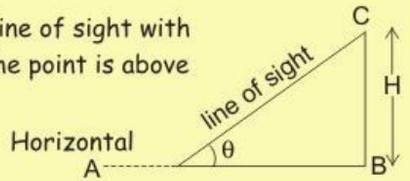
Heights & Distances

Angle of Elevation

Angle formed by the line of sight with the horizontal when the point is above the horizontal.



Height of tower
$BC = AB \times \tan\theta$
(given AB & θ)

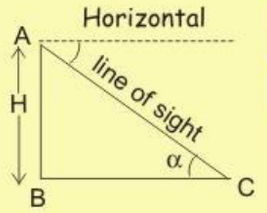
θ = Angle of elevation

Applications

- @ Navigation
- @ Land surveys
- @ Buildings
- @ Optics
- @ Statics
- @ Crystallography

Angle of Depression

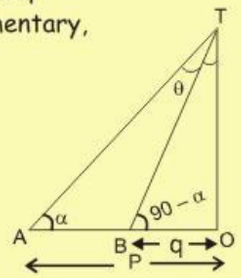
Angle formed by the line of sight with the horizontal when the point is below the horizontal.



Height of tower
$AB = \tan\alpha \times BC$
(given α & BC)

α = Angle of Depression

The angle of elevation of the top of a tower, as seen from two points A & B situated in the same line and at distances 'p' and 'q' respectively from the foot of the tower, are complementary, then show that the height of the tower is $\sqrt{pq}$



Sol. In ΔAOT,

$$\tan\alpha = \frac{OT}{OA} = \frac{h}{p} \quad \ldots\ldots (I)$$

In ΔBOT

$$\Rightarrow \tan(90-\alpha) = \frac{OT}{OB} = \frac{h}{q} \text{ or } \cot\alpha = \frac{h}{q} \quad \ldots.(ii)$$

Multiplying (i) and (ii), we have

$$\Rightarrow \tan\alpha \cot\alpha = \frac{h}{p} \times \frac{h}{q} \Rightarrow 1 = \frac{h^2}{pq} \Rightarrow h = \sqrt{pq}$$

The angle of elevation of a cloud from a point 60m above a lake is 30° and the angle of depression of the reflection of the cloud in the lake is 60°. Find the height of the cloud from the surface of the lake.

$$\tan 30° = \frac{H}{x} \Rightarrow x = \sqrt{3}H \quad \ldots (i)$$

$$\tan 60° = \frac{H+120}{x} \Rightarrow x = \frac{H+120}{\sqrt{3}} \quad \ldots (ii)$$

From eq. (i) and (ii)

$3H = H + 120$

$\Rightarrow H = 60m$

Height of the cloud from the surface of the lake = $H + 60 = 60 + 60 = 120m$