

# Trigonometry Cheatsheet

## Basic Identities:

$$\begin{aligned}\sin^2(\theta) + \cos^2(\theta) &= 1 \\ \tan(\theta) &= \frac{\sin(\theta)}{\cos(\theta)}\end{aligned}$$

## Reciprocal Identities:

$$\begin{aligned}\csc(\theta) &= \frac{1}{\sin(\theta)} \\ \sec(\theta) &= \frac{1}{\cos(\theta)} \\ \cot(\theta) &= \frac{1}{\tan(\theta)}\end{aligned}$$

## Pythagorean Identities:

$$\begin{aligned}\sin^2(\theta) &= 1 - \cos^2(\theta) \\ \cos^2(\theta) &= 1 - \sin^2(\theta)\end{aligned}$$

## Sum and Difference Formulas:

$$\begin{aligned}\sin(\alpha \pm \beta) &= \sin(\alpha) \cos(\beta) \pm \cos(\alpha) \sin(\beta) \\ \cos(\alpha \pm \beta) &= \cos(\alpha) \cos(\beta) \mp \sin(\alpha) \sin(\beta)\end{aligned}$$

## Double Angle Formulas:

$$\begin{aligned}\sin(2\theta) &= 2 \sin(\theta) \cos(\theta) \\ \cos(2\theta) &= \cos^2(\theta) - \sin^2(\theta)\end{aligned}$$

## Half Angle Formulas:

$$\begin{aligned}\sin\left(\frac{\theta}{2}\right) &= \pm \sqrt{\frac{1 - \cos(\theta)}{2}} \\ \cos\left(\frac{\theta}{2}\right) &= \pm \sqrt{\frac{1 + \cos(\theta)}{2}}\end{aligned}$$

## Law of Sines:

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

## Law of Cosines:

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

## Product-to-Sum Formulas:

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

## Cofunction Identities:

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

## Secant and Cosecant Identities:

$$\begin{aligned}\sec(\theta) &= \frac{1}{\cos(\theta)} \\ \csc(\theta) &= \frac{1}{\sin(\theta)}\end{aligned}$$

## Periodicity Identities:

$$\begin{aligned}\sin(\theta + 2\pi) &= \sin(\theta) \\ \cos(\theta + 2\pi) &= \cos(\theta)\end{aligned}$$

## Angle Addition Formulas:

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

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

## Inverse Trigonometric Functions:

$$\sin^{-1}(x) = \arcsin(x)$$

$$\cos^{-1}(x) = \arccos(x)$$

$$\tan^{-1}(x) = \arctan(x)$$

## Multiple-Angle Formulas:

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

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

## Area of a Triangle:

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

## Derivable Formulas:

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

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

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

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

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

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