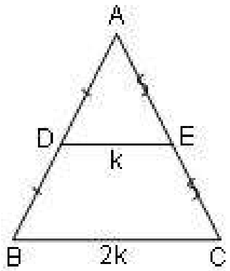
ÜÇGENLER HAKKINDA

TEMEL

HATIRLATMALAR

ORTA TABAN



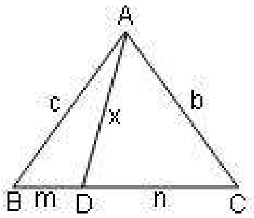
[DE]: orta taban

[DE] // [BC]

|BC|= 2.|DE|

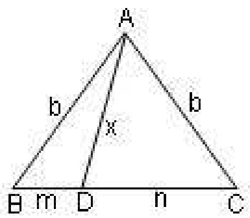
Orta nokta görünce orta taban çizmeye çalışalım.

STEWART TEOREMİ



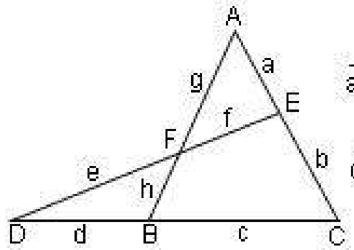
$$x^2 = \frac{b^2 m + c^2 n}{m + n} - m.n$$

<u>Özel olarak **ikizkenar üçgende** Stewart Teoremi daha kısa olarak</u>:



$$x^2 = b^2 - m.n$$

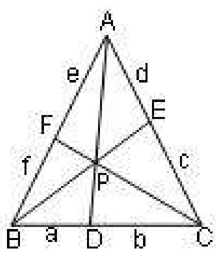
MENELAUS TEOREMİ



$$\frac{a}{a+b} \cdot \frac{c}{d} \cdot \frac{e}{f} = 1 \text{ ya da}$$

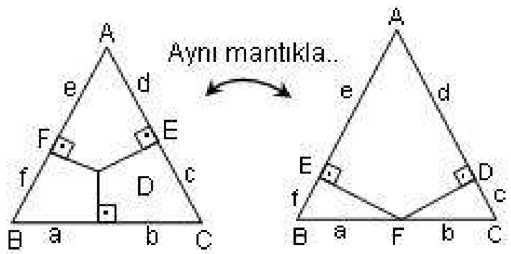
$$\frac{d}{d+c} \cdot \frac{b}{a} \cdot \frac{g}{h} = 1$$

SEVA (CEVA) TEOREMİ



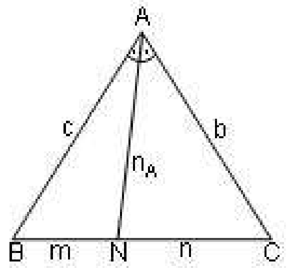
a.c.e = b.d.f

CARNOT TEOREMİ



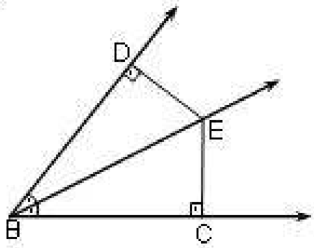
$$a^2+c^2+e^2 = b^2+d^2+f^2$$

İÇ AÇIORTAY TEOREMİ



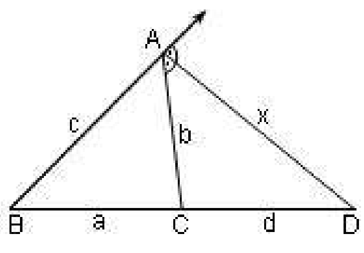
$$\frac{c}{m} = \frac{b}{n}$$

$$|n_A|^2 = b.c - m.n$$



|ED| = |EC| ve
|BD| = |BC| dir.

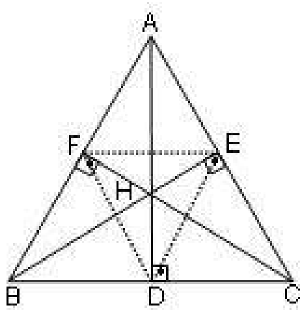
DIŞ AÇIORTAY TEOREMİ



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

$$x^2 = d.(d+a) - b.c$$

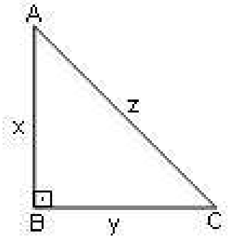
DİKLİK MERKEZİ



H: ABC nin diklik merkezi,

H: FED nin iç teğet çemberinin merkezi

DİK ÜÇGEN

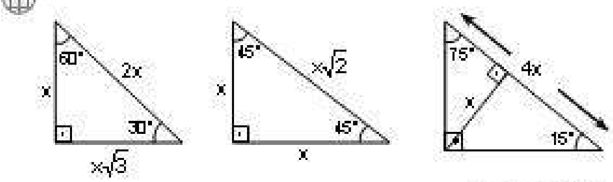


z ⟶ hipotenüs
x, y ⟶ dik kenarlar

$z^2 = x^2 + y^2$ (pisagor teoremi)

$Alan(\widehat{ABC}) = \frac{x.y}{2}$

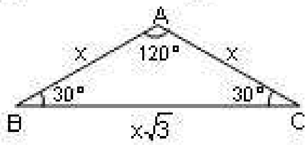
max {x, y, z} = z



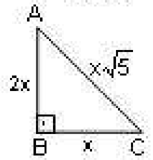
30°, 60°, 90° dik üçgeni

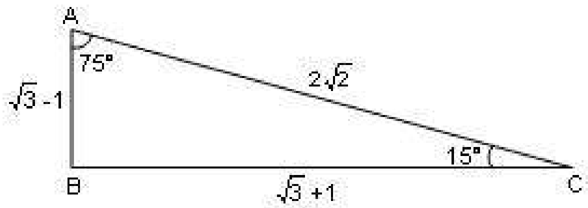
45°, 45°, 90° dik üçgeni

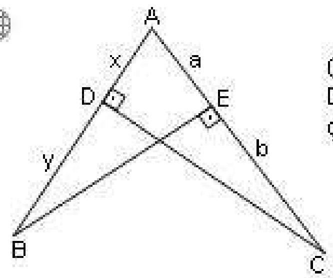
15°, 75°, 90° dik üçgeni



30°,30°, 120° ikizkenar üçgeni

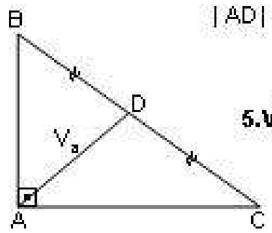






a.(a+b) = x.(x+y)

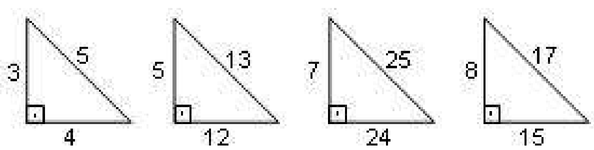
(A.A.A benzerliğinden yada D,B,C,E nin çemberselliğinden)



$|AD| = \frac{|BC|}{2}$ (muhteşem üçlü)

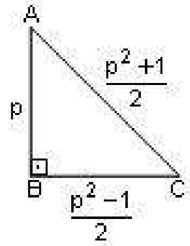
$5.V_a^2 = V_b^2 + V_c^2$

KENARLARI TAMSAYILI TEMEL DİK ÜÇGENLER



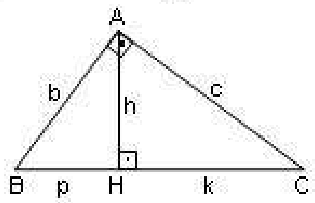
ve katları……………

Genelleme:
p, asal sayı ve tüm kenarlar tamsayı ise;

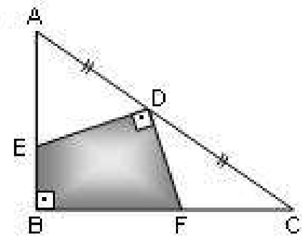


$|AC| = \frac{p^2+1}{2}$, $|BC| = \frac{p^2-1}{2}$

Öklid bağıntıları: **(Dikmeden dikme)**



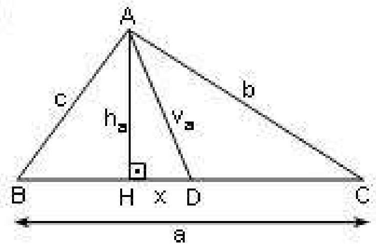
I) $h^2 = p.k$
II) $b^2 = p.(p+k)$
III) $c^2 = k.(k+p)$



ABC ikizkenar dik üçgen,
|AD|= |DC| ,
[ED] ⊥ [DF]

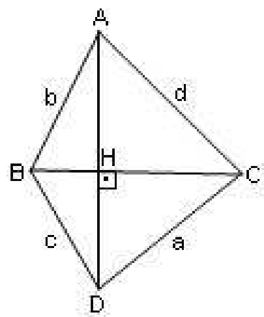
$A(BEDF) = \frac{A(\widehat{ABC})}{2}$

(A.A.A benzerlikten)



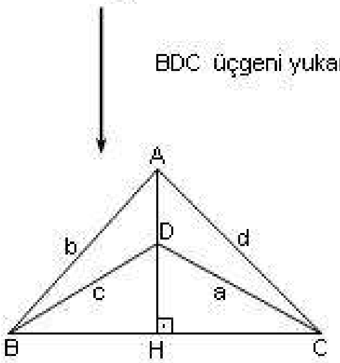
$x = \frac{b^2 - c^2}{2.a}$

V_a: kenarortay h_a: yükseklik



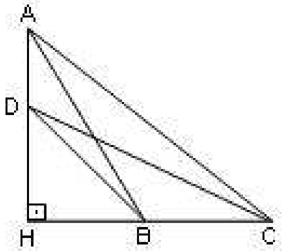
[AD] ⊥ [BC] ise
$a^2 + b^2 = c^2 + d^2$
(pisagor teoreminden)

