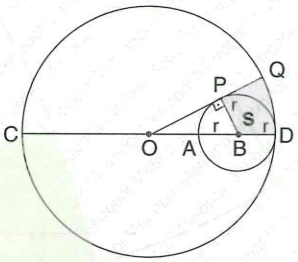
$x^2 = 6 \cdot (6 + 8) = 72$

$x = 6\sqrt{2}\,cm$



Yanıt / The Answer is B

5.



$|OB| = 2r$, $|BP| = r \Rightarrow m(\widehat{POB}) = 30^\circ$

$S = A(\overset{\triangledown}{ODQ}) - A(\widehat{OBP})$

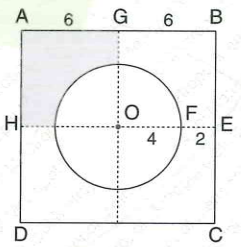
$S = \frac{\pi \cdot (3r)^2 \cdot 30^\circ}{360^\circ} - \frac{r \cdot r\sqrt{3}}{2}$

$= \frac{\pi r^2 \cdot 270^\circ}{360^\circ} - \frac{r^2 \cdot \sqrt{3}}{2}$

$= \frac{3\pi - 2\sqrt{3}}{4} \cdot r^2$

Yanıt / The Answer is C

6.



$TA/SA = \frac{12^2 - \pi \cdot 4^2}{4} = \frac{144 - 16\pi}{4} = 36 - 4\pi\,cm^2$

Yanıt / The Answer is B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $S = A(\overset{\triangledown}{AOB}) - A(\widehat{AOB})$

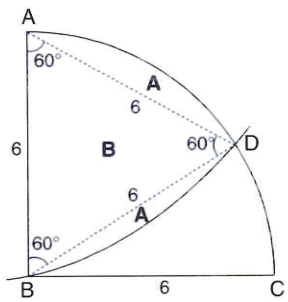
$= \pi \cdot r^2 \cdot \frac{60^\circ}{360^\circ} - \frac{6^2 \cdot \sqrt{3}}{4}$

$= \pi \cdot 6^2 \cdot \frac{1}{6} - 9\sqrt{3}$

$= 6\pi - 9\sqrt{3}$

Yanıt / The Answer is D

8.



$B = \frac{36\sqrt{3}}{4} = 9\sqrt{3}$

$A = \pi \cdot 6^2 \cdot \frac{60^\circ}{360^\circ} \cdot \pi 6^2 - 9\sqrt{3}$

$A = 6\pi - 9\sqrt{3}$

$S = 2A + B$

$S = 12\pi - 18\sqrt{3} + 9\sqrt{3}$

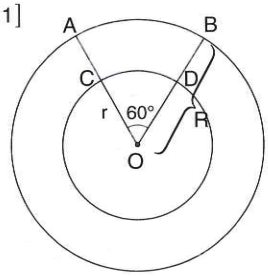
$= 12\pi - 9\sqrt{3}$

Yanıt / The Answer is A

9. $S = \frac{\pi \cdot R^2 \cdot 60^\circ}{360^\circ} - \frac{\pi r^2 60^\circ}{360^\circ} - [R = 2, r = 1]$

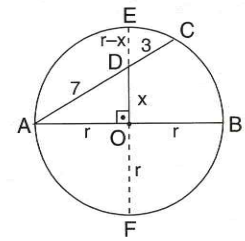
$= \frac{\pi \cdot 4 \cdot 60^\circ}{360^\circ} - \frac{\pi \cdot 60^\circ}{360^\circ}$

$= \frac{\pi}{2} br^2 (u^2)$



Yanıt / The Answer is B

10.



$\overset{\triangle}{AOD}$:

$49 = x^2 + r^2 \ldots (1)$

$7 \cdot 3 = (r - x)(x + r) \Rightarrow 21 = r^2 - x^2 \ldots (2)$

(1)&(2):

$x^2 + r^2 = 49$

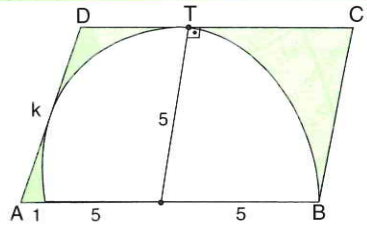
$+ \quad r^2 - x^2 = 21$

$2r^2 = 70$

$r^2 = 35, \; x^2 = 14 \Rightarrow x = \sqrt{14}$

Yanıt / The Answer is B

11.



$A(ABCD) = 5 \cdot 11 = 55\,cm^2$

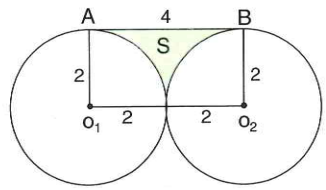
$TA/SA = A(ABCD) - \frac{\pi \cdot r^2}{2}$

$TA/SA = 55 - \frac{\pi \cdot 5^2}{2}$

$= 55 - \frac{25\pi}{2}\,cm^2$

Yanıt / The Answer is A

12.



$S = A(AB0_2 0_1) - 2 \cdot \pi \cdot 2^2 \cdot \frac{90^\circ}{360^\circ}$

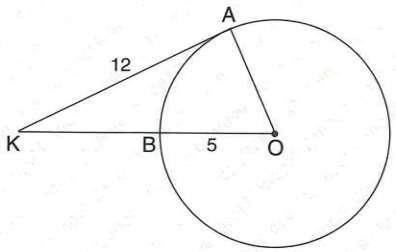
$S = 4 \cdot 2 - 2\pi$

$S = 8 - 2\pi\,cm^2$

Yanıt / The Answer is A

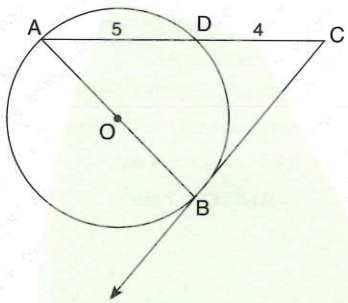
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$|AK| = 12$ cm,
$|BO| = 5$ cm
$\Rightarrow$ **$|KB| = ?$ cm**



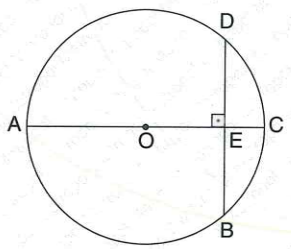
Yanıt / The Answer is 8

2. [CB şekildeki O merkezli çembere teğettir.
[CB is tangent to the circle with center O in the figure.
$|AD| = 5$ cm,
$|CD| = 4$ cm
$\Rightarrow$ **$|AB| = ?$ cm**



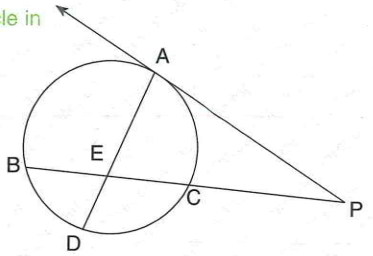
Yanıt / The Answer is $3\sqrt{5}$

3. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$[AC] \perp [DB]$,
$|AC| = 26$ cm,
$|BD| = 24$ cm
$\Rightarrow$ **$|EC| = ?$ cm**



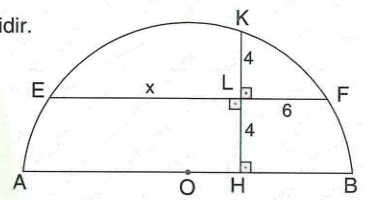
Yanıt / The Answer is 8

4. [PA, şekildeki çembere teğettir.
[PA is tangent to the circle in the figure.
$|CP| = 4$ cm,
$|EC| = |ED| = 2$ cm,
$|AE| = 3$ cm
$\Rightarrow$ **$|AP| = ?$ cm**



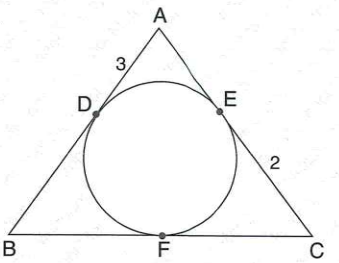
Yanıt / The Answer is 6

5. O noktası, şekildeki yarım çemberin merkezidir.
The point O is center of the semicircle in the figure.
$[KH] \perp [AB]$,
$[EF] \perp [KH]$,
$|KL| = |LH| = 4$ cm,
$|LF| = 6$ cm $\Rightarrow$ **$|EL| = x = ?$ cm**



Yanıt / The Answer is 8

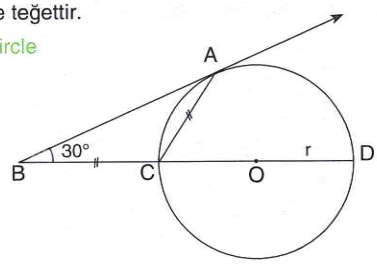
6. D, E, F değme noktalarıdır.
The points D, E, F are points of tangency.
$|AC| = |BC|$,
$|AD| = 3$ cm,
$|EC| = 2$ cm
$\Rightarrow$ **$A(\widehat{ABC}) = ?\ cm^2$**



Yanıt / The Answer is 12

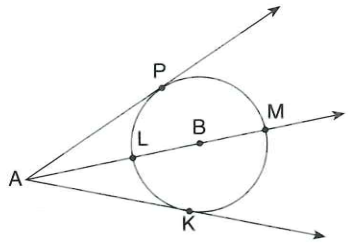
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [BA, şekildeki çembere teğettir.
[BA is tangent to the circle the figure.
$|BC| = |AC|$,
$m(\widehat{ABC}) = 30°$,
$|AB| = 2\sqrt{3}$ cm
$\Rightarrow$ **$|OD| = r = ?$ cm**



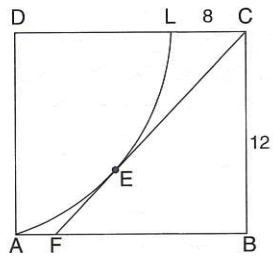
Yanıt / The Answer is 2

8. P, K değme noktalarıdır.
The points P and K are points of tangency.
$|LB| = |BM|$,
$|AB| = 13$ cm,
$|AP| = 12$ cm
$\Rightarrow$ **$|LB| = ?$ cm**



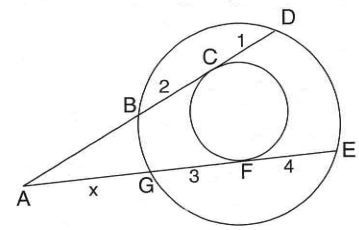
Yanıt / The Answer is 5

9. [CF] şekildeki çeyrek çembere teğettir.
[CB is tangent to the quarter circle in the figure.
ABCD bir dikdörtgendir.
ABCD is a rectangle.
$|BC| = 12$ cm,
$|CL| = 8$ cm
$\Rightarrow$ **$|CE| = ?$ cm**



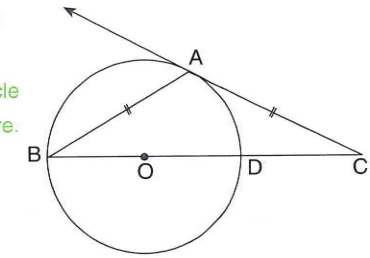
Yanıt / The Answer is 16 cm

10. C, F değme noktalarıdır.
The points C and F are points of tangency.
$|BC| = 2$ cm,
$|CD| = 1$ cm,
$|FE| = 4$ cm,
$|GF| = 3$ cm
$\Rightarrow$ **$|AG| = x$ cm**



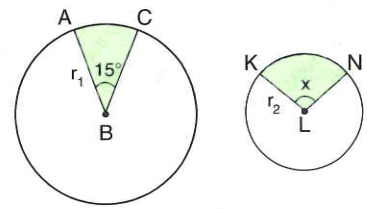
Yanıt / The Answer is 2

11. [CA şekildeki O merkezli çembere teğettir.
[CA is tangent to the circle with center O in the figure.
$|AB| = |AC| = 4$ cm
$\Rightarrow$ **$A(\widehat{ABC}) = ?$ cm^2**



Yanıt / The Answer is $4\sqrt{3}$

12.

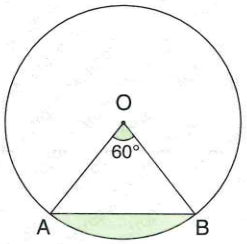


B ve L şekildeki çemberlerin merkezidir.
B and L are centers of the circles in the figure.
$r_1 = 3r_2$, $m(\widehat{ABC}) = 15°$,
$A(\overset{\triangledown}{ABC}) = A(\overset{\triangledown}{KLN}) \Rightarrow$ **$m(\widehat{KLN}) = x = ?$**

Yanıt / The Answer is 135°

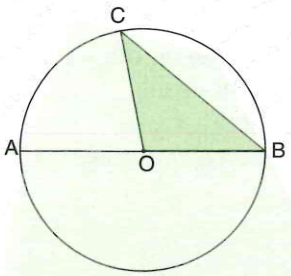
METROPOL YAYINLARI • METROPOL PUBLICATIONS

13. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$|\widehat{AB}| = 4\pi$ cm,
$m(\widehat{AOB}) = 60°$
⇒ **TA / SA = ? cm²**



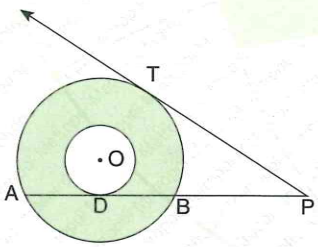
Yanıt / The Answer is $12(2\pi - 3\sqrt{3})$

14. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
|AB| = 30 cm,
|BC| = 24 cm
⇒ **A($\widehat{BOC}$) = ? cm²**



Yanıt / The Answer is 108

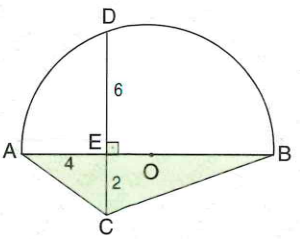
15.



Şekildeki O merkezli çemberde D ve T değme noktalarıdır.
D and T are points of tangency of the circle with the center O.
$|PT| = 6\sqrt{2}$ cm, $|PB| = 4$ cm ⇒ **TA / SA = ? π cm²**

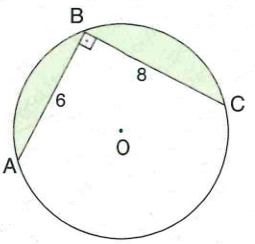
Yanıt / The Answer is 49 π

16. O noktası, şekildeki yarım çemberin merkezidir.
The point O is center of the semicircle in the figure.
[AB] ⊥ [CD],
|AE| = 4 cm,
|DE| = 6 cm,
|EC| = 2 cm
⇒ **A($\widehat{ACB}$) = ? cm²**



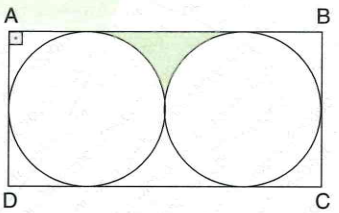
Yanıt / The Answer is 13

17. O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
|AB| = 6 cm,
|BC| = 8 cm
⇒ **TA / SA = ? cm²** (π = 3)



Yanıt / The Answer is $\frac{27}{2}$

18.

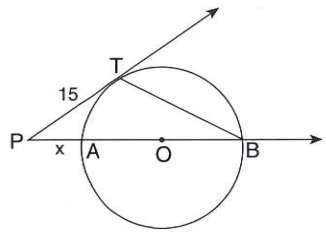


[AD] // [BC], [AB] // [DC], $m(\widehat{BAD}) = 90°$
$\Rightarrow \frac{\textbf{TA / SA}}{\textbf{A(ABCD)}} = ?$ (π = 3)

Yanıt / The Answer is $\frac{1}{16}$

METROPOL YAYINLARI • METROPOL PUBLICATIONS

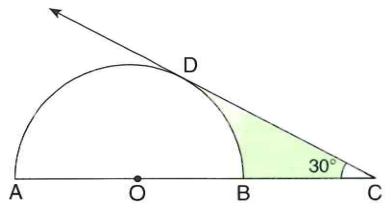
19.



[PT, şekildeki O merkezli çembere T noktasında teğettir.
[PT is tangent to the circle with center O at the point T as shown in the figure.
|AB| = 16 cm, |PT| = 15 cm ⇒ **|PA| = x = ? cm**

Yanıt / The Answer is 9

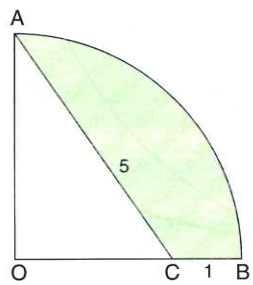
20.



[CD şekildeki O merkezli yarım çembere teğettir.
[CD is tangent to the semicircle with center O in the figure.
$m(\widehat{DCB}) = 30°$, |DC| = 9 cm ⇒ **TA(SA) = ? cm²**

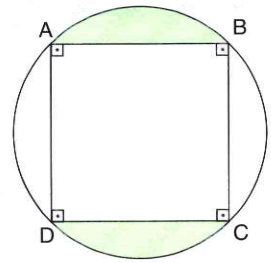
Yanıt / The Answer is $\frac{3}{2}(9\sqrt{3}-3\pi)$

21. O noktası, şekildeki çeyrek çemberin merkezidir.
The point O is center of the quarter circle in the figure.
|AC| = 5 cm,
|CB| = 1 cm
⇒ **TA(SA) = ? cm²**



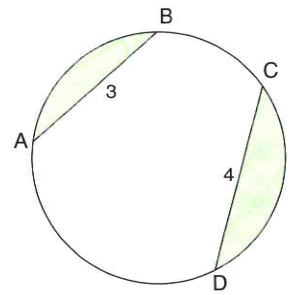
Yanıt / The Answer is $4\pi - 6$

22. ABCD bir karedir.
ABCD is a square.
|AB| = 4 cm
⇒ **TA(SA) = ? cm²**



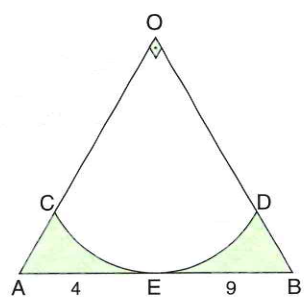
Yanıt / The Answer is $4\pi - 8$

23. $m(\widehat{AB}) + m(\widehat{CD}) = 180°$
|AB| = 3 cm,
|CD| = 4 cm
⇒ **TA(SA) = ? cm²**



Yanıt / The Answer is $\frac{25\pi - 48}{8}$

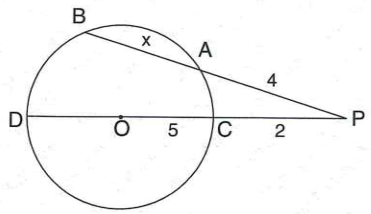
24. O noktası, şekildeki çeyrek çemberin merkezidir.
The point O is center of the quarter circle in the figure.
[AO] ⊥ [OB],
|AE| = 4 cm,
|EB| = 9 cm
⇒ **TA(SA) = ? cm²**



Yanıt / The Answer is $39 - 9\pi$

METROPOL YAYINLARI • METROPOL PUBLICATIONS

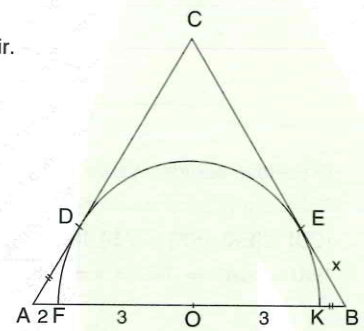
1.



O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
IPAI = 4 cm, IPCI = 2 cm, IOCI = 5 cm
⇒ **IABI = x = ? cm**

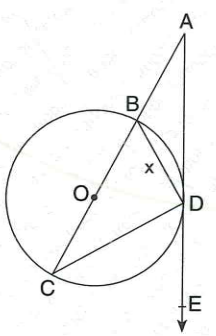
A) 2 B) 3 C) 4
D) 5 E) 6

2. O noktası şekildeki yarım çemberin merkezidir.
The point O is center of the semicircle in the figure.
IADI = IKBI,
IAFI = 2 cm,
IFOI = IOKI = 3 cm
⇒ **IEBI = x = ? cm**



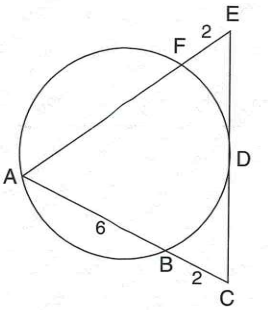
A) $\sqrt{10}$ B) $2\sqrt{10}$ C) $3\sqrt{10}$
D) $4\sqrt{10}$ E) $5\sqrt{10}$

3. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
ICOI = IOBI = $3\sqrt{5}$ cm,
IABI = $3\sqrt{5}$ cm
⇒ **IBDI = x = ? cm**



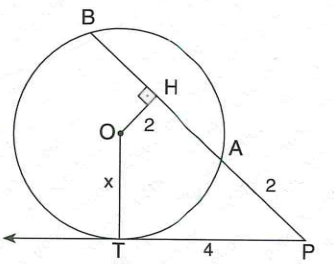
A) $\sqrt{5}$ B) $2\sqrt{5}$ C) $3\sqrt{5}$
D) $4\sqrt{5}$ E) $5\sqrt{5}$

4. D değme noktasıdır.
D is the point of tangency.
IEDI = IDCI,
IBCI = IFEI = 2 cm,
IABI = 6 cm
⇒ **IAEI = ? cm**



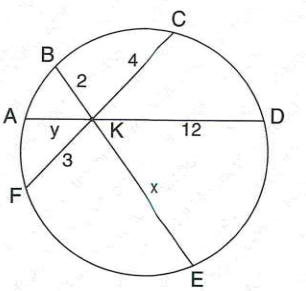
A) 4 B) 5 C) 6
D) 7 E) 8

5. [PT şekildeki O merkezli çembere teğettir.
[PT is tangent to the circle with center O in the figure.
IPTI = 4 cm,
IAPI = IOHI = 2 cm
⇒ **IOTI = x = ? cm**



A) $\sqrt{10}$ B) $\sqrt{11}$ C) $2\sqrt{3}$
D) $\sqrt{13}$ E) $\sqrt{14}$

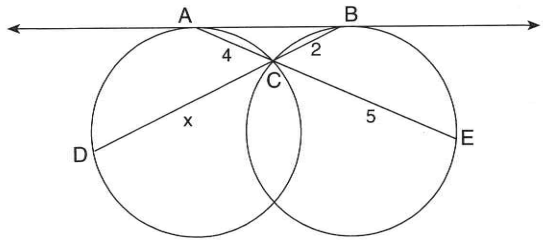
6. IBKI = 2 cm,
ICKI = 4 cm,
IDKI = 12 cm,
IFKI = 3 cm,
IEKI = x cm,
IAKI = y cm
⇒ **x + y = ? cm**



A) 5 B) 6 C) 7
D) 8 E) 9

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



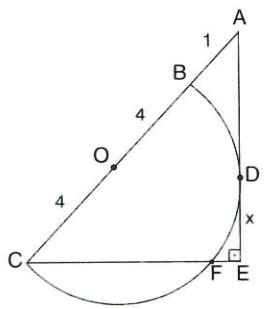
|AC| = 4 cm, |CE| = 5 cm, |BC| = 2 cm

⇒ **|CD| = x = ? cm**

A) 14 B) 15 C) 16

D) 17 E) 18

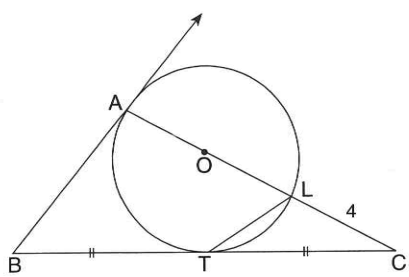
8. O noktası, şekildeki yarım çemberin merkezidir.
The point O is center of the semicircle in the figure.
|AB| = 1 cm,
|BO| = |OC| = 4 cm
⇒ **|DE| = x = ? cm**



A) 1,2 B) 1,8 C) 2,4

D) 2,8 E) 3,2

9.

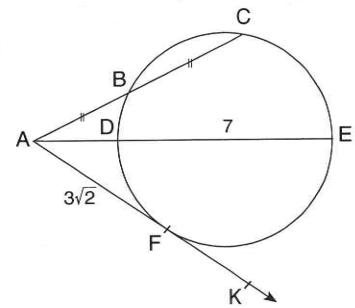


[BA ve [BT şekildeki O merkezli çembere teğettir.
[BA and [BT are tangent to the circle with center O in the figure.
|BT| = |TC|, |LC| = 4 cm ⇒ **|TL| = ? cm**

A) 1 B) 2 C) 3

D) 4 E) 5

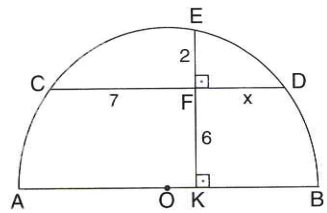
10. F değme noktasıdır.
F is the point of tangency.
|AB| = |BC|,
|DE| = 7 cm,
|AF| = $3\sqrt{2}$ cm
⇒ **|AB| + |AD| = ? cm**



A) 1 B) 2 C) 3

D) 4 E) 5

11.

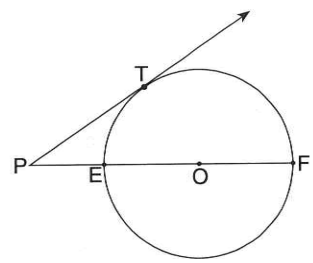


O noktası, şekildeki yarım çemberin merkezidir.
The point O is center of the semicircle in the figure.
[CD] ⊥ [EK], [EK] ⊥ [AB], |CF| = 7 cm, |EF| = 2 cm,
|FK| = 6 cm ⇒ **|FD| = x = ? cm**

A) 2 B) 4 C) 6

D) 8 E) 10

12. [PT şekildeki O merkezli çembere teğettir.
[PT is tangent to the circle with center O in the figure.
|PE| = (2x + 3) cm,
|PF| = (8x + 1) cm,
|PT| = (4x + 3) cm
⇒ **|PT| = ? cm**



A) 12 B) 14 C) 15

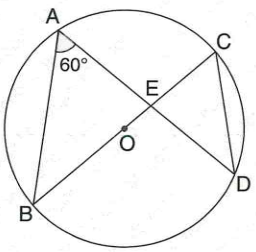
D) 16 E) 17

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
A	B	C	E	D	C	C	C	D	E	B	C

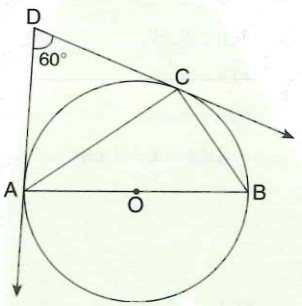
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$m(\widehat{BAD}) = 60°$
$|BC| = 12\sqrt{3}$ cm
$\Rightarrow$ **$|CD| = ?$ cm**



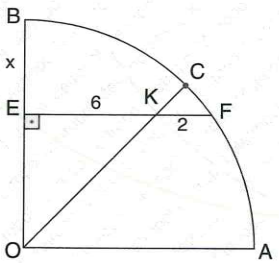
A) 12 B) 8 C) 6 D) $6\sqrt{3}$ E) $4\sqrt{3}$

2. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure
$|AC| = 6\sqrt{3}$ cm,
$m(\widehat{ADC}) = 60°$
$\Rightarrow$ **$|AO| = ?$ cm**



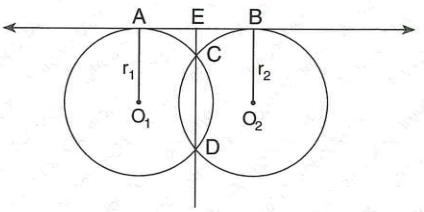
A) 8 B) 7 C) 6 D) 4 E) 3

3. O noktası şekildeki çemberin merkezidir.
The point O is center of the quarter circle in the figure.
$m(\widehat{BC}) = m(\widehat{CA})$,
$[FE] \perp [OB]$,
$|EK| = 6$ cm,
$|KF| = 2$ cm
$\Rightarrow$ **$|EB| = x = ?$ cm**



A) 6 B) 5 C) 4 D) 3 E) 2

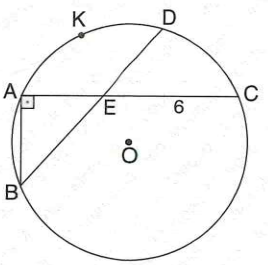
4.



AB şekildeki O_1 ve O_2 merkezli çemberlere teğettir.
AB is tangent to the circles with center O_1 and O_2 in the figure.
$|AB| = 8$ cm, $|CD| = 6$ cm, $r_1 = r_2$ $\Rightarrow$ **$|EC| = ?$ cm**

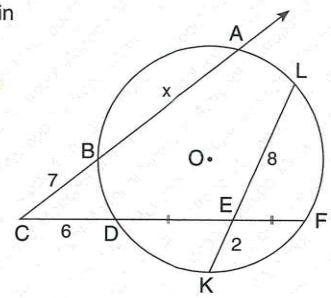
A) 5 B) 4 C) 3 D) 2 E) 1

5. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$m(\widehat{AKD}) = 60°$,
$|AC| = |BD|$,
$|EC| = 6$ cm,
$[BA] \perp [AC]$
$\Rightarrow$ **$|AB| = ?$ cm**



A) 7 B) 6 C) 4 D) $3\sqrt{3}$ E) $4\sqrt{2}$

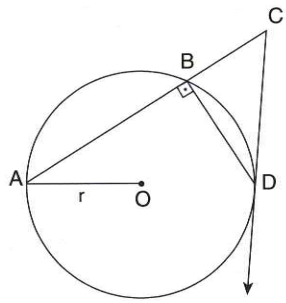
6. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$|DE| = |EF|$,
$|EL| = 8$ cm,
$|CB| = 7$ cm,
$|CD| = 6$ cm,
$|EK| = 2$ cm
$\Rightarrow$ **$|AB| = x = ?$ cm**



A) 8 B) 7 C) 6 D) 5 E) 4

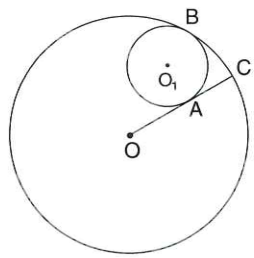
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. [CD şekildeki O merkezli çembere teğettir.
[CD is tangent to the circle with center O in the figure.
[DB] ⊥ [AC],
|AO| = r cm,
$m(\widehat{DCB}) = 30°$,
|DC| = 6 cm
⇒ **r = ? cm**



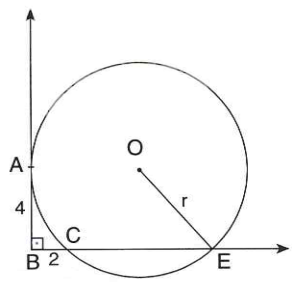
A) $\sqrt{2}$ B) $\sqrt{3}$ C) $\sqrt{6}$
D) $\sqrt{5}$ E) $\sqrt{8}$

8. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
|OC| = 8 cm,
$|O_1B| = 3$ cm
⇒ **|OA| = ? cm**



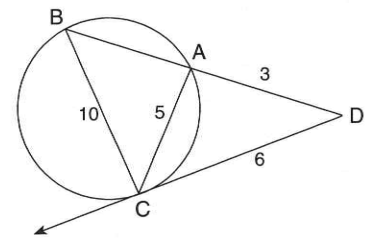
A) $3\sqrt{2}$ B) 6 C) 5
D) 4 E) 3

9. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
[AB] ⊥ [BE]
|OE| = r cm,
|AB| = 4 cm,
|BC| = 2 cm
⇒ **r = ? cm**



A) 5 B) 4 C) 3
D) $3\sqrt{3}$ E) $3\sqrt{2}$

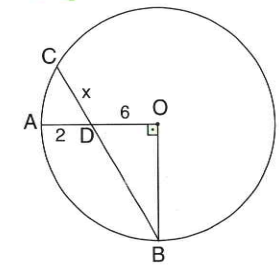
10.



|AD| = 3 cm, |AC| = 5 cm, |BC| = 10 cm ve(and) |CD| = 6 cm
⇒ **Çevre / The perimeter $(\widehat{ABC})$ = ? cm**

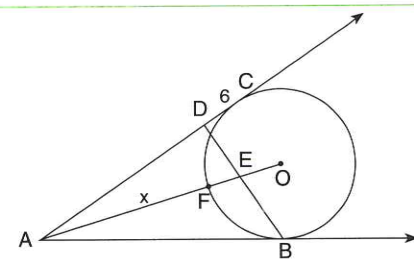
A) 24 B) 22 C) 20
D) 18 E) 14

11. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
[AO] ⊥ [OB],
|AD| = 2 cm,
|OD| = 6 cm
⇒ **|DC| = x = ? cm**



A) 1 B) 1,6 C) 2
D) 2,8 E) 3

12.



[AB ve [AC şekildeki O merkezli çembere teğettir.
[AB and [AC are tangent to the circle with center O in the figure.
|AO| = 26 cm, 4|DE| = 3|EB|, |DC| = 6 cm ⇒ **|AF| = x = ? cm**

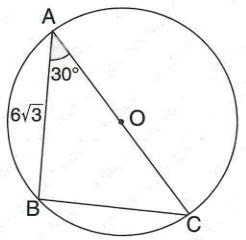
A) $6\sqrt{3}$ B) $2\sqrt{14}$ C) $6\sqrt{2}$
D) 16 E) 18

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	C	C	D	D	D	B	D	A	A	D	D

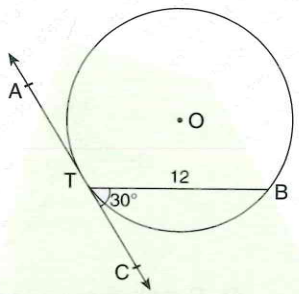
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$|CB| = 6$ cm,
$m(\widehat{BAC}) = 30°$
$\Rightarrow$ **$|\widehat{BC}| = ?$ cm**



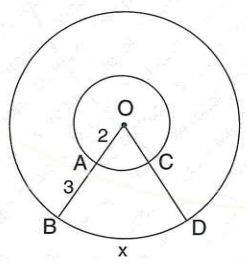
A) $\pi/2$ B) 6π C) 4π
D) 3π E) 2π

2. AC şekildeki O merkezli çembere teğettir.
[AC is tangent to the circle with center O in the figure.
$|AB| = 12$ cm,
$m(\widehat{CTB}) = 30°$
$\Rightarrow$ **$|\widehat{AB}| = ?$ cm**



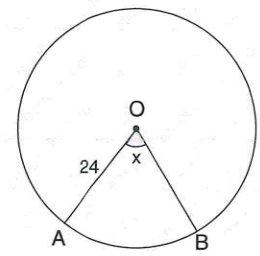
A) 24π B) 12π C) 6π
D) 4π E) 2π

3. O noktası şekildeki çemberlerin merkezidir.
The point O is center of the circles in the figure.
$|OA| = 2$ cm,
$|AB| = 3$ cm,
$|\widehat{AC}| = 4\pi$
$\Rightarrow$ **$|\widehat{BD}| = x = ?$ cm**



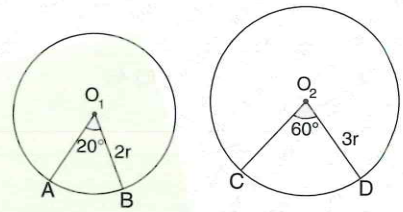
A) 6π B) 8π C) 10π
D) 12π E) 14π

4. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$|OA| = 24$ cm,
$|\widehat{AB}| = 16\pi$
$\Rightarrow$ **$m(\widehat{AOB}) = x = ?$**



A) 120° B) 135° C) 144°
D) 150° E) 155°

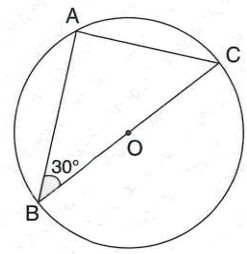
5.



$|O_1B| = 2r$, $|O_2D| = 3r$,
$m(\widehat{AO_1B}) = 20°$, $m(\widehat{CO_2D}) = 60°$
$\Rightarrow$ **$\dfrac{|\widehat{AB}|}{|\widehat{CD}|} = ?$**

A) $\frac{2}{3}$ B) $\frac{2}{9}$ C) $\frac{5}{9}$
D) $\frac{7}{9}$ E) 1

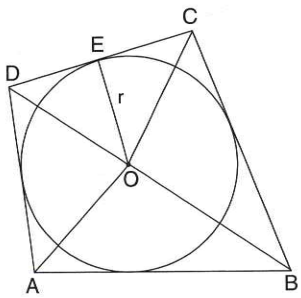
6. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$m(\widehat{ABC}) = 30°$,
$|AC| = 10$ cm
$\Rightarrow$ **Çevre / The perimeter = ? π cm**



A) 10 B) 12 C) 16
D) 18 E) 20

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.

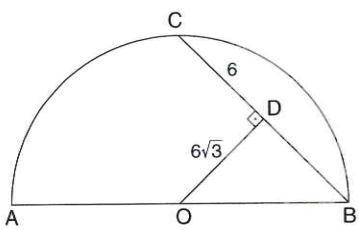


ABCD şekildeki O merkezli çemberin teğetler dörtgenidir.
ABCD is the circumscribed quadrilateral of the circle with the center O in the figure.
$|OE| = r = 4$ cm, $A(\widehat{AOB}) = 18\,cm^2$, $A(\widehat{DOC}) = 12\,cm^2$

⇒ **Çevre / The perimeter (ABCD) = ? cm**

A) 15 B) 18 C) 24
D) 30 E) 45

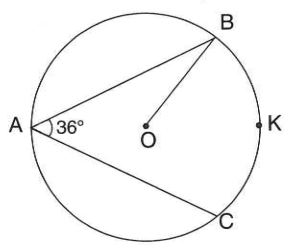
8.



O noktası, şekildeki yarım çemberin merkezidir.
The point O is center of the semicircle in the figure.
$[OD] \perp [CB]$, $|OD| = 6\sqrt{3}$ cm, $|CD| = 6$ cm ⇒ $|\widehat{AC}| = ?$ cm

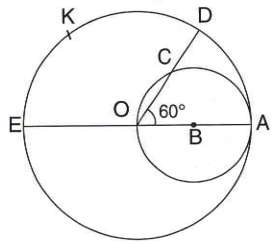
A) 4π B) 5π C) 6π
D) 7π E) 8π

9. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$|OB| = r = 10$ cm
⇒ $|\widehat{BKC}| = ?$ cm



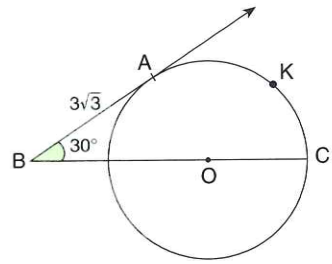
A) 3π B) 4π C) 6π
D) 7π E) 5π

10. O ve B noktaları şekildeki çemberlerin merkezidir.
The points O and B are centers of the circles in the figure.
$m(\widehat{DOA}) = 60°$,
$|\widehat{EKD}| = k \cdot |\widehat{OC}|$
⇒ **k = ?**



A) 9 B) 6 C) 4
D) 3 E) 2

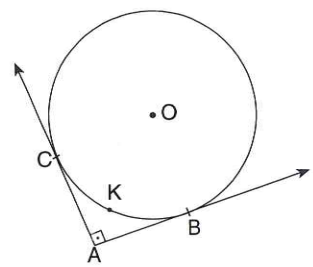
11.



[BA, O merkezli çembere A da teğettir.
[BA is tangent to the circle with center O at point A.
$m(\widehat{ABC}) = 30°$, $|BA| = 3\sqrt{3}$ cm ⇒ $|\widehat{AKC}| = ?$ cm

A) 3π B) 2π C) 4π
D) 9π E) 6π

12. [AB ve [AC şekildeki O merkezli çembere teğettir.
[AB and [AC are tangents to the circle with center O in the figure.
$[CA \perp [AB$,
$|AB| = 4$ cm
⇒ $|\widehat{BKC}| = ?$ cm



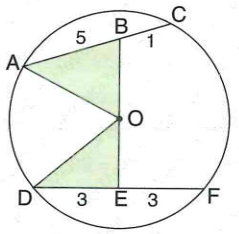
A) π/2 B) π C) 2π
D) 3π E) 4π

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
E	D	C	A	B	E	D	E	B	C	B	C

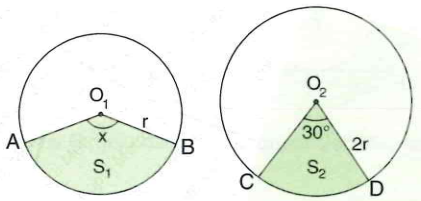
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$|AB| = 5$ cm, $|BC| = 1$ cm,
$|DE| = 3$ cm, $|EF| = 3$ cm,
$A(\widehat{AOB}) = 20\,cm^2$
$\Rightarrow$ **$A(\widehat{ODE}) = ?\,cm^2$**



A) 9 B) 10 C) 12
D) 15 E) 18

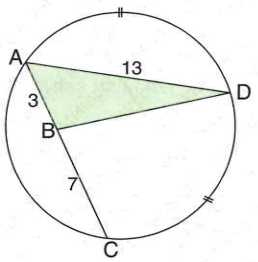
2.



O_1 ve O_2 noktaları şekildeki çemberlerin merkezidir.
Points O_1 and O_2 are centers of the circles in the figure.
$m(\widehat{CO_2D}) = 30°$, $|O_1B| = r$, $|O_2D| = 2r$
$S_1 = S_2 \Rightarrow$ **$m(\widehat{AO_1B}) = x = ?$**

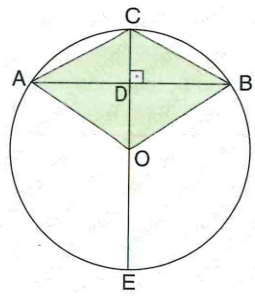
A) 30° B) 60° C) 90°
D) 120° E) 150°

3. $m(\widehat{AD}) = m(\widehat{DC})$
$|AB| = 3$ cm,
$|BC| = 7$ cm,
$|AD| = 13$ cm
$\Rightarrow$ **$A(\widehat{ABD}) = ?\,cm^2$**



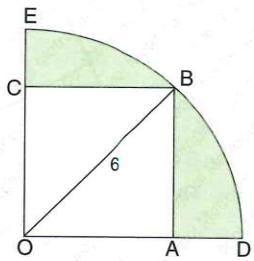
A) 18 B) 26 C) 36
D) 54 E) 60

4. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$[CE] \perp [AB]$,
$|AB| = |DE| = 8$ cm
$\Rightarrow$ **$A(AOBC) = ?\,cm^2$**



A) 10 B) 15 C) 20
D) 25 E) 30

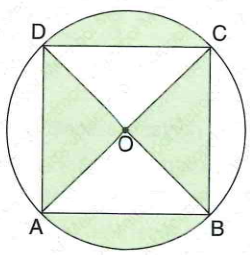
5. OABC bir kare olup
O noktası şekildeki çeyrek çemberin merkezidir.
OABC is a square and
The point O is center of the quarter circle in the figure.
$|OB| = 6$ cm



$\Rightarrow$ **Taralı alan / The shaded area = $?\,cm^2$** ($\pi = 3$)

A) 9 B) 12 C) 18
D) 24 E) 27

6. DABC bir kare olup
O noktası şekildeki çemberin merkezidir.
DABC is a square.
The point O is center of the circle in the figure.
$|OC| = 2$ cm

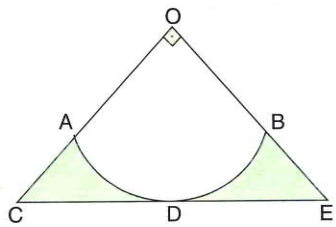


$\Rightarrow$ **Taralı alan / The shaded area = $?\,cm^2$** ($\pi = 3$)

A) 3 B) 6 C) 9
D) 12 E) 15

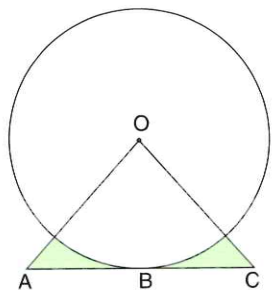
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. O noktası şekildeki çeyrek çemberin merkezi olup D, teğet noktasıdır.
The point O is center of the quarter circle and D is tangent point in the figure.
$|OB| = 6$ cm, $|DE| = 4$ cm
$\Rightarrow$ **Taralı alan / The shaded area = ? cm²** ($\pi = 3$)



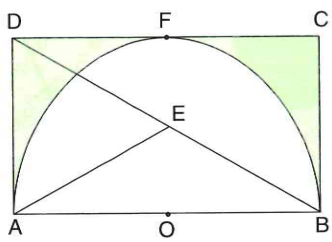
A) 24 B) 21 C) 18
D) 15 E) 12

8. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
AOC eşkenar üçgendir.
AOC is an equilateral triangle.
$r = 6$ cm
$\Rightarrow$ **TA / SA = ? cm²** ($\pi = 3$)



A) $8-8\sqrt{3}$ B) $18-12\sqrt{3}$
C) $12\sqrt{3}-18$ D) $12\sqrt{3}-12$
E) $6\sqrt{3}-6$

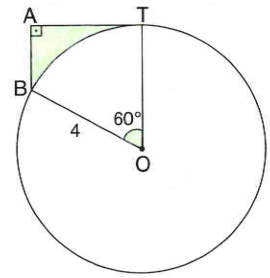
9.



O noktası şekildeki yarım çemberin merkezi olup ABCD bir dikdörtgen ve A, F, B noktaları teğet noktarıdır.
The point O is center of the semicircle. ABCD is a rectangle. Also, the rectangle is tangent to the semicircle at the points A, F, B as shown in the figure.
$|DE| = |EB|$, $|AE| = 2\sqrt{5}$ cm $\Rightarrow$ **TA / SA = ? cm²** ($\pi = 3$)

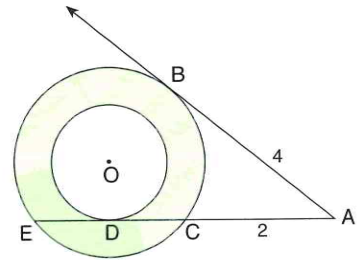
A) 8 B) 9 C) 10
E) 11 E) 12

10. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
$[AT] \perp [AB]$,
$m(\widehat{BOT}) = 60°$,
$|OB| = 4$ cm
$\Rightarrow$ **TA / SA = ? cm²** ($\pi = 3$)



A) $6\sqrt{3}-6$ B) $6\sqrt{3}-8$ C) $8\sqrt{3}-6$
D) $8\sqrt{3}-8$ E) $12\sqrt{3}-12$

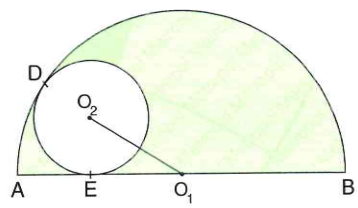
11.



O noktası şekildeki çemberin merkezi olup, B ve D teğet noktalarıdır.
The point O is center of the circle, B and D are tangent points in the figure.
$|AB| = 4$ cm, $|AC| = 2$ cm $\Rightarrow$ **TA / SA = ? cm²**

A) 4π B) 9π C) 25π
D) 36π E) 49π

12.



