

1

$\alpha = 90^\circ + \frac{m(\widehat{A})}{2}$

[AD] çizilirse açıortay olur.

D : İç teğet çemberin merkezi, iç açıortayların kesişme noktasıdır.

2

$\alpha = 90^\circ - \frac{m(\widehat{A})}{2}$

[AD] çizilirse açıortay olur.

D : Dış teğet çemberlerden birinin merkezidir.

3

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

[AD] çizilirse açıortay olur.

1

$b = a + c$

2

$a + b + c = 360^\circ$

3

$a + b = 180^\circ$

4

$a + b = 180^\circ$

5 $x + y = 90^\circ$ ise x ve y tümlem açıdır.

6 $x + y = 180^\circ$ ise x ve y bütünler açıdır.

7 $1^\circ = 60' = 3600'' \Rightarrow \frac{D}{180^\circ} = \frac{R}{\pi}$

1

i. Yükseklik $\rightarrow h_a$
ii. Açıortay $\rightarrow n_a$
iii. Kenarortay $\rightarrow V_a$
iv. İkizkenarlık $\rightarrow |AB| = |AC|$

$|AH| = h_a = n_a = V_a$

Dört bilgidten ikisi varsa, diğer ikisi de vardır.

2

$h_b = h_c$
 $n_b = n_c$
 $V_b = V_c$

3

$|DE| + |DF| = |AB| = |AC|$
 $|DE| + |DF| = |BH| = |CK|$

1

2

$|AH| = |BK| = |CL|$

3

$|DE| + |DF| + |DK| = a$

4

$|DE| + |DF| + |DK| = |AH|$

ÜÇGENDE AÇILAR

EŞKENAR ÜÇGEN

ÜÇGENLER - 1

DOĞRUDA AÇILAR

DİK ÜÇGEN VE TRİGONOMETRİ-İ

İKİZKENAR ÜÇGEN

1

Muhteşem üçlü

2 Pisagor Bağıntısı

$b^2 = a^2 + c^2$

3 Öklid Bağıntıları

$h^2 = p \cdot k$
 $c^2 = p \cdot a$
 $b^2 = k \cdot a$
 $a \cdot h = b \cdot c$

4 Kenarlarına Göre Özel Üçgenler

- 3 - 4 - 5 üçgeni
- 5 - 12 - 13 üçgeni
- 8 - 15 - 17 üçgeni
- 7 - 24 - 25 üçgeni
- k - 2k - k√5 üçgeni

5

$\sin \alpha = \frac{c}{b}$
 $\cos \alpha = \frac{a}{b}$
 $\tan \alpha = \frac{c}{a}$
 $\cot \alpha = \frac{a}{c}$

6 Kosinüs Teoremi

$a^2 = b^2 + c^2 - 2 \cdot b \cdot c \cdot \cos \alpha$

7 Sinüs Teoremi

$\frac{a}{\sin \widehat{A}} = \frac{b}{\sin \widehat{B}} = \frac{c}{\sin \widehat{C}} = 2r$

1

$A(\widehat{ABC}) = \frac{a \cdot h}{2}$

2

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

3

$A(\widehat{ABC}) = \sqrt{u \cdot (u-a) \cdot (u-b) \cdot (u-c)}$
(u : üçgenin çevresinin yarısı)

4

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

5

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

6

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

1

$A(\widehat{ABC}) = \frac{a \cdot n}{2}$

2

$A(\widehat{ABC}) = \frac{a \cdot n}{2}$

3

$A(\widehat{ABC}) = \frac{a \cdot n}{2}$

ÜÇGENDE
ALAN

ÜÇGENDE
BENZERLİK

AÇIORTAY

ÜÇGENLER-2

KENARORTAY

ÜÇGENDE AÇI-KENAR BAĞINTILARI

1

$A(\widehat{ABC}) = \frac{a \cdot h_1}{2}$

2 Temel Benzerlik

$A(\widehat{ABC}) = \frac{a \cdot h_1}{2}$

3 Kelebek Benzerliği

$A(\widehat{ABC}) = \frac{a \cdot h_1}{2}$

4 Thales Teoremi

$A(\widehat{ABC}) = \frac{a \cdot h_1}{2}$

5 Eş Üçgenler

$A(\widehat{ABC}) = \frac{a \cdot h_1}{2}$

1

$A(\widehat{ABC}) = \frac{a \cdot h_1}{2}$

2 Üçgen Eşitsizliği

$A(\widehat{ABC}) = \frac{a \cdot h_1}{2}$

3

$A(\widehat{ABC}) = \frac{a \cdot h_1}{2}$

1

$A(\widehat{ABC}) = \frac{a \cdot h_1}{2}$

2

$A(\widehat{ABC}) = \frac{a \cdot h_1}{2}$

3

$A(\widehat{ABC}) = \frac{a \cdot h_1}{2}$

4

$A(\widehat{ABC}) = \frac{a \cdot h_1}{2}$

5

$A(\widehat{ABC}) = \frac{a \cdot h_1}{2}$

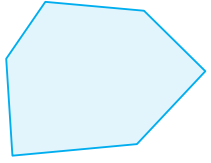
6

$A(\widehat{ABC}) = \frac{a \cdot h_1}{2}$

7

$A(\widehat{ABC}) = \frac{a \cdot h_1}{2}$

n kenarlı bir çokgenin,



- Bir köşesinden $n - 3$ tane köşegen çizilir.
- Bir köşesinden çizilen köşegenler $n - 2$ tane üçgen oluşturur.
- Köşegen sayısı $\frac{n(n-3)}{2}$ dir.
- İç açı toplamı $(n - 2) \cdot 180^\circ$ dir.
- Dış açı toplamı 360° dir.

