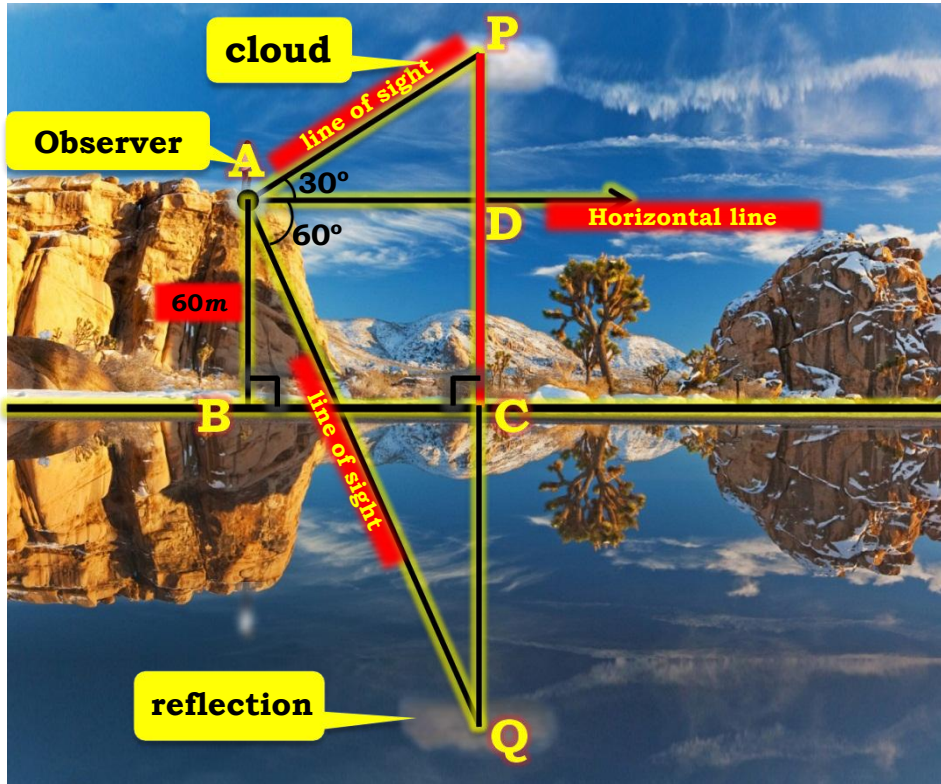


TOPIC

SOLVED QUESTIONS

Q. The angle of elevation of a cloud from a point 60m above a lake is 30° and the angle of depression of the reflection of cloud in the lake is 60° . Find the height of the cloud from lake surface.

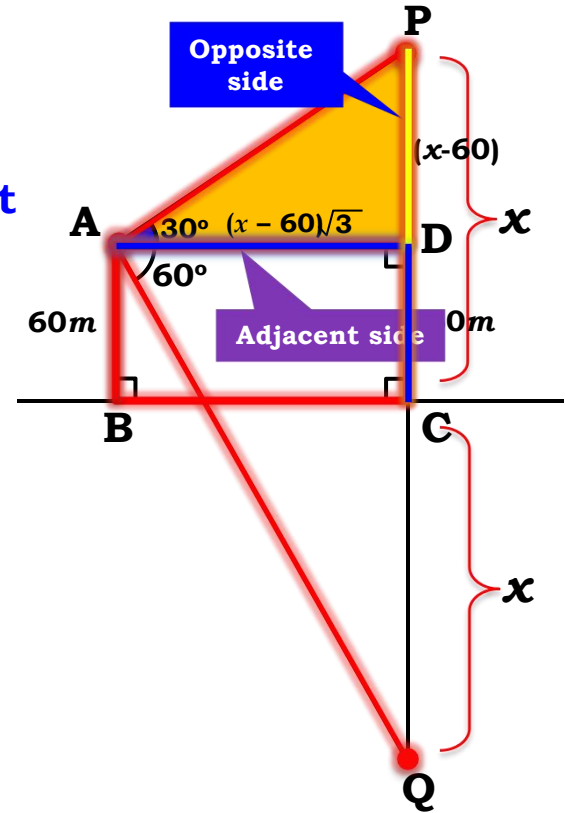


Height of the person is neglected

Distance of cloud from lake surface = Distance of its reflection from lake surface

Q. The angle of elevation of a cloud from a point A is 30° and the angle of depression of its reflection in the lake is 60° . Find the height of the cloud.