BDC üçgeni yukarı katlanırsa

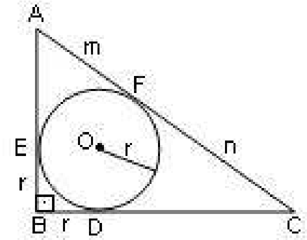


[AH] ⊥ [BC]
$a^2+b^2 = c^2+d^2$

(Bir önceki şekilde ABH üçgeni sağa katlanırsa)

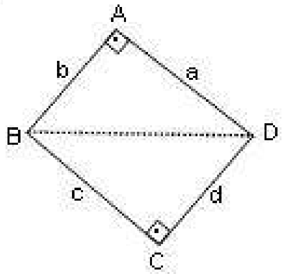


$|DB|^2 + |AC|^2 = |DC|^2 + |AB|^2$



$A(\widehat{ABC}) = m.n$

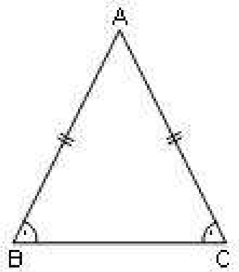
$|EB| = |BD| = r$



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

(pisagor teoreminden)

İKİZKENAR ÜÇGEN



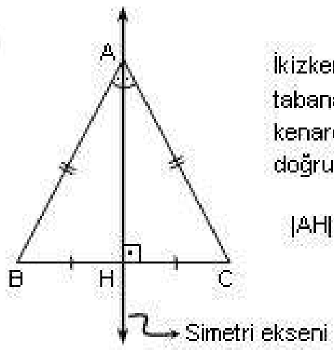
$m(\widehat{B}) = m(\widehat{C})$

$h_b = h_c$, $V_b = V_c$, $n_B = n_C$

İkizkenarlara ait kenarortaylar (V_b,V_c) birbirine eşittir.

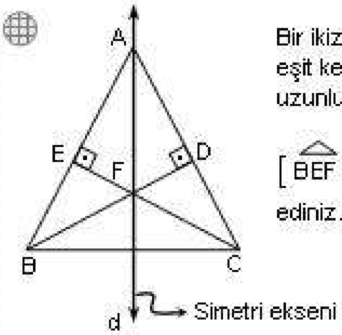
İkizkenarlara ait açıortaylar (n_b ,n_c) birbirine eşittir.

İkizkenarlara ait yükseklikler (h_b, h_c) birbirine eşittir.



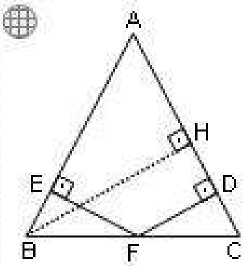
İkizkenar üçgende tepeden tabana çizilen açıortay, kenarortay, yükseklik aynı doğrudur.

$|AH| = h_a = n_A = V_a$



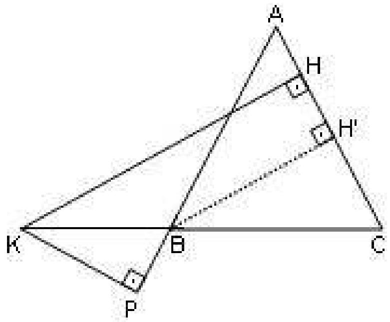
Bir ikizkenar üçgende uzunlukları eşit kenarlara ait yüksekliklerin uzunlukları da eşittir.

[$\widehat{BEF} \cong \widehat{CDF}$ olduğuna dikkat ediniz.]

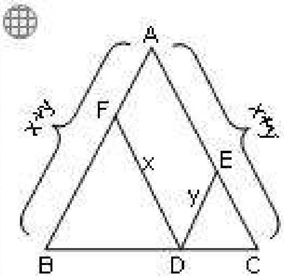


Bir ikizkenar üçgenin tabanında alınan herhangi bir noktadan eşit kenarlara çizilen dikmelerin uzunlukları toplamı eş yüksekliklerden birinin uzunluğuna eşittir.

$|AB| = |AC|$ ise $|FD| + |FE| = |BH|$



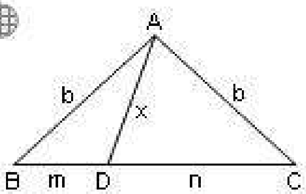
$|AB| = |AC|$ ise $|KH| - |KP| = |BH'|$



"İkizkenar üçgende taban üzerinde alınan bir noktadan ikizkenarlara çizilen paralellerin toplamı bir ikizkenarın uzunluğuna eşittir."

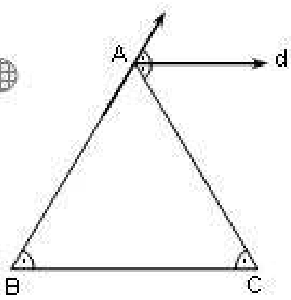
[DF] // [AC] ve [DE] // [AB]

$|AB| = |AC|$ ise $|DE| + |DF| = |AB|$



$x^2 = b^2 - m.n$

(veya tepeden dikme çizilerek de x bulunabilir.)

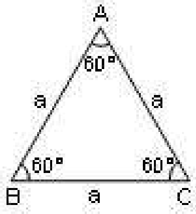


İkizkenar üçgende tepe açısının dış açıortayı tabana paraleldir.

$|AB| = |AC|$ ise $[BC]$ // d

EŞKENAR ÜÇGEN

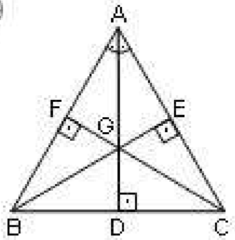
✿ **İkizkenar üçgenin tüm özelliklerini gösterir.**



$$\text{Alan}(\widehat{ABC}) = \frac{a^2\sqrt{3}}{4}$$

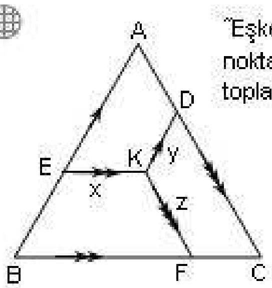
$$h = \frac{a\sqrt{3}}{2}$$

$$h_a = h_b = h_c = V_a = V_b = V_c = n_A = n_B = n_C$$



"Eşkenar üçgende ağırlık merkezi
= **iç teğet çemberinin merkezi**
= çevrel çemberinin merkezi
= diklik merkezi."

G:ağırlık merkezi = i.t.ç.m.

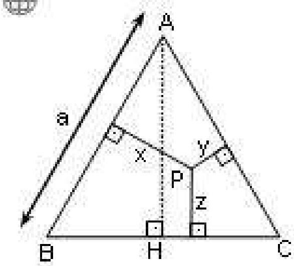


"Eşkenar üçgen içinde alınan bir noktadan kenarlara çizilen paralellerin toplamı bir kenarın uzunluğuna eşittir."

$x + y + z = |AB|$

K : ağırlık merkezi ise

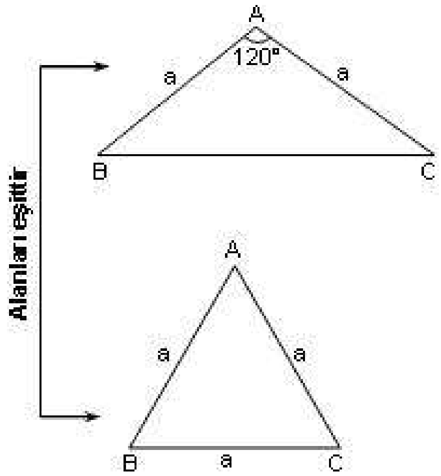
$x = y = z = a/3$



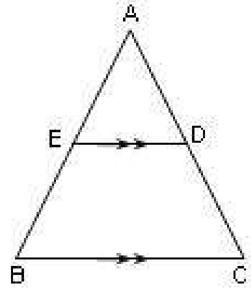
ABC eşkenar üçgen

$$x + y + z = |AH| = h = \frac{a\sqrt{3}}{2}$$

$$A(\widehat{ABC}) = \frac{a^2\sqrt{3}}{4}$$



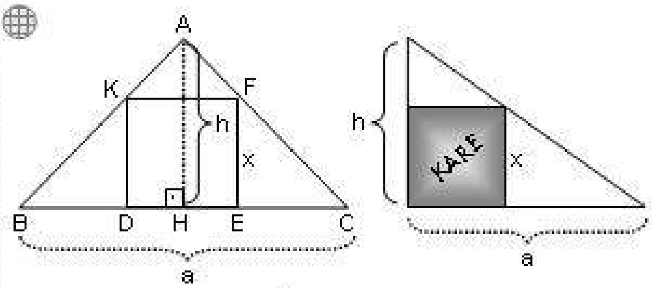
TEMEL BENZERLİK TEOREMİ (TALES)



[ED] // [BC] ise

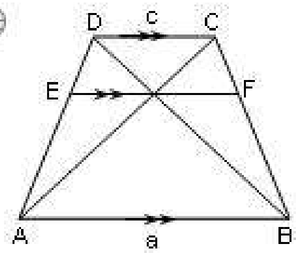
$$\frac{|AE|}{|EB|} = \frac{|AD|}{|DC|}$$

$$\frac{|AE|}{|AB|} = \frac{|AD|}{|AC|} = \frac{|ED|}{|BC|}$$



KDEF kare ise $x = \frac{a.h}{a+h}$ (Benzerlikten)

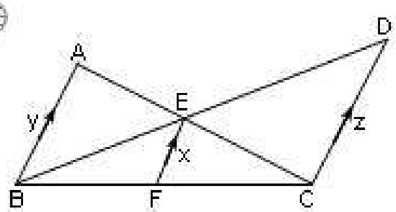
x; a ile h nin harmonik ortasının yarısıdır.



[AB] // [EF] // [DC]

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

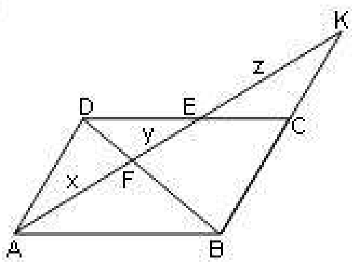
|EF|: a ile c nin harmonik ortası



[AB] // [EF] // [DC]

$$\frac{1}{x} = \frac{1}{y} + \frac{1}{z} \quad \text{ya da} \quad x = \frac{y.z}{y+z}$$

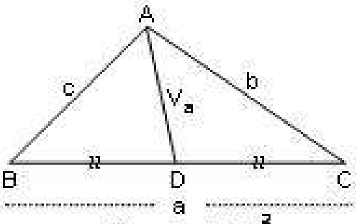
x; y ile z nin harmonik ortasının yarısıdır.