KONVEKS ÇOKGEN

DÜZGÜN ÇOKGEN

ÇOKGENLER

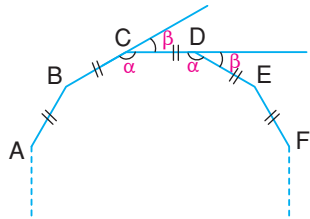
ÇOKGENLER VE DÖRTGENLER - 1

DÖRTGENLER

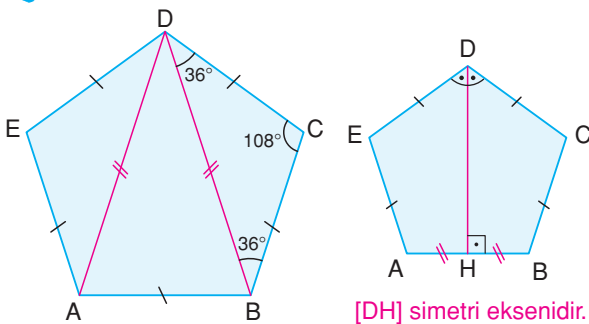
DELTOİD

1 n kenarlı bir düzgün çokgenin,

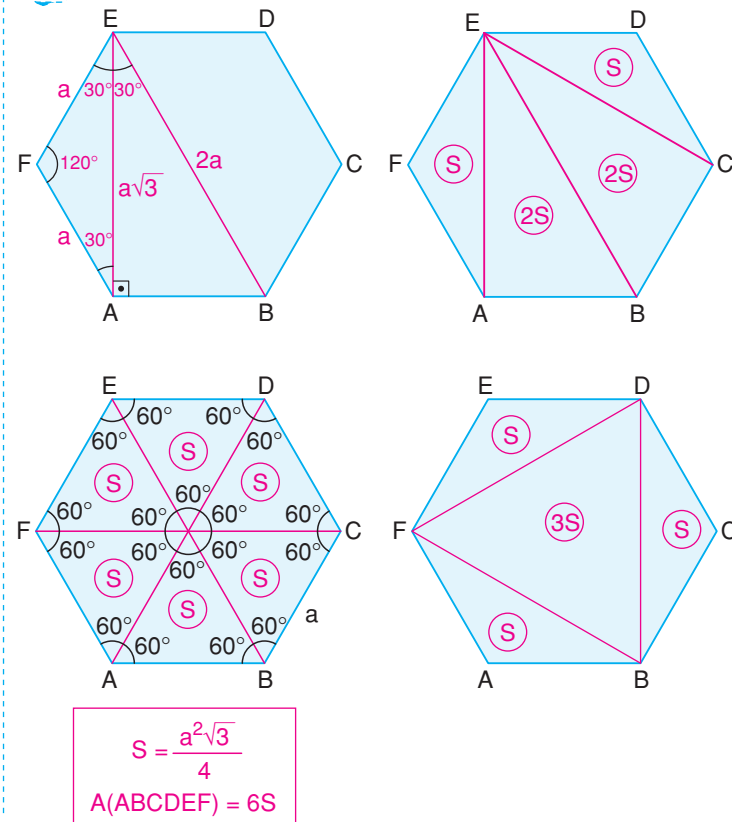
- Bir dış açısının ölçüsü $\beta = \frac{360^\circ}{n}$
- Bir iç açısının ölçüsü $\alpha = \frac{(n-2) \cdot 180^\circ}{n}$
- $\alpha + \beta = 180^\circ$



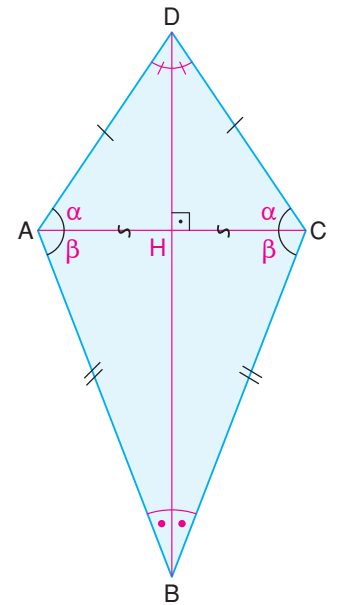
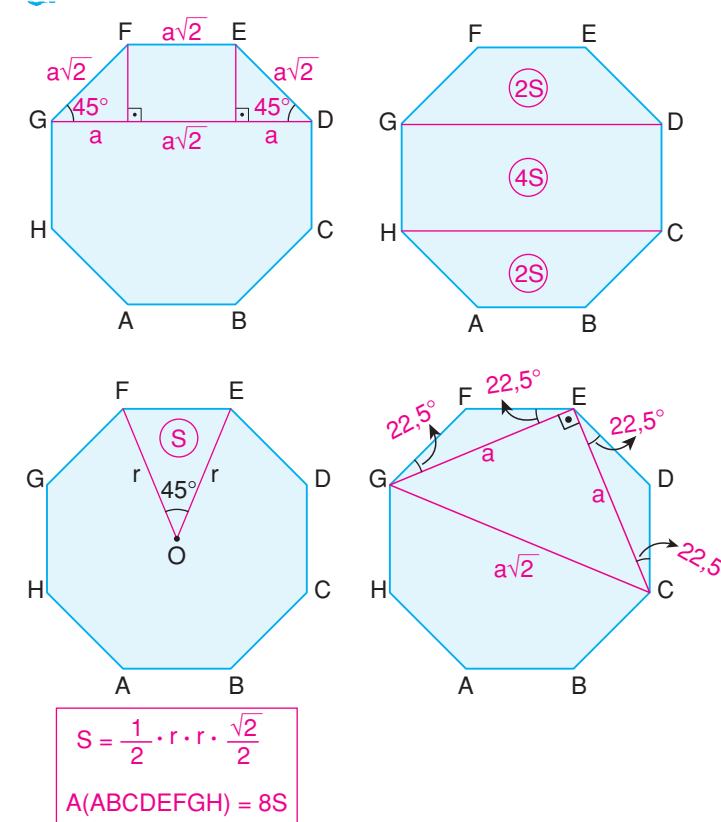
2 Düzgün Beşgen



