



Sahi Prep Hai Toh Life Set Hai

# Trigonometry

## Height & Distance

### Part 2

Agenda

→

15 Questions

Height &  
Distance

Homework

→ 22 Questions

Monday (Extra  
class)

→

Remaining } Identities  
+  
Max Minus }

Part of



Q8. A vertical tower stands on a horizontal plane and is surmounted by a vertical flag staff of height  $h$ . At a point on the plane, the angle of elevation of the bottom of the flag staff is  $\alpha$  and that of the top of the flag staff is  $\beta$ . then the height of the tower is

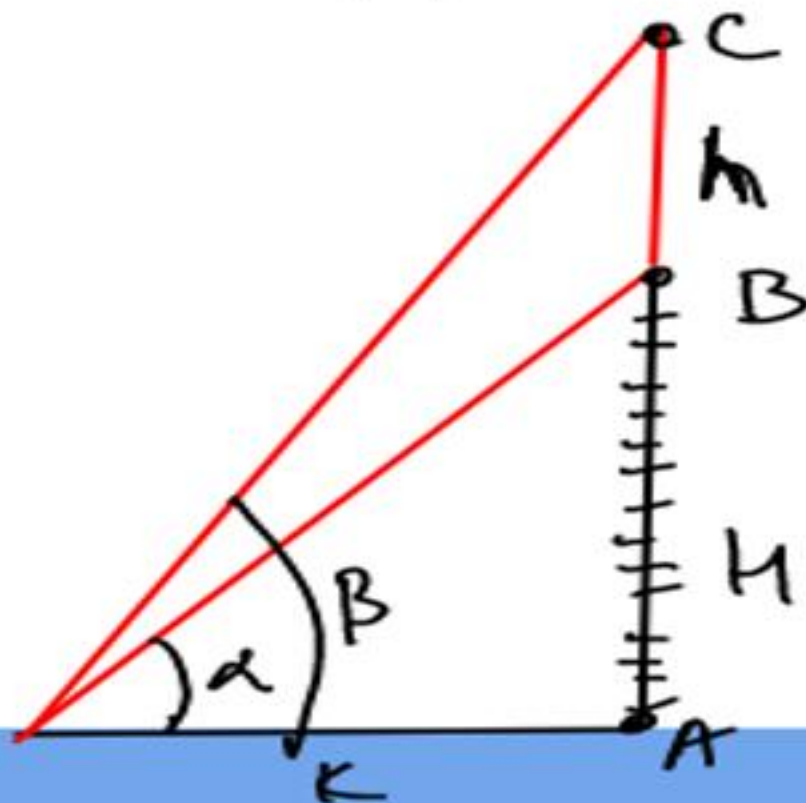
(a)  $h \tan \alpha$

~~(b)  $\frac{h \tan \alpha}{\tan \beta - \tan \alpha}$~~

(c)  $\frac{h \tan \alpha}{\tan \alpha - \tan \beta}$

(d) None of these

AB  $\rightarrow$  Tower  
BC  $\rightarrow$  Flagstaff



$$\tan \beta = \frac{H+h}{k}$$

$$\tan \alpha = \frac{H}{k}$$

$$\frac{\tan \beta}{\tan \alpha} = \frac{H+h}{H}$$

$$H \tan \beta = H \tan \alpha + h \tan \alpha$$

$$H = \left( \frac{h \tan \alpha}{\tan \beta - \tan \alpha} \right)$$

**Ans. (b)**





Q9. The angle of elevation of a cloud from a point 60m above a lake is  $30^\circ$  and the angle of depression of the reflection of cloud in the lake is  $60^\circ$ . Find the height of the cloud.