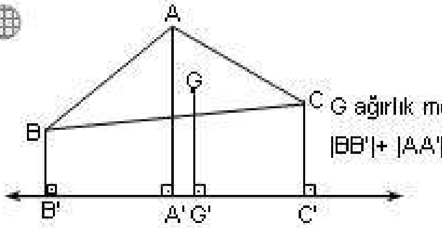
ABCD paralelkenar ise

$$x^2 = y.(y+z)$$

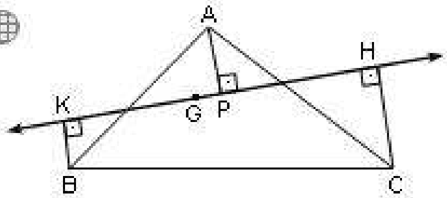
KENARORTAY TEOREMİ



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



G ağırlık merkezi ise
|BB'|+ |AA'|+ |CC'|= 3.|GG'|
(benzerlikten)

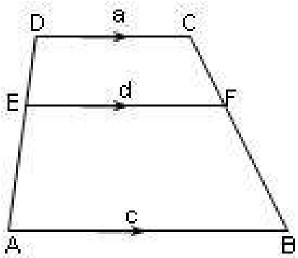


(Benzerlikten)

G: ağırlık merkezi ,|BK| + |HC|= |AP| dir.

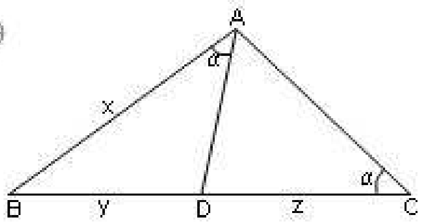
SONUÇLAR

- **Benzer iki üçgenin karşılıklı açıortayları oranı benzerlik oranına eşittir.**
- **Benzer iki üçgenin karşılıklı kenarortayları oranı benzerlik oranına eşittir.**
- **Benzer iki üçgenin karşılıklı yükseklikleri oranı benzerlik oranına eşittir.**
- **Benzer iki üçgenin alanları oranı benzerlik oranının karesine eşittir.**

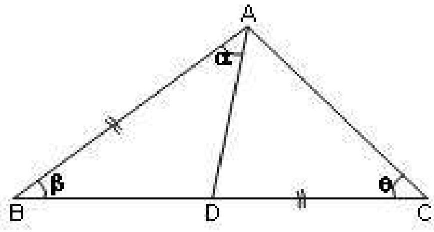


[AB] // [EF] // [DC]

$$\frac{|CF|}{|FB|} = \frac{d-a}{c-d}$$



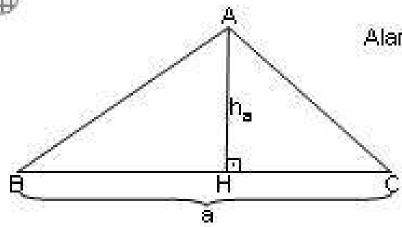
$x^2 = y.(y+z)$ (benzerlikten)



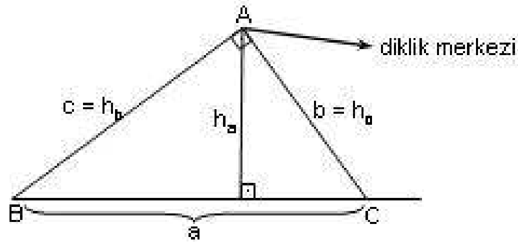
|AB| = |CD| ve

$2\alpha + 3\beta = 180° \Rightarrow \beta = \theta$ (benzerlikten)

ALAN HESABI

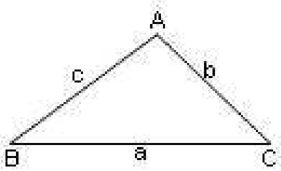


$$\text{Alan}(\widehat{ABC}) = \frac{h_a.a}{2}$$



$h_a.a = b.c$ (Alan eşitliğinden)

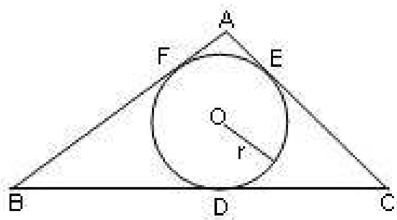
Heron formülü
("U" lu alan formülü)



$$U = \frac{a+b+c}{2}$$

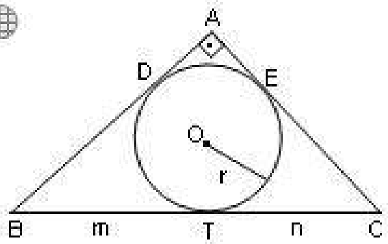
u : yarı çevre

$$\text{Alan}(\widehat{ABC}) = \sqrt{u.(u-a).(u-b).(u-c)}$$



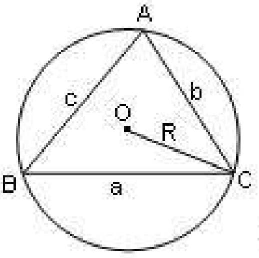
$\text{Alan}(\widehat{ABC}) = u.r$

r : iç teğet çemberin merkezi



ABC dik üçgen
|BT| = m birim,
|TC| = n birim

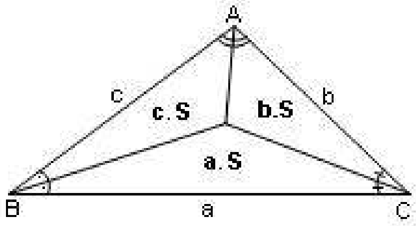
$m(\widehat{BAC}) = 90°$ ise $Alan(\overset{\triangle}{ABC}) = m.n$

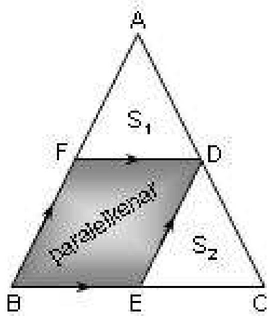


$Alan(\overset{\triangle}{ABC}) = \frac{a.b.c}{4R}$

R: çevrel çemberin yarıçapı

ALAN PARSELLEME (BÖLME)

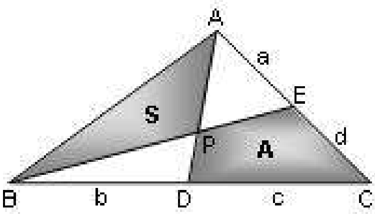




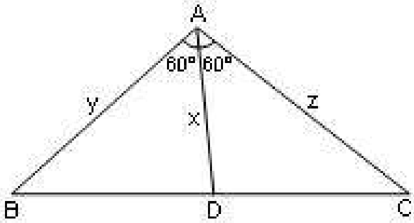
$Alan(\overset{\triangle}{ABC}) = (\sqrt{S_1} + \sqrt{S_2})^2$

$Alan(BEDF) = 2\sqrt{S_1 . S_2}$

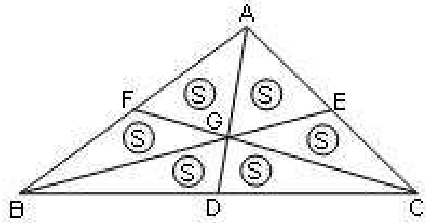
(Benzerlikten)



S = A ise a.b = c.d

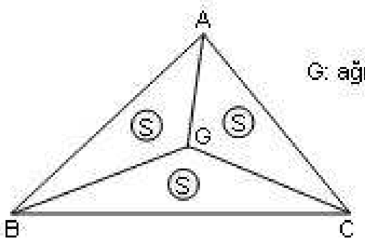


$\frac{1}{x} = \frac{1}{y} + \frac{1}{z}$ $\left[A(\overset{\triangle}{ABD}) + A(\overset{\triangle}{ADC}) = A(\overset{\triangle}{ABC}) \right]$

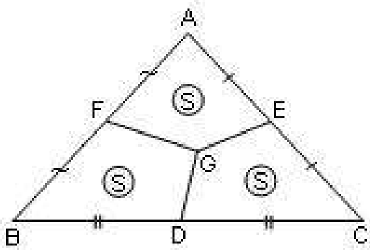


G: ağırlık merkezi

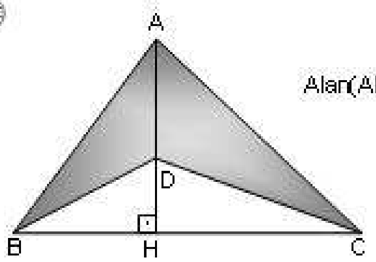
üç kenarortay alanı 6 eş alana böler.



G: ağırlık merkezi

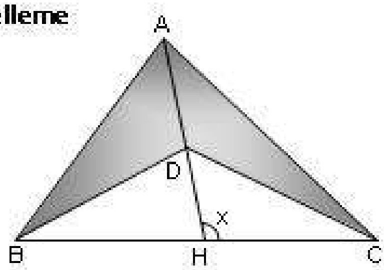


G: ağırlık merkezi



$Alan(ABDC) = \frac{|AD| . |BC|}{2}$

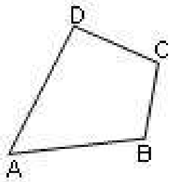
genelleme



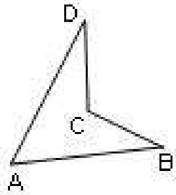
$Alan(ABDC) = \frac{|AD| . |BC| . \sin x}{2}$

ÇOKGENLER

Kenar sayısı 3 ya da daha fazla olan kapalı geometrik şekillere çokgen denir.

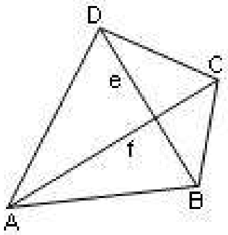


Konveks çokgen (Dışbükey)



Konkav çokgen (İçbükey)

KÖŞEGEN: Bir konveks çokgende komşu olmayan iki köşeyi birleştiren doğru parçasıdır. e,f gibi harflerle gösterilir.

