Trigonometry Cheat Sheet

$\csc\theta = \dfrac{1}{\sin\theta}$ $\sin\theta = \dfrac{1}{\csc\theta}$	$\sec\theta = \dfrac{1}{\cos\theta}$ $\cos\theta = \dfrac{1}{\sec\theta}$	$\cot\theta = \dfrac{1}{\tan\theta}$ but also… $\cot\theta = \dfrac{\cos\theta}{\sin\theta}$	$\tan\theta = \dfrac{\sin\theta}{\cos\theta}$

Pythagorean Identities:

$$\sin^2\theta + \cos^2\theta = 1 \qquad \tan^2\theta + 1 = \sec^2\theta$$

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

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

Sum and Difference Formulas:

$$\sin(A+B) = \sin A\cos B + \cos A\sin B$$
$$\cos(A+B) = \cos A\cos B - \sin A\sin B$$
$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A\tan B}$$

$$\sin(A-B) = \sin A\cos B - \cos A\sin B$$
$$\cos(A-B) = \cos A\cos B + \sin A\sin B$$
$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A\tan B}$$

Even/Odd Formulas

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

Double Angle Formulas

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

Half-Angle Formulas:

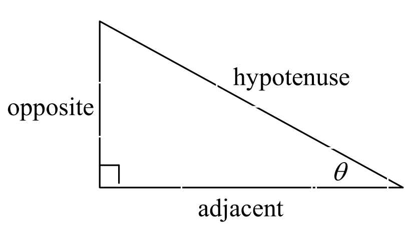
$$\sin(\tfrac{1}{2}A) = \pm\sqrt{\frac{1-\cos A}{2}}$$
$$\cos(\tfrac{1}{2}A) = \pm\sqrt{\frac{1+\cos A}{2}}$$
$$\tan(\tfrac{1}{2}A) = \frac{1-\cos(A)}{\sin(A)}$$
$$or \quad \frac{\sin(A)}{1+\cos(A)}$$

Definition of the Trig Functions

Right triangle definition

For this definition we assume that

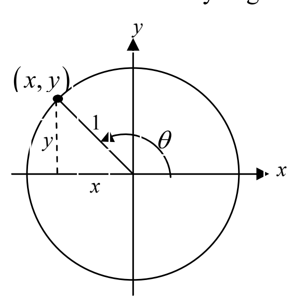
$0 < \theta < \frac{\pi}{2}$ or $0° < \theta < 90°$.



$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}} \qquad \csc\theta = \frac{\text{hypotenuse}}{\text{opposite}}$$
$$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}} \qquad \sec\theta = \frac{\text{hypotenuse}}{\text{adjacent}}$$
$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}} \qquad \cot\theta = \frac{\text{adjacent}}{\text{opposite}}$$

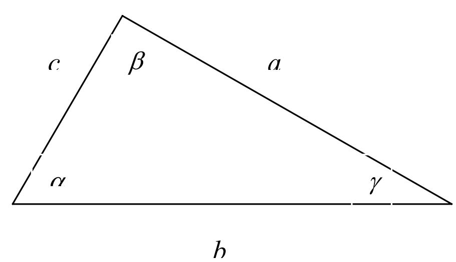
Unit circle definition

For this definition θ is any angle.



$$\sin\theta = \frac{y}{1} = y \qquad \csc\theta = \frac{1}{y}$$
$$\cos\theta = \frac{x}{1} = x \qquad \sec\theta = \frac{1}{x}$$
$$\tan\theta = \frac{y}{x} \qquad \cot\theta = \frac{x}{y}$$

