MATHS WITHOUT GUESSWORK · BOARD BOOSTER

Heights & Distances

LOCK THE SURE MARKS.
STRETCH FOR THE TOP.
PRACTISE THE BOARD WAY.

Chapter: **Some Applications of Trigonometry** · CBSE Class 10 Mathematics
Syllabus session 2026–27 · Standard (041)

🛡️ Secure Track | 🚀 Stretch Track | ~88 questions + 3 mini-mocks

Built around what the board actually tests

Elevation
looking up — angle above the horizontal

Depression
looking down — angle below the horizontal

$\tan\theta = h/d$
height over distance

Original questions and solutions. Answers kept separate. Not a substitute for the NCERT textbook or your teacher.

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Heights & Distances in the board paper

Know exactly how many marks are really at stake here — so you spend your effort where the paper pays.

◆ UNDERSTAND THE OFFICIAL NUMBER This chapter sits inside **Unit V — Trigonometry, worth 12 marks**, shared with "Introduction to Trigonometry". Heights & Distances is a **reliable 4–5 marks** — very often the **5-mark Long Answer** or the **4-mark case study** in the paper is a height-and-distance problem, because it is perfectly suited to a real-life scenario. CBSE publishes weightage per unit, not per chapter.

Where those marks usually fall (PYQ trend — based on past papers, not official)

Form it takes	Typical marks	What it tests
1–2 MCQ / Assertion-Reason	1–2	Elevation vs depression, a one-step tan θ = h/d
A VSA or SA	2–3	Find a height or distance from one angle
A 5-mark LA	5	Two triangles — two angles, a moving observer, two boats/ships
A case study	4	A real scene — tower, lighthouse, aeroplane, ladder

★ SPOT THE CLUE WHAT'S IN THE 2026–27 SCOPE The full chapter is in scope — **simple problems on heights and distances** using angles of elevation and depression, with angles limited to **30°, 45° and 60°**. There are no deletions. Problems never use more than **two right triangles**.

Q5 A tower of height h casts a shadow of length h. The sun's elevation is: A. 30° B. 45° C. 60° D. 90°

1 PART-GUIDED ★

Q6 A pole casts a shadow √3 times its height. The sun's elevation is: A. 30° B. 45° C. 60° D. 90°

1 PART-GUIDED ★

Q7 A tower is √3 times the length of its shadow. The sun's elevation is: A. 30° B. 45° C. 60° D. 90°

1 PART-GUIDED ★

Q8 For a right triangle with height h and base d, tan θ = A. d/h B. h/d C. h·d D. $\sqrt{(h^2 + d^2)}$

1 GUIDED ★

Q9 As an observer walks toward a tower, the angle of elevation of its top: A. decreases B. increases C. stays the same D. becomes 0

1 GUIDED ★

Q10 The angle of depression of a point from the top equals the angle of ___ of the top from that point: A. elevation B. depression C. reflection D. incidence

1 PART-GUIDED ★

Q11 A 10 m tower has a 10√3 m shadow. The sun's elevation is: A. 30° B. 45° C. 60° D. 15°

1 PART-GUIDED

Q12 A ladder leans against a wall at 60°. The ratio (height reached on wall)/(ladder length) is: A. sin 60° B. cos 60° C. tan 60° D. 1

1 PART-GUIDED

Q13 From a height, a car 50 m away is seen at a depression of 45°. The height is: A. 25 m B. 50 m C. 100 m D. 50√3 m

1 PART-GUIDED ★

Q14 A kite is at height 30 m; its string makes 30° with the ground. The string's length is: A. 15 m B. 30 m C. 60 m D. 15√3 m

1 INDEPENDENT ★

Q15 A 20 m tower; the elevation of its top from a point is 45°. The point's distance from the foot is: A. 10 m B. 20 m C. 20√3 m D. 40 m

1 GUIDED

Q16 tan 60° = A. 1 B. √3 C. 1/√3 D. 2

1 GUIDED

Q17 A 30 m tower; elevation 60° from a point. The point's distance from the foot is: A. 30√3 m B. 10√3 m C. 15 m D. 60 m

