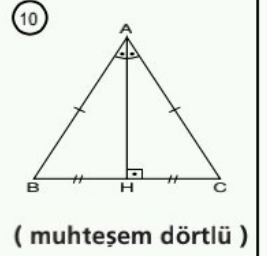
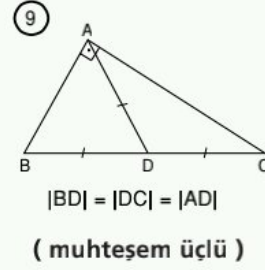
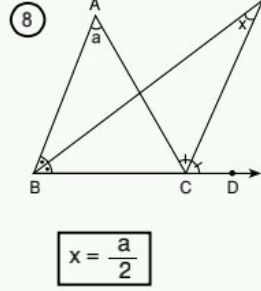
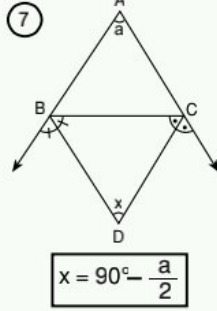
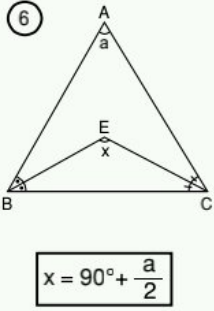
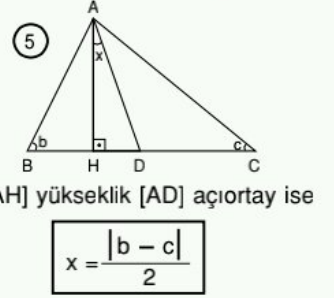
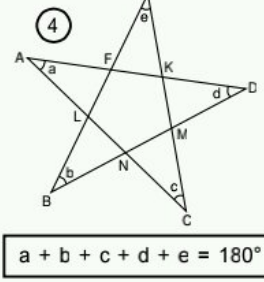
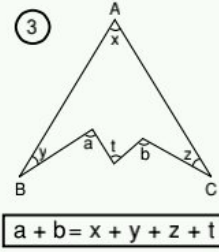
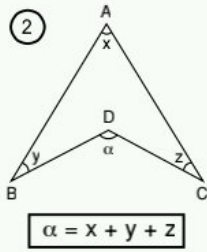
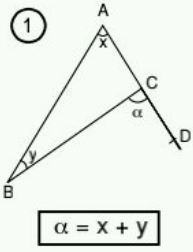
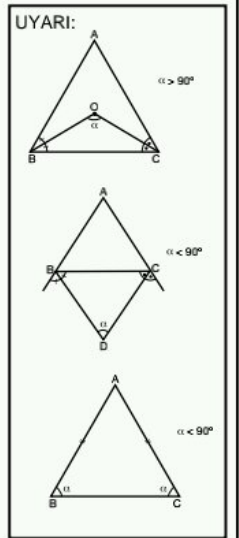
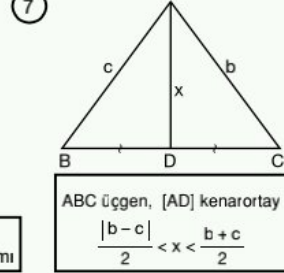
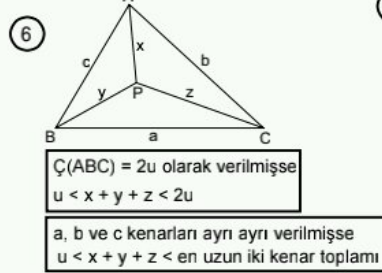
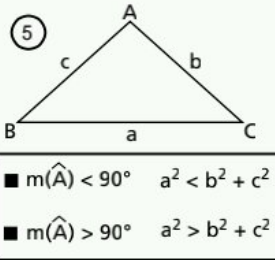
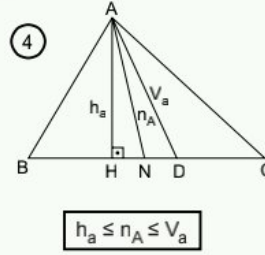
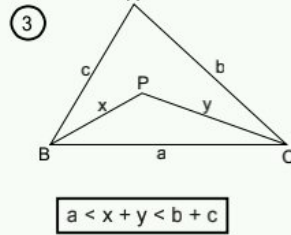
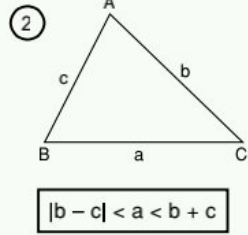
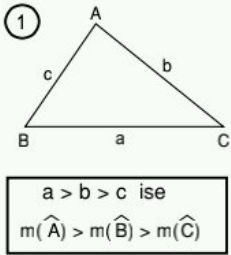


ÜÇGENDE AÇILAR

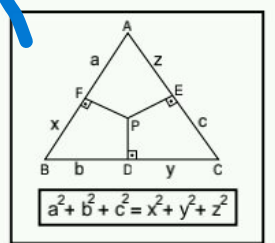
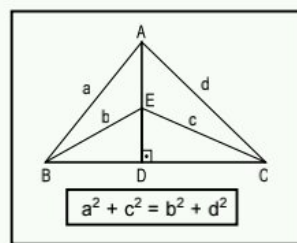
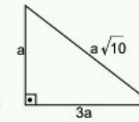
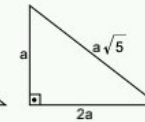
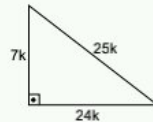
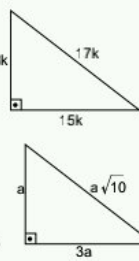
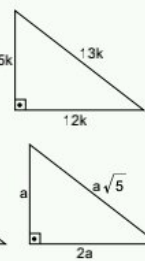
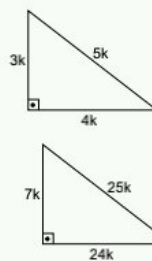
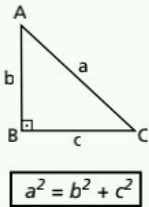
■ Bir üçgende, iç açılarının ölçüleri toplamı 180° , dış açılarının ölçüleri toplamı 360° dir.