O_1 ve O_2 noktaları şekildeki çemberin merkezi olup, D ve E teğet noktalarıdır.
Point O_1 and O_2 is center of the circle, D and E are tangent points in the figure.
$|O_1B| = 6$ cm, $|O_1O_2| = 4$ cm $\Rightarrow$ **TA / SA = ? cm²**

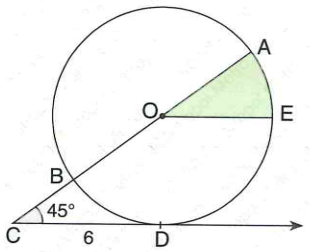
A) 10π B) 12π C) 14π
D) 16π E) 18π

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	D	A	C	A	B	E	C	A	B	B	C

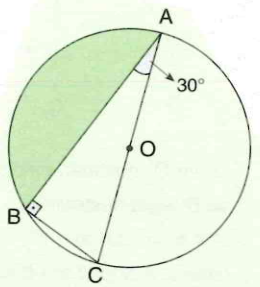
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. [CD şekildeki O merkezli çembere teğettir.
[CD is tangent to the circle with center O in the figure.
[OE] // [CD],
$m(\widehat{ACD}) = 45°$,
ICDI = 6 cm
⇒ **TA / SA = ? cm²**



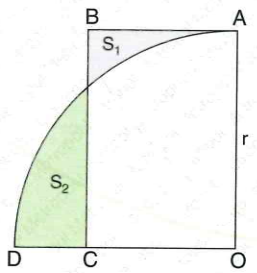
A) $\frac{9\pi}{2}$ B) 6π C) $\frac{13\pi}{2}$ D) 7π E) $\frac{15\pi}{2}$

2. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
[BC] ⊥ [AB],
$m(\widehat{BAC}) = 30°$,
IACI = 12 cm
⇒ **TA / SA = ? cm²** ($\pi = 3$)



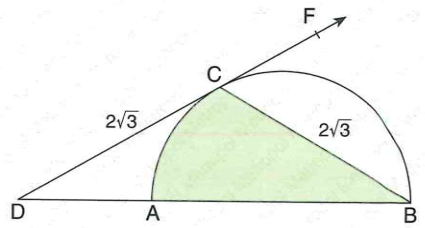
A) $27-9\sqrt{3}$ B) $27-6\sqrt{3}$ C) $36-9\sqrt{3}$ D) $36-6\sqrt{3}$ E) $36-4\sqrt{3}$

3. O noktası şekildeki çemberin merkezi, OABC dikdörtgendir.
The point O is center of the quarter circle and OABC is a rectangle in the figure.
$S_1 = S_2$,
A(OABC) = 16π cm² ⇒ **r = ? cm**



A) 1 B) 2 C) 4 D) 6 E) 8

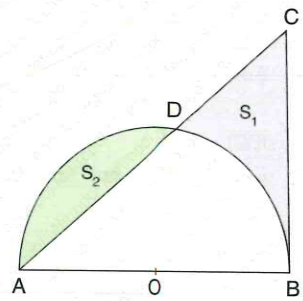
4.



C, teğet noktasıdır. / C is tangent point.
IDCI = ICBI = $2\sqrt{3}$ cm ⇒ **TA / SA = ? cm²** ($\pi = 3$)

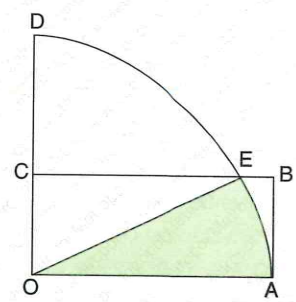
A) $1+\sqrt{3}$ B) $2+\sqrt{3}$ C) $3+\sqrt{3}$ D) $2+2\sqrt{3}$ E) $3+3\sqrt{3}$

5. O noktası şekildeki yarım çemberin merkezidir.
The point O is center of the semicircle in the figure.
[CB] ⊥ [AB],
IOBI = 4 cm,
$S_1 = S_2$
⇒ **IBCI = ? cm** ($\pi = 3$)



A) 4 B) 6 C) 8 D) 10 E) 12

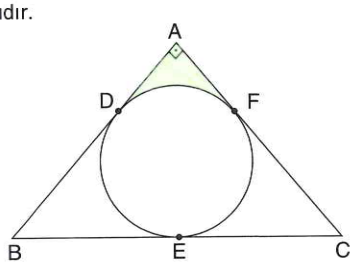
6. O noktası şekildeki çemberin merkezi, OABC dikdörtgendir.
The point O is center of the quarter circle and OABC is a rectangle in the figure.
A(OABC) = 8 cm²,
IODI = 4 cm
⇒ **Taralı Alan / The shaded area = ? cm²**



A) $\frac{2\pi}{3}$ B) $\frac{4\pi}{3}$ C) $\frac{5\pi}{3}$ D) $\frac{8\pi}{3}$ E) $\frac{10\pi}{3}$

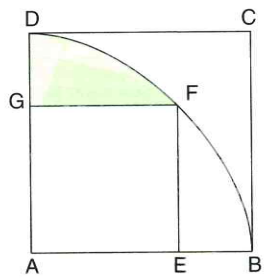
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. D, E, F değme noktalarıdır.
D, E, F are points of tangency.
[AB] ⊥ [AC],
IABI = 21 cm,
IACI = 28 cm
⇒ **TA / SA = ? cm²**



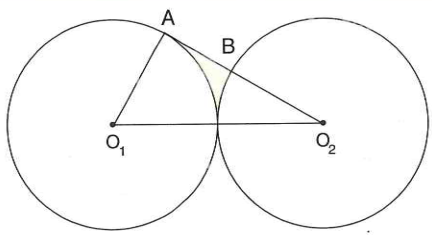
A) $49-\frac{49\pi}{3}$ B) $49-\frac{49\pi}{4}$ C) $36-\frac{36\pi}{5}$
D) $36-\frac{36\pi}{7}$ E) $7-\frac{7\pi}{2}$

8. O noktası şekildeki çeyrek çemberin merkezidir.
The point O is center of the quarter circle in the figure.
ABCD ve AEFG birer karedir.
ABCD and AEFG are squares.
IBCI = 4 cm
⇒ **TA / SA = ? cm²** ($\pi = 3$)



A) 1 B) 2 C) 3
D) 4 E) 5

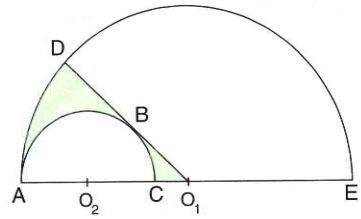
9.



O_1 ve O_2 noktaları şekildeki çemberlerin merkezidir.
Points O_1 and O_2 are centers of the circles in the figure.
$IO_1AI = IO_2BI = 2$ cm ⇒ **TA / SA = ? cm²** ($\pi = 3$)

A) $4\sqrt{3}-3$ B) $3\sqrt{3}-3$ C) $2\sqrt{3}-3$
D) $4-\sqrt{3}$ E) $2-\sqrt{3}$

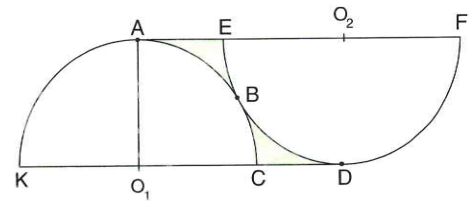
10.



O_1 ve O_2 noktaları şekildeki yarım çemberlerin merkezidir.
Points O_1 and O_2 are centers of semicircles in the figure.
$I\widehat{BC}I = 60°$, $IO_1DI = 18$ cm ⇒ **TA / SA = ? cm²**

A) 9π B) 10π C) 12π
D) 15π E) 18π

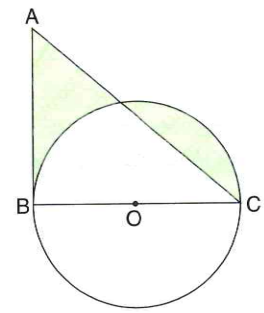
11.



O_1 ve O_2 noktaları şekildeki çemberlerin merkez noktaları olup A ve D teğet noktalarıdır.
The points O_1 and O_2 the points are center of the circles. A and D are tangent points in the figure.
[AF] // [KD], $IO_1AI = IO_2EI = 4$ cm
⇒ **Taralı Alan / The Shaded Area = ? cm²** ($\pi = 3$)

A) $16\sqrt{3}-2$ B) $16\sqrt{3}-16$ C) $16\sqrt{3}-24$
D) $18\sqrt{3}-18$ E) $18\sqrt{3}-12$

12. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
IABI = IBCI = 16 cm
⇒ **TA / SA = ? cm²**



A) 24 B) 32 C) 48
D) 64 E) 80

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
A	C	E	B	B	B	B	B	C	A	C	D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

BÖLÜM CHAPTER 13

TARİHSEL NOT / HISTORICAL NOTE

René Descartes [1596 – 1650]

Fransız matematikçi, filozof ve bilim adamıydı. Çalışmaları, Newton ve Leibniz tarafından geliştirilen, teğet çizgisi problemine sonsuz küçüklük uygulayan, böylece modern matematiğin bu dalının evrimine izin veren kalkülüsün temelini sağlamıştır. Onun işaret kuralı, aynı zamanda, bir polinomun pozitif ve negatif köklerinin sayısını belirlemek için yaygın olarak kullanılan bir yöntemdir. Ayrıca optik alanına katkılarda bulundu, geometrik konstrüksiyon ve kırılma yasası (Descartes yasası veya daha sıklıkla bilinen Snel yasası) kullanarak bir gökkuşağının açısal yarıçapının 42 derece olduğunu gösterdi.

He was a French mathematician, philosopher, and scientist. His work provided the basis for the calculus developed by Newton and Leibniz, who applied infinitesimal calculus to the tangent line problem, thus permitting the evolution of that branch of modern mathematics. His rule of signs is also a commonly used method to determine the number of positive and negative roots of a polynomial. He also made contributions to the field of optics, he showed by using geometric construction and the law of refraction (also known as Descartes law or more commonly Snell's law) that the angular radius of a rainbow is 42 degrees.

DOĞRUNUN ANALİTİĞİ
LINE in ANALYTIC GEOMETRY

Bu bölüm, 17 çözümlü örnek, 12 çözümlü test sorusu, 12 çözümlü YÖS sorusu, 12 alıştırma sorusu, 60 test sorusu içermektedir.

This chapter includes 17 examples with solutions, 12 test questions with solutions, 12 YÖS questions with solutions, 12 exercise questions and 60 test questions.

BÖLÜM / CHAPTER 13 ..... 443 - 476

DOĞRUNUN ANALİTİĞİ / LINE in ANALYTIC GEOMETRY

- Kartezyen Düzlem / The Cartesian Plane ..... 445 - 456
  - Dik Koordinat Sistemi / Cartesian Coordinates ..... 446 - 447
  - Bir Doğru Parçasını Belli Oranda Bölen Bir Noktanın Koordinatları
    The Coordinates of a Point That Divides a Line Segment into a Certain Ratio ..... 447 - 449
  - Bir Doğrunun Eğimi / Slope and Equation of a Line ..... 450 - 451
  - Doğru Denklemleri / Linear Equations ..... 452 - 455
  - Özel Doğru Denklemleri / The Special Line Equations 455
  - İki Doğru Arasındaki Açı / The Angle Between Two Lines ..... 455 - 456
  - Bir Noktanın Bir Doğruya Olan En Kısa Uzaklığı / The Shortest Distance of a Point From a Line 456
  - Paralel İki Doğru Arasındaki Uzaklık / The Distance Between Two Parallel Lines 456
- Çözümlü Test / Test With Solutions ..... 457 - 460
- YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 461 - 464
- Alıştırmalar / Exercises ..... 465 - 466
- Konu Testleri / Practice Tests ..... 467 - 476

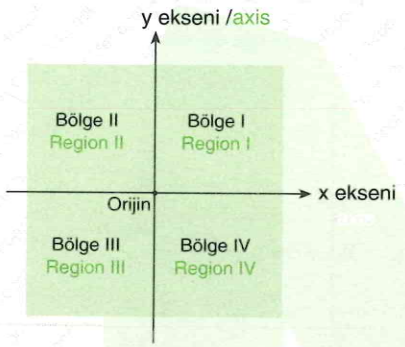
BÖLÜM
13
CHAPTER

DOĞRUNUN ANALİTİĞİ
LINE in ANALYTIC GEOMETRY

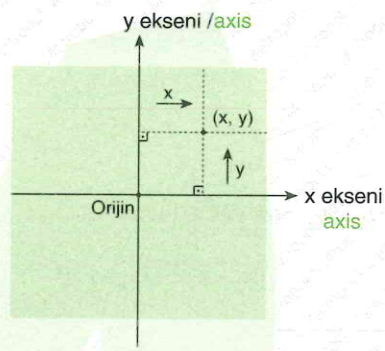
KARTEZYEN DÜZLEM / THE CARTESIAN PLANE

Koordinat düzlemi, aşağıda gösterildiği gibi, iki reel eksenin dik açılı olarak kesişiminden oluşur. Yatay sayı doğrusu x ekseni, düşey sayı doğrusu y eksenidir. İki doğrunun kesişim noktası orijindir ve eksenler düzlemi dört bölgeye ayırır.

The Coordinate plane is formed by two real lines intersecting at right angles, as shown in figure below. The horizontal number line is the x-axis and the vertical number line is the y-axis (The plural of axis is axes). The point of intersection of the two axes is the origin and the axes separate the plane into four quadrants.



Kartezyen düzlem
The Cartesian Plane



y ekseninden yönlendirilmiş uzaklık → x
Directed distance from y-axis

x ekseninden yönlendirilmiş uzaklık → y
Directed distance from x-axis

Koordinat düzleminde, x ve y reel sayılarının sıralı ikilisi (x,y) şeklinde tanımlanan noktalara, o noktanın koordinatları denir. Yukarıdaki şekilde gösterildiği gibi ilk sayı **[x koordinatı]**, noktanın yatay eksende sağ veya sol tarafa ne kadar uzak olduğu, ikinci sayı **[y koordinatı]** düşey eksende aşağı veya yukarıya ne kadar uzak olduğunu gösterir.

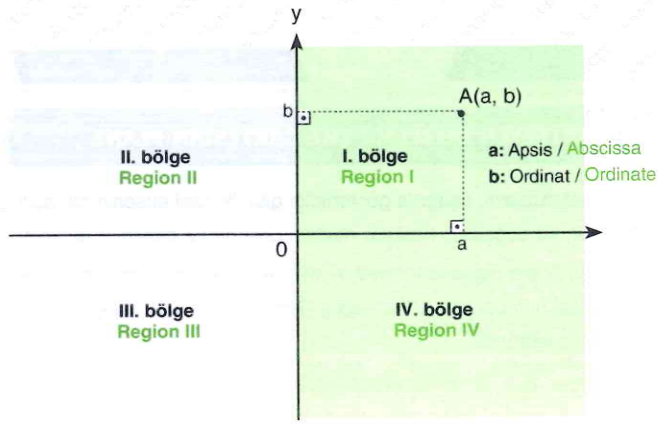
Each point in the coordinate plane corresponds to an ordered pair (x, y) of real numbers x and y, called the coordinates of the point. The first number **[x-coordinate]** tells how far to the left or right the point is from the vertical axis, and the second number **[y-coordinate]** tells, how far up or down the point is from the horizontal axis, as shown in the figure above.

DİK KOORDİNAT SİSTEMİ / CARTESIAN COORDINATES

Dik koordinat sistemi, düzlemi şekilde görüldüğü gibi dört bölgeye ayırır.

The coordinate axes divide the plane into four quadrants. These are numbered as shown in the figure.

	apsis the abscissa	ordinat the ordinate
I. Bölge / Region I.	+	+
II. Bölge / Region II.	−	+
III. Bölge / Region III.	−	−
IV. Bölge / Region IV.	+	−

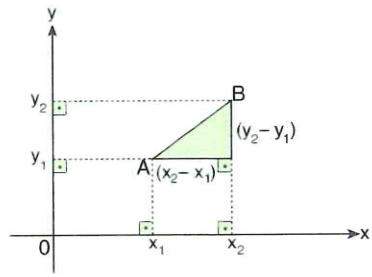


İki Nokta Arasındaki Uzaklık / The Distance Between Two Points

$A(x_1, y_1)$, $B(x_2, y_2)$

$|AB|^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$

$\Rightarrow |AB| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$



Örnek / Example 1

A(a, 1) ve (and) B(2, 4),

|AB| = 5 br (u) $\Rightarrow \sum a = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

Çözüm / Solution

Yanıt / Answer **C**

$|AB| = \sqrt{(2-a)^2 + (4-1)^2} = 5$

$|AB| = \sqrt{(2-a)^2 + 9} = 5$

$(2-a)^2 + 9 = 25$

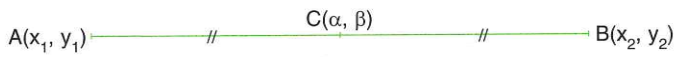
$(2-a)^2 = 16$

$2 - a = 4$ veya (or) $2 - a = -4$

$a = -2$ veya (or) $a = 6$

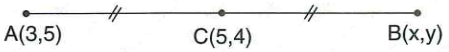
$\sum a = -2 + 6 = 4$

Orta Nokta Koordinatları / The Midpoint Coordinates



$$\alpha = \frac{x_1 + x_2}{2}, \quad \beta = \frac{y_1 + y_2}{2}$$

Örnek / Example 2



$\Rightarrow x+y=?$

A) 2 B) 5 C) 7 D) 10 E) 14

Çözüm / Solution Yanıt / Answer **D**

$5=\frac{3+x}{2} \Rightarrow x=7$

$4=\frac{5+y}{2} \Rightarrow y=3$

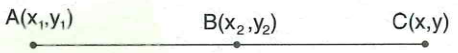
$x+y=10$

BİR DOĞRU PARÇASINI BELLİ ORANDA BÖLEN BİR NOKTANIN KOORDİNATLARI
THE COORDONATES of a POINT THAT DIVIDES a LINE SEGMENT into a CERTAIN RATIO

$\frac{|CA|}{|CB|}=k,(k\in R)$

i. $A(x_1, y_1)$ $C(x, y)$ $B(x_2, y_2)$

$x=\frac{x_1+kx_2}{1+k}$ ve (and) $y=\frac{y_1+ky_2}{1+k}$

ii. 

$x=\frac{x_1-kx_2}{1-k}$ ve (and) $y=\frac{y_1-ky_2}{1-k}$

Örnek / Example 3

$\Rightarrow C(\alpha, \beta) = (?, ?)$

A) $\left(\frac{4}{5},\frac{7}{5}\right)$ B) $\left(\frac{3}{5},1\right)$ C) $\left(\frac{2}{5},\frac{6}{5}\right)$

D) $\left(\frac{1}{5},\frac{7}{5}\right)$ E) $\left(1,\frac{3}{5}\right)$

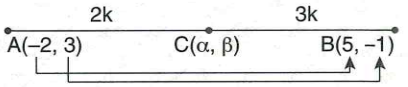
Çözüm / Solution Yanıt / Answer **A**

$\frac{|AC|}{|CB|}=\frac{2k}{3k}=\frac{2}{3} \Rightarrow \alpha=\frac{x_1+kx_2}{1+k} \Rightarrow \alpha=\frac{-2+\frac{2}{3}\cdot 5}{1+\frac{2}{3}}$

$\beta=\frac{y_1+ky_2}{1+k} \Rightarrow \beta=\frac{3+\frac{2}{3}\cdot(-1)}{1+\frac{2}{3}}$ $(\alpha,\beta)=\left(\frac{-2+\frac{2}{3}\cdot 5}{1+\frac{2}{3}},\frac{3+\frac{2}{3}\cdot(-1)}{1+\frac{2}{3}}\right)$

$(\alpha,\beta)=\left(\frac{4}{5},\frac{7}{5}\right)$

Pratik Yol / Practical Way:



5k +7 (–2+7 = 5)
2k ?

$5k\cdot ? = 2k\cdot 7$

$? = \frac{14}{5} \Rightarrow \alpha = -2+\frac{14}{5} = \frac{4}{5}$

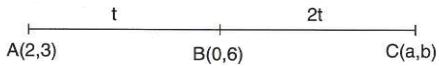
5k –4 (3–4 = –1)
2k ?

$5k\cdot ? = 2k\cdot(-4)$

$? = \frac{-8}{5} \Rightarrow \beta = 3-\frac{8}{5} = \frac{7}{5}$

$\Rightarrow C(\alpha, \beta) = \left(\frac{4}{5},\frac{7}{5}\right)$

Örnek / Example 4

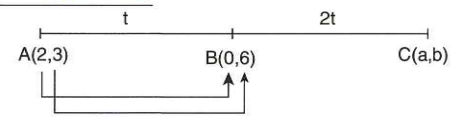


$\Rightarrow$ **C(a,b) = (?,?)**

A) (–4, 8) B) (–4, 5) C) (12, –4)
D) (–4, 12) E) (4, 12)

Çözüm / Solution Yanıt / Answer **D**

Pratik Yol / Practical Way:



t	−2	(2−2 = 0)	t	+3	(3+3 = 6)
3t	?		3t	?	
t·? = −2·3t			t·? = 3t·3		
? = −6 $\Rightarrow$ a = 2 − 6			? = 9 $\Rightarrow$ b = 3+9		
= −4			= 12		

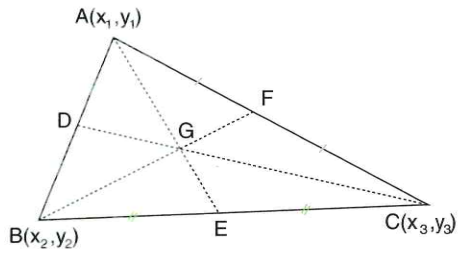
$\Rightarrow$ C(a, b) = (–4, 12)

Bir Üçgenin Ağırlık merkezi / Center of the Gravity of a Triangle

IADI = IDBI, IBEI = IECI, IAFI = IFCI

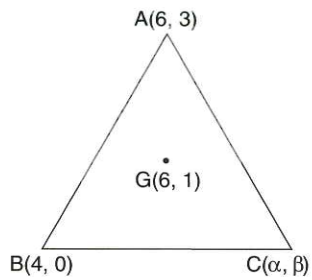
$A(x_1, y_1)$, $B(x_2, y_2)$, $C(x_3, y_3)$

$$\Rightarrow G(x,y) = \left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$$



Örnek / Example 5

G noktası ağırlık merkezidir.
G is center of the gravity.
A(6, 3), B(4, 0), C(α, β)
G(6, 1) $\Rightarrow$ **α + β = ?**



A) 8 B) 9 C) 10 D) 11 E) 12

Çözüm / Solution Yanıt / Answer **A**

$G(6,1) \Rightarrow 6 = \frac{6+4+\alpha}{3}$ ve (and) $1 = \frac{3+0+\beta}{3}$

$18 = 10 + \alpha$ $\quad 3 = 3 + \beta$

$\alpha = 8$ $\quad \beta = 0$

$\Rightarrow \alpha + \beta = 8 + 0 = 8$

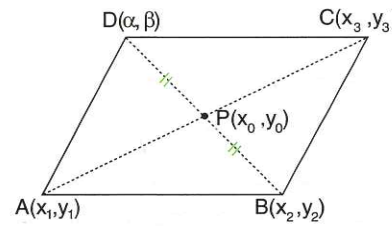
Paralelkenarda Dördüncü Köşenin Koordinatları / The Coordinates of the Fourth Corner of a Parallelogram

IPDI = IPBI ve (and) IPAI = IPCI

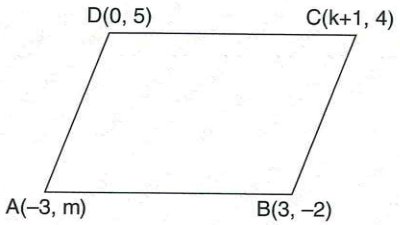
$$P(x_0, y_0) \Rightarrow x_0 = \frac{x_1+x_3}{2} = \frac{\alpha+x_2}{2}$$

$$\Rightarrow y_0 = \frac{y_1+y_3}{2} = \frac{\beta+y_2}{2},$$

$$\Rightarrow \alpha + x_2 = x_1 + x_3,\ \beta + y_2 = y_1 + y_3$$



Örnek / Example 6



ABCD bir paralelkenardır. / ABCD is a parallelogram.

A(–3, m), B(3, –2), C(k+1, 4), D(0, 5) ⇒ **k + m = ?**

A) 5 B) 4 C) 3 D) 2 E) 1

Çözüm / Solution Yanıt / Answer **B**

ABCD bir paralelkenardır. / ABCD is a parallelogram.

$-3 + k + 1 = 3 + 0$ ve (and) $m + 4 = 5 - 2$

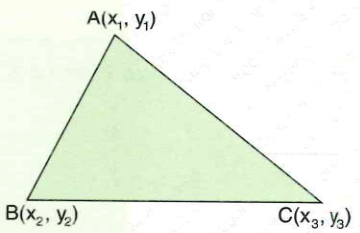
$\Rightarrow k = 5, \quad m = -1$

$\Rightarrow k + m = 5 - 1 = 4$

Bir Üçgenin Alanı / Area of a Triangle

$$A(\widehat{ABC}) = \frac{1}{2}\begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \\ x_3 & y_3 \\ x_1 & y_1 \end{vmatrix}_{+}^{-}$$

$$A(\widehat{ABC}) = \frac{1}{2}\,|x_1 \cdot y_2 + x_2 \cdot y_3 + x_3 \cdot y_1 - (x_2 \cdot y_1 + x_3 \cdot y_2 + x_1 \cdot y_3)|$$



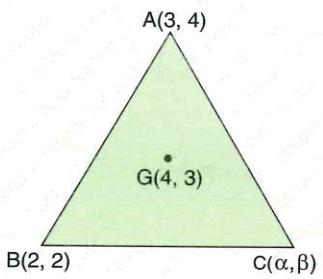
Örnek / Example 7

G ağırlık merkezidir.

G is center of the gravity.

A(3, 4), B(2, 2), C(α, β)

G(4, 3) ⇒ **A(ABC) = ?**



A) 4 B) $\frac{9}{2}$ C) 5 D) $\frac{11}{2}$ E) 6

Çözüm / Solution Yanıt / Answer **B**

$G(4,3) \Rightarrow 4 = \frac{3+2+\alpha}{3}$ ve (and) $3 = \frac{4+2+\beta}{3}$

$\alpha = 7$ $\beta = 3$

$$A(\widehat{ABC}) = \frac{1}{2}\begin{vmatrix} 3 & 4 \\ 2 & 2 \\ 7 & 3 \\ 3 & 4 \end{vmatrix}$$

$$= \frac{1}{2}|(3\cdot 2) + (2\cdot 3) + (7\cdot 4) - ((4\cdot 2) + (2\cdot 7) + (3\cdot 3))|$$

$$= \frac{1}{2}|6 + 6 + 28 - (8 + 14 + 9)|$$

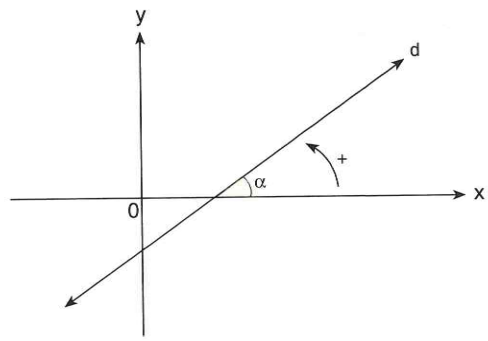
$$= \frac{1}{2}|40 - 31| = \frac{9}{2}\ \text{cm}^2$$

BİR DOĞRUNUN EĞİMİ / SLOPE and EQUATION of a LINE

Doğrunun Eğimi / The Slope of a Line

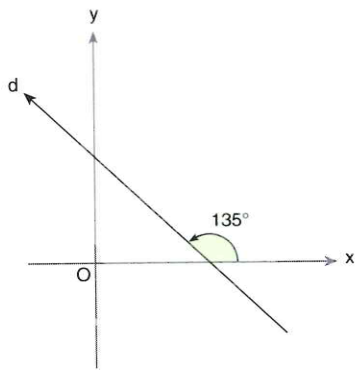
Düzlemde bir doğrunun eğimi, doğrunun x ekseni ile oluşturduğu pozitif yönlü açının tanjantıdır.
The slope of a line is the tangent of positive directed angle which it makes with x-axis.

Eğim / Slope $= m_d = \tan\alpha$



Örnek / Example 8

m_d = d doğrusunun eğimi / the slope of line d ?



A) $\sqrt{3}$ B) 1 C) –1

D) $-\frac{\sqrt{3}}{3}$ E) $-\sqrt{3}$

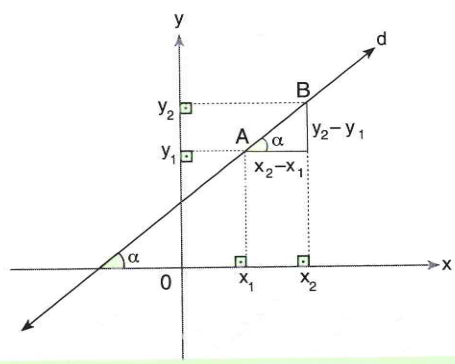
Çözüm / Solution Yanıt / Answer **C**

$m_d = \tan 135° = -1$

İki Noktası Bilinen Doğrunun Eğimi / The Slope of a Line with Two Known Points

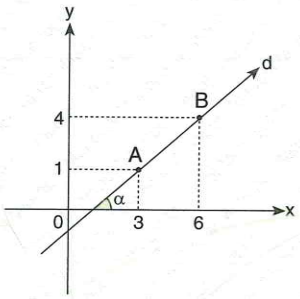
$A(x_1, y_1)$, $B(x_2, y_2)$

Eğim / Slope $= m_d = \tan\alpha = \frac{y_2 - y_1}{x_2 - x_1}$



Örnek / Example 9

A(3, 1),
B(6, 4)
$\Rightarrow m_d = \tan\alpha = ?$



A) $\frac{1}{\sqrt{3}}$ B) 1 C) $\sqrt{3}$ D) 0 E) –1

Çözüm / Solution Yanıt / Answer **B**

A(3, 1), B(6, 4)

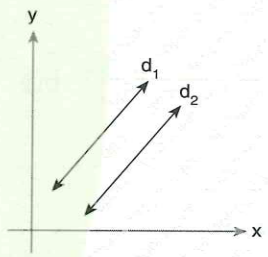
$m_d = \frac{4-1}{6-3} = \frac{3}{3} = 1$

$m_d = 1 \Rightarrow \tan\alpha = 1$

ÖNEMLİ/ IMPORTANT

İki doğru birbirine paralel ise, eğimleri birbirine eşittir.
If two lines are parallel, their slopes are equal to each other.

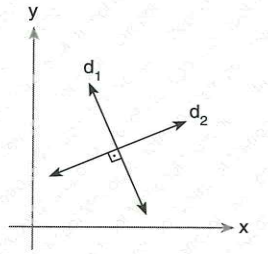
$$d_1 // d_2 \Leftrightarrow m_{d_1} = m_{d_2}$$



ÖNEMLİ/ IMPORTANT

İki doğru birbirine dik ise, eğimleri çarpımı –1'dir.
If two lines are perperdicular, then the product of their slopes is –1.

$$d_1 \perp d_2 \Leftrightarrow m_{d_1} \cdot m_{d_2} = -1$$



DOĞRU DENKLEMLERİ / LINEAR EQUATIONS

x ve y değişkenlerine bağlı, birinci dereceden her denklem bir doğru denklemidir.
Any first degree equation with two variables x and y is equation of a line.

d: ax + by + c = 0 ⇒ Eğim / Slope = $m_d = -\frac{a}{b}$

d: y = mx + n ⇒ Eğim / Slope = $m_d = m$

Örnek / Example 10

d: $2x-3y+1=0 \Rightarrow m_d = ?$

A) 1 B) $\frac{3}{2}$ C) $\frac{2}{3}$ D) $\frac{3}{4}$ E) $\frac{1}{2}$

Çözüm / Solution Yanıt / Answer **C**

d: $ax+by+c=0 \Rightarrow m_d = -\frac{a}{b}$

d: $2x-3y+1=0 \Rightarrow m_d = \frac{-2}{-3} = \frac{2}{3}$

Örnek / Example 11

d: $y=-2x+1 \Rightarrow m_d = ?$

A) –1 B) –2 C) $\frac{-1}{2}$ D) 2 E) 0

Çözüm / Solution Yanıt / Answer **B**

d: $y = mx+n \Rightarrow m_d = m$

d: $y=-2x+1 \Rightarrow m_d = -2$

Bir Noktası ve Eğimi Bilinen Doğrunun Denklemi
The Equation of a Line Whose One Point and Slope are Known

Eğim / Slope = m

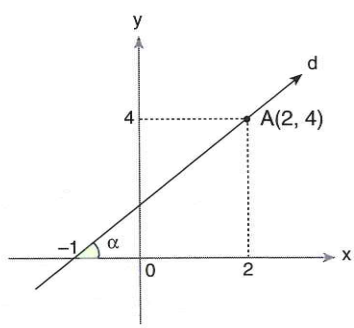
⇒ $d: y-y_1 = m\cdot(x-x_1)$

Örnek / Example 12

A(2, 4),
$m_d = \frac{4}{3}$

⇒ **d = ?**

A) y – 4x – 4 = 0
B) 3y – 4x + 4 = 0
C) 3y – 4x – 4 = 0
D) 3y + 4x + 4 = 0
E) 3y + 4x – 4 = 0



Çözüm / Solution Yanıt / Answer **C**

A(2,4), $m_d = \frac{4}{3} \Rightarrow d: y-4 = \frac{4}{3}(x-2)$

$d: y-4 = \frac{4x}{3} - \frac{8}{3}$

$d: y - \frac{4x}{3} - \frac{4}{3} = 0$

$d: 3y-4x-4=0$

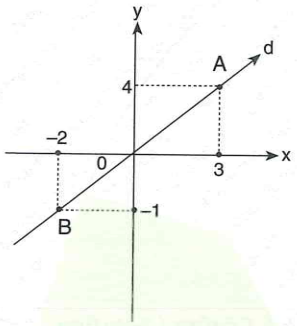
İki Noktası Bilinen Doğrunun Denklemi
The Equation of a Line Whose Two Points are Known

$$d = \frac{y-y_1}{y_2-y_1} = \frac{x-x_1}{x_2-x_1}$$

Örnek / Example 13

$A(3,4), B(-2,-1)$
$\Rightarrow$ **d = ?**

A) $x - y + 1 = 0$
B) $x + y - 1 = 0$
C) $x - y - 1 = 0$
D) $-x - y + 1 = 0$
E) $-x - y - 1 = 0$



Çözüm / Solution

Yanıt / Answer **A**

$A(\underset{x_1}{3}, \underset{y_1}{4}), B(\underset{x_2}{-2}, \underset{y_2}{-1}) \Rightarrow$ d: $\frac{y-4}{-1-4} = \frac{x-3}{-2-3}$

d: $\frac{y-4}{-5} = \frac{x-3}{-5}$

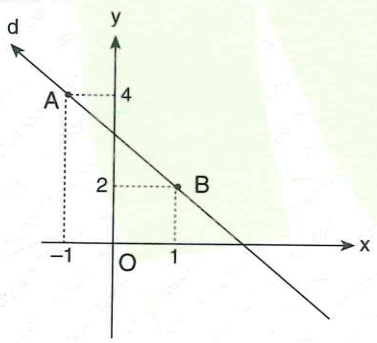
d: $y - 4 = x - 3$

d: $y = x + 1$

Örnek / Example 14

$A(-1, 4), B(1, 2)$
$\Rightarrow$ **d = ?**

A) $x + y - 3 = 0$
B) $x + y + 3 = 0$
C) $x - y - 3 = 0$
D) $x - y + 3 = 0$
E) $x + y + 2 = 0$



Çözüm / Solution

Yanıt / Answer **A**

$A(\underset{x_1}{-1}, \underset{y_1}{4})\ B(\underset{x_2}{1}, \underset{y_2}{2}) \Rightarrow$ d: $\frac{y-4}{2-4} = \frac{x-(-1)}{1-(-1)}$

d: $\frac{y-4}{-2} = \frac{x+1}{2}$

d : $2y - 8 = -2x - 2$

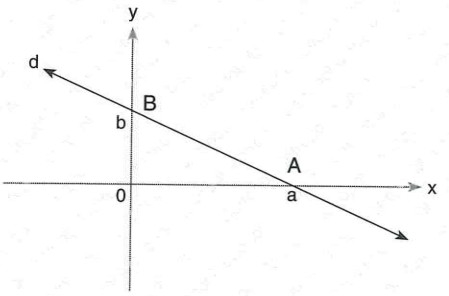
d : $2x + 2y - 6 = 0$

d : $x + y - 3 = 0$

Eksenleri Kestiği Noktaları Bilinen Bir Doğrunun Denklemi
The Equation of a Line Whose Points of Intersection of Axes are Known

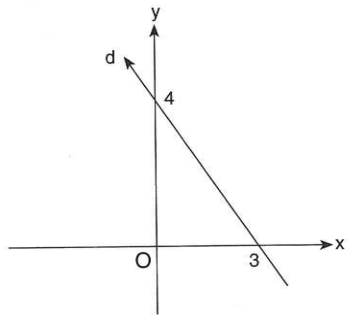
$A(a,0), B(0,b)$

d: $\frac{x}{a} + \frac{y}{b} = 1$



Örnek / Example 15

d = ?



A) $\frac{x}{2}+\frac{y}{4}=1$ B) $\frac{x}{3}+\frac{y}{3}=1$ C) $\frac{x}{3}+\frac{y}{4}=0$

D) $\frac{x}{3}+\frac{y}{4}=1$ E) $\frac{x}{4}+\frac{y}{3}=-1$

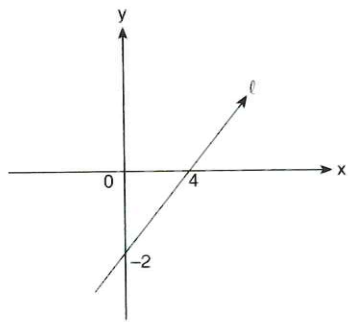
Çözüm / Solution Yanıt / Answer **D**

d: (3,0), (0,4)

d: $\frac{x}{3}+\frac{y}{4}=1$

Örnek / Example 16

ℓ = ?



A) $\frac{x}{-2}+\frac{y}{4}=1$ B) $\frac{x}{4}+\frac{y}{4}=1$ C) $\frac{x}{4}-\frac{y}{-2}=1$

D) $\frac{x}{4}+\frac{y}{-2}=1$ E) $\frac{x}{-2}-\frac{y}{4}=1$

Çözüm / Solution Yanıt / Answer **D**

ℓ: (4,0), (0,−2)

ℓ: $\frac{x}{4}+\frac{y}{-2}=1$

ÖZEL DOĞRU DENKLEMLERİ / THE SPECIAL LINE EQUATIONS

i. x ve y Eksenlerine Paralel Olan Doğruların Denklemi
Equation of the Lines Parallel to the Axis x and y

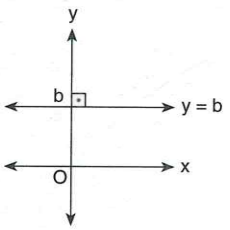
- x eksenine paralel doğruların denklemi

  b ∈ R olmak üzere,

  y = b biçimindedir. Eğimleri sıfırdır.

  y = 0 doğrusu x eksenini belirtir.

  Providing that b ∈ R, the equation of a line parallel to the x – axis is y = b. The slope of such lines equals to zero. The line y = 0 coincides with the x – axis.



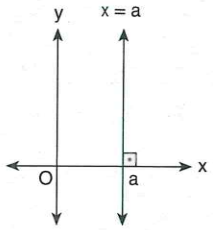
- y eksenine paralel doğruların denklemi

  a ∈ R olmak üzere, x = a biçimindedir.

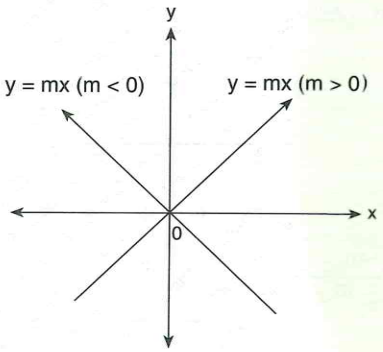
  Eğimleri tanımsızdır.

  x = 0 doğrusu y eksenini belirtir.

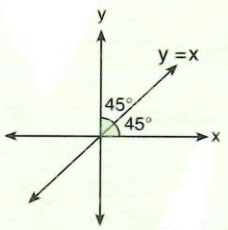
  Providing that a ∈ R, the equation of a line parallel to the y – axis is x = a. The slope of such lines is undefined. The line x = 0 coincides with the y – axis.



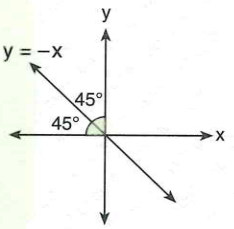
ii. Başlangıç Noktasından Geçen Doğruların Denklemi
Equation of the Lines which pass through the origin



Örnek / Example



y = x, 1. açıortay doğrusu.
first angle bisector line.



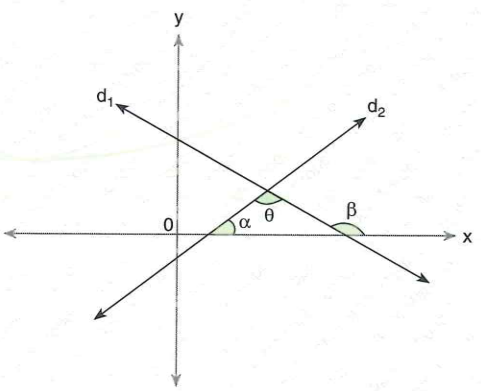
y = –x, 2. açıortay doğrusu.
second angle bisector line.

İKİ DOĞRU ARASINDAKİ AÇI / THE ANGLE BETWEEN TWO LINES

$$\theta = \beta - \alpha$$

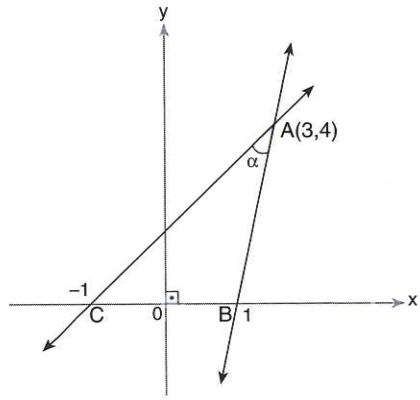
$$\tan\theta = \tan(\beta - \alpha) = \frac{\tan\beta - \tan\alpha}{1 + \tan\beta \cdot \tan\alpha}$$

$$\Rightarrow \boldsymbol{\tan\theta = \frac{m_{d_1} - m_{d_2}}{1 + m_{d_1} \cdot m_{d_2}}}$$



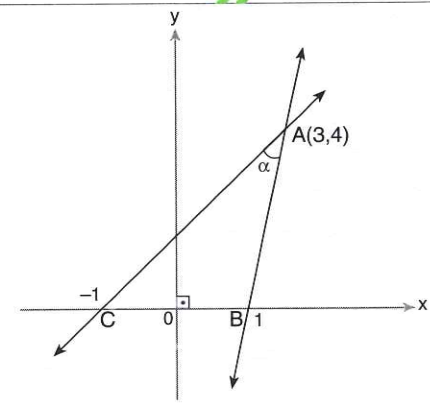
Örnek / Example 17

$\tan\alpha = ?$



A) -1 B) $-\frac{1}{2}$ C) 1 D) $\frac{1}{2}$ E) $\frac{1}{3}$

Çözüm / Solution Yanıt / Answer **E**



$A(3,4),\ C(-1,0) \Rightarrow AC: \dfrac{y-y_1}{y_2-y_1} = \dfrac{x-x_1}{x_2-x_1}$

$$\frac{y-4}{0-4} = \frac{x-3}{-1+-3}$$

$$\frac{y-4}{-4} = \frac{x-3}{-4}$$

$$y = x+1$$

$$\Rightarrow m_{AC} = 1$$

$A(3,4),\ B(1,0) \Rightarrow AB = \dfrac{y-4}{0-4} = \dfrac{x-3}{1-3}$

$$\frac{y-4}{-4} = \frac{x-3}{-2}$$

$$2y-8 = 4x-12$$

$$2y = 4x-4$$

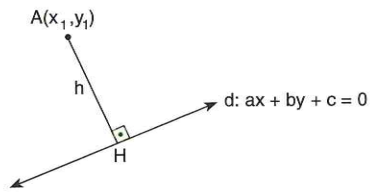
$$y = 2x-2$$

$$\Rightarrow m_{AB} = 2$$

$$\tan\alpha = \frac{m_{AB}-m_{AC}}{1+m_{AB}\cdot m_{AC}} = \frac{2-1}{1+2\cdot 1} = \frac{1}{3}$$

BİR NOKTANIN BİR DOĞRUYA OLAN EN KISA UZAKLIĞI / THE SHORTEST DISTANCE of a POINT FROM a LINE

$$|AH| = h = \frac{|a\cdot x_1 + b\cdot y_1 + c|}{\sqrt{a^2+b^2}}$$



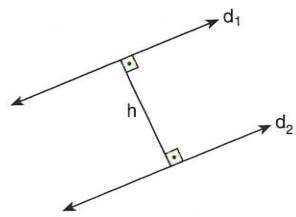
PARALEL İKİ DOĞRU ARASINDAKİ UZAKLIK / THE DISTANCE BETWEEN TWO PARALLEL LINES

$d_1 // d_2$,

$d_1: ax+by+c_1 = 0$

$d_2: ax+by+c_2 = 0$

$$\Rightarrow h = \frac{|c_1-c_2|}{\sqrt{a^2+b^2}}$$

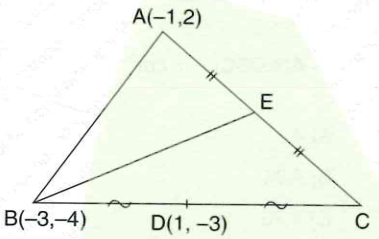


1.