3 Düzgün Altıgen

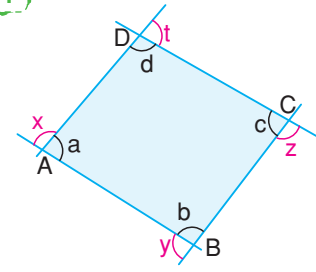


4 Düzgün Sekizgen



- Köşegenler dik kesişir.
- $[BD]$ açıortay ve simetri eksenidir.
- $m(\widehat{BAD}) = m(\widehat{BCD})$
- $|AH| = |HC|$
- $A(ABCD) = \frac{|AC| \cdot |BD|}{2}$

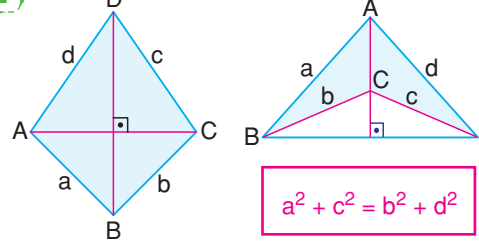
1



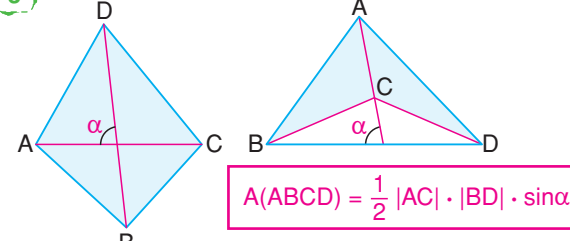
$$a + b + c + d = 360^\circ$$

$$x + y + z + t = 360^\circ$$

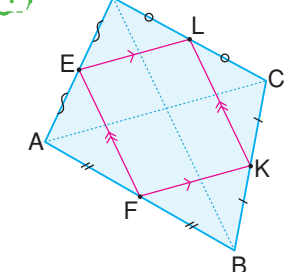
2



3



4



- EFKL paralelkenar
- $\angle(EFKL) = |\angle AC| + |\angle BD|$
- $A(EFKL) = \frac{A(ABCD)}{2}$

1 Köşegenler birbirini ortalar

2 $A(\widehat{APB}) = \frac{A(ABCD)}{2}$

3 $S_1 + S_3 = S_2 + S_4 = \frac{A(ABCD)}{2}$

4 $A(\widehat{ADE}) = \frac{A(ABCD)}{2}$

5 İkizkenar yamukta köşegenler eşittir.

6 $A(ABCD) = \left(\frac{a+c}{2}\right) \cdot h$

7 $h^2 = a \cdot c$

8 $|EF| = \frac{a+c}{2}$

9 $|DF| + |BH| = |AE| + |CK|$
 $[AE] \parallel [DF] \parallel [BH] \parallel [CK]$

ALAN

$A(ABCD) = a \cdot ha = b \cdot hb$

$A(ABCD) = a \cdot b \cdot \sin \alpha$

Dört kenarı birbirine eşit paralelkenardır.

ALAN

$A(ABCD) = a \cdot h$

- Köşegenler dik kesilir.
- Köşegenler açıortaydır.

1 $|EF| = \frac{a+c}{2}$

2 $A(\widehat{ADE}) = \frac{A(ABCD)}{2}$

3 İkizkenar yamukta köşegenler eşittir.

4 $h^2 = a \cdot c$

5 $A(ABCD) = \left(\frac{a+c}{2}\right) \cdot h$

6 $h^2 = a \cdot c$

7 $h^2 = a \cdot c$

ALAN

$A(ABCD) = \left(\frac{a+c}{2}\right) \cdot h$

ÇOKGENLER VE DÖRTGENLER 2

PARALELKENAR

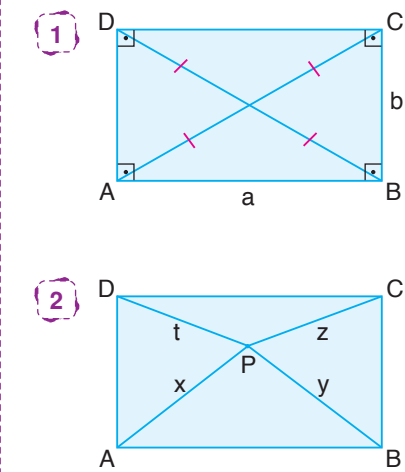
EŞKENAR DÖRTGEN

DİKDÖRTGEN

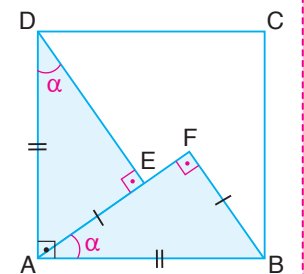
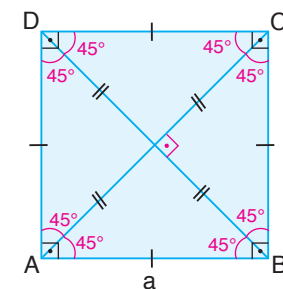
KARE

YAMUK

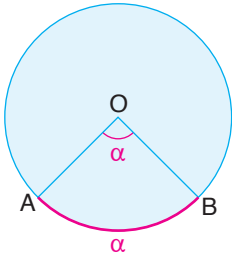
Bütün açıları 90° olan paralelkenardır.