(a) 100 metre

☒ (b) 120 metre

(c) 80 metre

(d) 60 metre

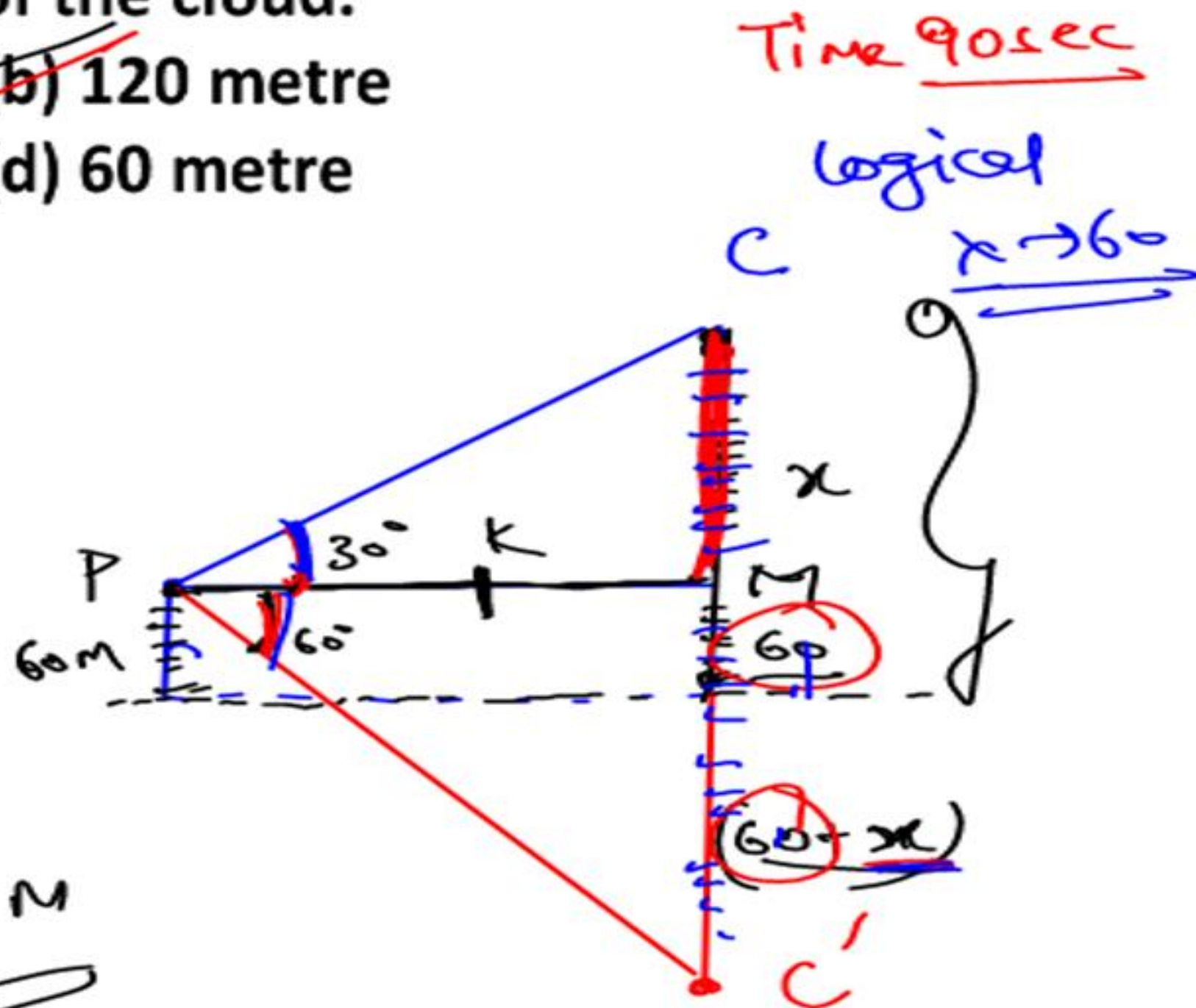
$$\tan 30^\circ = \frac{x}{K}$$

$$\tan 60^\circ = \frac{60 + 60 + x}{K}$$

$$\frac{1}{3} = \frac{x}{120 + x}$$

$$x = 60$$

120m





**Ans. (b)**



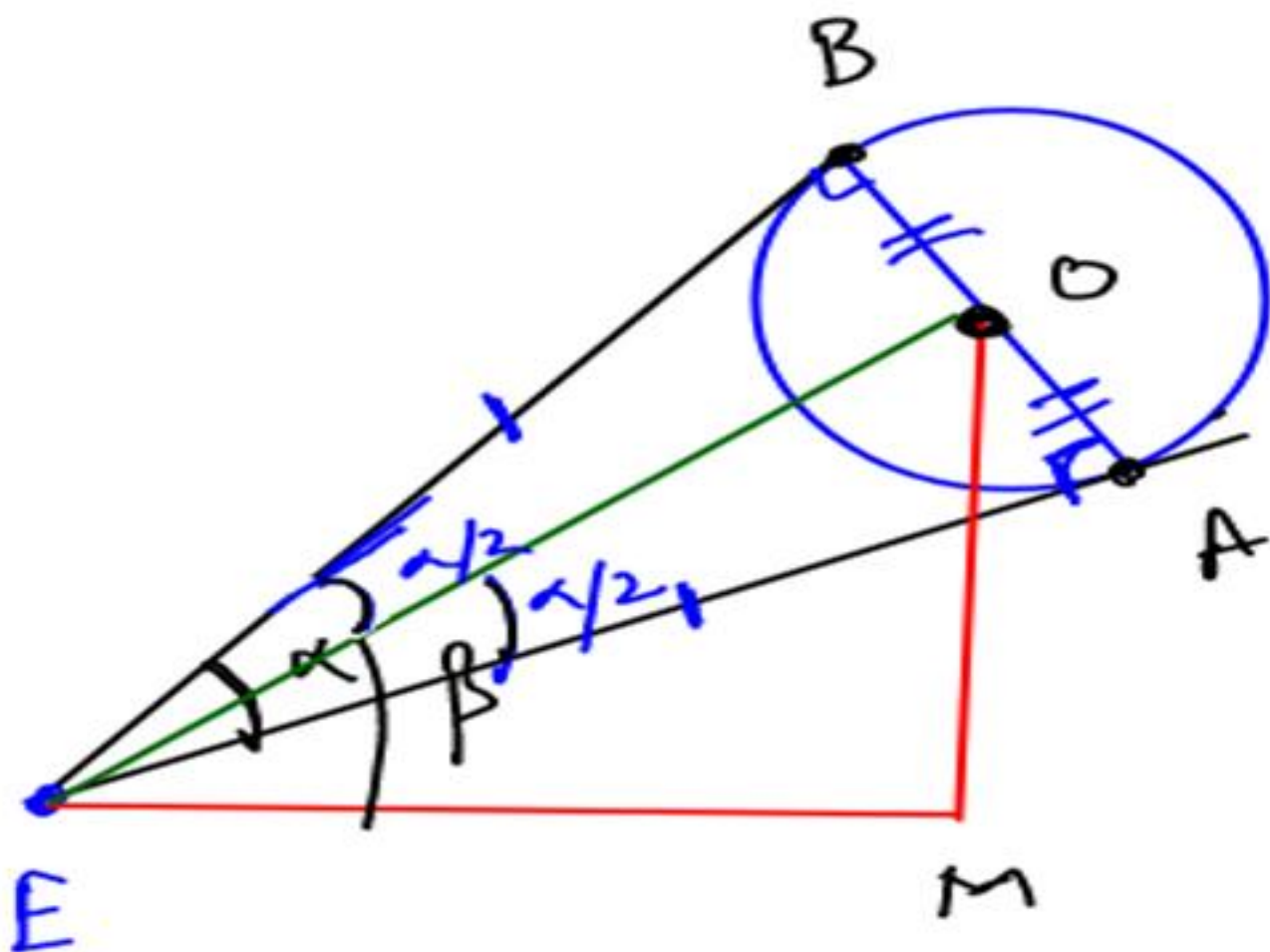
# ROUND BALLOON

$$\triangle OME$$

$$\sin \beta = \frac{OM}{OE}$$

$$OM = OE \sin \beta$$

$$OM \Rightarrow R \sec \frac{\alpha}{2} \sin \beta$$



$$\triangle OAE \text{ and } \triangle OBE$$

$$\triangle OAE \cong \triangle OBE \text{ (SAS)}$$

$$\triangle OAE$$

$$\sin \frac{\alpha}{2} = \frac{OA}{OE} = \frac{R}{OE}$$

$$OE = R \sec \frac{\alpha}{2}$$

$$\text{Height of Balloon} = R \sec \frac{\alpha}{2} \sin \beta$$



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Angle made by the balloon at the eye of observer =  $\alpha$

Angle of elevation from the centre of balloon =  $\beta$

Radius of the balloon =  $R$

Height of the centre of balloon  
from the bottom

✓✓  $R \operatorname{cosec} \left( \frac{\alpha}{2} \right) \sin \beta$

Q10. A round balloon of radius 10 m. subtends an angle  $60^\circ$  at the eye of the observer on the ground while the angle of elevation of its centre is  $45^\circ$ . Find the height of the centre of balloon ?

☒ (a)  $10\sqrt{2}$  metre

(b)  $10\sqrt{3}$  metre

(c) 10 metre

(d) 20 metre

$$R = 10 \text{ m} \quad \alpha = 60^\circ \quad \beta = 45^\circ$$

$$H = R \operatorname{cosec} \frac{\alpha}{2} \sin \beta$$

$$= 10 \cdot 2 \cdot \frac{1}{\sqrt{2}} = \underline{\underline{10\sqrt{2} \text{ m}}}$$

Ans. ~~(b)~~ a





Q11. A round balloon of radius  $R$  subtends an angle  $60^\circ$  at the eye of the observer on the ground while the angle of elevation of its centre is  $60^\circ$ . Find the height of the centre of balloon.

(a)  $\sqrt{3} R$

(b)  $\sqrt{2} R$

(c)  $3R$

(d)  $2R$

$$\begin{aligned}\text{Height of Balloon} &= R \operatorname{cosec} 30^\circ \sin 60^\circ \\ &= R \cdot \cancel{2} \cdot \frac{\sqrt{3}}{\cancel{2}} \\ &= \underline{\underline{\sqrt{3} R}}\end{aligned}$$



**Ans. (a)**

Q12. A 1.2m tall girl spots a balloon moving with the wind in a horizontal line at a height of 88.2m from the ground. The angle 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.

