

UPDAAN



2025

Some Application of Trigonometry

Mathematics

Lecture - 04

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Topics

to be covered

- 1 Ache SAWAAL
- 2 Case study Based





H.w Complete hu ya? Be honest Babuas!

- A) kya tha H.w 13%
- ☒ B) hogya aaaaaaa 55%
- C) Nahi hu ya. 27%
- D) nahi karenge, Hamasi maszi 3%

Sunday kya plan Evening main?

- A) No plans, chill kareenge.
- B) Backlogs, School H.w, Revision + chill kareenge!
- C) No plans.
- ☒ D) Revision with me.



WORK HARD
DREAM BIG
NEVER GIVE UP !!



Topic : Application



#Q. The tops of two towers of heights x and y , standing on a level ground subtend angles of 30° and 60° respectively at the centre of the line joining their feet. Then $x : y$ is

A 1 : 2

B 2 : 1

☒ C 1 : 3

D 3 : 1

$\triangle ABC$

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

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

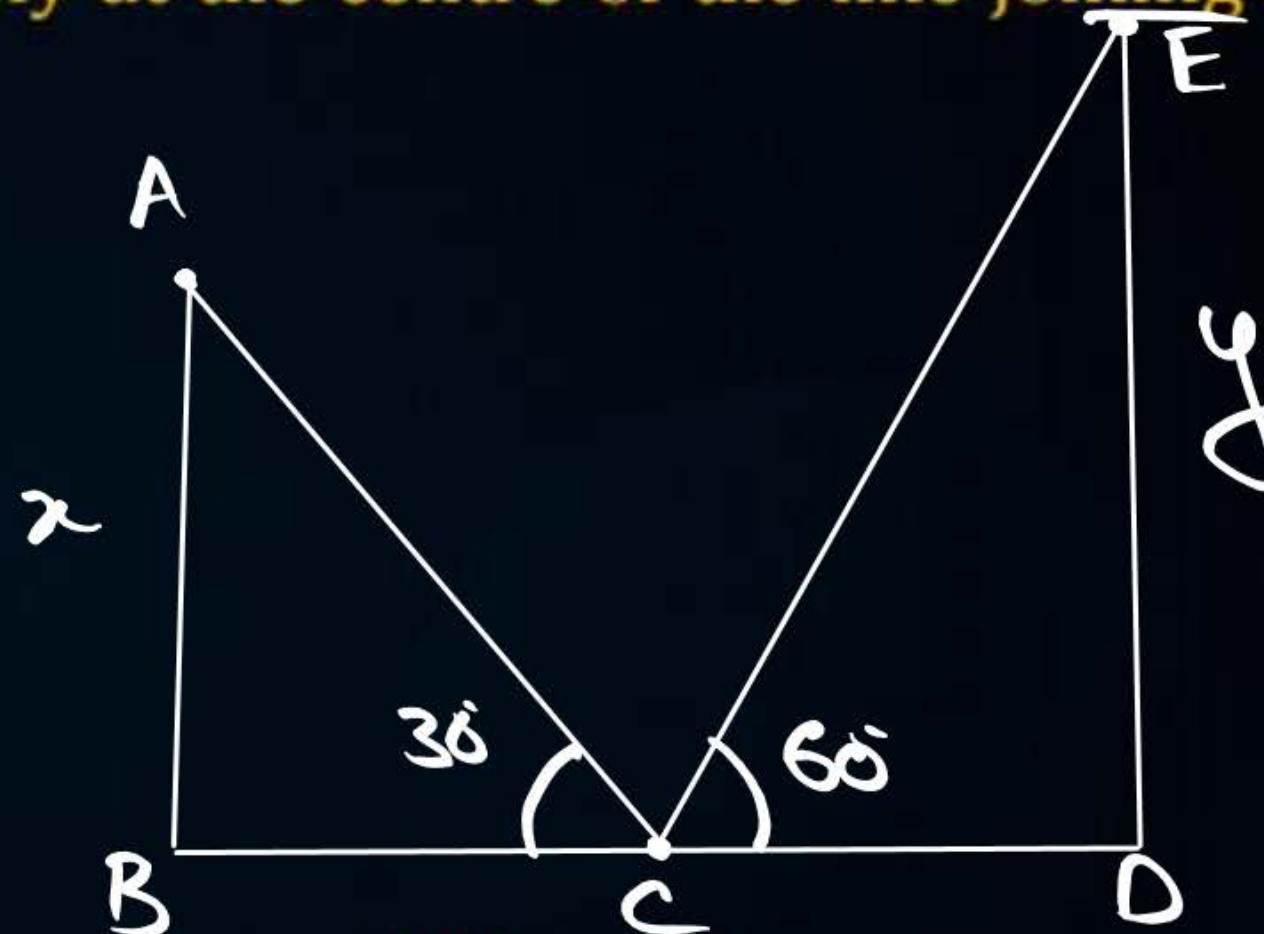
$$\frac{BC}{\sqrt{3}} = x$$

$\triangle EDC$

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

$$\sqrt{3} = \frac{y}{CD}$$

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



$$\frac{x}{y} = \frac{BC/\sqrt{3}}{CD\sqrt{3}}$$

$$\frac{BC}{3CD} = \left(\frac{1}{3}\right)$$

Topic : Application



#Q. At a point on level ground, the angle of elevation of a vertical tower is found to be such that its tangent is $\frac{5}{12}$. On walking 192 meters towards the tower, the tangent of the angle of elevation is $\frac{3}{4}$. Find the height of the tower.

