

MATHEMATICS • CLASS 10

CHAPTER 9

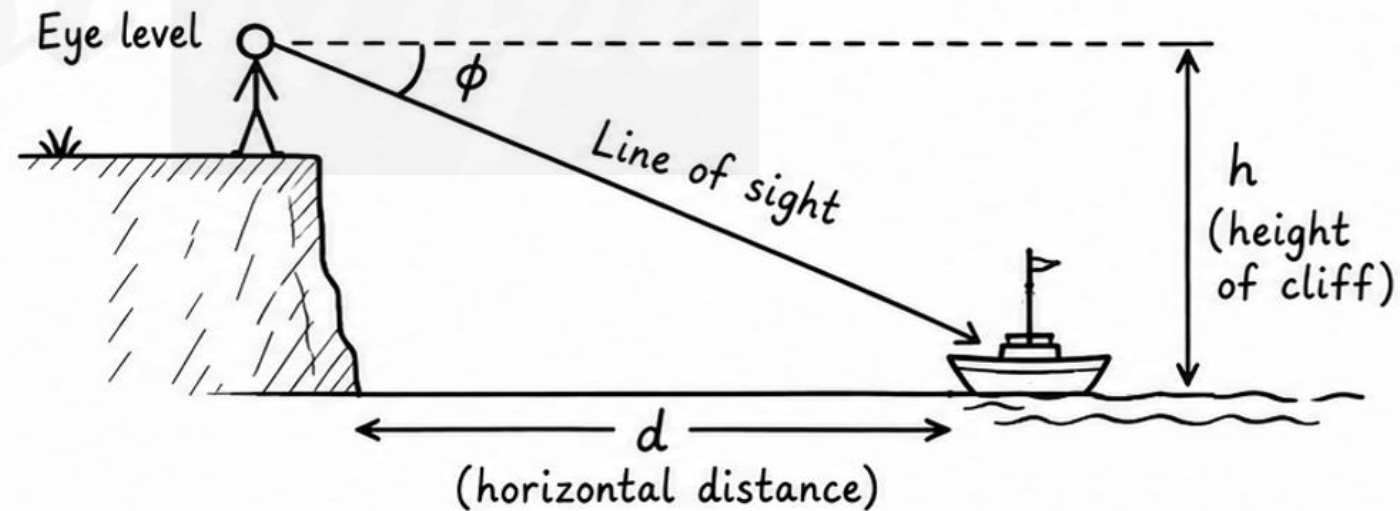
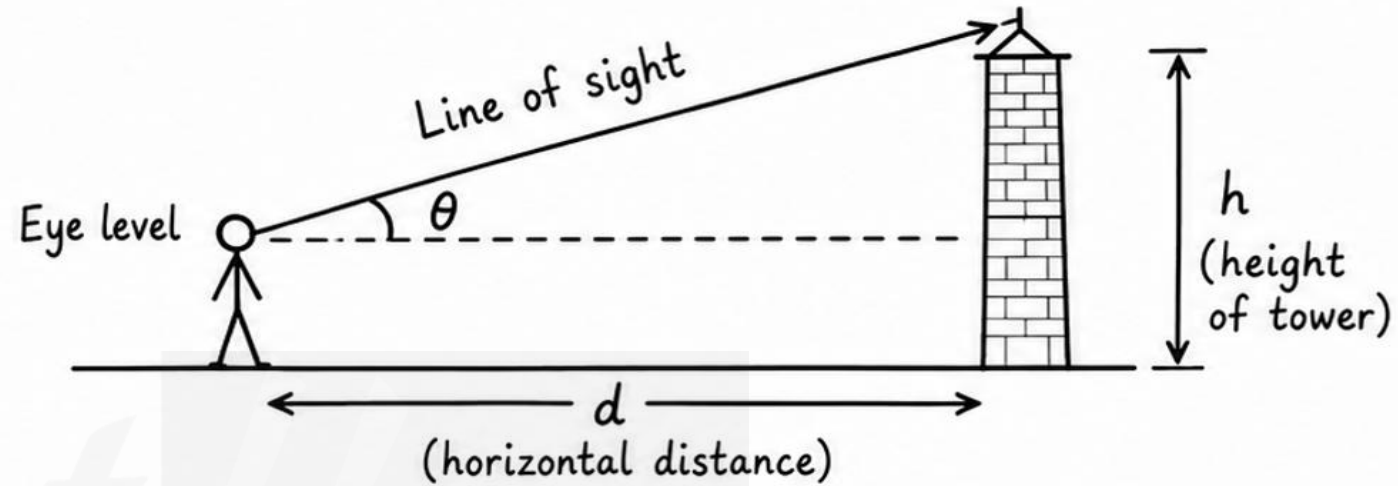
Some Applications of Trigonometry

CHAPTER NOTES



HEIGHTS & DISTANCES: KEY TERMS

- Line of sight
= straight line from observer's eye to object.
- Angle of elevation
= angle between horizontal through the eye and upward line of sight.
- Angle of depression
= angle between horizontal through the eye and downward line of sight.



