Trig Cheat Sheet

Definition of the Trig Functions

Right triangle definition
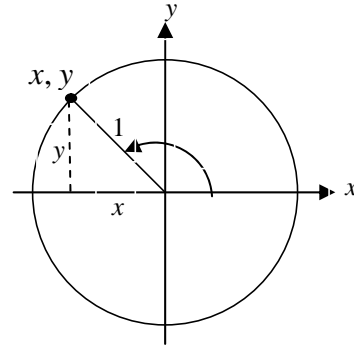For this definition we assume that

$0 \quad \dfrac{}{2}$ or $0 \quad 90$.

Unit circle definition
For this definition $\quad$ is any angle.

$$\sin \quad \frac{\text{opposite}}{\text{hypotenuse}} \qquad \csc \quad \frac{\text{hypotenuse}}{\text{opposite}}$$

$$\cos \quad \frac{\text{adjacent}}{\text{hypotenuse}} \qquad \sec \quad \frac{\text{hypotenuse}}{\text{adjacent}}$$

$$\tan \quad \frac{\text{opposite}}{\text{adjacent}} \qquad \cot \quad \frac{\text{adjacent}}{\text{opposite}}$$

$$\sin \quad \frac{y}{1} \quad y \qquad \csc \quad \frac{1}{y}$$

$$\cos \quad \frac{x}{1} \quad x \qquad \sec \quad \frac{1}{x}$$

$$\tan \quad \frac{y}{x} \qquad \cot \quad \frac{x}{y}$$

Facts and Properties

Domain
The domain is all the values of $\quad$ that can be plugged into the function.

$\sin \quad, \qquad$ can be any angle

$\cos \quad, \qquad$ can be any angle

$\tan \quad, \qquad n \quad \dfrac{1}{2} \quad, \ n \quad 0, \ 1, \ 2, \ldots$

$\csc \quad, \qquad n \quad, \ n \quad 0, \ 1, \ 2, \ldots$

$\sec \quad, \qquad n \quad \dfrac{1}{2} \quad, \ n \quad 0, \ 1, \ 2, \ldots$

$\cot \quad, \qquad n \quad, \ n \quad 0, \ 1, \ 2, \ldots$

Range
The range is all possible values to get out of the function.

$1 \quad \sin \quad 1 \qquad \csc \quad 1 \text{ and } \csc \quad 1$

$1 \quad \cos \quad 1 \qquad \sec \quad 1 \text{ and } \sec \quad 1$

$\tan$

Formulas and Identities

Tangent and Cotangent Identities

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

Reciprocal Identities

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

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

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

Pythagorean Identities

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

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

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

Even/Odd Formulas

$$\sin(-\theta) = -\sin\theta \qquad \csc(-\theta) = -\csc\theta$$

$$\cos(-\theta) = \cos\theta \qquad \sec(-\theta) = \sec\theta$$

$$\tan(-\theta) = -\tan\theta \qquad \cot(-\theta) = -\cot\theta$$

Periodic Formulas

If n is an integer.

