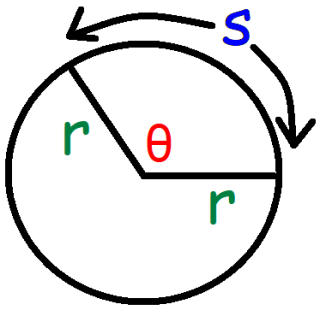
Trigonometry Formula Sheet:



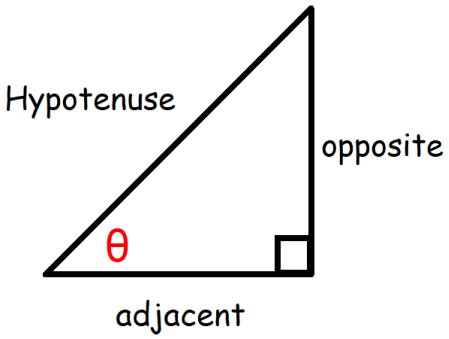
Arc Length:

$$s = \theta r \qquad \theta \to radians$$

Area of a Sector:

$$A = \frac{1}{2}\theta r^2 \qquad \theta \to radians$$

$$A = \left(\frac{\theta}{360°}\right)\pi r^2 \qquad \theta \to degrees$$

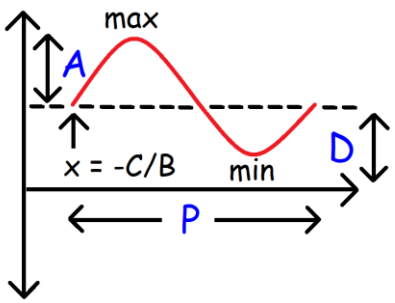


Six Trig Functions: (SOH CAH TOA)

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

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

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

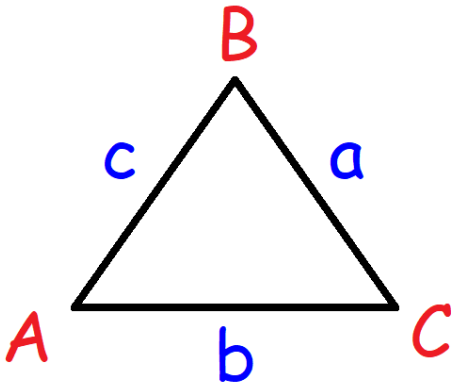


Graphing Trig Functions:

$$y = Asin(Bx + c) + D$$

Amplitude: $|A| = \frac{\max - min}{2}$ **Period:** $P = \frac{2\pi}{B}$

Vertical Shift: $D = \frac{\max + min}{2}$ **Phase Shift:** $x = \frac{-C}{B}$



Law of Sines:

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

Law of Cosines:

$$c^2 = a^2 + b^2 + 2ab\cos C$$

Law of Tangents:

$$\frac{a-b}{a+b} = \frac{\tan[1/2\,(A-B)]}{\tan[1/2\,(A+B)]}$$

Reciprocal Identities:

$$\cot\theta = \frac{1}{\tan\theta}$$

$$\csc\theta = \frac{1}{\sin\theta}$$

$$\sec\theta = \frac{1}{\cos\theta}$$

Quotient Identities:

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$

$$\cot\theta = \frac{\cos\theta}{\sin\theta}$$

Pythagorean Identities:

$$sin^2\theta + cos^2\theta = 1$$

$$1 + tan^2\theta = sec^2\theta$$

$$1 + cot^2\theta = csc^2\theta$$

Even-Odd Identities:

$$\sin(-\theta) = -\sin\theta$$
$$\cos(-\theta) = \cos\theta$$
$$\tan(-\theta) = -\tan\theta$$
$$\csc(-\theta) = -\csc\theta$$
$$\sec(-\theta) = \sec\theta$$
$$\cot(-\theta) = -cot\theta$$

Co-function Identities:

$$\cos(90° - \theta) = \sin\theta$$
$$\sin(90° - \theta) = \cos\theta$$
$$\tan(90° - \theta) = \cot\theta$$
$$\cot(90° - \theta) = \tan\theta$$
$$\sec(90° - \theta) = \csc\theta$$
$$\csc(90° - \theta) = \sec\theta$$

Power Reducing Formulas:

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

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

$$tan^2\theta = \frac{1 - \cos 2\theta}{1 + \cos 2\theta}$$

Double Angle Formulas:

$$\sin 2\theta = 2\sin\theta\cos\theta$$

$$\sin 2\theta = \frac{2\tan\theta}{1+tan^2\theta}$$

$$\cos 2\theta = cos^2\theta - sin^2\theta$$

$$\cos 2\theta = 2cos^2 - 1$$

$$\cos 2\theta = 1 - 2sin^2\theta$$

$$\cos 2\theta = \frac{1-tan^2\theta}{1+tan^2\theta}$$

$$\tan 2\theta = \frac{2\tan\theta}{1-tan^2\theta}$$

Half-Angle Formulas:

$$sin\left(\frac{\theta}{2}\right) = \pm\sqrt{\frac{1 - \cos\theta}{2}}$$

$$\cos\left(\frac{\theta}{2}\right) = \pm\sqrt{\frac{1 + \cos\theta}{2}}$$

$$\tan\left(\frac{\theta}{2}\right) = \frac{1 - \cos\theta}{2} = \frac{\sin\theta}{1 + \cos\theta}$$

$$\tan\left(\frac{\theta}{2}\right) = \pm\sqrt{\frac{1 - \cos\theta}{1 + \cos\theta}}$$