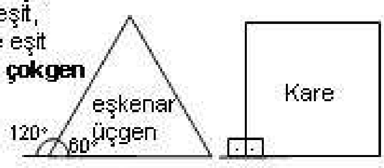


Köşegen sayısı : $\dfrac{n.(n-3)}{2}$

Bir köşeden (n – 3) tane köşegen çizilir, bu köşegenler çokgeni (n – 2) tane üçgene ayırır.

DÜZGÜN ÇOKGEN

Tüm kenarları birbirine eşit, tüm iç açıları birbirine eşit, tüm dış açıları birbirine eşit olan çokgene **düzgün çokgen** denir.



n-KENARLI BİR KONVEKS ÇOKGENDE;

1.) İç açılar toplamı = (n – 2). 180°

2.) Dış açılar toplamı = 360°

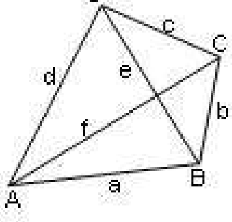
3.) Köşegen sayısı = $\dfrac{n.(n-3)}{2}$

4.) Bir köşeden (n – 3) tane köşegen çizilir bu köşegenler çokgeni (n – 2) tane üçgene ayırır.

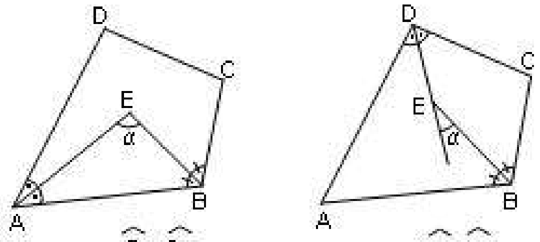
5.) En az (2n – 3) tane elemanı ile bellidir. [Bunlardan en az (n – 2) tanesi uzunluk en çok (n – 1) tanesi açıdır.]

6.) Düzgün konveks çokgende bir dış açı = $\dfrac{360}{n}$ **dir.**

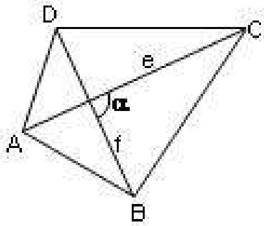
KONVEKS DÖRTGENLER



- **İç açılar toplamı = 360°**
- **Dış açılar toplamı = 360°**
- **Köşegenleri,** |BD|= e , |AC|= f



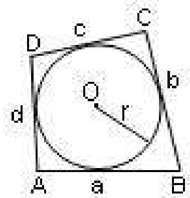
$\alpha = \dfrac{\widehat{D} + \widehat{C}}{2}$ $\alpha = \dfrac{|\widehat{A} - \widehat{C}|}{2}$



$\text{Alan(ABCD)} = \dfrac{1}{2}.e.f.\sin\alpha$

$\text{Sin}30^\circ = \dfrac{1}{2}$ (150°) $\text{Sin}45^\circ = \dfrac{\sqrt{2}}{2}$ (135°)

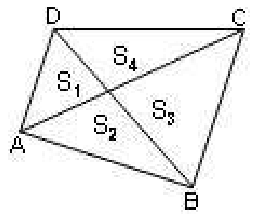
$\text{Sin}60^\circ = \dfrac{\sqrt{3}}{2}$ (120°) $\text{Sin}90^\circ = 1$



A(ABCD)=u.r

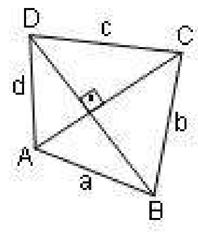
R: iç teğet çemberin merkezi

$u = \dfrac{a+b+c+d}{2}$, u : yarıçevre



$S_1.S_3 = S_2.S_4$

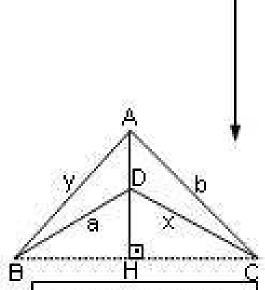
Köşegenleri dik kesişen bir dörtgende ([AC] ⊥ [BD])



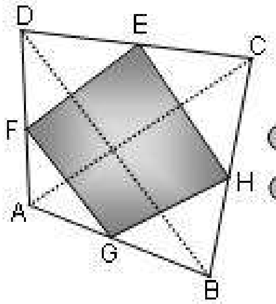
$\text{Alan(ABDC)} = \dfrac{e.f}{2}$

|BD| = e,
|AC| = f

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

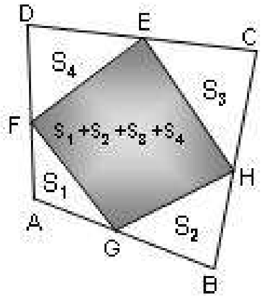


$a^2 + b^2 = y^2 + x^2$



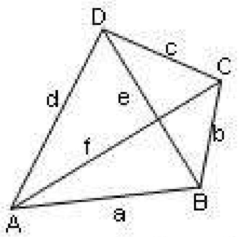
E,F,G,H orta noktalar ise

- **Çevre (EFGH) = |AC| + |BD|**
- **EFGH bir paralelkenardır.**



E, F, G, H orta noktalar

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

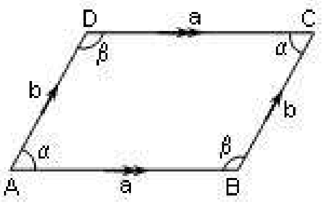


<u>BATLAMYUS (Ptolemy) teoremi</u> ABCD kirişler dörtgeni ve
|BD| = e birim
|AC| = f birim ise

a.c + b.d = e.f

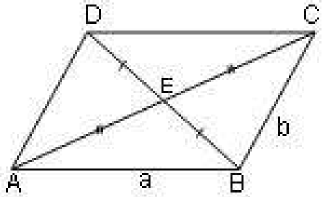
(KARE, DİKDÖRTGEN ,İKİZKENAR YAMUK birer <u>kirişler dörtgenidir.</u>)

PARALELKENAR



[AB] // [DC]
[BC] // [AD]
$\alpha + \beta = 180°$

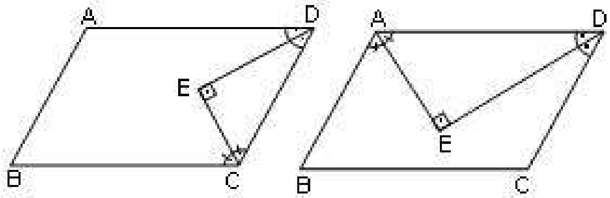
- Karşılıklı açılar eşit, komşu açılar bütünlerdir.

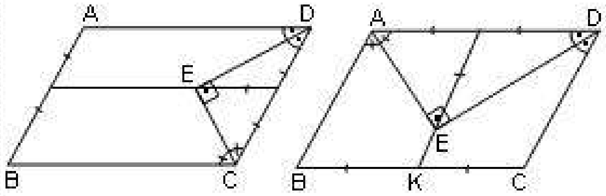


|AC| = e,
|BD| = f

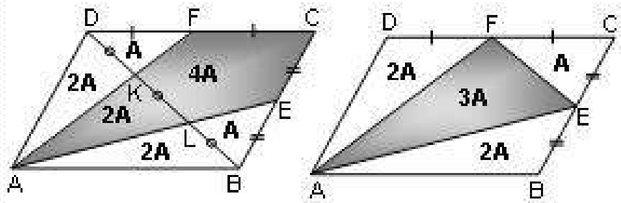
- Köşegenler birbirini ortalar ve köşegenlerle kenarlar arasında;

$e^2 + f^2 = 2(a^2 + b^2)$ bağıntısı vardır.



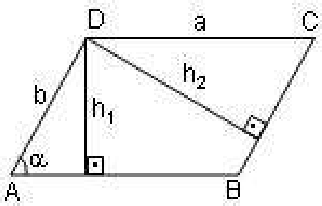


Paralelkenarda komşu iki açının açıortayları orta taban üzerinde ya da hizasında dik olarak kesişirler.

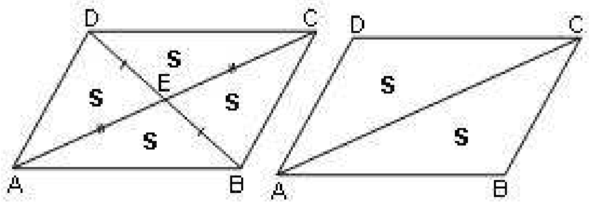


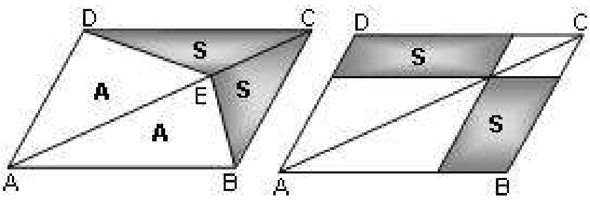
E ve F orta noktalar ise
|DK| = |KL| = |LB|

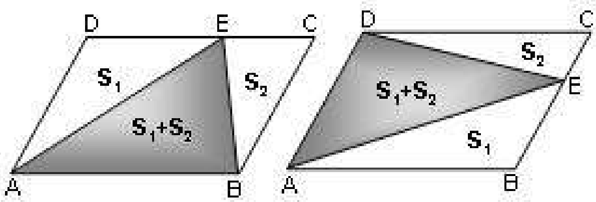
E ve F orta noktalar



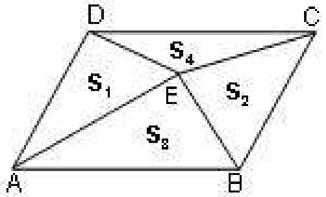
- **Alan(ABCD) = $h_1.a = h_2.b = a.b.\sin\alpha$**





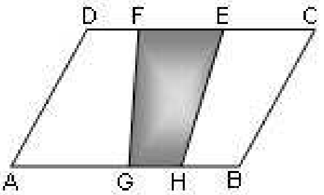


- Taralı alan tüm alanın yarısıdır.