Consider $\triangle ADP$ of right angle



Sol. : A represents observer above the lake.

$AB = 60 \text{ m}$

P represents the cloud.

$\angle PAD$ is the angle of elevation.

$\angle PAD = 30^\circ$

Q represents the reflection of cloud.

$\angle DAQ$ is the angle of depression.

$\angle DAQ = 60^\circ$

In right angled $\triangle ADP$,

$$\tan 30^\circ = \frac{PD}{AD}$$

$$\therefore \frac{1}{\sqrt{3}} = \frac{x - 60}{AD}$$

$$\therefore AD = (x - 60)\sqrt{3} \text{ m}$$

Q. The angle of elevation of a cloud from a point A on the ground is 60° and the angle of depression of the cloud from the same point A is 30°. Find the height of the cloud above the ground.

Consider $\Delta A Q D$
 Adjacent side $\rightarrow AD$

Sol. : In right angled $\Delta A Q D$,

$$\tan 60^\circ = \frac{DQ}{AD}$$

$$\sqrt{3} = \frac{x + 60}{\sqrt{3}(x - 60)}$$

$\tan 60^\circ = \sqrt{3}$

$$\sqrt{3} \cdot \sqrt{3}(x - 60) = x + 60$$

$$3x - 180 = x + 60$$

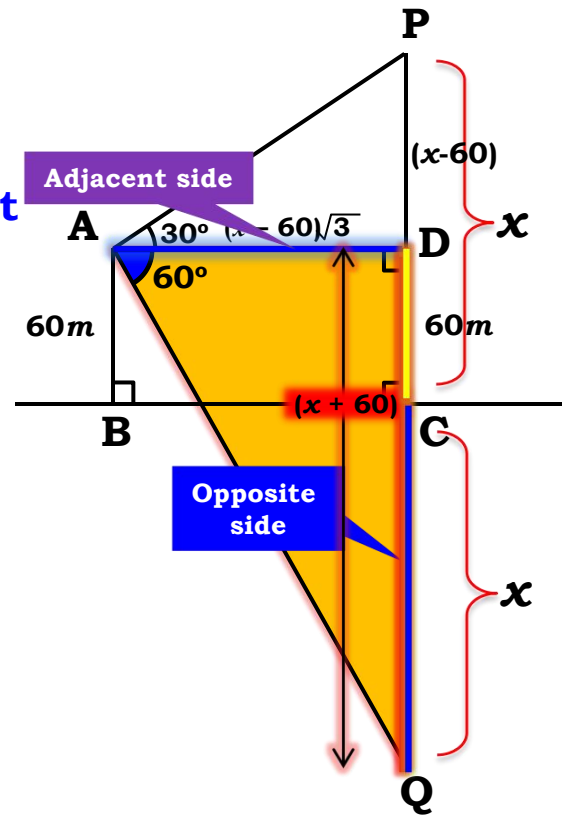
$$3x - x = 60 + 180$$

$$2x = 240$$

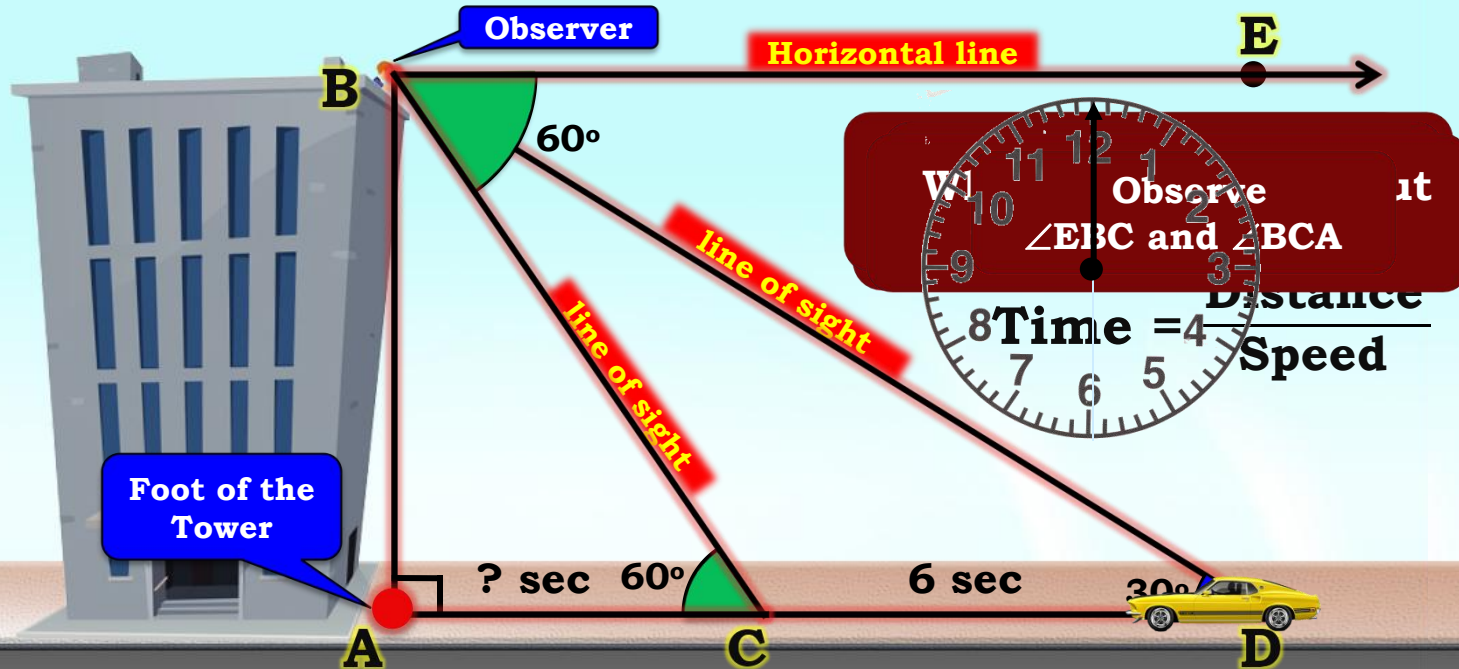
$$x = 120$$

$$PC = 120 \text{ m}$$

The height of cloud above the lake is 120 m



Q. A straight highway leads to the foot of tower. A man standing at the top of tower observes a car at an angle of depression of 30° , which is approaching the foot of the tower with uniform speed. Six seconds later, the 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.



