Some Applications of Trigonometry Ex 12.1 Q10

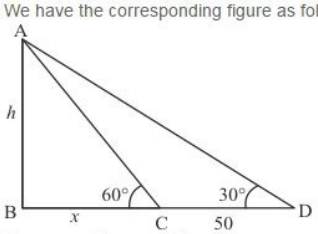
Answer :

Let AB be the tower of height h. And person makes an angle of elevation of top of tower is 30°, he walks 50 m towards the foot of tower then makes an angle of elevation 60°

Let $BC = x$, $CD = 50$, and $\angle ACB = 60°$, $\angle ADB = 30°$

Now we have to find height of tower.

We have the corresponding figure as follows



So we use trigonometric ratios.

In a triangle *ABC*,

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

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

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

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

Again in a triangle ADB,

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

$$\Rightarrow \qquad \tan 30° = \frac{h}{x + 50}$$

$$\Rightarrow \qquad \frac{1}{\sqrt{3}} = \frac{h}{x + 50}$$

$$\Rightarrow \qquad \sqrt{3}h = x + 50$$

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

$$\Rightarrow 3h = h + 50\sqrt{3}$$

$$\Rightarrow 2h = 50\sqrt{3}$$

$$\Rightarrow h = 25\sqrt{3}$$

$$\Rightarrow h = 25 \times 1.73$$

$$\Rightarrow h = 43.25$$

Hence the height of tower is $\boxed{43.25 \text{ m}}$.

Some Applications of Trigonometry Ex 12.1 Q11

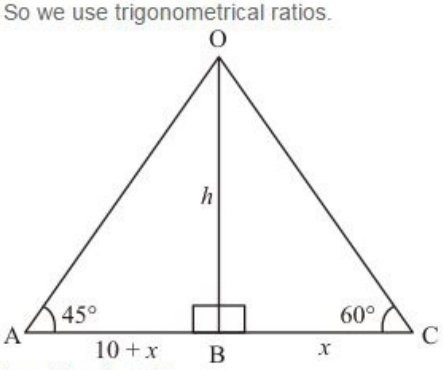
Answer :

Let h be height of tower AB and angle of elevation are 45° and 60° are given.

In a triangle OAC, given that $AB = 10+x$ and $BC = x$

Now we have to find height of tower.

So we use trigonometrical ratios.



In a triangle OAB,

$$\Rightarrow \qquad \tan A = \frac{OB}{AB}$$

$$\Rightarrow \qquad \tan 45° = \frac{OB}{AB}$$

$$\Rightarrow \qquad 1 = \frac{h}{10 + x}$$

$$\Rightarrow \qquad h = 10 + x$$

Therefore $x = h - 10$

Again in a triangle OCB,

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

$$\Rightarrow \quad \tan 60^\circ = \frac{OB}{BC}$$

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

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

Put $x = h - 10$

$$\Rightarrow \quad h = \sqrt{3}(h - 10)$$

$$\Rightarrow \quad h = \sqrt{3}h - 10\sqrt{3}$$

$$\Rightarrow \quad 10\sqrt{3} = h\left(\sqrt{3} - 1\right)$$

$$\Rightarrow \quad h = \frac{10\sqrt{3}}{\left(\sqrt{3} - 1\right)}$$

$$\Rightarrow \quad h = \frac{10 \times 1.732}{(1.732 - 1)}$$

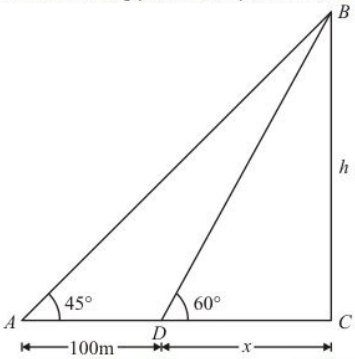
$$\Rightarrow \quad h = \frac{17.32}{0.372}$$

$$\Rightarrow \quad h = 23.66$$

Hence height of tower is $\boxed{23.66}$ m.

Answer :

Let BC be the height h of the parachutist and makes an angle of elevations 45° and 60° respectively at two observing points 100 apart from each other.



Let $\mathrm{AD}=100$, $\mathrm{CD}=x$, $\mathrm{BC}=h$ and $\angle \mathrm{CAB}=45^\circ$, $\angle \mathrm{CDB}=60^\circ$

So we use trigonometric ratios.

In triangle BCD

$$\tan 60^\circ = \frac{h}{x}$$

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

Now in triangle ABC,

$$\tan 45^\circ = \frac{h}{x+100}$$

$$\Rightarrow 1 = \frac{h}{x+100}$$

$$\Rightarrow x+100 = h$$

$$\Rightarrow \frac{h}{\sqrt{3}} + 100 = h$$

$$\Rightarrow h + 100\sqrt{3} = \sqrt{3}h$$

$$\Rightarrow h = \frac{100\sqrt{3}}{\sqrt{3}-1}$$

$$\Rightarrow h = 50\left(3+\sqrt{3}\right)$$

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

$$x = \frac{50\left(3+\sqrt{3}\right)}{\sqrt{3}}$$

$$= 50\left(1+\sqrt{3}\right)$$

Hence the maximum height is $\boxed{50\left(3+\sqrt{3}\right)}$ m = 236.6 m. and distance is $\boxed{50\left(1+\sqrt{3}\right)}$ m = 136.6 m.

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