

Applications of Trigonometry — Class 10 Summary

Heights and distances: turning a worded situation into a right triangle, then into marks. CBSE Class 10 Maths · Trigonometry unit (12 marks).

Key definitions

Line of sight — the straight line from the observer's eye to the point on the object being viewed.

Horizontal line — the ground-parallel line through the observer's eye. Both angles are measured from it.

Angle of elevation (θ) — the angle the line of sight makes with the horizontal when the object is **above** eye level (you look up).

Angle of depression (θ) — the angle the line of sight makes with the horizontal when the object is **below** eye level (you look down).

Equal-angle rule — for the same two points, angle of depression from the top = angle of elevation from the bottom (alternate interior angles between parallel lines).

Core formulas

$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}} = \frac{\text{height}}{\text{horizontal distance}}$$

θ	30°	45°	60°
$\sin \theta$	$1/2$	$1/\sqrt{2}$	$\sqrt{3}/2$
$\cos \theta$	$\sqrt{3}/2$	$1/\sqrt{2}$	$1/2$
$\tan \theta$	$1/\sqrt{3}$	1	$\sqrt{3}$

Key takeaways

- **The diagram is the marks.** Draw it first, every time — a wrong figure derails the whole solution.
- **Both angles are measured from the horizontal**, at the observer's eye — never at the object.
- **Given a depression angle?** Copy it down as the equal elevation angle at ground level, then solve the ground triangle.
- **$\tan \theta$ is the default ratio** — height (opposite) with base distance (adjacent). Use sin or cos only when a slant length (ladder, rope, wire) is involved.
- **Two triangles?** Name the shared side, write one equation per triangle, and eliminate.
- **Add the observer's height back** if the eye is above the ground — the computed height is measured from eye level.

Worked Example

Question. From the top of a 7 m tall building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45° . Find the height of the tower.

Step 1 – Draw and label. Let AB be the building with $AB = 7$ m, and CD the tower. Draw AE horizontal from A (top of the building) to meet the tower at E. Then $BC = AE = d$, and $CE = 7$ m.

Step 2 – Use the depression angle. The angle of depression of C (foot of the tower) from A is 45° , so by the equal-angle rule the angle of elevation of A from C is also 45° .

$$\tan 45^\circ = AB \div BC \Rightarrow 1 = 7 \div d \Rightarrow d = 7 \text{ m.}$$

Step 3 – Use the elevation angle. In right triangle AED, angle DAE = 60° and $AE = d = 7$ m.

$$\tan 60^\circ = DE \div AE \Rightarrow \sqrt{3} = DE \div 7 \Rightarrow DE = 7\sqrt{3} \text{ m.}$$

Step 4 – Add the two parts. Total height $CD = CE + DE = 7 + 7\sqrt{3} = 7(1 + \sqrt{3})$ m.

Step 5 – Approximate. $\sqrt{3} \approx 1.732$, so $CD \approx 7 \times 2.732 \approx 19.12$ m.

Height of the tower = $7(1 + \sqrt{3})$ m ≈ 19.12 m

Where marks slip

- Marking the 45° angle at the foot of the building instead of moving it into the ground-level triangle.
- Forgetting to add $CE = 7$ m and answering $7\sqrt{3}$ m.
- Choosing sin or cos when both the opposite and the adjacent side are known – use tan.

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