(a)  $50\sqrt{3}$

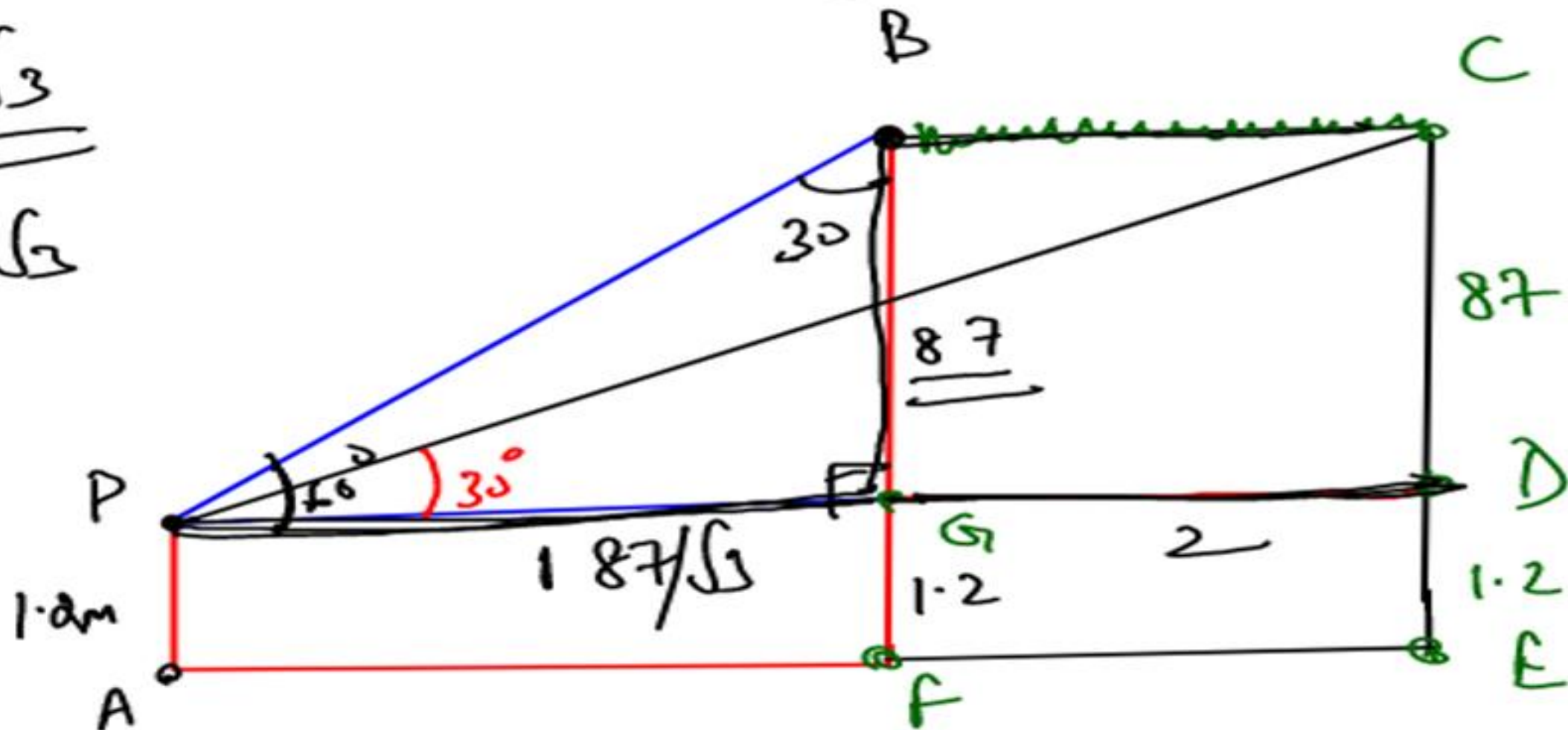
(b)  $52\sqrt{3}$

☒ (c)  $58\sqrt{3}$

(d)  $62\sqrt{3}$

$PG = 29\sqrt{3}$

$GD = 58\sqrt{3}$



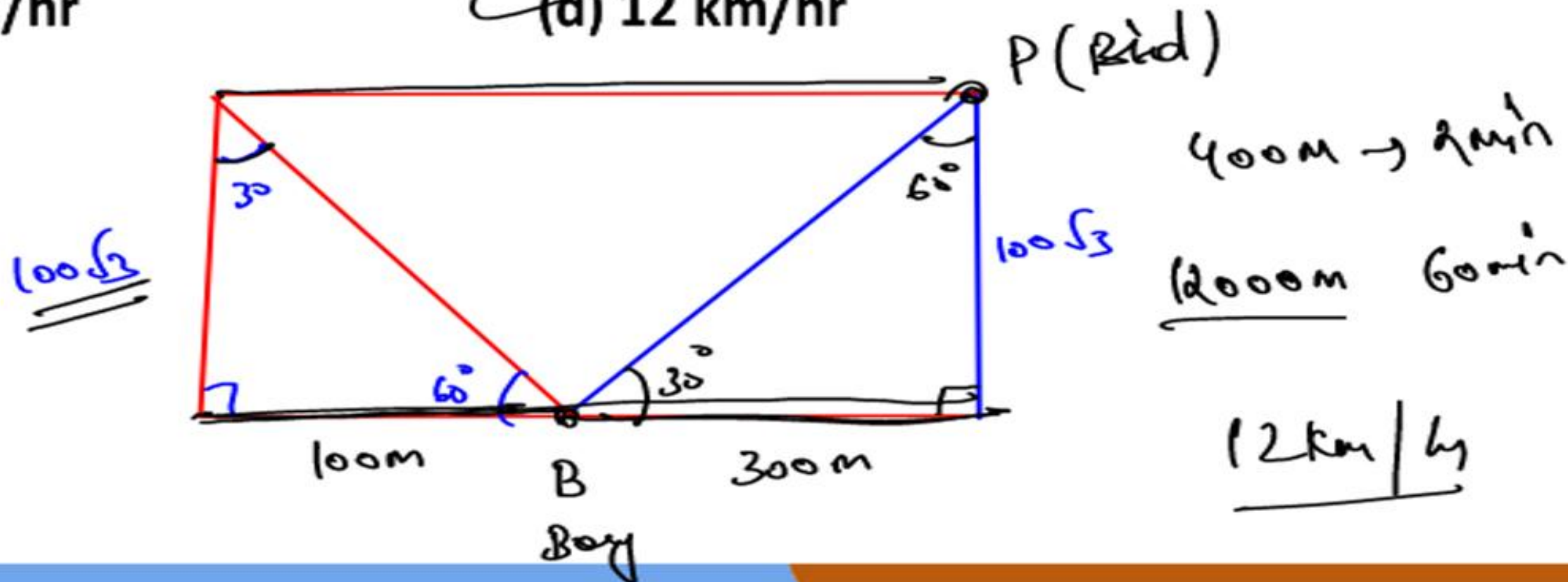


**Ans. (c)**

Q13. A boy is standing in the middle of a field, observes a flying bird in the north at an angle of elevation of  $30^\circ$  and after 2 min, he observes the same bird in the south at an angle of elevation of  $60^\circ$ . If the bird flies all along in a straight line at a height of  $100\sqrt{3}$  m then its speed in km/h is.

- (a)  $10/3$  km/hr  
(c) 10 km/hr

- (b)  $3/5$  km/hr  
(d) 12 km/hr







**Ans. (d)**

Q14. A bird is flying at constant height from the ground with a constant speed from an observer on the ground the angle of elevation of that flying bird is  $60^\circ$ . when bird flies 100m away from the observer the angle change to  $30^\circ$ . At what distance is the bird from the observer in the second position.

