Formulas for Advanced Math, Geometry, and Trigonometry

Point-Slope Formula:

$$y_1 - y_2 = m(x_1 - x_2)$$

Slope-Intercept Formula:

$y = mx + b$

Distance Formula (x,y axis):

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

Distance Formula (x,y,z axis):

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

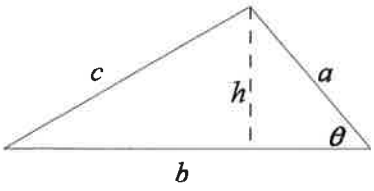
Midpoint Formula:

$$\left(\frac{x_1 + x_2}{2} , \frac{y_1 + y_2}{2} \right)$$

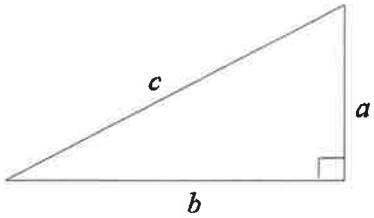
Triangle:

h = a sin θ

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



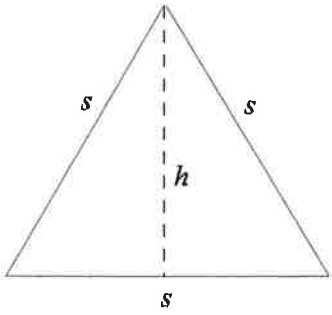
Right Triangle:
(Pythagorean theorem) $a^2 + b^2 = c^2$



Equilateral Triangle:

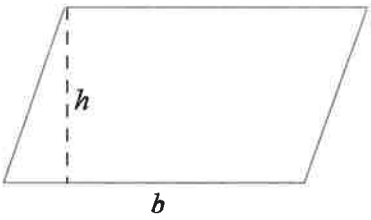
$h = \frac{s\sqrt{3}}{2}$

Area = $\frac{s^2\sqrt{3}}{4}$



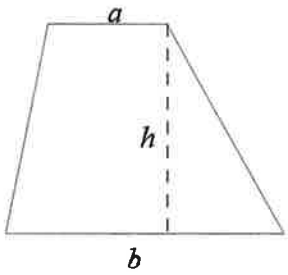
Parallelogram:

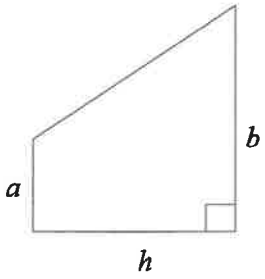
Area = bh



Trapezoid:

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

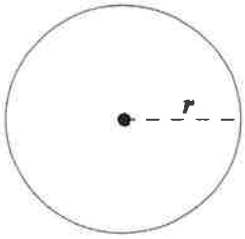




Circle:

Area = πr^2

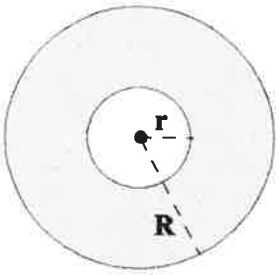
Circumference = $2\pi r$

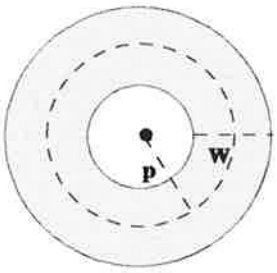


Circular Ring:

(p = average radius,

w = width of ring)

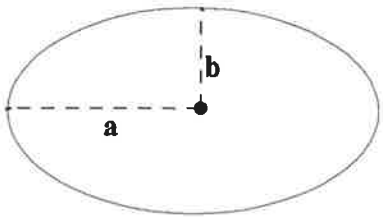




Area = $\pi(R^2 - r^2)$

$= 2\pi pw$

Ellipse:

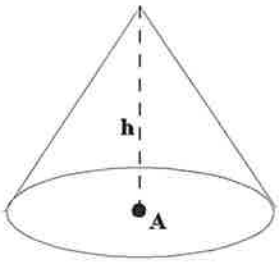


Area = πab

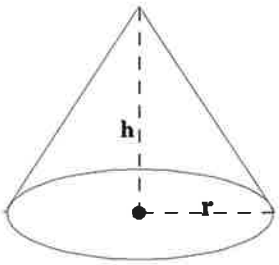
Circumference= $2\pi \sqrt{\frac{a^2 + b^2}{2}}$

Cone:

(A = area of base)



Volume = $\frac{Ah}{3}$



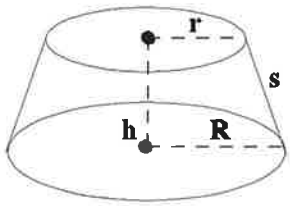
Right circular Cone:

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

Lateral Surface Area = $\pi r\sqrt{r^2 + h^2}$

Frustum of Right Circular Cone:

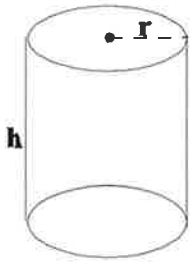
Volume = $\frac{\pi(r^2 + rR + R^2)h}{3}$



Lateral Surface Area = $\pi s(R + r)$

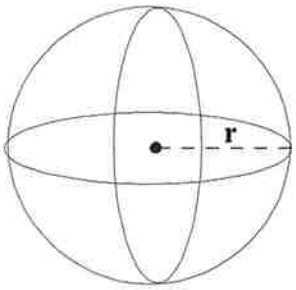
Right Circular Cylinder:

