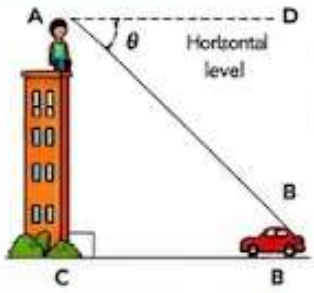
CLASS 10 CHEAT SHEET

ANGLE OF DEPRESSION

Some Applications of Trigonometry

WHAT IS ANGLE OF DEPRESSION?

Angle of depression is the angle made by the line of sight with the horizontal line through the observer's eye, when the observer looks downwards at an object.



In right ΔABC,
∠DAB = Angle of Depression = θ
(Angle of Depression = Angle of Elevation)

BASIC FORMULAS (Right-angled Triangle)

Let θ be the angle of depression.
Let the height of the observer above ground = h (AC)
Let the horizontal distance from observer to object = d (CB)
Line of sight (hypotenuse) = AB

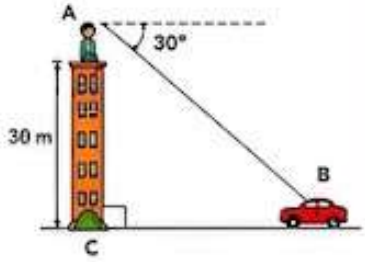
- $\tan\theta = \frac{\text{Opposite}}{\text{Adjacent}} = \frac{h}{d} \Rightarrow h = d\tan\theta \Leftrightarrow d = h\tan\theta$
- $\sin\theta = \frac{\text{Opposite}}{\text{Hypotenuse}} = \frac{h}{AB} \Rightarrow AB = \frac{h}{\sin\theta}$
- $\cos\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}} = \frac{d}{AB} \Rightarrow AB = \frac{d}{\cos\theta}$

Use tan θ most often in angle of depression problems!

EXAMPLES

Example 1

A person standing on the top of a 30 m high building observes a car on the ground at an angle of depression of 30°.
Find the distance of the car from the foot of the building.

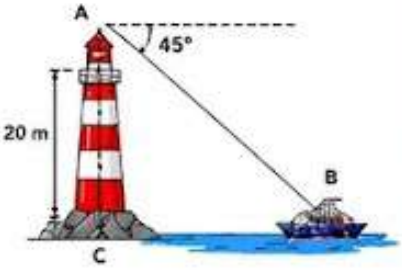


Solution:
Here, $\theta = 30°$, $h = 30$ m, distance d = ?

$$\tan 30° = \frac{h}{d} \Rightarrow \frac{1}{\sqrt{3}} = \frac{30}{d} \Rightarrow d = 30\sqrt{3}$$
$$\Rightarrow d = 30\sqrt{3} \text{ m} \approx 51.96 \text{ m}$$

Example 2

From the top of a 20 m high lighthouse, the angle of depression of a boat is 45°.
Find the horizontal distance of the boat.

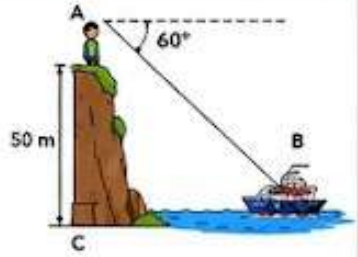


Solution:
Here, $\theta = 45°$, $h = 20$ m, distance d = ?

$$\tan 45° = \frac{h}{d} \Rightarrow 1 = \frac{20}{d} \Rightarrow d = 20 \text{ m}$$
$$\Rightarrow \text{Distance} = 20 \text{ m}$$

Example 3

A person standing on the top of a 50 m high cliff observes a ship in the sea at an angle of depression of 60°.
Find the distance of the ship from the foot of the cliff.

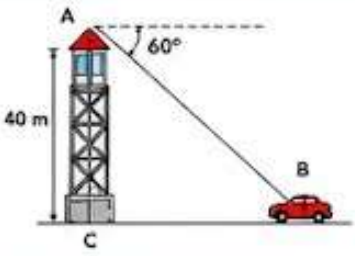


Solution:
Here, $\theta = 60°$, $h = 50$ m, distance d = ?

$$\tan 60° = \frac{h}{d} \Rightarrow \sqrt{3} = \frac{50}{d} \Rightarrow d = \frac{50}{\sqrt{3}}$$
$$\Rightarrow d = \frac{50\sqrt{3}}{3} \text{ m} \approx 28.87 \text{ m}$$

Example 4

A man standing on a 40 m high watch tower observes a car at an angle of depression of 60°.
Find the length of the line of sight.



Solution:
Here, $\theta = 60°$, $h = 40$ m, line of sight AB = ?

$$\sin 60° = \frac{h}{AB} \Rightarrow \frac{\sqrt{3}}{2} = \frac{40}{AB} \Rightarrow AB = \frac{40 \times 2}{\sqrt{3}}$$
$$\Rightarrow AB = \frac{80}{\sqrt{3}} \Rightarrow AB = \frac{80\sqrt{3}}{3} \text{ m} \approx 46.19 \text{ m}$$

TRICKS TO REMEMBER

- Draw a horizontal line through the observer.
- Mark the angle between the horizontal and line of sight.
- Angle of Depression = Angle of Elevation.
- Identify: Opposite (height) and Adjacent (horizontal distance).
- Use tan θ when height and distance are involved.

COMMON MISTAKES

- ✗ Measuring the angle from the vertical.
- ✗ Forgetting that angle of depression equals angle of elevation.
- ✗ Using sin instead of tan unnecessarily.
- ✗ Ignoring units in the final answer.
- ✗ Forgetting to draw the horizontal line through the observer.

STANDARD VALUES TO REMEMBER

θ	30°	45°	60°
tan θ	$1/\sqrt{3}$	1	$\sqrt{3}$
sin θ	1/2	$1/\sqrt{2}$	$\sqrt{5}/2$
cos θ	$\sqrt{3}/2$	$1/\sqrt{2}$	1/2

REMEMBER!

- ✓ Draw a neat labelled diagram.
- ✓ Convert the angle of depression into the angle of elevation.
- ✓ Choose the correct trigonometric ratio.
- ✓ Write the answer with proper units.

Good diagram + Correct ratio = Right answer!
Practice more problems to master ideas!

KEY TAKEAWAY: Angle of depression helps us determine heights, distances and line-of-sight lengths when an observer looks downward from an elevated position.