$\frac{|AB|}{|BC|} = \frac{3}{4} \Rightarrow$ **y – x = ?**

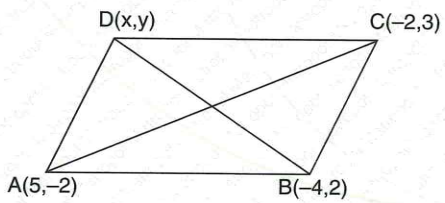
A) $\frac{13}{4}$ B) $\frac{16}{3}$ C) 16 D) 17 E) $\frac{39}{2}$

2. |BD| = |DC|, |EC| = |EA| **⇒ |BE| = ?**



A) 5 B) 9 C) $\sqrt{41}$ D) $2\sqrt{5}$ E) 12

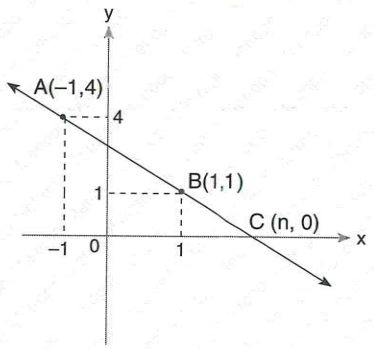
3. [DC] // [AB], [AD] // [BC] **⇒ x + y = ?**



A) 8 B) 6 C) – 7 D) – 6 E) – 8

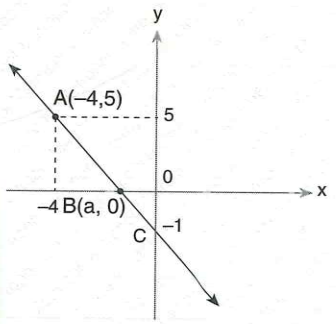
4. **n = ?**

A) $\frac{2}{3}$ B) $\frac{5}{4}$ C) $\frac{4}{3}$ D) $\frac{5}{3}$ E) 2



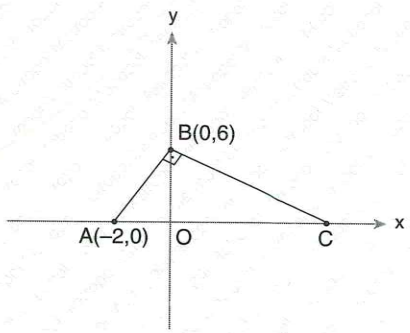
5. **a = ?**

A) $-\frac{3}{2}$ B) –1 C) $-\frac{1}{4}$ D) $-\frac{1}{3}$ E) $-\frac{2}{3}$



6. **|AC| = ?**

A) 16 B) 17 C) 18 D) 19 E) 20



METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. **a = ?**

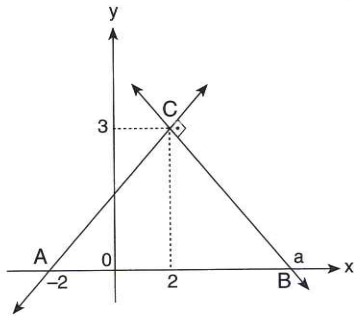
A) $\frac{17}{4}$

B) 3

C) $\frac{17}{3}$

D) 5

E) $\frac{1}{3}$



8. **a = ?**

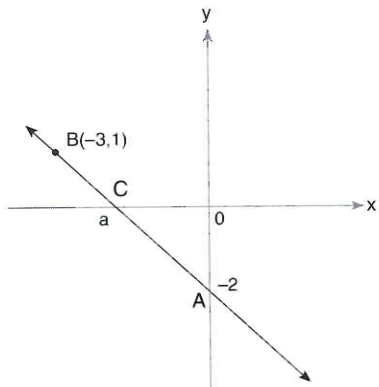
A) –6

B) –4

C) –3

D) –2

E) 2



9. A(4, –4),
B(–2, 2),
C(3, 1)
IADI = IDBI
⇒ **d_2 = ?**

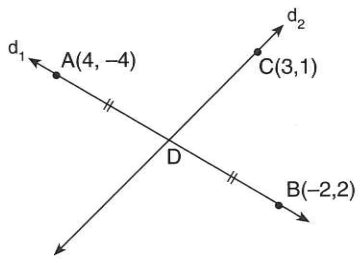
A) x – y + 2 = 0

B) y – x + 2 = 0

C) –y – x – 2 = 0

D) 2y – x – 2 = 0

E) 2y – x + 2 = 0



10. AB: 4x + 3y = 24
⇒ **IOCI = ?**

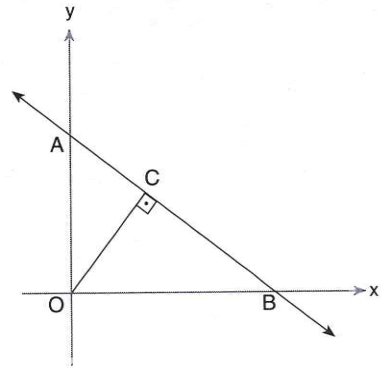
A) 4,8

B) 5

C) 6,4

D) 8

E) 10



11. AOBC bir karedir.
AOBC is a square.
⇒ **A(AOBC) = ? cm^2**

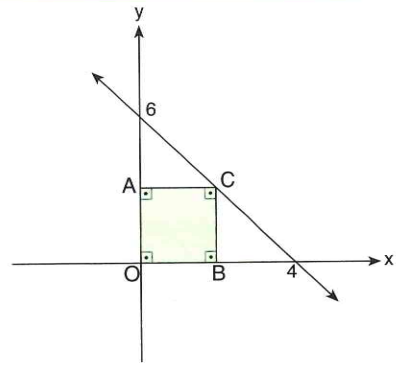
A) 4

B) 4,84

C) 5,76

D) 6

E) 6,76



12. **A($\widehat{AOB}$) = ?**

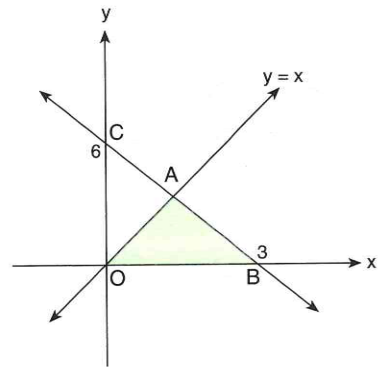
A) $\frac{2}{3}$

B) 1

C) $\frac{4}{3}$

D) $\frac{5}{3}$

E) 3

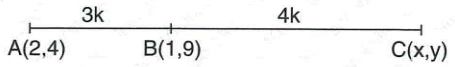


YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	C	B	D	E	E	A	D	B	A	C	E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



Pratik Yol / Practical Way:

$$\begin{array}{ll} 3k & -1 \quad (2-1=1) \\ 7k & ? \\ \hline 3k\cdot ? = 7k\cdot 1 & \end{array}$$

$$? = \frac{-7}{3} \Rightarrow x = 2-\frac{7}{3} = -\frac{1}{3}$$

$$\begin{array}{ll} 3k & 5 \quad (4+5=9) \\ 7k & ? \\ \hline 3k\cdot ? = 7k\cdot 5 & \end{array}$$

$$? = \frac{35}{3} \Rightarrow y = 4+\frac{35}{3} = \frac{47}{3}$$

$$\Rightarrow y-x = \frac{47}{3}-\left(-\frac{1}{3}\right)$$

$$= 16$$

Yanıt / The Answer is C

2. $|BD| = |DC| \Rightarrow C(5,-2)$

$$|AE| = |EC| \Rightarrow E\left(\frac{-1+5}{2}, \frac{2-2}{2}\right) = E(2,0)$$

$$|BE| = \sqrt{(-3-2)^2+(-4-0)^2} = \sqrt{25+16} = \sqrt{41}$$

Yanıt / The Answer is C

3. $x-4 = 5-2 \Rightarrow x = 7$

$y+2 = -2+3 \Rightarrow y = -1$

$x+y = 7-1 = 6$

Yanıt / The Answer is B

4. $\left.\begin{matrix} A(-1,4) \\ B(1,1) \end{matrix}\right\} \Rightarrow \frac{y-y_1}{y_2-y_1} = \frac{x-x_1}{x_2-x_1}$

$$\frac{y-4}{1-4} = \frac{x+1}{1-(-1)}$$

$\Rightarrow 3x+2y-5 = 0$

$y = 0 \Rightarrow x = \frac{5}{3} \Rightarrow n = \frac{5}{3}$

Yanıt / The Answer is D

5. A, B ve C noktaları aynı doğru üzerinde olduğu için $m_{AC} = m_{BC}$ dir.

Since the points A, B and C are on the same line, $m_{AC} = m_{BC}$.

$m_{AC} = m_{BC} \Rightarrow$

$$m_{AC} = \frac{y_1-y_2}{x_1-x_2} = \frac{5+1}{-4-0} = \frac{6}{-4} = -\frac{3}{2}$$

$$m_{BC} = \frac{0-(-1)}{a-0} = \frac{1}{a} = -\frac{3}{2} \Rightarrow a = -\frac{2}{3}$$

Yanıt / The Answer is E

6. $[AB] \perp [BC] \Rightarrow m_{AB}\cdot m_{BC} = -1$

$$m_{AB} = \frac{6-0}{0+2} = \frac{6}{2} = 3 \Rightarrow m_{BC} = -\frac{1}{3}$$

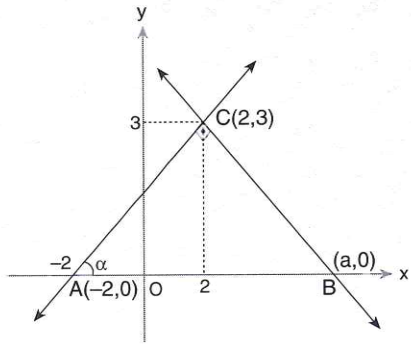
$$C(x,0) \Rightarrow m_{BC} = \frac{6-0}{0-x} = -\frac{1}{3} \Rightarrow x = 18$$

$\Rightarrow |AC| = 18+2 = 20$

Yanıt / The Answer is E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



$|AC| \perp |BC| \Rightarrow m_{AC} \cdot m_{BC} = -1$

$m_{AC} = \tan\alpha = \frac{3}{4} \Rightarrow m_{BC} = -\frac{4}{3} = \frac{3-0}{2-a} = \frac{3}{2-a} \Rightarrow a = \frac{17}{4}$

Yanıt / The Answer is A

8. $\left.\begin{matrix} A(0,-2) \\ B(-3,1) \end{matrix}\right\} \Rightarrow AB : \frac{y+2}{-2-1} = \frac{x-0}{0-(-3)}$

$\frac{y+2}{-3} = \frac{x}{3}$

$x + y + 2 = 0$

$C(a,0) \Rightarrow a + 0 + 2 = 0 \Rightarrow a = -2$

Yanıt / The Answer is D

9. $\left.\begin{matrix} |AD| = |DB| \\ D(a,b) \end{matrix}\right\} \Rightarrow a = \frac{4-2}{2} = 1, \; b = \frac{-4+2}{2} = -1$

$\left.\begin{matrix} C(3,1) \\ D(1,-1) \end{matrix}\right\} \Rightarrow \frac{y-1}{1+1} = \frac{x-3}{3-1} \Rightarrow y - x + 2 = 0$

Yanıt / The Answer is B

10. O (0, 0)

AB: $4x + 3y = 24 \Rightarrow 4x + 3y - 24 = 0$

$|OC| = h = \frac{|ax_1 + by_1 + c|}{\sqrt{a^2+b^2}} = \frac{|4 \cdot 0 + 3 \cdot 0 - 24|}{\sqrt{4^2+3^2}}$

$= \frac{24}{5} = 4,8$

Yanıt / The Answer is A

11. $|AO| = |OB| = |BC| = |AC| = x$

$\Rightarrow \frac{4-x}{4} = \frac{x}{6}$

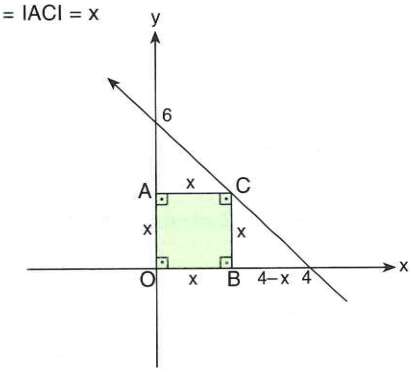
$24 - 6x = 4x$

$x = 2,4$

$A(AOBC) = x^2$

$= (2,4)^2$

$= 5,76$



Yanıt / The Answer is C

12. C(0, 6) , B(3, 0)

CB: $\frac{x}{3} + \frac{y}{6} = 1$

$2x + y = 6$

$A \in y = x$

$A = (a,a)$

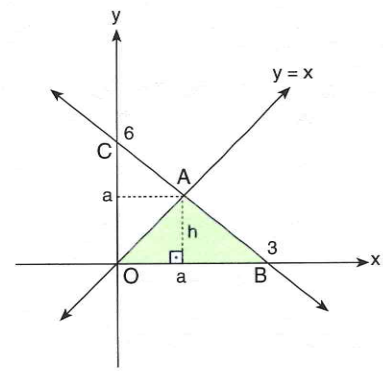
$\Rightarrow 2a + a = 6$

$3a = 6 \Rightarrow a = 2$

$A(2,2) \Rightarrow h = 2$

$A(\widehat{AOB}) = \frac{|OB| \cdot h}{2}$

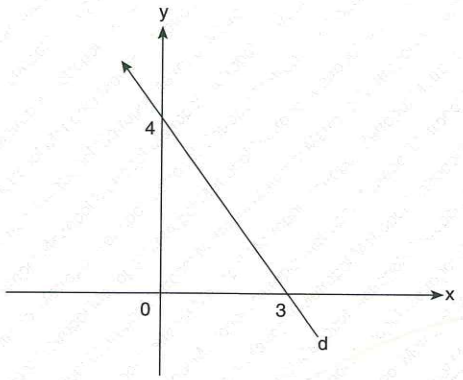
$= \frac{3 \cdot 2}{2} = 3$



Yanıt / The Answer is E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



d = ?

A) $x+y-3=0$ B) $x+y-4=0$

C) $3x+4y-12=0$ D) $4x+3y-3=0$

E) $4x+3y-12=0$

[İNÖNÜ ÜNİVERSİTESİ – YÖS 2018]

2. d_1.....$17x+13y-4=0$

d_2..... $5x-31y+2=0$

doğrularının kesim noktasından ve orijinden geçen doğrunun denklemi aşağıdakilerden hangisidir?

Which of the following is the equation of line that passes through the intersection point of lines d_1 and d_2 and origin?

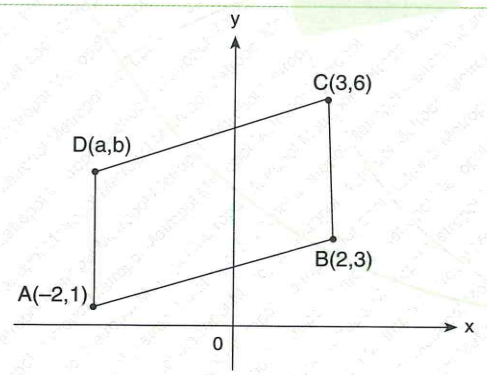
A) $11x=9y$ B) $22x=49y$

C) $3x=11y$ D) $27x=49y$

E) $11x=49y$

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2018]

3.



ABCD bir paralelkenardır.

ABCD is a parallelogram.

$A(-2,1)$, $B(2,3)$, $C(3,6)$, $D(a,b)$

$\Rightarrow$ **a+b = ?**

A) 2 B) 3 C) 4 D) 5 D) 6

[ANADOLU ÜNİVERSİTESİ – YÖS 2017]

4. Köşe noktalarının koordinatları A(5, 7), B(1,3), C(9,1) olan ABC üçgeninin AB ve AC kenarlarının orta noktaları sırasıyla D ve E dir. Buna göre IDEI kaç birimdir?

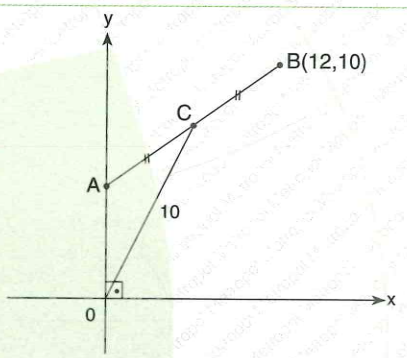
The middle points of the sides AB and AC of triangle ABC A(5,7), B(1,3), and C(9,1) are D and E respectively. According to this, what is the value of IDEI?

A) 3 B) $\sqrt{11}$ C) 4

D) $\sqrt{17}$ E) 5

[ANADOLU ÜNİVERSİTESİ – YÖS 2017]

5.



IACI = ICBI, IOCI = 10 cm ve (and) B(12,10),

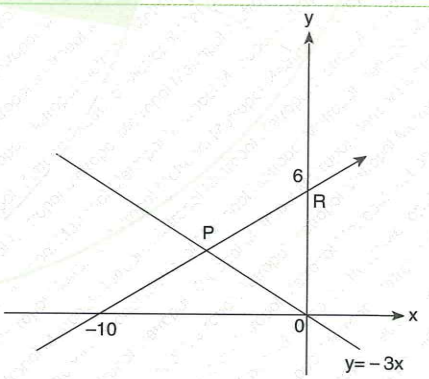
A(x,y) $\Rightarrow$ **y = ?**

A) 2 B) 3 C) 4

D) 5 E) 6

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2017]

6.



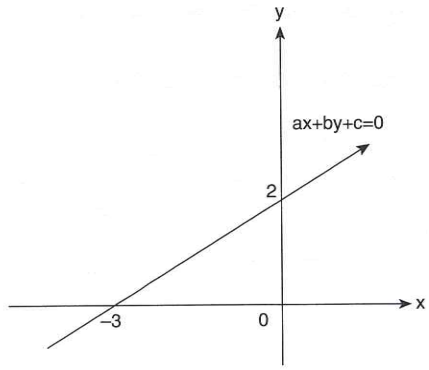
$A(\widehat{POR}) = ?$

A) 5 B) 6 C) 10 D) 12 D) 15

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2017]

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7.



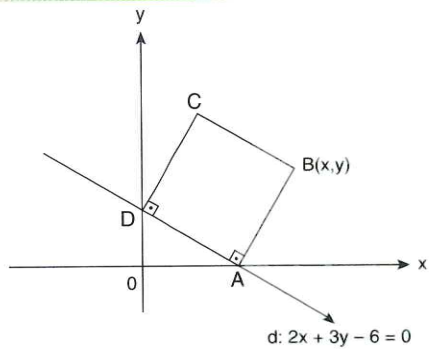
$ax+by+c=0 \Rightarrow (\mathbf{a,b,c})=(?,?,?)$

A) $(-2,3,6)$ B) $(-3,2,6)$ C) $(3,-2,6)$

D) $(-3,2,-6)$ E) $(-2,3,-6)$

[ERCİYES ÜNİVERSİTESİ – YÖS 2017]

8.



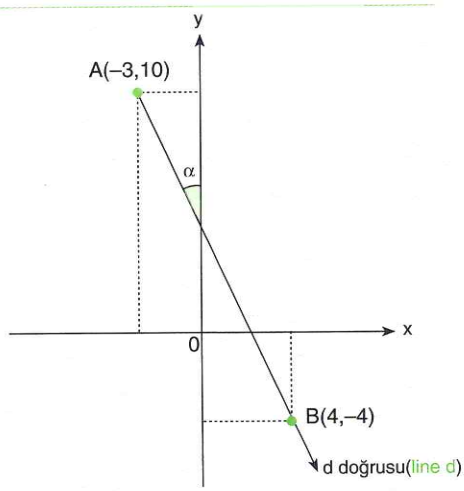
ABCD bir karedir. / ABCD is a square.

x + y = ?

A) 6 B) 7 C) 8 D) 9 E) 10

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2016]

9. **$\tan\alpha = ?$**

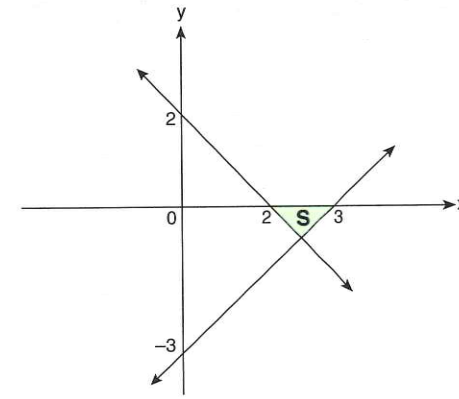


A) –1 B) $\frac{2}{3}$ C) $\frac{1}{2}$ D) $\frac{3}{4}$ E) $\frac{3}{5}$

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2015]

METROPOL YAYINLARI • METROPOL PUBLICATIONS

10. **S = ?**

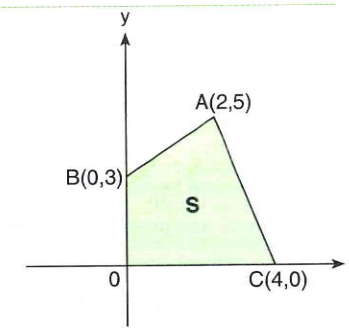


A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) $\frac{5}{4}$

D) 2 E) 3

[İSTANBUL ÜNİVERSİTESİ – YÖS 2013]

11. **S = ?**



A) 8 B) 100 C) 13 D) 15 D) 16

[ONDOKUZ MAYIS ÜNİVERSİTESİ – YÖS 2013]

12. $d_1 : y = 2x - 6$

$d_2 : y - x = 1$

$\Rightarrow$ **m + n = ?**

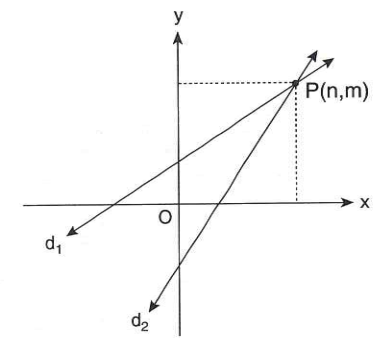
A) 5

B) 8

C) 10

D) 13

E) 15



[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2012]

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
E	D	B	D	E	A	E	C	C	A	C	E

1. d: (3,0), (0,4)

$d: \frac{x}{3} + \frac{y}{4} = 1$

$d: 4x + 3y = 12$

$d: 4x + 3y - 12 = 0$

Yanıt / The Answer is E

2. O(0,0),

$d_1: 17x + 13y = 4$

$d_2: 2x/5x - 31y = -2$

$d_1: 17x + 13y = 4$

$d_2: -10x + 62y = 4$

$17x + 13y = 62y - 10x$

$27x = 49y$

Yanıt / The Answer is D

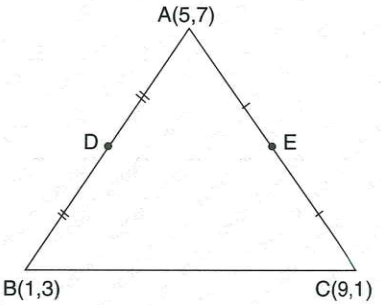
3. $a + 2 = -2 + 3$ | $b + 3 = 6 + 1$

$a = -1$ | $b = 4$

$\Rightarrow a + b = 3$

Yanıt / The Answer is B

4.



$D\left(\frac{5+1}{2}, \frac{7+3}{2}\right)$, $E\left(\frac{5+9}{2}, \frac{7+1}{2}\right)$

D(3,5), E(7,4)

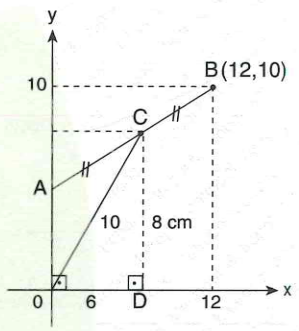
$|DE| = \sqrt{(3-7)^2 + (5-4)^2}$

$= \sqrt{4^2 + 1^2}$

$= \sqrt{17}$

Yanıt / The Answer is D

5.



$|AC| = |CB| \Rightarrow |OD| = 6\,cm$

$|OD| = 6\,cm \Rightarrow |OC| = 10,\ |CD| = 8\,cm$

$C(6,8) \Rightarrow A(x,y),\ \frac{x+12}{2} = 6,\ \frac{y+10}{2} = 8$

$\Rightarrow x = 0,\ y = 6$

Yanıt / The Answer is E

6. $|PH| = h$

$d_1: \frac{x}{-10} + \frac{y}{6} = 1$

$d_2: y = -3x$

$d_1 \cap d_2 = \{P\}$

$\frac{x}{-10} + \frac{-3x}{6} = 1$ (-10: (3), 6: (-5))

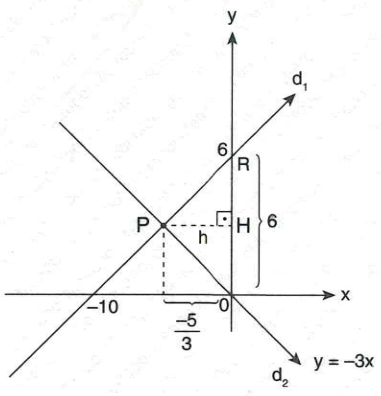
$3x + 15x = -30$

$18x = -30$

$3x = -5 \Rightarrow x = \frac{-5}{3}$

$\Rightarrow h = \frac{5}{3}$

$A(\widehat{POR}) = \frac{\frac{5}{3} \cdot 6}{2} = 5$



Yanıt / The Answer is A

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $ax+by+c=0$

$(-3,0),\ (0,2)$

$\frac{x}{\underset{(2)}{-3}}+\frac{y}{\underset{(-3)}{2}}=1$

$2x-3y=-6$

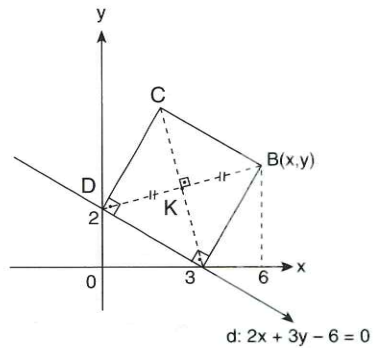
$-2x+3y-(-6)=0$

$\downarrow a \quad \downarrow b \quad \downarrow c$

$(a,b,c)=(-2,3,-6)$

Yanıt / The Answer is E

8.



$d: 2x+3y-6=0$

$x=0 \Rightarrow y=2 \quad \Rightarrow D(0,2)$

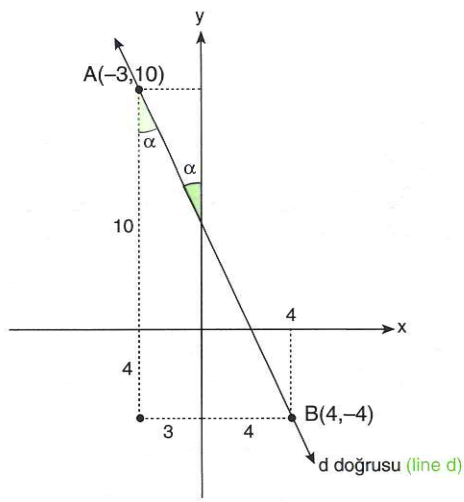
$y=0 \Rightarrow x=3 \quad \Rightarrow A(3,0)$

$K(3,2) \Rightarrow |DK| = |KB| \Rightarrow x=6, y=2$

$x+y=6+2=8$

Yanıt / The Answer is C

9.



$\tan\alpha = \frac{7}{14} = \frac{1}{2}$

Yanıt / The Answer is C

10. $\frac{x}{2}+\frac{y}{2}=1 \quad \Big| \quad \frac{x}{3}+\frac{y}{-3}=1$

$x+y=2 \quad \Big| \quad x-y=3$

$x+y=2$

$+\ x-y=3$

$2x=5$

$x=\frac{5}{2}$

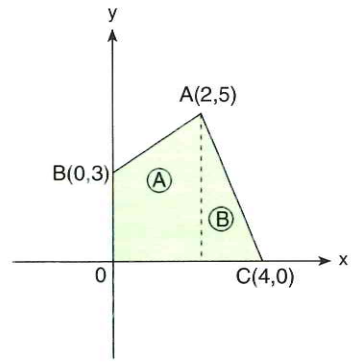
$\frac{5}{2}-3=y$

$,\quad -\frac{1}{2}=y$

$S=\frac{1\cdot\frac{1}{2}}{2}=\frac{1}{4}$

Yanıt / The Answer is A

11.



$A=\frac{(3+5)\cdot 2}{2}=8$

$B=\frac{5\cdot 2}{2}=5$

$S=A+B=8+5=13$

Yanıt / The Answer is C

12. $\left.\begin{matrix} d_1: y=2x-6 \\ d_2: y-x=1 \end{matrix}\right\} \Rightarrow 2x-6=x+1$

$x=7=n$

$x=7 \Rightarrow y-7=1$

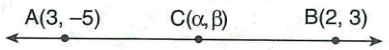
$y=8=m \Rightarrow P(n,m)=P(7,8)$

$\Rightarrow x+y=m+n=7+8=15$

Yanıt / The Answer is E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

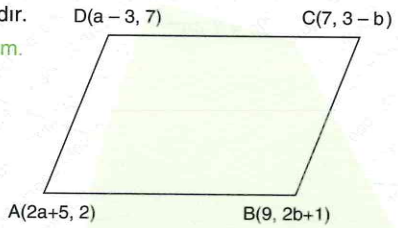
1.



$$\frac{|CA|}{|CB|} = \frac{2}{3} \Rightarrow \alpha + \beta = ?$$

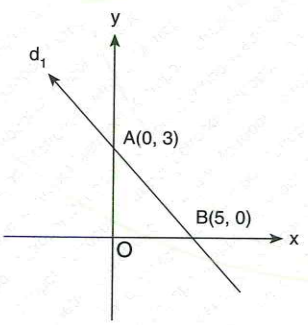
Yanıt / The Answer is $\frac{4}{5}$

2. ABCD bir paralelkenardır.
ABCD is a paralellogram.
$\Rightarrow a + b = ?$



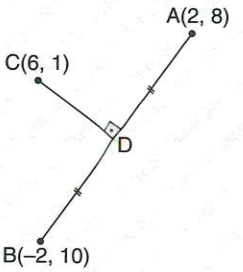
Yanıt / The Answer is –7

3. $d_1 = ?$



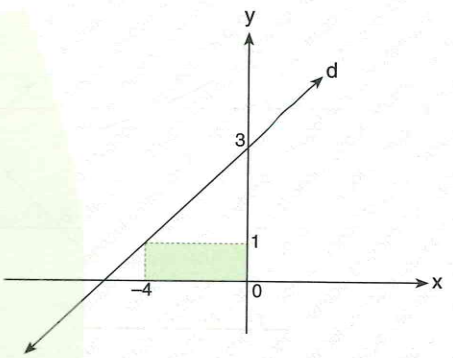
Yanıt / The Answer is $3x + 5y - 15 = 0$

4. |BD| = |DA|,
C(6, 1)
$\Rightarrow$ **|CD| = ?**



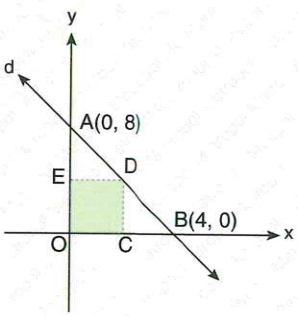
Yanıt / The Answer is 10

5. $d = ?$



Yanıt / The Answer is $x - 2y + 6 = 0$

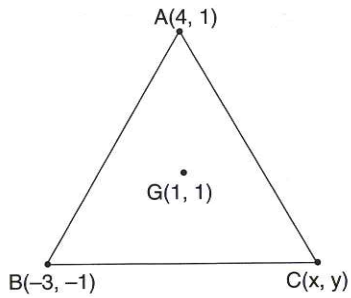
6. OEDC bir karedir.
OEDC is a square.
$\Rightarrow$ **A(OEDC) = ? cm²**



Yanıt / The Answer is $\frac{64}{9}$

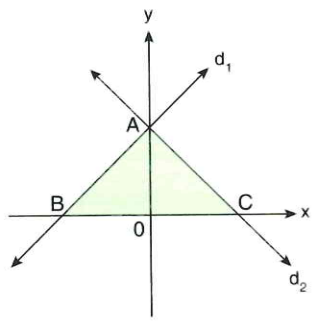
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. G ağırlık merkezidir.
G is center of the gravity.
A(4, 1), B(–3, –1), C(x, y)
G(1, 1)
⇒ **y – x = ?**



Yanıt / The Answer is 1

8. $d_1: 2x - 3y + 2 = 0$
$d_2: -x - 6y + 4 = 0$
⇒ **A(ABC) = ? cm²**

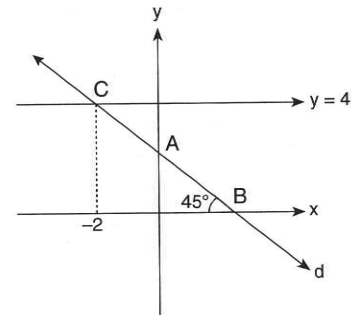


Yanıt / The Answer is $\frac{5}{3}$

9. $d_1: 2x - y + 8 = 0$,
$d_2: ax + y + 4 = 0$
$d_1 \perp d_2$ ⇒ **a = ?**

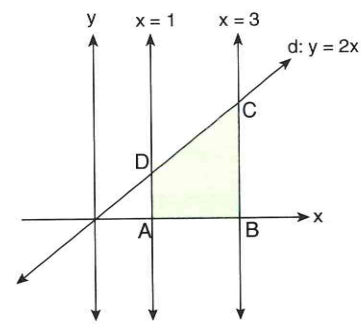
Yanıt / The Answer is $\frac{1}{2}$

10. $m(\widehat{ABO}) = 45°$
⇒ **d = ?**



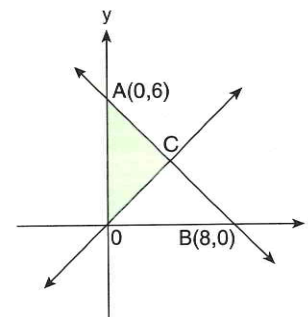
Yanıt / The Answer is y + x – 2 = 0

11. **A(ABCD) = ? cm²**



Yanıt / The Answer is 8

12. A(0, 6), B(8, 0)
3·|AC| = 2·|BC|
⇒ **A(ABC) = ? cm²**



Yanıt / The Answer is 9,6

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.

A(4, 3) C(–4, 1) B(a, b)

$|AC| = |CB| \Rightarrow a - b = ?$

A) –11 B) –12 C) –13 D) –14 E) –15

2.

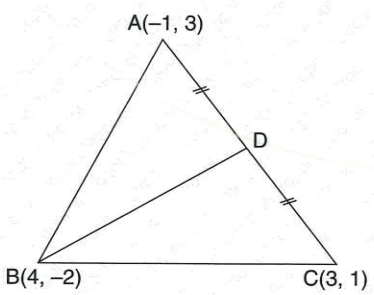
A(3, 2) C(x, y) B(12, –4)

$|AC| = 2 \cdot |BC| \Rightarrow x + y = ?$

A) 6 B) 7 C) 8 D) 9 E) 10

3. $|AD| = |DC|$

$\Rightarrow |BD| = ?$

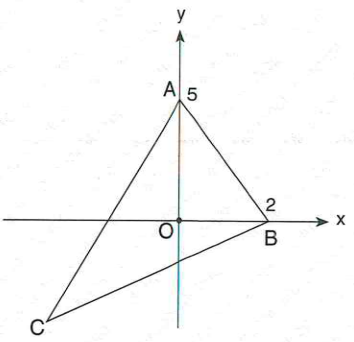


A) 1 B) 2 C) 3 D) 4 E) 5

METROPOL YAYINLARI • METROPOL PUBLICATIONS

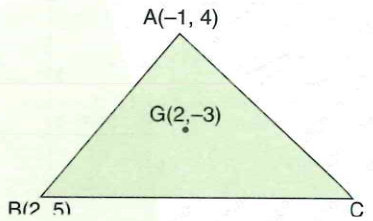
4. O, şekildeki ABC üçgeninin ağırlık merkezidir.
The point O is center of the gravity of triangle ABC in the figure.

$\Rightarrow C(x, y) = ?$



A) (–2, –5) B) (–2, 5) C) (2, –5) D) (5, 2) E) (–5, –2)

5.

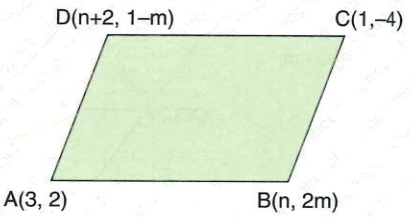


G(2,–3) noktası şekildeki üçgenin ağırlık merkezidir.
The point G(2, –3) is center of the gravity of the triangle in the figure.

$\Rightarrow A(\widehat{ABC}) = ?\ cm^2$

A) 12 B) 18 C) 24 D) 27 E) 36

6.

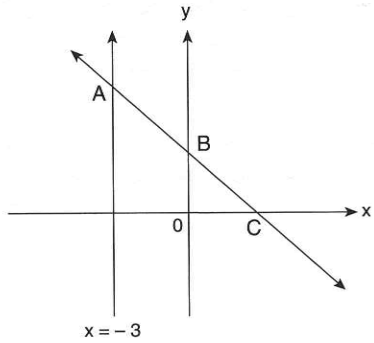


ABCD bir paralelkenardır. / ABCD is a parallelogram.

$\Rightarrow A(ABCD) = ?\ cm^2$

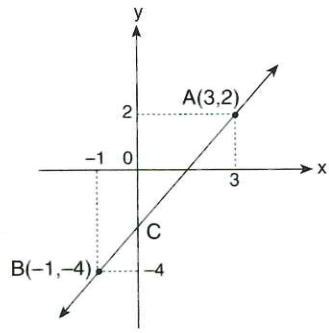
A) 12 B) 10 C) 8 D) 6 E) 4

7. B(0, 4),
C(6, 0),
A(x, y)
⇒ **y = ?**



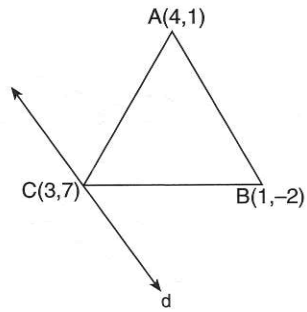
A) 3 B) 4 C) 5
D) 6 E) 7

8. A(3, 2),
B(–1, –4),
C(0, y)
⇒ **y = ?**



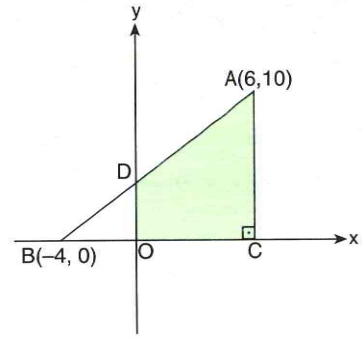
A) $-\frac{5}{2}$ B) –3 C) $-\frac{7}{2}$
D) –4 E) $-\frac{9}{2}$

9. d // [AB]
⇒ **d doğrusunun denklemi nedir?**
What is the equation of line d?



A) y = 2x – 3 B) y = 3x + 1 C) y = x + 4
D) y = x – 7 E) y = 4x + 1

10. A(6, 10),
B(–4, 0)
⇒ **A(OCAD) = ?**



A) 38 B) 40 C) 42
D) 44 E) 46

11. **Denklemleri 6x + 8y + 24 = 0 ve 3x + 4y – 48 = 0 olan doğrular arasındaki uzaklık kaç birimdir?**
What is the distance between these lines in units?

A) $6\sqrt{3}$ B) $8\sqrt{2}$ C) 12
D) 16 E) $\frac{9\sqrt{5}}{2}$

12. **A(1,2) noktasının x + 2y – 4 = 0 doğrusuna olan uzaklığı kaç birimdir?**
What is the distance between the point A(1, 2) and the line x + 2 y – 4 = 0 in units?

A) $\frac{\sqrt{5}}{5}$ B) $\frac{2\sqrt{5}}{5}$ C) $\frac{3\sqrt{5}}{5}$
D) $\frac{4\sqrt{5}}{5}$ E) $\sqrt{5}$

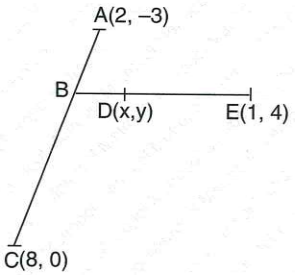
YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
A	B	E	A	E	E	D	A	C	C	C	A

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $\frac{|AB|}{|AC|} = \frac{1}{3}$, $\frac{|BD|}{|DE|} = \frac{1}{2}$, D(x, y)

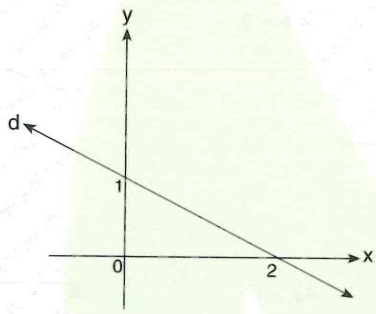
$\Rightarrow$ **x + y = ?**



A) 1 B) 2 C) 3 D) 4 E) 5

2. **d = ?**

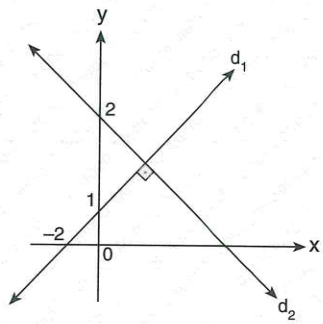
A) x + 2y + 2 = 0
B) x + 2y – 2 = 0
C) x + y – 1 = 0
D) 2x + y – 2 = 0
E) x + y + 1 = 0



3. $d_1 : y = (a-1)x + 2$,
$d_2 : y - 2ax = 1$,
$d_1 \parallel d_2$
$\Rightarrow$ **a = ?**

A) –2 B) –1 C) 0 D) 1 E) 2

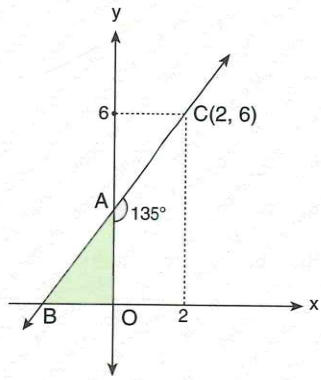
4. $d_1 \perp d_2$
$\Rightarrow$ **d_2 = ?**



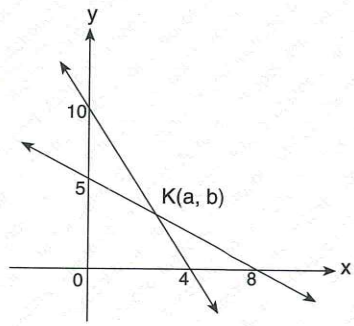
A) x – y – 1 = 0 B) x – 2y + 3 = 0
C) 2x – y + 3 = 0 D) y + 2x – 2 = 0
E) 3y – x + 1 = 0

5. $m(\widehat{OAC}) = 135°$
$\Rightarrow$ **$A(\widehat{ABO})$ = ?**

A) 4
B) 6
C) 8
D) 10
E) 12



6. **a + b = ?**



A) 6 B) 7 C) 8 D) 9 E) 10

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. **tanα = ?**

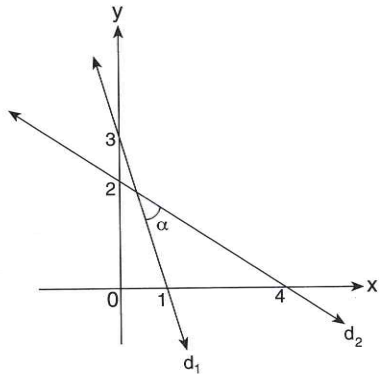
A) 1

B) $\frac{3}{2}$

C) 2

D) $\frac{5}{2}$

E) 3



8. $2 \cdot |AO| = 3 \cdot |AB|$

$\Rightarrow$ **A(AOCB) = ?**

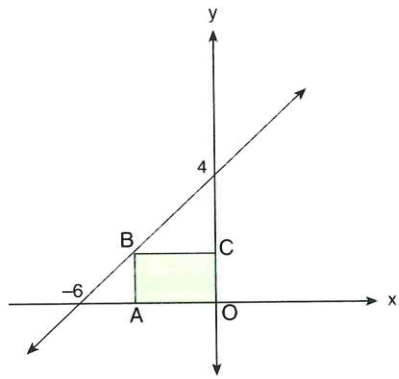
A) 6

B) 7

C) 8

D) 9,5

E) 10,5



9. **k = ?**

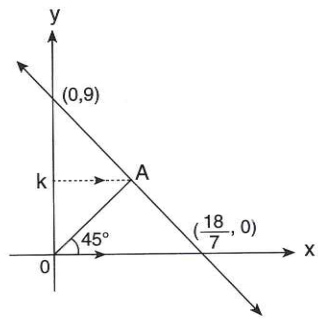
A) $\frac{1}{2}$

B) 1

C) $\frac{3}{2}$

D) 2

E) $\frac{5}{2}$



10. **$A(\widehat{OKN})$ = ?**

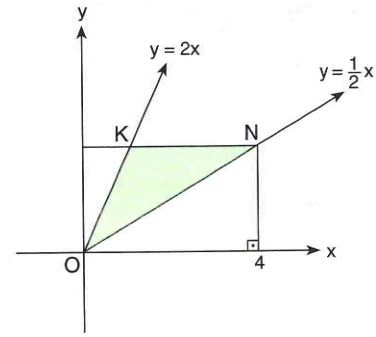
A) 1

B) 2

C) 3

D) 4

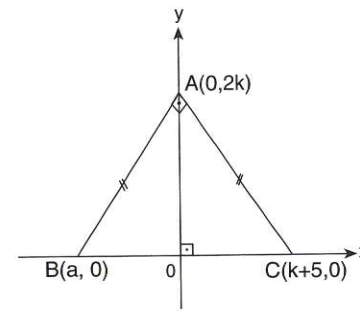
E) 5



11. $[AB] \perp [AC]$,

$|AB| = |AC|$

$\Rightarrow$ **a = ?**



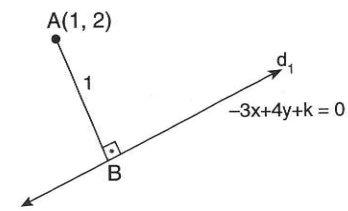
A) –12 B) –10 C) –8

D) –6 E) –5

12. $d_1 \perp [AB]$,

$|AB| = 1$ cm

$\Rightarrow$ **k = ?**



A) –8 B) –5 C) 0

D) 8 E) 10

YANITLAR / ANSWERS

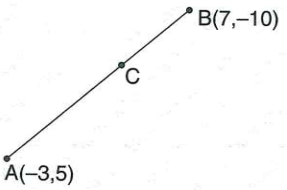
1	2	3	4	5	6	7	8	9	10	11	12
C	B	B	D	C	A	A	A	D	C	B	C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $C \in [AB]$,

$\frac{|CB|}{|CA|} = \frac{2}{3}$

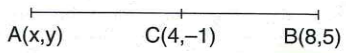
$\Rightarrow$ **C (x, y) = (?, ?)**



A) (3, –2) B) (2, –4) C) (3,–4)

D) (4,3) E) (5,–6)

2.



$2 \cdot |AC| = 3 \cdot |BC| \Rightarrow$ **x + y = ?**

A) –12 B) –10 C) –7

D) –4 E) –1

3. **A(m,n) noktası III. bölgede ise B($\frac{m}{n}$, m + n) noktası kaçıncı bölgededir?**

If A(m,n) is at quadrant III, which quadrant is B($\frac{m}{n}$, m + n) at ?

A) x ekseni / x–axis

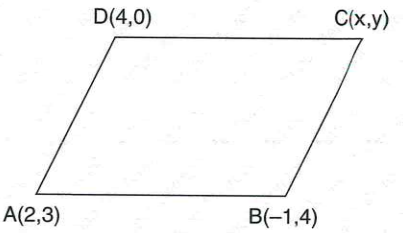
B) I

C) II

D) III

E) IV

4.



ABCD paralelkenardır./ ABCD is parallelogram.

$\Rightarrow$ **x + y = ?**

A) 1 B) 2 C) 3

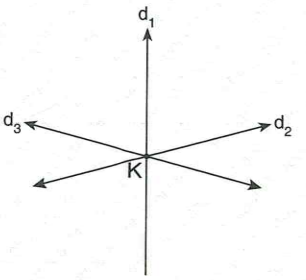
D) 4 E) 5

5. $d_1 : 2x - y - 1 = 0$

$d_2 : x + 3y + a = 0$

$d_3 : x - 3y + 7 = 0$

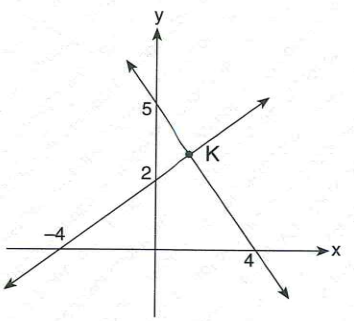
$\Rightarrow$ **a = ?**



A) –8 B) –9 C) –10

D) –11 E) –12

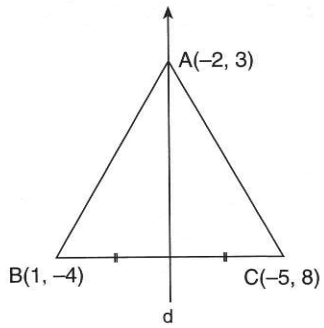
6. K(x, y) $\Rightarrow$ **x + y = ?**



A) $\frac{16}{7}$ B) $\frac{18}{7}$ C) $\frac{27}{7}$ D) $\frac{32}{7}$ E) $\frac{36}{7}$

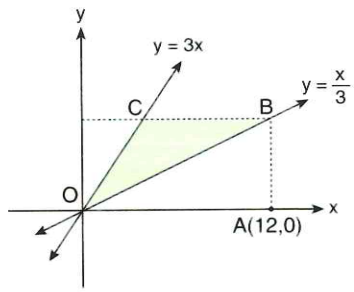
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. **Şekildeki d doğrusunun denklemi nedir?**
What is the equation of line d in the figure?