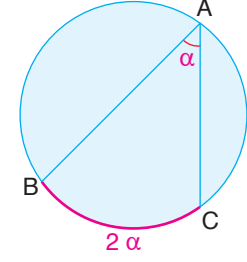
Bütün kenarları eşit olan dikdörtgendir.



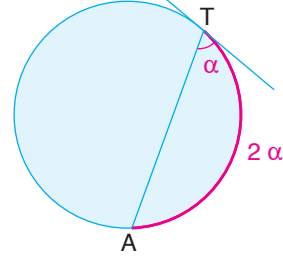
1 Merkez Açısı



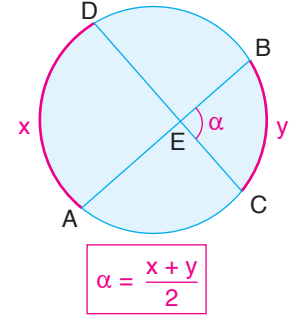
2 Çevre Açısı



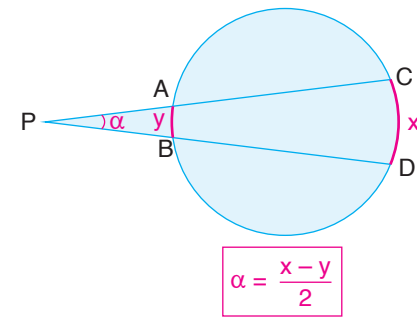
3 Teğet - Kiriş Açısı



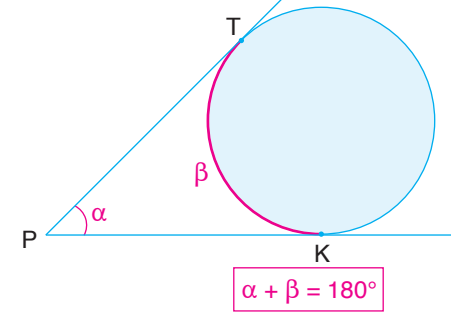
4 İç Açısı



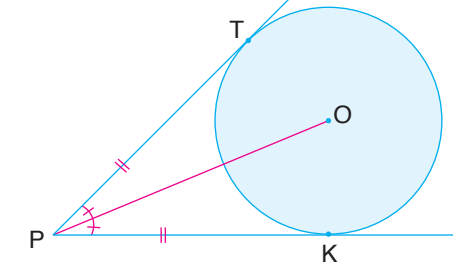
5 Dış Açısı



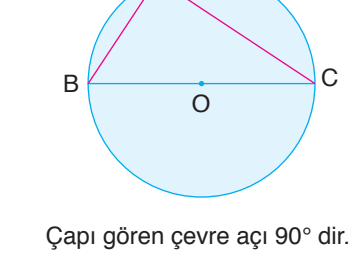
6



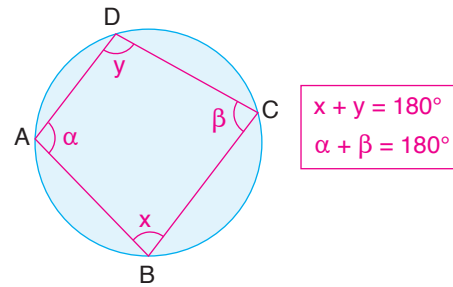
7



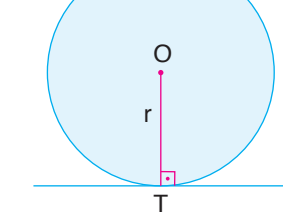
8



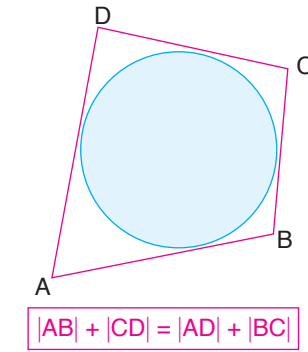
9 ABCD Kirişler Dörtgeni



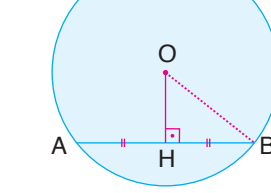
1



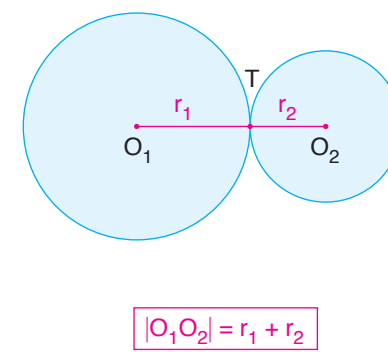
5 ABCD Teğetler Dörtgeni



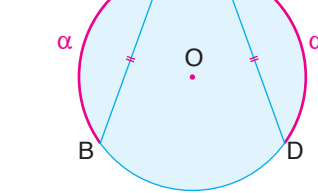
2



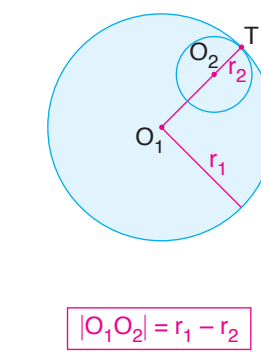
6 Dıştan Teğet Çemberler



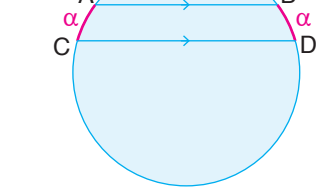
3



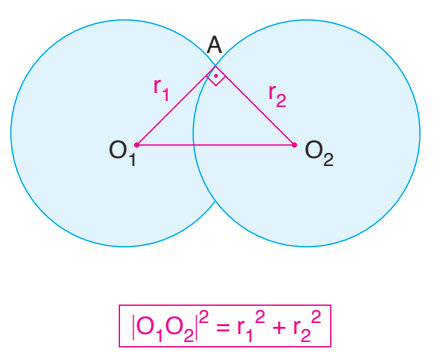
7 İçten Teğet Çemberler



4



8 Çemberler Dik Kesişirse

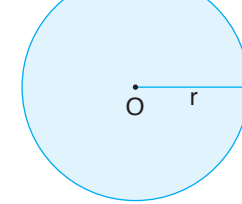
ÇEMBERDE
AÇI

ÇEMBER VE DAİRE

ÇEMBERDE UZUNLUK

