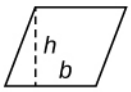
APPENDIX C | REVIEW OF PRE-CALCULUS

Formulas from Geometry

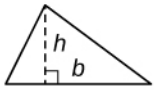
$A =$ area, $V =$ Volume, and $S =$ lateral surface area

Parallelogram



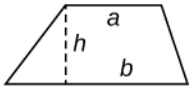
$A = bh$

Triangle



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

Trapezoid

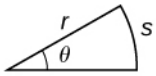


$A = \frac{1}{2}(a + b)h$

Circle

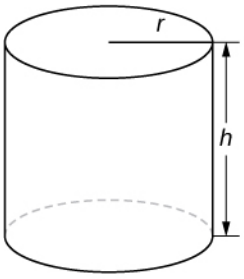
$A = \pi r^2$
$C = 2\pi r$

Sector



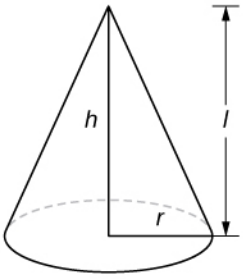
$A = \frac{1}{2}r^2\theta$
$s = r\theta$ (θ in radians)

Cylinder



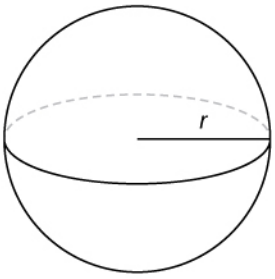
$V = \pi r^2 h$
$S = 2\pi rh$

Cone



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

Sphere



$V = \frac{4}{3}\pi r^3$
$S = 4\pi r^2$

Formulas from Algebra

Laws of Exponents

$$x^m x^n = x^{m+n} \qquad \frac{x^m}{x^n} = x^{m-n} \qquad (x^m)^n = x^{mn}$$

$$x^{-n} = \frac{1}{x^n} \qquad (xy)^n = x^n y^n \qquad \left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$$

$$x^{1/n} = \sqrt[n]{x} \qquad \sqrt[n]{xy} = \sqrt[n]{x}\sqrt[n]{y} \qquad \sqrt[n]{\frac{x}{y}} = \frac{\sqrt[n]{x}}{\sqrt[n]{y}}$$

$$x^{m/n} = \sqrt[n]{x^m} = (\sqrt[n]{x})^m$$

Special Factorizations

$$x^2 - y^2 = (x + y)(x - y)$$
$$x^3 + y^3 = (x + y)(x^2 - xy + y^2)$$
$$x^3 - y^3 = (x - y)(x^2 + xy + y^2)$$

Quadratic Formula

If $ax^2 + bx + c = 0$, then $x = \frac{-b \pm \sqrt{b^2 - 4ca}}{2a}$.

Binomial Theorem

$$(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \cdots + \binom{n}{n-1}ab^{n-1} + b^n,$$

where $\binom{n}{k} = \frac{n(n-1)(n-2)\cdots(n-k+1)}{k(k-1)(k-2)\cdots 3\cdot 2\cdot 1} = \frac{n!}{k!(n-k)!}$

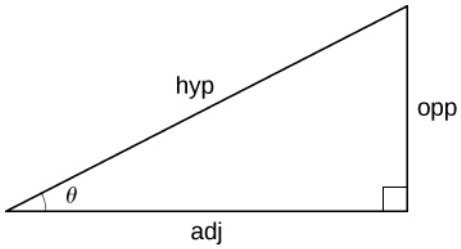
Formulas from Trigonometry

Right-Angle Trigonometry

$$\sin\theta = \frac{\text{opp}}{\text{hyp}} \qquad \csc\theta = \frac{\text{hyp}}{\text{opp}}$$

$$\cos\theta = \frac{\text{adj}}{\text{hyp}} \qquad \sec\theta = \frac{\text{hyp}}{\text{adj}}$$

$$\tan\theta = \frac{\text{opp}}{\text{adj}} \qquad \cot\theta = \frac{\text{adj}}{\text{opp}}$$



Trigonometric Functions of Important Angles

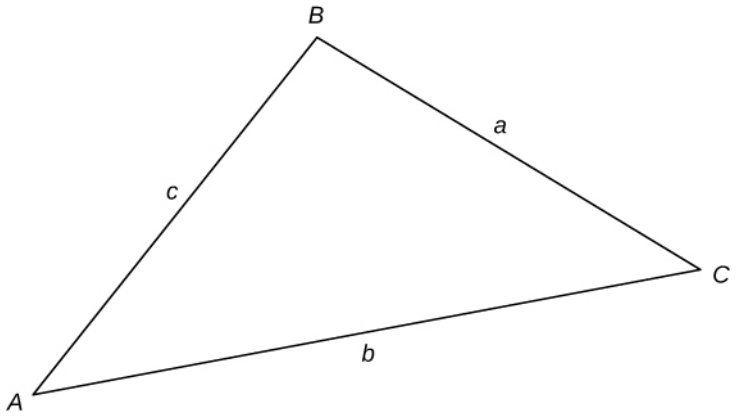
θ	Radians	$\sin\theta$	$\cos\theta$	$\tan\theta$
0°	0	0	1	0
30°	π/6	1/2	$\sqrt{3}/2$	$\sqrt{3}/3$
45°	π/4	$\sqrt{2}/2$	$\sqrt{2}/2$	1
60°	π/3	$\sqrt{3}/2$	1/2	$\sqrt{3}$
90°	π/2	1	0	—

Fundamental Identities

$$\begin{aligned}
\sin^2\theta+\cos^2\theta &= 1 & \sin(-\theta) &= -\sin\theta\\
1+\tan^2\theta &= \sec^2\theta & \cos(-\theta) &= \cos\theta\\
1+\cot^2\theta &= \csc^2\theta & \tan(-\theta) &= -\tan\theta\\
\sin\left(\frac{\pi}{2}-\theta\right) &= \cos\theta & \sin(\theta+2\pi) &= \sin\theta\\
\cos\left(\frac{\pi}{2}-\theta\right) &= \sin\theta & \cos(\theta+2\pi) &= \cos\theta\\
\tan\left(\frac{\pi}{2}-\theta\right) &= \cot\theta & \tan(\theta+\pi) &= \tan\theta
\end{aligned}$$

Law of Sines

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



Law of Cosines

$$\begin{aligned}
a^2 &= b^2+c^2-2bc\cos A\\
b^2 &= a^2+c^2-2ac\cos B\\
c^2 &= a^2+b^2-2ab\cos C
\end{aligned}$$

Addition and Subtraction Formulas

$$\begin{aligned}
\sin(x+y) &= \sin x\cos y+\cos x\sin y\\
\sin(x-y) &= \sin x\cos y-\cos x\sin y\\
\cos(x+y) &= \cos x\cos y-\sin x\sin y\\
\cos(x-y) &= \cos x\cos y+\sin x\sin y\\
\tan(x+y) &= \frac{\tan x+\tan y}{1-\tan x\tan y}\\
\tan(x-y) &= \frac{\tan x-\tan y}{1+\tan x\tan y}
\end{aligned}$$

Double-Angle Formulas

$$\begin{aligned}
\sin 2x &= 2\sin x\cos x\\
\cos 2x &= \cos^2 x-\sin^2 x=2\cos^2 x-1=1-2\sin^2 x\\
\tan 2x &= \frac{2\tan x}{1-\tan^2 x}
\end{aligned}$$

Half-Angle Formulas

$$\sin^2 x = \frac{1-\cos 2x}{2}$$

$$\cos^2 x = \frac{1+\cos 2x}{2}$$