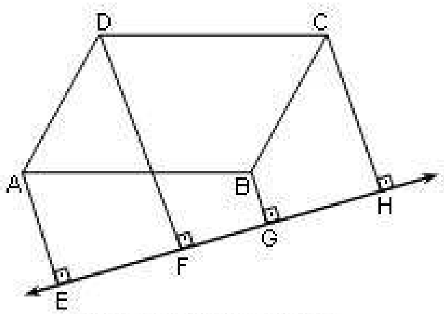


E iç bölgede herhangi bir nokta ise

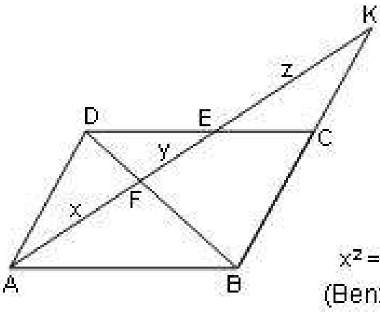
- **$S_1+S_2=S_3+S_4$** **(İspatı, bir önceki özellikte)**



- $\dfrac{\textbf{Taralı alan}}{\textbf{A(ABCD)}}=\dfrac{1}{2}\left(\dfrac{|EF|}{|DC|}+\dfrac{|GH|}{|AB|}\right)$

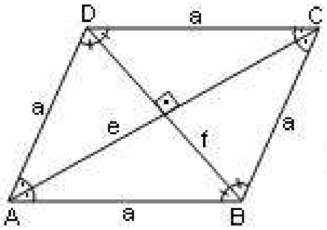


|AE| + |CH| = |DF| + |BG|



$x^2 = y.(y+z)$
(Benzerlikten)

EŞKENAR DÖRTGEN

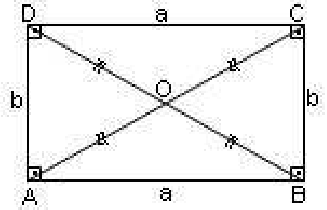


|AC| = e,
|BD| = f

- **Alan(ABCD) = $\dfrac{e.f}{2}$**

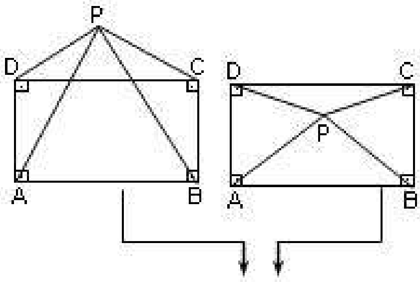
- **Paralel kenarın tüm özelliklerini gösterir.**
- **Köşegenler birbirine diktir**
- **Köşegenler açıortaydır.**

DİKDÖRTGEN

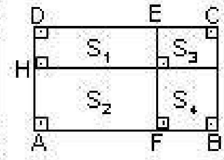


Ç(ABCD) = 2(a + b)
A(ABCD) = a.b

Köşegenler birbirine eşittir.(|AC| = |BD|)
Paralelkenarın tüm özelliklerini taşır.

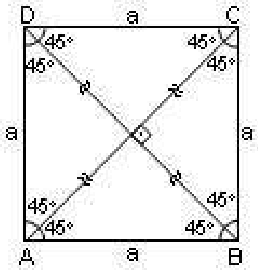


$|PA|^2+|PC|^2=|PD|^2+|PB|^2$



$\dfrac{S_1}{S_2}=\dfrac{S_3}{S_4}$

KARE

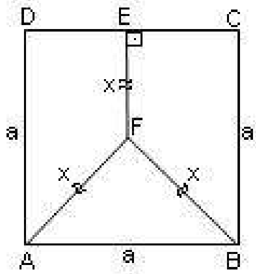


$|AC| = |BD| = e = a\sqrt{2}$

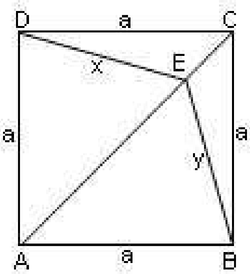
Ç(ABCD)= 4a

$A(ABCD)= a^2=\dfrac{e^2}{2}$

Köşegenler birbirine diktir. [AC] ⊥ [BD]
Köşegenler açıortaydır.



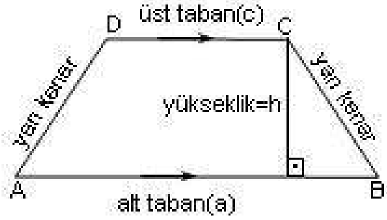
$x=\dfrac{5.a}{8}$



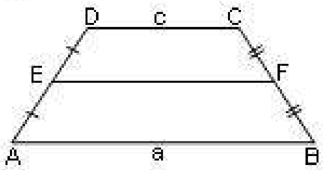
x = y

YAMUK

<u>Yalnız iki kenarı</u> paralel olan dörtgene denir.

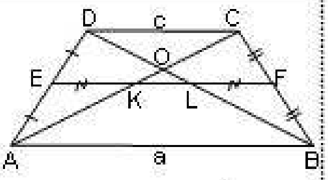


[AB] // [DC]



[EF]: orta taban

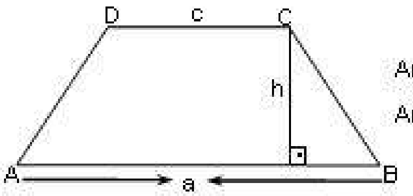
$|EF| = \frac{a+c}{2}$



$|EK| = |LF| = \frac{c}{2}$

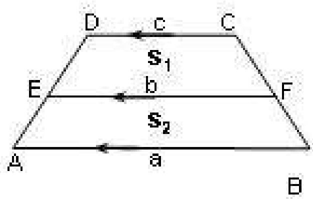
$|KL| = \frac{a-c}{2}$

YAMUĞUN ALANI

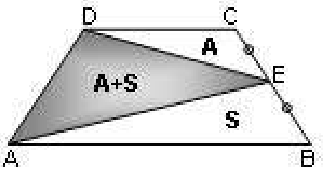


$A(ABCD) = \frac{a+c}{2}\,h$

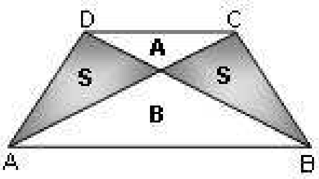
$A(ABCD) = (\text{orta taban}).h$



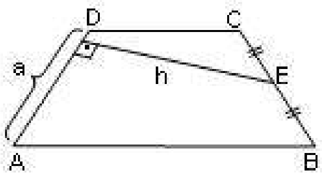
$\frac{S_1}{S_2} = \frac{b^2 - c^2}{a^2 - b^2}$



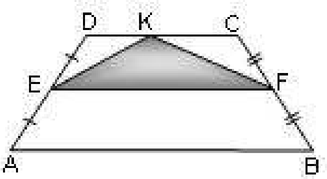
$A(\widehat{ADE}) = \frac{A(ABCD)}{2}$



$S^2 = A.B$

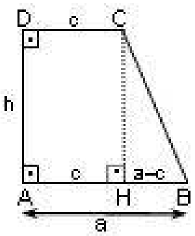


A(ABCD) = h.a

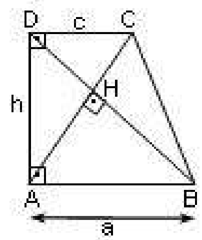


$A(\text{taralı}) = \frac{A(ABCD)}{4}$

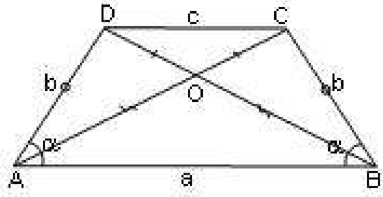
DİK YAMUK



Dik yamukta köşegenler dik kesişir ise $h^2 = a.c$



İKİZKENAR YAMUK



Taban açıları eşittir.

Köşegenleri eşittir.

|OA| = |OB|,

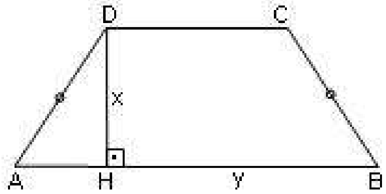
|OD| = |OC|,

O: simetri merkezi

Bir kirişler dörtgenidir.

İkizkenar Yamukta köşegenler dik kesişirse ([AC] ⊥ [BD])

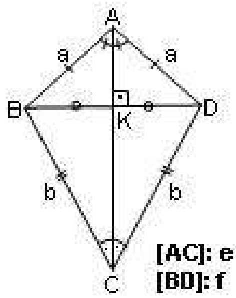
$h = \frac{a+c}{2}$ ve $A(ABCD) = h^2$



|DH| = x birim
|HB| = y birim

A(ABCD) = x.y

DELTOİD



[AC]: e
[BD]: f

Tepeleri birleştiren köşegen açıortaydır.

Köşegenleri dik kesişir.

|BK| = |KD|,

[AC] simetri ekseni

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

Deltoid bir teğetler dörtgenidir.

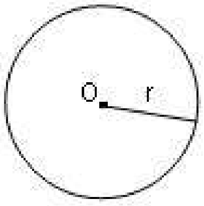
KÖŞEGENLERİ DİK KESİŞEN DÖRTGENLER;
Eşkenar dörtgen, Kare, Deltoid

KÖŞEGENLERİ EŞİT OLAN DÖRTGENLER
Dikdörtgen, Kare, İkizkenar yamuk

TEĞETLER DÖRTGENİ OLANLAR
Eşkenar dörtgen, Kare, Deltoid

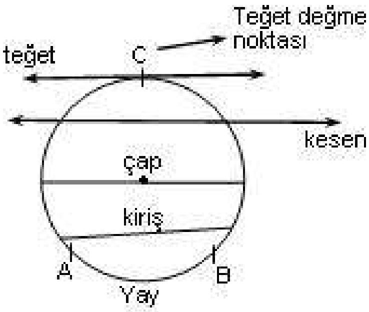
KİRİŞLER DÖRTGENİ OLANLAR
Dikdörtgen, Kare, İkizkenar yamuk

Çemberin Elemanları

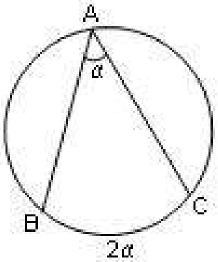


Çevre = $2.\pi.r$

Alan = $\pi.r^2$

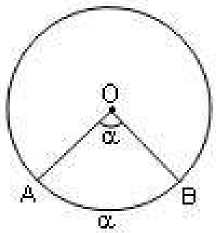


Çevre açı



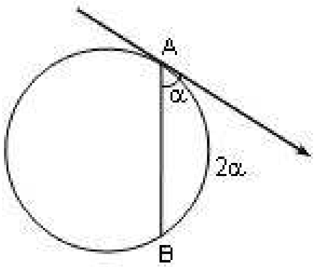
" Ölçüsü gördüğü yayın ölçüsünün yarısına eşittir."