Triple Angle Formulas:

$$\sin 3\theta = 3\sin\theta - 4sin^3\theta$$

$$\cos 3\theta = 4cos^3\theta - 3\cos\theta$$

$$\tan 3\theta = \frac{3\tan\theta - tan^3\theta}{1 - 3tan^2\theta}$$

Sum and Difference Identities:

$$\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$$

$$\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \mp \sin\alpha\sin\beta$$

$$\tan(\alpha \pm \beta) = \frac{\tan\alpha \pm \tan\beta}{1 \mp \tan\alpha\tan\beta}$$

Polar Equations:

$$x = r\cos\theta \qquad y = r\sin\theta$$

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

$$\theta = tan^{-1}\left(\frac{y}{x}\right)$$

Sum-to-Product Formulas:

$$\sin\alpha + \sin\beta = 2\sin\left(\frac{\alpha+\beta}{2}\right)\cos\left(\frac{\alpha-\beta}{2}\right)$$

$$\sin\alpha - \sin\beta = 2\sin\left(\frac{\alpha-\beta}{2}\right)\cos\left(\frac{\alpha+\beta}{2}\right)$$

$$\cos\alpha + \cos\beta = 2\cos\left(\frac{\alpha+\beta}{2}\right)\cos\left(\frac{\alpha-\beta}{2}\right)$$

$$\cos\alpha - \cos\beta = -2\sin\left(\frac{\alpha+\beta}{2}\right)\sin\left(\frac{\alpha-\beta}{2}\right)$$

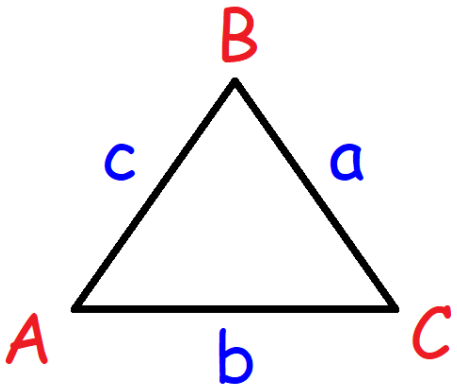
Product-to-Sum Formulas:

$$\sin\alpha\sin\beta = \frac{1}{2}[\cos(\alpha-\beta) - \cos(\alpha+\beta)]$$

$$\cos\alpha\cos\beta = \frac{1}{2}[\cos(\alpha-\beta) + \cos(\alpha+\beta)]$$

$$\sin\alpha\cos\beta = \frac{1}{2}[\sin(\alpha+\beta) + \sin(\alpha-\beta)]$$

$$\cos\alpha\sin\beta = \frac{1}{2}[\sin(\alpha+\beta) - \sin(\alpha-\beta)]$$



Area of a Triangle:

$$A = \frac{1}{2}ab\sin C$$

Heron's Formula:

$$Area = \sqrt{s(s-a)(s-b)(s-c)}$$

$$s = \frac{1}{2}(a+b+c)$$

Common Trigonometric Values:

Degrees:	Radians:	$\sin\theta$	$\cos\theta$	$\csc\theta$	$\sec\theta$	$\tan\theta$	$\cot\theta$
$0°$	0	0	1	Undefined	1	0	Undefined
$30°$	$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	2	$\frac{2\sqrt{3}}{3}$	$\frac{\sqrt{3}}{3}$	$\sqrt{3}$
$45°$	$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	$\sqrt{2}$	$\sqrt{2}$	1	1
$60°$	$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\frac{2\sqrt{3}}{3}$	2	$\sqrt{3}$	$\frac{\sqrt{3}}{3}$
$90°$	$\frac{\pi}{2}$	1	0	1	Undefined	Undefined	0
$180°$	π	0	-1	Undefined	-1	0	Undefined
$270°$	$\frac{3\pi}{2}$	-1	0	-1	Undefined	Undefined	0
$360°$	2π	0	1	Undefined	1	0	Undefined

Common Inverse Trigonometric Values:

x	$sin^{-1}(x)$	$cos^{-1}(x)$	$tan^{-1}(x)$
$-\sqrt{3}$	N/A	N/A	$-60° = -\frac{\pi}{3}$
-1	$-90° = -\frac{\pi}{2}$	$180° = \pi$	$-45° = -\frac{\pi}{4}$
$-\frac{\sqrt{3}}{2}$	$-60° = -\frac{\pi}{3}$	$150° = \frac{5\pi}{6}$	
$-\frac{\sqrt{2}}{2}$	$-45° = -\frac{\pi}{4}$	$135° = \frac{3\pi}{4}$	
$-\frac{\sqrt{3}}{3}$			$-30° = -\frac{\pi}{6}$
$-\frac{1}{2}$	$-30° = -\frac{\pi}{6}$	$120° = \frac{2\pi}{3}$	
0	$0°$	$90° = \frac{\pi}{2}$	$0°$
$\frac{1}{2}$	$30° = \frac{\pi}{6}$	$60° = \frac{\pi}{3}$	
$\frac{\sqrt{3}}{3}$			$30° = \frac{\pi}{6}$
$\frac{\sqrt{2}}{2}$	$45° = \frac{\pi}{4}$	$45° = \frac{\pi}{4}$	
$\frac{\sqrt{3}}{2}$	$60° = \frac{\pi}{3}$	$30° = \frac{\pi}{6}$	
1	$90° = \frac{\pi}{2}$	$0°$	$45° = \frac{\pi}{4}$
$\sqrt{3}$	N/A	N/A	$60° = \frac{\pi}{3}$