

# UPDAAN



## 2025

### Some Application of Trigonometry

Mathematics

Lecture – 03

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# Topics

*to be covered*



## 1 Badhiya Questions (Part - 02)







**WORK HARD**  
**DREAM BIG**  
**NEVER GIVE UP !!**



## Topic : Application



#Q. The angles of depression of the top and bottom of a building 50 meters high as observed from the top of a tower are  $30^\circ$  and  $60^\circ$  respectively. Find the height of the tower, and also the horizontal distance between the building and the tower. [PYQ]

To Find: AC, CD (BE)

$\triangle ABE$

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

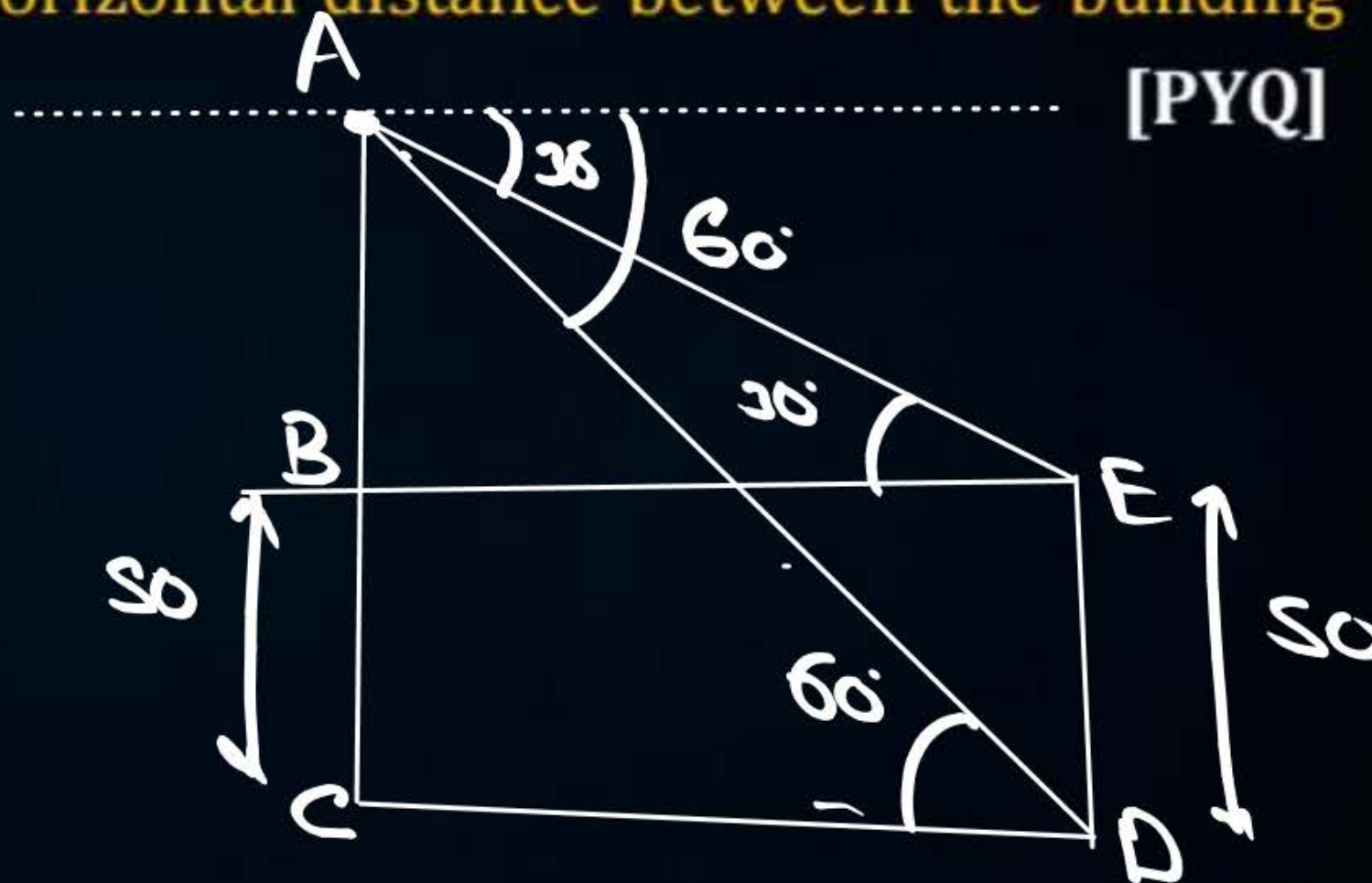
$$\frac{1}{\sqrt{3}} = \frac{AB}{BE}$$

$\triangle ACD$

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

$$\sqrt{3} = \frac{AB+BC}{DC}$$

$$\sqrt{3} = \frac{AB+50}{BE}$$







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

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

$$2S\sqrt{3} = BE$$

Horizontal distance  
b/w building  
and tower.

$$\frac{AB+SO}{BE} = \sqrt{3}$$

$$\frac{AB+SO}{AB\sqrt{3}} = \sqrt{3}$$

$$AB+SO = 3AB$$

$$SO = 3AB - AB$$

$$SO = 2AB$$

$$2Sm = AB$$

$$\begin{aligned} \therefore AC &= AB + BC \\ &= 2S + SO \\ AC &= 7Sm \end{aligned}$$



#Q. Two pillars of equal height and on either side of a road, which is 100 m wide. The angles of elevation of the top of the pillars are  $60^\circ$  and  $30^\circ$  at a point on the road between the pillars. Find the position of the point between the pillars and the height of each pillar. [PYQ]