(a) 173.2

(b) 273.2

(c) 373.2

(d) 473.2

Homework



**Ans. (a)**



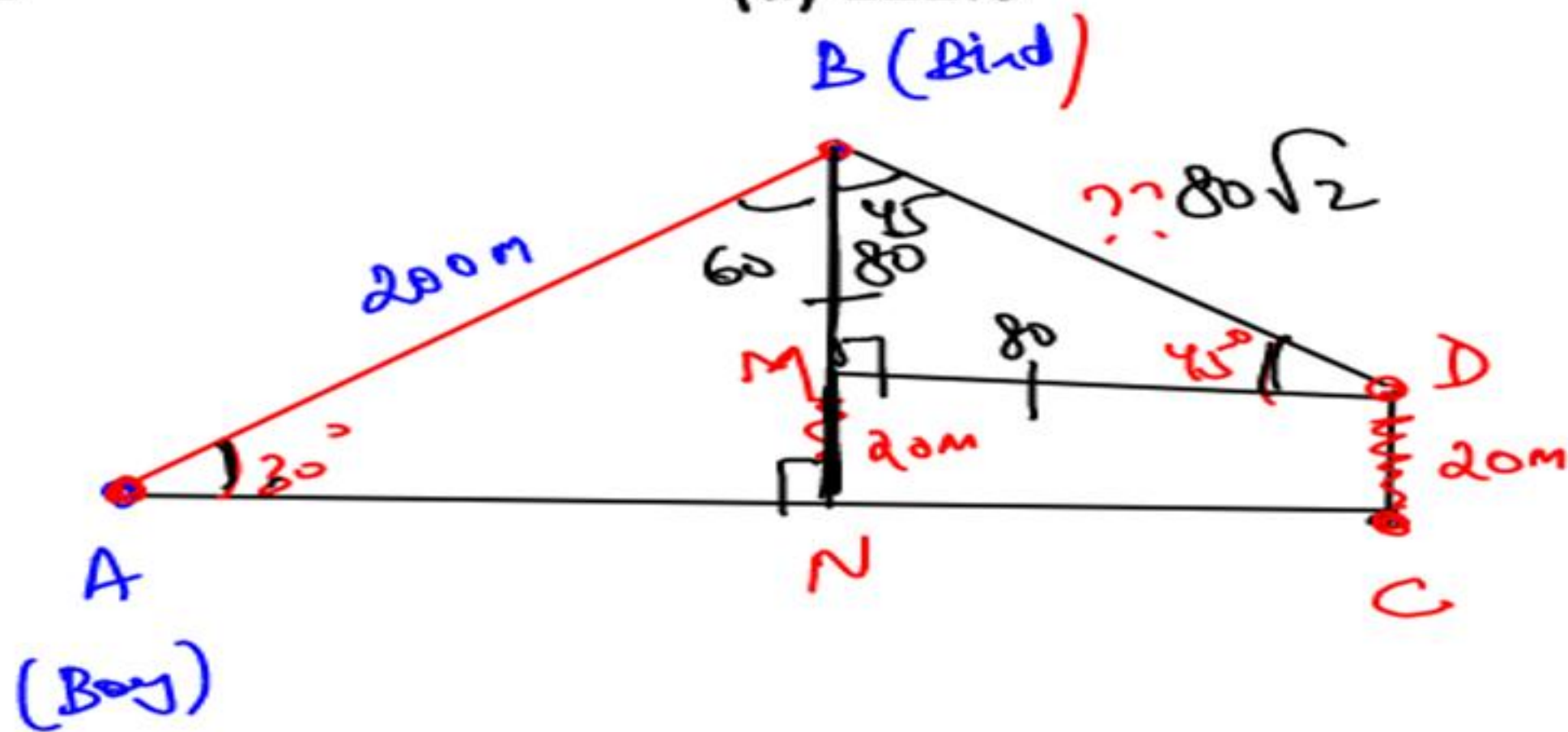
Q15

Q15. A boy standing on a horizontal plane finds a bird flying at a distance of 200m from him at an elevation of  $30^\circ$ . A girl standing on the roof of 20 m high building finds the angle of elevation of the same bird to be  $45^\circ$ . Both the boy and girl are on opposite sides of the bird. Find the distance of the bird from the girl ?

- (a) 106.28  
(c) 142.42

- (b) 113.12  
(d) 122.8

$$BN = 100\text{m}$$



$\triangle BMD$

$$80 \times 1.414$$

$$113.12$$





**Ans. (b)**



Q16. A tree 12 m high, is broken by the wind in such a way that its top touches the ground and makes an angle  $60^\circ$  with the ground. At what height from the bottom the tree is broken by the wind?

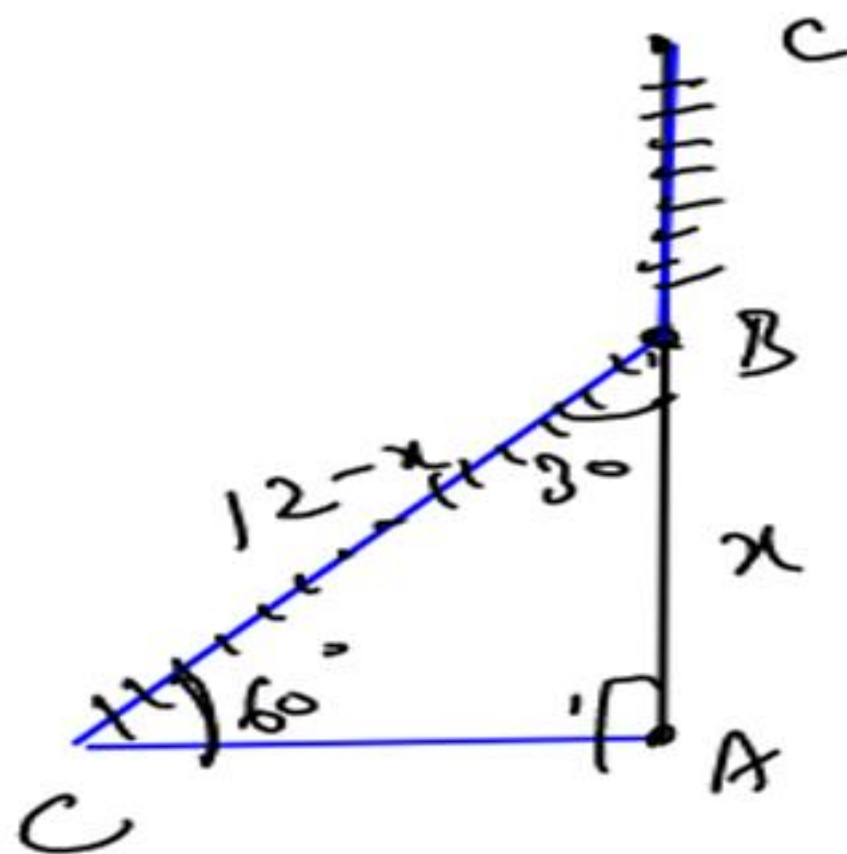
(a) 4.49 metre

(b) 3.36 metre

(c) 5.2 metre

~~(d) 5.56 metre~~

AC  $\rightarrow$  Tree



$$\frac{x}{12-x} = \frac{\sqrt{3}}{2}$$

$$2x = 12\sqrt{3} - x\sqrt{3}$$

$$x = \frac{12\sqrt{3}}{2+\sqrt{3}} \times \frac{2-\sqrt{3}}{2-\sqrt{3}}$$

$$\Rightarrow \boxed{24\sqrt{3} - 36}$$



$$\underline{\underline{24\sqrt{3}}} - 36$$

$$24 \times (\underline{\underline{1.73}}) - 36$$

$$\underline{24} \times (\underline{1.75} - 0.02) - 36$$

$$24 \left[ \frac{7}{4} - 0.02 \right] - 36$$

$$42 - 0.48 - 36$$
$$= 5.52$$



**Ans. (d)**

Q17. As the angle of elevation of the sun increases ~~form~~ <sup>from</sup>  $30^\circ$  to  $60^\circ$ , the length of the shadow of the building gets reduced by 20m. find the height of the building.