Q. A straight highway leads to the foot of tower. A man standing at the top of tower observes a car at C, the angle of depression is 60°. After 6 sec, the car is found to be at D. The angle of depression is 30°. Find the height of tower and the distance of the car to reach the foot of the tower from this point.

Consider $\triangle BAC$

Sol. Let the height of tower (AB) be 'h' m
Let the distance of the foot of tower to the car at C be 'x' m

Let the distance of the car from C to D be 'y' m

In right $\triangle BAC$,

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

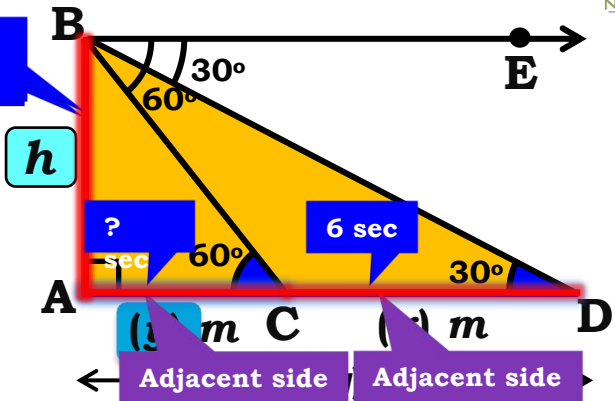
$$\therefore \sqrt{3} = \frac{h}{y}$$

$$\therefore h = \sqrt{3}y \dots(i)$$

In right $\triangle BAD$,

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

$$\therefore \frac{1}{\sqrt{3}} = \frac{h}{x+y}$$

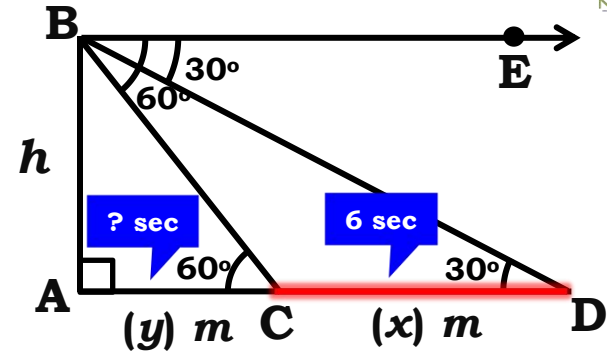


$$\begin{aligned} \therefore x + y &= h\sqrt{3} \\ \therefore x + y &= \sqrt{3}y \times \sqrt{3} \text{ [From (i)]} \\ \therefore x + y &= 3y \\ \therefore x &= 2y \dots(ii) \end{aligned}$$

Q. A straight highway leads to the foot of tower. A man standing at the top of tower observes a car at an angle of depression of 30° , which is approaching the foot of the tower with uniform speed. Six seconds later, the 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.