To Find: BC and CD,  $AB = DE$

$\triangle ABC$

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

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

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

$\triangle ECD$

$$\tan 30 = \frac{ED}{CD}$$

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

$$CD = AB\sqrt{3} \quad (2)$$

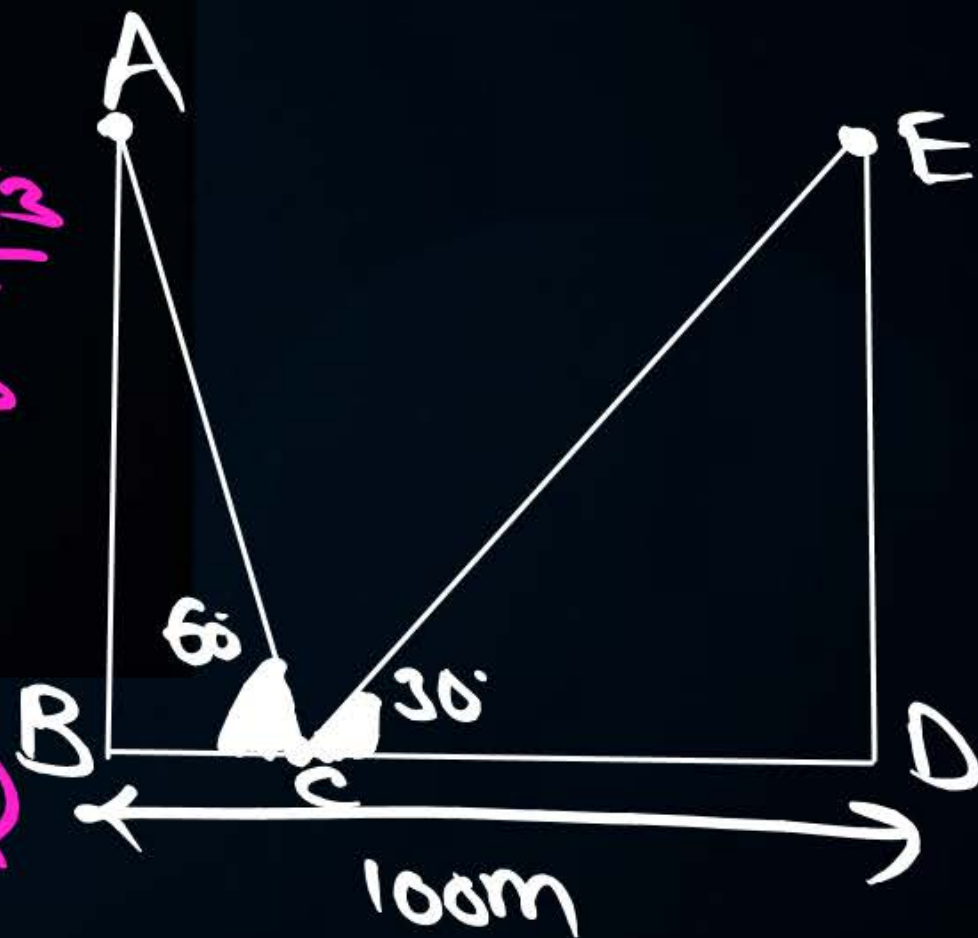
(1) + (2)

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

$$100 = \frac{AB + 3AB}{\sqrt{3}}$$

$$100\sqrt{3} = 4AB$$

$$25\sqrt{3} = AB$$



From eq<sup>n</sup> ①

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

$$BC = \frac{25\sqrt{3}}{\sqrt{3}}$$

$$BC = 25\text{m}$$

From eq<sup>n</sup> ②

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

$$CD = (25\sqrt{3})\sqrt{3}$$

$$CD = 75\text{m}$$



**Topic : Application**

#Q. From a window 15 meters high above the ground in a street, the angle of elevation and depression of the top and the foot of another house on the opposite side of the street are  $30^\circ$  and  $45^\circ$  respectively show that the height of the opposite house is 23.66 meters. (Take  $\sqrt{3} = 1.732$ )

$\triangle ABE$

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

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

$$\frac{1}{\sqrt{3}} = \frac{AB}{15}$$

$$\frac{15}{\sqrt{3}} = AB$$

$$5\sqrt{3} = AB$$

$\triangle EDC$

$$\tan 45^\circ = \frac{ED}{DC}$$

$$1 = \frac{ED}{DC}$$

$$1 = \frac{15}{DC}$$

$$DC = 15\text{m}$$

$$\Rightarrow EB = 15\text{m}$$

$$\begin{aligned} \therefore AC &= AB + BC \\ &= 5\sqrt{3} + 15 \\ &= 5(1.732) + 15 \\ &= 8.66 + 15 \\ &= 23.66\text{m} \end{aligned}$$





#Q. 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 angles of elevation of the balloon from the eyes of the girl at any instant is  $60^\circ$ . After some time, the angle of elevation reduces to  $30^\circ$ . Find the distance travelled by the balloon during the interval. [NCERT]