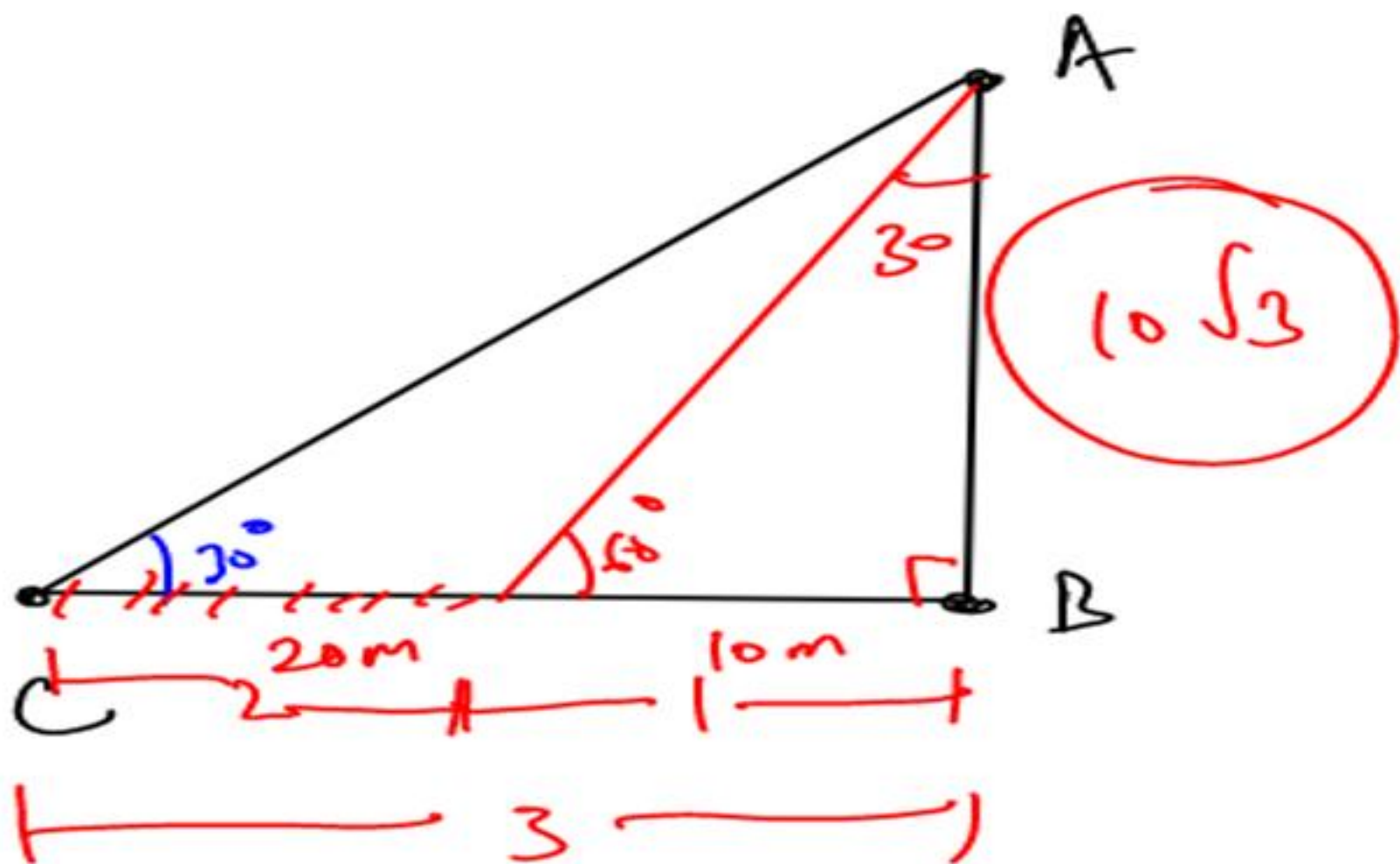
☒ (a)  $10\sqrt{3}$  metre

(b)  $5\sqrt{3}$  metre

☒ (c)  $4\sqrt{3}$  metre

(d) 5 metre

AB  $\rightarrow$  Building





**Ans. (a)**

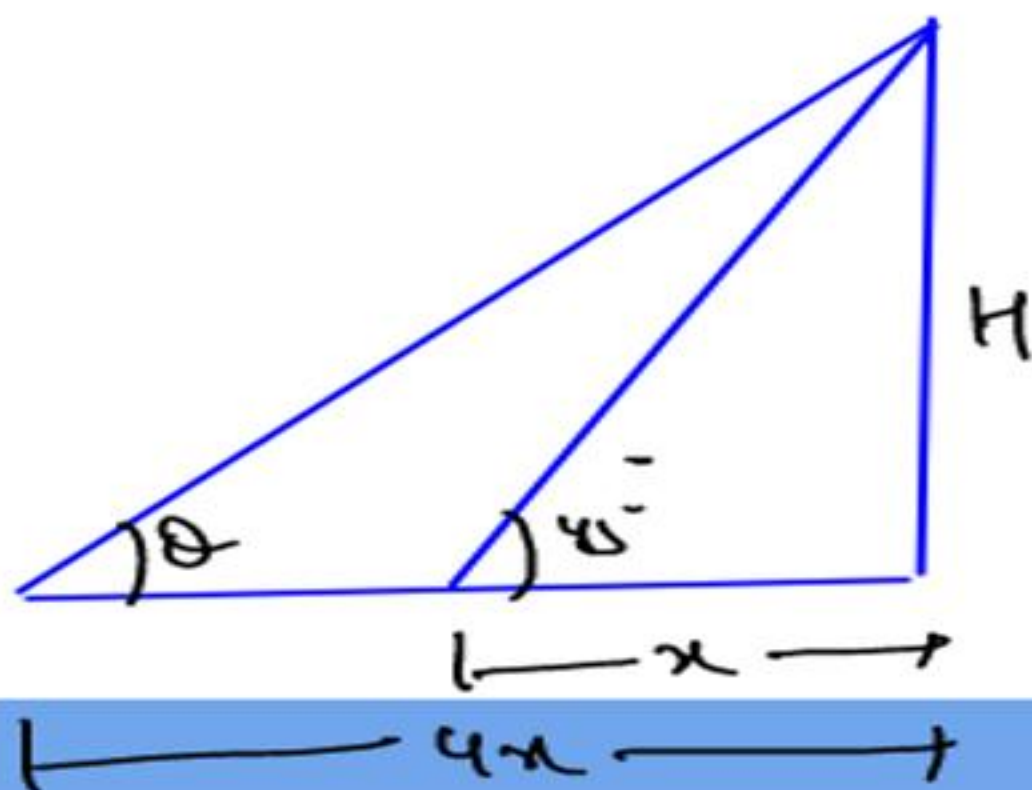
**Q18.** The shadow of a flag staff is four times as long as the shadow of the flag-staff when the sun rays meet the ground at an angle of  $45^\circ$ . find the angle between the sun rays and the ground at the time of longer shadow.

~~(a)~~  $\tan^{-1}\left(\frac{1}{4}\right)$

(c)  $\tan^{-1}\left(\frac{1}{3}\right)$

(b)  $\tan^{-1}\left(\frac{1}{2}\right)$

(d)  $\tan^{-1}\left(\frac{1}{8}\right)$



$$\tan 45^\circ = \frac{H}{x} \quad \text{--- (1)}$$

$$\tan \theta = \frac{H}{4x} \quad \text{--- (2)}$$

$$\frac{1}{\tan \theta} = \frac{4}{1}$$

$$\tan \theta = \frac{1}{4}$$

$$\theta = \tan^{-1}\left(\frac{1}{4}\right)$$





**Ans. (a)**

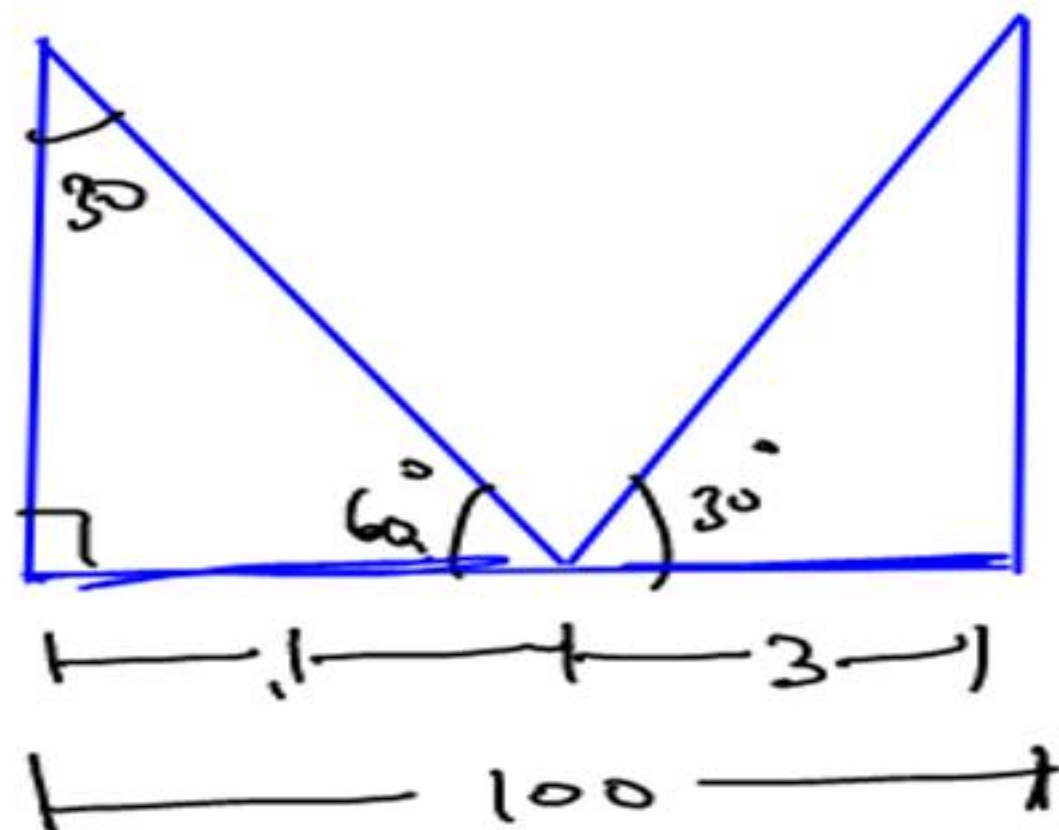
Q19. Two pillars of equal height and on either side of a road, which is 100m wide. The angles of elevation of the top of the pillars are  $60^\circ$  and  $30^\circ$  at a point on the road between the pillars. Find the height of each pillar.