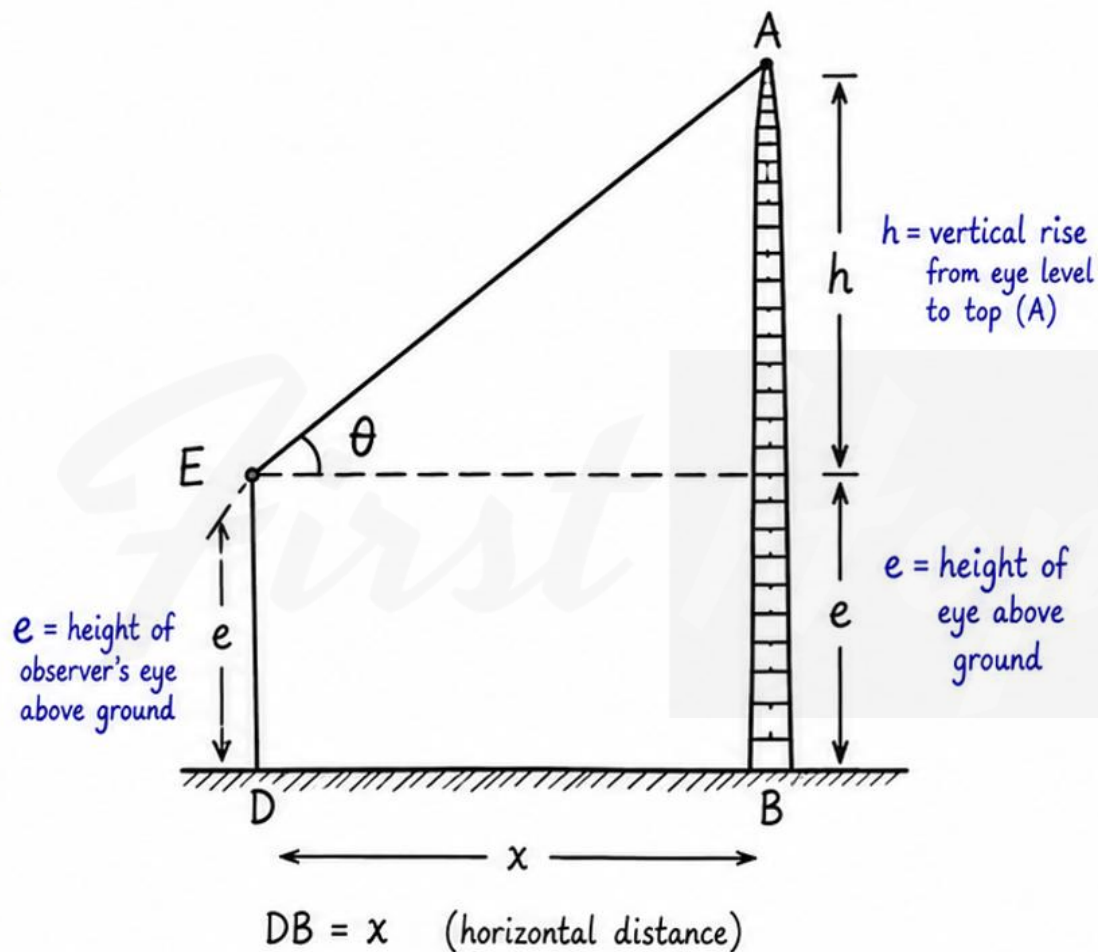
- Horizontal lines are parallel.

Therefore, angle of depression equals the corresponding angle of elevation at the lower point (alternate interior angles).

MODELLING A HEIGHT-DISTANCE PROBLEM

FIVE-STEP PROCESS

- ① Draw the object vertically and the ground horizontally.
- ② Draw a horizontal line through the observer's eye.
- ③ Join the eye to the top of the object as the line of sight.
- ④ Mark the angle of elevation or depression at the eye.
- ⑤ Choose the appropriate trigonometric ratio and solve for the required height or distance.



USUAL CASE (horizontal distance x is known)

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}} = \frac{h}{x}$$

$$\Rightarrow h = x \tan \theta$$

Total object height:

$$AB = h + e = x \tan \theta + e$$

COMPLEMENTARY CASES

If the slant distance (line of sight) is known:

$$\sin \theta = \frac{h}{(\text{slant distance})} \Rightarrow h = (\text{slant distance}) \sin \theta$$

$$\cos \theta = \frac{x}{(\text{slant distance})} \Rightarrow x = (\text{slant distance}) \cos \theta$$

If angle of depression is given:

Use the same ratios; the angle of depression equals the angle of elevation.

