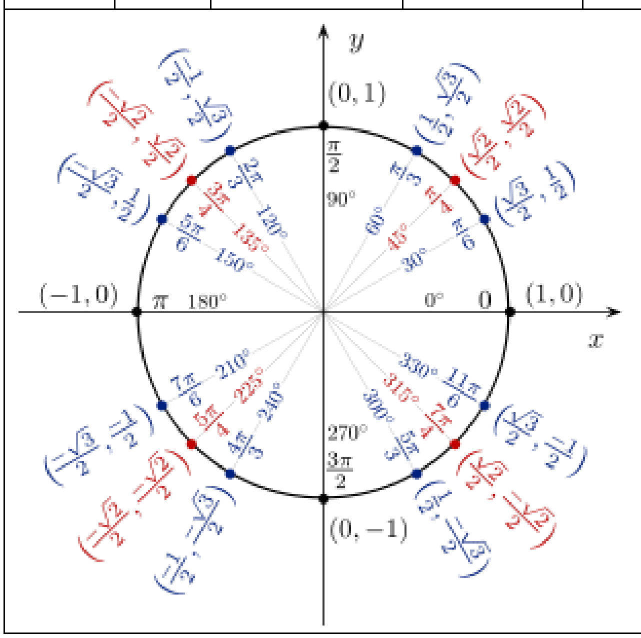
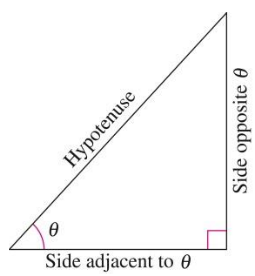
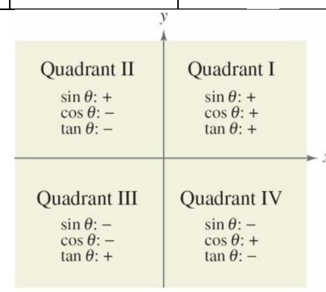
Trigonometry Table SOHCAHTOA $O^2 + A^2 = H^2$ $x^2 + y^2 = r^2$

Degrees	Radian	sin(θ)=$\frac{O}{H} = \frac{y}{r}$	cos(θ)=$\frac{A}{H} = \frac{x}{r}$	tan(θ)=$\frac{O}{A} = \frac{y}{x}$	cot(θ)=$\frac{A}{O} = \frac{x}{y}$	sec(θ)=$\frac{H}{A} = \frac{r}{x}$	csc(θ)=$\frac{H}{O} = \frac{r}{y}$
0˚	0	0	1	0	∞	1	∞
30˚	$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{3}$	$\sqrt{3}$	$\frac{2\sqrt{3}}{3}$	2
45˚	$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1	1	$\sqrt{2}$	$\sqrt{2}$
60˚	$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$	$\frac{\sqrt{3}}{3}$	2	$\frac{2\sqrt{3}}{3}$
90˚	$\frac{\pi}{2}$	1	0	∞	0	∞	1
120˚	$\frac{2\pi}{3}$	$\frac{\sqrt{3}}{2}$	$-\frac{1}{2}$	$-\sqrt{3}$	$-\frac{\sqrt{3}}{3}$	-2	$\frac{2\sqrt{3}}{3}$
135˚	$\frac{3\pi}{4}$	$\frac{\sqrt{2}}{2}$	$-\frac{\sqrt{2}}{2}$	-1	-1	$-\sqrt{2}$	$\sqrt{2}$
150˚	$\frac{5\pi}{6}$	$\frac{1}{2}$	$-\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{3}}{3}$	$-\sqrt{3}$	$\frac{-2\sqrt{3}}{3}$	2
180˚	π	0	-1	0	∞	-1	∞
210˚	$\frac{7\pi}{6}$	$-\frac{1}{2}$	$-\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{3}$	$\sqrt{3}$	$\frac{-2\sqrt{3}}{3}$	-2
225˚	$\frac{5\pi}{4}$	$-\frac{\sqrt{2}}{2}$	$-\frac{\sqrt{2}}{2}$	1	1	$-\sqrt{2}$	$-\sqrt{2}$
240˚	$\frac{4\pi}{3}$	$-\frac{\sqrt{3}}{2}$	$-\frac{1}{2}$	$\sqrt{3}$	$\frac{\sqrt{3}}{3}$	-2	$\frac{-2\sqrt{3}}{3}$
270˚	$\frac{3\pi}{2}$	-1	0	∞	0	∞	-1
300˚	$\frac{5\pi}{3}$	$-\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$-\sqrt{3}$	$-\frac{\sqrt{3}}{3}$	2	$\frac{-2\sqrt{3}}{3}$
315˚	$\frac{7\pi}{4}$	$-\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	-1	-1	$\sqrt{2}$	$-\sqrt{2}$
330˚	$\frac{11\pi}{6}$	$-\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{3}}{3}$	$-\sqrt{3}$	$\frac{2\sqrt{3}}{3}$	-2
360˚	2π	0	1	0	∞	1	∞