$$\tan x = \frac{5}{12}$$

$$\tan y = \frac{3}{4}$$

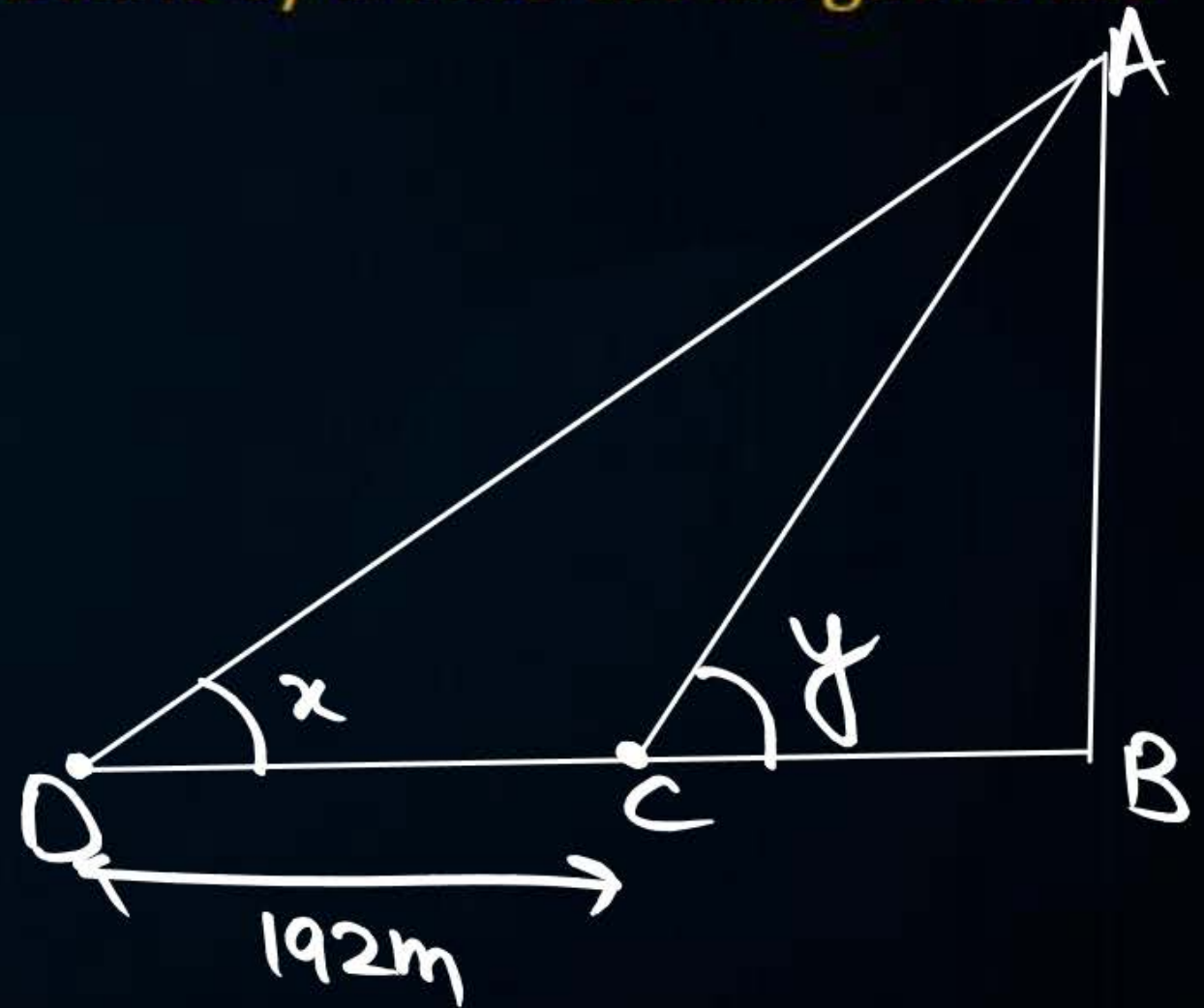
$$\frac{AB}{BD} = \frac{5}{12}$$

$$\frac{AB}{BC} = \frac{3}{4}$$

$$\frac{AB}{DC + CB} = \frac{5}{12}$$

$$\frac{4AB}{3} = BC$$

$$\frac{AB}{192 + CB} = \frac{5}{12}$$



$$\frac{AB}{192 + \textcircled{BC}} = \frac{5}{12}$$

$$12AB = 5[192 + BC]$$

$$12AB = 5\left[192 + \frac{4}{3}AB\right]$$

$$12AB = 960 + \frac{20}{3}AB$$

$$\frac{12AB - \frac{20AB}{3}}{1} = 960$$

$$\frac{36AB - 20AB}{3} = 960$$

$$16AB = 3(960)$$

$$AB = \frac{3 \times 960}{16}$$

$$\text{AB} = 180\text{m}$$

Topic : Application