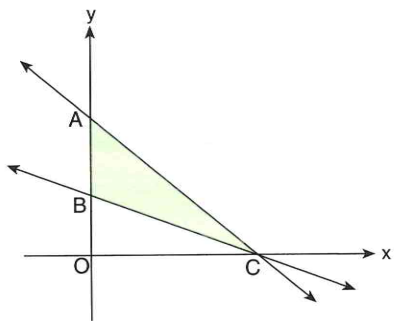
A) $x = -2$ B) $y = -2$ C) $x + y = 1$
D) $x + y = 4$ E) $x - y = 3$

8. **$A(\widehat{COB}) = ?$**



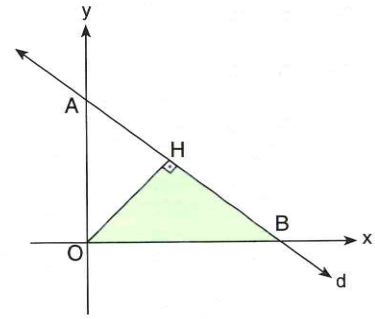
A) $\frac{16}{3}$ B) $\frac{32}{3}$ C) $\frac{64}{3}$
D) $\frac{80}{3}$ E) $\frac{100}{3}$

9. BC: $2x + 3y - 6 = 0$
A(0, 4)
$\Rightarrow$ **$A(\widehat{ABC}) = ?$**



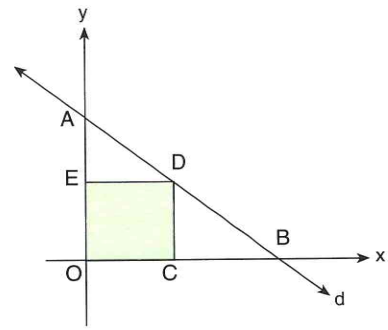
A) 2
B) 3
C) 4
D) 5
E) 6

10. $[OH] \perp [AB]$,
H(2, 6)
$\Rightarrow$ **$A(\widehat{OHB}) = ?$**



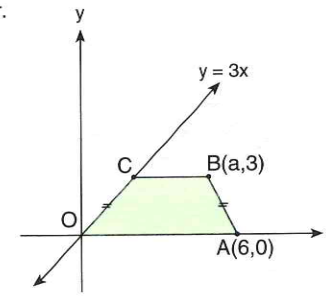
A) 40 B) 45 C) 50
D) 55 E) 60

11. OCDE bir karedir.
OCDE is a square.
A(0,6), B(12,0)
D(x, y)
$\Rightarrow$ **(x, y) = (?, ?)**



A) (3, 3)
B) (4, 4)
C) (6, 6)
D) (12, 12)
E) (–3, 5)

12. OABC bir ikizkenar yamuktur.
OABC is an isosceles trapezoid.
$\Rightarrow$ **a = ?**



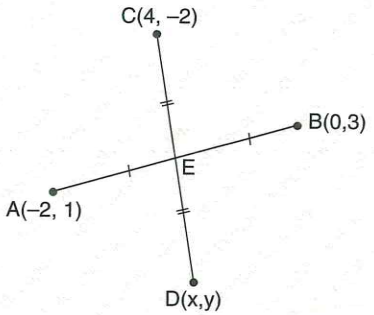
A) 2
B) 3
C) 4
D) 5
E) 6

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	A	E	B	D	D	A	C	B	E	B	D

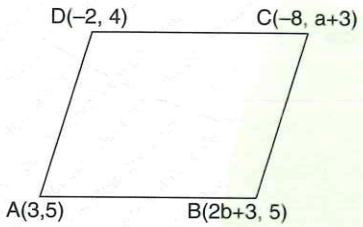
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. IAEI = IEBI,
ICEI = IEDI
⇒ **x + y = ?**



A) –2
B) –1
C) 0
D) 1
E) 2

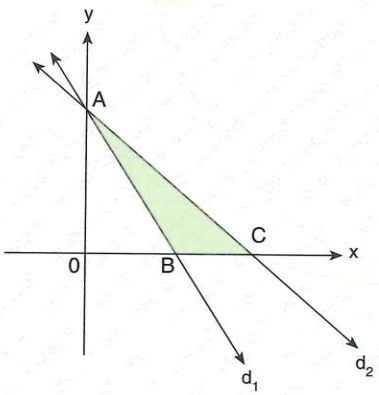
2.



ABCD bir paralelkenardır. / ABCD is a parallelogram.
⇒ **a + b = ?**

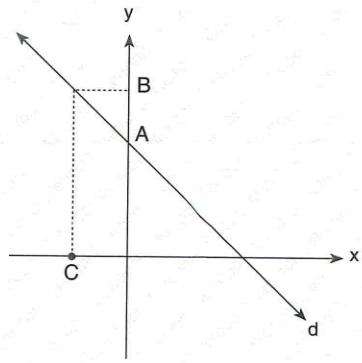
A) –2 B) –1 C) 0 D) 1 E) 2

3. $d_1: \frac{x}{4} + \frac{y}{5} = 1$
C(10, 0)
⇒ **A(ABC) = ?**



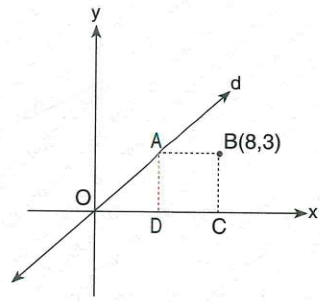
A) 10
B) 15
C) 20
D) 25
E) 30

4. A(0, 3), B(0, 5),
C(–3, 0)
⇒ **d doğrusunun denklemi nedir?**
What is the equation of line d?



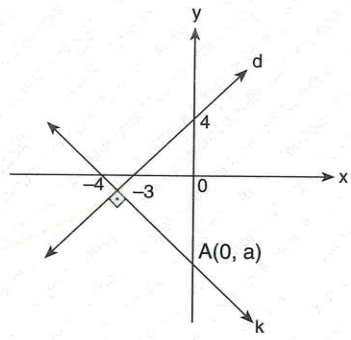
A) x + 2y – 6 = 0
B) 3x – 2y + 8 = 0
C) 2x – y + 9 = 0
D) 2x + 3y – 9 = 0
E) 3x + y – 5 = 0

5. ABCD karedir.
ABCD is square.
B(8, 3)
⇒ **d doğrusunun denklemi nedir?**
What is the equation of line d?



A) $y = \frac{x}{5}$ B) $y = \frac{2x}{5}$ C) $y = \frac{3x}{5}$ D) $y = \frac{4x}{5}$ E) $y = \frac{6x}{5}$

6.

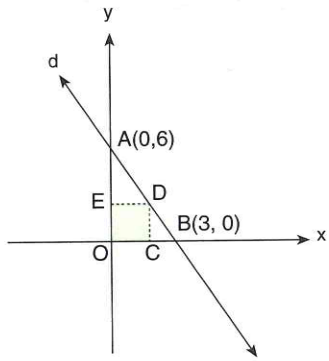


k ⊥ d ⇒ **a = ?**

A) –6 B) $-\frac{7}{2}$ C) –3 D) –2 E) $-\frac{3}{2}$

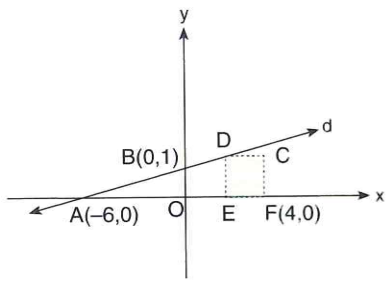
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. OCDE bir karedir.
OCDE is a square.
⇒ **A(OCDE) = ? cm²**



A) $\frac{1}{4}$
B) $\frac{9}{4}$
C) 1
D) $\frac{25}{16}$
E) 4

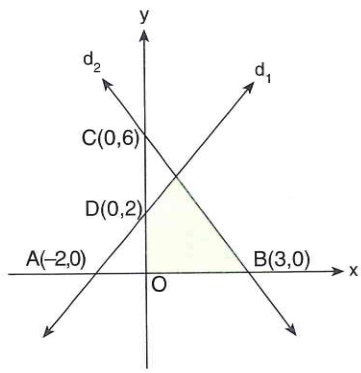
8.



EFCD bir karedir. / EFCD is a square.
⇒ **A(EFCD) = ? cm²**

A) $\frac{49}{25}$ B) $\frac{81}{25}$ C) $\frac{100}{49}$ D) $\frac{121}{81}$ E) $\frac{144}{125}$

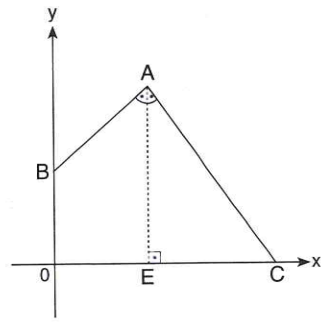
9.



⇒ **Taralı alan / The shaded area = ? cm²**

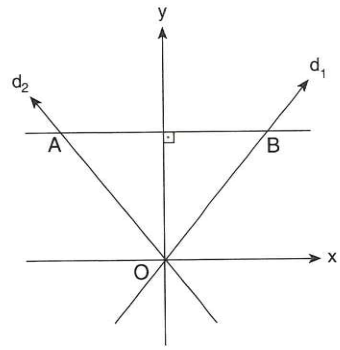
A) 7 B) $\frac{22}{3}$ C) $\frac{19}{3}$ D) 6 E) $\frac{17}{7}$

10. [AE] bir açıortaydır.
[AE] is a bisector.
A(2, 6), C(10, 0)
B(0, y) ⇒ **y = ?**



A) $\frac{5}{2}$ B) 3 C) $\frac{7}{2}$ D) 4 E) $\frac{9}{2}$

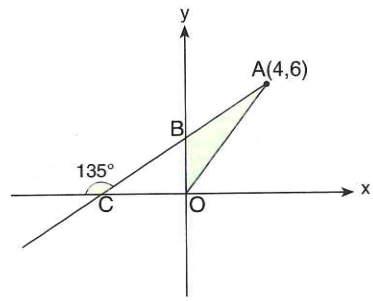
11. $d_1 : y = x$,
$d_2 : y + 3x = 0$,
$|AB| = 12$ cm
⇒ **|OB| = ? cm**



A) $3\sqrt{2}$ B) $4\sqrt{2}$ C) $6\sqrt{2}$ D) $8\sqrt{2}$ E) $9\sqrt{2}$

12. **A($\widehat{AOB}$) = ? cm²**

A) 8
B) 6
C) $\frac{9}{2}$
D) 4
E) $\frac{7}{2}$



YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	A	B	D	C	C	E	C	C	E	E	D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.

A(2,a) C(3,–2) B(b+2,3a–1)

$|AC| = |CB| \Rightarrow$ **a + b = ?**

A) $\frac{1}{2}$

B) $\frac{3}{4}$

C) 1

D) $\frac{5}{4}$

E) $\frac{3}{2}$

2.

A(1,2) B(–1,6) C(a,b)

$|AB| = \frac{4}{3} \cdot |BC| \Rightarrow$ **C (a, b) = ?**

A) $\left(-3,\frac{9}{2}\right)$ B) (–2, 3) C) $\left(-\frac{5}{2},3\right)$

D) (–2, 9) E) $\left(-\frac{5}{2},9\right)$

3. $a \neq 1$,

A(3, 1), B(a, a)

$|AB| = 2 \Rightarrow$ **a = ?**

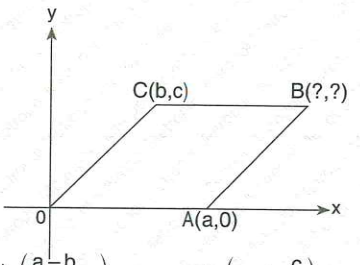
A) 2 B) 3 C) 4

D) 5 E) 6

4. [OA] // [CB],

[OC] // [AB]

$\Rightarrow$ **B (?,?) = ?**



A) $\left(\frac{a+b}{2},c\right)$ B) $\left(\frac{a-b}{2},c\right)$ C) $\left(a+b,\frac{c}{2}\right)$

D) $\left(a-b,\frac{c}{2}\right)$ E) (a + b, c)

5. $|AC| = |CB| \Rightarrow$ **|OC| = ?**

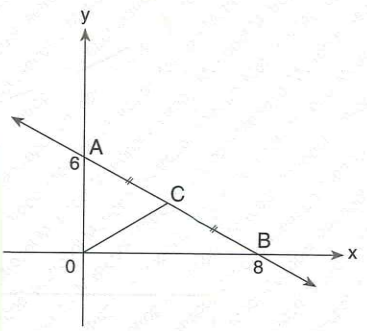
A) 4

B) $\frac{9}{2}$

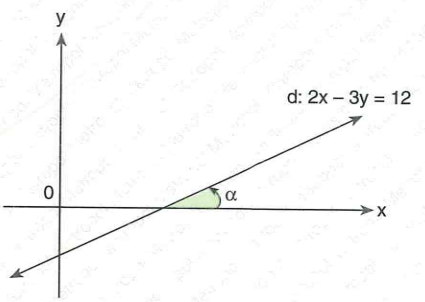
C) 5

D) $\frac{11}{2}$

E) 6



6. **cosα = ?**



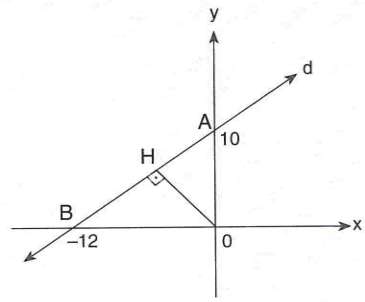
A) $\frac{1}{2}$ B) $\frac{3}{\sqrt{13}}$ C) $\frac{\sqrt{3}}{4}$

D) $\frac{5}{\sqrt{13}}$ E) $\frac{\sqrt{3}}{2}$

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $[OH] \perp [AB]$

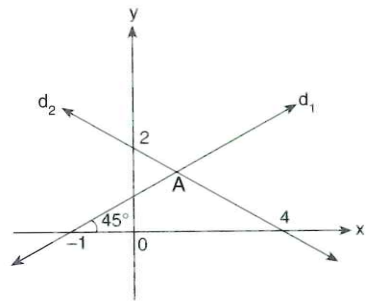
$\Rightarrow$ **$|OH| = ?$**



A) $2\sqrt{15}$ B) $\frac{60}{\sqrt{61}}$ C) $\frac{20}{\sqrt{7}}$

D) $5\sqrt{2}$ E) $\frac{4\sqrt{5}}{3}$

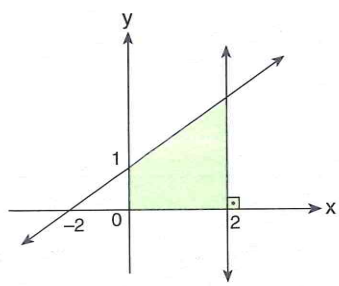
8. **A(a, b) = ?**



A) $\left(\frac{1}{2}, \frac{5}{4}\right)$ B) $\left(\frac{1}{2}, \frac{3}{2}\right)$ C) $\left(\frac{1}{3}, \frac{5}{3}\right)$

D) $\left(\frac{2}{3}, \frac{5}{3}\right)$ E) $\left(\frac{2}{3}, \frac{4}{3}\right)$

9.



$\Rightarrow$ **Taralı alan / The shaded area = ?**

A) 2 B) 3 C) 4

D) 5 E) 6

10. $|AD| = |BC|$

$\Rightarrow$ **A(ABCD) = ?**

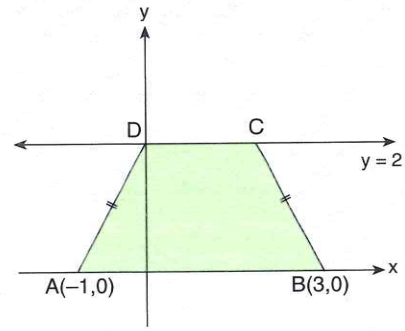
A) 6

B) 8

C) 9

D) 10

E) 12



11. $A(\widehat{ABC}) = 18\,cm^2$

$\Rightarrow$ **b = ? cm**

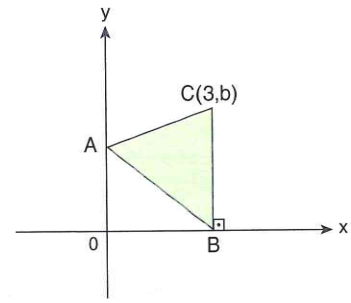
A) 6

B) 8

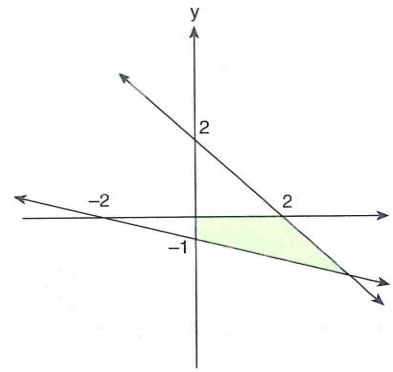
C) 9

D) 11

E) 12



12.



$\Rightarrow$ **Taralı alan / The shaded area = ?**

A) 3 B) $\frac{7}{2}$ C) 4

D) 5 E) 7

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	E	B	E	C	D	B	D	B	A	E	E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

BÖLÜM CHAPTER 14

TARİHSEL NOT / HISTORICAL NOTE

Georg Friedrich Bernhard Riemann [1826 – 1866]

Bir Alman matematikçidir. Analiz, sayı teorisi ve diferansiyel geometriye katkıda bulunan, gerçek analiz alanında, integrallerin ilk titiz formülasyonu, Riemann integrali ve Fourier serileri üzerine çalışmaları bilinir. Riemann hipotezinin orijinal ifadesini içeren asal sayma işleviyle ilgili ünlü 1859 tarihli makalesi, analitik sayı teorisindeki en etkili makalelerden biri olarak kabul edilmektedir. Geometriye öncülük eden katkılarıyla Riemann, genel göreliliğin matematiğinin temellerini attı.

He was a German mathematician who made contributions to analysis, number theory, and differential geometry. In the field of real analysis, he is mostly known for the first rigorous formulation of the integral, the Riemann integral, and his work on Fourier series. His famous 1859 paper on the prime-counting function, containing the original statement of the Riemann hypothesis, is regarded as one of the most influential papers in analytic number theory. Through his pioneering contributions to differential geometry, Riemann laid the foundations of the mathematics of general relativity.

ÇEMBERİN ANALİTİĞİ
CIRCLE in ANALYTIC GEOMETRY

Bu bölüm, 9 çözümlü örnek, 6 çözümlü test sorusu, 6 çözümlü YÖS sorusu, 12 alıştırma sorusu, 23 test sorusu içermektedir.

This chapter includes 9 examples with solutions, 6 test questions with solutions, 6 YÖS questions with solutions, 12 exercise questions and 23 test questions.

BÖLÜM / CHAPTER 14 ..... 477 - 494

ÇEMBERİN ANALİTİĞİ / CIRCEL in ANALYTIC GEOMETRY

- Merkezi ve Yarıçpı Bilinen Çemberin Denklemi / The Equation of a Circle Whose and Center are Known 479
- Çemberin Genel Denklemi / General Equation of a Circle ..... 479 - 484
  - Özel Çemberler / The Specifical circles ..... 480 - 484
- ▲ Çözümlü Test / Test With Solutions ..... 485 - 486
- ▲ YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 487 - 488
- ▲ Alıştırmalar / Exercises ..... 489 - 490
- ▲ Konu Testleri / Practice Tests ..... 491 - 494

BÖLÜM
14
CHAPTER

ÇEMBERİN ANALİTİĞİ
CIRCLE in ANALYTIC GEOMETRY

MERKEZİ VE YARIÇAPI BİLİNEN ÇEMBERİN DENKLEMİ / THE EQUATION of a CIRCLE WHOSE RADIUS and CENTER are KNOWN

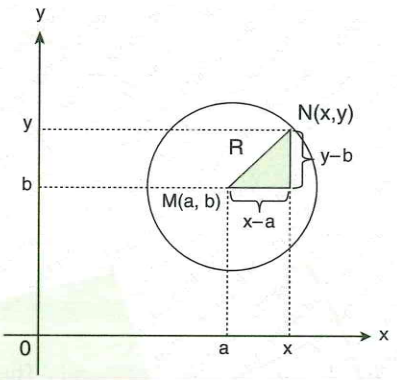
Merkez / The center : M(a, b)

Yarıçap / The radius: R

N(x, y) $\Rightarrow$ IMNI = R

$\Rightarrow \sqrt{(x-a)^2+(y-b)^2} = R$

$\Rightarrow (x-a)^2+(y-b)^2 = R^2$



Örnek / Example 1

Şekildeki çemberin denklemi nedir?

What is the equation of the circle given in the figure?

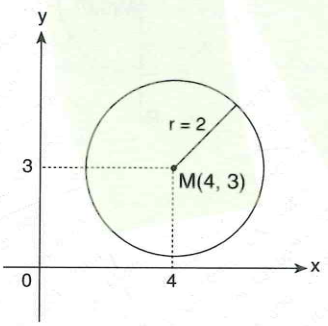
A) $(x-4)^2+(y-3)^2=2$

B) $(x-4)^2+(y-3)^2=4$

C) $(x+4)^2+(y-3)^2=4$

D) $(x+4)^2+(y+3)^2=4$

E) $(x-4)^2+(y+3)^2=4$



Çözüm / Solution Yanıt / Answer **B**

M(4, 3), r = 2 cm $\Rightarrow (x-4)^2+(y-3)^2=2^2$

$(x-4)^2+(y-3)^2=4$

ÇEMBERİN GENEL DENKLEMİ / GENERAL EQUATION of a CIRCLE

M(a, b): Merkez / center
R: yarıçap / radius
$\Rightarrow (x-a)^2+(y-b)^2=R^2$

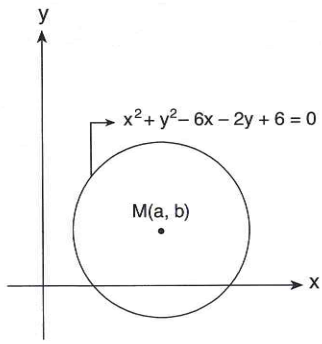
$x^2+y^2-2ax-2by+a^2+b^2-R^2=0$
$-2a=D,\ -2b=E,\ a^2+b^2-R^2=F$
$\Rightarrow x^2+y^2+Dx+Ey+F=0 \Rightarrow \Delta = D^2+E^2-4F>0$

$\Rightarrow M\left(-\frac{D}{2},-\frac{E}{2}\right),\ R=\frac{1}{2}\sqrt{\Delta}$

Örnek / Example 2

M(a, b) = ?

A) (3, 1)
B) (2, 1)
C) (–2, 2)
D) (2, –1)
E) (–2, 1)



Çözüm / Solution Yanıt / Answer **A**

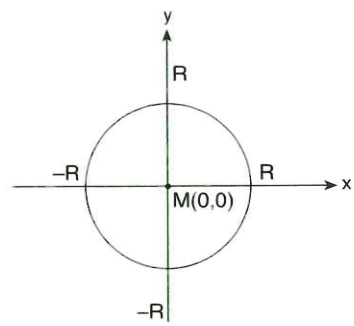
$M\left(-\frac{D}{2},-\frac{E}{2}\right)$

$M=\left(-\frac{-6}{2},-\frac{-2}{2}\right)\Rightarrow M(3,1)$

ÖZEL ÇEMBERLER / THE SPECIFICAL CIRCLES

Merkezi Orijin Olan Çemberin Denklemi / The Equation of a Circle the Center of Which is the Origin

M(0, 0) , r = R $\Rightarrow$ $(x-0)^2+(y-0)^2=x^2+y^2=R^2$

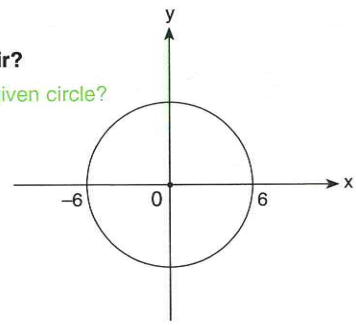


Örnek / Example 3

R = 6

⇒ Çemberin denklemi nedir?

What is the equation of the given circle?



A) $x^2+y^2=9$
B) $x^2+y^2=6$
C) $x^2-y^2=36$
D) $x^2+y^2=36$
E) $x^2+y^2=16$

Çözüm / Solution Yanıt / Answer **D**

R = 6, M(0,0)

$\Rightarrow (x-0)^2+(y-0)^2=6^2$

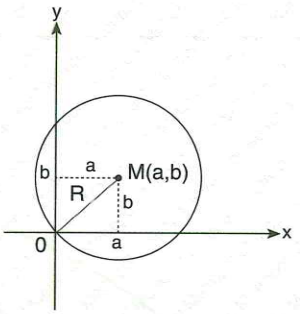
$\Rightarrow x^2+y^2=36$

Başlangıç Noktasından Geçen Çemberin Denklemi / The Equation of a Circle Passing Through the Origin

M(a, b) , r = R ⇒ $R^2 = a^2 + b^2$

$F = a^2 + b^2 - R^2 = 0$

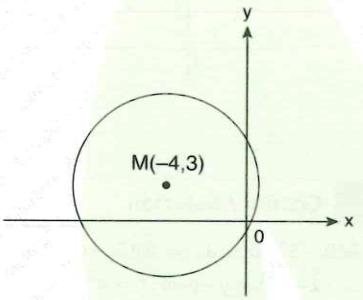
$x^2 + y^2 + Dx + Ey = 0$



Örnek / Example 4

M (–4, 3)

⇒ R = ? br (u)



A) 10 B) 9 C) 8 D) 7 E) 5

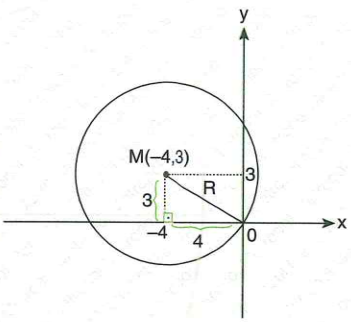
Çözüm / Solution

Yanıt / Answer E

$R^2 = 3^2 + 4^2$

$= 25$

R = 5 br(u)



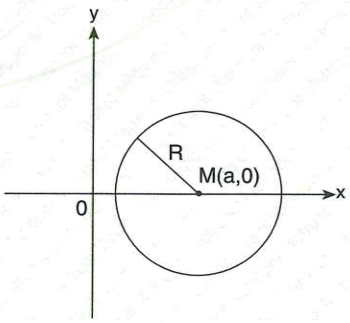
Merkezi Ox Ekseni Üzerinde Olan Bir Çemberin Denklemi
The Equation of Circle the Center of Which Lies on the Ox axes

M(a, 0) , r = R ⇒ $(x - a)^2 + (y - 0)^2 = R^2$

$(x - a)^2 + y^2 = R^2$

$Ey = 0 , F = a^2 - R^2$

$x^2 + y^2 + Dx + F = 0$



Örnek / Example 5

$x^2+y^2-4x+3=0 \Rightarrow$ **R = ?**

A) 1 B) $\frac{3}{2}$ C) 2 D) $\frac{5}{2}$ E) 3

Çözüm / Solution Yanıt / Answer **A**

$D=-4,\ E=0,\ F=3$

$R=\frac{1}{2}\cdot\sqrt{\Delta}=\frac{1}{2}\cdot\sqrt{D^2+E^2-4F}$

$=\frac{1}{2}\cdot\sqrt{16-12}$

$=\frac{1}{2}\cdot\sqrt{4}$

$=1$

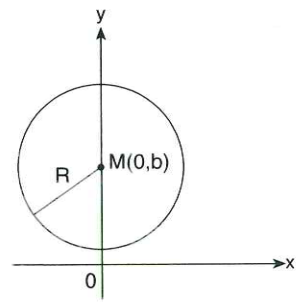
Merkezi Oy Ekseni Üzerinde Olan Bir Çemberin Denklemi / The Equation of Circle the Center of Which Lies Oy axis

M(0, b), r = R ⇒ $(x-0)^2+(y-b)^2=R^2$

$x^2+(y-b)^2=R^2$

$Dx=0,\ F=b^2-R^2$

$x^2+y^2+Ey+F=0$

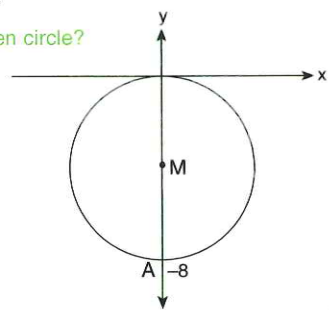


Örnek / Example 6

A(0, –8)

⇒ **Çemberin denklemi nedir?**

What is the equation of the given circle?



A) $x^2+y^2=64$

B) $x^2+(y+4)^2=64$

C) $x^2+y^2=16$

D) $x^2+(y+4)^2=16$

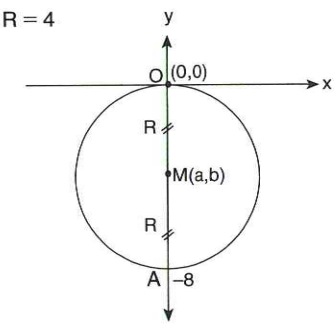
E) $x^2-(y+4)^2=16$

Çözüm / Solution Yanıt / Answer **D**

A(0,–8), O(0,0) ⇒ M(0,–4), R = 4

⇒ $(x-0)^2+(y-(-4))^2=4^2$

⇒ $x^2+(y+4)^2=16$



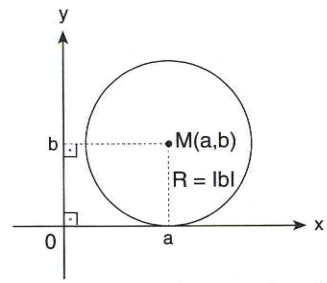
Ox Eksenine Teğet Olan Çemberin Denklemi / The equation of a Circle Tangent to the Ox axis

M(a, b), R = |b| ⇒ $(x-a)^2+(y-b)^2=R^2$

$(x-a)^2+(y-b)^2=b^2$

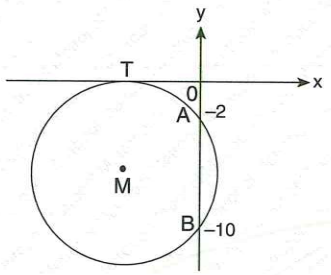
$F=a^2+b^2-R^2 \Rightarrow F=a^2$

$x^2+y^2+Dx+Ey+F=0$



Örnek / Example 7

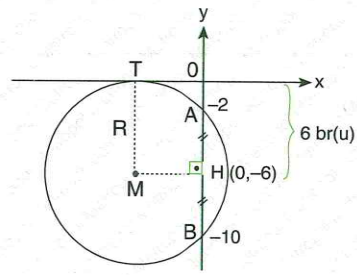
A(0,−2), B(0,−10)
⇒ **R = ?**



A) 4 B) 5 C) 5,5 D) 6 E) 6,5

Çözüm / Solution Yanıt / Answer **D**

⇒ R = 6 br(u)



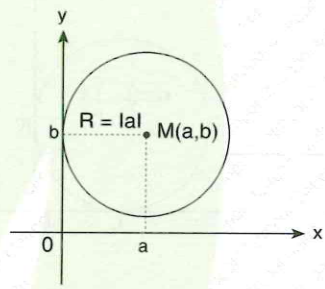
Oy Eksenine Teğet Olan Çemberin Denklemi / The Equation of a Circle Tangent to the Oy axis

M(a, b) , R = |a| ⇒ $(x-a)^2 + (y-b)^2 = R^2$

$(x-a)^2 + (y-b)^2 = a^2$

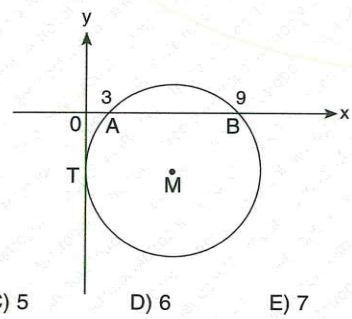
$F = a^2 + b^2 - R^2 \Rightarrow F = b^2$

$x^2 + y^2 + Dx + Ey + F = 0$



Örnek / Example 8

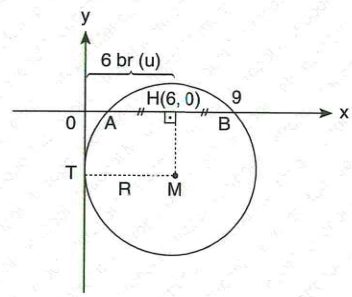
A(3,0),B(9,0)
⇒ **R = ?**



A) 3 B) 4 C) 5 D) 6 E) 7

Çözüm / Solution Yanıt / Answer **D**

⇒ R = 6 br(u)

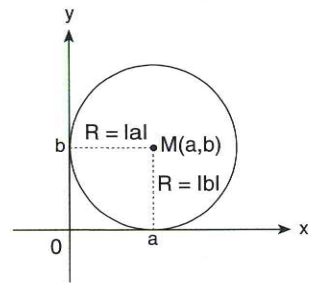


Her İki Eksene de Teğet Olan Çemberin Denklemi / The Equation of a Circle Tangent to the Both Axes

M(a, b) , R = |a| = |b| ⇒ $(x-a)^2+(y-b)^2=R^2$

$F=a^2+b^2-R^2 \Rightarrow F=R^2$

$x^2+y^2+Dx+Ey+F=0$

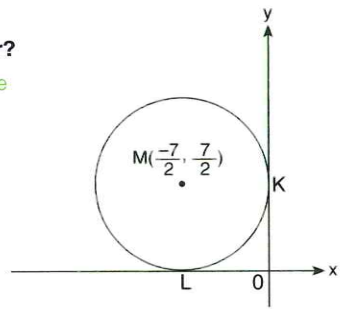


Örnek / Example 9

$M\left(\frac{-7}{2},\frac{7}{2}\right)$

⇒ **Çemberin denklemi nedir?**

What is the equation of the given circle?



A) $\left(x-\frac{7}{2}\right)^2+\left(y-\frac{7}{2}\right)^2=\frac{49}{4}$

B) $\left(x+\frac{7}{2}\right)^2+\left(y+\frac{7}{2}\right)^2=\frac{49}{4}$

C) $\left(x+\frac{7}{2}\right)^2+\left(y-\frac{7}{2}\right)^2=\frac{49}{4}$

D) $\left(x+\frac{7}{2}\right)^2+\left(y-\frac{7}{2}\right)^2=\frac{7}{2}$

E) $\left(x-\frac{7}{2}\right)^2+\left(y-\frac{7}{2}\right)^2=\frac{7}{2}$

Çözüm / Solution

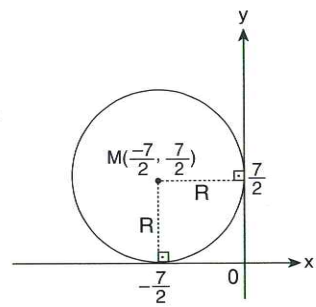
Yanıt / Answer **C**

$M\left(-\frac{7}{2},\frac{7}{2}\right)$

$\Rightarrow R=\frac{7}{2}$ br(u)

$\Rightarrow \left(x-\left(-\frac{7}{2}\right)\right)^2+\left(y-\frac{7}{2}\right)^2=\left(\frac{7}{2}\right)^2$

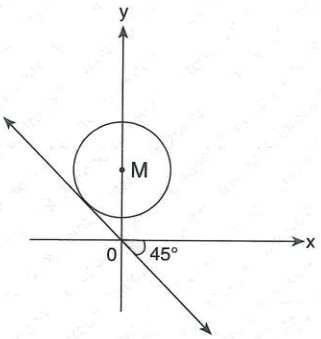
$\Rightarrow \left(x+\frac{7}{2}\right)^2+\left(y-\frac{7}{2}\right)^2=\frac{49}{4}$



1. M(0,4)

⇒ **Şekildeki çemberin denklemi nedir?**

What is the equation of the given circle in the figure?



A) $x^2 + (y-4)^2 = 2\sqrt{2}$

B) $x^2 + (y-4)^2 = 8$

C) $x^2 + (y+4)^2 = 8$

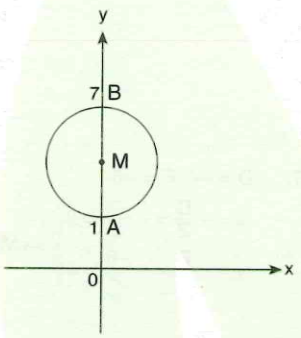
D) $x^2 + (y-4)^2 = 16$

E) $x^2 + (y-4)^2 = 4$

2. A(0,1), B(0,7)

⇒ **Şekildeki çemberin denklemi nedir?**

What is the equation of the given circle in the figure?



A) $x^2 + y^2 = 9$

B) $x^2 + (y-4)^2 = 9$

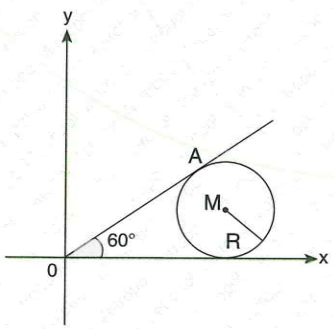
C) $x^2 + (y+4)^2 = 9$

D) $x^2 + (y-3)^2 = 6$

E) $(x-1)^2 + (y-4)^2 = 9$

3. A(3, 4), M(x, y)

⇒ **R = ?**



A) 2

B) $5\sqrt{3}$

C) $\frac{\sqrt{3}}{5}$

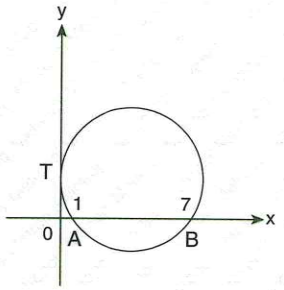
D) $\frac{5\sqrt{3}}{3}$

E) $5\sqrt{2}$

4. A(1,0), B(7,0)

Şekildeki çemberin denklemi nedir?

What is the equation of the given circle in the figure?



A) $(x-4)^2 + (y-2\sqrt{2})^2 = 16$

B) $(x-4)^2 + (y+\sqrt{7})^2 = 16$

C) $(x+4)^2 + (y+2\sqrt{2})^2 = 16$

D) $(x-4)^2 + (y-\sqrt{7})^2 = 16$

E) $x^2 + y^2 = 16$

5. $x^2 + y^2 - 4x - 6y - 12 = 0$

⇒ **M(x, y) = (?, ?)**

A) (2, 3)

B) (–2, –3)

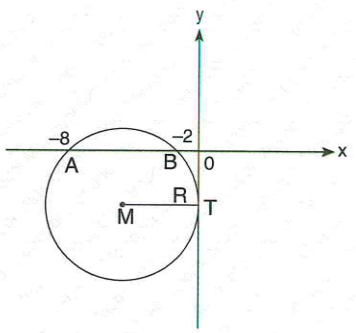
C) (–2, 3)

D) (4, 6)

E) (3, 2)

6. A(–8,0), B(–2,0)

⇒ **R = ?**



A) 3

B) $\frac{7}{2}$

C) $\frac{4}{7}$

D) $\frac{9}{2}$

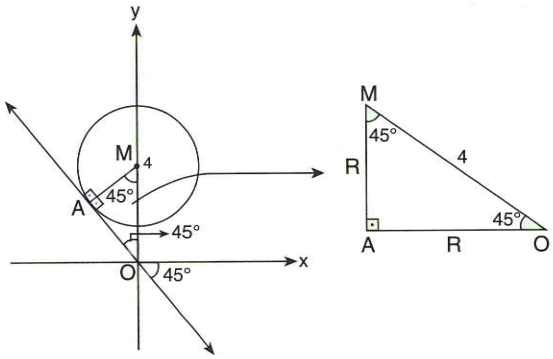
E) 5

YANITLAR / ANSWERS

1	2	3	4	5	6
B	B	D	D	A	E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



Şekildeki MAO üçgeni ikizkenar dik üçgendir.
MAO is a right isosceles triangle in the figure.

$\Rightarrow |MA| = |AO| = R$

$R = \frac{4}{\sqrt{2}} = 2\sqrt{2}$, $M(0,4)$

$(x-a)^2 + (y-b)^2 = R^2$

$x^2 + (y-4)^2 = (2\sqrt{2})^2$

$x^2 + (y-4)^2 = 8$

Yanıt / The Answer is B

2. M noktası orta noktadır. / M is midpoint.

$M(0,y) \Rightarrow y = \frac{7+1}{2} = 4$

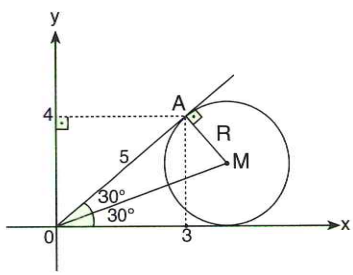
$M(0,4) \Rightarrow R = 3$

$(x-a)^2 + (y-b)^2 = R^2$

$x^2 + (y-4)^2 = 9$

Yanıt / The Answer is B

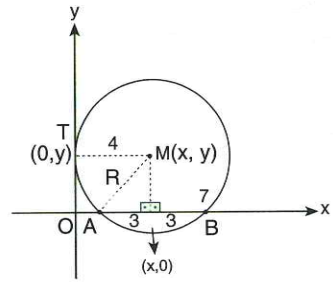
3.



$|OA| = 5 \Rightarrow R = \frac{5}{\sqrt{3}} = \frac{5\sqrt{3}}{3}$

Yanıt / The Answer is D

4.



$A(1,0), B(7,0) \Rightarrow (x,0) = \left(\frac{1+7}{2}, 0\right)$

$= (4,0)$

$\Rightarrow R = 4 \text{ br } (u)$

$\Rightarrow R^2 = y^2 + 3^2$

$4^2 = y^2 + 9$

$7 = y^2$

$\sqrt{7} = y \Rightarrow M(4\sqrt{7}), R = 4$

$\Rightarrow (x-4)^2 + (y-\sqrt{7})^2 = 16$

Yanıt / The Answer is D

5. $D = -4$, $E = -6$,

$$\left.\begin{array}{l} x = -\frac{D}{2} = -\frac{-4}{2} = 2 \\ y = -\frac{E}{2} = -\frac{-6}{2} = 3 \end{array}\right\} \Rightarrow M(x,y) = (2,3)$$

Yanıt / The Answer is A

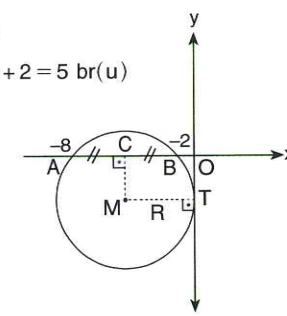
6. M çemberin merkezi / The center of the circle M

$|AC| = |CB|$

$|AB| = -2 - (-8) = 6$

$\Rightarrow |AC| = |CB| = \frac{6}{2} = 3$

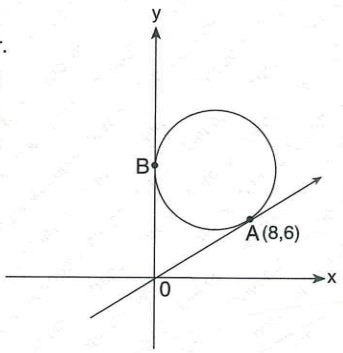
$\Rightarrow R = |MT| = |CO| = 3 + 2 = 5 \text{ br}(u)$



Yanıt / The Answer is E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

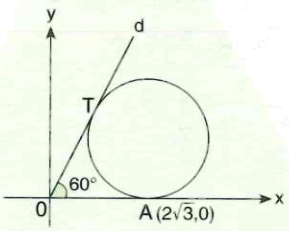
1. Şekildeki çemberde A ve B teğetlerin değme noktalarıdır.
In te shape above, the circle is tangent to points A and B.
Çemberin denklemi nedir?
What is the equation of the circle?



A) $(x-5)^2+(y-10)^2=25$
B) $(x-10)^2+(y-5)^2=25$
C) $(x-6)^2+(y-8)^2=36$
D) $(x-4)^2+(y-10)^2=25$
E) $(x-3)^2+(y-5)^2=4$

[BALIKESİR ÜNİVERSİTESİ – YÖS 2017]

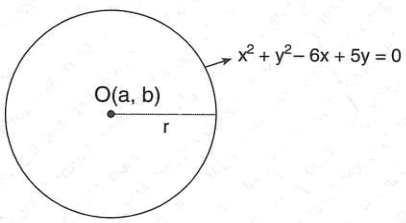
2. $M(\widehat{TOA})=60° \Rightarrow$ **R = ?**



A) $\sqrt{3}$ B) $\sqrt{2}$ E) 2
D) 3 E) 4

[YÖS 2010]

3.

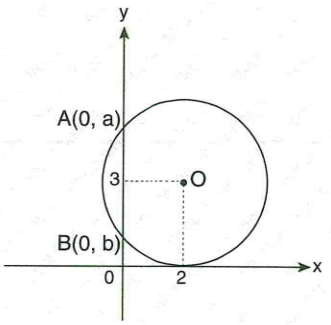


r = ? cm

A) $\frac{11}{2}$ B) $\frac{15}{2}$ C) $\frac{9}{4}$
D) $\frac{\sqrt{15}}{2}$ E) $\frac{\sqrt{61}}{2}$

[YÖS 2008]

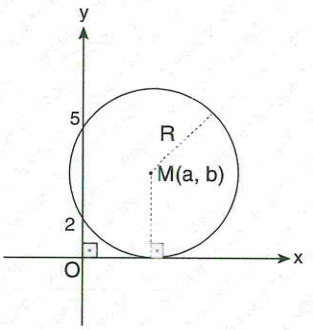
4. **Şekildeki çemberde**
In the circle in the figure
a = ?



A) $3\sqrt{3}$ B) $3+\sqrt{3}$ C) $3+\sqrt{5}$
D) 4 E) 5

[YÖS 1989]

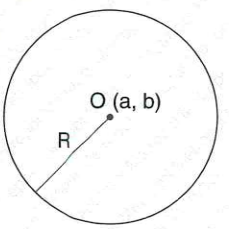
5. **Şekildeki çemberde**
According to the circle in the figure.
R = ?



