Class 10 Maths Chapter 9: Some Applications of Trigonometry - Notes, Important Questions and MCQs (2026-27)

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These Some Applications of Trigonometry Class 10 notes cover NCERT Class 10 Maths Chapter 9: line of sight, angle of elevation, angle of depression and heights-and-distances problems – with a step-by-step method, fully solved problems, 10 MCQs and a free PDF.

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Chapter Overview

Trigonometry helps us find heights and distances that cannot be measured directly – the height of a tower, the width of a river or the distance of a ship from a lighthouse – using angles measured from a point.

In 2026-27 the problems involve at most two right triangles and the angles 30°, 45° and 60°. The key is to draw a neat figure, mark the right angle and choose the ratio (usually tan) that links the known side with the unknown one.

Important Topics and Concepts

Basic Terms

- Line of sight: the line from the observer’s eye to the object.

- Angle of elevation: angle between the line of sight and the horizontal when the object is ABOVE the horizontal level.
- Angle of depression: angle between the line of sight and the horizontal when the object is BELOW the horizontal level.
- Angle of depression from A to B equals the angle of elevation from B to A (alternate angles).

Method to Solve

- Draw a clear figure; mark the right angle, angles and known lengths.
- Use tan when the problem links height and horizontal distance; use sin or cos when the slant length (string, ladder, wire) is involved.
- Write one equation per triangle; if two triangles share a side, solve them together.
- Rationalise and use $\sqrt{3} \approx 1.732$ only when asked.

Common Problem Types

- Height of a tower from one angle of elevation.
- Length of a kite string or ladder (use sin).
- A tree broken by wind with its top touching the ground.
- Two angles of elevation from two points on the same line.
- Angles of depression of two ships or two cars from a lighthouse or tower.
- A flagstaff or tower standing on a building.

Solved Examples

Board-pattern problems with full working.

- A tower stands vertically. From a point 30 m from its foot, the angle of elevation of the top is 30°. Find the height. $h = 30 \tan 30° = 30/\sqrt{3} = 10\sqrt{3}$ m.
- A kite is flying at a height of 60 m. The string makes 60° with the ground. Find the length of the string. $\sin 60° = 60/l \rightarrow l = 60 \times 2/\sqrt{3} = 40\sqrt{3}$ m.
- A tree breaks due to a storm and its top touches the ground 8 m from the foot, making an angle of 30°. Find the original height. Standing part = $8 \tan 30° = 8/\sqrt{3}$; broken part = $8/\cos 30° = 16/\sqrt{3}$. Height = $24/\sqrt{3} = 8\sqrt{3}$ m.
- The angles of elevation of the top of a tower from points 4 m and 9 m from its base, on the same line, are complementary. Find the height. $\tan \theta = h/4$ and $\tan(90° - \theta) = h/9 \rightarrow (h/4)(h/9) = 1 \rightarrow h = 6$ m.

Choosing the Ratio

Quick guide for each figure.

Known / unknown	Use
height and ground distance	tan
height and slant length	sin
ground distance and slant length	cos
two angles from one line	tan in both triangles, eliminate the common side

Useful Values for Heights and Distances

Angle	tan	sin	cos
30°	1/√3	1/2	√3/2
45°	1	1/√2	1/√2
60°	√3	√3/2	1/2

Important Formulas and Definitions

Formula / Term	Meaning / Use
Line of sight	Line from the eye of the observer to the object
Horizontal level	Line parallel to the ground through the eye
Angle of elevation	Angle above the horizontal to see a higher object
Angle of depression	Angle below the horizontal to see a lower object
Height	Vertical distance
Distance	Horizontal distance from the foot of the object

Short Answer Questions

Q1. The angle of elevation of the top of a 15 m tower from a point on the ground is 60°. How far is the point from the tower?

tan 60° = 15/d → d = 15/√3 = 5√3 m.

Q2. A ladder leans against a wall making 60° with the ground; its foot is 2 m from the wall. Find its length.

cos 60° = 2/l → l = 4 m.

Q3. A 1.5 m tall observer is 28.5 m from a chimney. The angle of elevation of its top from his eyes is 45°. Find the height of the chimney.

Height above eye = 28.5 tan 45° = 28.5 m. Chimney = 28.5 + 1.5 = 30 m.

Q4. If the shadow of a tower is √3 times its height, find the sun’s altitude.

tan θ = h/(√3 h) = 1/√3 → θ = 30°.

Q5. From the top of a 75 m lighthouse, the angle of depression of a ship is 30°. Find the distance of the ship.

tan 30° = 75/d → d = 75√3 m.

Q6. A 6 m pole casts a 2√3 m shadow. Find the sun’s elevation.

tan θ = 6/(2√3) = √3 → θ = 60°.

Q7. What is the angle of elevation of the sun when a pole’s shadow equals its height?

tan θ = 1 → θ = 45°.

Q8. Define angle of depression with an example.

Long Answer Questions

Q1. From a point on the ground, the angles of elevation of the bottom and top of a transmission tower fixed on a 20 m high building are 45° and 60°. Find the height of the tower.

Let the point be P at distance d from the building; tower height h.