To Find:  $GF = HE = CD$

$\triangle GHA$

$\triangle AFE$

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

$$\tan 30 = \frac{FE}{AE}$$

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

$$\frac{1}{\sqrt{3}} = \frac{87}{AH + HE}$$

$$AH = \frac{87 \times \sqrt{3}}{\sqrt{3}}$$

$$AH + HE = 87\sqrt{3}$$

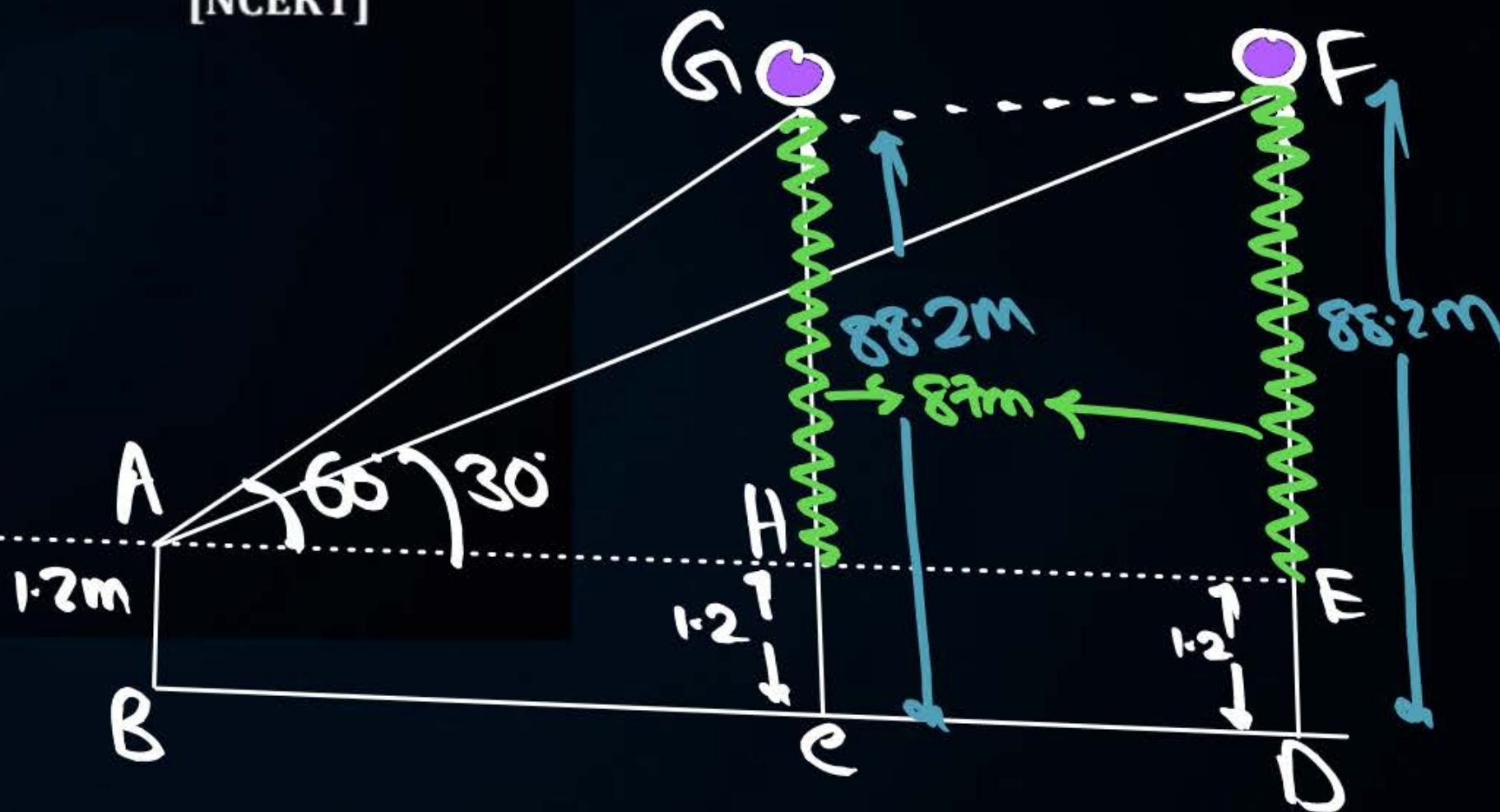
$$AH = \frac{87\sqrt{3}}{3}$$

$$29\sqrt{3} + GF = 87\sqrt{3}$$

$$GF = 87\sqrt{3} - 29\sqrt{3}$$

$$GF = 58\sqrt{3} \text{ m}$$

$$AH = 29\sqrt{3} \text{ m}$$





## Topic : Application



#Q. As observed from the top of a light house, 100m above sea level, the angle of depression of a ship, sailing directly towards it, changes from  $30^\circ$  to  $45^\circ$ . Determine the distance travelled by the ship during the period of observation.

