



APPLICATIONS OF TRIGONOMETRY

1 CHAPTER SNAPSHOT

Definition: Applications of Trigonometry deals with using trigonometric ratios to find unknown heights and distances indirectly, without actually measuring them.

Big Idea: Trigonometric ratios help us relate angles with sides of a right triangle to find heights and distances that are difficult or impossible to measure directly.

Real-Life Connections:

- Height of buildings, towers, lighthouse, airplanes, drones, etc.
- Distance between two objects
- Width of rivers, bridges, canals, etc.

Prerequisite Knowledge

- ✓ Right Triangle
- ✓ Trigonometric Ratios
- ✓ Standard Trigonometric Values
- ✓ Pythagoras Theorem

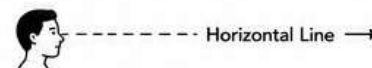
Key Vocabulary

- Horizontal Line
- Line of Sight
- Angle of Elevation
- Angle of Depression

2 HIGH-YIELD CONCEPTS

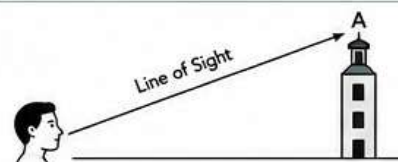
Horizontal Line:

The straight horizontal line parallel to the ground that passes directly through the observer's eye.



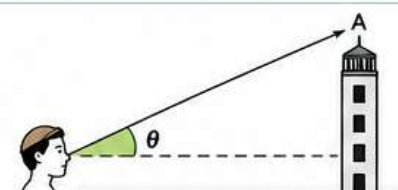
Line of Sight:

The line of sight is defined as the straight line drawn from the eye of an observer to the object viewed by the observer.



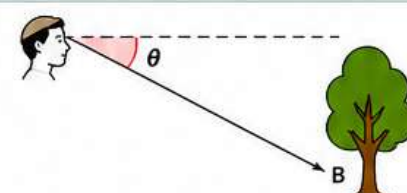
Angle of Elevation:

The angle of elevation is the angle formed by the line of sight and the horizontal line when the object is above the horizontal level.



Angle of Depression:

The angle of depression is the angle formed by the line of sight with the horizontal line when the object is below the horizontal level.



3 FORMULA BOX

Fundamental Formula

$$\tan \theta = \frac{\text{Opposite}}{\text{Adjacent}}$$

$$\sin \theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$$

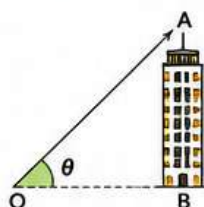
$$\cos \theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

Standard Trigonometric Values Table

Angle	0°	30°	45°	60°	90°
$\sin \theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan \theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not defined

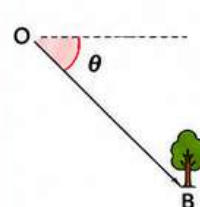
4 DIAGRAM LIBRARY

Angle of Elevation



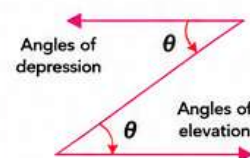
θ is the angle of elevation of A from O.

Angle of Depression



θ is the angle of depression of B from O.

Angle of Elevation and Angle of Depression are Equal



Angles of elevation and angle of depression are alternate interior angles; hence equal.

5 BOARD EXAM HOTSPOTS

- Finding Height
- Finding Distance
- Two Angles of Elevation
- Two Angles of Depression
- Width of River
- Height of Tower
- Building Shadow Problems
- Observer at Different Positions
- Combination of Trigonometry and Pythagoras
- Competency-Based Questions

6 PROBLEM SOLVING STRATEGY



1. Read the question carefully



2. Draw the diagram



3. Identify the angle



$\sin \theta$
 $\cos \theta$
 $\tan \theta$

4. Choose the correct trigonometric ratio



5. Substitute the values



6. Simplify



7. Write the answer with proper units.

7 SMART REVISION TIPS

- Angle of elevation: That is the case when we raise our heads to look at the objects.
- Angle of depression: That is the case when we lower our heads to look at the object.
- Alternate interior angles: Angle of depression is equal to angle of elevation, because they are alternate interior angles.



8 COMMON MISTAKES

- ✗ Using sin instead of tan (or vice versa)
- ✗ Forgetting to draw the horizontal line at eye level
- ✗ Incorrectly identifying the angle
- ✗ Taking wrong opposite or adjacent side
- ✗ Not keeping units in the final answer
- ✗ Calculation errors



9 TIPS TO REMEMBER

- ✓ Draw clear and neat diagrams.
- ✓ Mark angles properly.
- ✓ Use $\tan \theta$ in most height and distance problems.
- ✓ Check if the angle is elevation or depression.
- ✓ Always write the units.



10 RAPID REVISION (30 SECONDS)

- What is Angle of Elevation?
- What is Line of Sight?
- Which ratio is used when opposite and adjacent are known?
- What is $\tan 45^\circ$?
- What is $\tan 30^\circ$?



KEY TAKEAWAY:

Trigonometry helps us measure the unmeasurable! Observe the angle, choose the right ratio, and find the answer.