Sol. Distance covered by car in 6 seconds = x m **$x = 2y$... (ii)**

$$\begin{aligned}
 \therefore \text{Speed of the car} &= \frac{\text{Distance}}{\text{Time}} \\
 &= \frac{x}{6} \\
 &= \frac{\cancel{2y}}{\cancel{6}_3} \quad [\text{From (ii)}] \\
 \therefore \text{Speed of the car} &= \frac{y}{3} \text{ m/sec}
 \end{aligned}$$



\therefore Time taken by car to reach the foot of tower from point C,

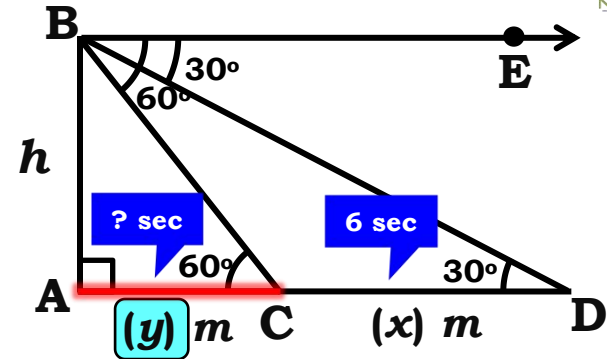
$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

Q. A straight highway leads to the foot of tower. A man standing at the top of tower observes a car at an angle of depression of 30° , which is approaching the foot of the tower with uniform speed. Six seconds later, the 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.

Sol. Time taken by car to reach the foot of tower from point C,

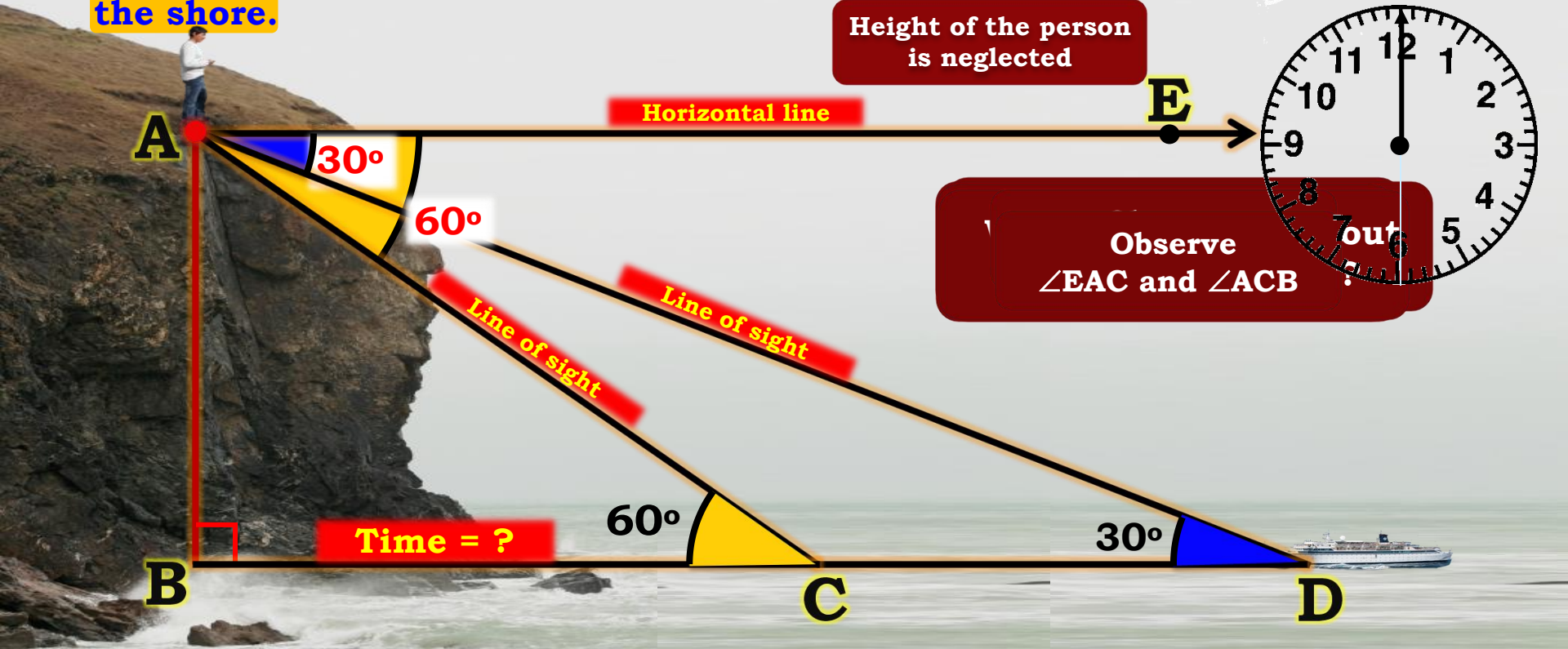
$$\begin{aligned} \text{Time} &= \frac{\text{Distance}}{\text{Speed}} \\ &= \frac{y}{\frac{y}{3}} \\ &= \cancel{y} \times \frac{3}{\cancel{y}} = 3 \text{ sec.} \end{aligned}$$