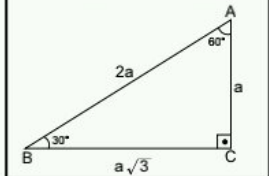
ÜÇGENDE AÇI-KENAR BAĞINTILARI



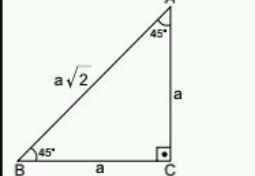
Pisagor Teoremi



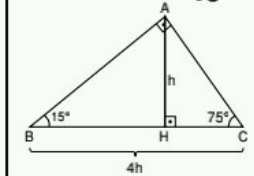
30° - 60° - 90° üçgeni



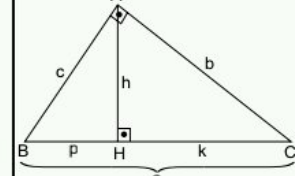
45° - 45° - 90° üçgeni



15° - 75° - 90° üçgeni

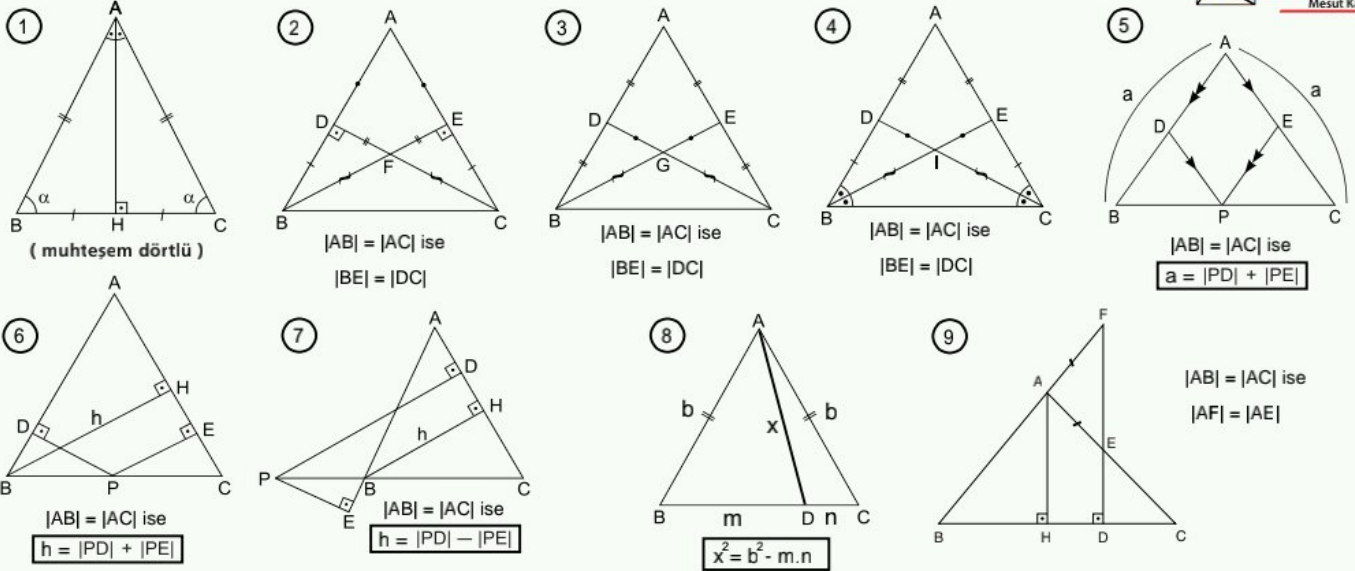


Öklid Bağlantıları

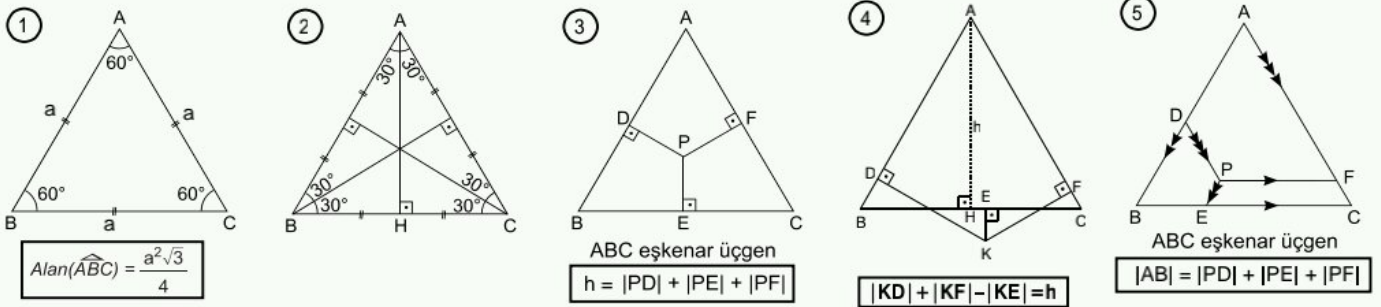


1. $h^2 = p \cdot k$
2. $a \cdot h = b \cdot c$
3. $b^2 = k \cdot a$
4. $c^2 = p \cdot a$

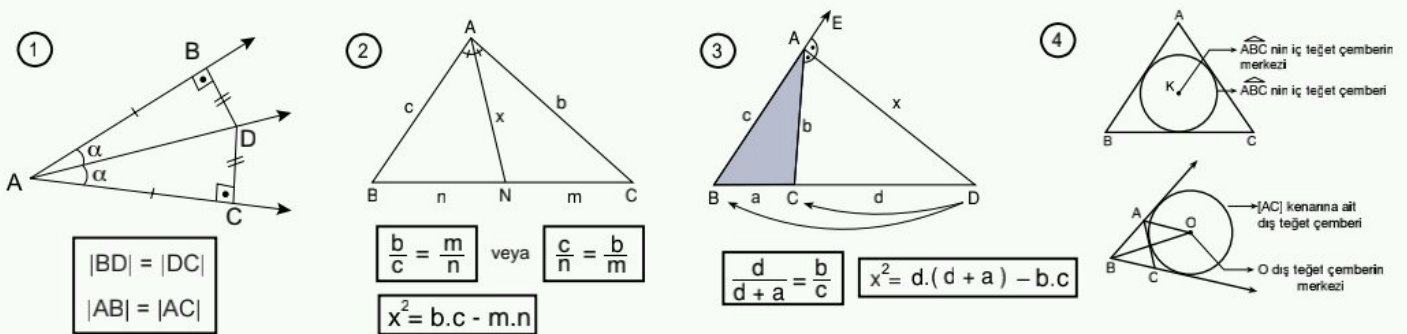
İKİZKENAR ÜÇGEN



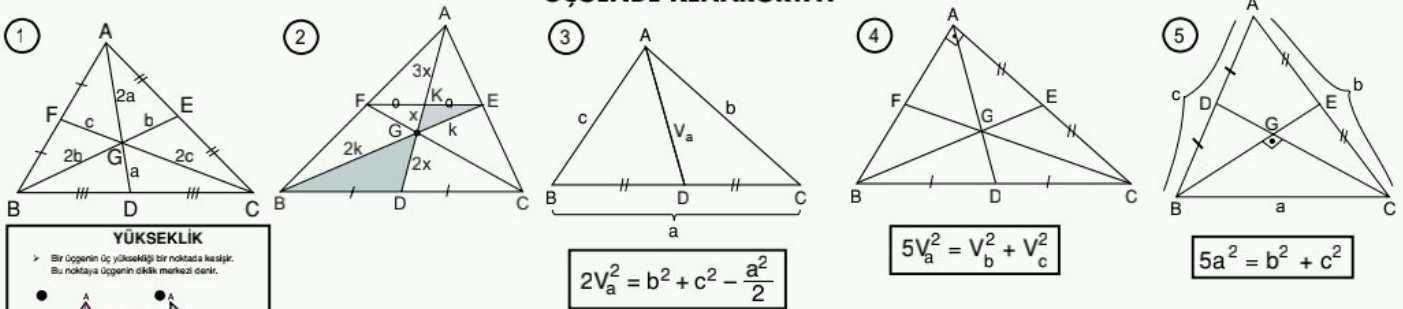
EŞKENAR ÜÇGEN



ÜÇGENDE AÇIORTAY



ÜÇGENDE KENARORTAY



ÜÇGENDE ALAN

1

$\text{Alan}(\widehat{ABC}) = \frac{a \cdot h_a}{2}$

2

$\text{Alan}(\widehat{ABC}) = \frac{1}{2} \cdot b \cdot c \cdot \sin \alpha$

3

$u = \frac{a+b+c}{2}$ olmak üzere,
 $A(\widehat{ABC}) = \sqrt{u \cdot (u-a) \cdot (u-b) \cdot (u-c)}$