- (a) 43.3 metre  
(c) 42.8 metre

- (b) 4.5 metre  
(d) 41.5 metre

$$\begin{array}{r} 255 \times 4 \\ \hline 4 \\ 173.2 \\ \hline 43.3 \end{array}$$

$53 \text{ m}$



$4 \rightarrow 100$   
 $1 \rightarrow 25$   
 $2553$



**Ans. (a)**



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✓✓✓  
ans

2\*

Q20. A hydrogen filled balloon ascending at the rate of 18 ~~km/ph~~<sup>km/h</sup> was drifted by wind. Its angle of elevation at 10th and 15th minutes were found to be 60° and 45° respectively. The wind speed (in whole numbers) during the last five minutes approximately, is equal to

(a) 7 km/hr

(c) 26 km/hr

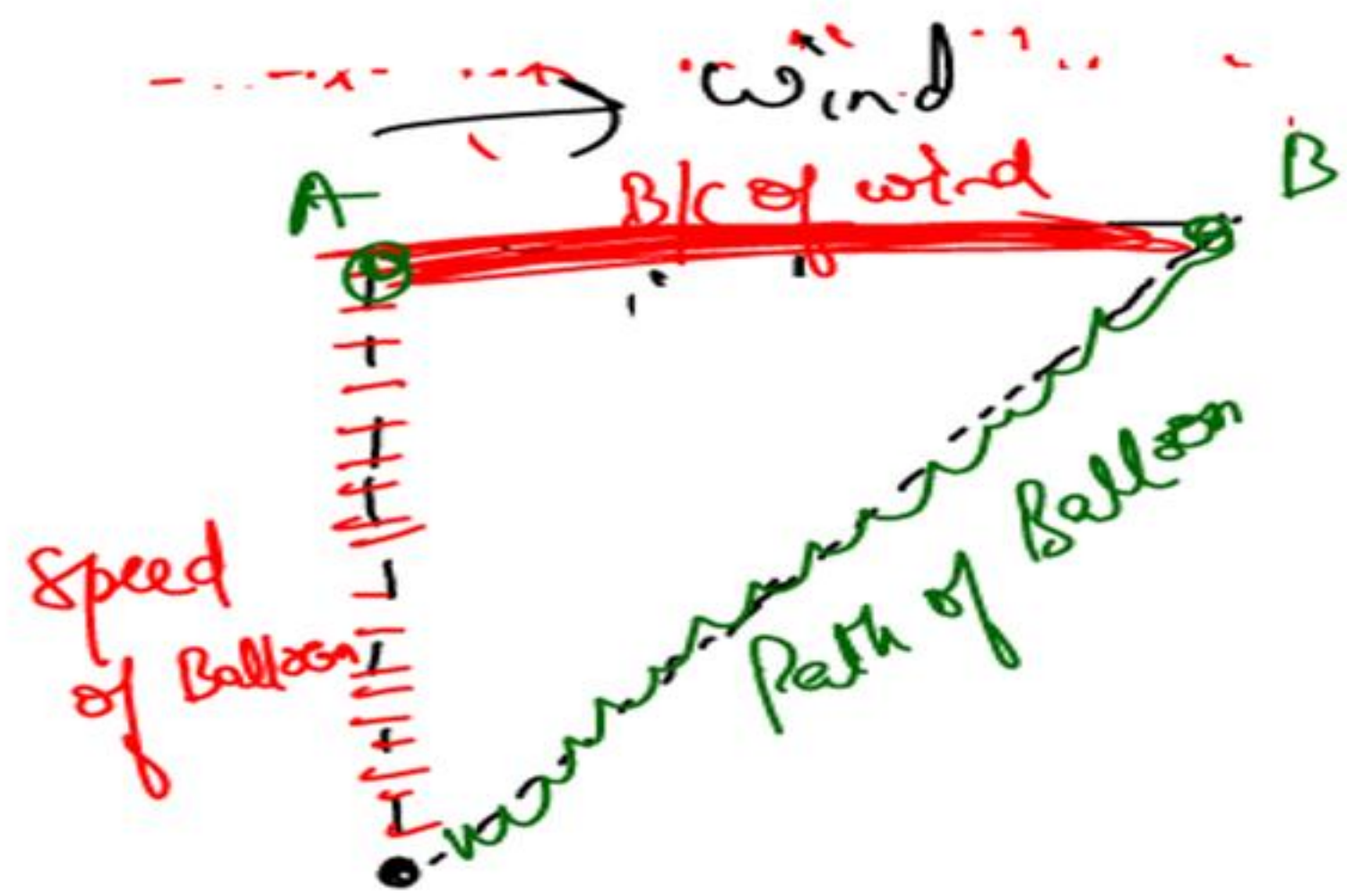
(b) 11 km/hr

(d) 33 km/hr

3 min



No wind →



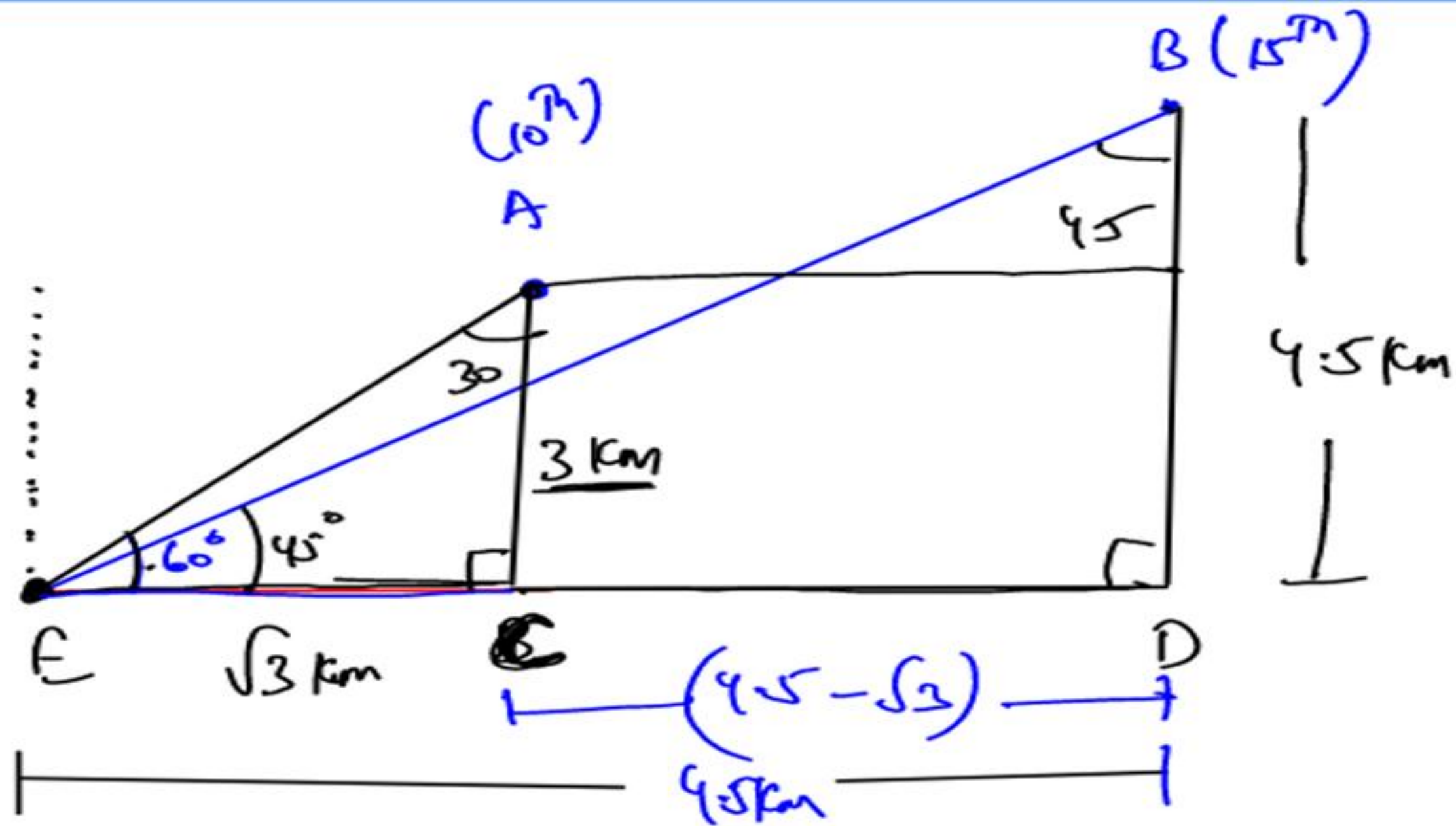


$$18 \text{ km/h}$$

$$10 \text{ min } \frac{1}{6} \text{ hr}$$

$$D = 18 \cdot \frac{1}{6} = 3 \text{ km}$$

$$D = 18 \cdot \frac{1}{4} = 4.5$$



Ans. (d)