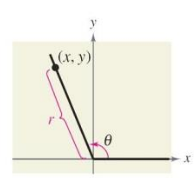
Definitions of Trigonometric Functions of Any Angle

Let θ be an angle in standard position with (x, y) a point on the terminal side of θ and $r = \sqrt{x^2 + y^2} \neq 0$.

$\sin\theta = \frac{y}{r}$ $\cos\theta = \frac{x}{r}$

$\tan\theta = \frac{y}{x},\quad x \neq 0$ $\cot\theta = \frac{x}{y},\quad y \neq 0$

$\sec\theta = \frac{r}{x},\quad x \neq 0$ $\csc\theta = \frac{r}{y},\quad y \neq 0$



Pythagorean Identities

$sin^2\theta + cos^2\theta = 1$	$sin^2\theta = 1 - cos^2\theta$	$cos^2\theta = 1 - sin^2\theta$
$sec^2\theta - tan^2\theta = 1$	$sec^2\theta = 1 + tan^2\theta$	$tan^2\theta = sec^2\theta - 1$
$csc^2\theta - cot^2\theta = 1$	$csc^2\theta = 1 + cot^2\theta$	$cot^2\theta = csc^2\theta - 1$

Formulas for the trigonometric functions of $\alpha \pm \beta$ are

$$\sin(\alpha+\beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$$
$$\sin(\alpha-\beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$$
$$\cos(\alpha+\beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$$
$$\cos(\alpha-\beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$$

Double-angle formulas

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

Law of Sines

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

Law of Cosines

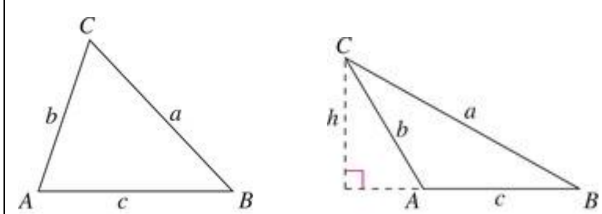
$$a^2 = b^2 + c^2 - 2bc\cos A$$
$$b^2 = a^2 + c^2 - 2ac\cos B$$
$$c^2 = a^2 + b^2 - 2ab\cos C$$

or

$$\cos A = \frac{(b^2 + c^2 - a^2)}{(2bc)}$$

$$\cos B = \frac{(a^2 + c^2 - b^2)}{(2ac)}$$

$$\cos C = \frac{(a^2 + b^2 - c^2)}{(2ab)}$$



Which Law to use

Given	Law to use
3 sides (SSS)	Law of Cosines
2 sides and included ∠ (SAS)	Law of Cosines
1 side and 2 ∠s (ASA)	Law of Sines
2 sides and opp ∠s (SSA)	Law of Sines (ambiguous)

Steps for Law of Sines Ambiguous case. (SSA)

1. Assume 2 triangles
2. Solve the first triangle using law of sines (if sin ratio is greater than 1 you don't have a triangle)
3. The angle you found first will be supplementary to the corresponding angle in the 2nd triangle.
4. Solve the second triangle (if your angles are over 180 you only have 1 triangle)

Area of a Triangle

SAS

$$K = \frac{1}{2}bc\sin A$$

$$K = \frac{1}{2}ac\sin B$$

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

Heron's Formula

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

where $s = \frac{a+b+c}{2}$