Some Applications of Trigonometry Ex 12.1 Q16

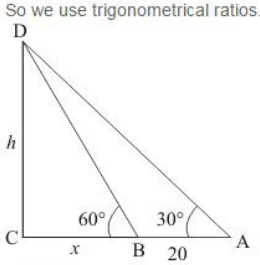
Answer :

Let h be height of tower and the angle of elevation of the top of tower from a point A on the ground is $30°$ and on moving with distance 20 m towards the foot of tower on the point B is $60°$.

Let $AB = 20$ and $BC = x$

Now we have to find height of tower and distance of tower from point A.

So we use trigonometrical ratios.



In ΔDBC,

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

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

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

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

Again in ΔDAC,

$$\Rightarrow \quad \tan A = \frac{CD}{BC + BA}$$

$$\Rightarrow \quad \tan 30° = \frac{h}{x + 20}$$

$$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{h}{x + 20}$$

$$\Rightarrow \quad x = \sqrt{3}h - 20$$

$$\Rightarrow \quad \frac{h}{\sqrt{3}} + 20 = \sqrt{3}h$$

$$\Rightarrow \frac{h}{\sqrt{3}} - \sqrt{3}h = -20$$

$$\Rightarrow \quad h - 3h = -20\sqrt{3}$$

$$\Rightarrow \quad -2h = -20\sqrt{3}$$

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

$$\Rightarrow \quad h = 17.32$$

$$\Rightarrow \quad x = \frac{10\sqrt{3}}{\sqrt{3}}$$

$$\Rightarrow \quad x = 10$$

So distance

$$\Rightarrow \quad AC = x + 20$$

$$\Rightarrow \quad AC = 30$$

Hence the required height is $\boxed{17.32}$ m and distance is $\boxed{30}$ m.

Some Applications of Trigonometry Ex 12.1 Q17

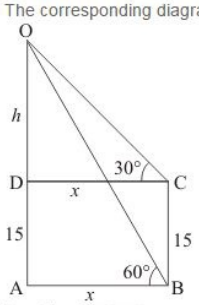
Answer :

In the figure let $OD = h$ and AD be the tower. The angle of elevation from the top of building to the top of tower is to be found 30°. Height of building is 15 m and an angle of elevation from the bottom of same building is found to be 60°.

Let $DC = x$ and $\angle C = 30°$, $\angle B = 60°$, $AD = 15$

Here we have to find height of tower and distance between the tower and building.

The corresponding diagram is as follows



In a triangle ODC,

$$\Rightarrow \quad \tan C = \frac{OD}{DC}$$

$$\Rightarrow \quad \tan 30° = \frac{OD}{DC}$$

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

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

Again in a triangle OAB,

$$\Rightarrow \quad \tan B = \frac{AD + DO}{AB}$$

$$\Rightarrow \quad \tan 60° = \frac{h+15}{x}$$

$$\Rightarrow \quad \sqrt{3} = \frac{h+15}{x}$$

$$\Rightarrow \quad \sqrt{3} = \frac{h+15}{\sqrt{3h}}$$

$$\Rightarrow \quad 3h = h+15$$

$$\Rightarrow \quad 2h = 15$$

$$\Rightarrow \quad h = 7.5$$

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

$$\Rightarrow \quad x = 7.5 \times 1.732$$

$$\Rightarrow \quad x = 12.9$$

So height of the tower is as follows:

$$\Rightarrow \quad OA = h+15$$

$$\Rightarrow \quad OA = 7.5+15$$

$$\Rightarrow \quad OA = 22.5$$

Hence the required height is $\boxed{22.5}$ meter and distance is $\boxed{12.9}$ meter.

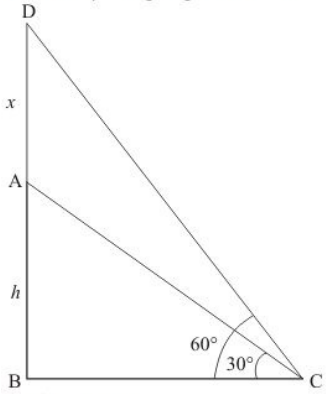
Some Applications of Trigonometry Ex 12.1 Q18

Answer :

Let *AB* be the tower of height *h* and *AD* be the flag pole on tower. At the point 9m away from the foot of tower, the angle of elevation of the top and bottom of flag pole are 60° and 30°. Let *AD* = *x*, *BC* = 9 and $\angle ACB = 30°$, $\angle DCB = 60°$.

Here we have to find height of tower and height of flag pole.

The corresponding diagram is as follows



In a triangle *ABC*,

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

$$\Rightarrow \quad \tan 30° = \frac{h}{9}$$

$$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{h}{9}$$

$$\Rightarrow \quad h = \frac{9}{\sqrt{3}}$$

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

Again in a triangle DBC,

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

$$\Rightarrow \quad \tan 60° = \frac{h + x}{9}$$

$$\Rightarrow \quad \sqrt{3} = \frac{h + x}{9}$$

$$\Rightarrow \quad 9\sqrt{3} = h + x$$

$$\Rightarrow \quad 9\sqrt{3} = 3\sqrt{3} + x$$

$$\Rightarrow \quad x = 6\sqrt{3}$$

So height of tower is $\boxed{3\sqrt{3}}$ meter and height of flag pole is $\boxed{6\sqrt{3}}$ meters.

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