Bottom: tan 45° = 20/d → d = 20 m.

Top: tan 60° = (20 + h)/20 → 20 + h = 20√3.

h = 20(√3 − 1) m ≈ 14.64 m.

Height of the tower = 20(√3 − 1) m.

Q2. As observed from the top of a 75 m lighthouse, the angles of depression of two ships are 30° and 45°. If one ship is exactly behind the other on the same side, find the distance between them.

Nearer ship (45°): tan 45° = 75/d_1 → d_1 = 75 m.

Farther ship (30°): tan 30° = 75/d_2 → d_2 = 75√3 m.

Distance between ships = d_2 − d_1 = 75√3 − 75.

= 75(√3 − 1) m ≈ 54.9 m.

Answer: 75(√3 − 1) m.

Q3. A straight highway leads to the foot of a tower. A man at the top observes a car at an angle of depression of 30°, approaching uniformly. Six seconds later the angle of depression is 60°. Find the time taken by the car to reach the foot of the tower.

Let tower height = h. Initial distance d_1 = h/tan 30° = h√3; later distance d_2 = h/tan 60° = h/√3.

Distance covered in 6 s = h√3 − h/√3 = 2h/√3.

Speed = (2h/√3)/6 = h/(3√3) per second.

Remaining distance h/√3 takes (h/√3)/(h/(3√3)) = 3 s.

The car reaches the foot in 3 more seconds.

MCQs with Answers

1. The angle of elevation of the top of a tower 30 m away is 45°. Height =(a) 15 m (b) 30 m (c) 30√3 m (d) 10√3 mAnswer: (b) 30 m

2. Angle of depression is measured from(a) the vertical (b) the horizontal (c) the ground (d) the objectAnswer: (b) the horizontal

3. If a pole’s shadow equals its height, the sun’s elevation is(a) 30° (b) 45° (c) 60° (d) 90°Answer: (b) 45°

4. A ladder 10 m long reaches a window 5 m high. Its angle with the ground is(a) 30° (b) 45° (c) 60° (d) 90°Answer: (a) 30° – sin θ = 1/2

6. As the sun’s elevation increases, a shadow becomes(a) longer (b) shorter (c) unchanged (d) zero alwaysAnswer: (b) shorter

7. The angle of elevation of the sun when shadow is √3 times height is(a) 30° (b) 45° (c) 60° (d) 90°Answer: (a) 30°

8. A kite string of 100 m makes 30° with the ground. Height of kite =(a) 50 m (b) 50√3 m (c) 100√3 m (d) 100 mAnswer: (a) 50 m

9. Angle of depression from A to B equals(a) angle of elevation from B to A (b) 90° minus elevation (c) twice elevation (d) zeroAnswer: (a) angle of elevation from B to A

10. From a point 20 m from a building, elevation of its top is 60°. Height =(a) 20 m (b) 20√3 m (c) 20/√3 m (d) 40 mAnswer: (b) 20√3 m

Quick Revision Points

- Elevation: object above eye; depression: object below eye.
- Depression from A = elevation from B (alternate angles).
- tan for height–distance; sin/cos with slant length.
- tan 30° = 1/√3, tan 45° = 1, tan 60° = √3.
- Draw a neat figure and mark all data first.
- Rationalise answers; use √3 ≈ 1.732 only if asked.

Chapter Summary

Some Applications of Trigonometry uses angles of elevation and depression to find heights and distances. A clear figure with right triangles turns each word problem into one or two equations using tan, sin or cos.

Typical problems include towers, kites, ladders, broken trees, lighthouses with ships and moving cars – all solved with the standard values at 30°, 45° and 60°.

Exam Tips and PYQ Pattern

- A 4–5 mark heights-and-distances problem is almost certain; a correct labelled figure carries marks.
- Write the ratio you are using with the triangle name, e.g. “In △ABC, tan 60° = AB/BC”.
- Keep answers in surd form unless an approximate value is asked.
- Remember the observer’s height when the angle is measured from the eye.
- Practise two-triangle problems – they are the most common long questions.

Frequently Asked Questions

Is this chapter in the 2026-27 CBSE syllabus?

Yes. It is part of the NCERT Class 10 Mathematics textbook and the rationalised CBSE syllabus for 2026-27.

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What is the difference between angle of elevation and depression?

Elevation is measured above the horizontal to see a higher object; depression is measured below the horizontal to see a lower object.

Which trigonometric ratio is used most in heights and distances?

tan, because it links the height and the horizontal distance directly.

Conclusion

Heights and distances becomes easy once you draw neat figures and pick the right ratio. Practise the solved problems here and keep the free PDF for revision before your board exam.

More Notes: Class 10 Maths Chapter 8: Introduction to Trigonometry notes | Class 10 Maths Chapter 10: Circles notes | All Class 10 Maths notes

Author Bio: Written and reviewed by the Nextoper Editorial Team, a group of CBSE mathematics educators who build chapter notes directly from the NCERT textbook and past board paper patterns.

Freshness Note: These notes follow the NCERT Class 10 Maths textbook, Mathematics (Reprint 2026-27), and the CBSE syllabus for the 2026-27 session. Last checked on 16 November 2026.