4

$A(\widehat{ABC}) = u \cdot r$

5

$A(\widehat{ABC}) = \frac{a \cdot b \cdot c}{4R}$

6

$A(\widehat{ABC}) = \frac{1}{3} A(\widehat{DEF})$

7

$A(\widehat{ABC}) = \frac{|AD| \cdot |BC|}{2}$

8

$A(\widehat{ABC}) = \frac{1}{3} A(\widehat{DEF})$

9

ABC üçgeninde G, ağırlık merkezi ise,

10

$\frac{A(\widehat{ADE})}{A(\widehat{ABC})} = \frac{a}{a+b} \cdot \frac{c}{c+d}$

11

$\frac{A(\widehat{FDE})}{A(\widehat{ABC})} = \frac{q \cdot k \cdot y + p \cdot z \cdot x}{(p+q) \cdot (k+z) \cdot (x+y)}$

ÜÇGENLERDE BENZERLİK

1 Açı - Açı (A.A.) Benzerliği

$\widehat{ABC} \sim \widehat{DEF}$ $\frac{a}{d} = \frac{b}{e} = \frac{c}{f}$

2 Kenar - Açı - Kenar Benzerliği

$\frac{a}{c} = \frac{b}{d}$ ve $m(\widehat{B}) = m(\widehat{E})$ ise, $\widehat{ABC} \sim \widehat{DEF}$

3 Kenar - Kenar - Kenar Benzerliği

$\frac{|AB|}{|DE|} = \frac{|BC|}{|EF|} = \frac{|AC|}{|DF|}$ ise, $\widehat{ABC} \sim \widehat{DEF}$

4 Thales Teoremi

$\frac{a}{b} = \frac{c}{d}$ $\frac{a}{c} = \frac{b}{d}$

5 Temel Orantı Teoremi

$\frac{a}{a+b} = \frac{c}{c+d} = \frac{e}{f}$

6 Kelebek Benzerliği

$\frac{a}{d} = \frac{b}{e} = \frac{c}{f}$

7 Menelaus Teoremi

$\frac{|FB|}{|FC|} \cdot \frac{|CD|}{|DA|} \cdot \frac{|AE|}{|EB|} = 1$
 $\frac{|AD|}{|AC|} \cdot \frac{|CB|}{|BF|} \cdot \frac{|FE|}{|ED|} = 1$

8 Seva Teoremi

$\frac{|AD|}{|DB|} \cdot \frac{|BE|}{|EC|} \cdot \frac{|CF|}{|FA|} = 1$

➤ Benzer üçgenlerin, eşit açılarının karşısındaki kenarları, yardımcı elemanları ve çevreleri orantılıdır.

$\frac{a}{d} = \frac{b}{e} = \frac{c}{f} = k$ (benzerlik oranı)

$\frac{h_a}{h_d} = \frac{n_a}{n_d} = \frac{V_a}{V_d} = k$ $\frac{\text{Çevre}(\widehat{ABC})}{\text{Çevre}(\widehat{DEF})} = k$

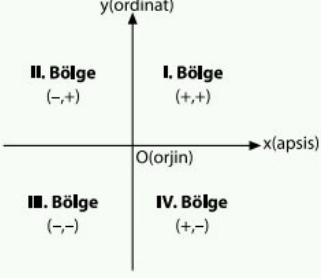
➤ Benzer üçgenlerin alanlarının oranı benzerlik oranının karesine eşittir.

$\frac{\text{Alan}(\widehat{ABC})}{\text{Alan}(\widehat{DEF})} = k^2$

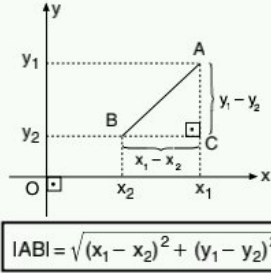
➤ Benzerlik oranı $k = 1$ olan üçgenler eşittir.

Doğrunun Analitik İncelenmesi

KOORDİNAT DÜZLEMİ



İki Nokta Arası Uzaklık



Doğru Parçasının Orta Noktası

$$A(x_1, y_1) \quad P(x_0, y_0) \quad B(x_2, y_2)$$

$$x_0 = \frac{x_1 + x_2}{2} \quad y_0 = \frac{y_1 + y_2}{2}$$

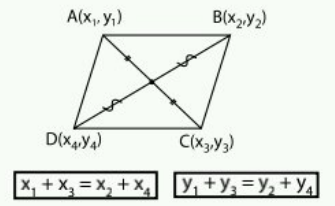
Doğru Parçasını Belli Oranda Bölme

$$A(x_1, y_1) \quad P(x_0, y_0) \quad B(x_2, y_2)$$

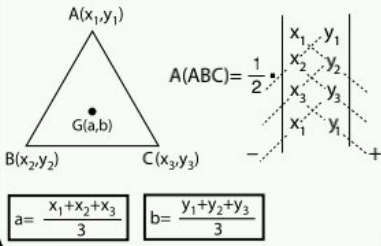
$$\frac{a}{b} = \frac{x_2 - x_0}{x_0 - x_1} \quad \frac{a}{b} = \frac{y_2 - y_0}{y_0 - y_1}$$

NOT :

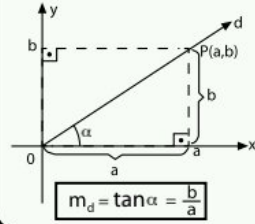
Köşegenleri birbirini ortaltayan dörtgenlerde



Üçgenin Ağırlık Merkezi ve Alanı



Doğrunun Eğimi



Eğim açısı α olan bir doğruya,
 • $0^\circ < \alpha < 90^\circ$ ise eğim m pozitifdir.
 • $90^\circ < \alpha < 180^\circ$ ise eğim m negatifdir.

NOT :

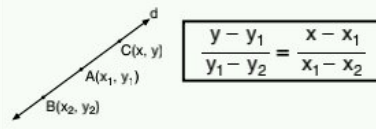
- iki noktası bilinen doğrunun eğimi: $m = \frac{y_2 - y_1}{x_2 - x_1}$
- $y = ax + b$ doğrusunun eğimi m dir.
- $ax + by + c = 0$ doğrusunun eğimi $m = -\frac{a}{b}$
- İki doğru paralel ise eğimleri eşittir.
- iki doğru dik ise eğimlerini çarpımı -1 dir.
- x eksenine paralel doğruların eğimi sıfırdır.
- y eksenine paralel doğruların eğimi tanımsızdır.

