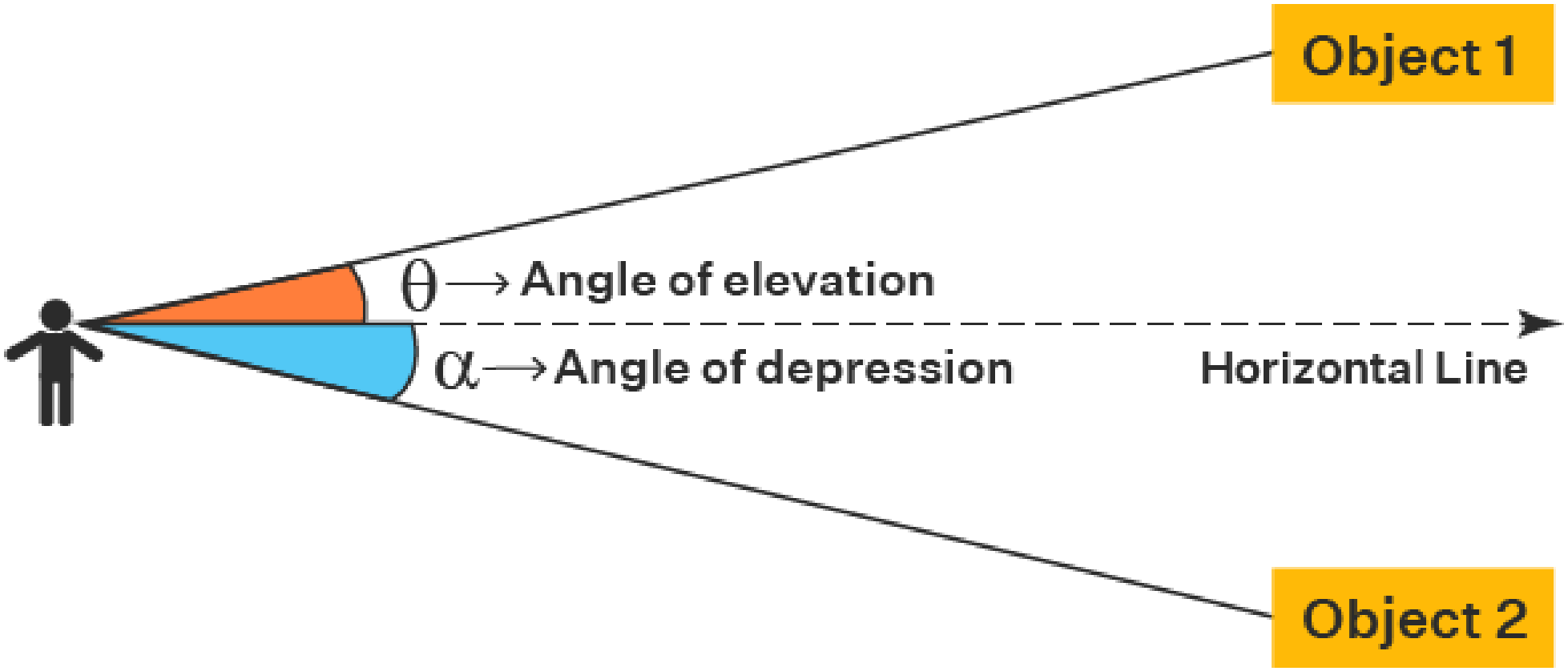
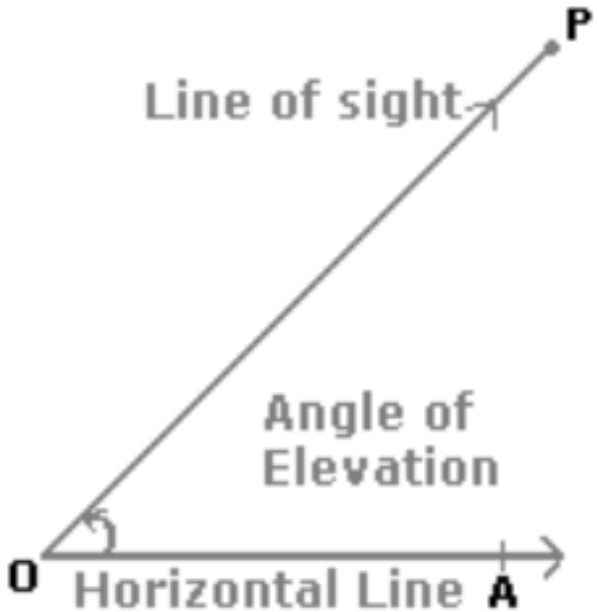
Height & Distances