Merkez açı



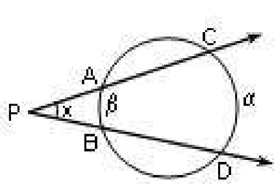
" Ölçüsü gördüğü yayın ölçüsüne eşittir."

Teğet - kiriş açı

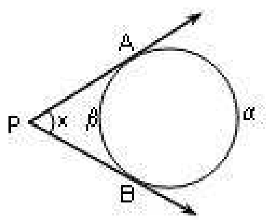


" Ölçüsü gördüğü yayın ölçüsünün yarısına eşittir."

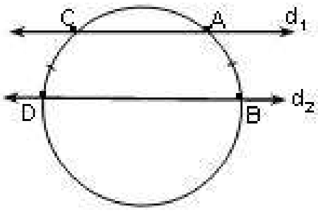
Dış açı



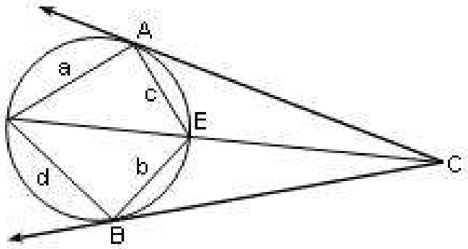
$x = \frac{\alpha - \beta}{2}$



$x + \beta = 180^\circ$

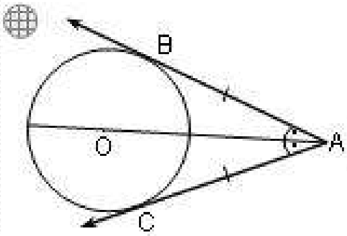


$d_1 // d_2 \Rightarrow |\overset{\frown}{AB}| = |\overset{\frown}{CD}|$



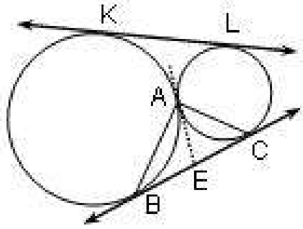
a.b = c.d

(Benzerlikten)



|AB|= |AC|

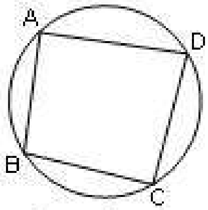
[AO]: Açıortay



[AB] ⊥ [AC], |BC|= |KL|

(|AE|= |EB|= |EC| olduğundan)

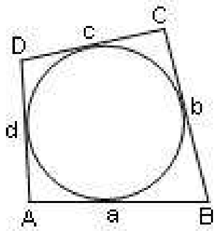
Kirişler dörtgeni



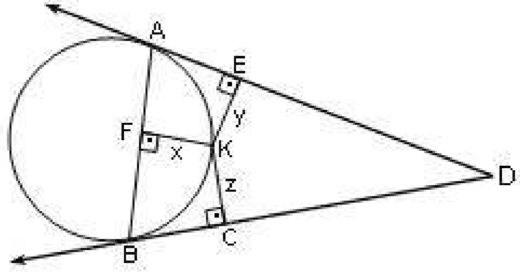
$m(\widehat{A}) + m(\widehat{C}) = 180^\circ$,

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

Teğetler dörtgeni

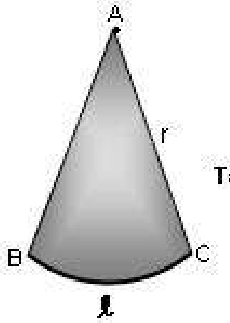


a+c = b+d



$x^2 = y.z$

(Benzerlikten)



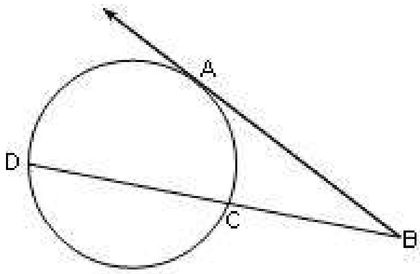
A: merkez

$|AC| = r$

$|\overset{\frown}{BC}| = \ell$

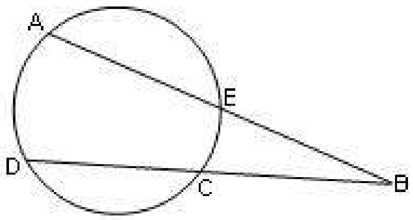
Taralı daire diliminin alanı: $\frac{r\ell}{2}$

ÇEMBERDE KUVVET



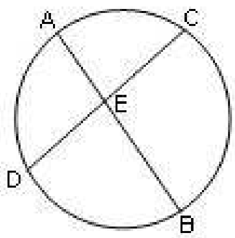
$|AB|^2 = |BC|.|BD|$

(Benzerlikten)



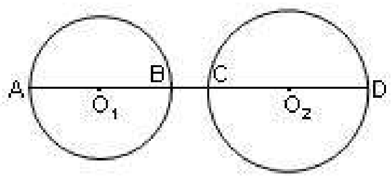
$|BE|.|BA| = |BC|.|BD|$

(Benzerlikten)

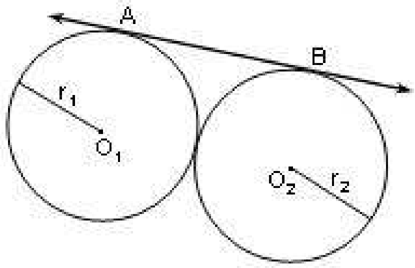


$|AE|.|EB| = |DE|.|EC|$

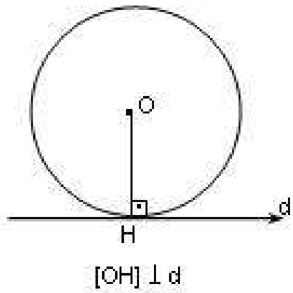
(Benzerlikten)



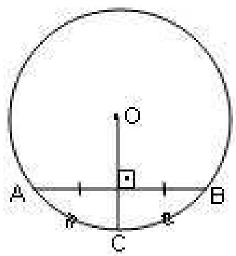
Çemberler arasındaki
- A) En kısa mesafe: |BC|
- B) En uzun mesafe: |AD|



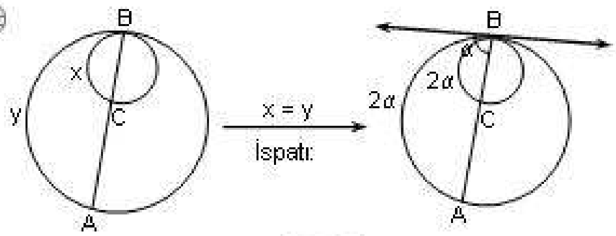
$|AB| = 2\sqrt{r_1.r_2}$

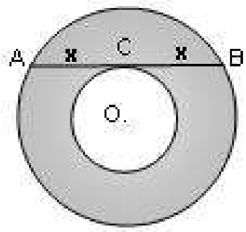


$[OH] \perp d$

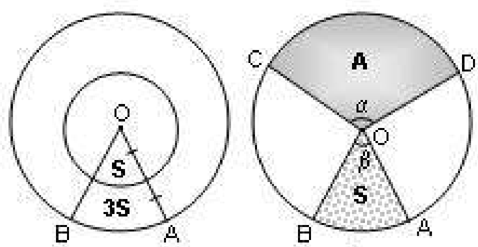


Merkezden kirişe inilen dikme, kirişi ve kirişin yayını eşit iki parçaya böler.

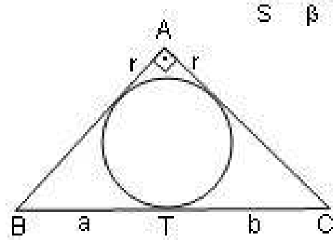




Taralı alan = $\pi.x^2$

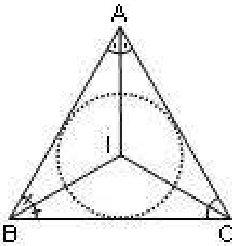


$\frac{A}{S} = \frac{\alpha}{\beta}$

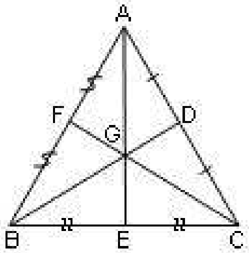


$Alan(\overset{\triangle}{ABC}) = a.b$

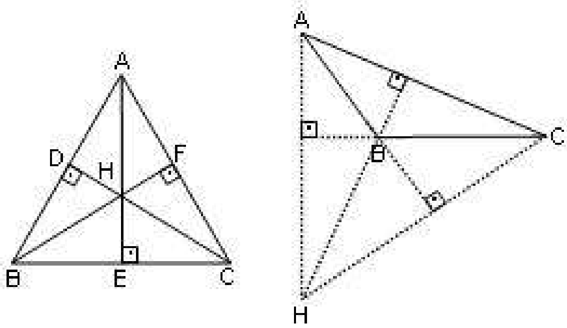
ÜÇGENİN ÖNEMLİ MERKEZLERİ



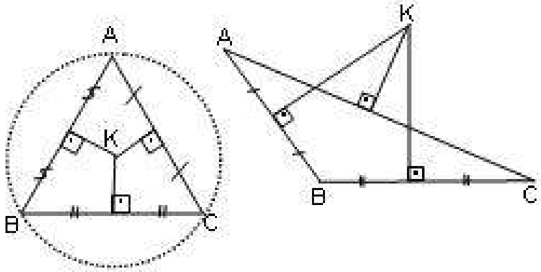
I; iç teğet çemberinin merkezi (açıortayların kesim noktası)



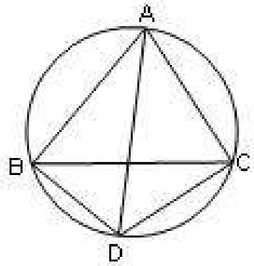
G; ağırlık merkezi (kenarortayların kesim noktası)



H; diklik merkezi (yüksekliklerin kesim noktası)

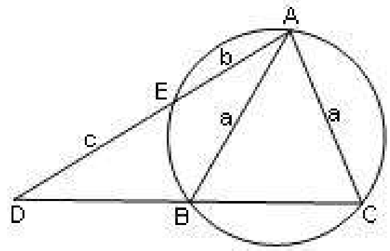


K; çevrel çemberinin merkezi (kenar orta dikmelerin kesim noktası)



ABC eşkenar ise
|AD| = |BD|+|DC|

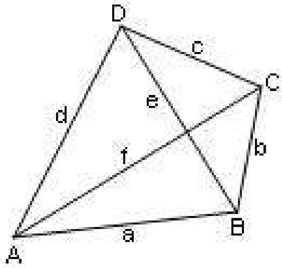
(ispatı: Batlamyus teo.)



