

Dr Oliver Mathematics

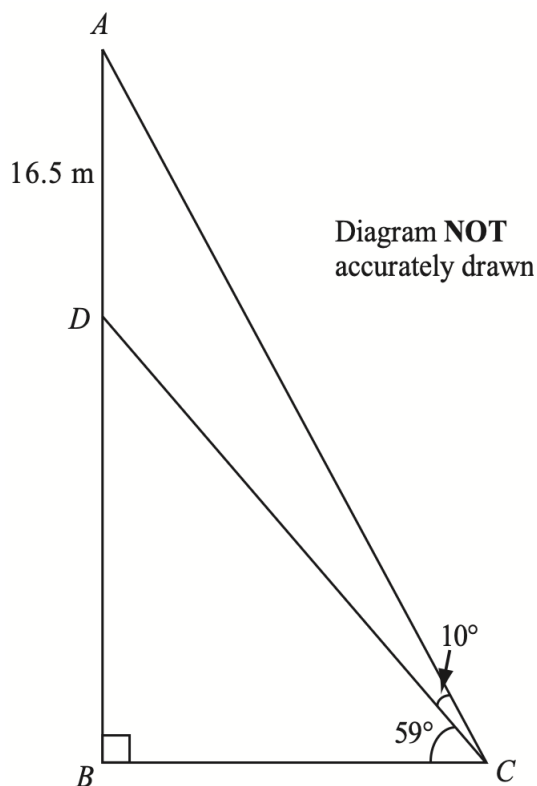
Worked Examples

Angles 3

From: IGCSE 2013 January Paper 4H Q25: Calculator

1. The diagram shows a vertical flagpole in Chennai, India.

(6)



- The point A is at the top of the flagpole.
- The point B is at the foot of the flagpole.
- There is a platform at the point D on the flagpole.
- B and C are points on horizontal ground.
- $AD = 16$ m.
- The angle of elevation of A from C is 69° .
- The angle of elevation of D from C is 59° .

Calculate the height, AB , of the flagpole.
Give your answer correct to 3 significant figures.

Solution

Well,

$$\begin{aligned}\tan &= \frac{\text{opp}}{\text{adj}} \Rightarrow \tan 59^\circ = \frac{BD}{BC} \\ &\Rightarrow \boxed{BD = BC \tan 59^\circ} \quad (1).\end{aligned}$$

and

$$\begin{aligned}\tan &= \frac{\text{opp}}{\text{adj}} \Rightarrow \tan 69^\circ = \frac{AD + BD}{BC} \\ &\Rightarrow \tan 69^\circ = \frac{16.5 + BD}{BC} \\ &\Rightarrow BC \tan 69^\circ = 16.5 + BD \\ &\Rightarrow \boxed{BD = BC \tan 69^\circ - 16.5} \quad (2).\end{aligned}$$

Equate (1) = (2):

$$\begin{aligned}BC \tan 59^\circ &= BC \tan 69^\circ - 16.5 \Rightarrow BC \tan 69^\circ - BC \tan 59^\circ = 16.5 \\ &\Rightarrow BC(\tan 69^\circ - \tan 59^\circ) = 16.5 \\ &\Rightarrow BC = \frac{16.5}{\tan 69^\circ - \tan 59^\circ}.\end{aligned}$$

Finally,

$$\begin{aligned}\tan &= \frac{\text{opp}}{\text{adj}} \Rightarrow \tan 69^\circ = \frac{AB}{BC} \\ &\Rightarrow AB = BC \tan 69^\circ \\ &\Rightarrow AB = \frac{16.5 \tan 69^\circ}{\tan 69^\circ - \tan 59^\circ} \\ &\Rightarrow AB = 45.688\,277\,81 \text{ (FCD)} \\ &\Rightarrow \underline{\underline{AB = 45.7 \text{ m (3 sf)}}}.\end{aligned}$$