Some Applications of Trigonometry Ex 12.1 Q46

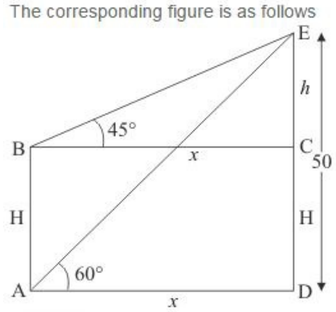
Answer :

Let H be the height of pole, makes an angle of depression from top of tower to top and bottom of poles are 45° and 60° respectively.

Let $AB = H$, $CE = h$, $AD = x$ and $DE = 50$m. $\angle CBE = 45°$ and $\angle DAE = 60°$.

Here we have to find height of pole.

The corresponding figure is as follows



In ΔADE

$$\Rightarrow \quad \tan A = \frac{DE}{AD}$$

$$\Rightarrow \quad \tan 60° = \frac{50}{x}$$

$$\Rightarrow \quad \sqrt{3} = \frac{3000}{x}$$

$$\Rightarrow \quad x = \frac{50}{\sqrt{3}}$$

Again in ΔBCE

$$\Rightarrow \quad \tan B = \frac{CE}{BC}$$

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

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

$$\Rightarrow \quad h = \frac{50}{\sqrt{3}}$$

$$\Rightarrow \quad h = 28.87$$

Therefore $H = 50 - h$

$$\Rightarrow \quad H = 50 - 28.87$$

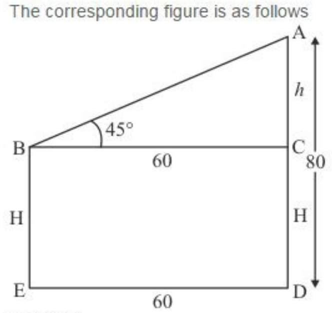
$$\Rightarrow \quad H = 21.13$$

Hence height of pole is $\boxed{21.13}$ m.

Some Applications of Trigonometry Ex 12.1 Q47

Answer :

Let the difference between two trees be DE = 60 m and angle of depression of the first tree from the top to the top of the second tree is $\angle ABC = 45^\circ$.
Let $BE = H$ m, $AC = h$ m, AD = 80m.
We have to find the height of the first tree
The corresponding figure is as follows



In ΔABC

$$\Rightarrow \quad \tan B = \frac{AC}{BC}$$

$$\Rightarrow \quad \tan 45^\circ = \frac{h}{60}$$

$$\Rightarrow \qquad 1 = \frac{h}{60}$$

$$\Rightarrow \qquad h = 60$$

Since $H = 80 - h$

$$\Rightarrow \quad H = 80 - 60$$

$$\Rightarrow \quad H = 20$$

Hence the height of first tree is $\boxed{20}$ m.

Some Applications of Trigonometry Ex 12.1 Q48

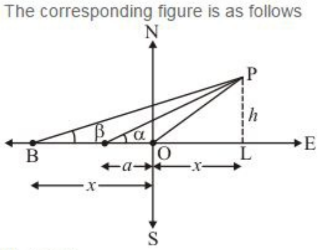
Answer :

Let OP be the tree and A, B be the two points such $OA = a$ and $OB = b$ and angle of elevation to the tops are α and β respectively. Let $OL = x$ and $PL = h$

We have to prove the following

$$h = \frac{(b-a)\tan\alpha\tan\beta}{(\tan\alpha - \tan\beta)}$$

The corresponding figure is as follows



In ΔALP

$$\Rightarrow \quad \tan\alpha = \frac{PL}{OA + OL}$$

$$\Rightarrow \quad \tan\alpha = \frac{h}{a + x}$$

$$\Rightarrow \quad \frac{1}{\cot\alpha} = \frac{h}{a + x}$$

$$\Rightarrow \quad h\cot\alpha = a + x \quad \text{...... (1)}$$

Again in ΔBLP

$$\Rightarrow \quad \tan\beta = \frac{PL}{OB + OL}$$

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

$$\Rightarrow \quad \frac{1}{\cot\beta} = \frac{h}{b + x}$$

$$\Rightarrow \quad h\cot\beta = b + x \quad \text{...... (2)}$$

Subtracting equation (1) from (2) we get

$$\Rightarrow \quad h\cot\beta - h\cot\alpha = b - a$$

$$\Rightarrow \quad h(\cot\beta - \cot\alpha) = b - a$$

$$\Rightarrow \qquad h = \frac{b-a}{\cot\beta - \cot\alpha}$$

$$h = \frac{(b-a)\tan\alpha\tan\beta}{(\tan\alpha - \tan\beta)}$$

Hence height of the top from ground is $\boxed{h = \frac{(b-a)\tan\alpha\tan\beta}{(\tan\alpha - \tan\beta)}}$.

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