

Trigonometry Formulas

Class 10 & 11 — Complete Reference Sheet

Compiled by Shamsher Sir | 20+ Years Teaching Experience | mathematicshometutor.in

This sheet covers every formula you need for Class 10 and Class 11 Trigonometry — organised the same simple way, and building block by building block, so it's easy to revise before an exam. Keep it handy for quick revision, homework, and last-minute recall.

PART A | CLASS 10 TRIGONOMETRY FORMULAS

1. The Six Trigonometric Ratios

In a right-angled triangle, for angle θ (theta):

Ratio	Formula	Reciprocal Of
$\sin \theta$	Opposite / Hypotenuse	$\operatorname{cosec} \theta$
$\cos \theta$	Adjacent / Hypotenuse	$\sec \theta$
$\tan \theta$	Opposite / Adjacent	$\cot \theta$
$\operatorname{cosec} \theta$	Hypotenuse / Opposite	$\sin \theta$
$\sec \theta$	Hypotenuse / Adjacent	$\cos \theta$
$\cot \theta$	Adjacent / Opposite	$\tan \theta$

Simple relationships to remember:

- $\tan \theta = \sin \theta / \cos \theta$
- $\cot \theta = \cos \theta / \sin \theta$
- $\sin \theta \times \operatorname{cosec} \theta = 1$
- $\cos \theta \times \sec \theta = 1$
- $\tan \theta \times \cot \theta = 1$

2. Trigonometric Ratios of Standard Angles

This table is asked in almost every Class 10 board paper — learn it thoroughly.

θ	0°	30°	45°	60°	90°
$\sin \theta$	0	$1/2$	$1/\sqrt{2}$	$\sqrt{3}/2$	1
$\cos \theta$	1	$\sqrt{3}/2$	$1/\sqrt{2}$	$1/2$	0
$\tan \theta$	0	$1/\sqrt{3}$	1	$\sqrt{3}$	Not defined

θ	0°	30°	45°	60°	90°
cosec θ	Not defined	2	$\sqrt{2}$	$2/\sqrt{3}$	1
sec θ	1	$2/\sqrt{3}$	$\sqrt{2}$	2	Not defined
cot θ	Not defined	$\sqrt{3}$	1	$1/\sqrt{3}$	0

Memory Trick:

- Write 0, 1, 2, 3, 4 under a square root and divide each by 2 — this gives sin 0° to sin 90° in order: $\sqrt{0}/2, \sqrt{1}/2, \sqrt{2}/2, \sqrt{3}/2, \sqrt{4}/2 = 0, 1/2, 1/\sqrt{2}, \sqrt{3}/2, 1$
- For cos θ , write the same values in reverse order.
- Once sin and cos are known, $\tan = \sin/\cos$ gives the rest automatically.

3. Trigonometric Identities (Class 10)

These three identities come directly from the Pythagoras theorem and are asked very often in board exams:

Core Identities:

- $\sin^2\theta + \cos^2\theta = 1$
- $1 + \tan^2\theta = \sec^2\theta$
- $1 + \cot^2\theta = \text{cosec}^2\theta$

Other useful forms (often used in tricky questions):

- $\sin^2\theta = 1 - \cos^2\theta$
- $\cos^2\theta = 1 - \sin^2\theta$
- $\sec^2\theta - \tan^2\theta = 1$
- $\text{cosec}^2\theta - \cot^2\theta = 1$

4. Complementary Angle Formulas

When two angles add up to 90° , they are called complementary angles. These formulas help you switch between them:

- $\sin(90^\circ - \theta) = \cos \theta$
- $\cos(90^\circ - \theta) = \sin \theta$
- $\tan(90^\circ - \theta) = \cot \theta$
- $\cot(90^\circ - \theta) = \tan \theta$
- $\sec(90^\circ - \theta) = \text{cosec} \theta$
- $\text{cosec}(90^\circ - \theta) = \sec \theta$

PART B | CLASS 11 TRIGONOMETRY FORMULAS

Class 11 does not discard what was learnt in Class 10 — it extends those same ideas to all angles (not just 0° – 90°) and adds formulas for combining two angles together. This is also where JEE-level Trigonometry begins.

5. Sign of Trigonometric Ratios in Different Quadrants

Quadrant	Angle Range	Positive Ratios
I	$0^\circ - 90^\circ$	All (sin, cos, tan)
II	$90^\circ - 180^\circ$	sin, cosec
III	$180^\circ - 270^\circ$	tan, cot
IV	$270^\circ - 360^\circ$	cos, sec

Easy trick to remember:

- "Add Sugar To Coffee" — stands for All, Sin, Tan, Cos, positive in Quadrants I, II, III, IV.

6. Sum and Difference Formulas

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

7. Double Angle Formulas

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

8. Half Angle Formulas

- $\sin(A/2) = \pm\sqrt{(1 - \cos A) / 2}$
- $\cos(A/2) = \pm\sqrt{(1 + \cos A) / 2}$
- $\tan(A/2) = \pm\sqrt{(1 - \cos A) / (1 + \cos A)}$

9. Sum-to-Product Formulas

- $\sin A + \sin B = 2 \sin[(A+B)/2] \cos[(A-B)/2]$
- $\sin A - \sin B = 2 \cos[(A+B)/2] \sin[(A-B)/2]$
- $\cos A + \cos B = 2 \cos[(A+B)/2] \cos[(A-B)/2]$
- $\cos A - \cos B = -2 \sin[(A+B)/2] \sin[(A-B)/2]$

10. Product-to-Sum Formulas

- $2 \sin A \cos B = \sin(A+B) + \sin(A-B)$
- $2 \cos A \sin B = \sin(A+B) - \sin(A-B)$
- $2 \cos A \cos B = \cos(A+B) + \cos(A-B)$
- $2 \sin A \sin B = \cos(A-B) - \cos(A+B)$

5-Minute Revision Chart (Night Before the Exam)

If you're short on time, focus only on these — they cover about 80% of what actually gets asked:

- $\sin^2\theta + \cos^2\theta = 1$
- The 0° – 90° standard angle table
- Complementary angle rules
- $\sin(A\pm B)$ and $\cos(A\pm B)$
- $\sin 2A$, $\cos 2A$, $\tan 2A$

3 Mistakes Almost Every Student Makes

1. Mixing up $\sin(90^\circ - \theta)$ with $\sin(\theta - 90^\circ)$

The first equals $\cos \theta$. The second equals $-\cos \theta$. One small sign change can cost marks in a board exam.

2. Writing $\sin \theta^2$ instead of $\sin^2\theta$

$\sin^2\theta$ means "square the value of $\sin \theta$." $\sin \theta^2$ means "find the sine of theta-squared" — a different calculation altogether.

3. Assuming $\tan \theta$ and $\cot \theta$ always have a value

$\tan 90^\circ$ is not zero — it is simply not defined. Same with $\cot 0^\circ$. This often catches students off guard in MCQs.

Golden Rule

Trigonometry is not really 40 formulas — it's about 5 core ideas, repeated with small changes. Understand where a formula comes from, and you'll be able to rebuild it even if you forget it during an exam.

Need help making these formulas stick?

Shamsher Sir has been teaching Class 10–12, IIT-JEE, and IB Maths students for over 20 years, helping them understand Trigonometry (and everything built on it) with real conceptual clarity, not just memorisation.

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