To Find: SR

$\triangle POR$

$$\tan 45^\circ = \frac{PO}{OR}$$

$$1 = \frac{100}{OR}$$

$$OR = 100m$$

$\triangle POS$

$$\tan 30^\circ = \frac{PO}{OS}$$

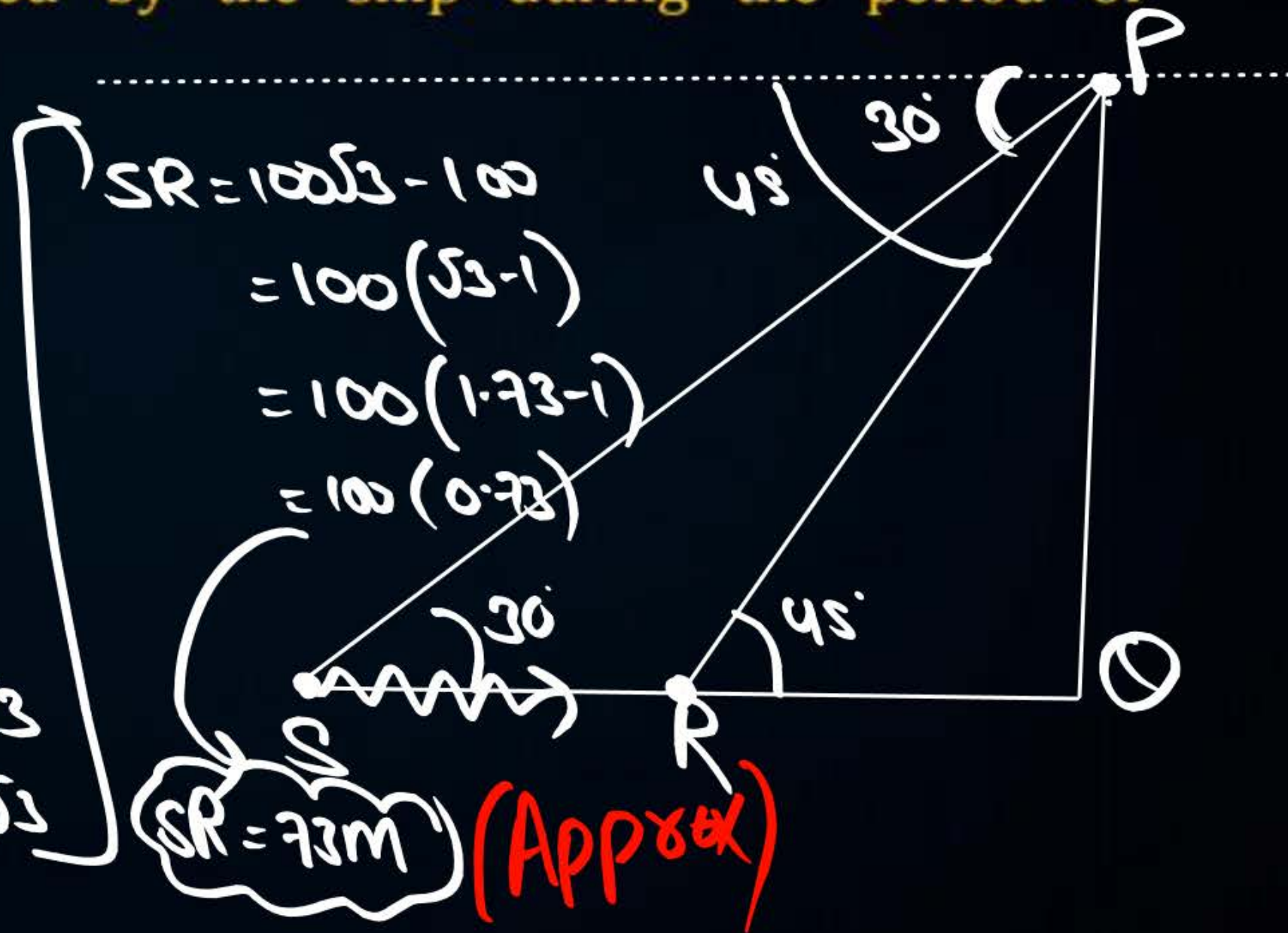
$$\frac{1}{\sqrt{3}} = \frac{100}{SR + RO}$$

$$SR + RO = 100\sqrt{3}$$

$$SR + 100 = 100\sqrt{3}$$

$$\begin{aligned} SR &= 100\sqrt{3} - 100 \\ &= 100(\sqrt{3} - 1) \\ &= 100(1.73 - 1) \\ &= 100(0.73) \end{aligned}$$

$$SR = 73m \text{ (Approx)}$$





#Q. The angle of elevation of an aeroplane from a point A on the ground is  $60^\circ$ . After a flight of 15 seconds, the angle of elevation changes to  $30^\circ$ . If the aeroplane is flying at a constant height of  $1500\sqrt{3}$  m, find the speed of the plane in km/hr.

$\triangle ABE$

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

$$\sqrt{3} = \frac{1500\sqrt{3}}{AB}$$

$$AB = \frac{1500\sqrt{3}}{\sqrt{3}}$$

$$AB = 1500\text{m}$$

$\triangle ADC$

$$\tan 30^\circ = \frac{CD}{AC}$$

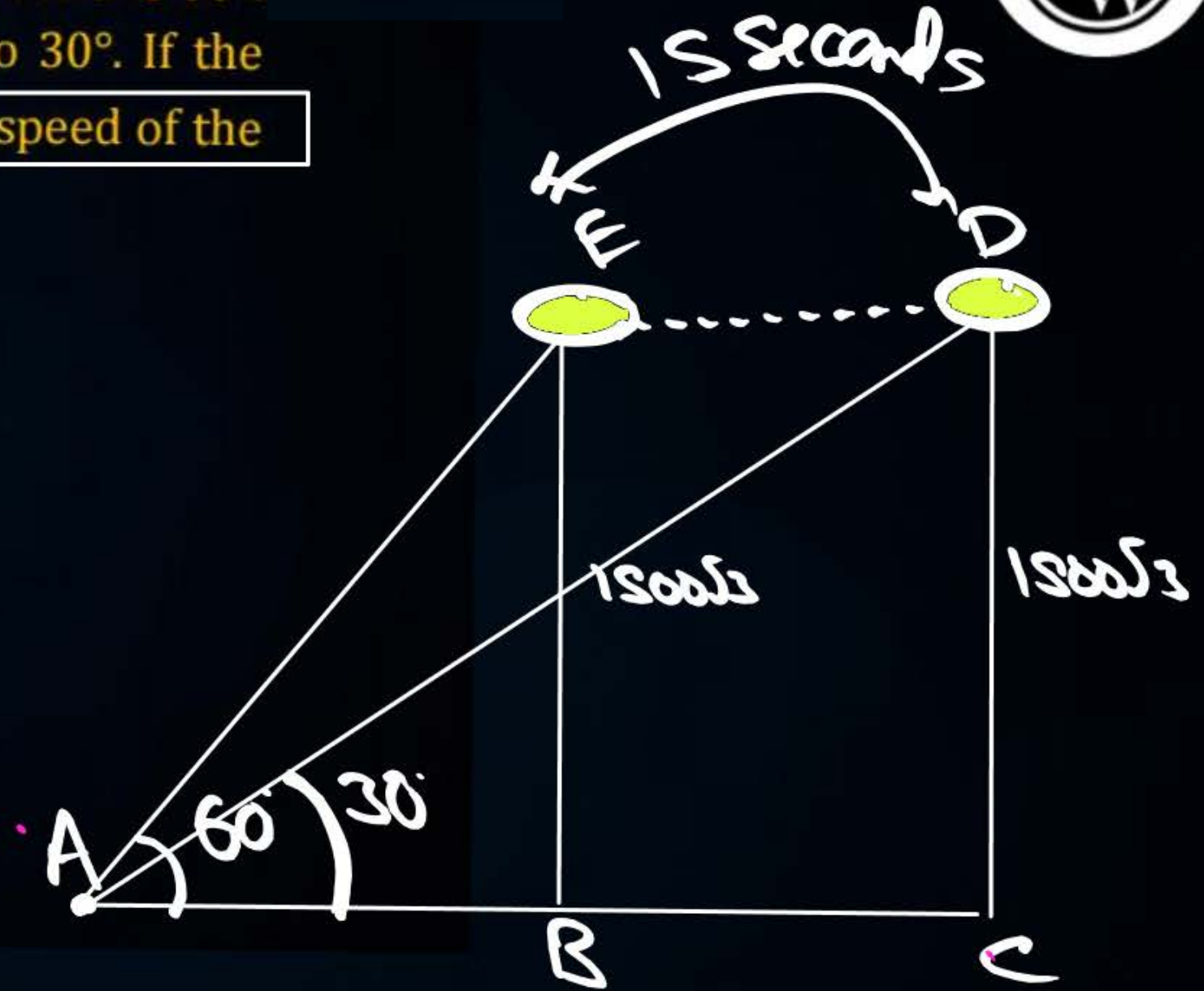
$$\frac{1}{\sqrt{3}} = \frac{1500\sqrt{3}}{AB+BC}$$

