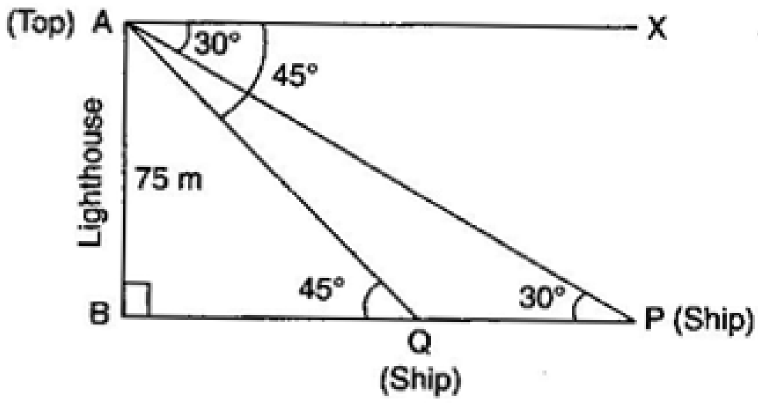


$$\tan 45^\circ = \frac{AB}{BQ}$$

$$\Rightarrow 1 = \frac{75}{BQ}$$

$$\Rightarrow BQ = 75 \text{ m..........(i)}$$

In right triangle ABP,

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

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AB}{BQ + QP}$$

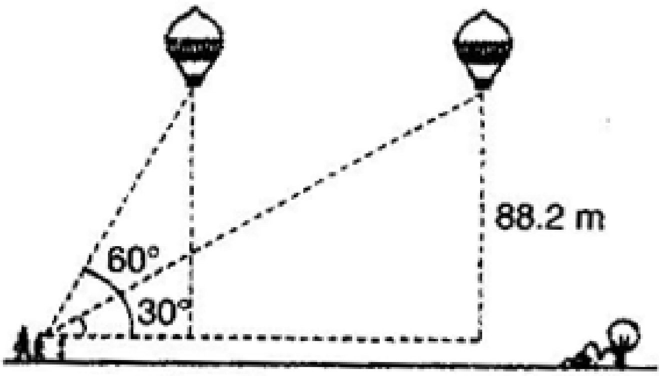
$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AB}{75 + QP} \text{ [From eq. (i)]}$$

$$\Rightarrow 75 + QP = 75\sqrt{3}$$

$$\Rightarrow QP = 75\left(\sqrt{3} - 1\right) \text{ m}$$

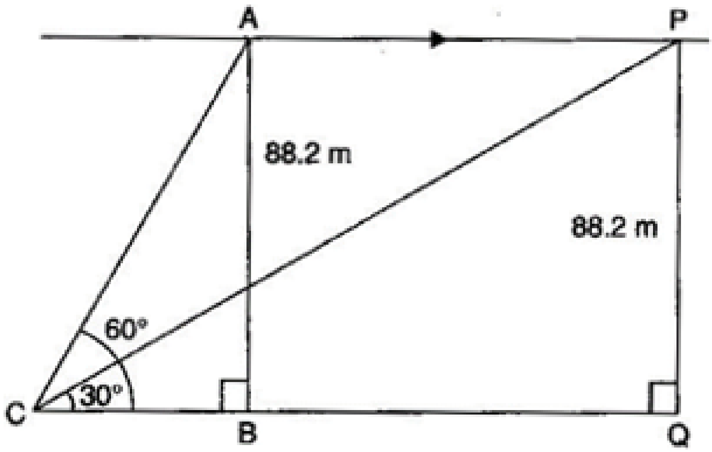
Hence the distance between the two ships is $75\left(\sqrt{3} - 1\right)$ m.

Q14. 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 distant is 60° After some time, the angle of elevation reduces to 30° (see figure). Find the distance travelled by the balloon during the interval.



Ans: In right triangle ABC,

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



$$\Rightarrow \sqrt{3} = \frac{88.2}{BC}$$

$$\Rightarrow BC = \frac{88.2}{\sqrt{3}} \text{ m}$$

In right triangle PQC,

$$\tan 30^\circ = \frac{PQ}{CQ}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{PQ}{CB + BQ}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{88.2}{\frac{88.2}{\sqrt{3}} + BQ}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{88.2\sqrt{3}}{88.2 + BQ\sqrt{3}}$$

$$\Rightarrow 88.2 + BQ\sqrt{3} = 264.6$$

$$\Rightarrow BQ\sqrt{3} = 264.6 - 88.2$$

$=176.4$

$$\Rightarrow BQ = \frac{176.4}{\sqrt{3}} = \frac{176.4 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}}$$