$$D = 4.5 - 1.73$$

$$= (2.77) \text{ km}$$

$$S = \frac{2.77 \cdot 60}{5}$$

$$= (2.77) \times 12$$

$$= \underline{\underline{33.24 \text{ km/h}}}$$

Q21. A man standing in one corner of a square football field observes that the angle subtended by a pole in the corner just diagonally opposite to this corner is  $60^\circ$ . When he retreats 80m from the corner along the same straight line, he finds the angle to be  $30^\circ$ . The length of the field is-

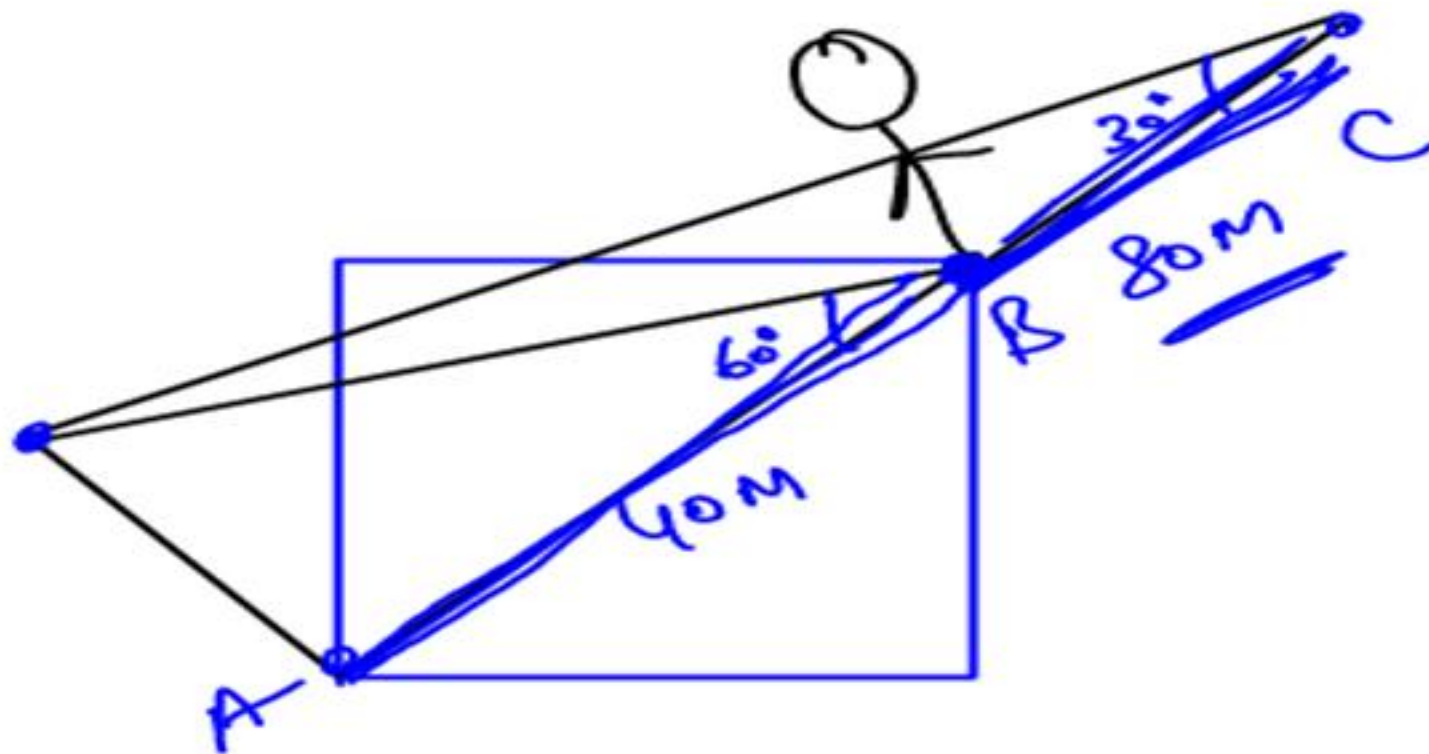
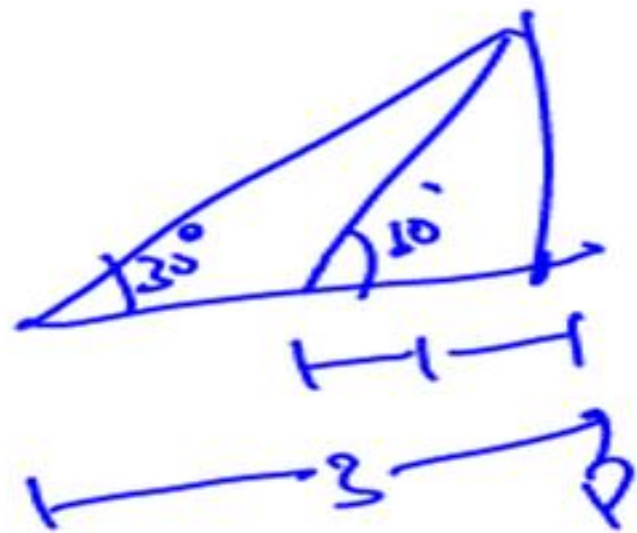
(a) 20 metre

(c)  $30\sqrt{2}$  metre

(b)  $20\sqrt{2}$  metre

(d)  $40\sqrt{2}$  metre

90sec



$$\sqrt{2} \cdot \text{side} = 40\text{m}$$

$$\text{side} = 20\sqrt{2}$$



**Ans. (b)**

# PRACTICE QUESTIONS





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**Q1. An observer 1.5m tall is 28.5 m away from a tower. The angle of elevation of the top of the tower from her eyes is  $45^\circ$ . What is the height of the tower?**

**(a) 40 metre**

**(b) 30 metre**

**(c) 60 metre**

**(d) 50 metre**

Ans. (b)



**Q2. The angle of elevation of the top of an unfinished pillar at a point 150 meters from its base is  $30^\circ$ . The height (in meters) that the pillar must be raised so that its angle of elevation at the same point may be  $45^\circ$  is :**

**(Take  $\sqrt{3} = 1.732$ )**

**(a) 63.4 metre**

**(c) 173.2 metre**

**(b) 86.6 metre**

**(d) 126.8 metre**

Ans. (a)

Q3. From the top of a church spire 96m high the angles of depression of two vehicles on a road, at the same level as the base of the spire and on the same side of it are  $x^\circ$  and  $y^\circ$  and where  $\operatorname{cosec} x^\circ = \sqrt{17}$  and  $\sec y^\circ = \frac{5\sqrt{2}}{7}$ . calculate the distance between the vehicles.

(a) 258 metre

(b) 288 metre

(c) 296 metre

(d) 238 metre



Ans. (d)



**Q4. From a window 15 metres high above the ground in a street, the angles 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. Find the height of the house. Take  $\sqrt{3} = 1.732$**

**(a) 22 metre**

**(c) 23.66 metre**

**(b) 24 metre**

**(d) 25.5 metre**

Ans. (c)

**Q5.** An electrician has to repair an electric fault on a pole of height 4m. He needs to reach a point 1.3 m below the top of the pole to undertake the repair work. What should be the length of the ladder that he should use which when inclined at an angle of  $60^\circ$  to the horizontal would enable him to reach the required position?