Eğim ve Bir Noktası Bilinen Doğrunun Denklemi

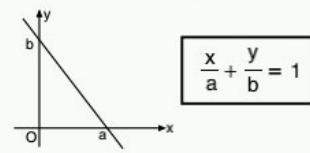
Eğimi m olan ve $A(x_1, y_1)$ noktasından geçen doğrunun denklemi:

$$y - y_1 = m(x - x_1)$$

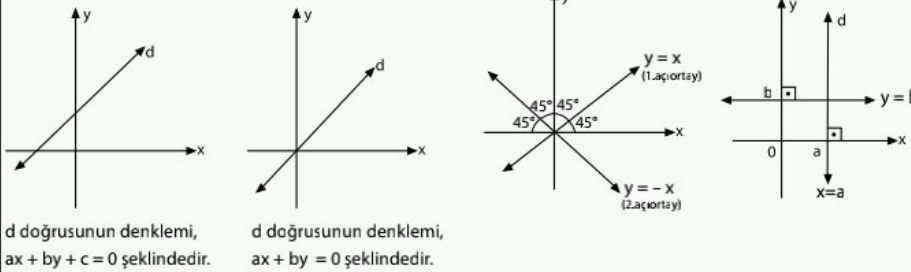
İki Noktası Bilinen Doğrunun Denklemi



Eksenleri Kesen Doğruların Denklemi



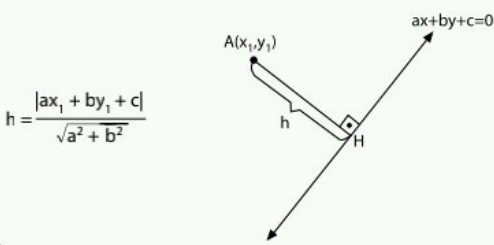
Özel Doğrular



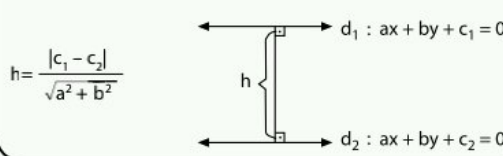
İki Doğrunun Birbirine Göre Durumları

- $a_1x + b_1y + c_1 = 0$
 $a_2x + b_2y + c_2 = 0$
- $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ ise doğrular paraleldir.
 - $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ ise doğrular çakışık.
 - $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ ise doğrular bir noktada kesişir.

Bir Noktanın Bir Doğruya Dik (En Yakın) Uzaklığı

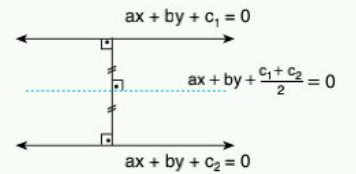


Paralel İki Doğru Arasındaki Uzaklık

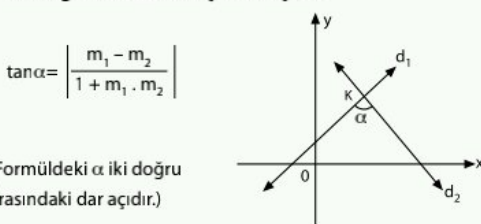


NOT :

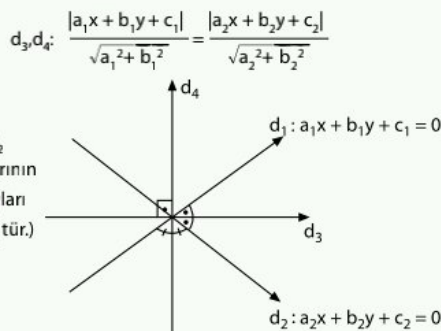
Paralel doğrulara eşit uzaklıktaki noktaların geometrik yeri,



İki Doğru Arasındaki Açının Tanjantı

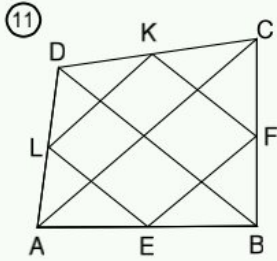
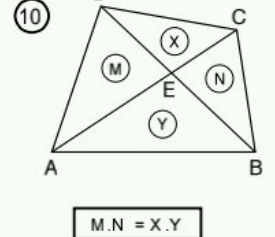
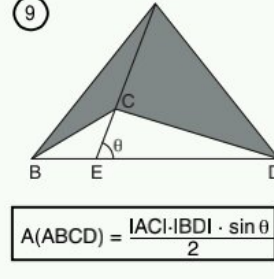
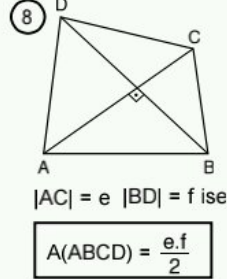
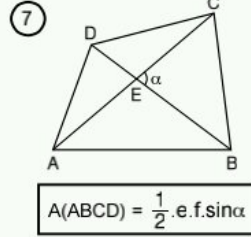
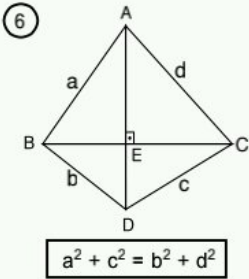
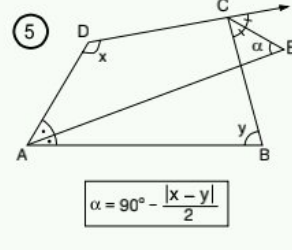
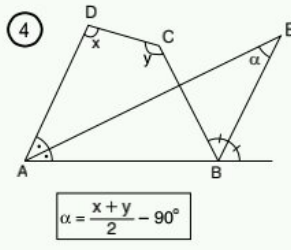
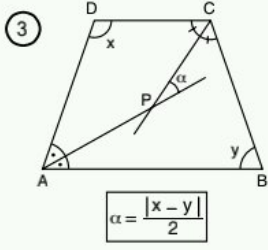
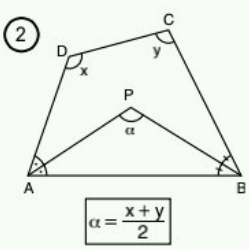


Açıortay Denklemleri

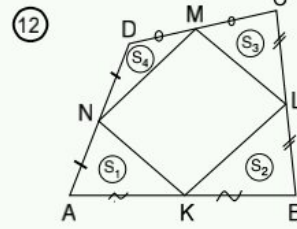


DÖRTGENLER

① Dörtgenin iç açılarının ölçüleri toplamı 360° dir. Dış açılarının ölçüleri toplamı da 360° dir.

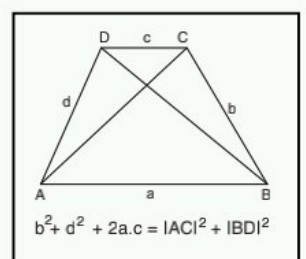
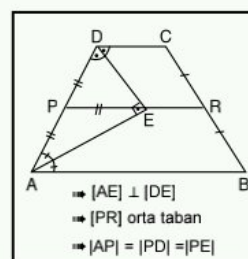
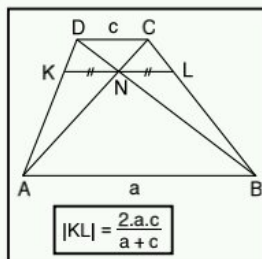
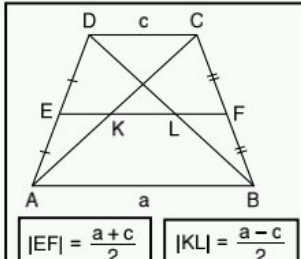
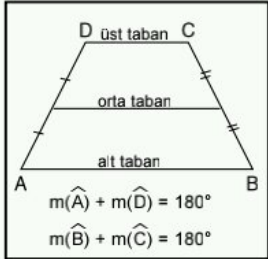


- L, E, F ve K kenar orta noktaları ise
- * EFKL paralelkenardır.
 - * Çevre(EFKL) = |AC| + |BD|
 - * $[DB] \perp [AC] \Rightarrow$ EFKL dikdörtgendir.
 - * $|DB| = |AC| \Rightarrow$ EFKL eşkenar dörtgendir.
 - * $|DB| = |AC|$ ve $[DB] \perp [AC] \Rightarrow$ EFKL karedir.