A) $\frac{5}{2}$ B) 3 E) $\frac{7}{2}$
D) 4 E) $\frac{9}{2}$

[YÖS 1987]

6. $x^2 + y^2 - 4x + 6y + 9 = 0$
$\Rightarrow$ **O(a, b) = (?, ?) ; R = ?**



A) (–2, 3); 2 B) (2, 3); 3 C) (–2, 3); 3
D) (2, –3); 3 E) (2, –3); 2

[YÖS 1985]

YANITLAR / ANSWERS

1	2	3	4	5	6
A	C	E	C	C	E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $|OA| = |OB| = 10$ br(u)

$|KA| = 8 - R$

$|ON| = 6$ br (u) $\Rightarrow |BN| = 4 = |KM|$

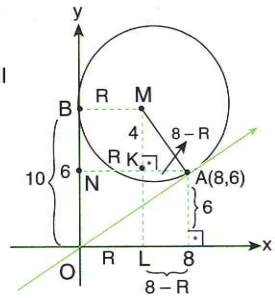
$\overset{\triangle}{KMA}$:

$4^2 + (8-R)^2 = R^2 \Rightarrow R = 5$

$M(5, 10)$

$(x-5)^2 + (y-10)^2 = 5^2$

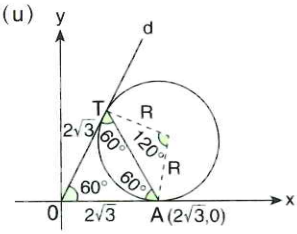
$(x-5)^2 + (y-10)^2 = 25$



Yanıt / The Answer is A

2. $|OA| = |OT| = |AT| = 2\sqrt{3}$ br (u)

$m(\widehat{TMA}) = 120° \Rightarrow R = 2$



Yanıt / The Answer is C

3. $x^2 + y^2 - 6x + 5y = 0$

$D = -6,\ E = 5,\ F = 0$

$\Rightarrow r = \frac{1}{2} \cdot \sqrt{\triangle} = \frac{1}{2} \cdot \sqrt{D^2 + E^2 - 4F}$

$= \frac{1}{2} \cdot \sqrt{36 + 25}$

$= \frac{1}{2} \cdot \sqrt{61}$ br (u)

Yanıt / The Answer is E

4. $O(2, 3),\ R = 3$

$\left.\begin{array}{l}(x-2)^2 + (y-3)^2 = 9 \\ A(0,a) \Rightarrow x = 0,\ y = a\end{array}\right\} (0-2)^2 + (a-3)^2 = 9$

$\Rightarrow (a-3)^2 = 9 - 4$

$(a-3)^2 = 5,\ a_1 = 3 + \sqrt{5},\ a_2 = 3 - \sqrt{5}$

$\Rightarrow a > 3,\ a_1 = 3 + \sqrt{5} = a$

Yanıt / The Answer is C

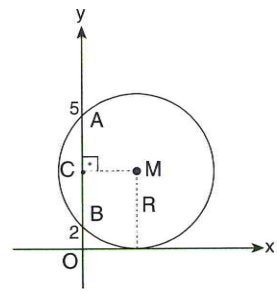
5. $|AC| = |CB|$

$R = |OC| = \frac{|AB|}{2} + 2$

$R = \frac{5-2}{2} + 2$

$= \frac{3}{2} + 2$

$= \frac{7}{2}$



Yanıt / The Answer is C

6. $O\left(-\frac{D}{2}, -\frac{E}{2}\right)$

$D = -4,\ E = 6,\ F = 9$

$\Rightarrow O(2, -3)$

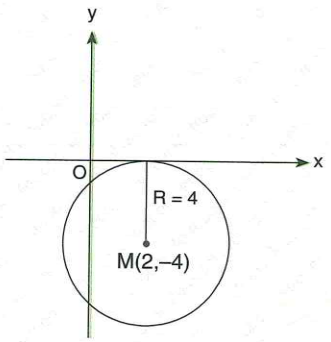
$R = \frac{1}{2}\sqrt{D^2 + E^2 - 4F} = \frac{1}{2}\sqrt{16 + 36 - 4 \cdot 9}$

$= \frac{1}{2} \cdot 4 = 2$

Yanıt / The Answer is E

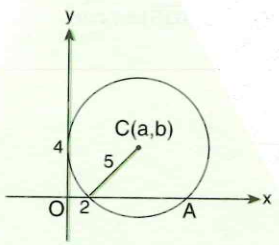
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. **Şekildeki çemberin denklemi nedir?**
What is the equation of the circle in the figure?



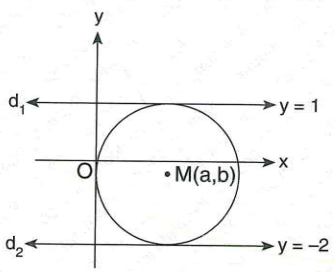
Yanıt / The Answer is $(x-2)^2+(y+4)^2=16$

2. **a + b = ?**



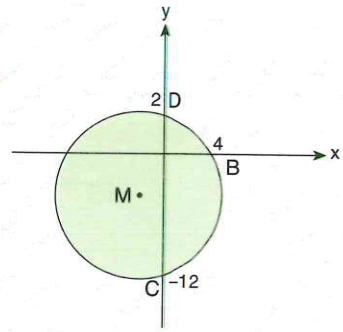
Yanıt / The Answer is **9**

3. d_1 ve d_2 doğruları şekildeki çembere teğettir.
Lines d_1 and d_2 are tangent lines as shown in the figure.
⇒ **M(a,b) = (?,?)**



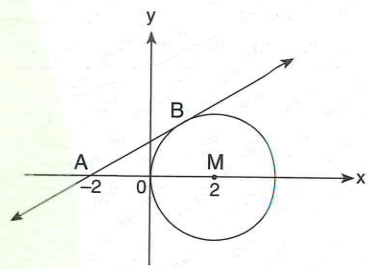
Yanıt / The Answer is $\left(\frac{3}{2},-\frac{1}{2}\right)$

4. D(a,2), B(4,0), C(O,–12)
⇒ **Şekildeki dairenin alanı kaç birimkaredir?**
How many units is the area of the circle in the figure?



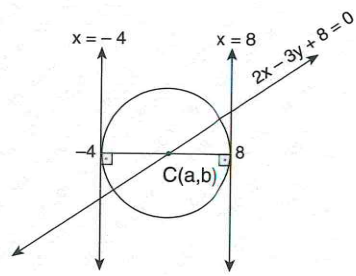
Yanıt / The Answer is 50π

5. **|AB| = ? br (u)**



Yanıt / The Answer is $2\sqrt{3}$

6. **Şekildeki çemberin denklemi nedir?**
What is the equation of the circle in the figure?

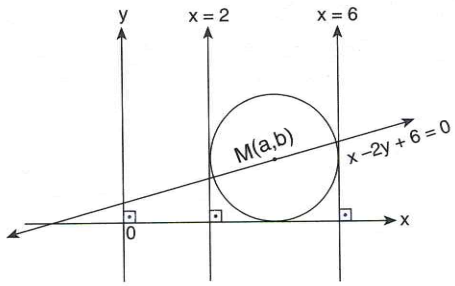


Yanıt / The Answer is $(x-2)^2+(y-4)^2=36$

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. M(a,b)

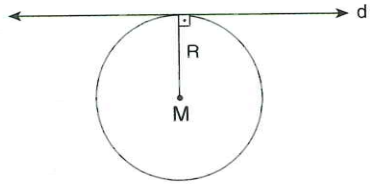
⇒ a + b = ?



Yanıt / The Answer is 9

8. d : 8x + 6y + 10 = 0,

M(–1, 1) ⇒ **R = ?**

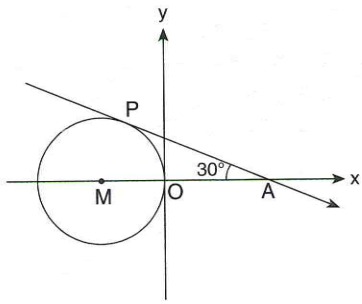


Yanıt / The Answer is $\frac{4}{5}$

9. $m(\widehat{MAP}) = 30°$,

$|PA| = 2\sqrt{3}$ cm

⇒ |OA| = ? cm



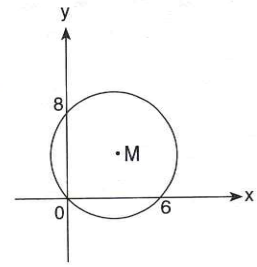
Yanıt / The Answer is 2

10. M noktası şekildeki çemberin merkezidir.

M is center of the circle in the figure.

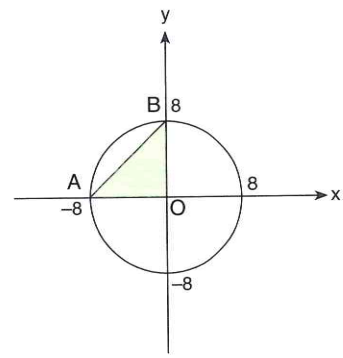
⇒ Çemberin denklemi nedir?

What is the equation of the circle?



Yanıt / The Answer is $(x-3)^2 + (y-4)^2 = 25$

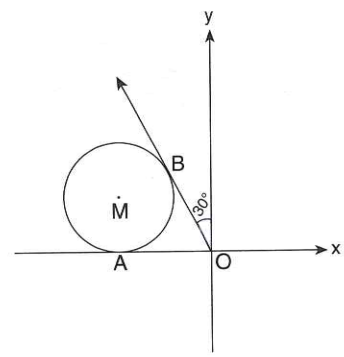
11. $A(\widehat{AOB}) = ?\ cm^2$



Yanıt / The Answer is 32

12. |AO| = $5\sqrt{3}$ cm

⇒ R = ? cm

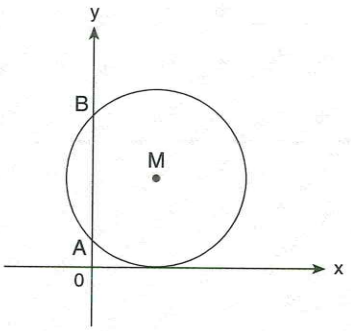


Yanıt / The Answer is 5

METROPOL YAYINLARI • METROPOL PUBLICATIONS

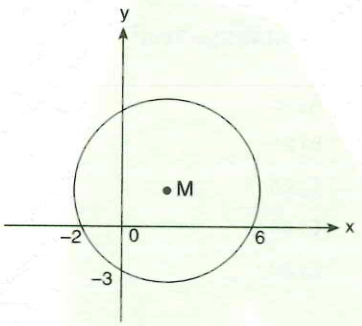
1. M(3, 5)
⇒ **|AB| = ?**

A) 5
B) 6
C) 7
D) 8
E) 10



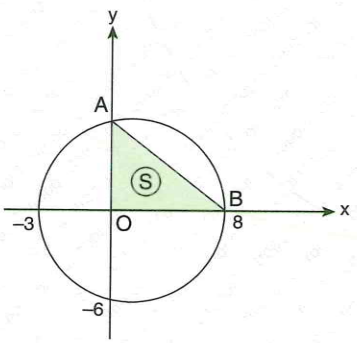
2. **M(a, b) = (?, ?)**

A) $\left(2,\frac{1}{2}\right)$
B) (2, 2)
C) $\left(\frac{1}{2},2\right)$
D) $\left(\frac{1}{2},\frac{1}{2}\right)$
E) $\left(\frac{3}{2},2\right)$



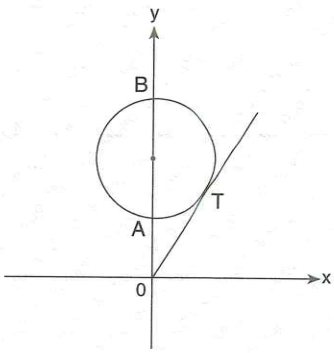
3. **A($\widehat{AOB}$) = S = ?**

A) 14
B) 16
C) 18
D) 24
E) 32



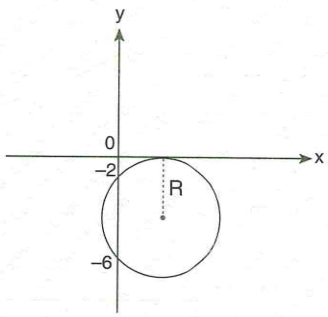
4. T(3, 3), A(0, 2)
⇒ **|AB| = ?**

A) 4
B) 5
C) 6
D) 8
E) 10

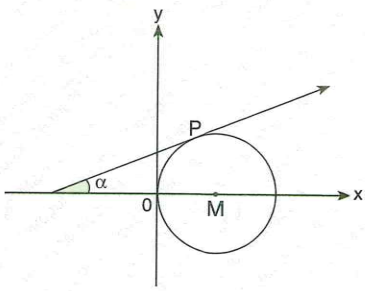


5. **R = ?**

A) 4
B) $4\sqrt{2}$
C) $4\sqrt{3}$
D) 5
E) $5\sqrt{3}$



6. P(1, 3), R = 5
⇒ **tanα = ?**



A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) $\frac{3}{4}$ D) $\frac{4}{3}$ E) $\frac{5}{4}$

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. A(–6, 8) ⇒ **R = ?**

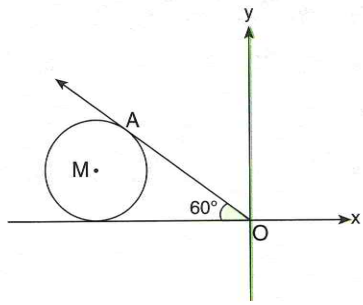
A) $\frac{\sqrt{3}}{3}$

B) $\frac{10}{3}$

C) $\frac{10\sqrt{3}}{3}$

D) $5\sqrt{3}$

E) $\frac{16}{3}$



8. **R = ?**

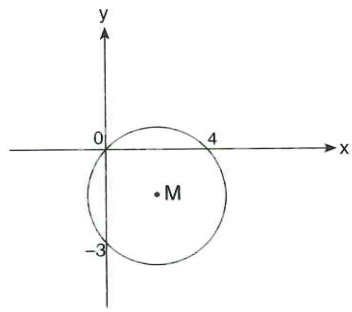
A) $\frac{5}{2}$

B) 3

C) $\frac{7}{2}$

D) 5

E) $\frac{9}{2}$



9. T(0,2), A(–8,0)
⇒ **R = ?**

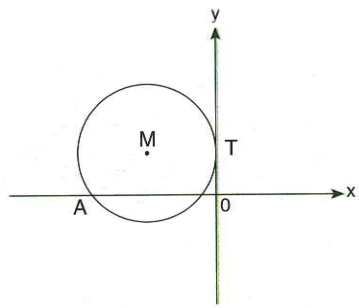
A) 4

B) $\frac{17}{4}$

C) 5

D) 6

E) $\frac{21}{4}$



10. A(0,16), B(12,0)
⇒ **R = ?**

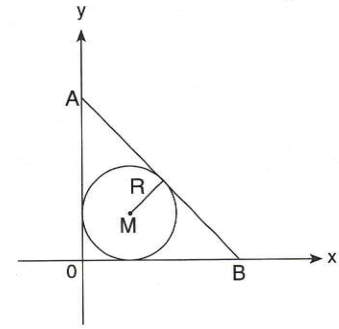
A) 1

B) $\frac{3}{2}$

C) 2

D) 4

E) $\frac{9}{2}$



11. M : merkez / center
⇒ **A($\widehat{ABC}$) = ? cm²**

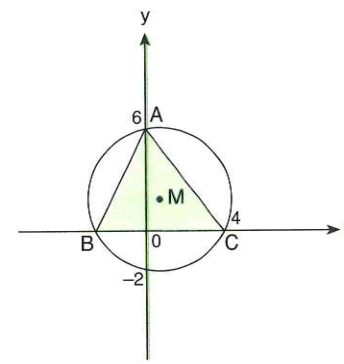
A) 18

B) 21

C) 24

D) 30

E) 32



12. A(4,0), B(0,6)
⇒ **R = ?**

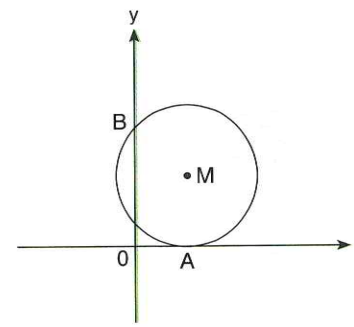
A) $\frac{13}{3}$

B) $\frac{14}{3}$

C) 5

D) $\frac{16}{3}$

E) $\frac{17}{3}$

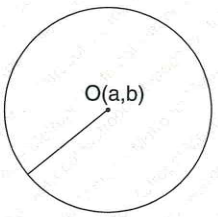


YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	A	B	D	A	D	C	A	B	D	B	A

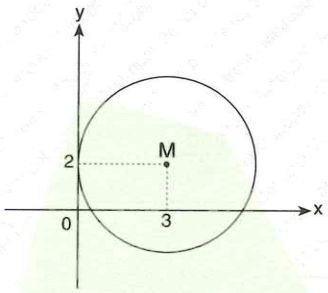
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. O noktası, şekildeki çemberin merkezidir.
O is center of the circle in the figure.
$x^2 + y^2 - 2x + 4y = 0$
$\Rightarrow$ **O(a, b) = (?, ?)**



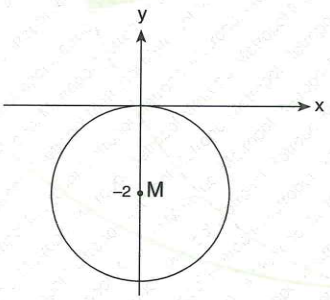
A) (–1, 3) B) (1, –2) C) (1, 1)
D) (–2, 1) E) (–2, –1)

2. M noktası, şekildeki çemberin merkezidir. M(3, 2) ise çemberin denklemi nedir?
M is center of the circle in the figure. If M(3, 2) what is the equation of the circle?



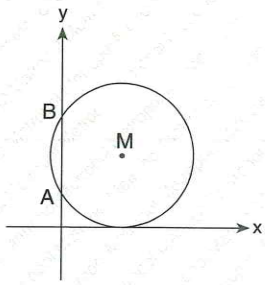
A) $(x - 3)^2 + (y - 4)^2 = 25$
B) $(x + 1)^2 + (y - 2)^2 = 1$
C) $(x - 3)^2 + (y - 2)^2 = 9$
D) $(x + 3)^2 + (y + 2)^2 = 9$
E) $(x - 3)^2 + (y - 2)^2 = 25$

3. M noktası, şekildeki çemberin merkezidir. Çemberin denklemi nedir?
M is center of circle in the figure. What is the equation of the circle?



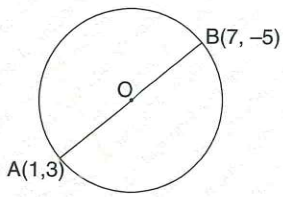
A) $(x + 2)^2 + (y - 2)^2 = 4$
B) $(x - 2)^2 + (y - 2)^2 = 4$
C) $(x + 1)^2 + (y - 2)^2 = 9$
D) $x^2 + (y + 2)^2 = 4$
E) $(x + 2)^2 + y^2 = 4$

4. M noktası, şekildeki çemberin merkezidir.
M is center of the circle in the figure.
M(2, 6) $\Rightarrow$ **|AB| = ?**



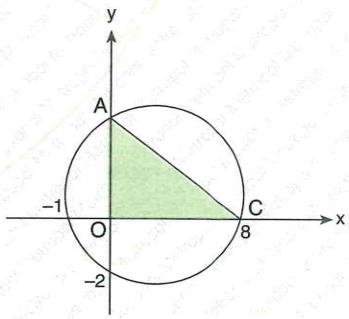
A) $4\sqrt{2}$ B) $5\sqrt{2}$ C) $6\sqrt{2}$
D) $7\sqrt{2}$ E) $8\sqrt{2}$

5. O noktası, şekildeki çemberin merkezidir. Çemberin denklemi nedir?
O is center of the circle in the figure. What is the equation of the circle?



A) $(x - 4)^2 + (y + 1)^2 = 25$
B) $(x - 1)^2 + (y - 3)^2 = 100$
C) $(x + 7)^2 + (y + 5)^2 = 25$
D) $(x + 4)^2 + (y + 1)^2 = 25$
E) $(x - 2)^2 + (y - 2)^2 = 36$

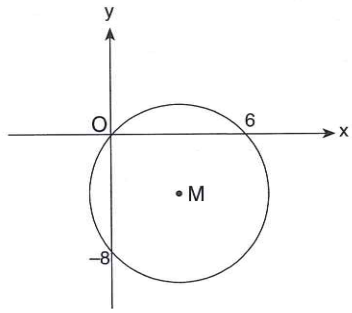
6. **A($\widehat{AOC}$) = ?**



A) 6
B) 8
C) 12
D) 16
E) 24

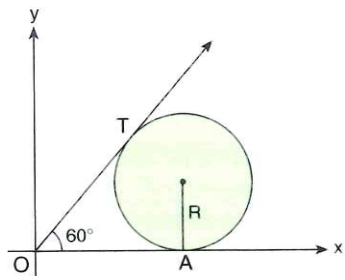
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. M noktası, şekildeki çemberin merkezidir.
M is center of the circle in the figure.
⇒ **R = ? cm**



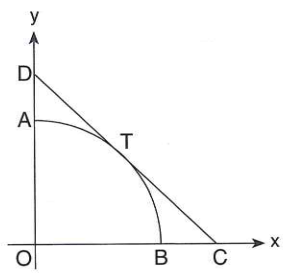
A) 5 B) 6 C) 7 D) 8 E) 9

8. T ve A teğet noktalarıdır.
T and A are tangent points.
$m(\widehat{TOA}) = 60°$,
$A(\sqrt{3},0) \Rightarrow$ **r = ?**



A) 1 B) 2 C) $2\sqrt{3}$ D) 3 E) $3\sqrt{3}$

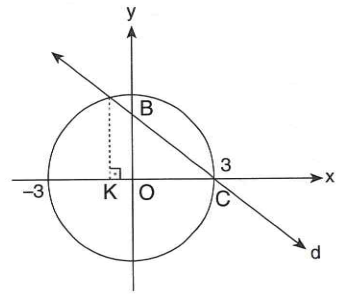
9. O noktası şekildeki çeyrek çemberin merkezi, T teğetin değme noktasıdır.
O is center of the quarter circle and T is tangent point in the figure.
A(0, 2), C(4, 0), T(a,b)
⇒ **a = ?**



A) $\frac{1}{2}$ B) 1 C) $\frac{3}{2}$ D) 2 E) $\frac{5}{2}$

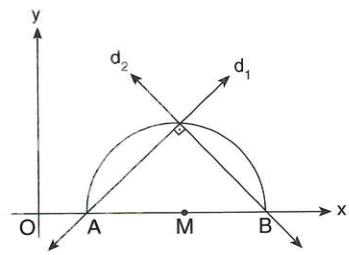
10. $d: \frac{x}{3} + \frac{y}{a} = 1$

O noktası, şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
K(–1, 0)
⇒ **a = ?**



A) $\frac{\sqrt{2}}{2}$
B) $\frac{3\sqrt{2}}{2}$
C) $\frac{5\sqrt{2}}{2}$
D) $\frac{7\sqrt{2}}{2}$
E) $\frac{9\sqrt{2}}{2}$

11.



d_1: 2x – 3y – 2 = 0 , $d_1 \perp d_2$ R = 3 cm
M, şekildeki yarım çemberin merkezidir.
d_2 doğrusunun denklemi nedir?
M is the center of the circle in the figure. What is the equation of the line d_2?

A) x + 2y – 21 = 0
B) x – 2y + 21 = 0
C) 2x – y + 21 = 0
D) 2x + y + 21 = 0
E) 3x + 2y – 21 = 0

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11
B	C	D	E	A	D	A	A	B	B	E

METROPOL YAYINLARI • METROPOL PUBLICATIONS

BÖLÜM CHAPTER 15

TARİHSEL NOT / HISTORICAL NOTE

Sir Andrew John Wiles [1953 –]

İngiliz matematikçi ve Oxford Üniversitesi'nde Royal Society Research Profesörü, sayı teorisinde uzmanlaşmıştır. Fermat'ın Son Teoremini kanıtlamakla ünlüdür. Royal Society tarafından 2017 Copley Madalyası ile ödüllendirildiği. 2000 yılında İngiliz İmparatorluğu Emri'nin Knight Komutanı olarak atandı. 2018'de Oxford'daki ilk Regius Matematik Profesörü olarak atandı.

He is a British mathematician and a Royal Society Research Professor at the University of Oxford, specializing in number theory. He is best known for proving Fermat's Last Theorem, for which he was awarded the 2017 Copley Medal by the Royal Society. He was appointed Knight Commander of the Order of the British Empire in 2000, and in 2018 was appointed as the first Regius Professor of Mathematics at Oxford.

KATI CİSİMLER
SOLIDS

Bu bölüm, 24 çözümlü örnek, 12 çözümlü test sorusu, 6 çözümlü YÖS sorusu, 12 alıştırma sorusu, 24 test sorusu içermektedir.

This chapter includes 24 examples with solutions, 12 test questions with solutions, 6 YÖS questions with solutions, 12 exercise questions and 24 test questions.

BÖLÜM / CHAPTER 15 ..... 495 - 522

KATI CİSİMLER / SOLIDS

- Prizmalar / Prisms ..... 497 - 498
  - Prizma Çeşitleri / Kinds of Prisms ..... 497 - 498
- Dikdörtgenler Prizması / The Rectangular Prisms 499
- Kare Dik Prizma / The Square Right Prism 500
- Küp / Cube ..... 501 - 502
- Silindir / Cylinder ..... 502 - 503
- Piramit / Pyramid ..... 504 - 509
  - Düzgün Piramit / Regular Pyramid ..... 504 - 505
  - Düzgün Dörtyüzlü / The Regular Tetrahedron ..... 505 - 506
  - Dik Koni / Right Cone ..... 507 - 509
- Küre / Sphere ..... 509 - 510
- Çözümlü Test / Test With Solutions ..... 511 - 514
- YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 515 - 516
- Alıştırmalar / Exercises ..... 517 - 518
- Konu Testleri / Practice Tests ..... 519 - 522

BÖLÜM
15
CHAPTER

KATI CİSİMLER
SOLIDS

Tanım: Üç boyutlu (uzunluk–genişlik–yükseklik) cisimlere **katı cisim** denir. Katı cisim; uzayda yer kaplama ile ilgili olup bu, hacim kavramı ile ifade edilir.

Definition: A three–dimensional (length–width–height) object is called a **solid object**. Solid object is conserned with space occupation, and expressed with the concept of volume.

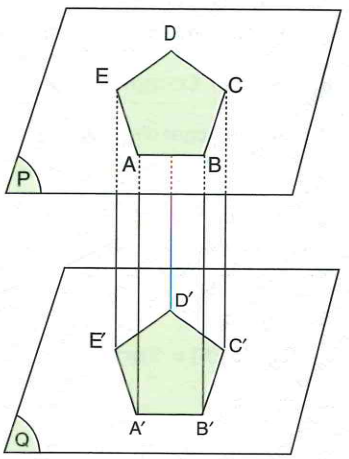
PRİZMALAR / PRISMS

P ve Q paralel iki düzlemdir. Alt ve üst tabanları paralel eş şekillerden oluşan cisimlere ***prizma*** denir. ABCDE A′B′C′D′E′ prizmasında ABCDE ve A′B′C′D′E′ çokgensel bölgelerine ***prizmanın tabanları*** denir.

Prizmaların tabanları eş ve paralel bölgelerdir. Prizmalar, taban biçimlerine göre adlandırılır. Üçgen prizma, kare prizma, ...

The parallel planes P and Q given in the figure, object formed with parallel congruent figures as top and bottom bases are called prisms. For the prism ABCDE A′B′C′D′E′, the polygonal areas ABCDE and A′B′C′D′E′ are named the ***bases of the prism.***

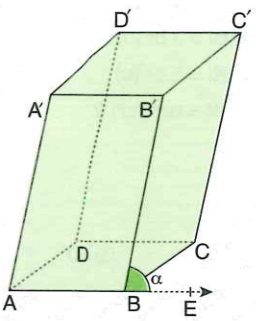
The bases of prisms are equal and parallel regions. Prisms are named according to shape of their bases. Triangle prism, square prism, ...



PRİZMA ÇEŞİTLERİ / KINDS of PRISMS

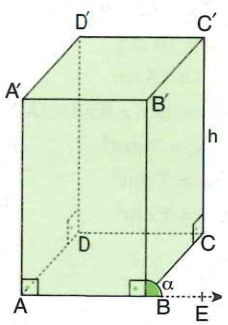
◆ Prizmalarda yan yüzeyleri birleştiren ayrıtlara ***yanal ayrıt*** denir. / The edges which connect side faces of prisms are called ***lateral edges***.

1. **Eğik Prizma:** Yanal ayrıtları taban düzlemine dik olmayan prizmadır.
   Oblique Prism: The prism whose lateral edges are not perpendicular to the base plane is called an oblique prism.



$[\alpha \neq 90°]$

2. **Dik Prizma:** Yanal ayrıtları taban düzlemine dik olan prizmadır.
   Right Prism: The prism whose lateral edges are perpendicular to the base plane is called a right prism.

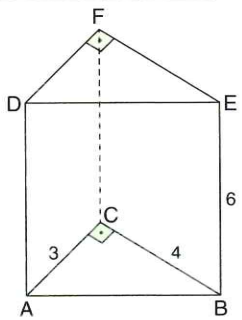


$[\alpha = 90°]$

- Bir prizmanın iki taban düzlemi arasındaki uzaklığa bu **prizmanın yüksekliği** denir.
  The distance between two base planes of the prism is called the height.
- Bir dik prizmada yükseklik uzunluğu, yanal ayrıt uzunluğuna eşittir.
  In a right prism, the height length is equal to the length of its lateral edge.
- ABCDA'B'C'D' dik prizmasında [AA'], [BB'], [CC'], [DD'] uzunlukları hem yanal ayrıt hem de yüksekliktir.
  In ABCD A'B'C'D' which is a right prism, [AA'], [BB'], [CC'], [DD'] are both heights and lateral edges.
- **Dik Prizmanın Yanal Alanı /** Lateral Area of a Right Prism (A_Y)
  Yanal alan / Lateral Area = (Taban Çevresi / Base Perimeter)·(Yükseklik / Height)
- **Dik Prizmanın Alanı /** Area of a Right Prism (A)
  Bütün Alan / Total Area = (Yanal Alan / Lateral Area) + 2·(Taban Alan / Base Area)
- **Dik Prizmanın Hacmi** / Volume of a Right Prism (V)
  Hacim / Volume = (Taban Alanı / Base Area)·(Yükseklik / Height)

Örnek / Example 1

ABCDEF bir üçgen dik prizmadır.
ABCDEF is a triangular right prism.
[AC] ⊥ [BC],
|AC| = 3 br (u),
|BC| = 4 br (u),
|BE| = 6 br (u)
⇒ **A(ABCDEF) = ? br^2 (u^2)**



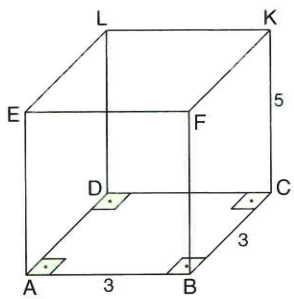
A) 80 B) 84 C) 86 D) 90 E) 92

Çözüm / Solution — Yanıt / Answer B

A(ABCDEF) = Yanal Alan + 2·Taban Alanı
A(ABCDEF) = Total Area + 2·Base Area
$\Rightarrow (3 \cdot 6 + 4 \cdot 6 + 5 \cdot 6) + 2 \cdot \frac{3 \cdot 4}{2}$
⇒ (18 + 24 + 30) + 12
⇒ 72 + 12 = 84 br^2 (u^2)

Örnek / Example 2

ABCDEFKL bir dik prizmadır.
ABCDEFKL is a right prism.
|BC| = 3 br (u),
|AB| = 3 br (u),
|CK| = 5 br (u)
⇒ **V = br^3 (u^3) ?**



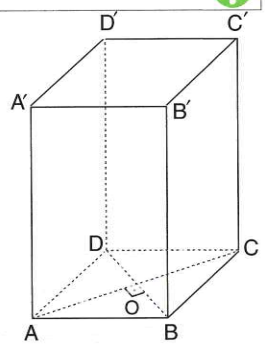
A) 45 B) 60 C)90 D) 96 E) 108

Çözüm / Solution — Yanıt / Answer A

Hacim / Volume (V) = (Taban Alan / Base Area) · (Yükseklik / Height)
⇒ (3 · 3) · 5
⇒ 45 br^3 (u^3)

Örnek / Example 3

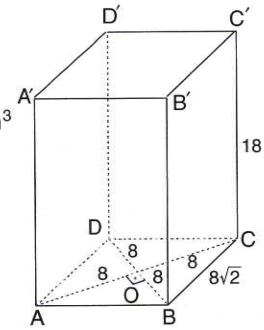
|AC| = 16 cm,
|BD| = 16 cm,
|CC'| = 18 cm,
|AB| = |BC| = |CD| = |AD|
i. A_Y = ? cm^2
ii. A = ? cm^2
iii. V = ? cm^3



A) 2200 B) 2300 C) 2304 D) 3304 E) 4304

Çözüm / Solution — Yanıt / Answer C

I. $A_y = 4 \cdot 8\sqrt{2} \cdot 18 = 576\sqrt{2}$ cm^2
II. $A = 576\sqrt{2} + \frac{2 \cdot 16 \cdot 16}{2}$ cm^2
III. $V = \frac{16 \cdot 16}{2} \cdot 18 = 128 \cdot 18 = 2304$ cm^3

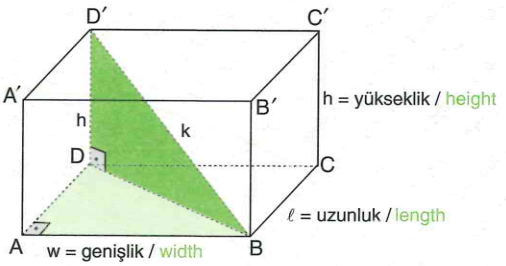


DİKDÖRTGENLER PRİZMASI / THE RECTANGULAR PRISMS

Tanım: Bir dikdörtgenler prizması, **yüzey** olarak adlandırılan 6 dikdörtgen ile biçimlendirilmiş katı cisimdir. Dikdörtgenlerin kenarları, **kenarlar** olarak adlandırılır.

Definition: A rectangular prism is a solid formed by six rectangles, called faces. The sides of the rectangles are called edges.

1. **Cisim köşegeni / Body diagonal (K):**
   $k = \sqrt{\ell^2 + w^2 + h^2}$
2. **Alan / Area:** $(A) = 2(w\cdot\ell + \ell\cdot h + w\cdot h)$
3. **Hacim / Volume:** $(V) = \ell\cdot w\cdot h$



ÖNEMLİ/ IMPORTANT

*Prizmanın birbirine en uzak iki noktasını birleştiren doğru parçasına **cisim köşegeni** denir.*

A line segment whose endpoints are two most distant corners of the prism is called body diagonal.

Örnek / Example 4

ABCDEFKL bir dikdörtgenler prizmasıdır.

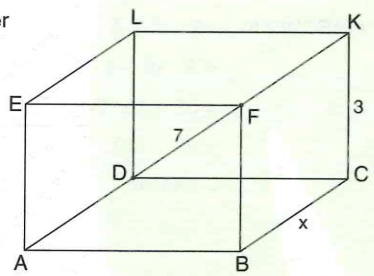
ABCDEF is a rectangular prism.

$|AB| = 6$ cm,

$|CK| = 3$ cm,

$|DF| = 7$ cm

$\Rightarrow$ **$|BC| = x = ?$ cm**



A) 1 B) 2 C) 3 D) 4 E) 5

Çözüm / Solution

Yanıt / Answer **B**

$[FB] \perp [DB]$, $[DB] = y$

$\Rightarrow 7^2 = y^2 + 3^2$

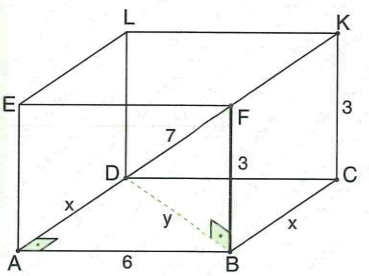
$\Rightarrow 40 = y^2$

$\Rightarrow 2\sqrt{10} = y$

$[AD] \perp [AB] \Rightarrow y^2 = x^2 + 6^2$

$\Rightarrow 40 = x^2 + 36$

$\Rightarrow 2 = x$



Örnek / Example 5

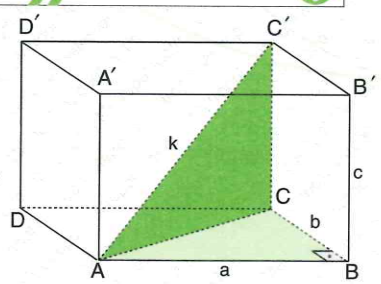
$|AB| = a = 5n$ cm,

$|BB'| = c = 2n$ cm,

$|BC| = b = 3n$ cm,

$|AC'| = 3\sqrt{38}$ cm

$\Rightarrow$ **$A(ABCDA'B'C'D') = ?$ cm^2**



A) 558 B) 492 C) 449 D) 378 E) 249

Çözüm / Solution

Yanıt / Answer **A**

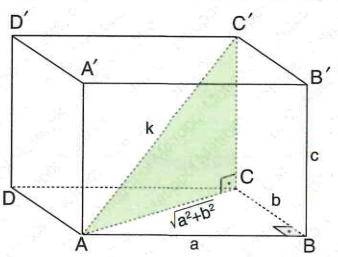
$a = 5n$, $b = 3n$, $c = 2n$

$k = \sqrt{a^2 + b^2 + c^2}$

$k = \sqrt{25n^2 + 9n^2 + 4n^2} = 3\sqrt{38}$

$n\sqrt{38} = 3\sqrt{38}$

$n = 3$



$a = 15$ cm, $b = 9$ cm, $c = 6$ cm

$A = 2 \cdot (a \cdot b + a \cdot c + b \cdot c)$

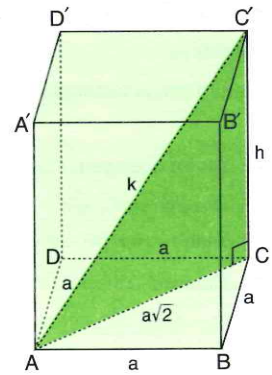
$A = 2 \cdot (15 \cdot 9 + 15 \cdot 6 + 9 \cdot 6)$

$A = 2 \cdot (135 + 90 + 54) = 2 \cdot 279 = 558$ cm^2

KARE DİK PRİZMA / THE SQUARE RIGHT PRISM

Tanım: Tabanları iki eş kareden, yan yüzü 4 eş dikdörtgenden oluşan prizmadır.

Definition: It is a prism with two bases of which are equal squares and four faces of which are rectangles.



Kare dik prizmanın / Square Right Prism's:

1. Hacmi / The Volume (V) = $a^2 \cdot h$
2. Yanal alanı / Lateral area (y) = $4 \cdot a \cdot h$
3. Bütün alanı / Total Area (A) = $2 \cdot a^2 + 4ah$
4. Cisim köşegeni / Body diagonal (k) = $\sqrt{2 \cdot a^2 + h^2}$

Örnek / Example 6

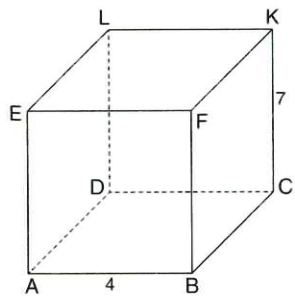
ABCDEFKL bir kare dik prizmadır.

ABCDEFKL is a square right prism.

IABI = 4 cm,

ICKI = 7 cm,

⇒ **A(ABCDEFKL) = ? cm²**



A) 144 B) 142 C) 140 D) 136 E) 124

Çözüm / Solution — Yanıt / Answer A

h = 7, a = 4

$A(ABCDEFKL) = 2 \cdot a^2 + 4 \cdot a \cdot h$

$= 2 \cdot 16 + 4 \cdot 4 \cdot 7$

$= 32 + 16 \cdot 7$

$= 32 + 112$

$= 144\ cm^2$

Örnek / Example 7

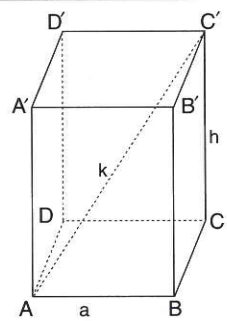
ABCDA′B′C′D′ bir kare dik prizmadır.

ABCDA′B′C′D′ is a square right prism.

A(ABCD) = 32 cm²,

Hacim / Volume = 480 cm³

⇒ **Cisim köşegeni / Body diagonal = k = ? cm**



A) 13 B) 15 C) 17 D) 19 E) 21

Çözüm / Solution — Yanıt / Answer C

$A(ABCD) = a^2 = 32 \Rightarrow a = 4\sqrt{2}$ cm

Hacim / Volume $= a^2 \cdot h = 32 \cdot h = 480\ cm^3$

$480\ cm^3 \Rightarrow h = \frac{480}{32} = 15$ cm

Cisim köşegeni / Body diagonal $= k = \sqrt{2a^2 + h^2}$

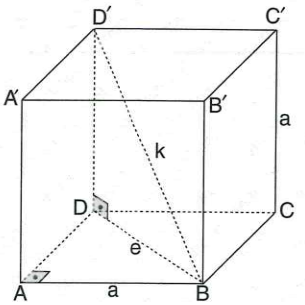
$= \sqrt{2 \cdot 32 + 225}$

$= \sqrt{289} = 17$ cm

KÜP / CUBE

Tanım: Uzunluğu, genişliği ve yüksekliği eşit, dolayısıyla tüm kenarları eşit uzunlukta olan dikdörtgensel katı cisme **küp** denir.

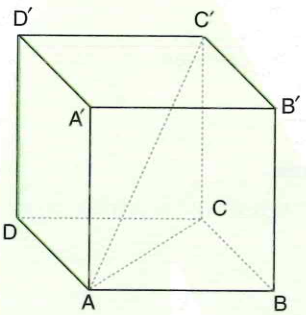
Definition: A rectangular solid in which the length, width and height are equal, and therefore, all the edges have the same length is called a **cube**.



1. Yüzey köşegeni / The face diagonal (e) = $a\sqrt{2}$
2. Cisim köşegeni / The body diagonal (k) = $a\sqrt{3}$
3. Alan / The area (A) = $6a^2$
4. Hacim / The volume (V) = a^3

Örnek / Example 8

ABCDA′B′C′D′ küptür.
ABCDA′B′C′D′ is a cube.
A(ABCDA′B′C′D′) = 216 cm^2
⇒ **|AC′| + |AC| = ? cm**

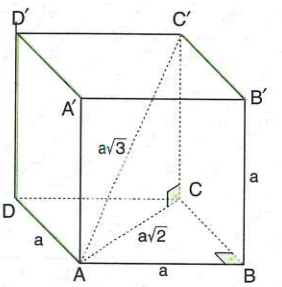


A) 3 B) $3\sqrt{3}$ C) 6 D) $6\sqrt{2} + 6$ E) $6\sqrt{3} + 6\sqrt{2}$

Çözüm / Solution

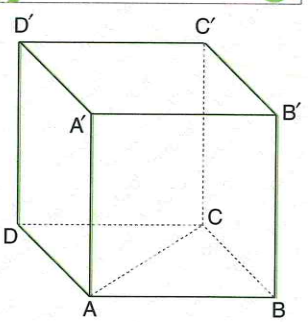
Yanıt / Answer **E**

|AB| = a ⇒ A(ABCDA′B′C′D′) = $6a^2$
$6a^2 = 216\ cm^2 \Rightarrow a^2 = 36$ cm
a = 6 cm
e = |AC| = $a\sqrt{2}$ cm ⇒ |AC| = $6\sqrt{2}$
k = |AC′| = $a\sqrt{3}$ cm
⇒ |AC′| = $6\sqrt{3}$ cm
⇒ |AC′| + |AC| = $(6\sqrt{3} + 6\sqrt{2})$ cm



Örnek / Example 9

ABCDA′B′C′D′ bir küptür.
ABCDA′B′C′D′ is a cube.
|AC| = $4\sqrt{2}$ cm
⇒ **V = ? cm^3**

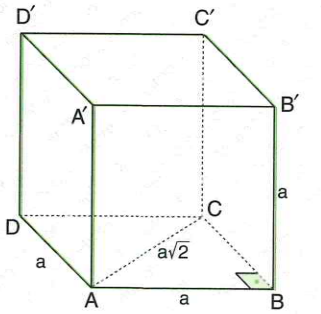


A) 24 B) 48 C) 64 D) 72 E) 86

Çözüm / Solution

Yanıt / Answer **C**

|AB| = a cm ⇒ |AC| = $a\sqrt{2}$ cm
|AC| = $4\sqrt{2}$ cm ⇒ |AB| = 4 cm
$V = a^3 \Rightarrow V = 4^3 = 64\ cm^3$



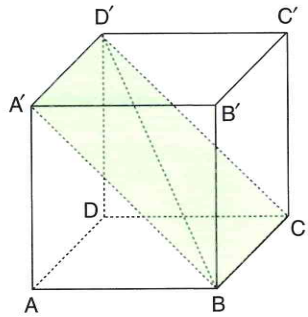
Örnek / Example 10

ABCDA'B'C'D' bir küp, A'D'CB bir dikdörtgendir.

ABCDA'B'C'D' is a cube and A'D'CB is a rectangle.

A(ABCDA'B'C'D') = 300 cm²

⇒ **A(A'D'CB) = ? cm²**



A) $50\sqrt{2}$ B) $48\sqrt{2}$ C) $40\sqrt{2}$ D) $36\sqrt{2}$ E) $30\sqrt{2}$

Çözüm / Solution Yanıt / Answer **A**

$A(ABCDA'B'C'D') = 6a^2\ cm^2 = 300\ cm^2$

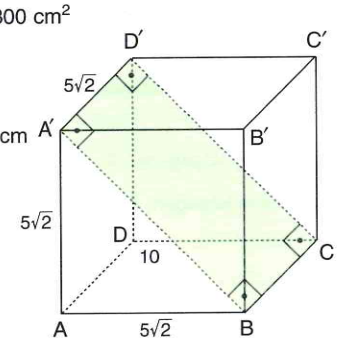
$\Rightarrow a^2 = 50 \Rightarrow a = 5\sqrt{2}$ cm

$|A'D'| = |BC| = 5\sqrt{2}$ cm

$|A'B| = |D'C| = 5\sqrt{2} \cdot \sqrt{2} = 10$ cm

$A(A'D'CB) = 5\sqrt{2} \cdot 10$

$= 50\sqrt{2}\ cm^2$



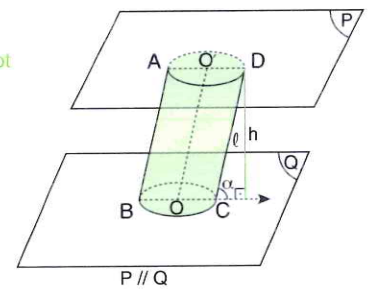
SİLİNDİR / CYLINDER

Tanım: Bir prizmanın tabanları daire olarak seçilirse silindir meydana gelir.

Definition: If the base shapes of a prism are circular regions, then the formed solid is called a cylinder.

1. **Eğik Silindir : Ana doğrusu (ℓ) taban düzlemine dik olmayan silindirdir.**

   The Oblique Cylinder: If the axis (the line throught the centre of the circle) of a cylinder is not perpendicular to base plane, then it is called an oblique cylinder.

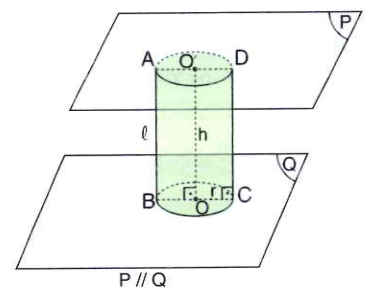


2. **Dik Silindir : Ana doğrusu (ℓ) taban düzlemine dik olan silindirdir.**

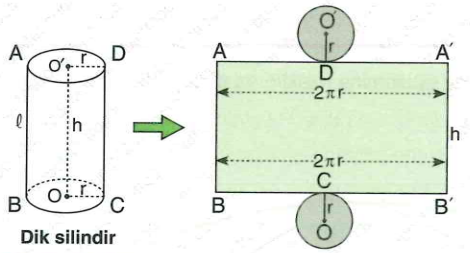
   The Right Cylinder: If the axis of a cylinder is perpendicular to the plane of the base, then it is called a right cylinder.