- (a)  $\frac{9\sqrt{3}}{5}$  metre      (b)  $\frac{6\sqrt{3}}{5}$  metre      (c)  $\frac{9\sqrt{2}}{5}$  metre      (d)  $\frac{6\sqrt{2}}{5}$  metre

**Ans. (a)**

**Q6.** If the angle of elevation of a cloud from a point 'h' meter above a lake is  $\alpha$  and the angle of depression of its reflection in the lake is  $\beta$ . find the height of the cloud.

**(a)**  $\frac{h \cot \alpha + \cot \beta}{\tan \alpha - \tan \beta}$

**(b)**  $\frac{h \cot \alpha - \cot \beta}{\tan \alpha - \tan \beta}$

**(c)**  $\frac{h \cot \alpha - \cot \beta}{\cot \alpha + \cot \beta}$

**(d)**  $\frac{h \cot \alpha + \cot \beta}{\cot \alpha - \cot \beta}$



Ans. (d)



**Q7. At the foot of a mountain, the elevation of its summit is  $45^\circ$ . After ascending 42m towards the mountain up a slope of  $30^\circ$  inclination the elevation is found to be  $60^\circ$ . find the height of the mountain.**

**(a) 55.4 metre**

**(b) 57.4 metre**

**(c) 59.4 metre**

**(d) 61.4 metre**

Ans. (b)

**Q8.** From the top of a lamp post of height  $x$  metres, two objects on the ground on the same side of it (and in line with the foot of the lamp post) are observed at angles of depression of  $45^\circ$  &  $60^\circ$ , respectively. The distance between the objects 10 m is . The value of  $x$  is:

- A.**  $5(\sqrt{3} + 1)$
- B.** 10
- C.**  $10(\sqrt{3} + 1)$
- D.** 30

Ans. (a)



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**Q9. The elevation of a building from a point on the ground is  $30^\circ$ . After moving towards the building by 10 m , the elevation becomes  $45^\circ$ . The height of the building is:**

- A.  $10 (\sqrt{3} + 1)$**
- B.  $5 (\sqrt{3} - 1)$**
- C.  $5 (\sqrt{3} + 1)$**
- D.  $10 (\sqrt{3} - 1)$**



Ans. (c)



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**Q10.** The angle of elevation of the top of a vertical tower is observed as  $60^\circ$  from a point P on the same plane. From another point Q, 10 m vertically above the point P, the angle of depression of the foot of the tower is  $30^\circ$ . Then the height of the tower is

- A.** 15 metre
- B.** 30 metre
- C.** 25 metre
- D.** 20 metre

Ans. (b)



**Q11. Two electricity poles one of which is 45 meters high are connected with an electricity wire. The angle of elevation from the bottom of 45 m high pole to the top of second pole is  $45^\circ$ . If the distance between the poles is 36 m, what is the length of wire?**

- A. 36 metre    B.  $9\sqrt{17}$  metre    C.  $15\sqrt{3}$  metre    D.  $19\sqrt{3}$  metre**

Ans. (b)



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**Q12.** A ship sailing toward a light house found the angle of elevation of top of light house as  $15^\circ$ . After 25 minutes the angle of elevation changes to  $45^\circ$ . If the light house is 100 meters high, find the speed of ship.

A.  $4(2 - \sqrt{3})$  m/min

B.  $4(1 + \sqrt{3})$  m/min

C.  $4\sqrt{3}$  m/min

D.  $4(1 - \sqrt{3})$  m/min



Ans. (b)



**Q13.** The ratio of heights of two towers stand at P and Q respectively is  $\sqrt{3} : 2$ . The angle of elevation of a point O in the line joining P and Q to the top of bigger tower to that of smaller tower is  $5:2$ . If difference between the elevations is  $45^\circ$ , the ratio of the distances of O from P to Q is:

**A.**  $3:2 (2 - \sqrt{3})$

**B.**  $3: (2 - \sqrt{3})$

**C.**  $(2 - \sqrt{3}) : 3$

**D.**  $(2 + \sqrt{3}) : 2$

Ans. (a)

**Q14. On a plane area, there are two vertical towers separated by 100 feet apart. The shorter tower is 40 feet tall. A pole of length 6 feet stands on the line joining the base of two towers so that the tip of the towers and tip of the pole are also on the same line. If the distance of the pole from the shorter tower is 75 feet, then what is the height of the taller tower (approximately)?**

**A. 85 feet**

**B. 110 feet**

**C. 125 feet**

**D.140 feet**

Ans. (a)



**Q15. Find the decrease in the length of the shadow of a pole, when the angle of elevation becomes double. Given that at this moment, the shadow on the ground of a vertical pole of 12 m high is 48 m.**

**A. 22.5 metre**

**B. 25.5 metre**

**C. 28.5 metre**

**D. 39.5 metre**



Ans. (b)

Q16. The angle of elevation of a tower at a level ground is  $30^\circ$ . The angle of elevation becomes  $\theta$  when moved 15 m towards the tower. If the height of the tower is 10 m, then the value of  $\theta$  is?

A.  $\theta = 45^\circ$

B.  $\theta = \tan^{-1}\left(\frac{2}{3}\right)$

C.  $\theta = \tan^{-1}\left(\frac{2}{\sqrt{3}-3}\right)$

D.  $\theta = \tan^{-1}\left(\frac{2}{2\sqrt{3}-3}\right)$

Ans. (d)



**Q17.** A boy on the side of the roof of his house held a string attached with a kite. He found the angle of elevation of kite as  $30^\circ$  while his mother from the ground near the wall of house found the angle of elevation as  $45^\circ$ . Height of the boy is 2 feet less than his mother. If the height of the kite from the ground is 80 feet and height of mother is 5.8 feet, find the height of the house. *Take  $\sqrt{3} = 1.7$*

**A. 32.6 feet**

**B. 28.5 feet**

**C. 30 feet**

**D. 33.7 feet**

Ans. (a)

**Q18.** Consider a regular hexagon ABCDEF. Two towers are situated at B and C. The angle of elevation from A to the top of the tower at B is  $30^\circ$ , and the angle of elevation to the top of the tower at C is  $45^\circ$ . What is the ratio of the height of towers at B and C?

**A.**  $1 : \sqrt{3}$

**B.**  $1 : 3\sqrt{3}$

**C.**  $1 : 2$

**D.**  $1 : 2$

Ans. (b)



**Q19.** A falcon sitting on the top of a tree found the angle of depression of a rat at 50 meters away from the bottom of tree to be  $30^\circ$ . The falcon first flew horizontally for some distance and then attack the rat when he found the angle of depression  $60^\circ$ . Find the distance the falcon flew horizontally before attack?

- A.**  $50\sqrt{3}$  metre      **B.**  $\frac{100}{\sqrt{3}}$       **C.**  $33\frac{1}{3}$       **D.**  $33\sqrt{3}$  metre

**Ans. (c)**



**Q20.** The upper part of a long tree broke and leaned against nearby another small tree such that, the broken part makes an angle of  $60^\circ$  with horizon. If the height of smaller tree is 18 meters and distance between the tree is 6 meters, find the height of the larger tree before it was broken?

**A.**  $6(3 - \sqrt{3})$  metre

**C.**  $6(2 + \sqrt{3})$  metre

**B.**  $6(3 + \sqrt{3})$  metre

**D.**  $6(5 - \sqrt{3})$  metre

Ans. (d)

**Q21. An aeroplane when 900m high passes vertically above another aeroplane at an instant when their angles of elevation at same observing point are  $60^\circ$  and  $45^\circ$  respectively. Approximately how many meters higher is the one than the other ?**

**(a) 381 metre**

**(b) 169 metre**

**(c) 254 metre**

**(d) 211 metre**

**Ans. (a)**

**Q22. From the top of a building 60 m high, the angle of depression of top and bottom of a vertical lamp post is  $30^\circ$  and  $60^\circ$  respectively**

**(a) find the distance between the lamp post and the building.**

**(b) find the Height of the lamp post.**

**(a) 20metre,  $20\sqrt{3}$  metre**

**(b) 40metre,  $20\sqrt{3}$  metre**

**(c) 30metre,  $30\sqrt{3}$  metre**

**(d) 40metre,  $10\sqrt{3}$  metre**



**Ans. (b)**



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Practise  
topic-wise quizzes

Keep attending  
live classes