#Q. An aeroplane when flying at a height of 4000 m from the ground passes vertically above another aeroplane at an instant when the angles of the elevation of the two planes from the same point on the ground are 60° and 45° respectively. Find the vertical distance between the aeroplanes at that instant.

$$\Delta BCD$$

$$\tan 45^\circ = \frac{BC}{CD}$$

$$1 = \frac{BC}{CD}$$

$$CD = BC$$

$$\Delta ACD$$

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

$$\sqrt{3} = \frac{AC}{DC}$$

$$DC = \frac{4000}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

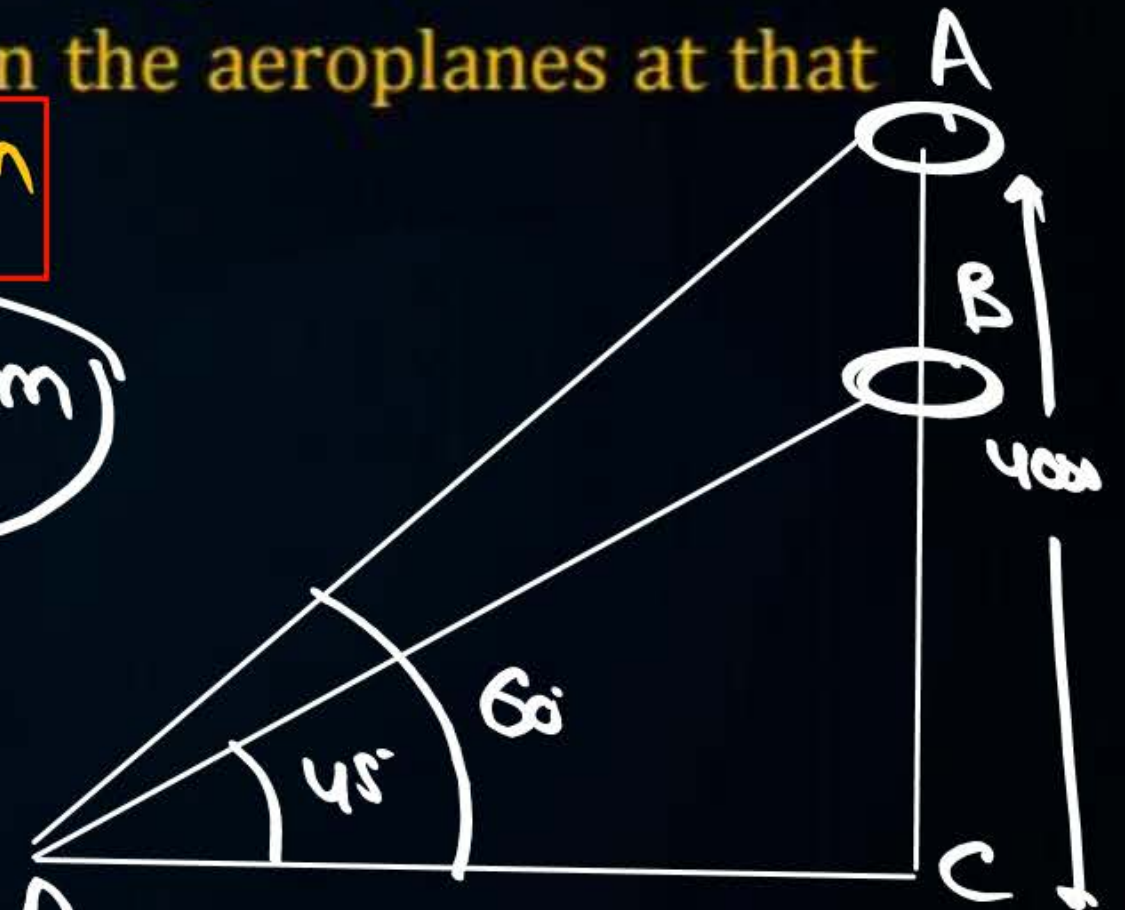
$$DC = \frac{4000\sqrt{3}}{3} \text{ m}$$

