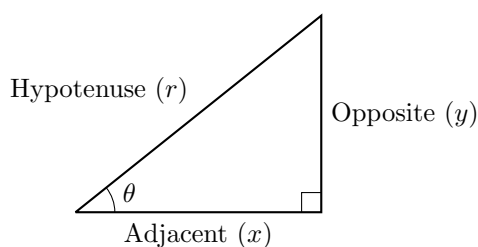


Trigonometry Cheat Sheet

6. Half Angle Formulas

1. Right Triangle Definitions



$$\begin{aligned}\sin \theta &= \frac{\text{Opp}}{\text{Hyp}} = \frac{y}{r} & \csc \theta &= \frac{\text{Hyp}}{\text{Opp}} = \frac{r}{y} \\ \cos \theta &= \frac{\text{Adj}}{\text{Hyp}} = \frac{x}{r} & \sec \theta &= \frac{\text{Hyp}}{\text{Adj}} = \frac{r}{x} \\ \tan \theta &= \frac{\text{Opp}}{\text{Adj}} = \frac{y}{x} & \cot \theta &= \frac{\text{Adj}}{\text{Opp}} = \frac{x}{y}\end{aligned}$$

2. Pythagorean Identities

$$\begin{aligned}\sin^2 \theta + \cos^2 \theta &= 1 \\ 1 + \tan^2 \theta &= \sec^2 \theta \\ 1 + \cot^2 \theta &= \csc^2 \theta\end{aligned}$$

3. Even / Odd Identities

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

4. Sum and Difference Formulas

$$\begin{aligned}\sin(A \pm B) &= \sin A \cos B \pm \cos A \sin B \\ \cos(A \pm B) &= \cos A \cos B \mp \sin A \sin B \\ \tan(A \pm B) &= \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}\end{aligned}$$

5. Double Angle Formulas

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

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

7. Laws of Sines and Cosines

For any triangle with sides a, b, c and opposite angles A, B, C :

Law of Sines

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

Law of Cosines

$$\begin{aligned}a^2 &= b^2 + c^2 - 2bc \cos A \\ b^2 &= a^2 + c^2 - 2ac \cos B \\ c^2 &= a^2 + b^2 - 2ab \cos C\end{aligned}$$

8. Unit Circle Values (First Quadrant)

θ (deg)	0°	30°	45°	60°	90°
θ (rad)	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
$\sin \theta$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\tan \theta$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	Undef