$a^2 = b\,(b+c)$

(ispatı: Benzerlik)

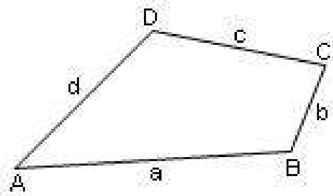
BATLAMYUS (Ptolemy) teoremi
ABCD kirişler dörtgeni ise



|BD| = e , |AC| = f

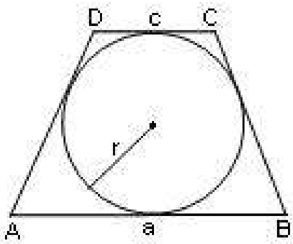
a.c + b.d = e.f

ABCD kirişler dörtgeni ise



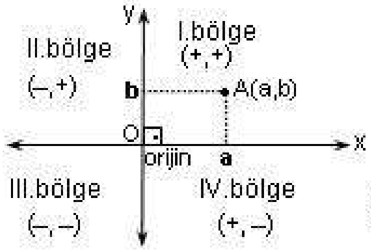
$$u = \frac{a+b+c+d}{2}$$

$$A(ABCD) = \sqrt{(u-a)(u-b)(u-c)(u-d)}$$



ABCD ikizkenar yamuk, teğetler dörtgeni ise;
$h^2 = a.c$

KOORDİNAT SİSTEMİ



Not: Eksenler bölgelere ait değildir.

BİR NOKTANIN EKSENLERE VE ORİJİNE OLAN UZAKLIĞI

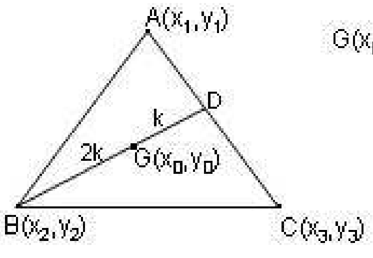
A(a,b) noktasının

- x–eksenine uzaklığı= |b|
- y–eksenine uzaklığı= |a|
- Orijine olan uzaklığı= $\sqrt{a^2+b^2}$

ORTA NOKTANIN KOORDİNATLARI

|AC|= |CB| ise $x_0=\frac{x_1+x_2}{2}$ ve $y_0=\frac{y_1+y_2}{2}$

ÜÇGENİN AĞIRLIK MERKEZİNİN KOORDİNATLARI



$G(x_0,y_0)$: ağırlık merkezi

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

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

İKİ NOKTA ARASINDAKİ UZAKLIK

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

ya da

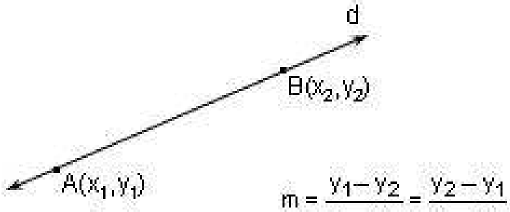
$$|AB|=d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

ÜÇGENİN ALANI

Köşelerinin koordinatları $A(x_1,y_1)$, $B(x_2,y_2)$, $C(x_3,y_3)$ olan ABC üçgeninin alanı;

$$Alan(\widehat{ABC})=\frac{1}{2}\begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \\ x_3 & y_3 \\ x_1 & y_1 \end{vmatrix}=\frac{1}{2}\left|x_1.y_2+x_2.y_3+x_3.y_1-(y_1.x_2+y_2.x_3+y_3.x_1)\right|$$

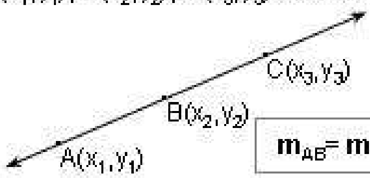
İKİ NOKTASI BELLİ OLAN DOĞRUNUN EĞİMİ



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

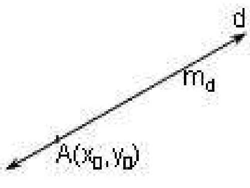
DOĞRUSALLIK ŞARTI

$A(x_1,y_1)$, $B(x_2,y_2)$, $C(x_3,y_3)$ noktaları doğrusal ise



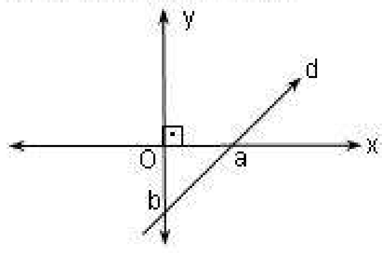
$$m_{AB}=m_{BC}=m_{AC}$$

EĞİMİ (m) VE $A(x_0,y_0)$ NOKTASINDAN GEÇEN DOĞRUNUN DENKLEMİ



$$y-y_0=m.(x-x_0)$$

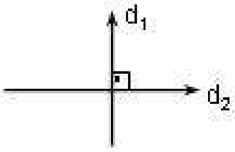
EKSENLERİ KESTİĞİ NOKTALARI BELLİ OLAN DOĞRUNUN DENKLEMİ



$$\frac{x}{a}+\frac{y}{b}=1$$

DİKLİK ŞARTI

İki doğru dik ise eğimleri çarpımı –1 dir.



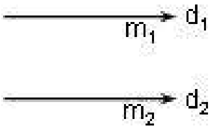
d_1 doğrusunun eğimi = m_1

d_2 doğrusunun eğimi = m_2

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

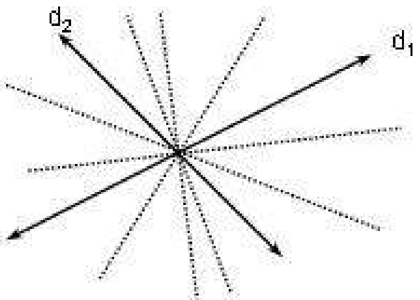
PARALELLİK ŞARTI

İki doğru paralel ise eğimleri eşittir.



$d_1 // d_2 \Leftrightarrow m_1 = m_2$

DOĞRU DEMETİ



Doğru demetinin genel denklemi;

$\mathbf{d_1 + k.d_2 = 0}$

İki doğrunun kesim noktasından sonsuz sayıda doğru geçer. Bu doğrulara **<u>doğru demeti</u>** denir.

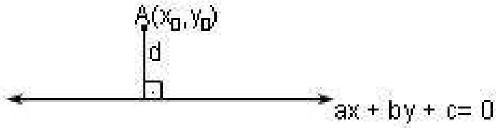
İKİ DOĞRUNUN KESİM NOKTASI

İki doğrunun kesim noktasını bulmak için doğru denklemleri ortak çözülür.

ORİJİNDEN GEÇEN DOĞRU

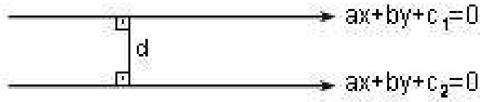
Orijinden geçen doğru denkleminde sadece x ve y li terimler vardır. Yani denklem **" y = mx "** şeklindedir.

BİR NOKTANIN BİR DOĞRUYA UZAKLIĞI;



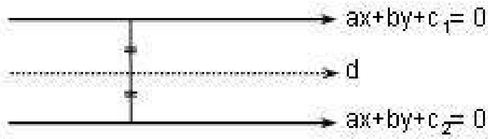
$$d = \frac{|ax_0 + by_0 + c|}{\sqrt{a^2 + b^2}}$$

PARALEL İKİ DOĞRU ARASINDAKİ UZAKLIK



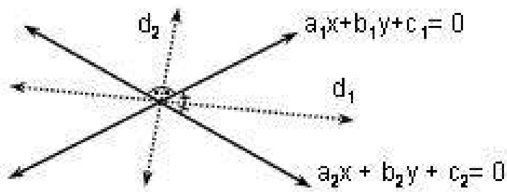
$$d = \frac{|c_1 - c_2|}{\sqrt{a^2 + b^2}}$$

PARALEL İKİ DOĞRUYA EŞİT UZAKLIKTAKİ DOĞRUNUN DENKLEMİ



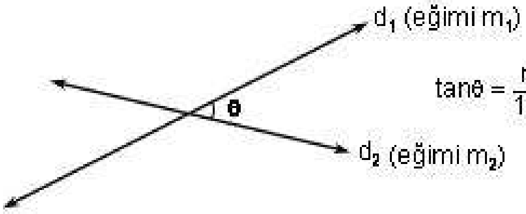
$$d : ax + by + \frac{c_1 + c_2}{2} = 0$$

İKİ DOĞRUNUN AÇIORTAY DENKLEMLERİ



$$d_1, d_2 \quad \frac{a_1x + b_1y + c_1}{\sqrt{a_1^2 + b_1^2}} = \pm \frac{a_2x + b_2y + c_2}{\sqrt{a_2^2 + b_2^2}}$$

