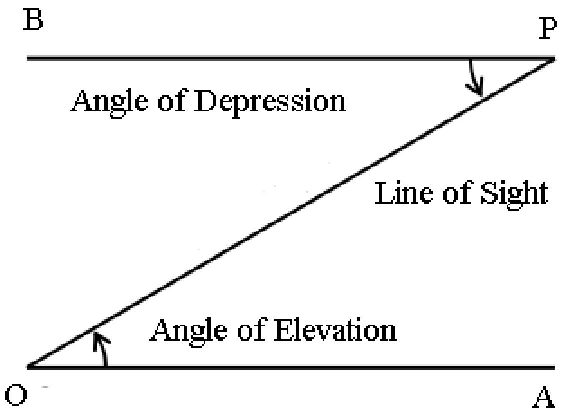
Revision Notes

Class 10 Maths

Chapter 9 - Applications of Trigonometry

Angles of Elevation and Depression:

- The **line of sight** is a line drawn from an observer's eye to a point in the thing being observed.
- **Angle of Elevation**:
  When the point being observed is above the horizontal level, the angle created by the line of sight with the horizontal is called the angle of elevation of the point being viewed.
- Let O and P be two points, with P being the greater level. Assume that OA and PB are horizontal lines that pass through O and P, respectively.
- If the observer is at O and the object is at P, the line OP is known as the line of sight of Point P, and the angle AOP between the line of sight and the horizontal line OA is known as the **angle of elevation** of Point P as seen from O.

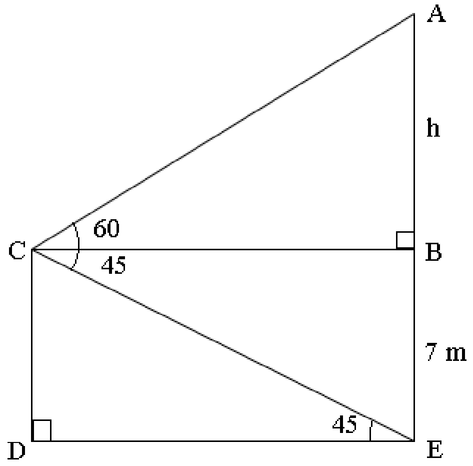


- **Angle of Depression**:
  The angle created by the line of sight with the horizontal when the point is below the horizontal level is known as the angle of depression of a point on the object being viewed.
- The angle BPO is known as the **angle of depression** of O as seen from P if the observer is at P and the object under examination is at O.
- From the diagram, it is obviously clear that the angle of elevation of a point P when viewed from a point O is **equal to** the angle of depression of O when viewed from P.

Example:

From the top of a 7 m high building, the angle of elevation of the top of a cable tower is 60^0 and the angle of depression of its foot is 45^0. Determine the height of the tower.

Answer:



- **Given Data:**
  Given height of building $= 7\text{ m}$
  Angle of the elevation of top of a tower from the top of building $= 60^0$
  Angle of the depression of the foot of a tower $= 45^0$

- **To find:**
  We need to calculate the height of the tower, that is AE

- **Solution:**
  From the given data, we have
  Angle of elevation, that is
  $\angle ACB = 60^0$
  Angle of depression, that is
  $\angle BCE = 45^0$
  Here,
  $BE = CD$
  $= 7\text{ m}$
  In the right angled triangle ABC,
  $$\tan\theta = \frac{\text{Opposite Side}}{\text{Adjacent Side}}$$

Therefore,

$$\tan 60^0 = \frac{\text{Opposite Side}}{\text{Adjacent Side}}$$

$$\tan 60^0 = \frac{h}{CB}$$

Thus,

$$h = CB \times \tan 60^0$$

Since,

$$\tan 60^0 = \sqrt{3}$$

Therefore,

$$h = CB \times \sqrt{3}$$

$$h = \sqrt{3}\ CB \qquad \text{------}(1)$$

In the right angled triangle CBE,

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

Therefore,

$$\tan 45^0 = \frac{\text{Opposite Side}}{\text{Adjacent Side}}$$

$$\tan 45^0 = \frac{7}{CB}$$

Since,

$$\tan 45^0 = 1$$

Therefore,

$$7 = CB \times 1$$

$$CB = 7 \qquad \text{------}(2)$$

By putting the equation (2) in the equation (1), we get

$$h = 7 \times \sqrt{3}$$

$$AB = 7\sqrt{3}$$

Therefore, total height of the tower can be calculated as,

Total height of the tower,

$$AE = AB + BE$$

$AE = 7\sqrt{3} + 7$

$AE = 7\left(\sqrt{3} + 1\right)$

Therefore, the total height of the tower is $7\left(\sqrt{3} + 1\right)$ **unit.**