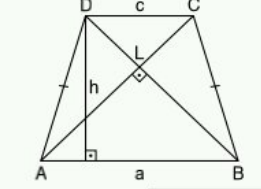
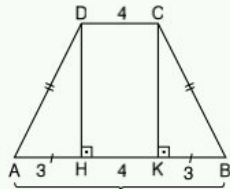
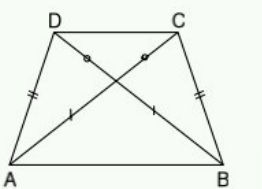


$$A(KLMN) = \frac{A(ABCD)}{2}$$

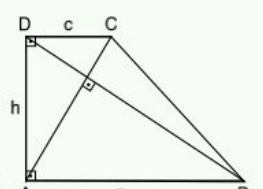
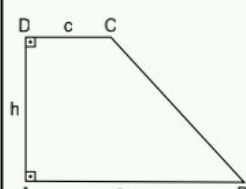
YAMUK



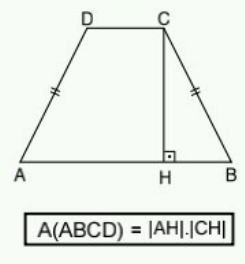
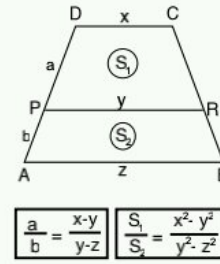
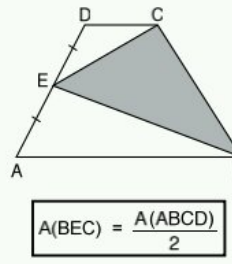
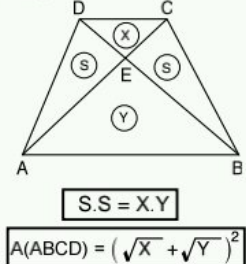
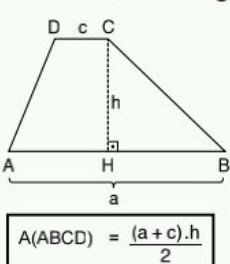
İkizkenar Yamuk



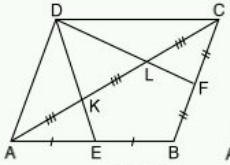
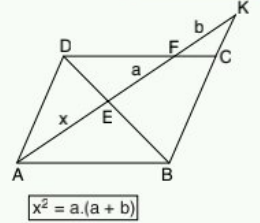
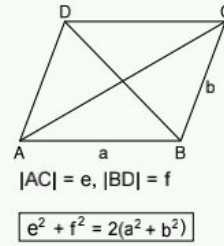
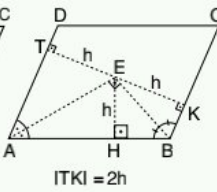
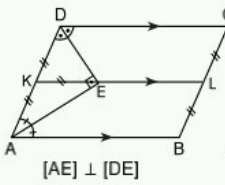
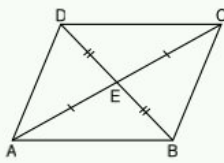
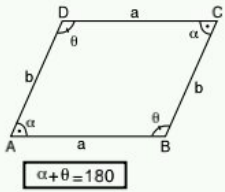
Dik Yamuk



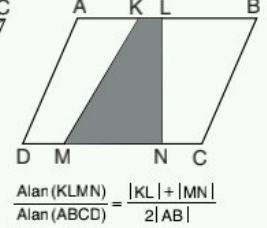
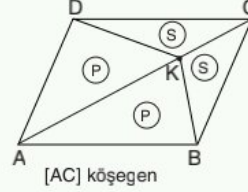
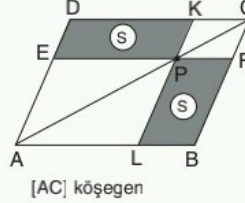
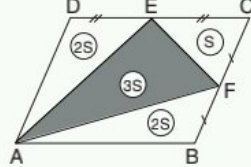
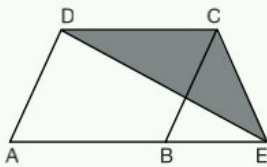
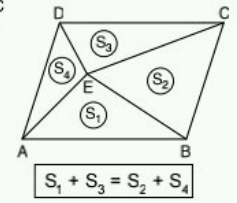
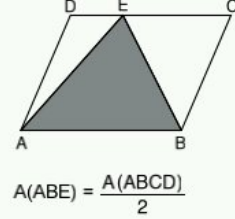
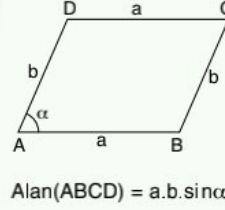
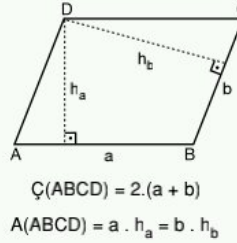
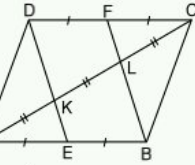
Yamuksal Bölgenin Alan



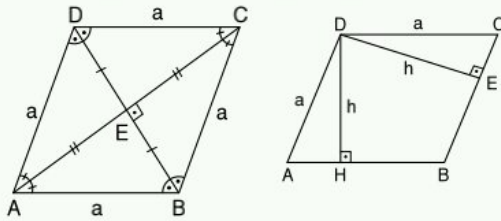
PARALELKENAR



[AC] köşegen ise
 $|AK| = |KL| = |LC|$



EŞKENAR DÖRTGEN



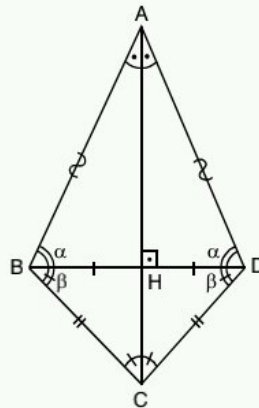
- Paralelkenarın tüm özelliklerini taşır.
- Köşegenler açıortay ve birbirine diktir.
- Yükseklikleri eşittir.
- $|BD| = e, |AC| = f, |AB| = a$ ise

$$e^2 + f^2 = 4a^2$$

$$A(ABCD) = a.h$$

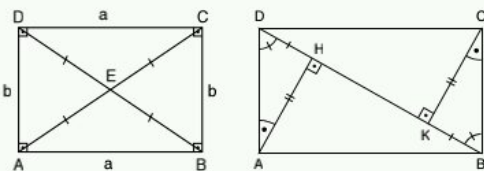
$$A(ABCD) = \frac{e.f}{2}$$

DELTOİD

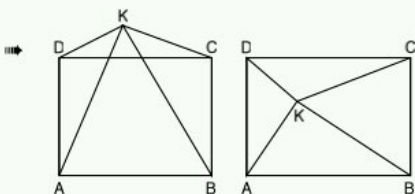


- $|AB| = |AD|$
- $|BC| = |CD|$
- $m(\widehat{ABC}) = m(\widehat{ADC})$
- [AC] açıortay köşegeni
- $[AC] \perp [BD]$
- $|BH| = |HD|$
- $\text{Alan}(ABCD) = \frac{|AC| \cdot |BD|}{2}$