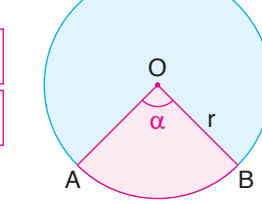
DAİREDE UZUNLUK VE ALAN

1



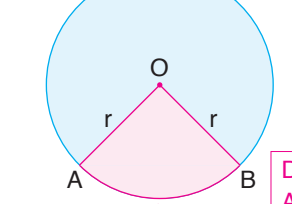
$$\begin{aligned} \text{Çevre} &= 2\pi r \\ \text{Alan} &= \pi r^2 \end{aligned}$$

2



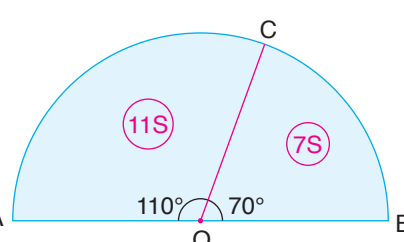
$$\begin{aligned} |\widehat{AB}| &= 2\pi r \cdot \frac{\alpha}{360^\circ} \\ \text{Dilim Alanı} &= \pi r^2 \cdot \frac{\alpha}{360^\circ} \end{aligned}$$

3

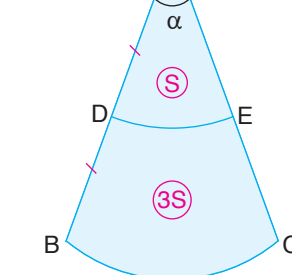


$$\text{Dilim Alanı} = \frac{l \cdot r}{2}$$

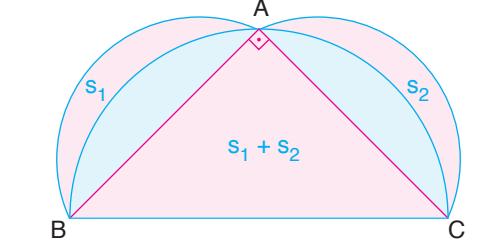
4



5



6

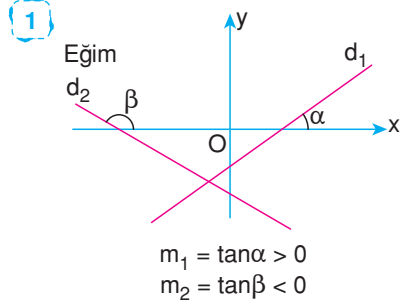


ANALİTİK GEOMETRİ-1

DOĞRU ANALİTİĞİ-1

NOKTA ANALİTİĞİ

DOĞRU ANALİTİĞİ - 2

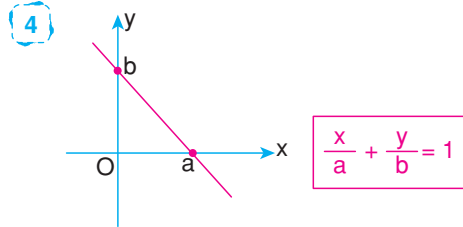


2 İki noktası bilinen doğrunun eğimi;
 $A(x_1, y_1)$ ve $B(x_2, y_2)$ noktaları için

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

3 Eğim ve bir noktası bilinen doğru denklemleri
(Kartezyen veya Kapalı Denklemler)
Eğim m ve nokta $A(x_1, y_1)$ için

d: $m = \frac{y - y_1}{x - x_1}$ şeklinde yazılır.



5 x eksenini $y = 0$ doğrusudur.
y eksenini $x = 0$ doğrusudur.