$$\sin(\theta + 2\pi n) = \sin\theta \qquad \csc(\theta + 2\pi n) = \csc\theta$$

$$\cos(\theta + 2\pi n) = \cos\theta \qquad \sec(\theta + 2\pi n) = \sec\theta$$

$$\tan(\theta + \pi n) = \tan\theta \qquad \cot(\theta + \pi n) = \cot\theta$$

Double Angle Formulas

$$\sin(2\theta) = 2\sin\theta\cos\theta$$

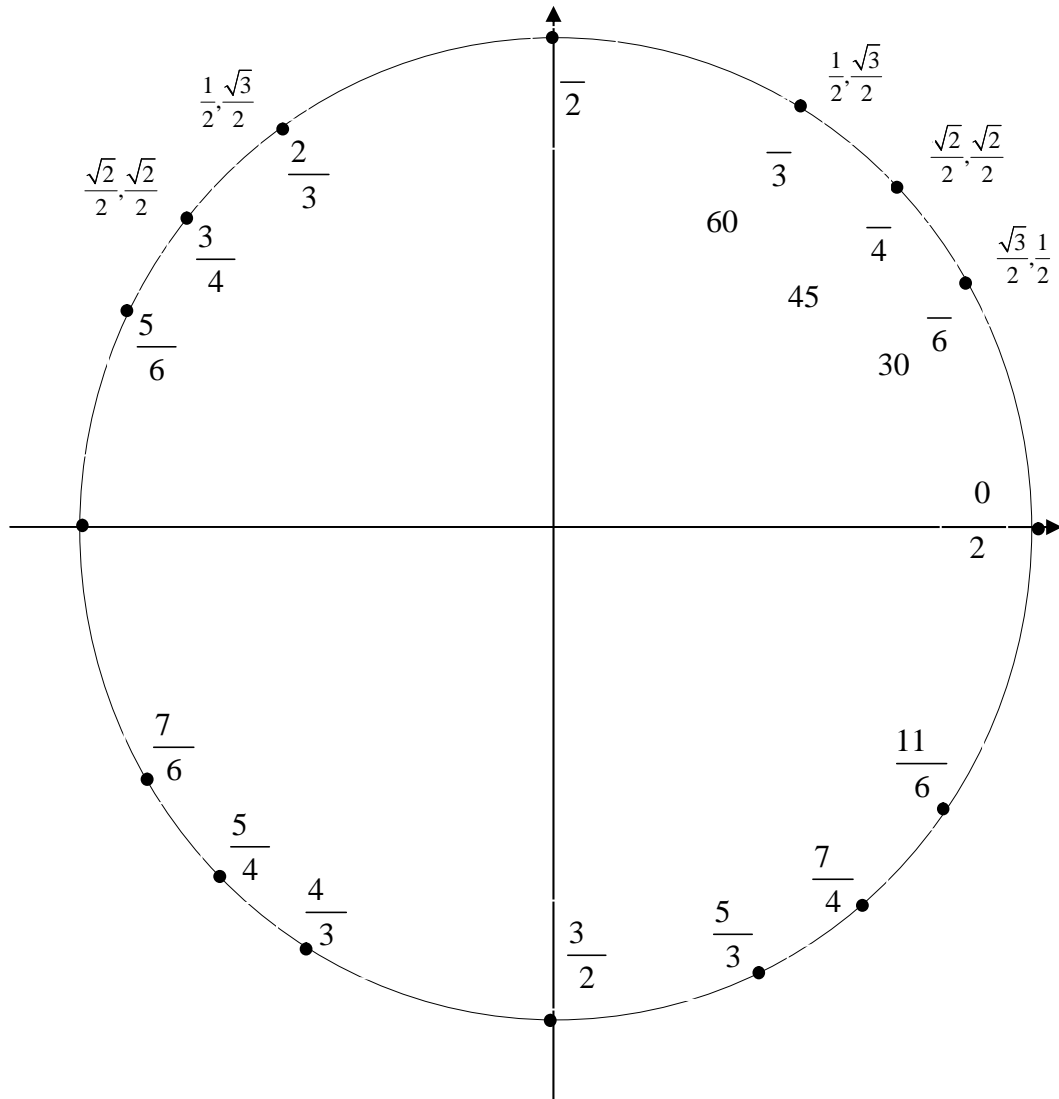$$\cos(2\theta) = \cos^2\theta - \sin^2\theta$$

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

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

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

Degrees to Radians ... **Double Angle** ...

Unit Circle

$$\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$$

$$\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$$

$$\frac{\pi}{2}$$

$$\frac{2\pi}{3}$$

$$\frac{3\pi}{4}$$

$$\frac{5\pi}{6}$$

$$\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$$

$$\frac{\pi}{3}$$

$$60$$

$$\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$$

$$\frac{\pi}{4}$$

$$45$$

$$\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$$

$$\frac{\pi}{6}$$

$$30$$

$$0$$

$$2\pi$$

$$\frac{7\pi}{6}$$

$$\frac{5\pi}{4}$$

$$\frac{4\pi}{3}$$

$$\frac{3\pi}{2}$$

$$\frac{5\pi}{3}$$

$$\frac{7\pi}{4}$$

$$\frac{11\pi}{6}$$

For any ordered pair on the unit circle (x, y) : $\cos\theta = x$ and $\sin\theta = y$

Example

$$\cos\left(\frac{5\pi}{3}\right) = \frac{1}{2} \qquad \sin\left(\frac{5\pi}{3}\right) = -\frac{\sqrt{3}}{2}$$