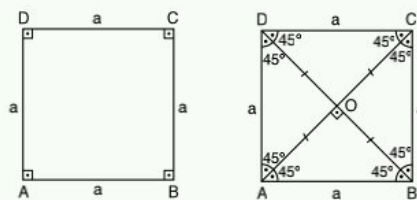
DİKDÖRTGEN



- Dikdörtgen, paralelkenarın tüm özelliklerini taşır.
- Köşegen uzunlukları eşit olup birbirini ortalar.
- $A(ABCD) = a.b$

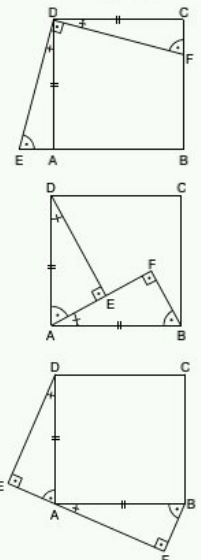


KARE



- Kare, paralelkenarın tüm özelliklerini taşır.
- Köşegen uzunlukları birbirine eşittir.
- Köşegenler birbirini ortalar.
- Köşegenler birbirine diktir.
- Köşegenler açıortaydır.
- $A(ABCD) = a^2$

Karede Eş Üçgenler



ÇOKGENLER

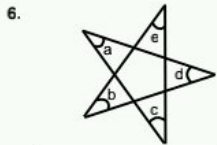
Konveks Çokgenlerin Özellikleri

1. İç açılarının ölçüleri toplamı $= (n - 2) \cdot 180^\circ$ dir.
2. Dış açılarının ölçüleri toplamı $= 360^\circ$ dir.



3. Köşegen sayısı $= \frac{n \cdot (n - 3)}{2}$ dir.

4. Bir köşeden en fazla $(n - 3)$ tane köşegen çizilebilir. Çizilen bu köşegenlerle $(n - 2)$ tane üçgen oluşur.
5. n kenarlı bir çokgenin çizilebilmesi için en az $2n - 3$ eleman verilmelidir. Bunlardan en az $n - 2$ tanesi uzunluk olmalıdır.

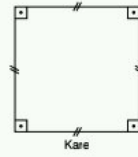
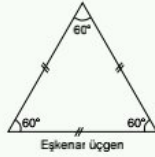


$$a + b + c + d + e = 180^\circ$$

$$a + b + c + d + e + \dots = (n - 4) \cdot 180^\circ$$

DÜZGÜN KONVEKS ÇOKGENLER

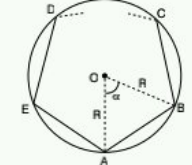
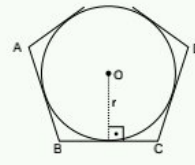
Tüm kenar uzunlukları ve iç açılarının ölçüleri eşit olan çokgenlere **düzgün çokgen** denir.



Düzgün Konveks Çokgenin Özellikleri

1. Bir dış açısının ölçüsü $= \frac{360^\circ}{n}$ dir.
2. Bütün iç açılarının ölçüleri birbirine eşittir. Bütün dış açılarının ölçüleri birbirine eşittir.

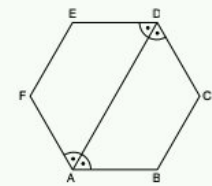
3. Düzgün konveks çokgenlerin iç teğet çemberi ve çevrel çemberi vardır. Çevrel çemberin merkezi, iç teğet çemberinin merkezi ve ağırlık merkezi ortaktır.



$$A(ABCD...) = n \cdot \frac{a \cdot r}{2}$$

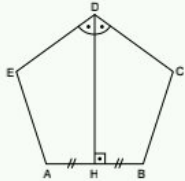
$$A(...DEABC...) = n \cdot \frac{1}{2} \cdot R^2 \cdot \sin \alpha$$

4. Düzgün çokgenlerde kenar sayısı çift sayı ise karşılıklı kenarlar paraleldir. Karşılıklı iki köşeyi birleştiren köşegen açıortaydır.

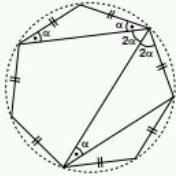


[ED] // [AB]
[EF] // [BC]
[AF] // [CD]

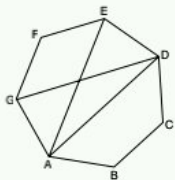
5. Düzgün çokgenlerde kenar sayısı tek sayı ise bir köşeden karşı kenara çizilen dikme hem kenarortay hem de açıortaydır. (Simetri eksenini)



6. Düzgün çokgenlerde eşit uzunlukta veya eşit sayıda kırımları gören çevre açılarının ölçüleri birbirine eşittir.

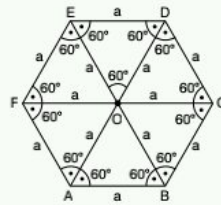


7. Düzgün çokgenlerde aynı sayıda köşeleri birleştiren köşegenlerin uzunlukları eşittir.



$$|GD| = |AE| = |AD|$$

DÜZGÜN ALTIGEN



$$|AD| = |BE| = |FC| = 2a$$

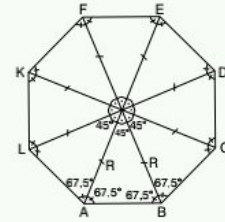
Karşılıklı köşeleri birleştiren köşegenler çizildiğinde; [AD], [BE], [FC]

- * Bu köşegenler açıortay olur ve uzunlukları birbirine eşittir.
- * Bu köşegenlerin her biri düzgün altıgeni iki tane eş ikizkenar yamuğa ayırır.
- * 6 adet eşkenar üçgen oluşur.

$$A(ABCDEF) = 6 \cdot \frac{a^2 \sqrt{3}}{4}$$

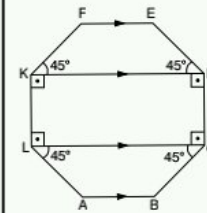
- * Düzgün altıgenin bir iç açısı 120° ve bir dış açısı 60° dir.
- * Düzgün altıgenin kenar sayısı çift sayı olduğundan karşılıklı kenarlar paraleldir.
- * O noktası; düzgün altıgenin iç teğet çemberinin merkezi, çevrel çemberinin merkezi ve aynı zamanda ağırlık merkezidir.

DÜZGÜN SEKİZGEN



- * Karşılıklı kenarlar paraleldir.
- * Karşılıklı köşeleri birleştiren köşegenler, açıortaydır ve uzunlukları birbirine eşittir.
- * Bu köşegenler düzgün sekizgenin merkezinden geçer ve düzgün sekizgeni 8 adet eş üçgene ayırır.