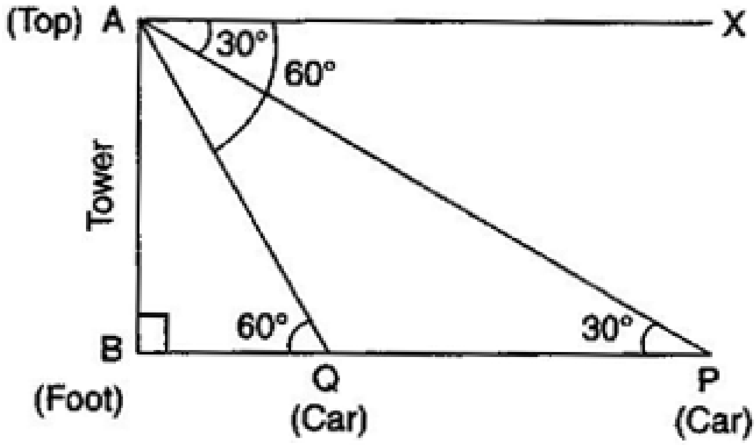
$$= 58.8\sqrt{3} = \frac{588\sqrt{3}}{10} = \frac{294\sqrt{3}}{5} \text{ m}$$

Hence the distance travelled by the balloon during the interval is $\frac{294\sqrt{3}}{5}$ m.

Q15. 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, the angle of depression of the car is found to be Find the time taken by the car to reach the foot of the tower from this point.

Ans: In right triangle ABP,

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



$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AB}{BP}$

$\Rightarrow$ BP = AB$\sqrt{3}$ ....(i)

In right triangle ABQ,

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

$\Rightarrow \sqrt{3} = \frac{AB}{BQ}$

$\Rightarrow$ BQ = $\frac{AB}{\sqrt{3}}$ ....(ii)

$\because$ PQ = BP − BQ

$\therefore$ PQ = AB$\sqrt{3}$ − $\frac{AB}{\sqrt{3}}$

= $\frac{3AB - AB}{\sqrt{3}}$ = $\frac{2AB}{\sqrt{3}}$ = 2BQ [From eq. (ii)]

$\Rightarrow$ BQ = $\frac{1}{2}$ PQ

$\because$ Time taken by the car to travel a distance PQ = 6 seconds.

$\therefore$ Time taken by the car to travel a distance BQ,

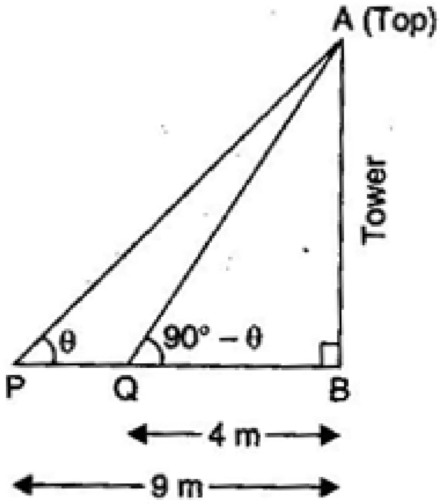
i.e. $\frac{1}{2}$ PQ = $\frac{1}{2}$ x 6 = 3 seconds.

Hence, the further time taken by the car to reach the foot of the tower is 3 seconds.

Q16. The angles of elevation of the top of a tower from two points at a distance of 4 m and 9 m from the base of the tower and in the same straight line with it are complementary. Prove that the height of the tower is 6 m.

Ans: Let $\angle$ APB = θ

Then, $\angle$ AQB = $(90^\circ - \theta)$



[$\angle$ APB and $\angle$ AQB are complementary]

In right triangle ABP,

$$\tan\theta = \frac{AB}{PB}$$

$$\Rightarrow \tan\theta = \frac{AB}{9} \quad \text{..........(i)}$$

In right triangle ABQ,

$$\tan\left(90^\circ - \theta\right) = \frac{AB}{QB}$$

$$\Rightarrow \cot\theta = \frac{AB}{4} \quad \text{..........(ii)}$$

Multiplying eq. (i) and eq. (ii),

$$\frac{AB}{9}.\frac{AB}{4} = \tan\theta.\cot\theta$$

$$\Rightarrow \frac{AB^2}{36} = 1 \Rightarrow AB^2 = 36$$

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

Hence, the height of the tower is 6 m.

Proved.

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