$$\Rightarrow BC = \frac{4000\sqrt{3}}{3} \text{ m}$$

$$AC = AB + BC$$

$$AC - BC = AB$$

$$4000 - \frac{4000\sqrt{3}}{3} = AB$$



$$\frac{12000 - 4000\sqrt{3}}{3} = AB$$

$$\frac{4000[3 - \sqrt{3}]}{3} m \Rightarrow AB$$

Topic : Application



#Q. 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 angles of elevation of the bottom and the top of the flag-staff are α and β respectively. Prove that the height of the tower is $\frac{h \tan \alpha}{\tan \beta - \tan \alpha}$.

$\triangle BCD$

$$\tan \alpha = \frac{BC}{CD}$$

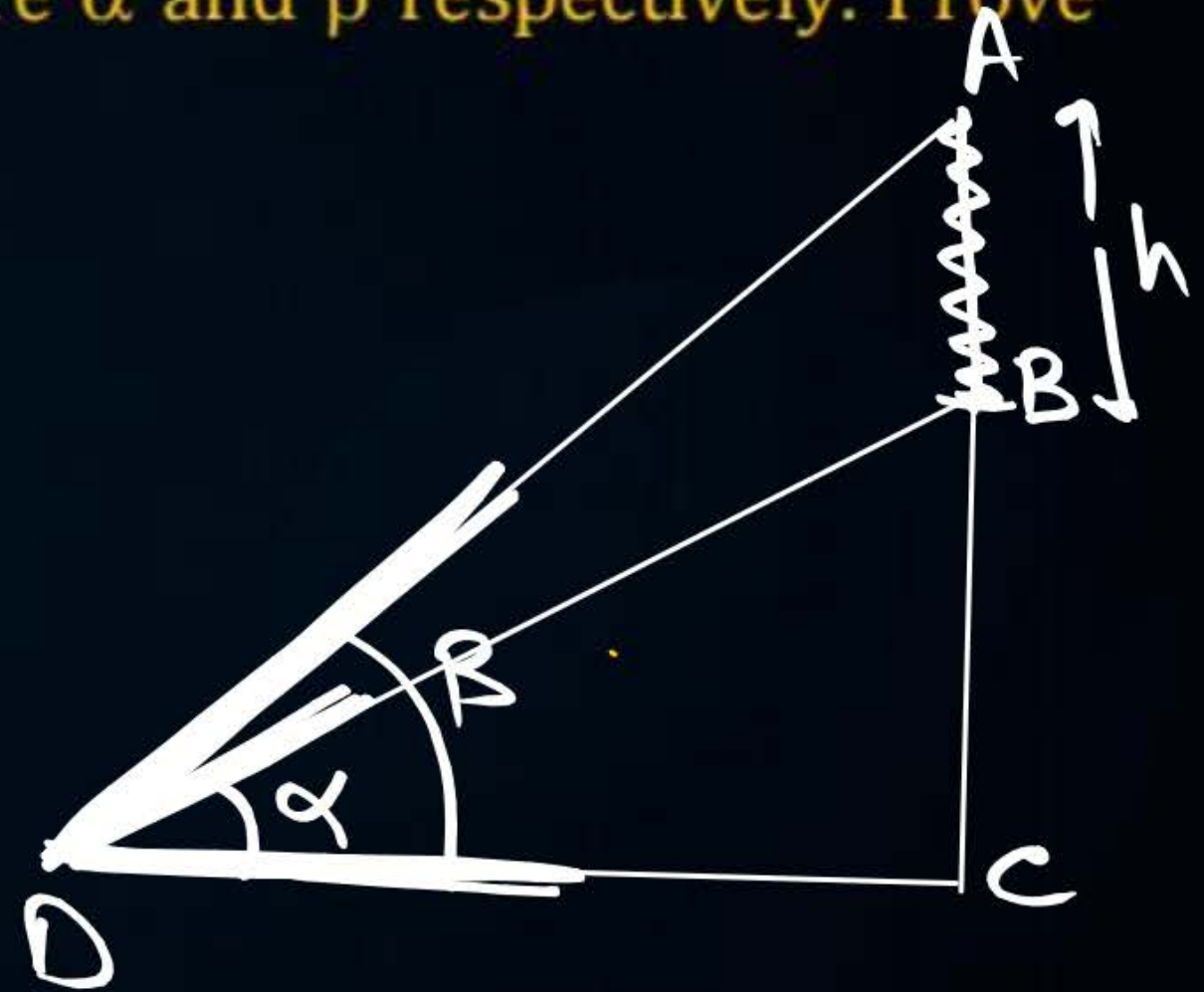
$$CD = \frac{BC}{\tan \alpha}$$

$\triangle ACD$

$$\tan \beta = \frac{AC}{DC}$$

$$\tan \beta = \frac{AB + BC}{DC}$$

$$\tan \beta = \frac{h + BC}{DC}$$



$$\tan \beta = \frac{h + BC}{CD}$$

$$\textcircled{CD} \tan \beta = h + BC$$

$$\frac{BC \tan \beta}{\tan \alpha} = h + \textcircled{BC}$$

$$\frac{BC \tan \beta}{\tan \alpha} - BC = h$$

$$BC \left[\frac{\tan \beta}{\tan \alpha} - \frac{1}{1} \right] = h$$

$$BC \left[\frac{\tan \beta - \tan \alpha}{\tan \alpha} \right] = h$$

$$BC = \frac{h \tan \alpha}{\tan \beta - \tan \alpha}$$

Ans, //

Topic : Application



#Q. From an aeroplane vertically above a straight horizontal road, then angles of depression of two consecutive milestones on opposite sides of the aeroplane are observed to be α and β . Show that the height in miles of aeroplane above the road is given by $\frac{\tan\alpha\tan\beta}{\tan\alpha+\tan\beta}$.