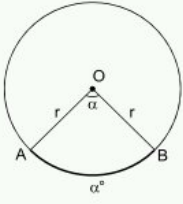
$$\text{Oluşan her bir üçgenin alanı} = \frac{1}{2} \cdot R \cdot R \cdot \sin 45^\circ \text{ dir.}$$



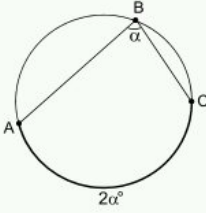
LCDK dikdörtgen
ABCL ve KDEF
İkizkenar yamuk olur.

Çemberde Açılar

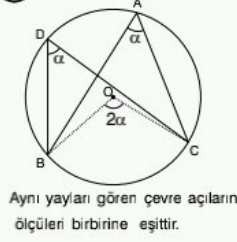
1 Merkez Aç



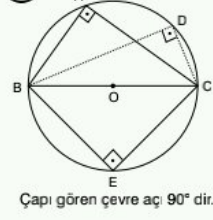
2 Çevre Aç



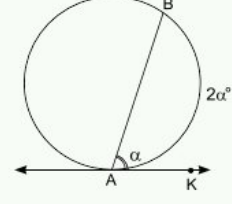
3



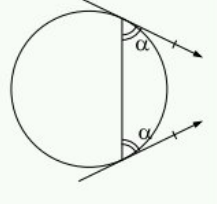
4



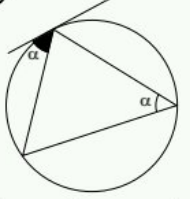
5 Teğet – Kiriş Aç



6

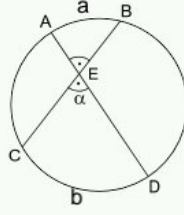


7



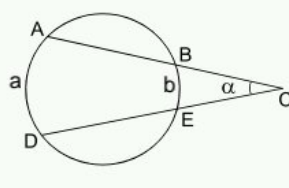
Aynı yayı gören çevre aç ile teğet - kiriş açının ölçüsü birbirine eşittir.

8 İç Aç

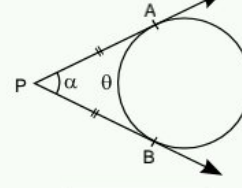


$$\alpha = \frac{a + b}{2}$$

9 Dış Aç

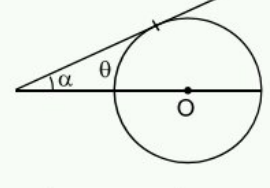


$$\alpha = \frac{a - b}{2}$$



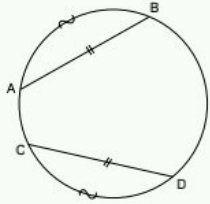
$$\alpha + \theta = 180^\circ$$

$$|PA| = |PB|$$

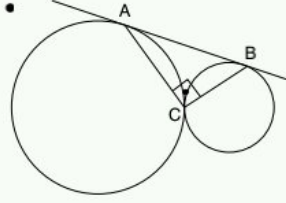
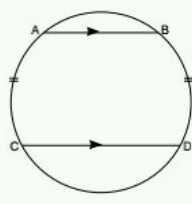


$$\alpha + \theta = 90^\circ$$

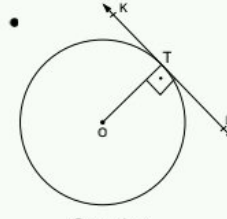
- Eşit uzunluktaki kirişler çemberden eş yaylar ayırır.



- Paralel iki kiriş arasında kalan yayların ölçüleri birbirine eşittir.



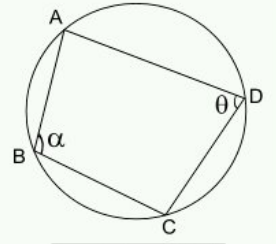
$$m(\widehat{ACB}) = 90^\circ$$



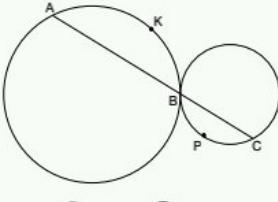
$$O \text{ merkez}$$

$$[OT] \perp KL$$

Kirişler Dörtgeni

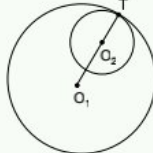
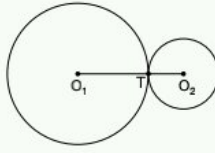


$$\alpha + \theta = 180^\circ$$

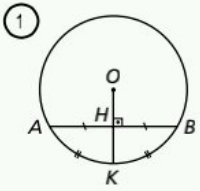


$$m(\widehat{AKB}) = m(\widehat{BPC})$$

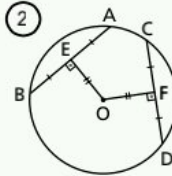
Çemberlerin merkezleri ve teğet noktalar doğrusaldır.



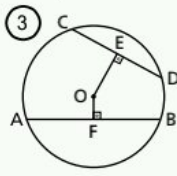
ÇEMBERDE UZUNLUK



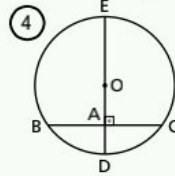
$[OK] \perp [AB]$ ise
 $|AH| = |HB|$



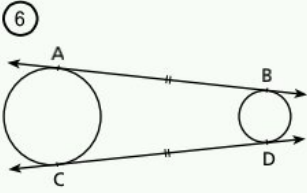
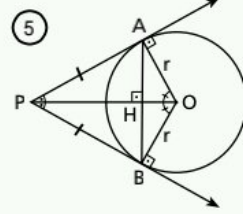
$|OE| = |OF|$ ise
 $|AB| = |CD|$



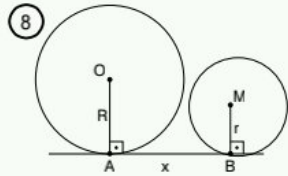
$|OF| < |OE|$ ise
 $|AB| > |CD|$



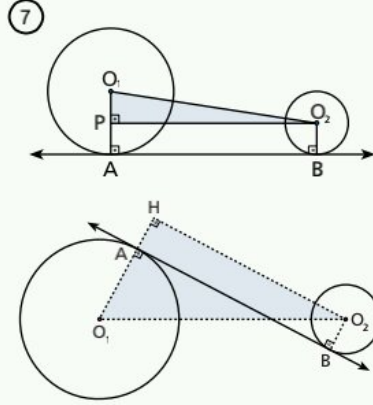
A noktasından geçen
en uzun kiriş $[DE]$,
en kısa kiriş i $[BC]$