Time taken by the car to reach the foot of tower from this point is 3 sec.



$$\text{Speed of the car} = \frac{y}{3} \text{ m/sec}$$

Q. A man on cliff observes a boat at an angle of depression 30° , which is sailing towards the point of the shore immediately beneath him. Three minutes later the angle of depression of boat is found to be 60° . Assuming that the boat sails at uniform speed, determine how much more time it will take to reach the shore.



Q. A man on cliff observes a boat at an angle of depression 30° , which is sailing towards the point of the shore immediately beneath him. Three minutes later the angle of depression of boat is found to be 60° . Assuming that the boat sails at uniform speed, determine how much more time it will take to reach the shore.

Sol. D and C are the initial and final positions of the ship.

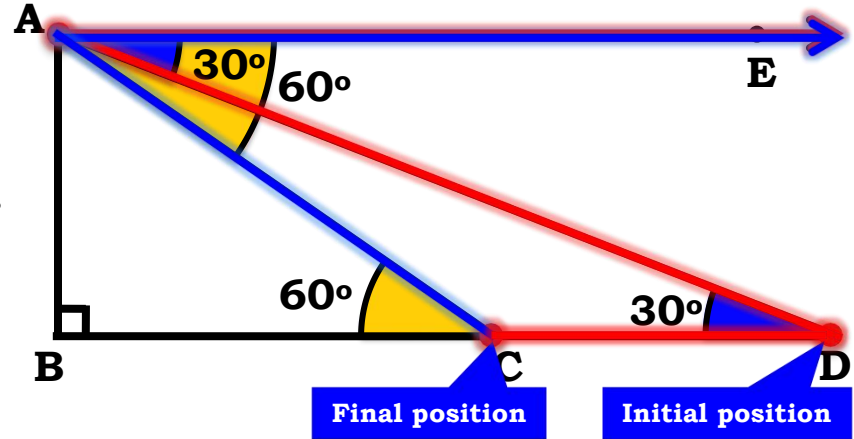
A represents the position of observer.

$\angle EAD$ and $\angle EAC$ are the angles of depression.

$$\angle EAD = 30^\circ, \quad \angle EAC = 60^\circ,$$

$$\left. \begin{aligned} \angle EAD &= \angle ADB = 30^\circ \\ \angle EAC &= \angle ACB = 60^\circ \end{aligned} \right\} \text{ [Alternate angles]}$$

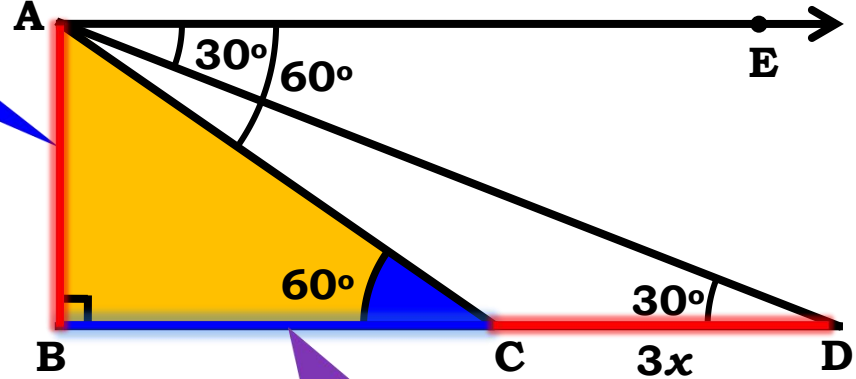
The ship took 3 mins to travel from D to C



Q. A man on a cliff observes a boat at an angle of depression 30° , which is sailing towards him. Immediately beneath him, the angle of depression of the boat is found to be 60° . Assuming that the boat sails at a uniform speed, how much more time it will take to reach the shore.