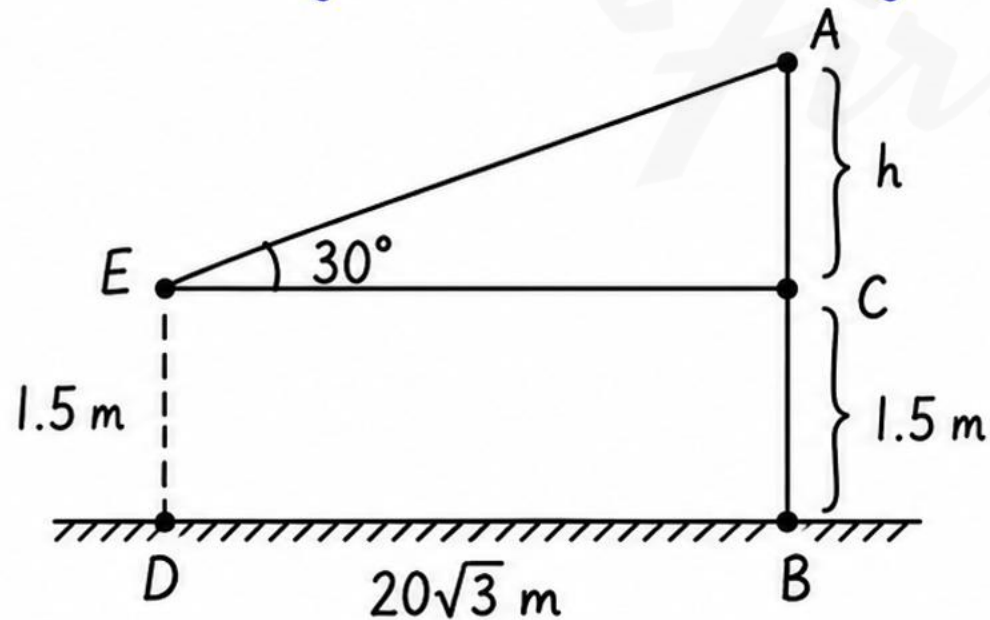
CHECKS (ALWAYS!)

- Use the same units for all lengths (e.g., all in m).
- Put your calculator in DEGREE mode.
- Add the observer's or instrument height (e) only when the problem asks for the total height of the object.
- Sketch need not be to scale, but labels must be consistent and correct.

HEIGHT OF A TOWER

EXAMPLE – Observer Height Included

From a point $20\sqrt{3}$ m from the base of a tower, the angle of elevation of its top from an observer's eye is 30° . The observer's eye is 1.5 m above ground. Find tower height.



Let $AC = h$ (height from eye-level to the top).

In right triangle ECA,

$$\tan 30^\circ = \frac{AC}{EC} = \frac{h}{20\sqrt{3}} = \frac{1}{\sqrt{3}}$$

$$\frac{h}{20\sqrt{3}} = \frac{1}{\sqrt{3}} \Rightarrow h = \frac{20\sqrt{3}}{\sqrt{3}} = 20 \text{ m}$$

$$\begin{aligned}\text{The tower height } AB &= AC + CB \\ &= 20 + 1.5 \\ &= 21.5 \text{ m}\end{aligned}$$

$$\text{Tower height} = 21.5 \text{ m}$$

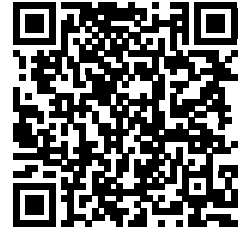


FREE PREVIEW

[Click here to visit our website](#)

SCHOOL NOTES & NCERT SOLUTIONS

Complete notes and
NCERT solutions are
available on
FirstHope app only.



[Scan or click here](#)

Click here to get the app

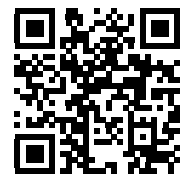


Available on Google Play

JOIN THE FIRSTHOPE COMMUNITY

Join our Telegram channel

Click here to join Telegram



[Scan or click here](#)

@FirstHope_CBSE_Notes

Instagram

@firsthope.school

[Click here to follow >](#)

YouTube channel

@firsthope.school

[Click here to watch >](#)

FirstHope website

firsthope.co.in

[Click here to visit our website >](#)

CBSE / Class 9 / Class 10 / Class 11 / Class 12

Preview notes and NCERT solutions. Full PDFs in the FirstHope app.