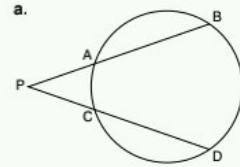
$|AB| = |CD|$



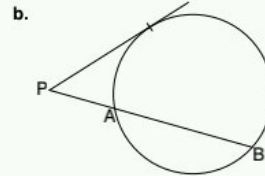
$|AB| = x = 2\sqrt{R \cdot r}$



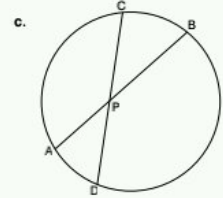
9 Bir noktanın çembere göre kuvveti



$|PA| \cdot |PB| = |PC| \cdot |PD|$

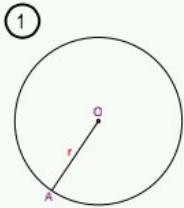


$|PT|^2 = |PA| \cdot |PB|$



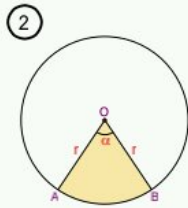
$|PA| \cdot |PB| = |PC| \cdot |PD|$

DAİREDE ALAN



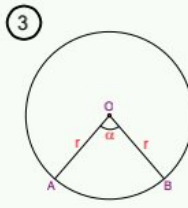
Dairenin Alanı = πr^2

Dairenin Çevresi = $2\pi r$

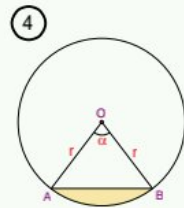


Taralı Alan = $\frac{\pi r^2 \cdot \alpha}{360^\circ}$

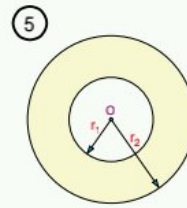
Taralı Alan = $\frac{r \cdot |\widehat{AB}|}{2}$



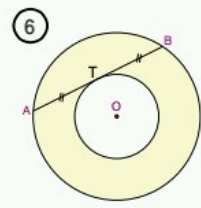
$|\widehat{AB}| = \frac{2\pi r \cdot \alpha}{360^\circ}$



Taralı Alan = $\frac{\pi r^2 \cdot \alpha}{360^\circ} - \frac{r^2 \cdot \sin \alpha}{2}$

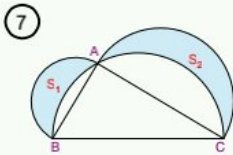


Taralı Alan = $\pi r_2^2 - \pi r_1^2$

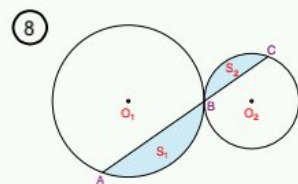


$|AT| = |BT|$

Taralı Alan = $\pi \cdot |AT|^2$

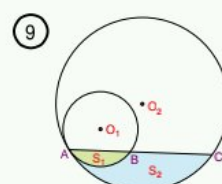


$A(ABC) = S_1 + S_2$

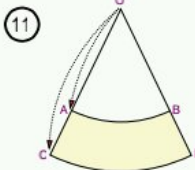
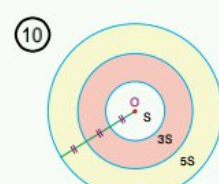


Benzerlik oranı = $\frac{r_1}{r_2} = \frac{|AB|}{|BC|} = \frac{|\widehat{AB}|}{|\widehat{BC}|}$ dir.

Alan oranı ise benzerlik oranının karesine eşittir.



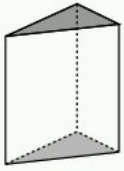
Benzerlik oranı = $\frac{r_1}{r_2} = \frac{|AB|}{|AC|} = \frac{|\widehat{AB}|}{|\widehat{AC}|}$



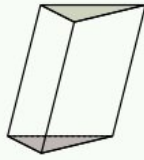
$\frac{|OA|}{|OC|} = \frac{|OB|}{|OD|} = \frac{|\widehat{AB}|}{|\widehat{CD}|}$

Taralı Alan = $\frac{(|\widehat{AB}| + |\widehat{CD}|) \cdot |BD|}{2}$

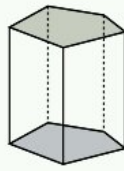
PRİZMALAR



Üçgen dik prizma



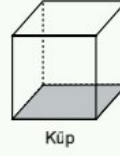
Üçgen eğik prizma



Düzgün beşgen prizma



Dikdörtgenler Prizması

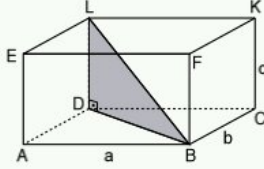


Küp

Yanal alan = Taban çevresi x yükseklik
Bütün alan = Yanal alan + 2.Taban alanı

Hacim = Taban alanı x Yükseklik

DİKDÖRTGENLER PRİZMASI



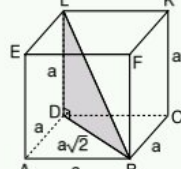
Cisim köşegeni $|LB| = \sqrt{a^2 + b^2 + c^2}$

Yanal alan = $2(a + b) \cdot c$

Bütün alan = $2(ab + ac + bc)$

$V = a \cdot b \cdot c$

KÜP



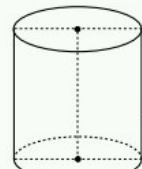
Yüzey köşegeni = $a\sqrt{2}$

Cisim köşegeni = $a\sqrt{3}$

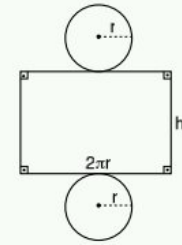
$A = 6 \cdot a^2$

$V = a^2 \cdot a = a^3$

SİLİNDİR



Dik silindir



Yanal Alan = Taban çevresi x Yükseklik = $2\pi r h$

Alan = Yanal alan + 2.Taban alanı

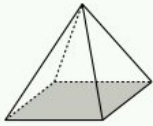
$S = 2\pi r h + 2 \cdot \pi r^2 = 2\pi r(h + r)$

Hacim = Taban alanı x Yükseklik

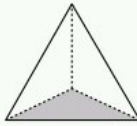
$V = \pi r^2 h$

PİRAMİT

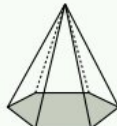
Düzgün Piramit



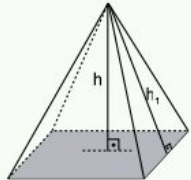
Kare piramit



Eşkenar üçgen piramit



Düzgün altıgen piramit

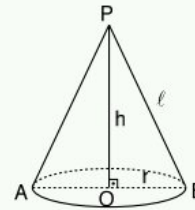


$Y.A = \frac{\text{Taban çevresi} \times \text{Yan yüz yüksekliği}}{2}$

Bütün alan = Yanal alan + Taban alanı

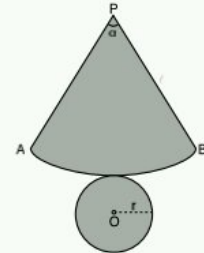
$V = \frac{1}{3} \text{Taban Alanı} \times \text{Yükseklik}$

KONI



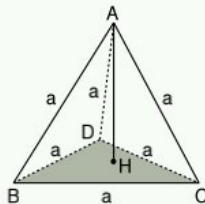
Alan = $\pi r l + \pi r^2$

$V = \frac{1}{3} \pi r^2 h$



$\frac{r}{l} = \frac{\alpha}{360^\circ}$

DÜZGÜN DÖRTYÜZLÜ

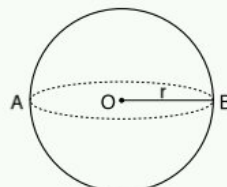


$|AH| = \frac{a\sqrt{6}}{3}$

Alan = $a^2 \sqrt{3}$

$V = \frac{a^3 \sqrt{2}}{12}$

KÜRE



$A = 4\pi r^2$

$V = \frac{4}{3} \pi r^3$