6 Parametrik ve vektörel denklemler

$\vec{u} = (a, b)$ $\vec{u}$ doğrultman vektör

$A(x_1, y_1)$ $\vec{u} \parallel d$

$x = x_1 + k \cdot a$
 $y = y_1 + k \cdot b$ Parametrik denklem

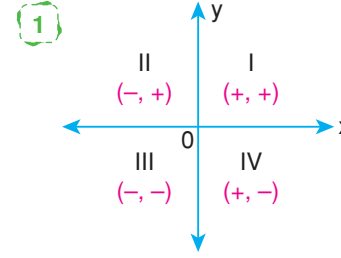
$(x, y) = (x_1, y_1) + k \cdot (a, b)$ Vektörel denklem

7 • Paralel doğruların eğimleri eşittir.

$$d_1 \parallel d_2 \Leftrightarrow m_1 = m_2$$

• Dik doğruların eğimleri çarpımı -1 'dir.

$$d_1 \perp d_2 \Leftrightarrow m_1 \cdot m_2 = -1$$



2 İki nokta arasındaki uzaklık

$A(x_1, y_1)$ $B(x_2, y_2)$

$$|AB| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

3 Orta Nokta

$A(x_1, y_1)$ $C(x_0, y_0)$ $B(x_2, y_2)$

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

4 Paralelkenarın Köşe Koordinatları

$D(x_4, y_4)$ $C(x_3, y_3)$
 $A(x_1, y_1)$ $B(x_2, y_2)$

$$x_1 + x_3 = x_2 + x_4$$

$$y_1 + y_3 = y_2 + y_4$$

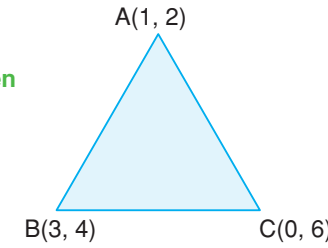
5 Üçgenin Ağırlık Merkezinin Koordinatları

$A(x_1, y_1)$ $G(x_0, y_0)$ $B(x_2, y_2)$ $C(x_3, y_3)$

$$x_0 = \frac{x_1 + x_2 + x_3}{3}$$

$$y_0 = \frac{y_1 + y_2 + y_3}{3}$$

6 Üç köşesi bilinen
üçgen alanı



$$A(\widehat{ABC}) = \frac{1}{2} \begin{vmatrix} 1 & 2 \\ 3 & 4 \\ 0 & 6 \end{vmatrix}$$

$$L = 6 + 0 + 6, \quad K = 4 + 18 + 0$$

$$A(\widehat{ABC}) = \frac{1}{2} |K - L|$$

$$A(\widehat{ABC}) = \frac{1}{2} |22 - 12| = 5 \text{ br}^2$$

1 Noktanın doğruya uzaklığı

$A(x_1, y_1)$ h H $d : ax + by + c = 0$

$$h = \frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$$

2 İki doğru arasındaki uzaklık

$d_1 : ax + by + c_1 = 0$
 $d_2 : ax + by + c_2 = 0$
 $d_1 \parallel d_2$

$$h = \frac{|c_2 - c_1|}{\sqrt{a^2 + b^2}}$$

3 İki doğru arasındaki uzaklık

d_1 d_2 α β θ

$$\tan \theta = \frac{m_2 - m_1}{1 + m_1 \cdot m_2}$$

4 Açıkortay doğru denklemi

$d_1 : a_1x + b_1y + c_1 = 0$
 $d_2 : a_2x + b_2y + c_2 = 0$
 d_3 d_4

$$\frac{a_1x + b_1y + c_1}{\sqrt{a_1^2 + b_1^2}} = \pm \frac{a_2x + b_2y + c_2}{\sqrt{a_2^2 + b_2^2}}$$

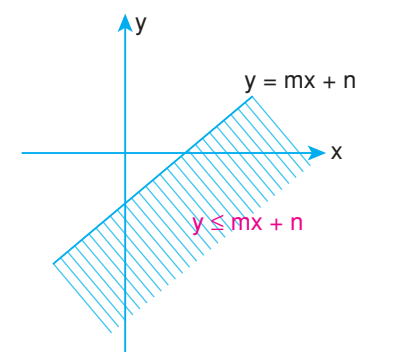
$\Rightarrow$ denklemden d_3 ve d_4 açıkortay
doğru denklemlerine ulaşılır. $d_3 \perp d_4$

5 Doğru demeti

d_1 d_2 P

$$kd_1 + d_2 = 0$$

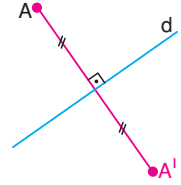
6 Eşitsizlik Grafiği



1 Noktanın noktaya göre simetriği



2 Noktanın doğruya göre simetriği

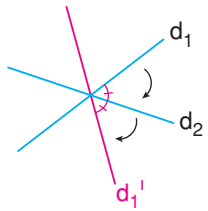


$A(x_1, y_1)$	Ox eksenine göre	$A'(x_1, -y_1)$
	Oy eksenine göre	$A'(-x_1, y_1)$
	Orijin	$A'(-x_1, -y_1)$
	$y = x$	$A'(y_1, x_1)$
	$y = -x$	$A'(-y_1, -x_1)$
	$x = a$	$A'(2a - x_1, y_1)$
	$y = b$	$A'(x_1, 2b - y_1)$