1 INDEPENDENT ★

Q18 The horizontal and the line of sight to an object *below* the observer make the angle of: A. elevation B. depression C. reflection D. 90°

1 GUIDED

Q19 As the sun's angle of elevation decreases, a tower's shadow: A. decreases B. increases C. stays the same D. becomes zero

1 PART-GUIDED ★

Q20 A 12 m tree; the elevation of its top from a point is 30°. The point's distance is: A. 12√3 m B. 4√3 m C. 6 m D. 12 m

1 INDEPENDENT

Very Short Answer (2-mark) set

16 two-mark questions. Draw the right triangle, write tan θ = h/d (or sin/cos for a slant), substitute. Worked solutions in the Answer Key.

Q1 A tower is 30 m high. Find the angle of elevation of its top from a point 30 m from its foot.

2 GUIDED ★

Q2 The angle of elevation of the top of a 15 m tower from a point on the ground is 30°. Find the distance of the point from the foot.

2 PART-GUIDED ★

Q3 A ladder 10 m long leans against a wall at 60° with the ground. Find the height it reaches on the wall.

2 PART-GUIDED ★

Q4 A kite is flying at a height of 60 m. The (straight) string makes 30° with the ground. Find the length of the string.

2 PART-GUIDED ★

Q5 The shadow of a tower is √3 times its height. Find the sun's angle of elevation.

2 PART-GUIDED

Q6 From the top of a 50 m cliff, the angle of depression of a boat is 45°. Find the boat's distance from the base.

2 PART-GUIDED ★

Case studies (4-mark)

8 source-based cases, each 1 + 1 + 2 marks. Re-draw each scene as a right triangle before you compute. Solutions in the Answer Key.

Case 1 — The clock tower

4 marks

A town clock tower is 60 m tall. A visitor looks at its top from different points on the flat ground.

(i) Which ratio links the height and the horizontal distance?

1

(ii) At what distance is the angle of elevation of the top 45°?

1

(iii) At what distance is the angle of elevation 30°?

2

Answer Key

Kept at the back on purpose — so a parent needn't teach. The recurring methods are worked in full once; the drills get the key step, the answer and the likely slip. Take √3 = 1.73, √2 = 1.41.

Worked methods (learn these once)

One triangle (tan θ = h/d). Tower top T, foot B, observer O at distance d; elevation θ at O. tan θ = TB/OB = h/d. *Example (SA Q2):* h from d = 30 m, θ = 30°: tan 30° = h/30 ⇒ h = 30 × 1/√3 = 30/√3 = 10√3 m ≈ 17.32 m. Always rationalise (30/√3 = 30√3/3 = 10√3).

Two triangles, moving observer (LA Q1). Height h, nearer distance x. At 60°: tan 60° = h/x ⇒ h = x√3. At 30° (20 m farther): tan 30° = h/(x + 20) ⇒ h = (x + 20)/√3. Equate: x√3 = (x + 20)/√3 ⇒ 3x = x + 20 ⇒ x = 10, so h = 10√3 m ≈ 17.32 m. The same h sits in both equations — that is what lets you solve.

Angle of depression (LA Q5 / Case 2). From the top, the depression is measured from the horizontal; the equal alternate angle sits at the object. So "depression of a ship = 30°" ⇒ mark 30° at the ship ⇒ tan 30° = (lighthouse height)/(distance). Two ships at 30° and 45° from a 75 m light: d_1 = 75/tan30° = 75√3, d_2 = 75/tan45° = 75; gap = 75√3 − 75 = 75(√3 − 1) m ≈ 54.9 m.

Observer's own height (SA Q8). Eye 1.5 m up, 28.5 m from the tower, elevation 45°. The triangle's vertical side is (h − 1.5): tan 45° = (h − 1.5)/28.5 ⇒ h − 1.5 = 28.5 ⇒ h = 30 m. Add the 1.5 m back at the end.

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- **Long Answer.** 10 five-mark questions
- **Case studies.** 8 four-mark source-based cases
- **HOTS and trickiest variations.** 10 questions
- **Timed mini-mocks and Answer Key.** 3 single-chapter mini-mocks; every question has its answer, kept at the back

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