Dik silindirin / Right Cylinder's:

1. Taban alanı / Base area (G) = πr^2
2. Yanal alanı / Lateral surface area (A_Y) = $2\pi rh$
3. Tüm alanı / Total Area (A) = $2 \cdot \pi r^2 + 2 \cdot \pi rh = 2 \cdot \pi r(r + h)$
4. Hacmi / Volume (V) = $G \cdot h = \pi r^2 \cdot h$



ÖNEMLİ/ IMPORTANT



Dik silindir
Right cylinder

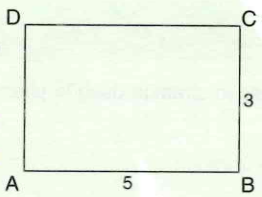
Dik silindirin açılımı
Net view of right cylinder

[ABCD bir dikdörtgendir.]
[ABCD is a rectangle.]

Örnek / Example 11

ABCD dikdörtgeni [AB] etrafında 360° döndürülürse oluşan cismin hacmi kaç br^3 olur?

What is the volume in u^3 of formed shape when the rectangle ABCD is rotared around line segment [AB]?



A) 35π B) 40π C) 45π D) 55π E) 60π

Çözüm / Solution

Yanıt / Answer **C**

DD'C'C bir dik silindirdir.

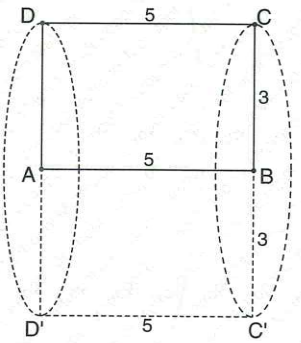
DD'C'C is a right cylinder.

r = 3 br, h = 5 br

$V = G \cdot h$

$= \pi \cdot 3^2 \cdot 5$

$= 45\pi\ br^3$

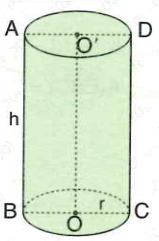


Örnek / Example 12

$|OC| = r = 4$ cm,

$A(ABCD) = 128\pi\ cm^2$

$\Rightarrow$ **V = ? π cm³**



A) 128 B) 144 C) 172 D) 192 E) 216

Çözüm / Solution

Yanıt / Answer **D**

$A = 2G + A_Y$

$2\pi r(r + h) = 128\pi$

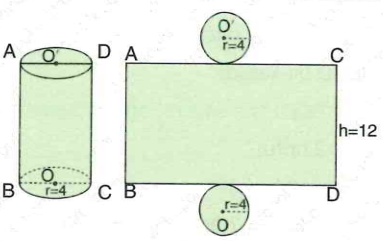
$r(r + h) = 64$

$4 \cdot (4 + h) = 64$

$4 + h = 16$

$h = 12$ cm

$V = \pi r^2 h = 16 \cdot 12\pi = 192\pi\ cm^3$



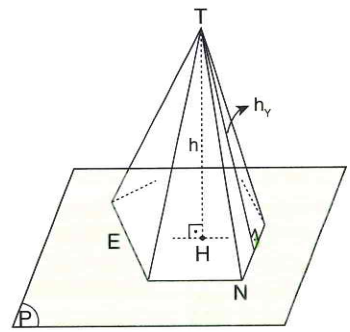
PİRAMİT / PYRAMID

Tanım: Bir P düzleminde, E çokgensel bölgesi ile düzlemin dışında bir T noktası verilmiş olsun. N ∈ (E) koşulu ile [TN] doğru parçalarının birleşim kümesine **piramit** denir. Piramitler; üçgen dik piramid, kare dik piramit, dikdörtgen dik piramit, ... şeklinde adlandırılır. T noktası piramitin tepe noktası, E çokgensel bölgesi **piramidin tabanı** olup tepe noktasının taban düzlemine uzaklığına **piramidin yüksekliği** denir.

Definition: Let a polygonal region E in the plane P and a point T out of the plane P be given. Stating that N ∈ (E), the set formed by the combination of the line segments [TN] that joined the point T with all the points of the polygon is called a **pyramid**. Pyramids are named as triangular right pyramid, square right pyramid, rectangular right pyramid, ... The point T is the apex of the pyramid. The polygonal region E is the **base of the pyramid**. The altitude of a pyramid is the straight line segment from the apex perpendicular to the base.

Piramidin / Pyramid's :

1. Taban Çevresi / Base Perimeter: $Ç_T$
2. Taban Alanı / Base Area: G
3. Yanal Alanı / Lateral Surface Area: A_Y
4. Tüm Alanı / Total Area: A
5. Yüksekliği / Height: h
6. Yanal Yüz Yüksekliği / Height of lateral face: h_Y
7. Hacmi / Volume: V



DÜZGÜN PİRAMİT / REGULAR PYRAMID

- Tabanı düzgün çokgen olan ve yüksekliği tabanın ağırlık merkezinden geçen piramite düzgün piramit denir. Düzgün piramidin yan yüzleri eş ikizkenar üçgenlerdir.
  If the base of a pyramid is a regular polygon and if the axis of it passes through the center of gravity of the base, then it is called a regular pyramid. The lateral faces of a regular pyramid are isosceles triangles.

Düzgün Piramidin Özellikleri / Properties of a Regular Pyramid

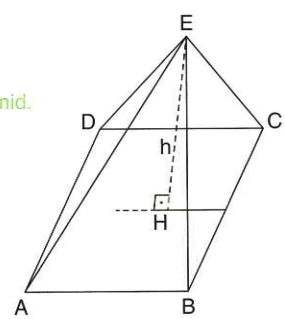
1. **Yanal Alanı / Lateral Surface Area** $(A_Y) = \frac{1}{2} \cdot Ç_T \cdot h_Y$

2. **Tüm Alanı / Total Area** $(A) = G + A_Y$

3. **Hacim / Volume** $(V) = \frac{1}{3} \cdot G \cdot h$

Örnek / Example 13

(E, ABCD) bir düzgün piramittir.
ABCD bir karedir.
(E, ABCD) is a square regular pyramid.
h = 12 br (u),
|AB| = 10 br (u)
⇒ **A(EBC) = ? br² (u²)**

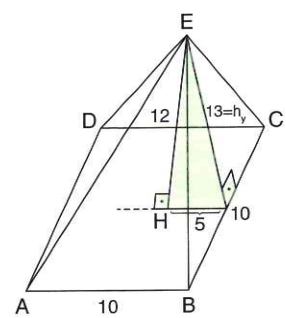


A) 42 B) 48 C) 52 D) 60 E) 65

Çözüm / Solution Yanıt / Answer **E**

$h_Y = 13$

$A(\widehat{EBC}) = \frac{13 \cdot 10}{2} = 65\,br^2$



Örnek / Example 14

(E, ABCD) bir düzgün piramittir.

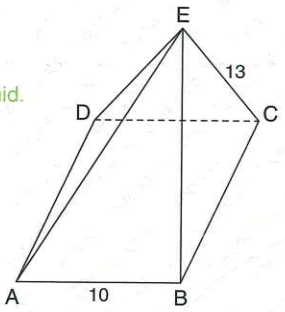
ABCD bir karedir.

(E, ABCD) is a square regular pyramid.

|AB| = 10 cm,

|EC| = 13 cm

$\Rightarrow$ **A_Y = ? cm²**



A) 200 B) 220 C) 240 D) 260 E) 280

Çözüm / Solution

Yanıt / Answer **C**

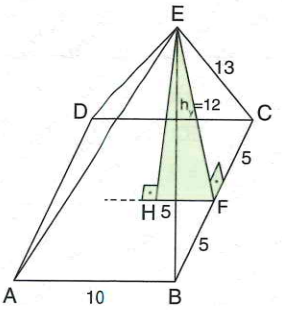
|HF| = 5 cm,

|BF| = |FC| = 5 cm

$\widehat{EFC}$:

|EF| = 12 cm = h_Y

$A_Y = 4 \cdot \frac{12 \cdot 10}{2} = 240\,cm^2$



Örnek / Example 15

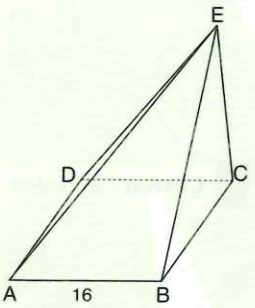
(E, ABCD) bir kare dik piramittir.

(E, ABCD) is a square right pyramid.

|AB| = 16 cm,

A(E, ABCD) = 576 cm²

$\Rightarrow$ **V = ? cm³**



A) 96 B) 128 C) 169 D) 512 E) 682

Çözüm / Solution

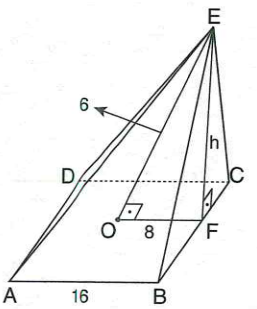
Yanıt / Answer **D**

|OF| = 8 cm

$576 = 16^2 + \frac{16h}{2} \cdot 4 \Rightarrow h = 10$

|OE| = 6 cm,

$V = \frac{16^2 \cdot 6}{3} = 512\,cm^3$



DÜZGÜN DÖRTYÜZLÜ / THE REGULAR TETRAHEDRON

Tanım: Bütün yüzeyleri eşkenar üçgen olan üçgen dik piramide **düzgün dörtyüzlü** denir.

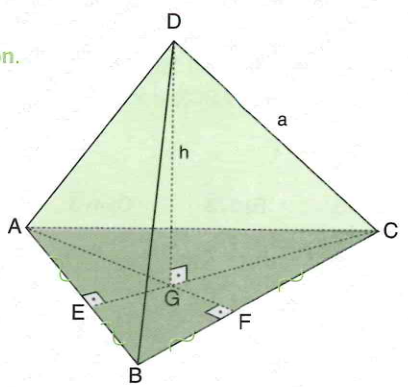
Definition: A pyramid of which its all faces of which are equilateral triangles is called regular tetrahedron.

|DC| = a, |DH| = h

Yükseklik / Height (h) = $\frac{a\sqrt{6}}{3}$

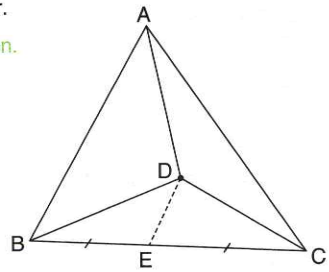
Bütün Alan / Total Area (A) = $4 \cdot \frac{a^2\sqrt{3}}{4} = a^2 \cdot \sqrt{3}$

Hacim / Volume (V) = $\frac{1}{3} \cdot \frac{a^2\sqrt{3}}{4} \cdot \frac{a\sqrt{6}}{3} = \frac{a^3\sqrt{2}}{12}$



Örnek / Example 16

(A, BCD) bir düzgün dörtyüzlüdür.
(A, BCD) is a regular tetrahedron.
|AB| = 4 cm,
|BE| = |EC|
⇒ **|DE| = ? cm**

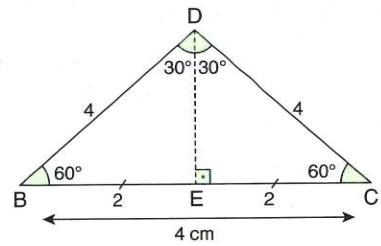


A) 2 B) $2\sqrt{3}$ C) 3 D) $3\sqrt{3}$ E) 4

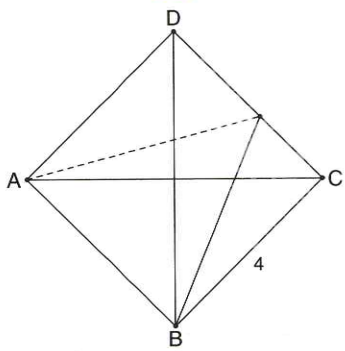
Çözüm / Solution

Yanıt / Answer **B**

|AB| = |BC| = 4 cm
|BD| = |DC| = |BC| = 4 cm
⇒ $|DE| = 2\sqrt{3}$ cm



Örnek / Example 17

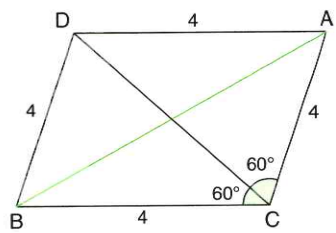


(D, ABC) düzgün dörtyüzlüsünün, B köşesinden, yüzeyden hareketle B'den A'ya gidecek olan karıncanın en kısa alabileceği yol kaç br dir?
What is the shortest way that an ant can travel on the regular tetrahedron (D, ABC), from point B to point A traveling on the surface?

A) $2\sqrt{3}$ B) $3\sqrt{3}$ C) $4\sqrt{3}$ D) $6\sqrt{3}$ E) $8\sqrt{3}$

Çözüm / Solution

Yanıt / Answer **C**



|AB| = $4\sqrt{3}$ br [En kısa yol / The shortest way]

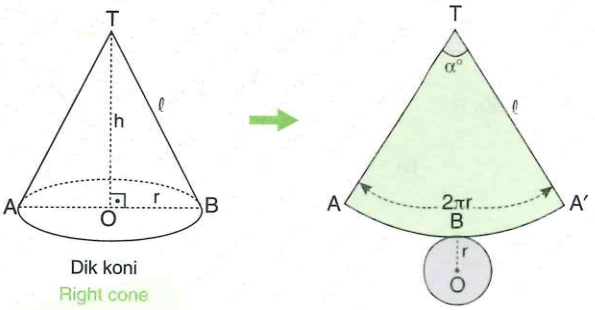
DİK KONİ / RIGHT CONE

Tanım: Bir daire düzlemi ile düzlemin dışında bir T noktası verilsin. T noktasını daire düzleminin tüm noktaları ile birleştiren doğru parçalarının birleşim kümesine ***koni*** denir. Dik üçgenin bir dik kenarı etrafında döndürülerek elde edilen koniye ***dik koni*** denir.

Definition: Let a circular region in a plane and a point T out of this plane be given. The set formed by the combination of the line segments that joined the point T with all the points of the circular region is called a ***cone***. The cone formed by rotating a right triangle around one of its legs called a **right cone.**

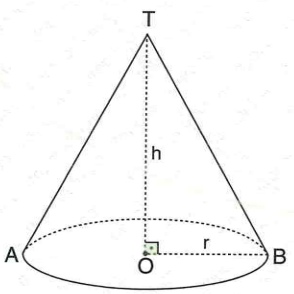
Dik koninin / Right Cone's :

1. Taban yarıçapı / The base radius (r)
   Ana doğrusu / The axis (ℓ)
   Yüksekliği / The height (h)
   $\Rightarrow \ell^2 = h^2 + r^2$
2. Taban alanı / The base area (G) $= \pi \cdot r^2$
3. Yanal alanı / The lateral area $(A_Y) = \dfrac{2 \cdot \pi \cdot r \cdot \ell}{2} = \pi \cdot r \cdot \ell$
4. Toplam alanı / The total area $(A) = A_Y + G = \pi \cdot r \cdot \ell + \pi \cdot r^2 = \pi \cdot r(\ell + r)$
5. Hacmi / The volume $(V) = \dfrac{1}{3} \cdot \pi \cdot r^2 \cdot h$



Örnek / Example 18

(T, AOB) bir dik konidir.
(T, AOB) is a right cone.
h = 10 cm
$V = 30\pi$ cm^3
$\Rightarrow$ **r = ? cm**



A) 2 B) 3 C) 4 D) 5 E) 6

Çözüm / Solution Yanıt / Answer **B**

$V = \dfrac{1}{3}\pi \cdot r^2 \cdot h$

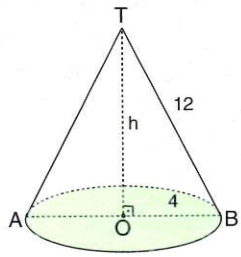
$30\pi = \dfrac{1}{3}\pi r^2 \cdot 10$

$r^2 = 9$

$r = 3$ cm

Örnek / Example 19

(T, AOB) bir dik konidir.
(T, AOB) is a right cone.
ITBI = 12 cm,
IOBI = r = 4 cm
⇒ **V = ? cm³**



A) 42π B) $\frac{128\pi\sqrt{3}}{3}$ C) $18\pi\sqrt{2}$ D) $\frac{128\pi\sqrt{2}}{3}$ E) $32\pi\sqrt{2}$

Çözüm / Solution

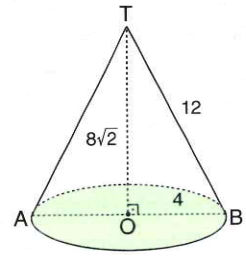
Yanıt / Answer **D**

$h = ITOI = \sqrt{ITBI^2 - IOBI^2}$

$= \sqrt{144-16} = \sqrt{128} = 8\sqrt{2}$ cm

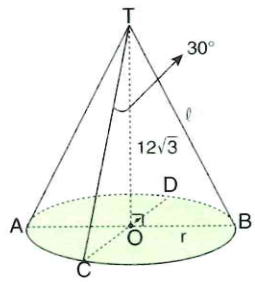
$V = \frac{1}{3}\cdot\pi\cdot r^2\cdot h$

$\Rightarrow V = \frac{1}{3}\cdot\pi\cdot 16\cdot 8\sqrt{2} = \frac{128\pi\sqrt{2}}{3}$ cm³



Örnek / Example 20

(T, AOB) bir dik konidir.
(T, AOB) is a right cone.
[AB]∩[CD] = {O},
ITOI = $12\sqrt{3}$ cm,
$m(\widehat{OTC}) = 30°$
⇒ $\frac{\ell}{r}$ = ?



A) 1 B) 2 C) 3 D) $\frac{7}{2}$ E) 4

Çözüm / Solution

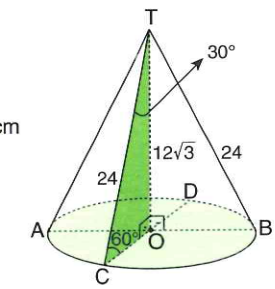
Yanıt / Answer **B**

$m(\widehat{CTO}) = 30° \Rightarrow m(\widehat{TCO}) = 60°$

ITOI = $12\sqrt{3}$ cm ⇒ IOCI = r = 12 cm

ITCI = 24 cm ⇒ ITCI = ITBI = ℓ = 24 cm

⇒ $\frac{\ell}{r} = \frac{24}{12} = 2$



Kesik Koni / Conical Frustum

Tanım: Bir dik koni tabanına paralel bir düzlemle kesildiğinde taban ile düzlem arasında kalan cisme ***kesik koni*** denir.

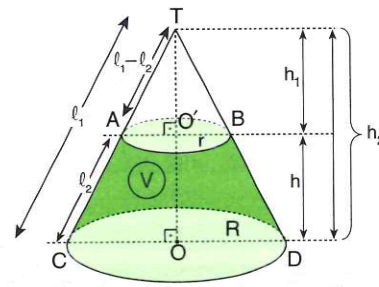
Definition: The solid which stays in between the base and the plane when a cone gets cut by a plane parallel to the base plane is called a *conical frustum.*

Yanal Alan / The lateral area $(A_Y) = \frac{2\cdot\pi\cdot R\cdot\ell_1}{2} - \frac{2\cdot\pi\cdot r\cdot(\ell_1-\ell_2)}{2} = \pi\cdot R\cdot\ell_1 - \pi\cdot r\cdot\ell_1 + \pi\cdot r\cdot\ell_2$

Hacmi / The volume (V) = $V_{(T,COD)} - V_{(T,AO'B)} = \frac{\pi\cdot R^2\cdot h_2}{3} - \frac{\pi\cdot r^2\cdot h_1}{3}$

$\frac{r}{R} = \frac{h_1}{h_2} = k$ [Konilerin benzerlik oranı / Similarity ratio of cones]

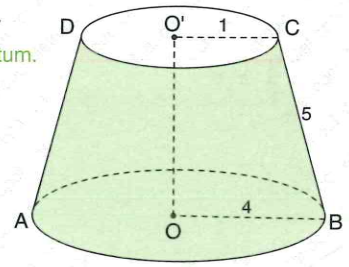
$\frac{V_{(T,AO'B)}}{V_{(T,COD)}} = k^3$ [Hacimlerin benzerlik oranı / Similarity ratio of volumes]



Örnek / Example 21

(DO'CBOA) bir kesik konidir.
(DO'CBOA) is a conical frustum.

|O'C| = 1 cm,
|OB| = 4 cm,
|BC| = 5 cm
$\Rightarrow A_Y = ?\ cm^2$



A) 23π B) 24π C) 25π D) 26π E) 27π

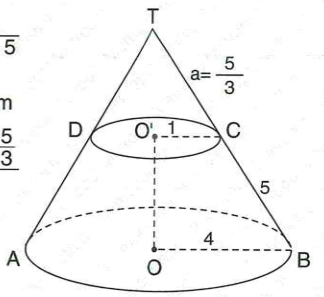
Çözüm / Solution Yanıt / Answer **C**

$|TC| = a,\ \frac{|O'C|}{|OB|} = \frac{|TC|}{|TB|} \Rightarrow \frac{1}{4} = \frac{a}{a+5}$

$\Rightarrow a = \frac{5}{3}$ cm

$A_Y = \frac{2\cdot\pi\cdot 4\cdot\left(5+\frac{5}{3}\right)}{2} - \frac{2\cdot\pi\cdot 4\cdot\frac{5}{3}}{2}$

$= 25\pi\ cm^2$



KÜRE / SPHERE

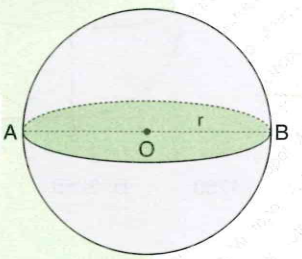
Tanım: Uzayda sabit bir noktaya (merkez) eşit uzaklıkta bulunan noktaların kümesine ***küre*** denir.

Definition: In the space, the set of all points that are located at a constant distance from a fixed point (the center) is called a *sphere*.

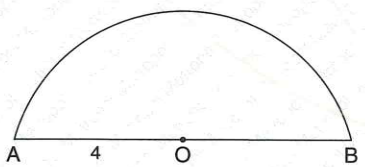
O noktası kürenin merkezi, |OB| = r yarıçaptır.
O is the center of the sphere, |OB| = r is the radius.

Yüzey Alanı / Surface Area (A) = $4\cdot\pi\cdot r^2$

Hacim / Volume (V) = $\frac{4}{3}\cdot\pi\cdot r^3$



Örnek / Example 22



O merkezli ve |AO| = 4 br yarıçaplı yarım daire [AB] etrafında 360° dördürülüyor. **Oluşan cismin alanı kaç br^2 dir?**
A semicirde with center of O and radious of |AO| = 4 is rotared 360° around the line segment [AB]. **What u^2 is the volume of formed shape?**

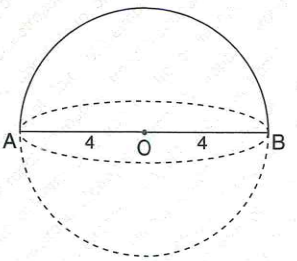
A) 32π B) 36π C) 48π D) 64π E) 92π

Çözüm / Solution Yanıt / Answer **D**

Döndürme sonucunda oluşan cisim, O merkezli küredir.
The solid resulted from rotation is a sphere with center O.

$A = 4\cdot\pi\cdot r^2 = 4\cdot\pi\cdot 4^2$

$= 64\pi$

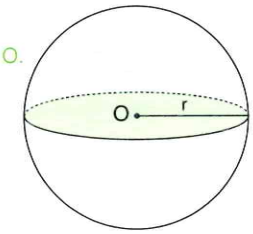


Örnek / Example 23

Şekildeki O merkezli bir küredir.
In the figure is a sphere with the center O.

$V = 288\pi$ cm^3

$\Rightarrow$ **r = ?**



A) 3 B) 4 C) 5 D) 6 E) 7

Çözüm / Solution

Yanıt / Answer **D**

$V = \frac{4}{3} \cdot \pi \cdot r^3$

$288\pi = \frac{4}{3} \cdot \pi \cdot r^3$

$r = 6$ cm

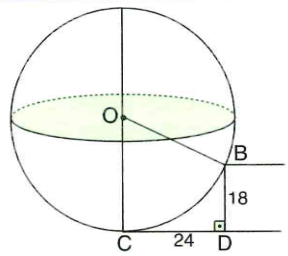
Örnek / Example 24

$|CD| = 24$ cm,

$|BD| = 18$ cm,

$|OB| = r$ cm

$\Rightarrow$ **A = ? cm^2**



A) 1250 B) 1500 C) 1750 D) 2250 E) 2500

Çözüm / Solution

Yanıt / Answer **E**

$|OA| = (r - 18)$ cm, $|OB| = r$ cm

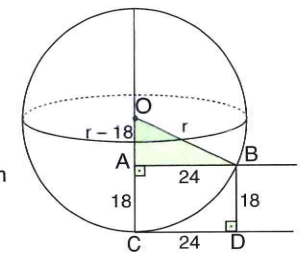
$|OB|^2 = |AB|^2 + |OA|^2$

$r^2 = 24^2 + (r - 18)^2$

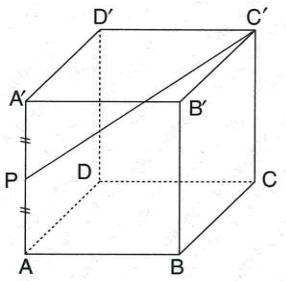
$r^2 = 576 + r^2 - 36r + 324$

$36r = 576 + 324 = 900 \Rightarrow r = 25$ cm

$A = 4 \cdot \pi \cdot r^2 = 4 \cdot \pi \cdot (25)^2 = 2500\pi$ cm^2

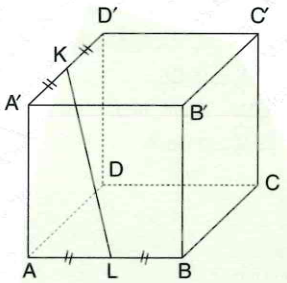


1. ABCDA′B′C′D′ bir küptür.
ABCDA′B′C′D′ is a cube.
$|AB| = 8$ cm,
$|PA'| = |PA|$
$\Rightarrow$ **$|PC'| = ?$ cm**



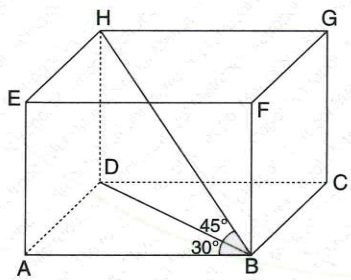
A) $6\sqrt{3}$ B) $6\sqrt{5}$ C) 12
D) $12\sqrt{3}$ E) 14

2. ABCDA′B′C′D′ bir küptür.
ABCDA′B′C′D′ is a cube.
$|A'K| = |KD'|$,
$|AL| = |LB|$
$\Rightarrow$ **$|KL| = ?$ cm**



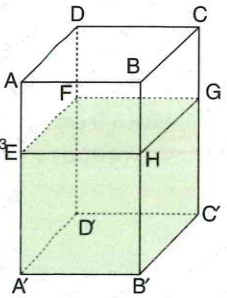
A) $2\sqrt{6}$ B) $3\sqrt{6}$ C) $4\sqrt{6}$
D) $6\sqrt{3}$ E) $8\sqrt{3}$

3. ABCDEFGH bir dikdörtgenler prizmasıdır.
ABCDEFGH is a rectangular prism.
$|BH| = 8\sqrt{2}$ cm,
$m(\widehat{ABD}) = 30°$,
$m(\widehat{HBD}) = 45°$
$\Rightarrow$ **$V = ?$ cm^3**



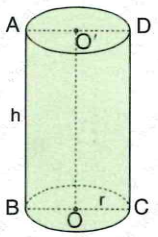
A) $64\sqrt{2}$ B) $64\sqrt{3}$ C) $128\sqrt{3}$
D) $216\sqrt{2}$ E) $312\sqrt{3}$

4. A′B′C′D′ABCD bir kare dik prizmadır.
A′B′C′D′ABCD is a square right prism.
$|A'B'| = 6$ cm,
$|AA'| = 12$ cm,
Taralı hacim / Shaded volume = 288 cm^3
$\Rightarrow$ **$|AE| = ?$ cm**



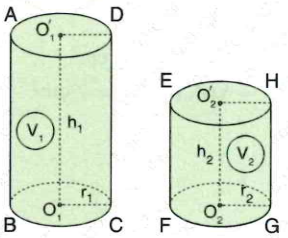
A) 1 B) 2 C) 3
D) 4 E) 5

5. ABCD bir dik silindirdir.
ABCD is a right cylinder.
$V(ABCD) = 1500 \cdot \pi \cdot cm^3$,
$|AB| = 15$ cm
$\Rightarrow$ **$|OC| = r = ?$ cm**



A) 10 B) 15 C) 20
D) 24 E) 27

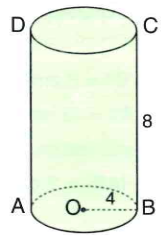
6. $h_1 = 2 \cdot h_2$
$r_1 = 2 \cdot r_2$
$\Rightarrow \dfrac{V_1}{V_2} = ?$



A) 4 B) 6 C) 8
D) 10 E) 12

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. Şekildeki bir dik silindirdir.
In the figure is a right cylinder.
$|OB| = 4$ cm,
$|BC| = 8$ cm
$\Rightarrow$ **V(ABCD) = ? cm³**

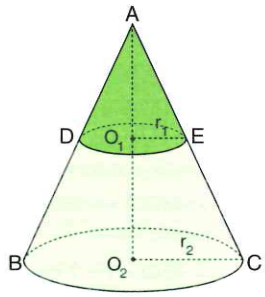


A) 96π B) 104π C) 116π D) 120π E) 128π

8. (A, BO_2C) bir dik konidir.
(A, BO_2C) is a right cone.

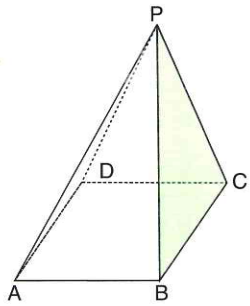
$$\frac{r_1}{r_2} = \frac{1}{2}$$

$$\Rightarrow \frac{\mathbf{V(A, BO_2C)}}{\mathbf{V(A, DO_1E)}} = \mathbf{?}$$



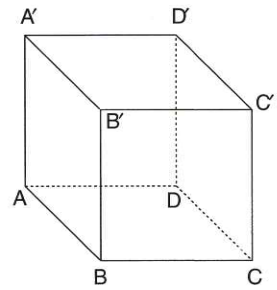
A) 2 B) 4 C) 6 D) 8 E) 10

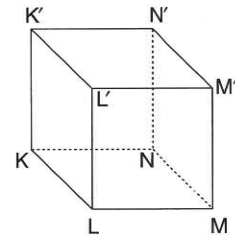
9. (P, ABCD) bir düzgün kare piramittir.
(P, ABCD) is a regular square pyramid.
$|AB| = |BC| = |DC| = |DA|$,
$|AB| = 32$ cm,
$A(\widehat{BPC}) = 320$ cm²
$\Rightarrow$ **V(P, ABCD) = ? cm³**



A) 4096 B) 5124 C) 6400
D) 7200 E) 8100

10.

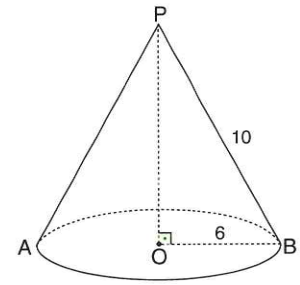




ABCDA′B′C′D′ ve KLMNK′L′M′N′ bir küptür.
ABCDA′B′C′D′ and KLMNK′L′M′N are cube.
$|AB| = 2 \cdot |KL| \Rightarrow \dfrac{\mathbf{V(ABCDA'B'C'D')}}{\mathbf{V(KLMNK'L'M'N)}} = \mathbf{?}$

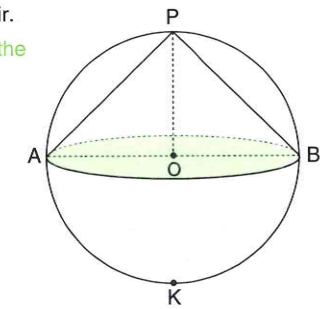
A) 2 B) 4 C) 8 D) 16 E) 32

11. (P, AOB) bir dik konidir.
(P, AOB) isa right cone.
$[PO] \perp [OB]$,
$|OB| = 6$ cm, $|PB| = 10$ cm
$\Rightarrow$ **V = ? cm³**



A) 96π B) 104π C) 116π D) 120π E) 128π

12. Şekildeki O merkezli bir küredir.
In the figure is a sphere with the center O.
$A_{\text{küre(sphere)}} = 36\pi$ cm²
$\Rightarrow$ **V(P, AOB) = ? cm³**



A) 6π B) 9π C) 18π D) 27π E) 54π

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	C	C	D	A	C	E	D	A	C	A	B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $|PE| = |AC| = 8\sqrt{2}$ cm

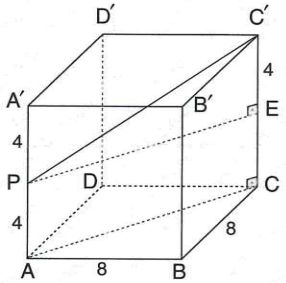
$|PC'|^2 = |C'E|^2 + |PE|^2$

$= 4^2 + (8\sqrt{2})^2$

$= 16 + 128$

$= 144$

$|PC'| = 12$ cm



Yanıt / The Answer is C

2. $[KE] \perp [EL]$,

$|KE| = 8$ cm,

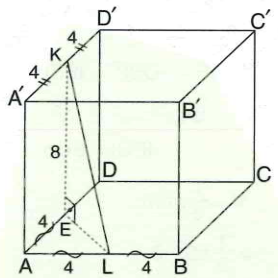
$|EL| = 4\sqrt{2}$ cm

$|KL|^2 = |KE|^2 + |EL|^2$

$= 64 + 32$

$= 96$

$|KL| = 4\sqrt{6}$ cm



Yanıt / The Answer is C

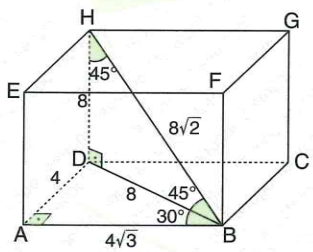
3. $|HD| = |DB| = 8$ cm,

$|AD| = \frac{8}{2} = 4$ cm,

$|AB| = 4\sqrt{3}$ cm,

$V = 4 \cdot 4\sqrt{3} \cdot 8$

$= 128\sqrt{3}$ cm^3



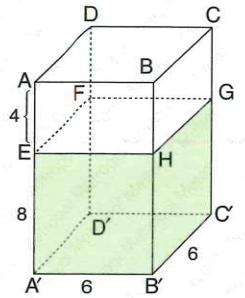
Yanıt / The Answer is C

4. 288 cm$^3 = 36 \cdot |EA'|$,

$|EA'| = 8$ cm,

$|AE| = |AA'| - |A'E|$

$= 12 - 8 = 4$ cm



Yanıt / The Answer is D

5. $V(ABCD) = \pi \cdot r^2 \cdot h$

$1500 \cdot \pi = \pi \cdot r^2 \cdot 15$

$100 = r^2$

$r = 10$ cm

Yanıt / The Answer is A

6. $V_1 = \pi \cdot r_1^2 \cdot h_1 = \pi \cdot (2r_2)^2 \cdot 2h_2 = \pi \cdot 8 \cdot r_2^2 \cdot h_2$

$V_2 = \pi \cdot r_2^2 \cdot h_2$

$\Rightarrow \frac{V1}{V2} = \frac{\pi \cdot 8 \cdot r_2^2 \cdot h_2}{\pi \cdot r_2^2 \cdot h_2} = 8$

Yanıt / The Answer is C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

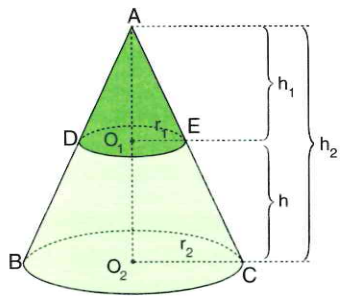
7. $V(ABCD) = \pi \cdot r^2 \cdot h$
$= \pi \cdot 4^2 \cdot 8$
$= 128\pi \text{ cm}^3$

Yanıt / The Answer is E

8. $\frac{r_1}{r_2} = \frac{h_1}{h_2} = \frac{1}{2}$

$\frac{V(A, DO_1E)}{V(A, BO_2C)} = k^3 = \frac{1}{8}$

$\frac{V(A, BO_2C)}{V(A, DO_1E)} = 8 \text{ cm}^3$

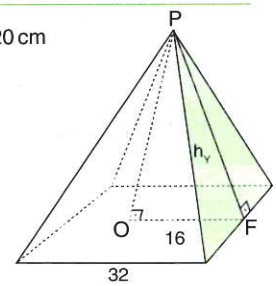


Yanıt / The Answer is C

9. $A(\widehat{BPC}) = 320 = \frac{32 \cdot h_Y}{2} \Rightarrow h_Y = 20 \text{ cm}$

$|OF| = 16 \text{ cm} \Rightarrow |OP| = 12 \text{ cm}$

$V = \frac{32^2 \cdot 12}{3} = 4096 \text{ cm}^3$



Yanıt / The Answer is A

10. $\left.\begin{matrix} |KL| = k \\ |AB| = 2k \end{matrix}\right\} \Rightarrow V(ABCDA'B'C'D') = (2k)^3 = 8k^3$
$V(KLMNK'L'M'N) = k^3$

$\Rightarrow \frac{V(ABCDA'B'C'D')}{V(KLMNK'L'M'N)} = 8$

Yanıt / The Answer is C

11. $[PO] \perp [OB] \Rightarrow$
$|PO|^2 + |OB|^2 = |PB|^2$

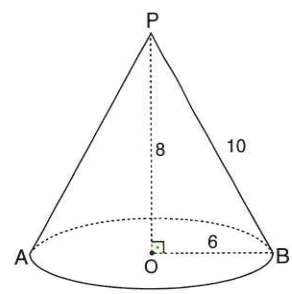
$|PO|^2 + 6^2 = 10^2$

$|PO| = 8 \text{ cm}$

$V = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi 6^2 \cdot 8$

$= 96\pi \text{ cm}^3$



Yanıt / The Answer is A

12. $|AO| = |OB| = |OP| = r$

$A_{\text{küre(sphere)}} = 4\pi r^2 = 36\pi \text{ cm}^2$

$4\pi r^2 = 36\pi$

$r = 3 \text{ cm}$

$V(P, AOB) = \frac{\pi \cdot r^2 \cdot h}{3}$ [h = |OP| = r]

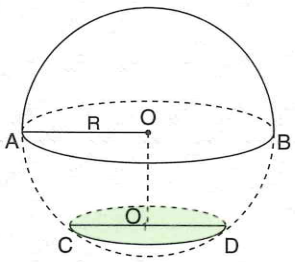
$= \frac{\pi \cdot 3^2 \cdot 3}{3}$

$= 9\pi$

Yanıt / The Answer is B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

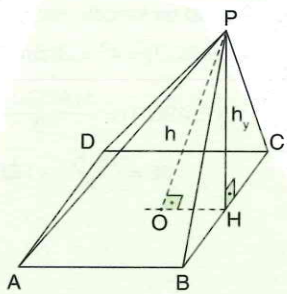
1. Şekildeki O merkezli bir küredir.
In the figure is a sphere with the center O.
$|CD| = 16$ br (u),
$|OA| = R = 10$ br (u)
$\Rightarrow |OO_1| = ?$ br (u)



A) 5 B) 6 C) 8 D) 10 E) 12

[ANKARA ÜNİVERSİTESİ – YÖS 2018]

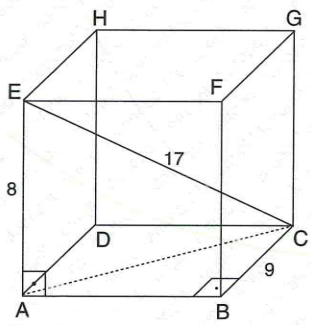
2. (P, ABCD) bir kare piramittir.
(P, ABCD) is a square pyramid.
$|AB| = 18$ cm,
$h_Y = 15$ cm
$\Rightarrow$ **h = ? cm**



A) 10 B) 11 C) 12 D) 13 E) 14

[ULUDAĞ ÜNİVERSİTESİ – YÖS 2018]

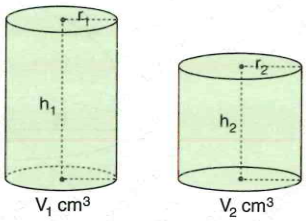
3. $|EC| = 17$ cm
$|BC| = 9$ cm
$|AE| = 8$ cm
$\Rightarrow$ **|AB| = ? cm**



A) 12 B) 10 C) 9 D) 8 E) 7

[EGE ÜNİVERSİTESİ – YÖS 2016]

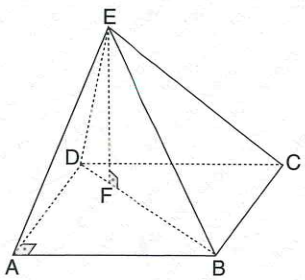
4. $V_1 = V_2$
$3 \cdot r_1 = 2 \cdot r_2$
$\Rightarrow \dfrac{h_1}{h_2} = ?$



A) 3 B) $\frac{9}{4}$ C) $\frac{3}{2}$ D) $\frac{2}{3}$ E) $\frac{4}{9}$

[YÖS 1988]

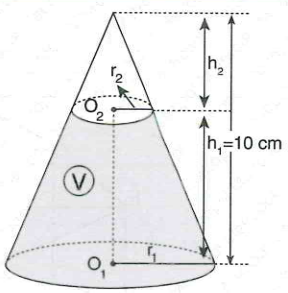
5. $[AB] \perp [AD]$,
$[BD] \perp [EF]$,
$[EF] \perp ABCD$,
$|AB| = |BC| = 4$ cm,
$|CD| = 4$ cm,
$V(E, ABCD) = 96$ cm^3
$\Rightarrow$ **|EF| = ? cm**



A) 2 B) 6 C) 8 D) 12 E) 18

[YÖS 1987]

6. $r_1 = 5$ cm,
$r_2 = 2$ cm,
$h_1 = 10$ cm
$\Rightarrow$ **V = ? cm^3**



A) 78π B) $\frac{196}{3}\pi$ C) 62π D) $\frac{127}{3}\pi$ E) $\frac{44}{3}\pi$

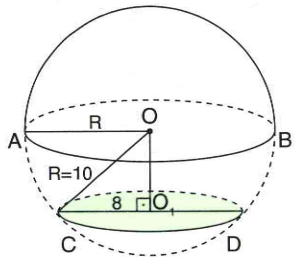
[YÖS 1985]

YANITLAR / ANSWERS

1	2	3	4	5	6
B	C	A	B	E	A

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1.



$|OD| = 16$ br (u) $\Rightarrow |CO_1| = 8$ br (u)

$|OA| = R = 10 = |OC|$

$\widehat{OO_1C}$:

$|OO_1|^2 + |CO_1|^2 = |OC|^2$

$|OO_1|^2 + 8^2 = 10^2$

$|OO_1|^2 = 36$

$|OO_1| = 6$ br (u)

Yanıt / The Answer is B

2. $|AB| = 18$ cm $\Rightarrow |OH| = 9$ cm

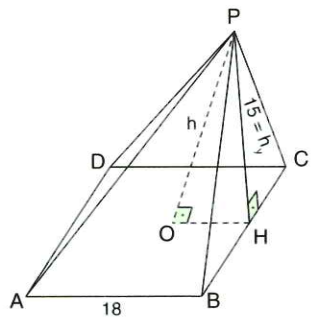
$\widehat{POH}$:

$|PO|^2 + |OH|^2 = |PH|^2$

$h^2 + 9^2 = 152$

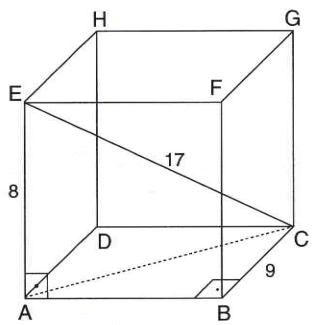
$h^2 = 225 - 81$

$h^2 = 144 \Rightarrow h = 12$ cm



Yanıt / The Answer is C

3.