Ratio of BC belongs to $\triangle ABC$

Sol. Let the uniform speed be x
 Time taken from C to D = 3 minutes
 \therefore Distance from C to D = Speed \times Time



Opposite side

Adjacent side

$\tan 60^\circ = \sqrt{3}$

$$\text{Time} = \frac{\text{Distance}}{\text{speed}} = \frac{BC}{x}$$

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

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

$$\therefore AB = \sqrt{3} BC$$

Q. A man is sailing on a boat towards a lighthouse on a cliff. The angle of depression from the top of the cliff to the boat is 30° , which is sailing $3\sqrt{3}$ units directly beneath him. Three minutes later the angle of depression is to be 60° . Assuming that the boat sails at a constant speed, how much more time it will take to reach the shore.

Ratio of $\tan 30^\circ = \frac{1}{\sqrt{3}}$
 BD is made up of BC and CD

Sol. In right angled $\triangle ABD$,

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

$$\therefore \frac{1}{\sqrt{3}} = \frac{AB}{BD}$$

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

$$\therefore \sqrt{3} BC = \frac{BD}{\sqrt{3}}$$

$$\therefore 3BC = BD$$

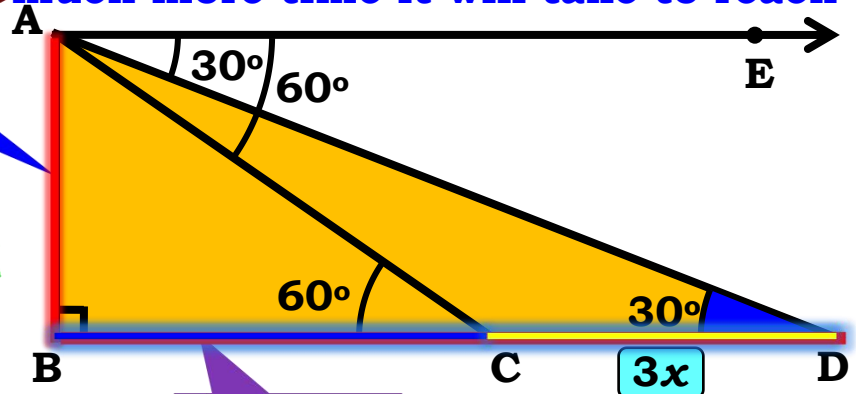
$$\therefore 3BC = BC + CD$$

$$\therefore 2BC = CD$$

Opposite side

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

$$\text{Time} = \frac{BC}{x}$$



Adjacent side

$$\begin{aligned} \text{Time} &= \frac{\text{Distance}}{\text{speed}} = \frac{BC}{x} \\ &= \frac{1.5x}{x} = 1.5 \text{ min} \end{aligned}$$