Law of Sines, Cosines and Tangents



Law of Sines

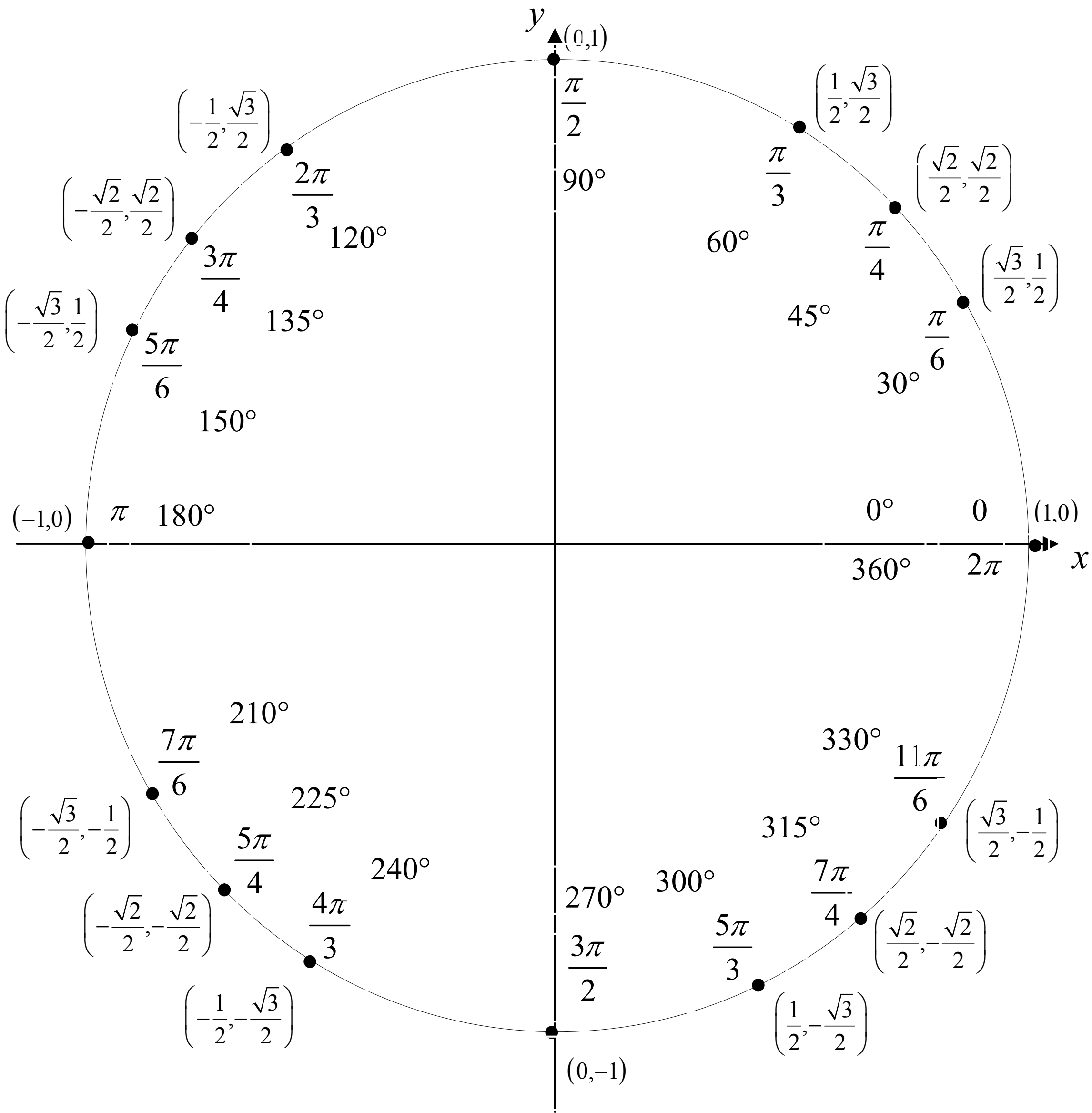
$$\frac{\sin\alpha}{a} = \frac{\sin\beta}{b} = \frac{\sin\gamma}{c}$$

Law of Cosines

$$a^2 = b^2 + c^2 - 2bc\cos\alpha$$
$$b^2 = a^2 + c^2 - 2ac\cos\beta$$
$$c^2 = a^2 + b^2 - 2ab\cos\gamma$$

Law of Tangents

$$\frac{a-b}{a+b} = \frac{\tan\frac{1}{2}(\alpha-\beta)}{\tan\frac{1}{2}(\alpha+\beta)}$$
$$\frac{b-c}{b+c} = \frac{\tan\frac{1}{2}(\beta-\gamma)}{\tan\frac{1}{2}(\beta+\gamma)}$$
$$\frac{a-c}{a+c} = \frac{\tan\frac{1}{2}(\alpha-\gamma)}{\tan\frac{1}{2}(\alpha+\gamma)}$$



y
(0,1)
π/2
90°
(1/2, √3/2)
π/3
60°
(√2/2, √2/2)
π/4
45°
(√3/2, 1/2)
π/6
30°
(−1/2, √3/2)
2π/3
120°
(−√2/2, √2/2)
3π/4
135°
(−√3/2, 1/2)
5π/6
150°
(−1,0)
π
180°
0°
0
(1,0)
360°
2π
x
210°
7π/6
(−√3/2, −1/2)
225°
5π/4
(−√2/2, −√2/2)
240°
4π/3
(−1/2, −√3/2)
270°
3π/2
(0,−1)
300°
5π/3
(1/2, −√3/2)
315°
7π/4
(√2/2, −√2/2)
330°
11π/6
(√3/2, −1/2)