

Trigonometric Ratios & Identities

1. Basic Definitions (Right Triangle)

- $\sin \theta = \text{Opp} / \text{Hyp}$
- $\cos \theta = \text{Adj} / \text{Hyp}$
- $\tan \theta = \text{Opp} / \text{Adj}$
- $\csc \theta = \text{Hyp} / \text{Opp}$
- $\sec \theta = \text{Hyp} / \text{Adj}$
- $\cot \theta = \text{Adj} / \text{Opp}$

2. Reciprocal Identities

- $\csc \theta = 1 / \sin \theta$
- $\sec \theta = 1 / \cos \theta$
- $\cot \theta = 1 / \tan \theta$

3. Quotient Identities

- $\tan \theta = \sin \theta / \cos \theta$
- $\cot \theta = \cos \theta / \sin \theta$

4. Pythagorean Identities

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

5. Co-function Identities

- $\sin(90^\circ - \theta) = \cos \theta$
- $\cos(90^\circ - \theta) = \sin \theta$
- $\tan(90^\circ - \theta) = \cot \theta$
- $\cot(90^\circ - \theta) = \tan \theta$
- $\sec(90^\circ - \theta) = \csc \theta$
- $\csc(90^\circ - \theta) = \sec \theta$

6. Negative Angle Identities

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

7. Sum & Difference Formulas

- $\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$
- $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$
- $\tan(A \pm B) = (\tan A \pm \tan B) / (1 \mp \tan A \tan B)$

8. Double Angle Formulas

- $\sin 2A = 2 \sin A \cos A$
- $\cos 2A = \cos^2 A - \sin^2 A = 2\cos^2 A - 1 = 1 - 2\sin^2 A$
- $\tan 2A = (2 \tan A) / (1 - \tan^2 A)$

9. Half Angle Formulas

- $\sin^2(A/2) = (1 - \cos A) / 2$
- $\cos^2(A/2) = (1 + \cos A) / 2$
- $\tan(A/2) = \sin A / (1 + \cos A) = (1 - \cos A) / \sin A$

10. Special Angles Table

θ	$\sin \theta$	$\cos \theta$	$\tan \theta$	$\cot \theta$	$\sec \theta$	$\csc \theta$
0°	0	1	0	∞	1	∞
30°	$1/2$	$\sqrt{3}/2$	$1/\sqrt{3}$	$\sqrt{3}$	$2/\sqrt{3}$	2
45°	$\sqrt{2}/2$	$\sqrt{2}/2$	1	1	$\sqrt{2}$	$\sqrt{2}$
60°	$\sqrt{3}/2$	$1/2$	$\sqrt{3}$	$1/\sqrt{3}$	2	$2/\sqrt{3}$
90°	1	0	∞	0	∞	1