$|EC|^2 = |EA|^2 + |AC|^2$

$17^2 = 8^2 + |AC|^2$

$|AC| = 15$ cm

$|AC|^2 = |AB|^2 + |BC|^2$

$15^2 = |AB|^2 + 9^2$

$|AB| = 12$ cm

Yanıt / The Answer is A

4. $\left.\begin{matrix} V_1 = \pi r_1^2 \cdot h_1 \\ V_2 = \pi r_2^2 \cdot h_2 \end{matrix}\right\} \Rightarrow \dfrac{V_1}{V_2} = \dfrac{\pi r_1^2 \cdot h_1}{\pi r_2^2 \cdot h_2}$

$$1 = \left(\frac{r_1}{r_2}\right)^2 \cdot \frac{h_1}{h_2}$$

$$1 = \left(\frac{2}{3}\right)^2 \cdot \frac{h_1}{h_2}$$

$$\frac{h_1}{h_2} = \frac{9}{4}$$

Yanıt / The Answer is B

5. ABCD bir karedir. / ABCD is a square.

$A(ABCD) = 4^2 = 16\,cm^2$, $|EF| = h$

$$V(E, ABCD) = \frac{A(ABCD) \cdot h}{3}$$

$$96 = \frac{16 \cdot h}{3} \Rightarrow |EF| = h = 18\,cm$$

Yanıt / The Answer is E

6. $\dfrac{h_2}{h_1} = \dfrac{r_2}{r_1} \Rightarrow \dfrac{h_2}{10} = \dfrac{2}{5}$

$h_2 = 4$ cm $\Rightarrow \dfrac{h_1 \cdot r_1^2 \cdot \pi}{3} - \dfrac{h_2 \cdot r_2^2 \cdot \pi}{3}$

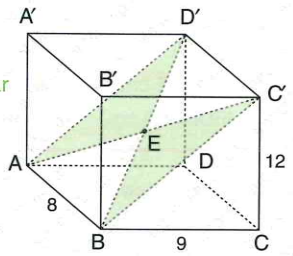
$$\frac{10 \cdot 5^2 \pi}{3} - \frac{4 \cdot 2^2 \cdot \pi}{3} = \frac{250\pi - 16\pi}{3}$$

$$= 78\pi\ cm^3$$

Yanıt / The Answer is A

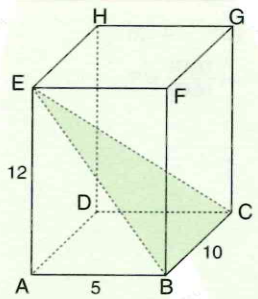
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. ABCDA′B′C′D′ bir dikdörtgenler prizmasıdır.
ABCDA′B′C′D′ is a rectangular prism.
|AB| = 8 cm,
|BC| = 9 cm,
|CC′| = 12 cm
⇒ **A(ÂD′E) + A(ÊBC′) = ? cm²**



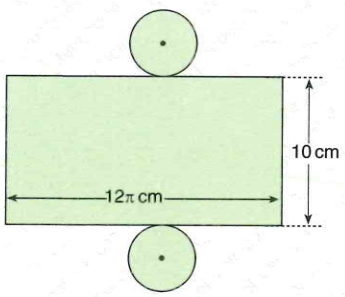
Yanıt / The Answer is 60

2. ABCDEFGH bir dikdörtgenler prizmasıdır.
ABCDEFGH is a rectangular prism.
|AB| = 5 cm,
|BC| = 10 cm,
|AE| = 12 cm
⇒ **A(B̂EC) = ? cm²**



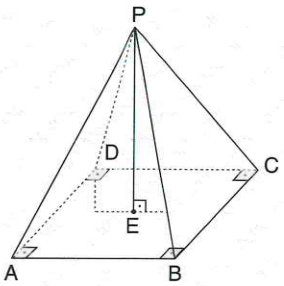
Yanıt / The Answer is 65

3. **V = ? cm³**



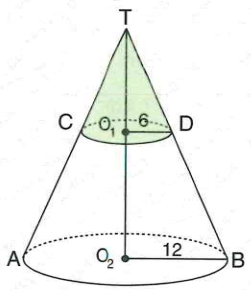
Yanıt / The Answer is 360π

4. [PE] ⊥ ABCD,
|PE| = 24 cm
|AB| = |BC| = 14 cm
⇒ **A(P, ABCD) = ? cm²**



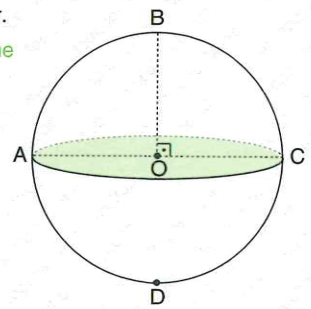
Yanıt / The Answer is 896

5. $|O_1D| = 6$ cm,
$|O_2B| = 12$ cm,
$|TO_2| = 24$ cm,
⇒ **$V(T, CO_1D) = ?$ cm³**



Yanıt / The Answer is 144π

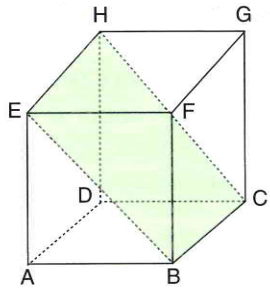
6. Şekildeki O merkezli bir küredir.
In the figure is a sphere with the center O.
$A = 16\pi$ cm²
⇒ **|OB| = ? cm**



Yanıt / The Answer is 2

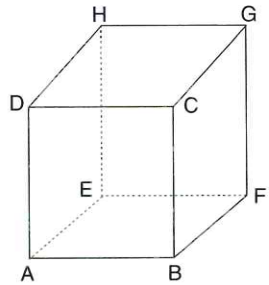
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCDEFGH bir küptür.
ABCDEFGH is a cube.
IABI = 4 cm
⇒ **A(EBCH) = ? cm²**



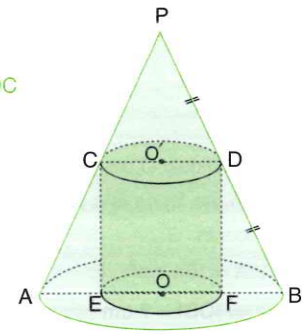
Yanıt / The Answer is $16\sqrt{2}$

8. ABFEDCGH bir küptür.
ABFEDCGH is a cube.
A = 18 cm²
⇒ **V = ? cm³**



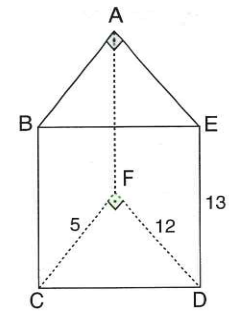
Yanıt / The Answer is $3\sqrt{3}$

9. (P, AOB) bir dik koni ve EFDC bir dik silindirdir.
(P, AOB) is a right cone and EFDC is a right cylinder.
IPDI = IDBI
⇒ $\frac{\mathbf{V(P,CO'D)}}{\mathbf{V(EFDC)}} = ?$



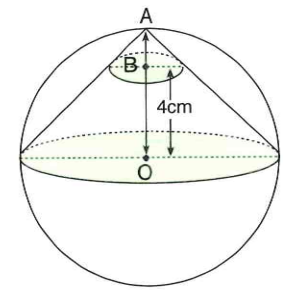
Yanıt / The Answer is $\frac{1}{3}$

10. ABEFCD bir üçgen dik prizmadır.
ABEFCD is a triangular right prism.
IFCI = 5 cm,
IFDI = 12 cm,
IEDI = 13 cm,
⇒ **V = ? cm³**



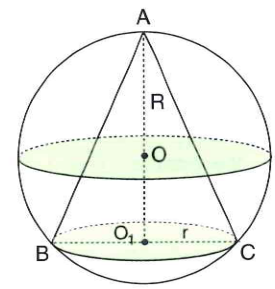
Yanıt / The Answer is 390

11. Şekildeki O merkezli bir küredir.
In the figure is a sphere with the center O.
$A_{küre\ (sphere)} = 144\pi$ cm²,
IOBI = 4 cm
⇒ $\frac{\mathbf{IABI}}{\mathbf{IAOI}} = ?$



Yanıt / The Answer is $\frac{1}{3}$

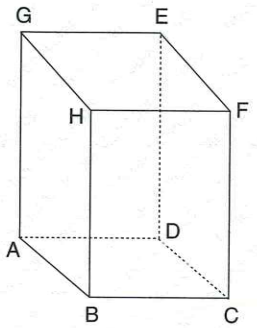
12. $IO_1CI = r = 9$ cm,
$A_Y(A,BO_1C) = 81\sqrt{10}\pi$ cm²
⇒ **IOAI = ? cm**



Yanıt / The Answer is 15

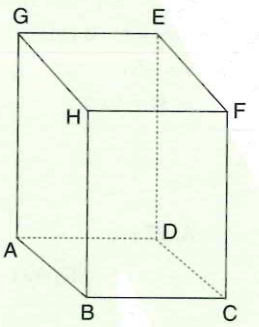
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. ABCDEFGH bir dikdörtgenler prizmasıdır.
ABCDEFGH is a rectangular prism.
$A(ABCD) = 7\ cm^2$,
$A(GHBA) = 15\ cm^2$,
$A(HBCF) = 12\ cm^2$
$\Rightarrow$ **V = ? cm^3**



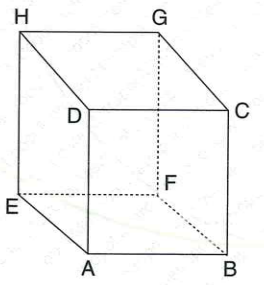
A) $2\sqrt{35}$ B) $3\sqrt{35}$ C) $4\sqrt{35}$
D) $5\sqrt{35}$ E) $6\sqrt{35}$

2. ABCDEFGH bir dikdörtgenler prizmasıdır.
ABCDEFGH is a rectangular prism.
$2 \cdot |AB| = 3 \cdot |BC| = 5 \cdot |HB|$,
$V = 900\ cm^3$
$\Rightarrow$ **|GH| = ? cm**



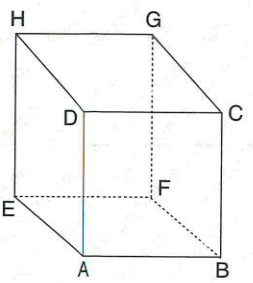
A) 3 B) 5 C) 6
D) 10 E) 15

3. ABFEDCGH bir kare dik prizmasıdır.
ABFEDCGH is a square right prism.
$|AD| = 2|AB|$,
$A(ABCD) = 64\ cm^2$
$\Rightarrow$ **V = ? cm^3**



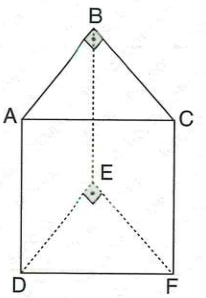
A) $64\sqrt{2}$ B) $128\sqrt{2}$ C) $256\sqrt{2}$
D) $512\sqrt{2}$ E) $1024\sqrt{2}$

4. ABCDEFGH bir dikdörtgenler prizmasıdır.
ABCDEFGH is a rectangular prism.
$|AB| = x$,
$|BC| = y$,
$|AE| = z$,
$\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=\frac{3}{7}$,
$V = 42\ cm^3$
$\Rightarrow$ **A = ? cm^2**



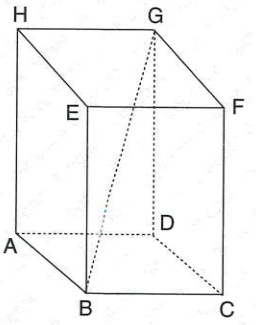
A) 18 B) 24 C) 32
D) 36 E) 40

5. ABCDEF bir üçgen dik prizmadır.
ABCDEF is a triangle right prism.
$[AB] \perp [BC]$,
$|AB| = |BC|$,
$|AC| = 6\sqrt{2}$ cm,
$|CF| = 10$ cm
$\Rightarrow$ **V = ? cm^3**



A) 60 B) 100 C) 120
D) 180 E) 240

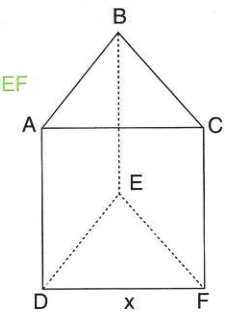
6. ABCDEFGH bir dikdörtgenler prizmasıdır.
ABCDEFGH is a rectangular prism.
$|AB| + |BC| + |EB| = 6\sqrt{2}$ cm,
$|GB| = 5\sqrt{2}$ cm
$\Rightarrow$ **A = ? cm^2**



A) 18 B) 20 C) 22
D) 24 E) 26

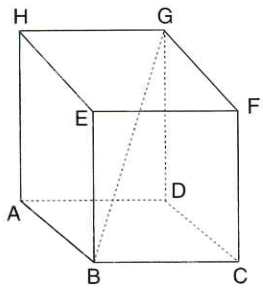
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABC bir eşkenar üçgen ve ABCDEF bir üçgen dik prizmadır.
ABC is an equilateral triangle and ABCDEF is a triangular right prism.
IACI = ICFI,
$V = 16\sqrt{3}$ cm^3
⇒ **IDFI = x = ? cm**



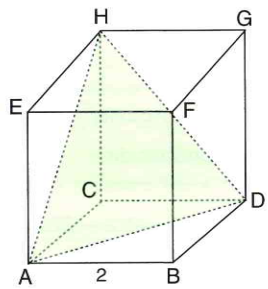
A) 4 B) 8 C) 10
D) 12 E) 16

8. ABCDHEFG bir küptür.
ABCDHEFG is a cube.
$V = x$ cm^3,
$A = y$ cm^2,
$x = y$
⇒ **IBGI = ? cm**



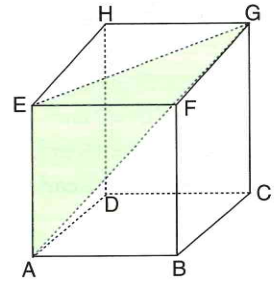
A) $2\sqrt{3}$ B) $3\sqrt{3}$ C) $4\sqrt{3}$
D) $5\sqrt{3}$ E) $6\sqrt{3}$

9. ABCDHEFG bir küptür.
ABCDHEFG is a cube.
⇒ **$A(\widehat{AHD})$ = ? cm^2**



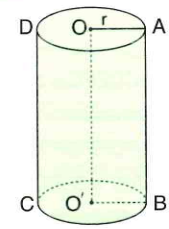
A) 2 B) $2\sqrt{2}$ C) $2\sqrt{3}$
D) 4 E) 6

10. ABCDHEFG bir küptür.
ABCDHEFG is a cube.
$A(\widehat{AGE}) = \sqrt{2}$ cm^2
⇒ **A = ? cm^2**



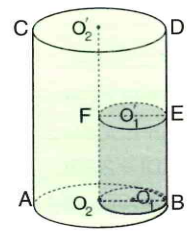
A) 10 B) 12 C) 14
D) 16 E) 18

11. DCBA bir dik silindirdir.
DCBA is a right cylinder.
IOAI = r = 3 cm,
$V = 45\pi$
⇒ **A = ? cm^2**



A) 27π B) 32π C) 36π
D) 40π E) 48π

12. CABD ve FO_2BE dik silindirlerdir.
CABD and FO_2BE are right cylinders.
O_1 ve O_2 noktaları şekildeki silindirlerin merkezleridir.
The point O1 and O2 are centers of the cylinders in the figure.
2·IEBI = IDEI
⇒ $\frac{\mathbf{V(FO_2BE)}}{\mathbf{V(CABD)}} = ?$



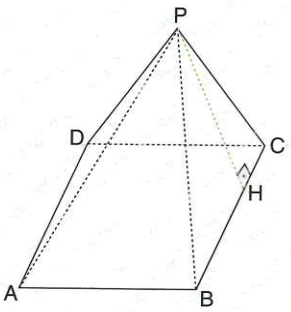
A) $\frac{1}{2}$ B) $\frac{1}{5}$ C) $\frac{1}{7}$
D) $\frac{1}{12}$ E) $\frac{1}{14}$

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
E	E	C	D	C	D	A	E	C	B	E	D

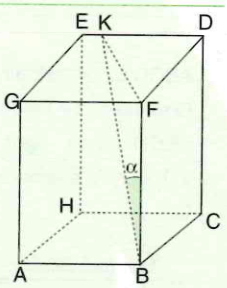
METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. (P, ABCD) bir kare piramittir.
(P, ABCD) is a square pyramid.
IPHI = 10 cm,
IABI = 12 cm
⇒ **V = ? cm³**



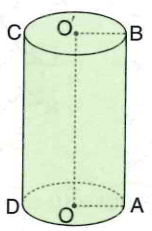
A) 348 B) 356 C) 360
D) 372 E) 384

2. ABCDHGFDE bir küptür.
ABCDHGFDE is a cube.
5·IEKI = IEDI
⇒ **tanα = ?**



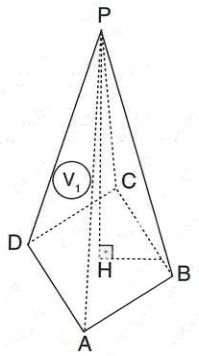
A) $\frac{4\sqrt{2}}{5}$ B) $\frac{\sqrt{35}}{5}$ C) $\frac{6}{5}$
D) $\frac{\sqrt{39}}{5}$ E) $\frac{\sqrt{41}}{5}$

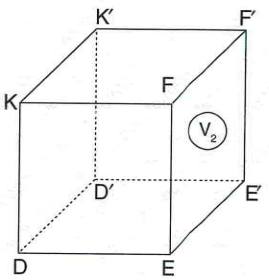
3. CDAB bir dik silindirdir.
CDAB is a right cylinder.
IABI = 9 cm,
V = 576π cm³
⇒ **A = ? cm²**



A) 212π B) 238π C) 256π
D) 272π E) 300π

4.

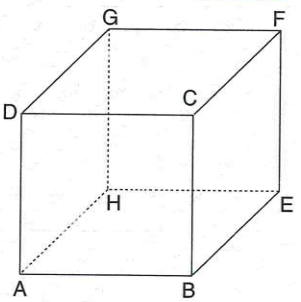




(P, ABCD) bir dik piramit ve DEE'DKFF'K' bir dik prizmadır.
(P, ABCD) is a right pyramid and DEE'DKFF'K' is a right prism.
$V_1 = V_2$, $2 \cdot A(ABCD) = A(DEE'D') \Rightarrow$ **$\frac{IPHI}{IEFI}$ = ?**

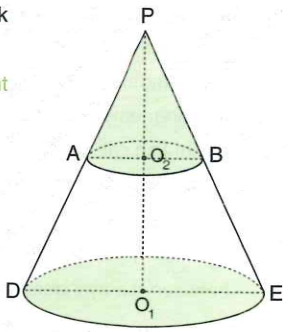
A) 3 B) 4 C) 5
D) 6 E) 7

5. ABEHDCFG bir dikdörtgenler prizmasıdır.
ABEHDCFG is a rectangular prism.
A(ABCD) = 75 cm²,
A(CBEF) = 18 cm²
A(DCFG) = 24 cm²
⇒ **V = ? cm³**



A) 150 B) 180 C) 200
D) 210 E) 240

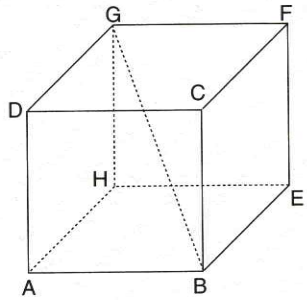
6. (P, DO_1E) ve (P, AO_2B) bir dik konidir.
(P, DO_1E) are (P, AO_2B) right cones.
$2 \cdot IPO_2I = IO_2O_1I$,
$V_{(P, DO_1E)} = 243$ cm³
⇒ **$V_{(P, AO_2B)}$ = ? cm³**



A) 3 B) 6 C) 9
D) 18 E) 27

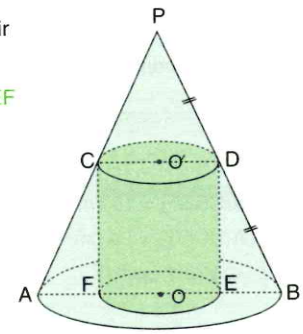
METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCDHEFG bir dikdörtgenler prizmasıdır.
ABCDHEFG is a rectengular prism.
$|AB| + |BE| + |CB| = 12$ cm,
$A = 80$ cm^2
$\Rightarrow$ **$|GB| = ?$ cm**



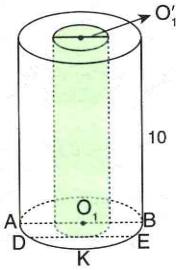
A) 5 B) 6 C) 7 D) 8 E) 9

8. (P, AOB) bir dik koni ve CDEF bir dik silindirdir.
(P, AOB) is a right cone and CDEF is a right cylinder.
$|PD| = |DB|$
$\Rightarrow \dfrac{V_{CDEF}}{V_{(P,AOB)}} = ?$



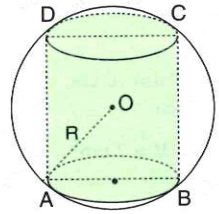
A) $\frac{3}{8}$ B) $\frac{1}{2}$ C) $\frac{5}{8}$ D) $\frac{3}{4}$ E) $\frac{7}{8}$

9. $|BC| = 10$ cm, $|DE| = 4$ cm, [DE], içteki silindire K noktasında teğet ise silindirler arasında kalan hacim kaç cm^3 tür?
If [DE] is tangent to the inner cylinder at point K. How many cm^3 the volume between the cylinders?



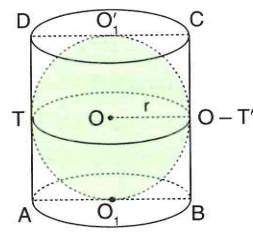
A) 36π B) 40π C) 44π D) 48π E) 52π

10. O noktası şekildeki çemberin merkezidir.
The point O is center of the circle in the figure.
ABCD bir dik silindirdir.
ABCD is a right cylinder.
$V_{(ABCD)} = 648$ cm^3
$|AD| = 18$ cm $\Rightarrow$ **$r = ?$ cm**



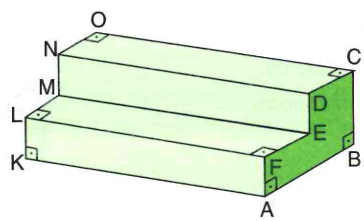
A) $\sqrt{13}$ B) $2\sqrt{13}$ C) $3\sqrt{13}$ D) $4\sqrt{13}$ E) $5\sqrt{13}$

11. ABCD bir dik silindir ve $TO_1T'O_1'$, O merkezli bir küredir.
ABCD ib a right cylinder and $TO_1T'O_1'$ is a sphere with the center O.
$\Rightarrow \dfrac{V_{silindir\,(cylinder)}}{V_{küre\,(sphere)}} = ?$



A) $\frac{9}{2}$ B) $\frac{7}{2}$ C) $\frac{5}{2}$ D) $\frac{3}{2}$ E) $\frac{1}{2}$

12.



$|OC| = 10$ cm, $A(ABCDEF) = 12$ cm^2 $\Rightarrow$ **$V = ?$ cm^3**

A) 60 B) 80 C) 100 D) 120 E) 240

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
E	E	D	D	B	C	D	A	B	C	D	D

METROPOL YAYINLARI • METROPOL PUBLICATIONS

BÖLÜM CHAPTER 16

TARİHSEL NOT / HISTORICAL NOTE

Georg Ferdinand Ludwig Philipp Cantor [1845 – 1918]

Alman matematikçidir. Matematikte temel bir teori haline gelen set kuramını yarattı. Cantor, topolojide önemli kavramlar ve bunların kardinalite ile ilişkisi geliştirdi. 1870 ve 1872 yılları arasında tüm olası alt kümelerinin kümesi olan A kümesinin güç seti gibi küme teorisinde temel yapıları tanıttı; Cantor, trigonometrik seriler hakkında ve aynı zamanda akılcı sayıları rasyonel sayıların yakınsak dizileri olarak tanımlayan çok sayıda makale yayınlamıştır.

He was a German mathematician. He created set theory, which has become a fundamental theory in mathematics. Cantor developed important concepts in topology and their relation to cardinality. He introduced fundamental constructions in set theory, such as the power set of a set A, which is the set of all possible subsets of A. Between 1870 and 1872, Cantor published numerous papers on trigonometric series, and also a paper defining irrational numbers as convergent sequences of rational numbers.

VEKTÖRLER VECTORS

Bu bölüm, 27 çözümlü örnek, 12 çözümlü test sorusu, 6 çözümlü YÖS sorusu, 12 alıştırma sorusu, 48 test sorusu içermektedir.

This chapter includes 27 examples with solutions, 12 test questions with solutions, 6 YÖS questions with solutions, 12 exercise questions and 48 test questions.

BÖLÜM / CHAPTER 16 ..... 523 - 552

VEKTÖRLER / VECTORS

- Yönlü Doğru Parçası / Directed Line Segment 525
- Vektör'ün Tanımı / Definition of a Vektor ..... 525 - 531
  - Konum Vektörü / Position Vector ..... 526 - 527
  - Bir Vektörün Uzunluğu (Normu) / The Length (Norm) of a Vector 527
  - Vektörlerde Toplama ve Çıkarma / Addition and Subtraction in Vectors 528
  - Bir Vektörün Bir Skaler İle Çarpımı / Product of a Vector by a Scalar 529
  - Vektörlerin Skaler (İç) Çarpımı / Scalar (Inner) Product of Two Vectors ..... 529 - 530
  - Birim Vektör / Unit Vector 531
  - Paralrl Vektörler / Parallel Vectors 531
- Uzayda Vektörler / Vectors in Space ..... 532 - 536
  - Uzayda Vektörelerin Uzunluğu (Normu) / The (Length) Norm of Vecttors in Space 532
  - Uzayda Vektörelerin Bir Skaler İle Çarpımı / The Product of Vectors by a Scalar in Space 532
  - Uzayda Vektörelerin Kümesinde Toplama İşlemi / Addition in Set of Vectors in Space 533
  - Uzayda Vektörelerin Skaler (İç) Çarpımı / Scalar Product of Vectors in Space ..... 533 - 534
  - Uzayda İki Vektör Arasındaki Açı / Angle Berween Two Vectors in Space ..... 534 - 535
  - Uzayda Dik Vektörler / Perpendicular Vectors in Space 535
  - Uzayda Paralel Vektörler / Parallel Vectrors in Space 536
- Çözümlü Test / Test With Solutions ..... 537 - 540
- YÖS Soruları ve Çözümleri / YÖS Questions and Solutions ..... 541 - 542
- Alıştırmalar / Exercises ..... 543 - 544
- Konu Testleri / Practice Tests ..... 545 - 552

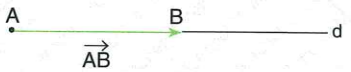
BÖLÜM
16
CHAPTER

VEKTÖRLER
VECTORS

YÖNLÜ DOĞRU PARÇASI / DIRECTED LINE SEGMENT

Tanım: Başlangıç noktası A, bitim noktası B olarak belirtilen bir doğru parçasına **yönlü doğru parçası** denir.

Definition: A line segment whose initial and ending (terminal) points are stated respectively as A and B is called a directed line segment.



Şekildeki yönlü doğru parçası $\overrightarrow{AB}$ ile gösterilir.

The directed line segment in the figure is denoted by $\overrightarrow{AB}$.

ÖNEMLİ/ IMPORTANT

- A ve B noktaları arasındaki uzaklık, $\overrightarrow{AB}$ yönlü doğru parçasının uzunluğu olup $|\overrightarrow{AB}|$ ile gösterilir.
  The distance between the points A and B is the length of directed line segment $\overrightarrow{AB}$ and is denoted by $|\overrightarrow{AB}|$.
- $\overrightarrow{AA}$ yönlü doğru parçasının uzunluğu sıfır olup, yönü ve doğrultusu belirsizdir.
  The length of directed line segment $\overrightarrow{AA}$ is zero, and its direction is uncertain.

VEKTÖR'ÜN TANIMI / DEFINITION of a VEKTOR

Düzlemde tüm yönlü doğru parçalarının kümesi K olsun.

Let K be the set of all directed line segments in the plane.

1. $\overrightarrow{AB}, \overrightarrow{CD} \in K$
2. $\overrightarrow{AB}$ ile $\overrightarrow{CB}$ aynı doğrultulu ve aynı yönde
   $\overrightarrow{AB}$ and $\overrightarrow{CD}$ are directed in the same direction.
3. $|\overrightarrow{AB}| = |\overrightarrow{CD}|$

$\Leftrightarrow$ $\overrightarrow{AB}$ ile $\overrightarrow{CD}$ eştir.
$\overrightarrow{AB}$ and $\overrightarrow{CD}$ are equivalet.

$\overrightarrow{AB}$ ile $\overrightarrow{CD}$ nin eşliği, $\overrightarrow{AB} \cong \overrightarrow{CD}$ ile gösterilir.

K kümesinde tanımlanan "$\cong$" eşlik bağıntısı bir denklik bağıntısıdır. Bu denklik bağıntısının K kümesinde ayırdığı denklik sınıflarının her birine **vektör** denir.

Yönlü doğru parçaları olarak $\overrightarrow{AB} \cong \overrightarrow{CD}$ ise $\overrightarrow{AB}$ ve $\overrightarrow{CD}$ vektörlerinin eşitliği $\overrightarrow{AB} = \overrightarrow{CD}$ ile gösterilir. $\overrightarrow{AA}$ vektörüne $\vec{0}$ (sıfır) vektörü denir.

The equivalence of $\overrightarrow{AB}$ and $\overrightarrow{CD}$ is represented by $\overrightarrow{AB} \cong \overrightarrow{CD}$

We have thus defined an equivalence relation in the set K. We call each equivalence classes in the set K separated by the relation defined above as a vector.

If $\overrightarrow{AB} \cong \overrightarrow{CD}$ as they are directed line segments then we represent the equality of vectors AB and CD by $\overrightarrow{AB} = \overrightarrow{CD}$.

The vector $\overrightarrow{AA}$ is called the zero vector and denoted by $\vec{0}$.

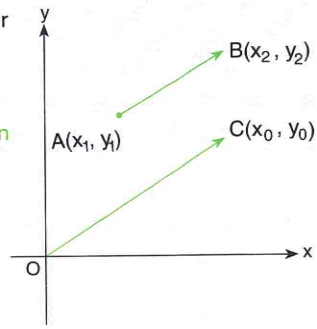
KONUM VEKTÖRÜ / POSITION VECTOR

$\overrightarrow{OC} = \overrightarrow{AB}$ ise $\overrightarrow{OC}$ yönlü doğru parçasına ***AB vektörünün konum vektörü*** denir. Her vektörün bir ve yalnızca bir konum vektörü vardır. $\overrightarrow{AB}$ nin konum vektörü olan $\overrightarrow{OC}$ vektörü $\overrightarrow{C}$ ile gösterilir.

$\overrightarrow{C}$ vektörünün; $\overrightarrow{C} = (x_0, y_0)$, $\overrightarrow{C} = [x_0, y_0]$, $\overrightarrow{C} = \begin{bmatrix} x_0 \\ y_0 \end{bmatrix}$ şeklinde gösteriliş biçimleri vardır.

If $\overrightarrow{OC} = \overrightarrow{AB}$ then $\overrightarrow{OC}$ is called the **position vector of** $\overrightarrow{AB}$. Each vector is represented by one and only one position vector. The vector $\overrightarrow{OC}$ which is position vector of $\overrightarrow{AB}$ is represented by $\overrightarrow{C}$

The vector C may be denoted by the followings: $\overrightarrow{C} = (x_0, y_0) = \overrightarrow{C} = [x_0, y_0]$, $\overrightarrow{C} = \begin{bmatrix} x_0 \\ y_0 \end{bmatrix}$



$A(x_1, y_1)$ ve $B(x_2, y_2)$ ve $\overrightarrow{AB}$ nin konum vektörü $\overrightarrow{C}$ dir.

$A(x_1 , y_1)$ and $B(x_2 , y_2)$ and $\overrightarrow{C}$ is the position vector of $\overrightarrow{AB}$.

$$\overrightarrow{AB} = \overrightarrow{C} = (x_2 - x_1,\ y_2 - y_2) \Leftrightarrow |\overrightarrow{AB}| = |\overrightarrow{C}| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Örnek / Example 1

A(4, 6) ve B(2, 2) ise, **$\overrightarrow{AB}$ nin konum vektörü $\overrightarrow{C}$ 'yi bulunuz.**

If A(4, 6) and B(2, 2) then find the vector $\overrightarrow{C}$, which is the position vector of $\overrightarrow{AB}$.

A) (–2, –4) B) (–4, –2) C) (–2, –2) D) (–3, –4) E) (–4, –4)

Çözüm / Solution

Yanıt / Answer **A**

$\overrightarrow{AB} = \overrightarrow{C} = (2 - 4,\ 2 - 6) = (-2, -4)$

Vektörlerde Eşitlik / Equality of Vectors

$$\left.\begin{array}{l} \overrightarrow{A} = (x_1 , y_1) \\ \overrightarrow{B} = (x_2 , y_2) \end{array}\right\} \quad \overrightarrow{A} = \overrightarrow{B} \Leftrightarrow x_1 = x_2 \text{ ve (and) } y_1 = y_2$$

Örnek / Example 2

$\overrightarrow{A} = (6, -3)$, $\overrightarrow{B} = (x - 2, y + 1)$,

$\overrightarrow{A} = \overrightarrow{B} \Rightarrow$ **x · y = ?**

A) –24 B) –28 C) –30 D) –32 E) –36

Çözüm / Solution

Yanıt / Answer **D**

$\overrightarrow{A} = \overrightarrow{B} \Leftrightarrow 6 = x - 2$ ve (and) $-3 = y + 1$

$8 = x$ $\quad -4 = y$

$\Rightarrow x \cdot y = 8 \cdot -4 = -32$

Örnek / Example 3

$\overrightarrow{A} = (2^x , 3)$, $\overrightarrow{B} = (4 , 3^{y-2})$,

$\overrightarrow{A} = \overrightarrow{B} \Rightarrow \overrightarrow{C} = (x, y) = ?$

A) (1, 3) B) (2, 3) C) (3, 4) D) (2, 4) E) (4, 5)

Çözüm / Solution

Yanıt / Answer **B**

$\overrightarrow{A} = \overrightarrow{B} \Leftrightarrow 2^x = 4$ ve (and) $3^{y-2} = 3$

$x = 2$ $\quad y - 2 = 1$

$y = 3$

$\Rightarrow \overrightarrow{C} = (x, y) = (2, 3)$

Örnek / Example 4

$\vec{A} = (5, x)$,

$\vec{B} = (y - 2, 3)$,

$\vec{C} = (-2, 8)$,

$\vec{AB} = \vec{C} \Rightarrow x \cdot y = ?$

A) –25 B) –10 C) –5 D) 5 E) 10

Çözüm / Solution Yanıt / Answer **A**

$\vec{AB} = (y - 2 - 5, 3 - x)$

$= (y - 7, 3 - x)$

$\vec{AB} = \vec{C} \Rightarrow (y - 7, 3 - x) = (-2, 8)$

$\Rightarrow y - 7 = -2$ ve (and) $3 - x = 8$

$y = -5$ $-5 = x$

$\Rightarrow x \cdot y = -25$

BİR VEKTÖRÜN UZUNLUĞU (NORMU) / THE LENGTH (NORM) of a VECTOR

$\vec{A} = (m, n)$ vektörünün uzunluğu, $|\vec{A}|$ ile gösterilir.

The length of $\vec{A} = (m, n)$ is denoted by $|\vec{A}|$.

$$|\vec{A}| = \sqrt{m^2 + n^2} \text{ br (u)}$$

Örnek / Example 5

$\vec{A} = (5, 12) \Rightarrow |\vec{A}| = ?$ br(u)

A) 11 B) 12 C) 13 D) 14 E) 15

Çözüm / Solution Yanıt / Answer **C**

$|\vec{A}| = \sqrt{5^2 + 12^2}$

$= \sqrt{25 + 144}$

$= \sqrt{169}$

$= 13$ br (u)

Örnek / Example 6

A(–3, 4) , B(5, –2) $\Rightarrow |\vec{AB}| = ?$

A) 8 B) 9 C) 10 D) 11 E) 12

Çözüm / Solution Yanıt / Answer **C**

$\vec{AB} = (5 - (-3), -2 - 4) = (8, -6) \Rightarrow \vec{AB} = (8, -6)$

$\Rightarrow |\vec{AB}| = \sqrt{8^2 + (-6)^2} = \sqrt{100} = 10$ br (u)

Örnek / Example 7

$\vec{A} = (5, -3)$, $\vec{BA} = (-1, 6)$

$\Rightarrow |\vec{B}| = ?$

A) $3\sqrt{3}$ B) $4\sqrt{3}$ C) $3\sqrt{13}$ D) $6\sqrt{3}$ E) $9\sqrt{13}$

Çözüm / Solution Yanıt / Answer **A**

$\vec{B} = (b_1, b_2)$, $\vec{A} = (5, -3)$

$\vec{BA} = (5 - b_1, -3 - b_2) = (-1, 6)$

$\Rightarrow 5 - b_1 = -1$ ve (and) $-3 - b_2 = 6$

$6 = b_1$ $-9 = b_2$

$\vec{B} = (6, -9) \Rightarrow |\vec{B}| = \sqrt{6^2 + (-9)^2}$

$|\vec{B}| = \sqrt{117} = 3\sqrt{13}$ br (u)

VEKTÖRLERDE TOPLAMA ve ÇIKARMA / ADDITION and SUBTRACTION in VECTORS

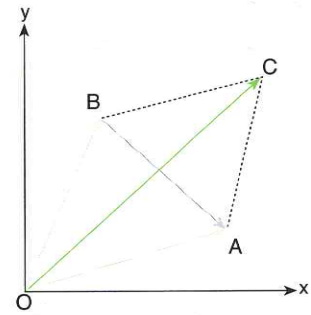
- Şekildeki grafikte $\overrightarrow{OA}$ ile $\overrightarrow{OB}$ vektörleri üzerine kurulmuş paralel kenar görülmektedir. $\overrightarrow{OC}$ vektörüne **$\overrightarrow{OA}$ ile $\overrightarrow{OB}$ vektörlerinin toplamı** denir.

  In the figure a parallelogram that is constructed on the vectors $\overrightarrow{OA}$ and $\overrightarrow{OB}$ is shown. Here, $\overrightarrow{OC}$ is the sum of $\overrightarrow{OA}$ and $\overrightarrow{OB}$.

$$\overrightarrow{OC} = \overrightarrow{OA} + \overrightarrow{OB}$$

- $\overrightarrow{BA}$ vektörüne **$\overrightarrow{OA}$ vektörü ile $\overrightarrow{OB}$ vektörünün farkı** denir.

  $\overrightarrow{BA}$ is called the difference of vector $\overrightarrow{OB}$ from vector $\overrightarrow{OA}$.



$$\overrightarrow{OA} - \overrightarrow{OB} = \overrightarrow{BA}$$
$$\overrightarrow{BA} = \overrightarrow{A} - \overrightarrow{B}$$

Vektörlerde Toplama İşleminin Özellikleri / Properties of Addition operation in Vectors

1. $\overrightarrow{A} + \overrightarrow{0} = \overrightarrow{0} + \overrightarrow{A} = \overrightarrow{A}$
2. $\overrightarrow{A} + \overrightarrow{B} = \overrightarrow{B} + \overrightarrow{A}$
3. $\overrightarrow{A} + (\overrightarrow{B} + \overrightarrow{C}) = (\overrightarrow{A} + \overrightarrow{B}) + \overrightarrow{C}$
4. $\overrightarrow{A} + (-\overrightarrow{A}) = \overrightarrow{0}$

Örnek / Example 8

$\overrightarrow{A} = (2, 5)$, $\overrightarrow{B} = (3, 4)$,
$\overrightarrow{A} + \overrightarrow{C} = \overrightarrow{B} \Rightarrow \overrightarrow{C} = ?$

A) (1, 1) B) (–1, 1) C) (–1, –1) D) (1, –1) E) (2, 1)

Çözüm / Solution — Yanıt / Answer D

$\overrightarrow{C} = (x, y) \Rightarrow (2, 5) + (x, y) = (3, 4)$

$\Rightarrow (2 + x, 5 + y) = (3, 4)$

$2 + x = 3$, $5 + y = 4$

$x = 1$ $y = -1$

$\Rightarrow \overrightarrow{C} = (1, -1)$

Örnek / Example 9

$\overrightarrow{A} = (2x - 1, 5)$, $\overrightarrow{B} = (-3, 3y + 1)$, $C = (2, -9)$,
$\overrightarrow{A} + \overrightarrow{B} = \overrightarrow{C} \Rightarrow x \cdot y = ?$

A) –15 B) –12 C) –8 D) 0 E) 18

Çözüm / Solution — Yanıt / Answer A

$\overrightarrow{A} + \overrightarrow{B} = \overrightarrow{C} = (2x - 4, 3y + 6) = (2, -9)$

$2x - 4 = 2$ $3y + 6 = -9$

$x = 3$ $y = -5$

$\Rightarrow x \cdot y = 3 \cdot (-5) = -15$

BİR VEKTÖRÜN BİR SKALER İLE ÇARPIMI / PRODUCT of a VECTOR by a SCALAR

$\overrightarrow{AB}$ ile $\overrightarrow{AC}$ vektörü aynı doğrultulu ve aynı yönlü olsun.

Let $\overrightarrow{AB}$ and $\overrightarrow{AC}$ be directed in the same direction.

1. $r \in R^+$, $r \cdot \overrightarrow{AB} = \overrightarrow{AC}$
2. $|\overrightarrow{AC}| = |r \cdot \overrightarrow{AB}| = |r| \cdot |\overrightarrow{AB}|$
3. $0 \cdot |\overrightarrow{AB}| = \overrightarrow{0}$
4. $r \cdot \overrightarrow{0} = \overrightarrow{0}$

$\overrightarrow{AB}$ ile $\overrightarrow{AC}$ aynı doğrultulu zıt yönlü olsun.

Let $\overrightarrow{AB}$ and $\overrightarrow{AC}$ be directed in the opposite direction.

1. $r \in R^-$ ve (and), $r \cdot \overrightarrow{AB} = \overrightarrow{AC}$
2. $0 \cdot |\overrightarrow{AB}| = \overrightarrow{0}$
3. $r \cdot \overrightarrow{0} = \overrightarrow{0}$

Örnek / Example 10

$\overrightarrow{A} = (-2, 2)$,

$\overrightarrow{B} = (1, 3) \Rightarrow 3 \cdot \overrightarrow{A} + 2 \cdot \overrightarrow{B} = ?$

A) (–2, 12) B)(1, 12) C) (–1, 12) D) (–3, 12) E) (–4, 12)

Çözüm / Solution Yanıt / Answer **E**

$$3 \cdot \overrightarrow{A} + 2 \cdot \overrightarrow{B} = 3 \cdot (-2, 2) + 2 \cdot (1, 3)$$
$$= (-6, 6) + (2, 6)$$
$$= (-6 + 2,\ 6 + 6)$$
$$= (-4, 12)$$

Örnek / Example 11

$\overrightarrow{A} = (4, -2)$,

$\overrightarrow{B} = (-1, 3)$,

$x \cdot \overrightarrow{A} + y \cdot \overrightarrow{B} = (1, 7) \Rightarrow x + y = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

Çözüm / Solution Yanıt / Answer **D**

$$x \cdot \overrightarrow{A} + y \cdot \overrightarrow{B} = x \cdot (4, -2) + y \cdot (-1, 3) = (1, 7)$$
$$\Rightarrow (4x, -2x) + (-y, 3,) = (1, 7)$$
$$\Rightarrow (4x - y, -2x + 3y) = (1, 7)$$
$$\Rightarrow \left.\begin{matrix} 4x - y = 1 \\ -2x + 3y = 7 \end{matrix}\right\} \Rightarrow x = 1 \text{ ve(and) } y = 3$$
$$\Rightarrow x + y = 1 + 3 = 4$$

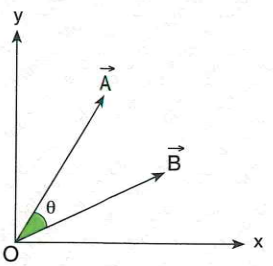
VEKTÖRLERİN SKALER (İÇ) ÇARPIMI / SCALAR (INNER) PRODUCT of TWO VECTORS

$\overrightarrow{A}$ ile $\overrightarrow{B}$ vektörlerinin skaler çarpımı aşağıdaki şekilde tanımlanır.

The scalar product of vectors $\overrightarrow{A}$ and $\overrightarrow{B}$ is defined as the following.

$$\Rightarrow \langle A, B \rangle = \overrightarrow{A} \cdot \overrightarrow{B} = |\overrightarrow{A}| \cdot |\overrightarrow{B}| \cdot \cos\theta$$

$$\Rightarrow \overrightarrow{A} = (x_1, y_1) \text{ ve } \overrightarrow{B} = (x_2, y_2) \Rightarrow \overrightarrow{A} \cdot \overrightarrow{B} = x_1 \cdot x_2 + y_1 \cdot y_2$$



Vektörlerin Skaler Çarpımının Özellikleri / Properties of Scalar Product of Vectors

1. $\vec{A} \cdot \vec{A} = |\vec{A}|^2$
2. $\vec{A} \cdot \vec{B} = \vec{B} \cdot \vec{A}$
3. $\vec{A} \cdot (\vec{B} + \vec{C}) = (\vec{A} \cdot \vec{B}) + (\vec{A} \cdot \vec{C})$
4. $\vec{A} \cdot \vec{A} = \vec{0} \Rightarrow \vec{A} = \vec{0}$
5. $\vec{A} \perp \vec{B} \Rightarrow \vec{A} \cdot \vec{B} = \vec{0}$
6. $\vec{A} \cdot \vec{B} = \vec{A} \cdot \vec{C} \Rightarrow \vec{B} = \vec{C}$ veya (or) $\vec{A} = 0$
7. $(\vec{A} \cdot \vec{B})^2 \le |\vec{A}|^2 \cdot |\vec{B}|^2$

Örnek / Example 12

$\vec{u} = (m, 6)$, $\vec{v} = (2, 4)$,

$< u, v > = 0 \Rightarrow$ **m = ?**

A) –10 B) –12 C) –14 D) –16 E) –18

Çözüm / Solution

Yanıt / Answer **B**

$< u, v > = m \cdot 2 + 6 \cdot 4 = 0$

$2m + 24 = 0 \Rightarrow m = -12$

Örnek / Example 13

$\vec{A} = (3, 1)$, $\vec{B} = (-1, 2)$,

$\vec{C} = (2, 5) \Rightarrow \vec{AB} \cdot \vec{BC} = ?$

A) –9 B) –3 C) 0 D) 3 E) 9

Çözüm / Solution

Yanıt / Answer **A**

$\vec{AB} = (-1, -3, 2-1) = (-4, 1)$

$\vec{BC} = (2-(-1), 5-2) = (3, 3)$

$\vec{AB} \cdot \vec{BC} = -4 \cdot 3 + 1 \cdot 3$

$= -9$

Örnek / Example 14

$\vec{A} = (x, x+1)$, $\vec{B} = (x, 3)$,

$\vec{A} \cdot \vec{B} = 2 \Rightarrow \sum x = ?$

A) –5 B) –4 C) –3 D) –2 E) –1

Çözüm / Solution

Yanıt / Answer **C**

$\vec{A} \cdot \vec{B} = x \cdot x + (x + 1) \cdot 3 = 2$

$\Rightarrow x^2 + 3x + 3 = 2$

$\Rightarrow x^2 + 3x + 1 = 0 \Rightarrow \sum x = -3$

BİRİM VEKTÖR / UNIT VECTOR

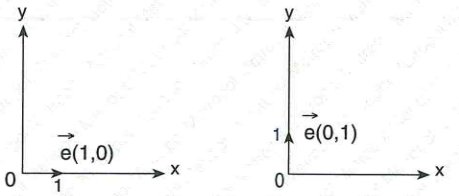
$|\vec{A}| = 1$ ise $\vec{A}$ vektörüne ***birim vektör*** denir.

If $|\vec{A}| = 1$ then $\vec{A}$ is called the **unit vector.**

◆ $\vec{A} = (x_1, y_1)$ vektörü ile aynı doğrultu ve yöndeki birim vektör:

A unit vector in same direction with the vector $\vec{A} = (x_1, y_1)$:

$$\vec{I} = \frac{1}{|\vec{A}|} \cdot \vec{A}$$



Temel birim vektörlerin koordinat sisteminde gösterimi

The notation of basic unit vectors

Örnek / Example 15

Aşağıdakilerden hangisi birim vektör değildir?

Which one of the followings is not a unit vector?

A) $\left(\frac{3}{5}, \frac{4}{5}\right)$ B) $(-1, 1)$ C) $(\sin x, -\cos x)$ D) $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$ E) $(0, -1)$

Çözüm / Solution

Yanıt / Answer **B**

$\left(\frac{3}{5}, \frac{4}{5}\right): \sqrt{\left(\frac{3}{5}\right)^2 + \left(\frac{4}{5}\right)^2} = 1$ ✓

$(-1, 1): \sqrt{(-1)^2 + 1^2} = \sqrt{2}$ x ×

$(\sin x, -\cos x): \sqrt{(\sin x)^2 + (-\cos x)^2} = 1$ ✓

$\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right): \sqrt{\left(\frac{3}{2}\right)^2 + \left(\frac{1}{2}\right)^2} = 1$ ✓

$(0, -1): \sqrt{0^2 + (-1)^2} = 1$ ✓

PARALEL VEKTÖRLER / PARALLEL VECTORS

$\vec{AB} \,//\, \vec{CD} \Rightarrow \vec{AB} = k \cdot \vec{CD}$ $(k \in R, k \neq 0)$

$\Rightarrow \vec{A} = (a, b)$, $\vec{B} = (c, d)$ ve (and) $m_A = m_B$, $\frac{b}{a} = \frac{d}{c}$

Örnek / Example 16

$\vec{A} = (3 - a, 2)$,

$\vec{B} = (3a - 1, -4)$

$\vec{A} \,//\, \vec{B} \Rightarrow$ **a = ?**

A) –5 B) –4 C) 0 D) 4 E) 5

Çözüm / Solution

Yanıt / Answer **A**

$$\frac{2}{3-a} = \frac{-4}{3a-1}$$

$$2 \cdot (3a - 1) = -4 \cdot (3 - a)$$

$$6a - 2 = -12 + 4a$$

$$2a = -10$$

$$a = -5$$

Örnek / Example 17

$\vec{A} = (3, x)$, $\vec{B} = (2, 3)$, $\vec{C} = (1, 1)$

$\vec{AB} \,//\, \vec{C} \Rightarrow$ **x = ?**

A) 1 B) 2 C) 3 D) 4 E) 5

Çözüm / Solution

Yanıt / Answer **D**

$\vec{AB} = (2 - 3, 3 - x) = (-1, 3 - x)$

$\vec{AB} \,//\, \vec{C} \Rightarrow \frac{3-x}{-1} = \frac{1}{2}$

$$3 - x = -1$$

$$4 = x$$

UZAYDA VEKTÖRLER / VECTORS in SPACE

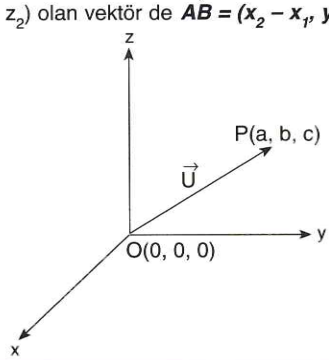
◆ $R \times R \times R = R^3 = \{(x, y, z) \mid x, y, z \in R\}$ kümesi üç boyutlu Öklit uzayıdır. R^3 te, vektörlerin başlangıç noktası O(0, 0, 0) alınırsa uzayın her (a, b, c) noktasına, başlangıç noktası O(0, 0, 0), bitim noktası (a, b, c) olan $\vec{U} = [a, b, c]$ vektörü karşılık gelir. Bu nedenle, her (a, b, c) sıralı üçlüsü bir vektör olarak düşünülebilir.