Angle of Elevation and Depression



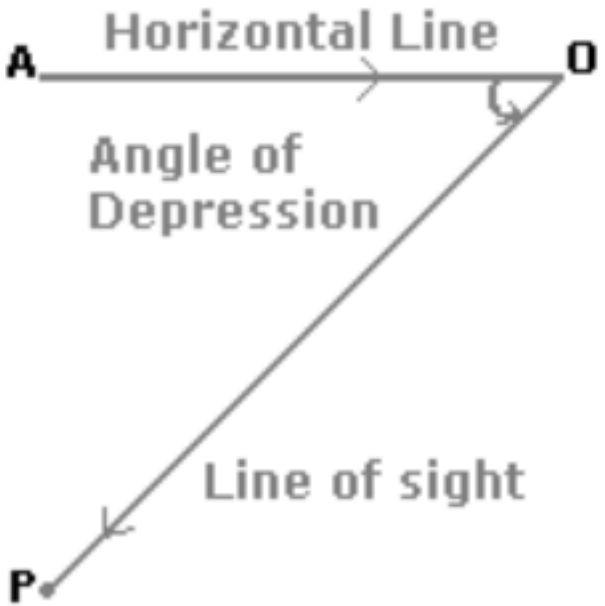
Angle of Elevation:



Suppose a man from a point O looks up at an object P, placed above the level of his eye. Then, the angle which the line of sight makes with the horizontal through O, is called the **angle of elevation** of P as seen from O.

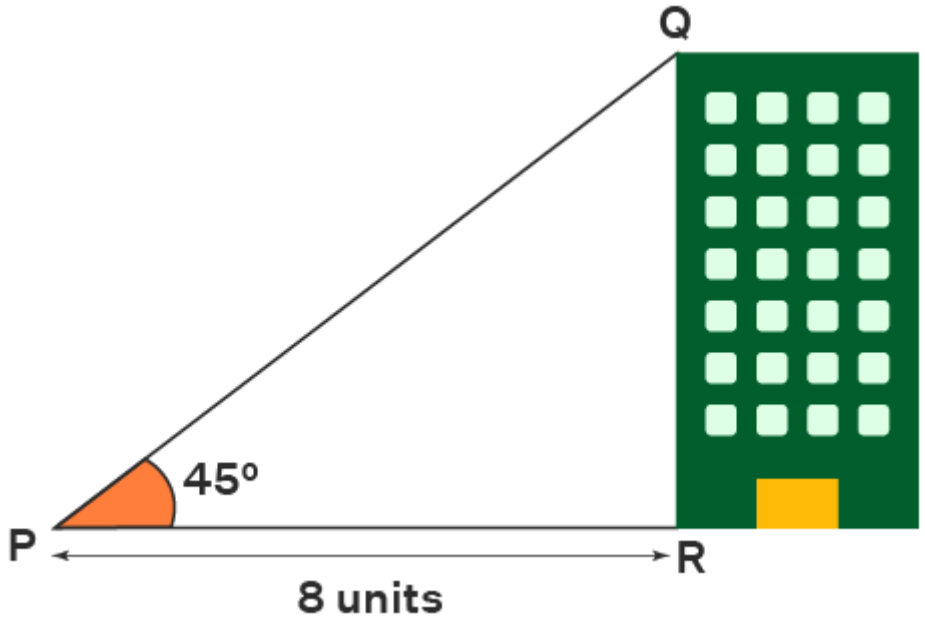
∴ Angle of elevation of P from O = ∠AOP.

Angle of Depression:



Suppose a man from a point O looks down at an object P, placed below the level of his eye, then the angle which the line of sight makes with the horizontal through O, is called the **angle of depression** of P as seen from O.

If a girl is standing at point P, which is 8 units away from a building, making an angle of elevation of 45° with point Q, find the height of the building.



