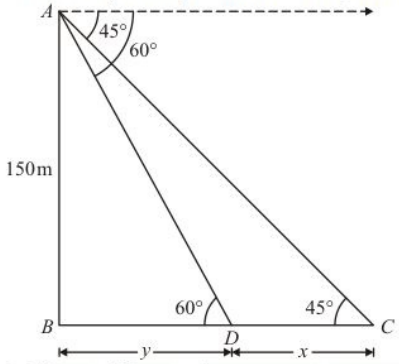
Some Applications of Trigonometry Ex 12.1 Q13

Answer :

Let AB be the tower of height $150\,\text{m}$ and Two objects are located when top of tower are observed, makes an angle of depression from the top and bottom of tower are 45° and 60° respectively.



Let $CD = x$, $BD = y$ and $\angle ADB = 60^\circ$, $\angle ACB = 45^\circ$

So we use trigonometric ratios.

In a triangle ABC,

$$\tan 45^\circ = \frac{150}{x+y}$$

$$\Rightarrow x + y = 150 \qquad \ldots\ldots(1)$$

Again in a triangle ABD,

$$\tan 60^\circ = \frac{150}{y}$$

$$\Rightarrow \sqrt{3} = \frac{150}{y}$$

$$\Rightarrow \sqrt{3}y = 150 \qquad \ldots\ldots(2)$$

So from (1) and (2) we get

$$x + \frac{150}{\sqrt{3}} = 150$$

$$\Rightarrow \sqrt{3}x = 150\left(\sqrt{3} - 1\right)$$

$$\Rightarrow x = 63.39$$

Hence the required distance is approximately $\boxed{63.4}$ m.

Some Applications of Trigonometry Ex 12.1 Q14

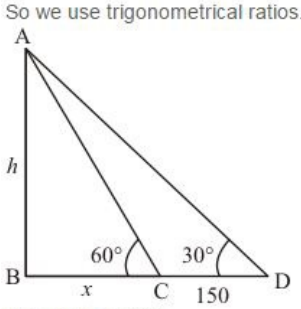
Answer :

Let h be height of tower and angle of elevation of foot of tower is 30°, on advancing 150 m towards the foot of tower then angle of elevation becomes 60°.

We assume that $BC = x$ and $CD = 150$ m.

Now we have to prove height of tower is 129.9 m.

So we use trigonometrical ratios.



In a triangle ABC,

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

$$\Rightarrow \quad \tan 60° = \frac{AB}{BC}$$

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

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

Again in a triangle ABD,

$$\Rightarrow \quad \tan D = \frac{AB}{BC + CD}$$

$$\Rightarrow \quad \tan 30° = \frac{h}{x + 150}$$

$$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{h}{x + 150}$$

$$\Rightarrow \quad x + 150 = \sqrt{3}h$$

$$\Rightarrow \quad x = \sqrt{3}h - 150$$

$$\Rightarrow \quad \frac{h}{\sqrt{3}} = \sqrt{3}h - 150$$

$$\Rightarrow \quad h = 3h - 150\sqrt{3}$$

$$\Rightarrow \quad 2h = 150\sqrt{3}$$

$$\Rightarrow \quad h = \frac{150 \times 1.732}{2}$$

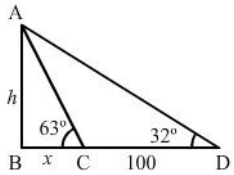
$$\Rightarrow \quad h = 129.9$$

Hence the height of tower is $\boxed{129.9}$ m proved.

Some Applications of Trigonometry Ex 12.1 Q15

Answer :

Let h be height of tower and the angle of elevation as observed from the foot of tower is 32° and observed move towards the tower with distance 100 m then angle of elevation becomes 63°.
Let $BC = x$ and $CD = 100$
Now we have to find height of tower
So we use trigonometrical ratios.



In a triangle ABC,

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

$$\Rightarrow \quad \tan 63° = \frac{AB}{BC}$$

$$\Rightarrow \quad 1.9626 = \frac{h}{x}$$

$$\Rightarrow \quad x = \frac{h}{1.9626}$$

Again in a triangle ABD,

$$\Rightarrow \quad \tan D = \frac{AB}{BC + CD}$$

$$\Rightarrow \quad \tan 32° = \frac{h}{x + 100}$$

$$\Rightarrow \quad 0.6248 = \frac{h}{x + 100}$$

$$\Rightarrow \quad x + 100 = \frac{h}{0.6248}$$

$$\Rightarrow \quad 100 = \frac{h}{0.6248} - \frac{h}{1.9626}$$

$$\Rightarrow \quad 100 = \frac{h \times 1.9626 - h \times 0.6248}{0.6248 \times 1.9626}$$

$$\Rightarrow \quad 100 = \frac{h(1.9626 - 0.6248)}{0.6248 \times 1.9626}$$

$$\Rightarrow \quad 100 = \frac{h(1.3378)}{0.6248 \times 1.9626}$$

$$\Rightarrow \quad 100 \times 0.6248 \times 1.9626 = h \times 1.3378$$

$$\Rightarrow \quad h = \frac{100 \times 0.6248 \times 1.9626}{1.3378}$$

$$\Rightarrow \quad = \frac{122.6232}{1.3378}$$

$$\Rightarrow \quad = 91.66$$

$$\Rightarrow \quad x = \frac{91.66}{1.9626}$$

$$\Rightarrow \quad = 46.7$$

So distance of the first position from the tower is = 100 + 46.7 = 146.7 m

Hence the height of tower is $\boxed{91.66}$ m and the desires distance is $\boxed{146.7.}$ m.

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