$R \times R \times R = R^3 = \{(x, y, z) \mid x, y, z \in R\}$ is the set representing the three–dimensional Euclidean Space. In R^3, if the initial point of vectors is taken as O(0,0,0) then each vector $\vec{U} = [a, b, c]$ with the initial point O(0,0,0) and the terminal point (a,b,c) may be matched to the corresponding point (a,b,c) of R^3. Hence, each ordered triple (a,b,c) may be determined as a vector.

◆ Bir $\vec{U} = [a, b, c]$ vektörü geometrik olarak, O(0, 0, 0) orijin noktasını P(a, b, c) noktasına birleştiren yönlü doğru parçasıyla gösterilebilir. a, b, c sayılarına $\vec{U} = [a, b, c]$ **vektörünün bileşenleri** denir.

Geometrically, a vector $\vec{U} = [a, b, c]$ may be represented by a directed line segment that connects the origin O(0, 0, 0) with P(a, b, c). Here the numbers a,b,c are called the **vector** of $\vec{U} = (a, b, c)$. The vector with initial point $A(x_1, y_1, z_1)$ and with terminal point $B(x_2, y_2, z_2)$ may be shown by the ordered triple $\vec{AB} = (x_2 - x_1, y_2 - y_1, z_2 - z_1)$.

◆ Başlangıç noktası $A(x_1, y_1, z_1)$, bitim noktası $B(x_2, y_2, z_2)$ olan vektör de $\vec{AB} = (x_2 - x_1, y_2 - y_1, z_2 - z_1)$ biçiminde bir sıralı üçlü ile gösterilebilir.



UZAYDA VEKTÖRLERİN UZUNLUĞU (NORMU) / THE (LENGTH) NORM of VECTORS in SPACE

$\vec{U} = [a, b, c]$ ise, $\|\vec{U}\| = \sqrt{a^2 + b^2 + c^2}$ sayısına $\vec{U}$ ***vektörünün uzunluğu (normu)*** denir.

Let $\vec{U} = [a, b, c]$. The number $\|\vec{U}\| = \sqrt{a^2 + b^2 + c^2}$ is called *norm of the vector* $\vec{U}$.

Örnek / Example 18

$\vec{A} = [6, -12, -2\sqrt{14}]$ **vektörünün boyu (normu) kaç birimdir?**

Find the length (norm) of vector $\vec{A} = [6, -12, -2\sqrt{14}]$

A) $\sqrt{59}$ B) $2\sqrt{59}$ C) $3\sqrt{59}$ D) $4\sqrt{59}$ E) $5\sqrt{59}$

Çözüm / Solution

Yanıt / Answer **B**

$$\|\vec{A}\| = \sqrt{6^2 + (-12)^2 + (-2\sqrt{14})^2}$$
$$= \sqrt{36 + 144 + 56}$$
$$= \sqrt{236}$$
$$= 2\sqrt{59} \text{ br (u)}$$

UZAYDA VEKTÖRLERİN BİR SKALER İLE ÇARPIMI / THE PRODUCT of VECTORS by a SCALAR in SPACE

$k \in R$ ve (and) $\vec{U} = [a, b, c] \Rightarrow$ $k \cdot \vec{U} = [k \cdot a, k \cdot b, k \cdot c]$

Örnek / Example 19

$\vec{A} = [8, 3, -2] \Rightarrow 3 \cdot \vec{A} = ?$

A) [24, 9, –6] B) [22, 9, –6] C) [24, 6, –9] D) [22, 6, –9] E) [20, 6, –6]

Çözüm / Solution

Yanıt / Answer **A**

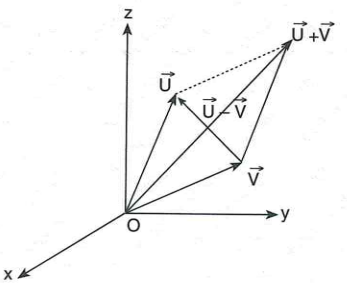
$$3 \cdot \vec{A} = 3 \cdot [8, 3, -2]$$
$$= [3 \cdot 8, 3 \cdot 3, 3 \cdot -2]$$
$$= [24, 9, -6]$$

UZAYDA VEKTÖRLER KÜMESİNDE TOPLAMA İŞLEMİ / ADDITION in SET of VECTORS in SPACE

$\vec{U} = [x_1, y_1, z_1]$, $\vec{V} = [x_2, y_2, z_2]$

$\Rightarrow \vec{U} + \vec{V} = [x_1 + x_2, y_1 + y_2, z_1 + z_2]$

$\Rightarrow \vec{U} - \vec{V} = [x_1 - x_2, y_1 - y_2, z_1 - z_2]$



Örnek / Example 20

$\vec{A} = [-5, 7, -3]$,

$\vec{B} = [6, 2, 9] \Rightarrow \vec{A} + \vec{B} = ?$

A) [2, 6, 9 B) [1, 6, 9] C) [1, 9, 6]

D) [2, 9, 6] E) [3, 9, 6]

Çözüm / Solution

Yanıt / Answer **C**

$\vec{A} + \vec{B} = [-5 + 6, 7 + 2, -3 + 9]$

$= [1, 9, 6]$

Örnek / Example 21

$\vec{U} = (-3, 4, 7)$, $\vec{V} = (-2, 4, 6)$

$\Rightarrow \vec{U} - \vec{V} = ?$

A) (1, 0, –1) B) (1, –1, 1) C) (–1, –1, 0)

D) (–1, 0, 1) E) (0, –1, 1)

Çözüm / Solution

Yanıt / Answer **D**

$\vec{U} - \vec{V} = (-3 - (-2), 4 - 4, 7 - 6)$

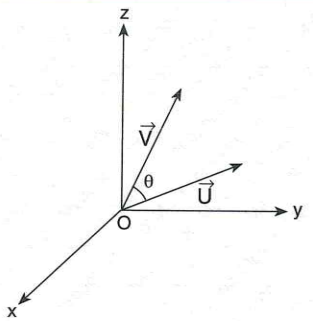
$= (-1, 0, 1)$

UZAYDA VEKTÖRLERİN SKALER (İÇ) ÇARPIMI / SCALAR PRODUCT of VECTORS in SPACE

$\vec{U} = (x_1, y_1, z_1)$, $\vec{V} = (x_2, y_2, z_2)$

$\Rightarrow \vec{U} \cdot \vec{V} = x_1 \cdot x_2 + y_1 \cdot y_2 + z_1 \cdot z_2$

$\Rightarrow \vec{U} \cdot \vec{V} = \|\vec{U}\| \cdot \|\vec{V}\| \cdot \cos\theta$



Örnek / Example 22

$\vec{U} = (-2, \sqrt{3}, 1)$, $\vec{V} = (3, -2\sqrt{3}, 4)$

$\Rightarrow \vec{U} \cdot \vec{V} = ?$

A) –2 B) –4 C) –6 D) –8 E) –10

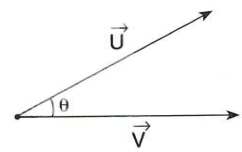
Çözüm / Solution Yanıt / Answer **D**

$\vec{U} \cdot \vec{V} = (-2) \cdot 3 + \sqrt{3} \cdot (-2\sqrt{3}) + 1 \cdot 4$

$\vec{U} \cdot \vec{V} = -6 - 6 + 4 = -8$

UZAYDA İKİ VEKTÖR ARASINDAKİ AÇI / ANGLE BETWEEN TWO VECTORS in SPACE

$$\vec{U} \cdot \vec{V} = \|\vec{U}\| \cdot \|\vec{V}\| \cdot \cos\theta \Rightarrow \cos\theta = \frac{\vec{U} \cdot \vec{V}}{\|\vec{U}\| \cdot \|\vec{V}\|}$$



Örnek / Example 23

$\vec{U}$ = [–1, 1, 2], $\vec{V}$ = [1, 2, 1] vektörlerinin arasındaki açı kaç derecedir?

What is the measure of angle between the vectors $\vec{U}$ = [–1, 1, 2] and $\vec{V}$ = [1, 2, 1]?

A) 15° B) 30° C) 45° D) 55° E) 60°

Çözüm / Solution Yanıt / Answer **E**

$$\cos\theta = \frac{\vec{U} \cdot \vec{V}}{\|\vec{U}\| \cdot \|\vec{V}\|} = \frac{-1+2+2}{\sqrt{1+1+4} \cdot \sqrt{1+4+1}} = \frac{3}{6} = \frac{1}{2}$$

$\cos\theta = \frac{1}{2} \Rightarrow \theta = 60°$

Örnek / Example 24

$\vec{A} = [-2, 2a - 1, 3]$, $\vec{B} = [1, -2, 4]$

$\vec{A} \perp \vec{B} \Rightarrow$ **a = ?**

A) –3 B) –2 C) 0 D) 2 E) 3

Çözüm / Solution Yanıt / Answer **E**

$\vec{A} \perp \vec{B} \Rightarrow \vec{A} \cdot \vec{B} = 0$

$(-2) \cdot 1 + (2a - 1) \cdot (-2) + 3 \cdot 4 = 0$

$-2 - 4a + 2 + 12 = 0$

$-4a = -12$

$a = 3$

Örnek / Example 25

$\vec{A} = (-1, 2, 3)$, $\vec{B} = (0, 3, x)$,

$\vec{A} \perp \vec{B} \Rightarrow$ **x = ?**

A) –2 B) –1 C) 0 D) 1 E) 2

Çözüm / Solution Yanıt / Answer **A**

$\vec{A} \perp \vec{B} \Rightarrow \vec{A} \cdot \vec{B} = 0$

$(-1) \cdot 0 + 2 \cdot 3 + 3 \cdot x = 0$

$0 + 6 + 3x = 0$

$3x = -6$

$x = -2$

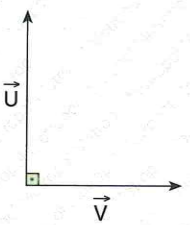
UZAYDA DİK VEKTÖRLER / PERPENDICULAR VECTORS in SPACE

- $\vec{U} \perp \vec{V} \Rightarrow \theta = 90°$ ***(cos90° = 0)***

$$\frac{\vec{U} \cdot \vec{V}}{\|\vec{U}\| \cdot \|\vec{V}\|} = 0 \Rightarrow \vec{U} \cdot \vec{V} = 0$$

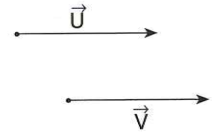
- $\vec{U} = [x_1, y_1, z_1]$, $\vec{V} = [x_2, y_2, z_2]$

$\vec{U} \perp \vec{V} \Leftrightarrow x_1 \cdot x_2 + y_1 \cdot y_2 + z_1 \cdot z_2 = 0$



UZAYDA PARALEL VEKTÖRLER / PARALLEL VECTORS in SPACE

$\vec{U} \,//\, \vec{V} \Rightarrow \theta = 0^\circ$ $\left.\begin{matrix}\vec{U} = [x_1, y_1, z_1] \\ \vec{V} = [x_2, y_2, z_2]\end{matrix}\right\} \Rightarrow \vec{U} = k \cdot \vec{V}$,



$[x_1, y_1, z_1] = [k \cdot x_2, k \cdot y_2, k \cdot z_2]$

$k = \dfrac{x_1}{x_2} = \dfrac{y_1}{y_2} = \dfrac{z_1}{z_2}$

$\vec{U} \,//\, \vec{V} \Leftrightarrow \dfrac{x_1}{x_2} = \dfrac{y_1}{y_2} = \dfrac{z_1}{z_2}$

Örnek / Example 26

$\vec{A} = [a - 2, 3, 4]$, $\vec{B} = [-1, 3 + 2b, 2]$,

$\vec{A} \,//\, \vec{B} \Rightarrow$ **a + b = ?**

A) $-\frac{1}{4}$ B) $-\frac{3}{4}$ C) -1 D) $-\frac{5}{4}$ E) $-\frac{7}{4}$

Çözüm / Solution

Yanıt / Answer **B**

$\vec{A} \,//\, \vec{B} \Rightarrow \dfrac{a-2}{-1} = \dfrac{3}{3+2b} = \dfrac{4}{2} = 2$

$a - 2 = -2 \Rightarrow a = 0$

$3 = 6 + 4b \Rightarrow b = -\dfrac{3}{4}$

$\Rightarrow a + b = -\dfrac{3}{4}$

Örnek / Example 27

$\vec{A} = (1, -1, 0)$, $\vec{B} = (3, -3, -2)$, $\vec{C} = (-2, x, y)$

$\vec{AB} \,//\, \vec{C} \Rightarrow$ **x + y = ?**

A) -4 B) -2 C) 0 D) 2 E) 4

Çözüm / Solution

Yanıt / Answer **E**

$\vec{AB} = (3 - 1, -3 + 1, -2 - 0) = (2, -2, -2)$

$\vec{AB} \,//\, \vec{C} \Rightarrow \dfrac{-2}{2} = \dfrac{x}{-2} = \dfrac{y}{-2}$

$\Rightarrow x = 2,\ y = 2$

$\Rightarrow x + y = 4$

1. $\vec{A} = (3, -2)$,
$\vec{B} = (8, 4)$
$\Rightarrow |\vec{AB}| = ?$ br (u)

A) 5 B) $\sqrt{34}$ C) 7
D) $\sqrt{61}$ E) 8

2. $\vec{A} = (1, 2)$,
$\vec{B} = (3, m)$,
$\vec{C} = (n, 2)$,
$2\cdot\vec{A} + 3\cdot\vec{B} = 4\cdot\vec{C} \Rightarrow m + n = ?$

A) $\frac{4}{9}$ B) $\frac{25}{12}$ C) $\frac{49}{12}$
D) $\frac{81}{12}$ E) $\frac{121}{12}$

3. $\vec{A} = (x - 1, -4)$,
$\vec{B} = (3, y)$,
$\vec{C} = (2x - 7, x + 4)$,
$\vec{A} + \vec{B} = \vec{C} \Rightarrow x + y = ?$

A) 13 B) 18 C) 21
D) 24 E) 26

4. $\vec{A} + \vec{B} = (-2, 3)$,
$\vec{A} - \vec{B} = (1, 4) \Rightarrow \vec{A}\cdot\vec{B} = ?$

A) –3 B) –1 C) 0 D) 1 E) 3

5. $\vec{A} = (-2, 4)$,
$\vec{B} = (3, 1)$
$\Rightarrow \vec{A}\cdot\vec{B} = ?$

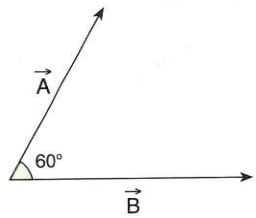
A) –2 B) –1 C) 0
D) 1 E) 2

6. $\vec{A} = (6, -3)$,
$\vec{B} = (x - 2, 5)$,
$\vec{A} // \vec{B} \Rightarrow x = ?$

A) –12 B) –8 C) –3 D) 8 E) 12

METROPOL YAYINLARI • METROPOL PUBLICATIONS

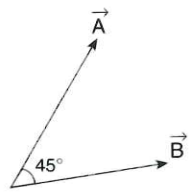
7.



$|\vec{A}| = 2\sqrt{5}$, $|\vec{B}| = 3\sqrt{5} \Rightarrow \vec{A} \cdot \vec{B} = ?$

A) 15 B) 18 C) 30 D) 45 E) 60

8. $|\vec{A}| = 2\sqrt{2}$,
$|\vec{B}| = 4$
$\Rightarrow \vec{A} \cdot \vec{B} = ?$ br (u)



A) 4 B) 6 C) 8 D) 10 E) 12

9. $\vec{A} = (\sin 65°, \cos 65°)$,
$\vec{B} = (\cos 25°, \sin 25°)$
$\Rightarrow \vec{A} \cdot \vec{B} = ?$ br (u)

A) –1 B) 0 C) 1 D) 2 E) 3

10. $\vec{A} = [2a+3,\ 4,\ b+2]$
$\vec{B} = [2,\ 6,\ -3]$
$\vec{A} \ // \ \vec{B} \Rightarrow a \cdot b = ?$ br (u)

A) 3 B) $\frac{10}{3}$ C) $\frac{13}{5}$ D) $-\frac{9}{5}$ E) –6

11. $\vec{X} = (3, -4, 12) \Rightarrow |\vec{X}| = ?$ br (u)

A) 11 B) 12 C) $6\sqrt{3}$ D) 13 E) $8\sqrt{2}$

12. $\vec{A} = (9, 8, -6)$,
$\vec{B} = (-3, 2, 6)$
$\Rightarrow |\vec{AB}| = ?$ br (u)

A) 16 B) 18 C) $9\sqrt{3}$ D) $6\sqrt{6}$ E) 21

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	C	E	B	A	B	A	C	C	B	D	B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $\vec{A} = (3, -2)$, $\vec{B} = (8, 4)$

$\overrightarrow{AB} = \vec{B} - \vec{A} = (8 - 3, 4 - (-2))$

$\overrightarrow{AB} = (5, 6)$

$\overrightarrow{AB} = (5, 6) \Rightarrow |\overrightarrow{AB}| = \sqrt{5^2 + 6^2} = \sqrt{61}$ br (u)

Yanıt / The Answer is D

2. $\vec{A} = (1, 2) \Rightarrow 2\vec{A} = (2, 4)$

$\vec{B} = (3, m) \Rightarrow 3\cdot\vec{B} = (9, 3m)$

$2\cdot\vec{A} + 3\cdot\vec{B} = (2 + 9, 4 + 3m)$

$\vec{C} = (n, 2) \Rightarrow 4\cdot\vec{C} = (4n, 8)$

$2\cdot\vec{A} + 3\cdot\vec{B} = 4\cdot\vec{C} \Rightarrow (11, 4 + 3m) = (4n, 8)$

$11 = 4n \Rightarrow n = \frac{11}{4}$

$4 + 3m = 8 \Rightarrow m = \frac{4}{3}$

$m + n = \underset{(3)}{\frac{11}{4}} + \underset{(4)}{\frac{4}{3}} = \frac{49}{12}$

Yanıt / The Answer is C

3. $\vec{A} + \vec{B} = (x - 1 + 3, -4 + y) = (x + 2, -4 + y) = \vec{C}$

$(x + 2, -4 + y) = (2x - 7, x + 4)$

$9 = x \quad , \quad y = 17 \Rightarrow x + y = 26$

Yanıt / The Answer is E

4.

$$\begin{array}{r} \vec{A} + \vec{B} = (-2, 3) \\ + \ \vec{A} - \vec{B} = (1, 4) \\ \hline 2\cdot\vec{A} = (-1, 7) \\ \vec{A} = \left(-\frac{1}{2}, \frac{7}{2}\right) \end{array}$$

$\vec{B} = (-2, 3) - \vec{A} = \left(-2 + \frac{1}{2}, 3 - \frac{7}{2}\right)$

$\vec{B} = \left(-\frac{3}{2}, -\frac{1}{2}\right)$

$\vec{A}\cdot\vec{B} = -\frac{1}{2}\cdot-\frac{3}{2} + \frac{7}{2}\cdot-\frac{1}{2}$

$= -1$

Yanıt / The Answer is B

5. $\vec{A} = (-2, 4)$,

$\vec{B} = (3, 1)$,

$\vec{A}\cdot\vec{B} = 3\cdot(-2) + 1\cdot4 = -6 + 4 = -2$

Yanıt / The Answer is A

6. $\vec{A} \,//\, \vec{B} \Rightarrow -\frac{3}{6} = \frac{5}{x - 2}$

$\Rightarrow 3x + 6 = 30$

$-3x = 24$

$x = -8$

Yanıt / The Answer is B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $\theta = 60°, |\vec{A}| = 2\sqrt{5}, |\vec{B}| = 3\sqrt{5}$

$\Rightarrow \vec{A} \cdot \vec{B} = |\vec{A}| \cdot |\vec{B}| \cdot \cos\theta$

$= 2\sqrt{5} \cdot 3\sqrt{5} \cdot \cos 60°$

$= 15$

Yanıt / The Answer is A

8. $\vec{A} \cdot \vec{B} = |\vec{A}| \cdot |\vec{B}| \cdot \cos 45°$

$= 2\sqrt{2} \cdot 4 \cdot \frac{\sqrt{2}}{2}$

$= 8$ br (u)

Yanıt / The Answer is C

9. $\vec{A} \cdot \vec{B} = \sin 65° \cdot \cos 25° + \cos 65° \cdot \sin 25° = \sin(65° + 25°)$

$= \sin 90°$

$= 1$ br (u)

Yanıt / The Answer is C

10. $\vec{A} \,//\, \vec{B} \Rightarrow \frac{2a+3}{2} = \frac{4}{6} = \frac{b+2}{-3}$

$6a + 9 = 4 \Rightarrow a = -\frac{5}{6}$

$3b + 6 = -6 \Rightarrow 3b = -12$

$b = -4$

$a \cdot b = \left(-\frac{5}{6}\right)(-4) = \frac{20}{6} = \frac{10}{3}$ br (u)

Yanıt / The Answer is B

11. $\vec{X} = (3, -4, 12)$

$\Rightarrow |\vec{X}| = \sqrt{3^2 + (-4)^2 + 12^2}$

$= \sqrt{9 + 16 + 144} = \sqrt{169} = 13$ br (u)

Yanıt / The Answer is D

12. $\vec{A} = (9, 8, -6)$,

$\vec{B} = (-3, 2, 6)$

$\Rightarrow \vec{AB} = \vec{B} - \vec{A} = (-3 - 9, 2 - 8, 6 - (-6))$

$= (-12, -6, 12)$

$\Rightarrow |\vec{AB}| = \sqrt{(-12)^2 + (-6)^2 + 12^2}$

$= \sqrt{144 + 36 + 144} = \sqrt{324} = 18$ br (u)

Yanıt / The Answer is B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $\vec{A} = [-3, 2, -1]$

$\vec{B} = [2, 1, 3]$

$\Rightarrow |\vec{A} \cdot \vec{B}| = ?$

A) 3 B) 4 C) 5 D) 6 E) 7

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2013]

2. $\vec{A} = (a, 6, 8)$

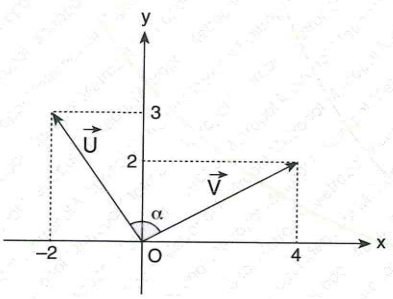
$\vec{B} = (3, b, 4)$

$\vec{A} \,//\, \vec{B} \Rightarrow a = ?\ b = ?$

A) $a = 6$, $b = 3$ B) $a = 8$, $b = 6$ C) $a = 4$, $b = 6$ D) $a = 1$, $b = 2$ E) $a = 8$, $b = 3$

[YILDIZ TEKNİK ÜNİVERSİTESİ – YÖS 2011]

3.



$\Rightarrow \cos\alpha = ?$

A) $\frac{-\sqrt{65}}{65}$ B) $\frac{-\sqrt{39}}{39}$ C) $\frac{-\sqrt{13}}{13}$ D) $\frac{\sqrt{26}}{9}$ E) $\frac{\sqrt{13}}{5}$

[YÖS 2009]

4. $\vec{A} + \vec{B} = (-2, 1)$

$|\vec{A}|^2 + |\vec{B}|^2 = 15$

$\Rightarrow \langle \vec{A}, \vec{B} \rangle = ?$

A) –10 B) –6 C) –5 D) –4 E) –3

[YÖS 2008]

5. $\vec{u} = (-1, m, 6)$,

$\vec{v} = (2, -4, 3)$,

$\langle \vec{u}, \vec{v} \rangle = 0$

$\Rightarrow m = ?$

A) –3 B) –1 C) 2 D) 3 E) 4

[YÖS 2007]

6. $\vec{a} = (2, 8)$,

$\vec{b} = (m, 4)$,

$\vec{a} = k \cdot \vec{b}$

$\Rightarrow m = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

[YÖS 2006]

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9
E	A	A	C	E	A			

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $\vec{A} = [-3, 2, -1]$

$\vec{B} = [2, 1, 3]$

$\Rightarrow |\vec{A} \cdot \vec{B}| = |(-3)\cdot 2 + 2\cdot 1 + (-1)\cdot 3|$

$= |-6 + 2 - 3|$

$= |-7|$

$= 7$

Yanıt / The Answer is E

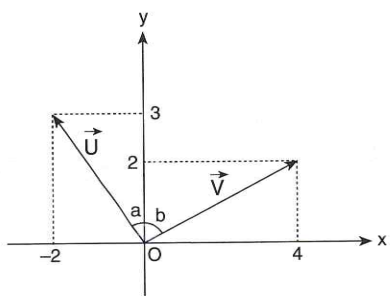
2. $\vec{A} \,//\, \vec{B} \Rightarrow \frac{a}{3} = \frac{6}{b} = \frac{8}{4}$

$\Rightarrow \frac{a}{3} = 2$ ve(and) $\frac{6}{b} = 2$

$a = 6 \quad , \quad 3 = b$

Yanıt / The Answer is A

3.



$<\vec{U} \cdot \vec{V}> = |U| \cdot |V| \cdot \cos\alpha$

$<(-2,3),(4,2)> = \sqrt{9+4} \cdot \sqrt{4+16} \cdot \cos\alpha$

$-2 = \sqrt{260} \cdot \cos\alpha$

$\cos\alpha = -\frac{2}{\sqrt{4 \cdot 65}} = -\frac{1}{\sqrt{65}} = -\frac{\sqrt{65}}{65}$

Yanıt / The Answer is A

4. $\vec{A} = (x, y), \ \vec{B} = (a, b)$

$\Rightarrow \vec{A} + \vec{B} = (x + a, y + b) = (-2, 1)$

$x + a = -2 \Rightarrow x^2 + 2ax + a^2 = 4$

$y + b = 1 \Rightarrow \underline{+ \ y^2 + 2yb + b^2 = 1}$

$x^2 + a^2 + y^2 + b^2 + 2(ax + yb) = 5$

$x^2 + a^2 + y^2 + b^2 + 2 <\vec{A} , \vec{B}> = 5$

$|\vec{A}|^2 + |\vec{B}|^2 = x^2 + y^2 + a^2 + b^2 = 15$

$\Rightarrow 15 + 2 <\vec{A}, \vec{B}> = 5$

$<\vec{A}, \vec{B}> = -5$

Yanıt / The Answer is C

5. $<\vec{u}, \vec{v}> = (-1)\cdot 2 + m\cdot(-4) + 6\cdot 3 = 0$

$-2 - 4m + 18 = 0$

$4m = 16 \Rightarrow m = 4$

Yanıt / The Answer is E

6. $\vec{a} = k \cdot \vec{b}$

$(2, 8) = k\cdot(m, 4)$

$(2, 8) = (k\cdot m, 4\cdot k)$

$4\cdot k = 8 \Rightarrow k = 2$

$2\cdot m = 2 \Rightarrow m = 1$

Yanıt / The Answer is A

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $x\cdot[3,1] + y\cdot[-2,5] = [-13,7] \Rightarrow \mathbf{x + y = ?}$

Yanıt / The Answer is **– 1**

2. $\left.\begin{matrix}\vec{A} = [2,\ a-1,\ 3] \\ \vec{B} = [4,\ 3a+4,\ 6]\end{matrix}\right\}, \vec{A} \ // \ \vec{B} \Rightarrow \mathbf{a = ?}$

Yanıt / The Answer is **– 6**

3. $\vec{A} = [2, 3]$,
$\vec{B} = [2k, -6]$ ve(and) $\vec{A} \ // \ \vec{B}$
$\Rightarrow \mathbf{k = ?}$

Yanıt / The Answer is **– 2**

4. $\vec{A} = [2m + 12, 4]$, $\vec{B} = [1, -6]$,
$\vec{A} \perp \vec{B} \Rightarrow \mathbf{m = ?}$

Yanıt / The Answer is **6**

5. A(2, 3), B(–1, 2),
C(–3, –2), D(0, 6)
$\Rightarrow \mathbf{\vec{AB} \cdot \vec{CD} = ?}$

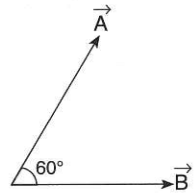
Yanıt / The Answer is **– 17**

6. $\vec{A} = (-3, 5)$,
$\vec{B} = (-1, 2)$,
$\vec{C} = (-4, x)$,
$\vec{AB} \perp \vec{BC} \Rightarrow \mathbf{x = ?}$

Yanıt / The Answer is **0**

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $|\vec{A}| = 4$,
$|\vec{B}| = 8$
$\Rightarrow \vec{A} \cdot \vec{B} = ?$ **br** (u)



Yanıt / The Answer is **16**

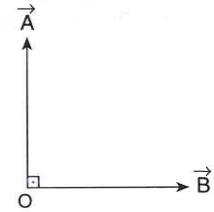
8. A(4, 0, –7), B(2, –1, –3) $\Rightarrow |\overrightarrow{AB}| = ?$

Yanıt / The Answer is $\sqrt{21}$

9. $\vec{A} = (-3, 4)$
$\vec{B} = (0, -2)$
$\Rightarrow (\vec{A} - \vec{B}) \cdot (\vec{A} + \vec{B}) = ?$

Yanıt / The Answer is **21**

10. $\vec{A} = (-2, 2, 4)$
$\vec{B} = (-3, 1, a)$
$\vec{A} \perp \vec{B} \Rightarrow$ **a = ? br**(u)



Yanıt / The Answer is **– 2**

11. $\vec{A} = (2, 3)$,
$\vec{B} = (0, 1)$,
$\vec{C} = (x, y)$,
$\overrightarrow{AC} = \overrightarrow{AB} \Rightarrow$ **x + y = ?**

Yanıt / The Answer is **1**

12. $\vec{A} = (4, -3)$
$\vec{B} = (-6, 8)$
$\Rightarrow \dfrac{\vec{A} \cdot \vec{B}}{|\vec{B}| - |\vec{A}|} = ?$

Yanıt / The Answer is $-\dfrac{48}{5}$

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $\vec{A} = (3, -5)$,
$\vec{B} = (-2, -10)$
$\Rightarrow \vec{A} - \vec{B} = ?$

A) $(-1, 5)$ B) $(1, 5)$ C) $(1, -15)$
D) $(5, 5)$ E) $(-5, -15)$

2. $\vec{A} = (2, 1)$,
$\vec{B} = (3, -4)$
$\Rightarrow \vec{A} + 2\vec{B} = ?$

A) $(7, -2)$ B) $(8, -7)$ C) $(5, -3)$
D) $(-1, 5)$ E) $(7, 3)$

3. $\vec{A} = (3, 6)$,
$\vec{B} = (-2, -5)$,
$\vec{C} = (1, -4)$,
$\vec{D} = (a, b)$,
$\overrightarrow{AC} = \overrightarrow{BD} \Rightarrow a + b = ?$

A) -19 B) -18 C) -17
D) -16 E) -15

4. $3\vec{A} - 2\vec{B} = (1, 11)$,
$2\vec{A} + \vec{B} = (3, 5)$
$\Rightarrow |\vec{A}| = ?$

A) $\sqrt{10}$ B) $2\sqrt{10}$ C) $3\sqrt{10}$
D) $4\sqrt{10}$ E) $5\sqrt{10}$

5. $\vec{A}(1, 3)$,
$\vec{B}(-4, -3)$,
$\vec{C}(2, a)$, $\vec{D}(-4, 1)$
ve (and) $\overrightarrow{AB} \perp \overrightarrow{DC} \Rightarrow a = ?$

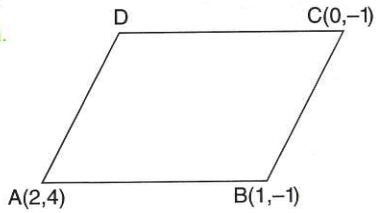
A) -5 B) -4 C) -3
D) -2 E) -1

6. $\vec{A}(-1, 2)$,
$\vec{B}(-2, 3)$,
$\vec{C}(4, -2)$, $\vec{D}(2, a)$,
$\overrightarrow{AB} // \overrightarrow{CD} \Rightarrow a = ?$

A) -2 B) -1 C) 0
D) 1 E) 2

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. ABCD bir paralelkenardır.
ABCD is a parallelogram.
$\Rightarrow \overrightarrow{AB} \cdot \overrightarrow{CD} = ?$



A) –27 B) –26 C) –25
D) –24 E) –23

8. $\vec{x} = (a + 1, 2 - a)$,
$\vec{y} = (2a - 1, 2a + 1)$
$\vec{x} \perp \vec{y} \Rightarrow$ **a = ?**

A) $-\frac{1}{5}$ B) $-\frac{1}{4}$ C) $-\frac{1}{3}$
D) $-\frac{1}{2}$ E) –1

9. $\vec{A} = (k + 1, 2)$,
$\vec{B} = (1, -6)$,
$\vec{C} = (-2, 3)$,
$\overrightarrow{BA} \,//\, \vec{C} \Rightarrow$ **k = ?**

A) $-\frac{18}{7}$ B) $-\frac{16}{3}$ C) $-\frac{14}{3}$
D) $-\frac{10}{3}$ E) $-\frac{8}{3}$

10. $\vec{A} = (5, 2)$,
$\vec{B} = (2, -3)$,
$\vec{X} = (a, b)$,
$2\cdot\vec{A} - \vec{B} = \vec{X} \Rightarrow$ **a + b = ?**

A) 12 B) 13 C) 14
D) 15 E) 16

11. $\vec{A} = (2, 1)$,
$\vec{B} = (1, 2)$,
$\vec{C} = (11, 4)$,
$a \cdot \vec{A} + b \cdot \vec{B} = \vec{C} \Rightarrow$ **a + b = ?**

A) 3 B) 4 C) 5
D) 6 E) 7

12. $\vec{A} = (k - 1, 4)$,
$\vec{B} = (k - 2, 3)$,
$\vec{A} \,//\, \vec{B} \Rightarrow$ **k = ?**

A) 3 B) 4 C) 5
D) 6 E) 7

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
D	B	A	A	B	C	B	B	B	D	C	C

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $\vec{A} = (7, 1)$,
$\vec{B} = (-2, 3)$
$\Rightarrow 3\cdot\vec{A} + \vec{B} = ?$

A) (19, 6) B) (21, 2) C) (21, 6)
D) (12, 0) E) (9, 4)

2. $\vec{A} = (2, -4)$,
$\vec{B} = (-1, 5)$,
$\vec{C} = (4, 3)$,
$\vec{D} = (a, 0)$,
$\overrightarrow{AB} // \overrightarrow{CD}$
$\Rightarrow a = ?$

A) 1 B) 2 C) 3
D) 4 E) 5

3. $3\vec{A} + \vec{B} = (5, 15)$,
$\vec{A} - \vec{B} = (3, 1)$
$\Rightarrow |\vec{AI}| = ?$

A) $\sqrt{5}$ B) $2\sqrt{5}$ C) $3\sqrt{5}$
D) $3\sqrt{6}$ E) $4\sqrt{6}$

4. $\vec{A} = (x, 3)$,
$\vec{B} = (-2, y)$,
$\vec{C} = (-4, 5)$,
$2\cdot\vec{A} - \vec{B} = \vec{C}$
$\Rightarrow x + y = ?$

A) –1 B) –2 C) –3
D) –4 E) –5

5. $\vec{A} = (-1, 4)$,
$\vec{B} = (3, y)$,
$\vec{A} \cdot \vec{B} = 5 \Rightarrow y = ?$

A) –2 B) –1 C) 0
D) 1 E) 2

6. $\vec{A} = (4, -5)$,
$\vec{B} = (2, y)$,
$\vec{C} = (1, 8)$,
$\vec{D} = (-2, 4)$,
$\overrightarrow{AB} \cdot \overrightarrow{CD} = 2$
$\Rightarrow y = ?$

A) –5 B) –4 C) –3
D) –2 E) –1

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $\vec{A} = (0, b)$,
$\vec{B} = (-2, 4)$,
$\vec{C} = (a, -1)$,
$\vec{D} = (3, 5)$,
$\vec{AB} = \vec{CD}$
$\Rightarrow$ **a + b = ?**

A) 1 B) 2 C) 3
D) 4 E) 5

8. $\vec{A} = (x, 4)$,
$\vec{B} = (5, -4)$,
$|\vec{AB}| = 10$ cm
$\Rightarrow \sum$ **x = ?**

A) 7 B) 8 C) 9
D) 10 E) 11

9. $\vec{A} = (x, -1)$,
$\vec{B} = (3, y)$,
$\vec{A} - 3\cdot\vec{B} = (5, 2)$
$\Rightarrow$ **x + y = ?**

A) 9 B) 10 C) 11
D) 12 E) 13

10. $\vec{A} = (3, -2)$,
$\vec{B} = (-1, y)$,
$\vec{C} = (4, 3)$,
$\vec{D} = (-2, 5)$,
$\vec{AB} \perp \vec{CD}$
$\Rightarrow$ **y = ?**

A) –13 B) –14 C) –15
D) –16 E) –17

11. $\vec{A} = (-1, 3)$,
$\vec{B} = (5, 2)$,
$\vec{C} = (-17, 17)$,
$a \cdot \vec{A} + b \cdot \vec{B} = \vec{C}$
$\Rightarrow$ **a·b = ?**

A) –16 B) –14 C) –12
D) –8 E) –6

12. $\vec{A} = (1, z + 2, -2)$,
$\vec{B} = (x + 2, -3, 4 - y)$,
$\vec{A} = \vec{B}$
$\Rightarrow$ **x + y + z = ?**

A) 0 B) 1 C) 2
D) 3 E) 4

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
A	E	B	B	E	B	C	D	E	B	B	A

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $\vec{A} = (2, 0)$,
$\vec{B} = (-3, 3)$
$\Rightarrow |\vec{A} - 2\cdot\vec{B}| = ?$

A) 6 B) 8 C) 10 D) 12 E) 15

2. $4\cdot\vec{e_1} - \vec{e_2} = x(2\cdot\vec{e_1} + \vec{e_2}) + y(-\vec{e_1})$
$\Rightarrow x + y = ?$

A) –7 B) –3 C) –2 D) –1 E) 0

3. $\vec{V_1} = (2 + x, 3, y)$,
$\vec{V_2} = (z, z - 1, 4)$,
$\vec{V_1} = \vec{V_2} \Rightarrow x + y + z = ?$

A) 9 B) 10 C) 11 D) 12 E) 13

4. $\vec{A} = (2, 8)$,
$\vec{B} = (-3, 7)$,
$\vec{C} = (0, 1)$,
$\vec{D} = (x, y)$
$\overrightarrow{AB} = \overrightarrow{CD} \Rightarrow x + y = ?$

A) –8 B) –7 C) –6 D) –5 E) –4

5. $\vec{A} = (-1, 2)$,
$\vec{B} = (3, 0)$,
$\vec{C} = (4, -1)$,
$\vec{D} = (2, a)$
$\overrightarrow{AB} \perp \overrightarrow{CD} \Rightarrow a = ?$

A) –8 B) –7 C) –6 D) –5 E) –4

6. $\vec{A} = (\cos 35°, \cos 25°)$
$\vec{B} = (\sin 25°, \sin 35°)$
$\Rightarrow \vec{A} \cdot \vec{B} = ?$

A) $\frac{1}{2}$ B) $\frac{\sqrt{3}}{2}$ C) $-\frac{1}{2}$ D) $-\frac{\sqrt{3}}{2}$ E) –1

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $\vec{A} = (-2, 4)$,
$\vec{B} = (2, -5)$,
$x\cdot\vec{A} + y\cdot\vec{B} = (-10, 22)$
$\Rightarrow$ **x + y = ?**

A) 1 B) 2 C) 3
D) 4 E) 5

8. $\vec{A} = (k + 1)\cdot\vec{e_1} - \vec{e_2}$,
$\vec{B} = 3\cdot\vec{e_1} + 2\vec{e_2}$,
$\vec{A} \,//\, \vec{B}$ $\Rightarrow$ **k = ?**

A) $-\frac{7}{2}$ B) $-\frac{5}{2}$ C) $-\frac{3}{2}$
D) $-\frac{1}{2}$ E) $\frac{1}{2}$

9. **$\vec{A} = (2, 4)$ ve $\vec{B} = (1, -2)$ vektörleri arasındaki açının cosinüsü nedir?**

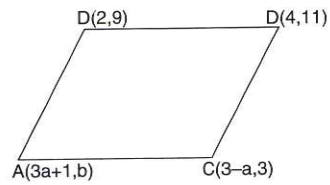
What is the cosinus of the angle between $\vec{A} = (2, 4)$ and $\vec{B} = (1, -2)$

A) –1 B) $-\frac{4}{5}$ C) $-\frac{3}{5}$
D) $-\frac{2}{5}$ E) $-\frac{1}{5}$

10. $\vec{A} = (2, 3)$,
$\vec{B} = (3, -2)$,
$\vec{C} = (3, 6)$
$x\cdot\vec{A} + y\cdot\vec{B} = \vec{C}$ $\Rightarrow$ **5y – x = ?**

A) –5 B) –4 C) –3
D) –2 E) –1

11. ABCD bir paralelkenardır.
ABCD is a parallelogram.
A(3a + 1, b),
B(3 – a, 3), C(4, 11)
D(2, 9) $\Rightarrow$ $\vec{AB}$ **= ?**



A) (2, 2) B) (3, –24) C) (0 , –22)
D) (1, –24) E) (–2, 24)

12. $\vec{A} = a\cdot\vec{e_1} - 3\vec{e_2}$
$\vec{B} = (-2, 5)$, $\vec{C}(1, -2)$,
$\vec{AB} \,//\, \vec{C}$ $\Rightarrow$ **a = ?**

A) 1 B) 2 C) 3
D) 4 E) 5

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	A	B	D	D	B	A	B	C	C	A	B

METROPOL YAYINLARI • METROPOL PUBLICATIONS

1. $\vec{A} = (7, 8)$,
$\vec{B} = (3, 4)$
$\Rightarrow |\vec{AB}| = ?$

A) $3\sqrt{2}$ B) 4 C) $4\sqrt{2}$
D) $5\sqrt{2}$ E) $6\sqrt{2}$

2. $\vec{A} = (4, 1)$,
$\vec{B} = (a, a-1)$,
$\vec{C} = (2, 3)$,
$\vec{AB} \,//\, \vec{C} \Rightarrow a = ?$

A) 6 B) 8 C) 10
D) 12 E) 14

3. $\vec{A} = (4^{2a+5}, 27)$,
$\vec{B} = (32, 3^{3b+1})$,
$\vec{A} = \vec{B} \Rightarrow a \cdot b = ?$

A) $-\frac{1}{6}$ B) $-\frac{5}{6}$ C) $-\frac{7}{6}$
D) $-\frac{11}{6}$ E) $-\frac{13}{6}$

4. $\vec{A} = [2m + 12, 4]$,
$\vec{B} = [1, -6]$,
$\vec{A} \perp \vec{B} \Rightarrow m = ?$

A) 8 B) $\frac{15}{2}$ C) 7
D) 6 E) $\frac{11}{2}$

5. $\vec{A} = [3 - a, 2]$,
$\vec{B} = [3a - 1, -4]$,
$\vec{A} \,//\, \vec{B} \Rightarrow a = ?$

A) 2 B) 1 C) 0
D) –3 E) –5

6. $\vec{A} = [3, 4]$,
$\vec{B} = [-6, 7]$
$\Rightarrow \vec{A} \cdot \vec{B} = ?$ br (u)

A) –24 B) –12 C) –6
D) 8 E) 10

METROPOL YAYINLARI • METROPOL PUBLICATIONS

7. $\vec{A}(4, 0, -7)$, $\vec{B}(2, -1, -3) \Rightarrow |\vec{AB}| = ?$ **br** (u)

A) $\sqrt{21}$ B) $3\sqrt{2}$ C) $4\sqrt{3}$

D) 6 E) 7

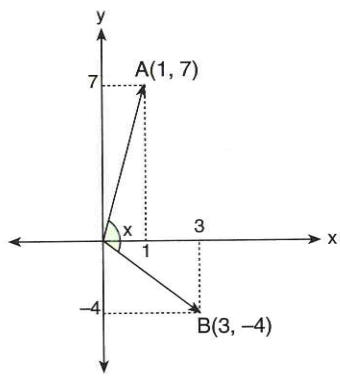
8. $\vec{A} = (3, 4, -2)$, $\vec{B} = (2, 2, -1)$, $\vec{C} = (-2, 1, -3)$

$\Rightarrow \vec{AB} \cdot \vec{AC} = ?$

A) -12 B) -11 C) -4

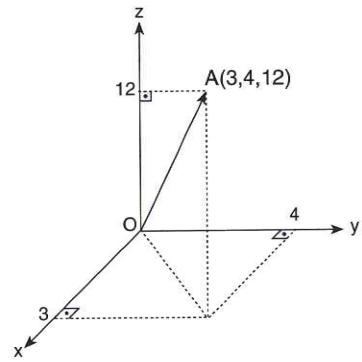
D) 10 E) 11

9. **cosx = ?**



A) $\frac{\sqrt{2}}{2}$ B) $\frac{1}{2}$ C) $\frac{\sqrt{3}}{2}$ D) $-\frac{\sqrt{2}}{2}$ E) $-\frac{1}{2}$

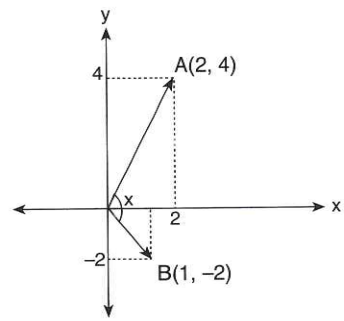
10. **|OA| = ? br** (u)



A) 10 B) 12 C) 13

D)15 E) 17

11. **cotx = ?**



A) $-\frac{3}{4}$ B) $-\frac{4}{3}$ C) $\frac{3}{4}$

D) $\frac{4}{3}$ E) 1

12. $\vec{AB} = 4 \cdot \vec{e_1} - 2 \cdot \vec{e_2}$

[AB] nin orta noktası / Midpoint of [AB] is (1, –3)

$\Rightarrow \vec{A} \cdot \vec{B} = ?$

A) 4 B) 5 C) 6

D) 7 E) 8

METROPOL YAYINLARI • METROPOL PUBLICATIONS

YANITLAR / ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12
C	B	B	D	E	E	A	D	D	C	A	B