

class-10
Exercise 9.1

- (14) A 1.2 m tall girl spots a balloon moving with the wind in a horizontal line at a height of 88.2 m from the ground. The angle of elevation of the balloon from the eyes of the girl at any instant is 60° . After some time, the angle of elevation reduces to 30° . Find the distance travelled by the balloon during the interval.

In ΔABC ,

$$\tan 60^\circ = \frac{AC}{BC}$$

$$\sqrt{3} = \frac{87}{BC}$$

$$BC = \frac{87}{\sqrt{3}}$$

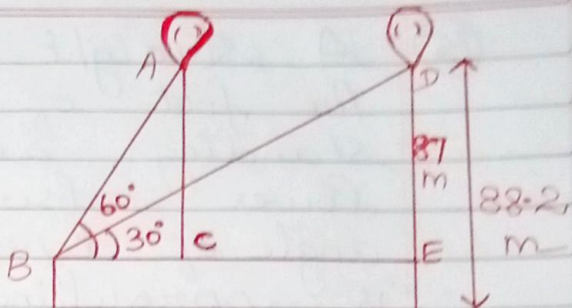
In ΔBDE ,

$$\tan 30^\circ = \frac{DE}{BE}$$

$$\frac{1}{\sqrt{3}} = \frac{87}{BE}$$

$$BE = 87\sqrt{3}$$

$$\begin{aligned} CE &= BE - BC \\ &= 87\sqrt{3} - \frac{87}{\sqrt{3}} \\ &= 87 \left(\sqrt{3} - \frac{1}{\sqrt{3}} \right) \\ &= 87 \left(\frac{3-1}{\sqrt{3}} \right) \\ &= 87 \times \frac{2}{\sqrt{3}} \\ &= 87 \times \frac{2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \\ &= \frac{87 \times 2\sqrt{3}}{3} \\ &= 29 \times 2\sqrt{3} \\ &= 58\sqrt{3} \text{ m} \end{aligned}$$



15) A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at an angle of depression of 30° , which is approaching the foot of the tower with a uniform speed. Six seconds later an angle of depression of the car is found to be 60° . Find the time taken by the car to reach the foot of the tower from this point?

Soln:

In $\triangle ABC$,

$$\tan 30^\circ = \frac{AB}{BC}$$

$$\frac{1}{\sqrt{3}} = \frac{AB}{BC}$$

$$BC = AB\sqrt{3} \rightarrow (1)$$

In $\triangle ABD$,

$$\tan 60^\circ = \frac{AB}{BD}$$

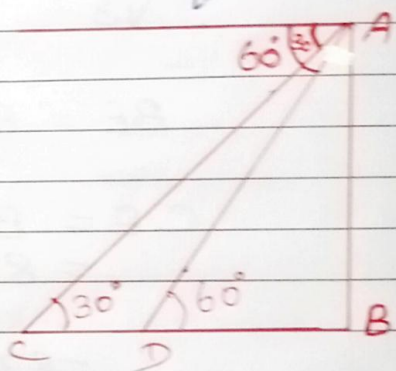
$$\sqrt{3} = \frac{AB}{BD}$$

$$BD = \frac{AB}{\sqrt{3}} \rightarrow (2)$$

$$BD = BC - CD$$

$$CD = BC - BD$$

$$= AB\sqrt{3} - \frac{AB}{\sqrt{3}} = \frac{2AB}{\sqrt{3}}$$



$$CD = \frac{2}{\sqrt{3}} AB$$

$$= 2BD$$

Since time taken by the car to travel a distance CD is 6 seconds.

$$\text{Time taken by the car to travel } BD = \frac{1}{2} CD$$

$$= \frac{1}{2} \times 6 \text{ seconds}$$

$$= 3 \text{ seconds.}$$

Hence the time taken by the car to reach the foot of the tower takes 3 seconds from that point.

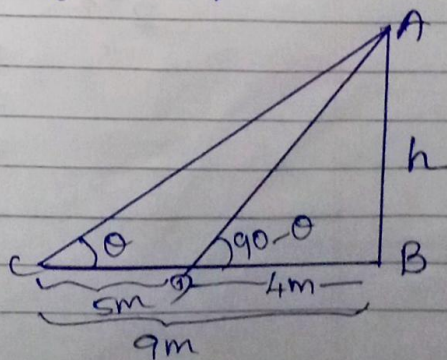
- (16) The angles of elevation of the top of a tower from two points at a distance of 4m and 9m from the base of the tower and in the same straight line with it are complementary. Prove that the height of the tower is 6m.

In $\triangle ABC$

$$\tan \theta = \frac{h}{9} \rightarrow \textcircled{1}$$

In $\triangle ABD$

$$\tan(90^\circ - \theta) = \frac{h}{4}$$



wkt, "tan (90 - θ) = cot θ ."

$$\text{Cot } \theta = \frac{h}{4}$$

$$\Rightarrow \tan \theta = \frac{4}{h} \rightarrow \textcircled{2}$$

from $\textcircled{1}$ and $\textcircled{2}$

$$\frac{h}{9} = \frac{4}{h}$$

$$\Rightarrow h^2 = 36$$

$$\Rightarrow h = 6 \text{ m}$$

\therefore Height of the tower = 6m.