The time taken to reach the shore is 1.5 min

$$\therefore BC = \frac{CD}{2}$$

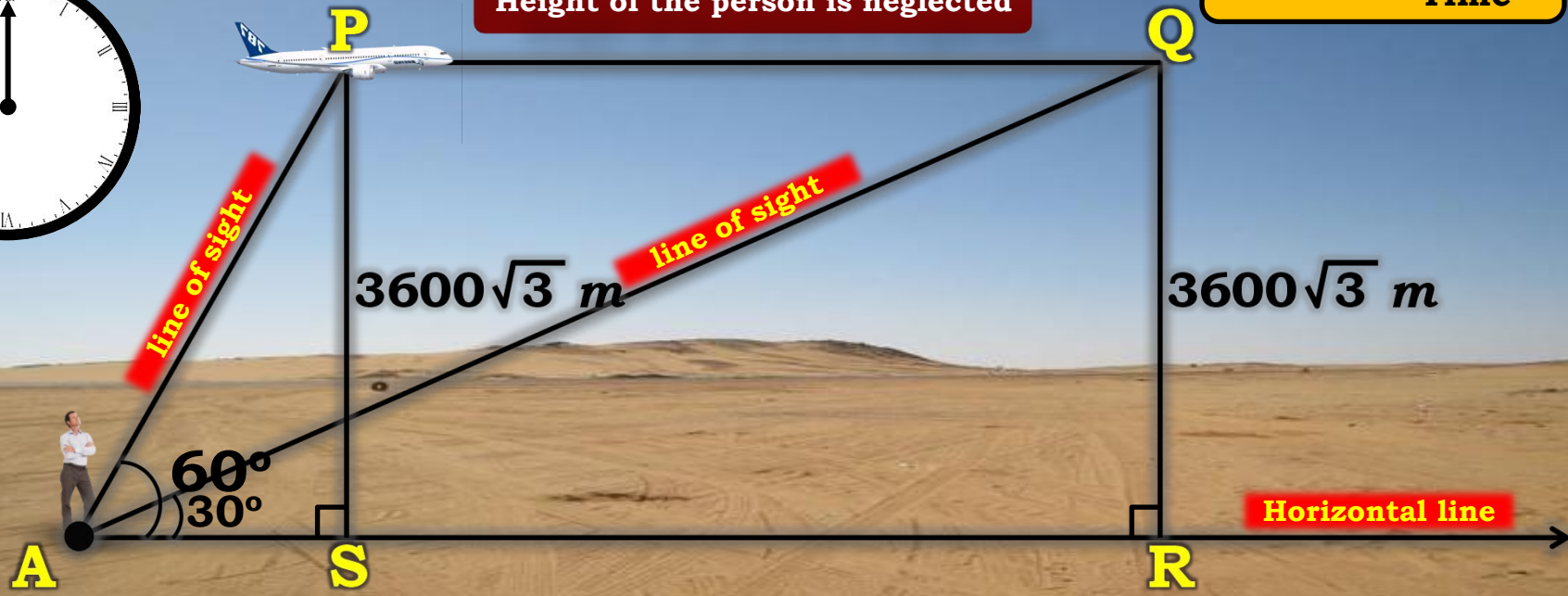
$$\therefore BC = \frac{3x}{2}$$

$$\therefore BC = 1.5x \text{ units}$$

Q. The angle of elevation of a jet plane from a point A on the ground is 60° . After a flight of 30 seconds, the angle of elevation changes to 30° . If the jet plane is flying at a constant height of $3600\sqrt{3}$ meter, Find the speed of the jet plane ($\sqrt{3} = 1.732$)

Speed = $\frac{\text{Distance}}{\text{Time}}$

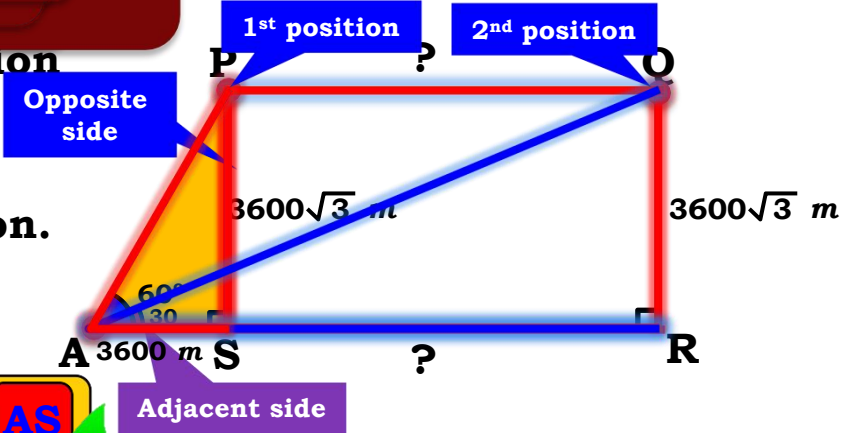
Height of the person is neglected



Q. The angle of elevation of a jet plane on the ground is 60° . After a flight of 30 seconds, the angle of elevation changes to 30° . If the jet plane is flying at a constant height of $3600\sqrt{3}$ meter, Find the speed of the jet plane.

Opposite side of ΔPSA

Sol. Let P and Q be the first and second position of a jet plane. A represents the point on the ground.



$\angle PAS$ and $\angle QAR$ are the angles of elevation.
 $\angle PAS = 60^\circ$, $\angle QAR = 30^\circ$

PS and QR represents constant height at which the jet plane is flying.

