Some Applications of Trigonometry Ex 12.1 Q49

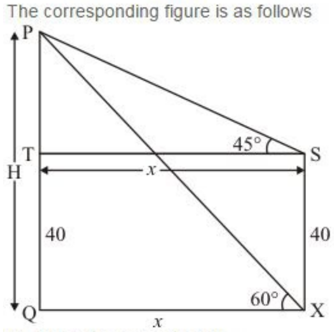
Answer :

Let PQ be the tower of height H m and an angle of elevation of the top of tower PQ from point X is 60°. Angle of elevation at 40 m vertical from point X is 45°.

Let $PQ = H$ m and $SX = 40$m. $OX = x$, $\angle PST = 45°$, $\angle PXQ = 60°$.

Here we have to find height of tower.

The corresponding figure is as follows



We use trigonometric ratios.

In ΔPST

$$\Rightarrow \quad \tan 45° = \frac{h}{x}$$

$$\Rightarrow \quad 1 = \frac{h}{x}$$

$$\Rightarrow \quad x = h$$

Again in ΔPXQ,

$$\Rightarrow \quad \tan 60° = \frac{h+40}{x}$$

$$\Rightarrow \quad \sqrt{3} = \frac{h+40}{x}$$

$$\Rightarrow \quad h+40 = \sqrt{3}h$$

$$\Rightarrow \quad h\left(\sqrt{3}-1\right) = 40$$

$$\Rightarrow \quad h = \frac{40}{\sqrt{3}-1}$$

$$\Rightarrow \quad h = 54.64$$

Therefore $H = 54.64 + 40$

$$\Rightarrow H = 94.64$$

Hence the height of tower is $\boxed{94.64 \text{ m}}$.

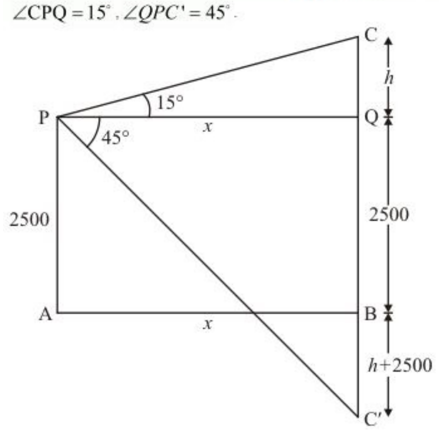
Some Applications of Trigonometry Ex 12.1 Q50

Answer :

Let AB be the surface of lake and P be the point of observation such that $AP = 2500$ m. Let C be the position of cloud and C' be the reflection in the lake. Then $CB = C'B$

Let PQ be the perpendicular from P on CB.

Let $PQ = x$ m, $CQ = h$, $QB = 2500$ m. then $CB = h + 2500$ consequently $C'B = h + 2500$ m. and $\angle CPQ = 15^\circ$, $\angle QPC' = 45^\circ$.



Here we have to find height of cloud.

We use trigonometric ratios.

In $\triangle PCQ$,

$$\Rightarrow \tan 15^\circ = \frac{CQ}{PQ}$$

$$\Rightarrow 2-\sqrt{3} = \frac{h}{x}$$

$$\Rightarrow x = \frac{h}{2-\sqrt{3}}$$

Again in $\triangle PQC'$,

$$\Rightarrow \tan 45^\circ = \frac{QB+BC'}{PQ}$$

$$\Rightarrow 1 = \frac{2500+h+2500}{x}$$

$$\Rightarrow x = 5000+h$$

$$\Rightarrow \frac{h}{2-\sqrt{3}} = 5000+h$$

$$\Rightarrow h = 2500\left(\sqrt{3}-1\right)$$

$$\Rightarrow CB = 2500+2500\left(\sqrt{3}-1\right)$$

$$\Rightarrow CB = 2500\sqrt{3}$$

Hence the height of cloud is $\boxed{2500\sqrt{3}}$ m.

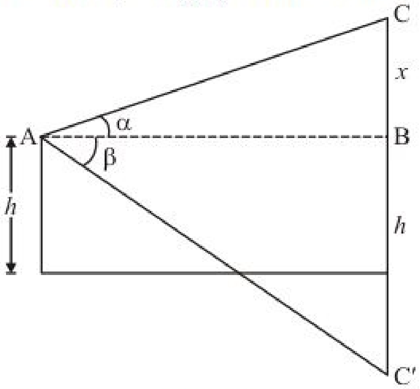
Some Applications of Trigonometry Ex 12.1 Q51

Answer :

Let C' be the image of cloud C. We have $\angle CAB = \alpha$ and $\angle BAC' = \beta$.
Again let $BC = x$ .and AC be the distance of cloud from point of observation.
We have to prove that

$$AC = \frac{2h\sec\alpha}{(\tan\beta - \tan\alpha)}$$

The corresponding figure is as follows



We use trigonometric ratios.

In ΔABC

$$\Rightarrow \quad \tan\alpha = \frac{BC}{AB}$$

$$\Rightarrow \quad \tan\alpha = \frac{x}{AB}$$

Again in $\Delta ABC'$

$$\Rightarrow \quad \tan\beta = \frac{BC'}{AB}$$

$$\Rightarrow \quad \tan\beta = \frac{x+2h}{AB}$$

Now,

$$\Rightarrow \tan\beta - \tan\alpha = \frac{x+2h}{AB} - \frac{x}{AB}$$

$$\Rightarrow \tan\beta - \tan\alpha = \frac{2h}{AB}$$

$$\Rightarrow \quad AB = \frac{2h}{\tan\beta - \tan\alpha}$$

Again in ΔABC

$$\Rightarrow \quad \cos\alpha = \frac{AB}{AC}$$

$$\Rightarrow \quad AC = \frac{AB}{\cos\alpha}$$

$$\Rightarrow \quad AC = \frac{2h\sec\alpha}{(\tan\beta - \tan\alpha)}$$

Hence distance of cloud from points of observation is $\boxed{\frac{2h\sec\alpha}{\tan\beta - \tan\alpha}}$

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