$$AB+BC = 4500$$

$$1500 + BC = 4500$$

$$BC = 3000\text{m}$$

$$\Rightarrow ED = 3000\text{m}$$

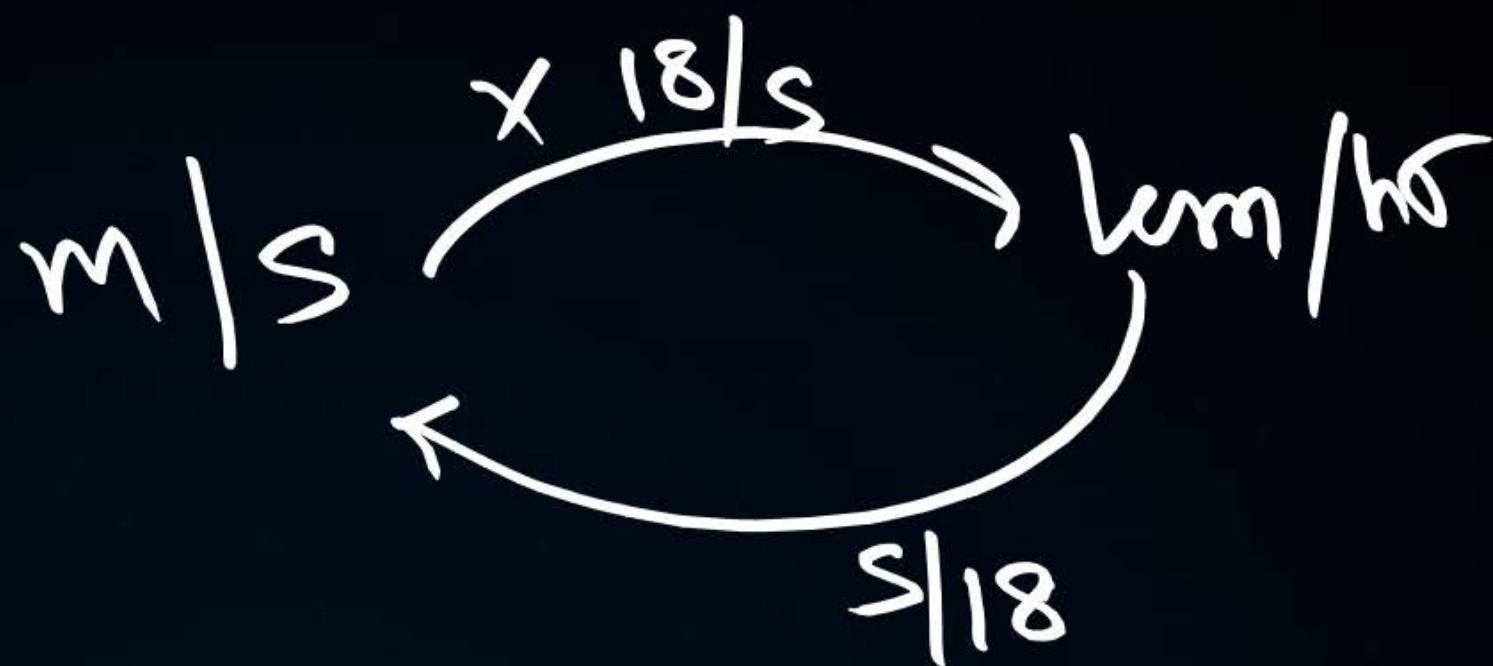


$$S = \frac{D}{T}$$

$$S = \frac{ED}{T}$$

$$S = \frac{200 \text{ m}}{18 \text{ s}}$$

$$S = 200 \text{ m/s}$$



$$\text{Speed} = \left( \frac{40}{8} \times 18 \right) \text{ km/hr}$$
$$= 720 \text{ km/hr}$$



#Q. A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at angle of depression of  $30^\circ$ , which is approaching to the foot of the tower with a uniform speed. Six seconds later, the angle of depression of the car is found to be  $60^\circ$ . Find the further time taken by the car to reach the foot of the tower.