Volume = $\pi r^2 h$
Lateral Surface Area = $2\pi rh$



Sphere:
Volume = $\frac{4}{3}\pi r^3$

Surface Area = $4\pi r^2$

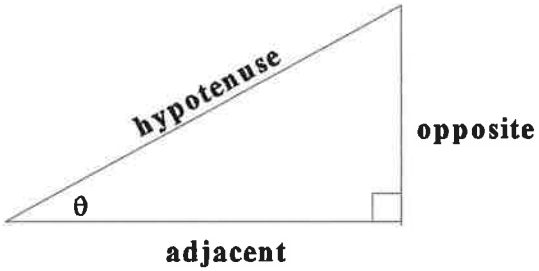


Trigonometric Identities:

$\sin\theta = \frac{opp}{hyp}$

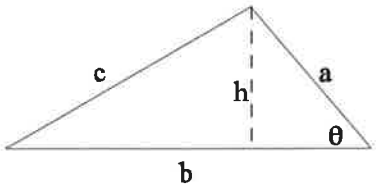
$\cos\theta = \frac{adj}{hyp}$

$\tan\theta = \frac{opp}{adj}$



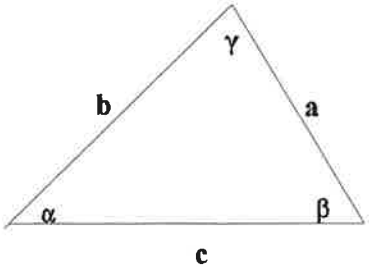
Law of Cosines (SAS) (SSS)

$c^2 = a^2 + b^2 - 2ab\cos\theta$

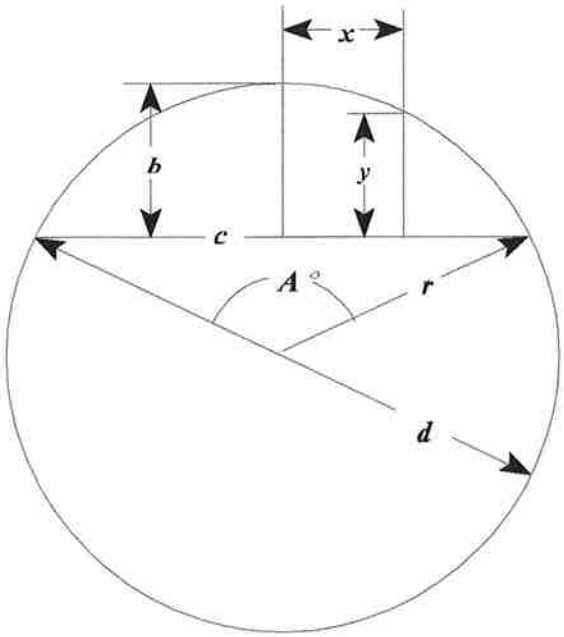


Law of Sines (SSA) (AAS)

$\frac{\sin\alpha}{a} = \frac{\sin\beta}{b} = \frac{\sin\gamma}{c}$



Properties of a Circle:



$$\text{Arc} = a = \frac{\pi r A^\circ}{180^\circ}$$

$$\text{Angle} = A^\circ = \frac{180^\circ a}{\pi r}$$

$$\text{Radius} = r = \frac{4b^2 + c^2}{8b}$$

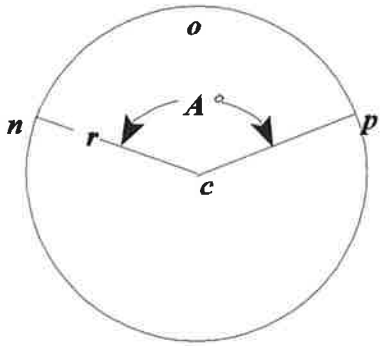
$$\text{Chord} = c = 2\sqrt{2br - b^2} = 2r \sin\frac{A}{2}$$

$$\text{Rise} = b = r - \frac{1}{2}\sqrt{4r^2 - c^2} = \frac{c}{2}\tan\frac{A}{4}$$

$$= 2r \sin^2\frac{A}{4} = r + y - \sqrt{r^2 - x^2}$$

$$y = b - r + \sqrt{r^2 - x^2}$$

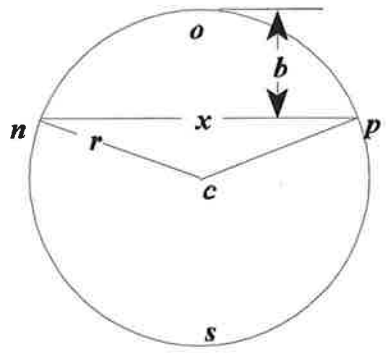
$$x = \sqrt{r^2 - (r + y - b)^2}$$



Circular Sector:
r = radius, x = chord, A = ∠ncp in degrees

Area of sector ncpo = ½ r(length of arc nop)

$$= \frac{A}{360}\pi r^2$$



Circular Segment:
r = radius, x = chord, b = rise
Area of segment nop = area of sector ncop - area of triangle ncp

$$= \frac{1}{2}\left(\frac{\pi r^2 A^\circ}{180^\circ} - x(r - b)\right)$$

Area of segment nsp = area of circle - segment nop