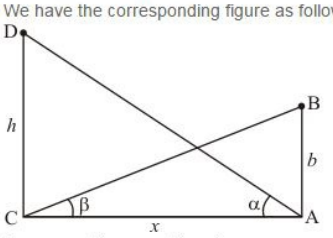
Some Applications of Trigonometry Ex 12.1 Q55

Answer :

Let h be the height of tower CD. The tower CD subtends an angle α at a point A. And the angle of depression of foot of tower at a point b meter just above A is β. Let $AC = x$ and $\angle ACB = \beta$, $\angle CAD = \alpha$.

Here we have to prove height of tower is $b\tan\alpha\cot\beta$

We have the corresponding figure as follows



So we use trigonometric ratios.

In ΔABC,

$$\Rightarrow \quad \tan\beta = \frac{AB}{AC}$$

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

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

$$\Rightarrow \quad x = b\cot\beta$$

Again in ΔACD

$$\Rightarrow \quad \tan\alpha = \frac{CD}{AC}$$

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

$$\Rightarrow \quad h = x\tan\alpha$$

$$\Rightarrow \quad h = b\tan\alpha\cot\beta$$

Hence the height of tower is $\boxed{b\tan\alpha\cot\beta}$.

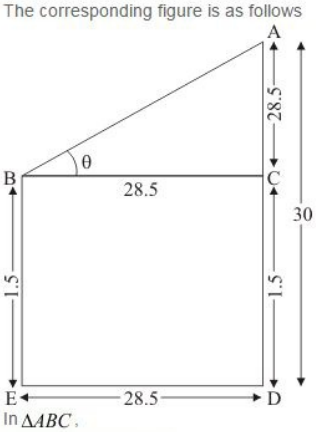
Some Applications of Trigonometry Ex 12.1 Q56

Answer :

Let BE be the observer of 1.5 m tall. And AD be the tower of height 30. Here we have to find angle of elevation of the top of tower.

Let $\angle ABC = \theta$

The corresponding figure is as follows



In ΔABC,

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

$$\Rightarrow \quad \tan\theta = \frac{28.5}{28.5}$$

$$\Rightarrow \quad \tan\theta = 1$$

$$\Rightarrow \quad \theta = 45^\circ$$

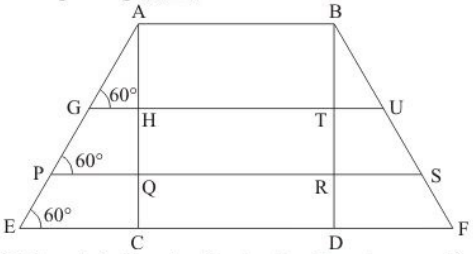
Hence the required angle is $\boxed{45^\circ}$.

Some Applications of Trigonometry Ex 12.1 Q57

Answer :

Let the length of stool, $AB = 0.5$ m, height $AC = 1.5$ m and its leg inclined at an angle of 60° to the ground.

Let length of leg $AE = h$ m.



We have to find length of leg, lengths of two steps equal in length.

In $\triangle AEC$, $\angle AEC = 60^\circ$

$$\sin 60^\circ = \frac{AC}{AE}$$

$$\Rightarrow \frac{\sqrt{3}}{2} = \frac{1.5}{h}$$

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

$$\Rightarrow h = 1.732$$

In ΔAGH, $\angle AGH = 60^\circ$ and $AH = 0.5$ m

$$\tan 60^\circ = \frac{AH}{GH}$$

$$\Rightarrow \sqrt{3} = \frac{0.5}{GH}$$

$$\Rightarrow GH = \frac{0.5}{\sqrt{3}}$$

$$\Rightarrow GH = 0.2886$$

Total length $= 0.5 + (0.2886 \times 2) = 1.1077$ m.

In ΔAPQ, $\angle APQ = 60^\circ$ and $AQ = 1$ m

$$\tan 60^\circ = \frac{AQ}{PQ}$$

$$\Rightarrow \sqrt{3} = \frac{1}{PQ}$$

$$\Rightarrow PQ = \frac{1}{\sqrt{3}}$$

$$\Rightarrow PQ = 0.577$$

Total lengths $0.5 + (0.577 \times 2) = 1.654$ m

Hence the length of leg is $\boxed{1.732}$ m.

And lengths of each step are $\boxed{1.1077}$ m and $\boxed{1.654}$ m.

********** END **********