Solution: Given that PR=8 units, and ∠QPR=45°. To find the height of the building (QR), we can use the angle of elevation formula tan θ=QR/PR.

tan 45° = QR/8

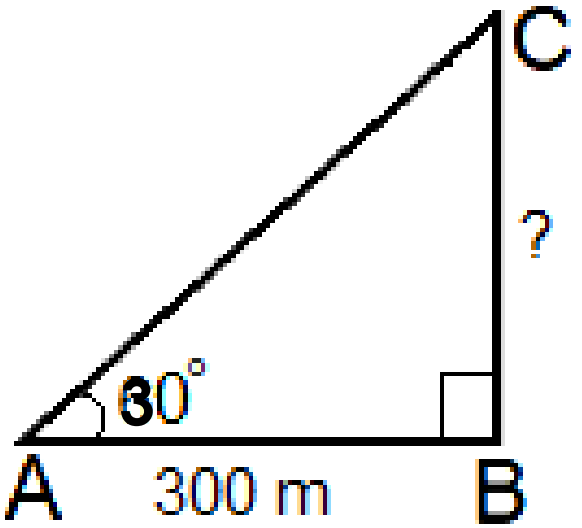
We know that tan 45° is 1, so,

1 = QR/8

QR=8 units

Answer: Therefore, the height of the building is 8 units.

300m from the foot of a cliff on level ground ,the angle of elevation of the top of a cliff is 30°. Find the height of this cliff.



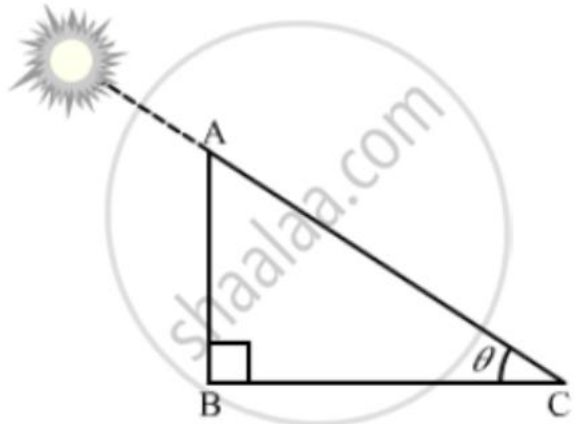
Let the foot of the cliff be B
Let the point of observer be A
Let the highest point of cliff be C

then ∠CBA=90°
∠CAB=30°

Applying tan to 30°,
we get-

BC/AB=tan 30°
BC/300=1/√3
BC=300/√3=100√3 m

The height of the vertical pole is $\sqrt{3}$ times the length of its shadow on the ground, then angle of elevation of the sun at that time is



Let the angle of elevation of the sun be θ.

Suppose AB is the height of the pole and BC is the length of its shadow.

It is given that, AB = $\sqrt{3}$BC

In right ΔABC,

$$\tan\theta = \frac{AB}{BC}$$

$$\Rightarrow \tan\theta = \frac{\sqrt{3}BC}{BC} = \sqrt{3}$$

$$\Rightarrow \tan\theta = \tan 60^\circ$$

$$\Rightarrow \theta = 60^\circ$$

Thus, the angle of elevation of the sun is 60°.

A ladder leaning against a wall makes an angle of 60° with the ground. If the length of the ladder is 19 m, then calculate the distance of the foot of the ladder from the wall.

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

Substituting the values:

$$\cos 60^\circ = \frac{x}{19}$$

Since $\cos 60^\circ = \frac{1}{2}$, we get:

$$\frac{1}{2} = \frac{x}{19}$$

Solving for x:

$$x = 19 \times \frac{1}{2} = 9.5 \text{ m}$$

If the height of a pole is $2\sqrt{3}$ metres and the length of its shadow is 2 metres, find the angle of elevation of the sun.

A. 50°

B. 60°

C. 70°

D. 80°

Let AB be the pole and AC be its shadow. Let angle of elevation, $\angle ACB = \theta$. Then, AB = $2\sqrt{3}$m, AC = 2 m. $\tan \theta = AB/AC = 2\sqrt{3}/2 = \sqrt{3}$ $\theta = 60°$. So, the angle of elevation is 60°