PS $\tan 60^\circ = \sqrt{3}$

$SR = AR - AS$

$\tan 60^\circ = \frac{PS}{AS}$

Speed = $\frac{\text{Distance}}{\text{Time}}$

$\therefore \sqrt{3} = \frac{3600\sqrt{3}}{AS}$

$\therefore AS = 3600 \text{ m}$

Q. The angle of elevation of a jet from point A on the ground is 60° . After a flight of 30 sec, the angle of elevation changes to 30° . If the jet is flying horizontally at a height of $3600\sqrt{3}$ meter, Find the speed of the jet.

△PQR and △PQR belongs to △QRA
 tan $30^\circ = \frac{QR}{AR}$

Sol. In right angled △QRA,

$$\tan 30^\circ = \frac{QR}{AR}$$

$$\therefore \frac{1}{\sqrt{3}} = \frac{3600\sqrt{3}}{AR}$$

$$\therefore AR = 3600\sqrt{3} \times \sqrt{3}$$

$$\therefore AR = 3600 \times 3$$

$$\therefore AR = 10800 \text{ m}$$

$$AS + SR = AR$$

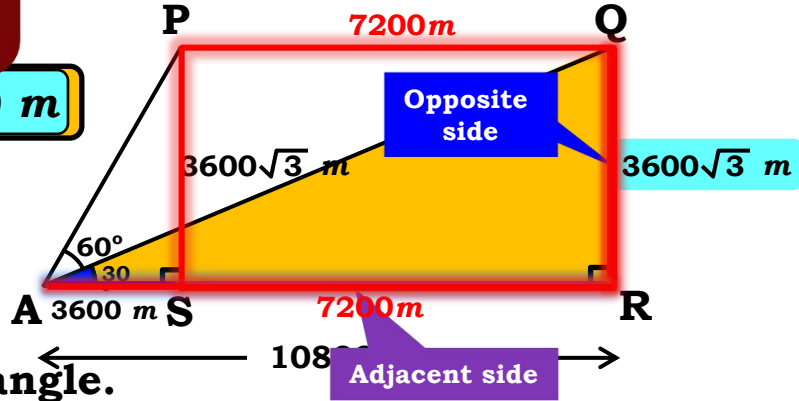
$$\therefore 3600 + SR = 10800$$

$$\therefore SR = 10800 - 3600$$

$$\therefore SR = 7200 \text{ m}$$

$$AS = 3600 \text{ m}$$

$$SR = AR - AS$$



□PQRS is a rectangle.

$$PQ = SR = 7200 \text{ m}$$

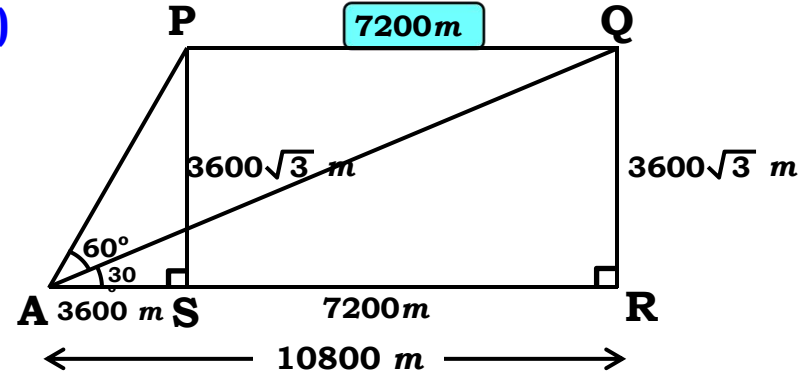
Distance covered in 30 sec. = 7200 m

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{PQ}{30 \text{ sec.}}$$

**Q. The angle of elevation of a jet plane from a point A on the ground is 60° .
After a flight of 30 seconds, the angle of elevation changes to 30° .
If the jet plane is flying at a constant height of $3600\sqrt{3}$ meter,
Find the speed of the jet plane. ($\sqrt{3} = 1.732$)**

Sol.

$$\begin{aligned}
 \text{Speed} &= \frac{\text{PQ}}{30 \text{ sec.}} && \boxed{1 \text{ hr.} = 3600 \text{ sec.}} \\
 &= \frac{7200 \text{ m}}{30 \text{ sec.}} \\
 &= \frac{7200}{1000} \div \frac{30}{3600} \text{ km/hr.} \\
 &= \frac{7200}{1000} \times \frac{3600}{30} = 72 \times 12 \\
 &= 864 \text{ km/hr.}
 \end{aligned}$$



The speed of the jet plane is 864 km/hr.

Thank You