Time  $\rightarrow$  C to B

Speed =  $x$

$D = S \times T$

$CD = x \times 6$

$CD = 6x$

$CB = x \times T$

$CB = Tx$

$6x = 2(Tx)$

$6 = 2T$

$3 = T$   
seconds

6 seconds

$\Delta ABC$   
 $\tan 60^\circ = \frac{AB}{CB}$

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

$CB\sqrt{3} = AB$

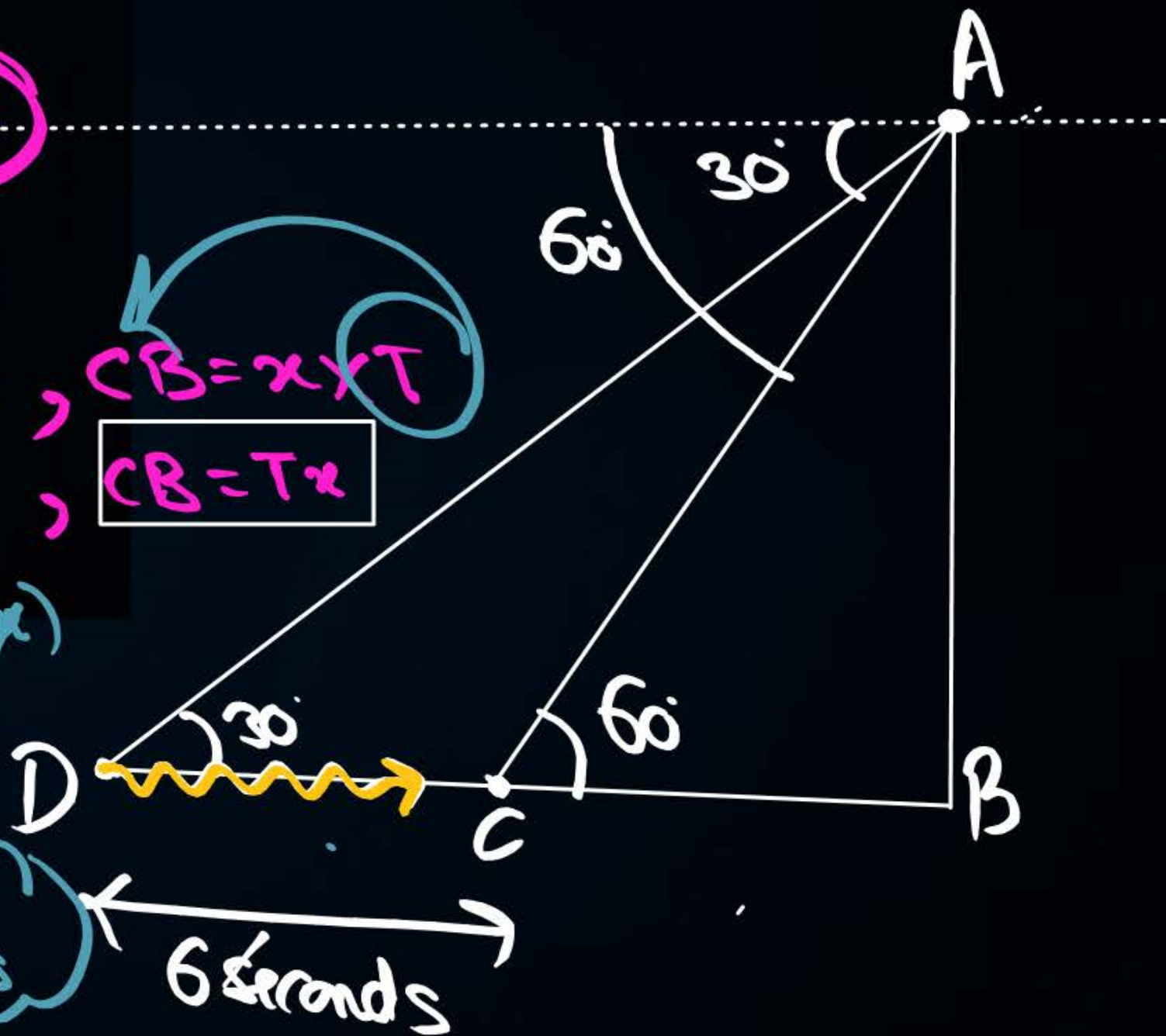
$\Delta ABD$   
 $\tan 30^\circ = \frac{AB}{DB}$

