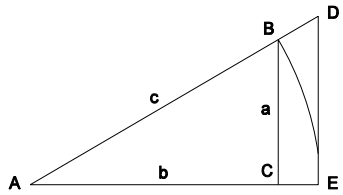
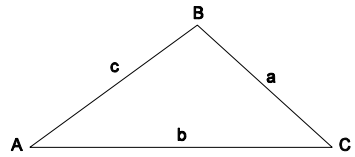


RIGHT TRIANGLE



OBLIQUE TRIANGLE

RIGHT TRIANGLES

$\sin A = \frac{a}{c} = \cos B$

$\cos A = \frac{b}{c} = \sin B$

$\tan A = \frac{a}{b} = \cot B$

$\sec A = \frac{c}{b} = \text{cosec } B$

$\text{cosec } A = \frac{c}{a} = \sec B$

$\cot A = \frac{b}{a} = \tan B$

$a = c \sin A = c \cos B = b \tan A = b \cot B = \sqrt{c^2 - b^2}$

$b = c \cos A = c \sin B = a \cot A = a \tan B = \sqrt{c^2 - a^2}$

$c = \frac{a}{\sin A} \quad \frac{a}{\cos B} \quad \frac{b}{\sin B} \quad \frac{b}{\cos B}$

OBLIQUE TRIANGLES

Given	Sought	Formula
A, B, a	b, c	$b = \frac{a}{\sin A} * \sin B$ $\quad c = \frac{a}{\sin A} * \sin (A + B)$
A, a, b	B, c	$\sin B = \frac{\sin A}{a} * b$ $\quad c = \frac{a}{\sin A} * \sin C$
C, a, b	$\frac{1}{2}(A + B)$ $\frac{1}{2}(A - B)$	$\frac{1}{2}(A + B) = 90° - \frac{1}{2} C$ $\tan \frac{1}{2}(A - B) = \frac{a - b}{a + b} * \tan \frac{1}{2}(A + B)$
a, b, c	A Area	Given s = 1/2 (a + b + c), then: $\sin \frac{1}{2} A = \sqrt{\frac{(s - b)(s - c)}{bc}}$ $\cos \frac{1}{2} A = \sqrt{\frac{s(s - a)}{bc}}$ $\tan \frac{1}{2} A = \sqrt{\frac{(s - b)(s - c)}{s(s - a)}}$ $\sin A = 2 \frac{\sqrt{s(s - a)(s - b)(s - c)}}{bc}$ $\text{Area} = \sqrt{s(s - a)(s - b)(s - c)}$
C, a, b	Area	$\text{Area} = \frac{1}{2} ab \sin C$

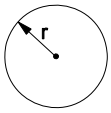
MATHEMATICAL FORMULAS

Figure 17-6A

Nomenclature

A = total surface area
d = distance
h = height
p = preimeter
r = radius
s = side (edge) length, arc length
V = volume
θ = vertex angle, in radians
ϕ = central angle, in radians

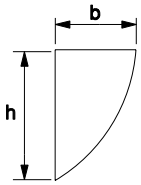
Circle



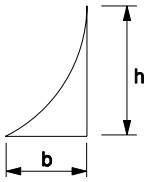
$p = 2\pi r$

$A = \pi r^2 = \frac{p^2}{4\pi}$

Parabola

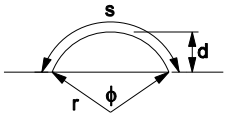


$A = \frac{2bh}{3}$



$A = \frac{1}{3}bh$

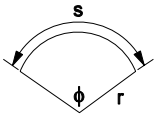
Circular Segment (1)



$A = \frac{1}{2}r^2(\phi - \sin\phi)$

$\phi = \frac{s}{r} = 2\left(\arccos\frac{r-d}{r}\right)$

Circular Sector

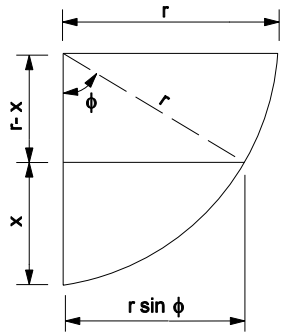


$A = \frac{1}{2}\phi r^2 = \frac{1}{2}sr$

$\phi = \frac{s}{r}$

Circular Segment (2)

$\cos\phi = \frac{r-x}{r}$



Area of Circle Segment

$\frac{\phi}{360°}\pi r^2$

Area of Triangle

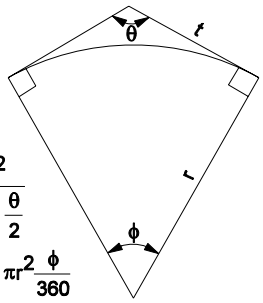
$\frac{1}{2}(r-x)(r\sin\phi)$

External Area

Total Area - Area of Circle Segment = External Area

$t = \frac{r}{\tan\frac{\theta}{2}}$

$\phi = 180° - \theta$



Total Area $= rt = \frac{r^2}{\tan\frac{\theta}{2}}$

Area of Circle Seg. $= \pi r^2\frac{\phi}{360}$

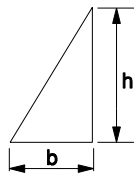
Ext. Area $= r^2\left[\frac{1}{\tan\frac{\theta}{2}} - \pi\frac{\phi}{360}\right]$

MATHEMATICAL FORMULAS

Figure 17-6A (Continued)

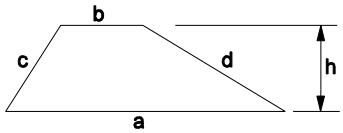
Number of Sides	Name of Polygon
3	triangle
4	rectangle
5	pentagon
6	hexagon
7	heptagon
8	octagon
9	nonagon
10	decagon

Triangle



$A = \frac{1}{2} bh$

Trapezoid

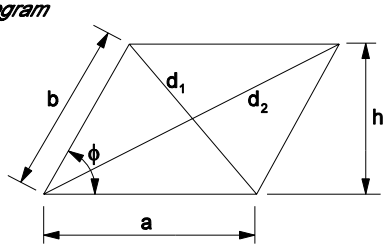


$p = a + b + c + d$

$A = \frac{1}{2} h (a + b)$

The trapezoid is isosceles if c = d.

Parallelogram



$p = 2(a + b)$

$d = \sqrt{a^2 + b^2 - 2ab\ (\cos\phi)}$

$d_2 = \sqrt{a^2 + b^2 + 2ab\ (\cos\phi)}$

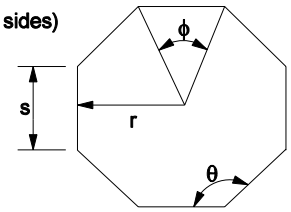
$d_1^2 + d_2^2 = 2(a^2 + b^2)$

$A = ah = ab(\sin\phi)$

If a = b, the parallelogram is a rhombus

Regular Polygon

(n equal sides)



$\phi \quad \frac{2\pi}{n}$

$\theta \quad \frac{\pi\ (n - 2)}{n}$

$p = ns$

$s = 2r\left[\tan\left(\frac{\phi}{2}\right)\right]$

$A = \frac{1}{2} nsr$

MATHEMATICAL FORMULAS

Figure 17-6A (Continued)