

Trigonometric Survival Sheet

Pythagorean Theorem

$$a^2 + b^2 = c^2$$

Unit Circle Key Values

θ	$\sin \theta$	$\cos \theta$	$\tan \theta$
0	0	1	0
$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1
$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
$\frac{\pi}{2}$	1	0	undefined

Radians and Degrees

$$180^\circ = \pi \text{ radians}$$

$$\text{degrees} \cdot \frac{\pi}{180}, \quad \text{radians} \cdot \frac{180}{\pi}$$

Signs by Quadrant

QI: All, QII: Sine, QIII: Tangent, QIV: Cosine

Reciprocal Identities

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

Pythagorean Identities

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

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

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

Quotient Identities

$$\tan \theta = \frac{\sin \theta}{\cos \theta}, \quad \cot \theta = \frac{\cos \theta}{\sin \theta}$$

Cofunction Identities

$$\sin\left(\frac{\pi}{2} - \theta\right) = \cos \theta, \quad \cos\left(\frac{\pi}{2} - \theta\right) = \sin \theta$$

$$\tan\left(\frac{\pi}{2} - \theta\right) = \cot \theta, \quad \cot\left(\frac{\pi}{2} - \theta\right) = \tan \theta$$

$$\sec\left(\frac{\pi}{2} - \theta\right) = \csc \theta, \quad \csc\left(\frac{\pi}{2} - \theta\right) = \sec \theta$$

Even-Odd Identities

$$\sin(-\theta) = -\sin \theta, \quad \cos(-\theta) = \cos \theta$$

$$\tan(-\theta) = -\tan \theta, \quad \cot(-\theta) = -\cot \theta$$

$$\sec(-\theta) = \sec \theta, \quad \csc(-\theta) = -\csc \theta$$

Sum and Difference Formulas

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

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

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

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

Product-to-Sum Formulas

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

$$\cos A \cos B = \frac{1}{2}[\cos(A - B) + \cos(A + B)]$$

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

Sum-to-Product Formulas

$$\sin A + \sin B = 2 \sin\left(\frac{A+B}{2}\right) \cos\left(\frac{A-B}{2}\right)$$

$$\sin A - \sin B = 2 \cos\left(\frac{A+B}{2}\right) \sin\left(\frac{A-B}{2}\right)$$

$$\cos A + \cos B = 2 \cos\left(\frac{A+B}{2}\right) \cos\left(\frac{A-B}{2}\right)$$

$$\cos A - \cos B = -2 \sin\left(\frac{A+B}{2}\right) \sin\left(\frac{A-B}{2}\right)$$

Inverse Trigonometric Functions

$$\sin^{-1}(x), \quad \cos^{-1}(x), \quad \tan^{-1}(x)$$

$$\sin^{-1}(x) : \left[-\frac{\pi}{2}, \frac{\pi}{2}\right], \quad \cos^{-1}(x) : [0, \pi], \quad \tan^{-1}(x) : \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$$