$\frac{1}{\sqrt{3}} = \frac{AB}{DC+CB}$

$\frac{1}{\sqrt{3}} = \frac{CB\sqrt{3}}{CD+CB}$

$CD+CB = 3CB$

$CD = 2CB$





To Find:  $G_E = 9$

# DCFA

$$\tan \phi = \frac{GF}{AF}$$

$$\frac{1}{v_3} = \frac{x}{AF}$$

$$AF = x\sqrt{3}$$

# DADC

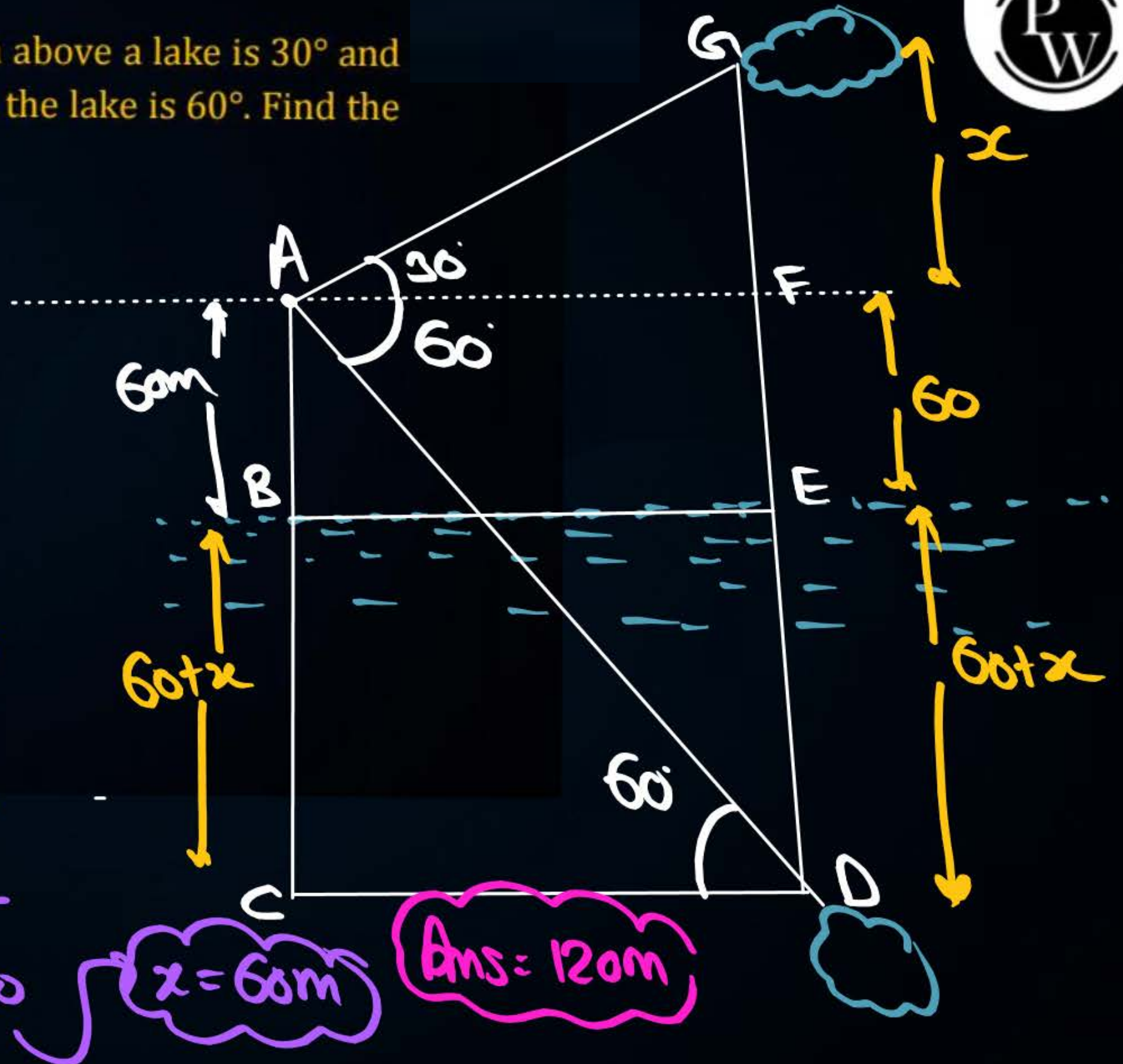
$$\tan 60^\circ = \frac{AC}{CD}$$

$$V_3 = \frac{60 + 60 \cdot 2}{AF}$$

$$AFS_3 = 120 + x$$

$$(x\sqrt{3})\sqrt{3} = 120 + u$$

$$3x - x = 120$$



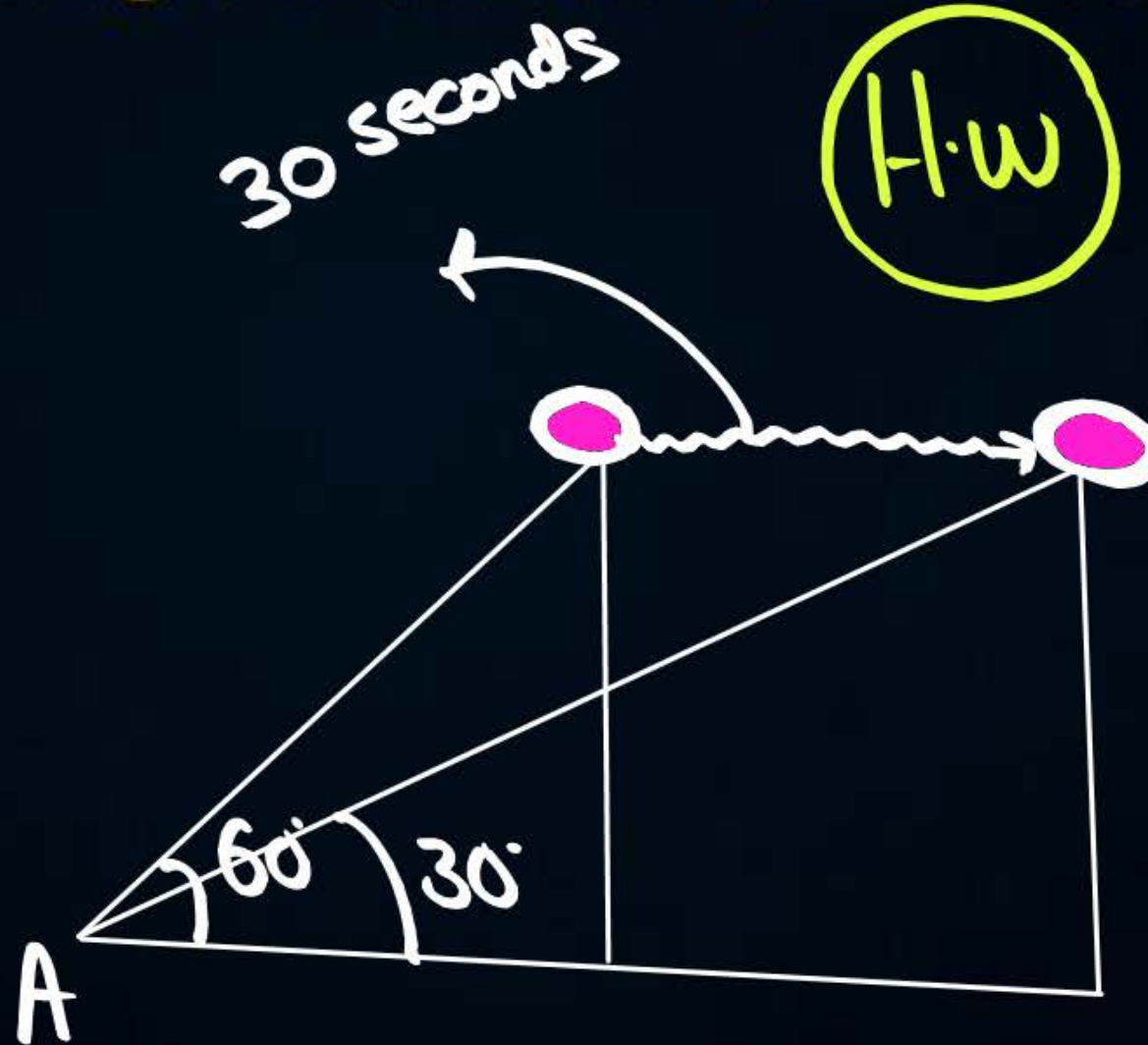


**Topic : Application**



#Q. The angle of elevation of a jet plane from a point A on the ground is  $60^\circ$ . After a flight of 30 seconds, the angle of elevation changes to  $30^\circ$ . If the jet plane is flying at a constant height of  $3600\sqrt{3}$  m, find the speed of the jet plane.

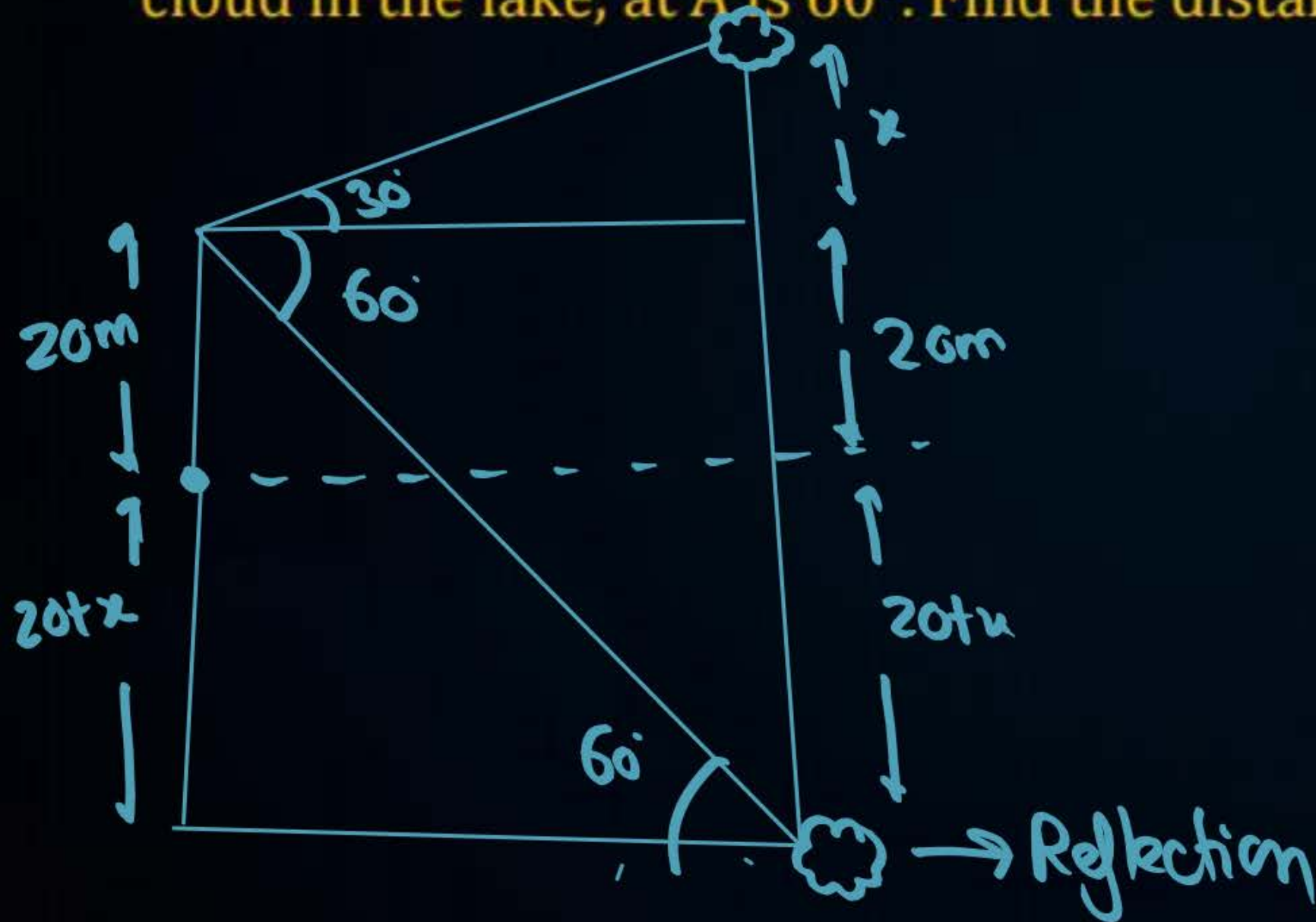
Ans = 240 m/s



## Topic : Application



#Q. At a point A, 20 metres above the level of water in a lake, the angle of elevation of a cloud is  $30^\circ$ . The angle of depression of the reflection of the cloud in the lake, at A is  $60^\circ$ . Find the distance of the cloud from A.



H.W

Ans = 40m





# Homework

DPP + 20







THANK  
YOU