KESİŞEN İKİ DOĞRU ARASINDAKİ AÇI



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

SİMETRİ; (Eşit Mesafe, Dik Uzaklık)

A(a,b) noktasının ⟷ (x–eksenine göre simetrisi) B(a, –b)

A(a,b) noktasının ⟷ (y–eksenine göre simetrisi) B(–a,b)

A(a,b) noktasının ⟷ (O(0,0)'a göre simetri) B(–a, –b)

A(a,b) noktasının ⟷ (x=c 'ye göre simetrisi) B(2c–a, b)

A(a,b) noktasının ⟷ (y=c 'ye göre simetrisi) B(a,2c–b)

A(a,b) noktasının ⟷ (A(c,d)'ya göre simetrisi) B(2c–a , 2d–b)

A(a,b) noktasının ⟷ (y=x 'e göre simetrisi) B(b,a)

A(a,b) noktasının ⟷ (y=–x 'e göre simetrisi) B(–b, –a)

ax+by+c=0 ⟷ (x–eksenine göre simetrisi) ax – by + c=0

ax+by+c=0 ⟷ (y–eksenine göre simetrisi) –ax + by + c=0

ax+by+c=0 ⟷ (O(0,0)'a göre simetrisi) –ax – by + c=0

ax+by+c=0 ⟷ (x=k 'ya göre simetrisi) a(2k – x)+by + c=0

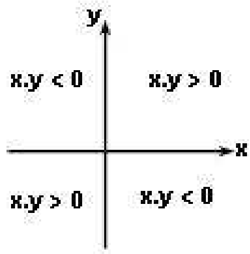
ax+by+c=0 ⟷ (y=k 'ya göre simetrisi) ax+b(2k –y) + c=0

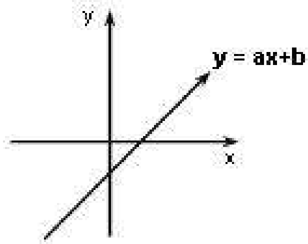
ax+by+c=0 ⟷ (y=x 'ya göre simetri) ay + bx + c=0

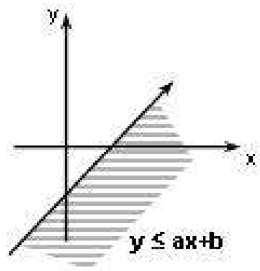
ax+by+c=0 ⟷ (y= –x 'ya göre simetri) –ay –bx + c=0

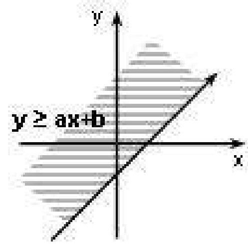
ax+by+c=0 ⟷ (A(p,q)'ya göre simetri) a(2p–x)+b(2q–y)+c= 0

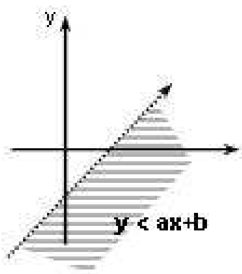
BÖLGE TARAMA; (Eşitsizlikler)

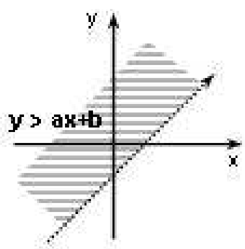


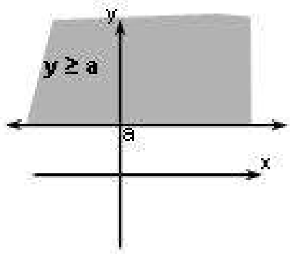


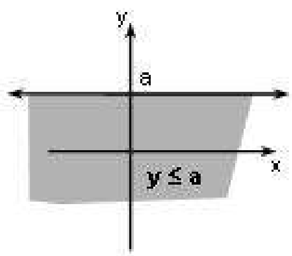


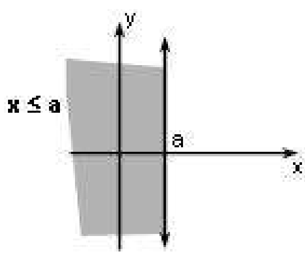


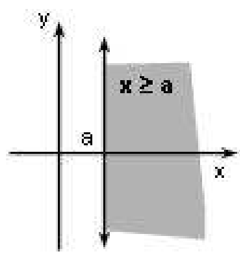






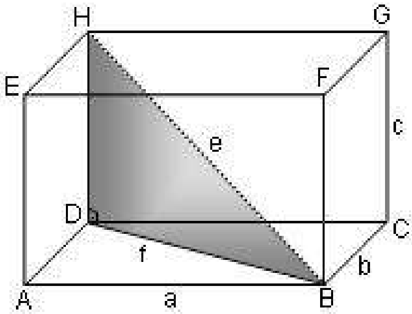






DİKDÖRTGENLER PRİZMASI

a,b,c ......Ayrıtlar(kenarlar)
e............:Cisim köşegeni
f.............:Yüzey köşegeni



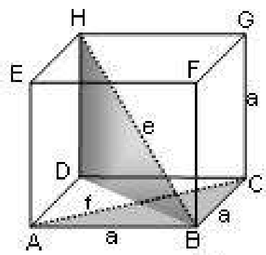
$V=a.b.c$

$A=2(a.b+a.c+b.c)$

$e=\sqrt{a^2+b^2+c^2}$

$f=\sqrt{a^2+b^2}$

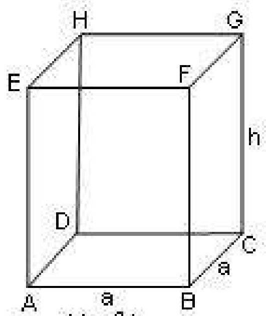
KÜP



$V=a^3$ $f=a\sqrt{2}$

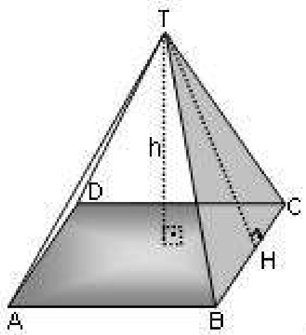
$A=6a^2$ $e=a\sqrt{3}$

KARE PRİZMA



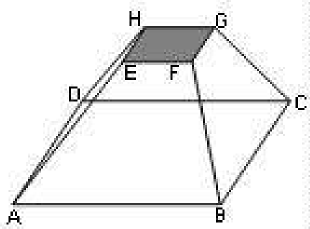
$V=a^2.h$

PİRAMİT

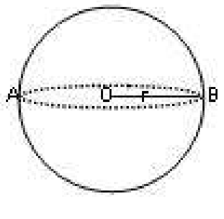


$V=\dfrac{\text{(taban alanı).h}}{3}$

Kesik Piramit



KÜRE



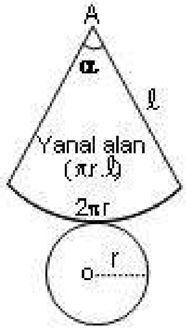
$V=\dfrac{4}{3}\pi r^3$

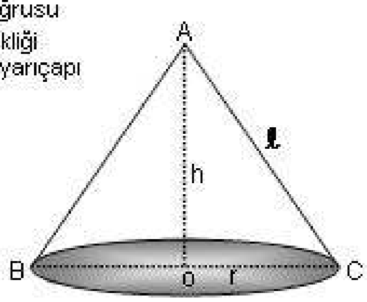
Alan$=4.\pi.r^2$

DİK (DÖNEL) KONİ

ℓ.....; koninin ana doğrusu
h ......; koninin yüksekliği
r ......; koninin taban yarıçapı

koninin açılımı





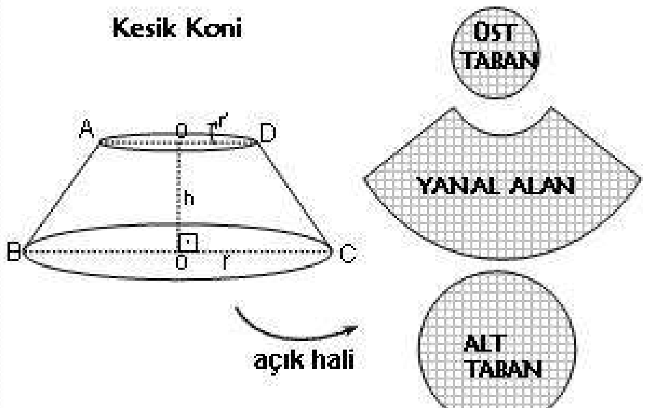
$V=\dfrac{\pi r^2.h}{3}$

Yanal alan$=\pi.r.\ell$

Tüm alan$=\pi.r.\ell+\pi.r^2$

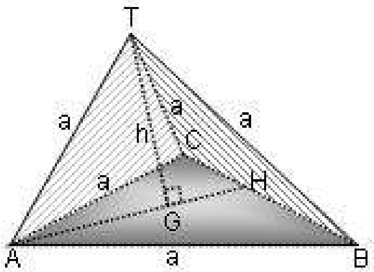
$\dfrac{r}{\ell}=\dfrac{\alpha}{360°}$

Kesik Koni



DÜZGÜN DÖRTYÜZLÜ

Tüm yüzeyleri eşkenar üçgen olan piramittir.

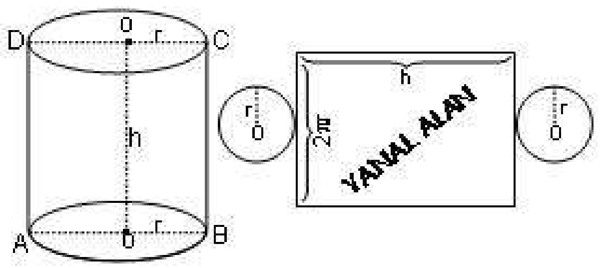


$V=\dfrac{a^3\sqrt{2}}{12}$

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

$h=\dfrac{a\sqrt{6}}{3}$

SİLİNDİR



$V=\pi.r^2.h$ Yanal alan$=2\pi.r.h$ Tüm alan$=2\pi.r.h+2\pi.r^2$