3 Doğrunun noktaya göre simetriği

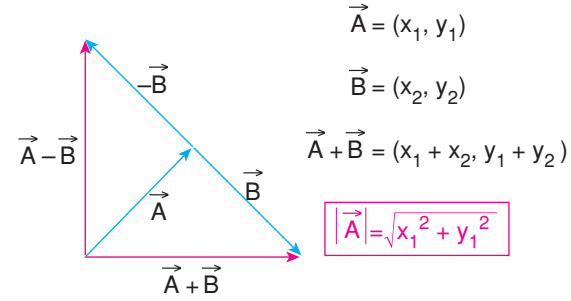


4 Doğrunun doğruya göre simetriği



$ax + by + c = 0$	Ox eksenine	$ax - by + c = 0$
	Oy eksenine	$-ax + by + c = 0$
	Orijin	$-ax - by + c = 0$
	$y = x$	$ay + bx + c = 0$
	$y = -x$	$-ay - bx + c = 0$
	$x = d$	$a(2d - x) + by + c = 0$
	$y = e$	$ax + b(2e - y) + c = 0$

1



4 Skaler Çarpım (Öklid İç Çarpımı)

$$\vec{A} = (x_1, y_1), \vec{B} = (x_2, y_2)$$

$$\vec{A} \cdot \vec{B} = x_1 \cdot x_2 + y_1 \cdot y_2$$

2

$$\vec{A} = (x_1, y_1), \vec{B} = (x_2, y_2)$$

$$\vec{AB} = \vec{B} - \vec{A} = (x_2 - x_1, y_2 - y_1)$$

Eşit vektörler

$$\vec{A} = \vec{B} \Leftrightarrow x_1 = x_2, y_1 = y_2$$

Vektörün bir reel sayı ile çarpımı

$$\hat{A} = (x_1, y_1) \quad k \in \mathbb{R} \quad k\vec{A} = (kx_1, ky_1)$$

Vektörlerin paralelliği

$$\vec{A} = (x_1, y_1) \quad \vec{B} = (x_2, y_2) \quad \frac{x_1}{x_2} = \frac{y_1}{y_2}$$

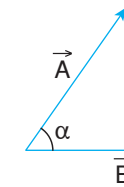
Vektörlerin dikliği;

$$x_1 \cdot x_2 + y_1 \cdot y_2 = 0$$

3

$\vec{A}$ vektörü ile aynı yönlü birim vektör,

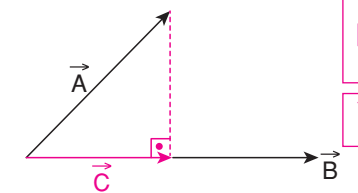
5 İç Çarpımın Geometrik Yorumu



$$\vec{A} \cdot \vec{B} = |\vec{A}| \cdot |\vec{B}| \cdot \cos \alpha$$

$$\cos \alpha = \frac{\vec{A} \cdot \vec{B}}{|\vec{A}| \cdot |\vec{B}|}$$

6 Dik İzdüşüm Uzunluğu ve Vektörü



$$|\vec{C}| = \frac{\vec{A} \cdot \vec{B}}{|\vec{B}|}$$

$$\vec{C} = |\vec{C}| \cdot \frac{\vec{B}}{|\vec{B}|}$$

SİMETRİ
(YANSIMA)

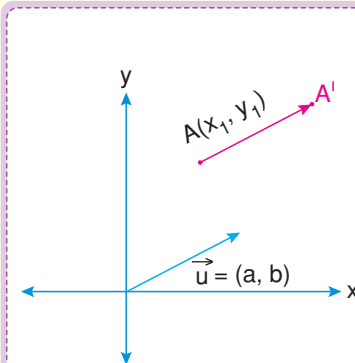
DÖNÜŞÜMLER

ANALİTİK
GEOMETRİ - 2

VEKTÖRLER

ÖTELEME

DÖNDÜRME

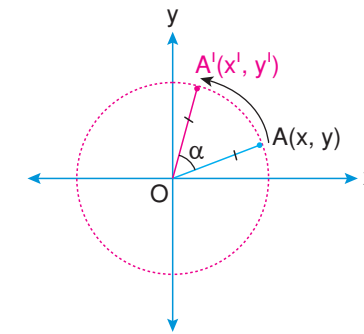


A noktasının $\vec{u}$ doğrultusunda ötelenmiş olan nokta A' dir.

$$\vec{A'} = \vec{A} + \vec{u}$$

$$A' = (x_1, y_1) + (a, b)$$

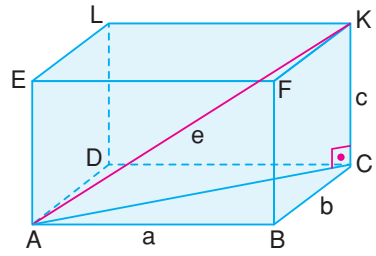
$$A' = (x_1 + a, y_1 + b)$$



A noktasının pozitif yönde dönme merkezi orijin etrafında α derece dönüşümü olan nokta A' dir.

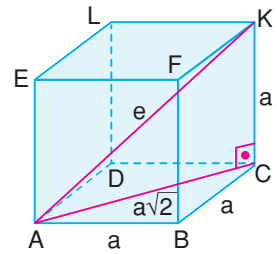
$$A'(x', y') = (x \cos \alpha - y \sin \alpha, x \sin \alpha + y \cos \alpha)$$

1 Dikdörtgenler Prizması



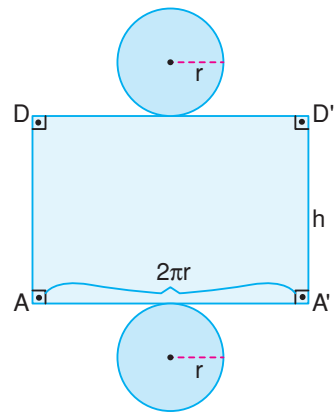
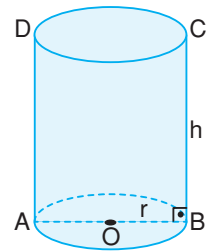
$$\begin{aligned} \text{Yanal Alan} &= 2(ac + bc) \\ \text{Alan} &= 2(ab + ac + bc) \\ \text{Hacim} &= a \cdot b \cdot c \\ e &= \sqrt{a^2 + b^2 + c^2} \end{aligned}$$

2 Küp



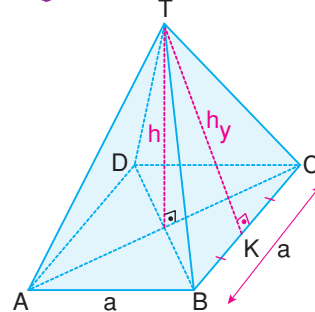
$$\begin{aligned} \text{Yanal Alan} &= 4a^2 \\ \text{Alan} &= 6a^2 \\ \text{Hacim} &= a^3 \\ e &= a\sqrt{3} \end{aligned}$$

3 Dik Silindir



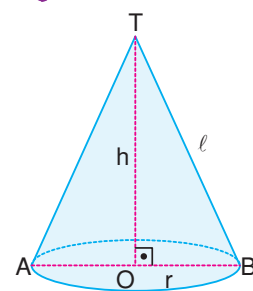
$$\begin{aligned} \text{Yanal Alan} &= 2\pi r \cdot h \\ \text{Alan} &= 2\pi rh + 2\pi r^2 \\ \text{Hacim} &= \pi r^2 \cdot h \end{aligned}$$

1 Düzgün Kare Dik Piramit



$$\begin{aligned} \text{Yanal Alan} &= 4 \cdot \frac{a \cdot h_y}{2} \\ \text{Alan} &= 4 \cdot \frac{a \cdot h_y}{2} + a^2 \\ \text{Hacim} &= \frac{1}{3} a^2 \cdot h \end{aligned}$$

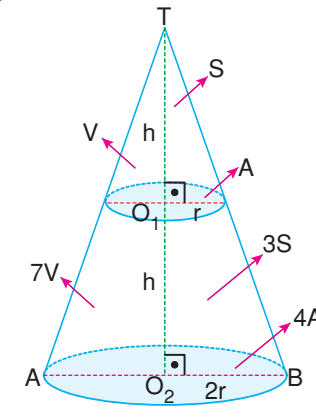
2 Dik Koni



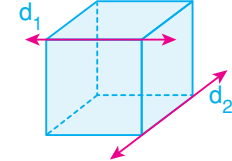
$$\text{Yanal Alan} = \pi r l$$

$$\text{Alan} = \pi r l + \pi r^2$$

3 Kesik Piramit

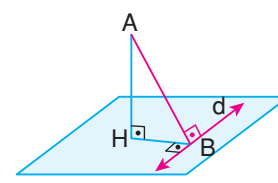


$$\begin{aligned} k = \frac{1}{2}, \quad k^2 = \frac{1}{4}, \quad k^3 = \frac{1}{8} \\ \downarrow \quad \downarrow \quad \downarrow \\ \text{uzunluk} \quad \text{alan} \quad \text{hacim} \\ \text{oranı} \quad \text{oranı} \quad \text{oranı} \\ r \quad A \quad V \\ 2r \quad 4A \quad 7V \end{aligned}$$

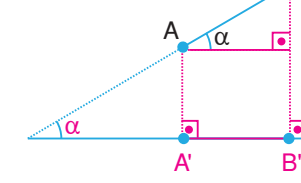
1 R^3 'de aykırı doğrular paralel değildir, kesişmez.

d_1 ve d_2 aykırı doğrulardır.

2 Üç Dikme Teoremi



3 Dik İzdüşüm



$$|A'B'| = |AB| \cdot \cos \alpha$$

UZAY GEOMETRİ

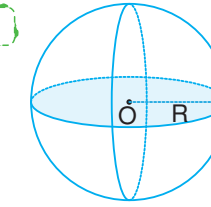
UZAY GEOMETRİ VE KATI CİŞİMLER

PRİZMA

KÜRE VE DÖNEL CİŞİMLER

PİRAMİT

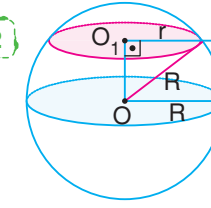
1



$$\text{Alan} = 4\pi R^2$$

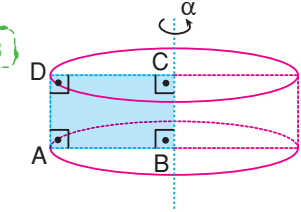
$$\text{Hacim} = \frac{4}{3} \pi R^3$$

2



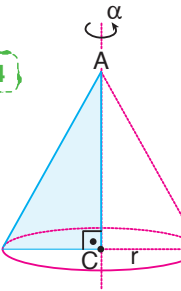
Küre düzlemde kesilirse oluşan kesit dairedir.

3



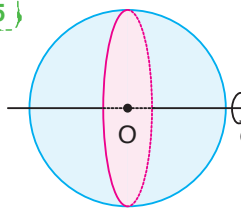
Dikdörtgen, kenarlarından biri etrafında $\alpha = 360^\circ$ döndürülürse **dik silindir** oluşur.

4



Dik üçgen, dik kenarlarından biri etrafında $\alpha = 360^\circ$ döndürülürse **dik koni** oluşur.

5



Daire, çap eksenini etrafında $\alpha = 180^\circ$ döndürülürse **küre** oluşur.