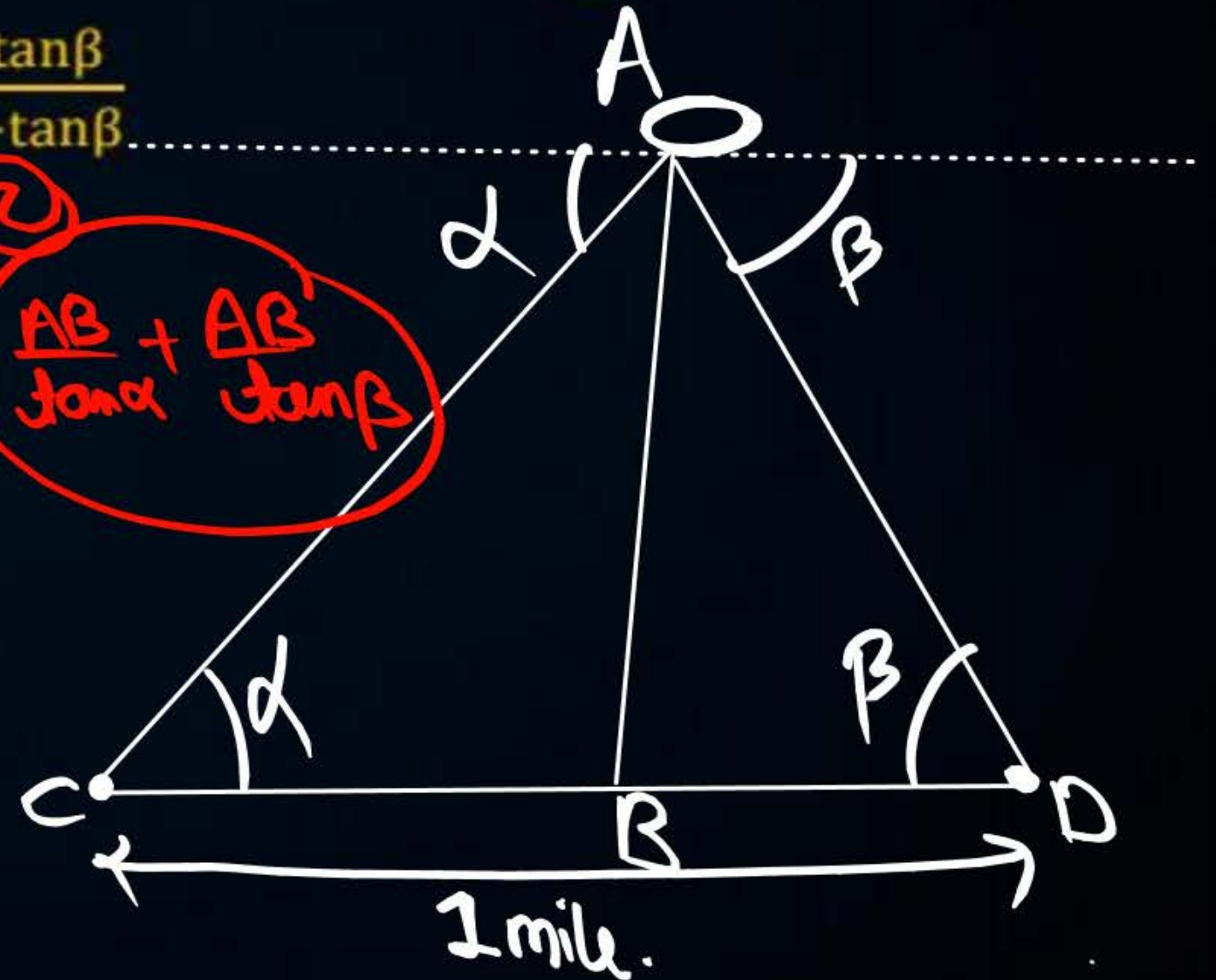
$\triangle ABC$
 $\tan\alpha = \frac{AB}{CB}$

$\triangle ABD$
 $\tan\beta = \frac{AB}{BD}$

① + ②
 $CB + BD = \frac{AB}{\tan\alpha} + \frac{AB}{\tan\beta}$

$CB = \frac{AB}{\tan\alpha}$ ①

$BD = \frac{AB}{\tan\beta}$ ②



$$1 = AB \left(\frac{1}{\tan \alpha} + \frac{1}{\tan \beta} \right)$$

$$1 = AB \left(\frac{\tan \beta + \tan \alpha}{\tan \alpha \tan \beta} \right)$$

$$\frac{\tan \alpha \tan \beta}{\tan \beta + \tan \alpha} = AB$$

Ans/

miles \rightarrow distance in mil.

$$1 \text{ mile} = 1.609 \text{ km}$$

Topic : Application



#Q. Amit, standing on a horizontal plane, and a bird flying at a distance of 200 m from him at an elevation of 30° . Deepak standing on the roof of a 50 m high building, and the angle of elevation of the same bird to be 45° . Amit and Deepak are on opposite sides of the bird. Find the distance of the bird from Deepak.

$\triangle ABE$

$$\sin 30^\circ = \frac{BE}{AE}$$

$$\frac{1}{2} = \frac{BE}{200}$$

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

$$BF + FE = 100$$

$$50 + FE = 100$$

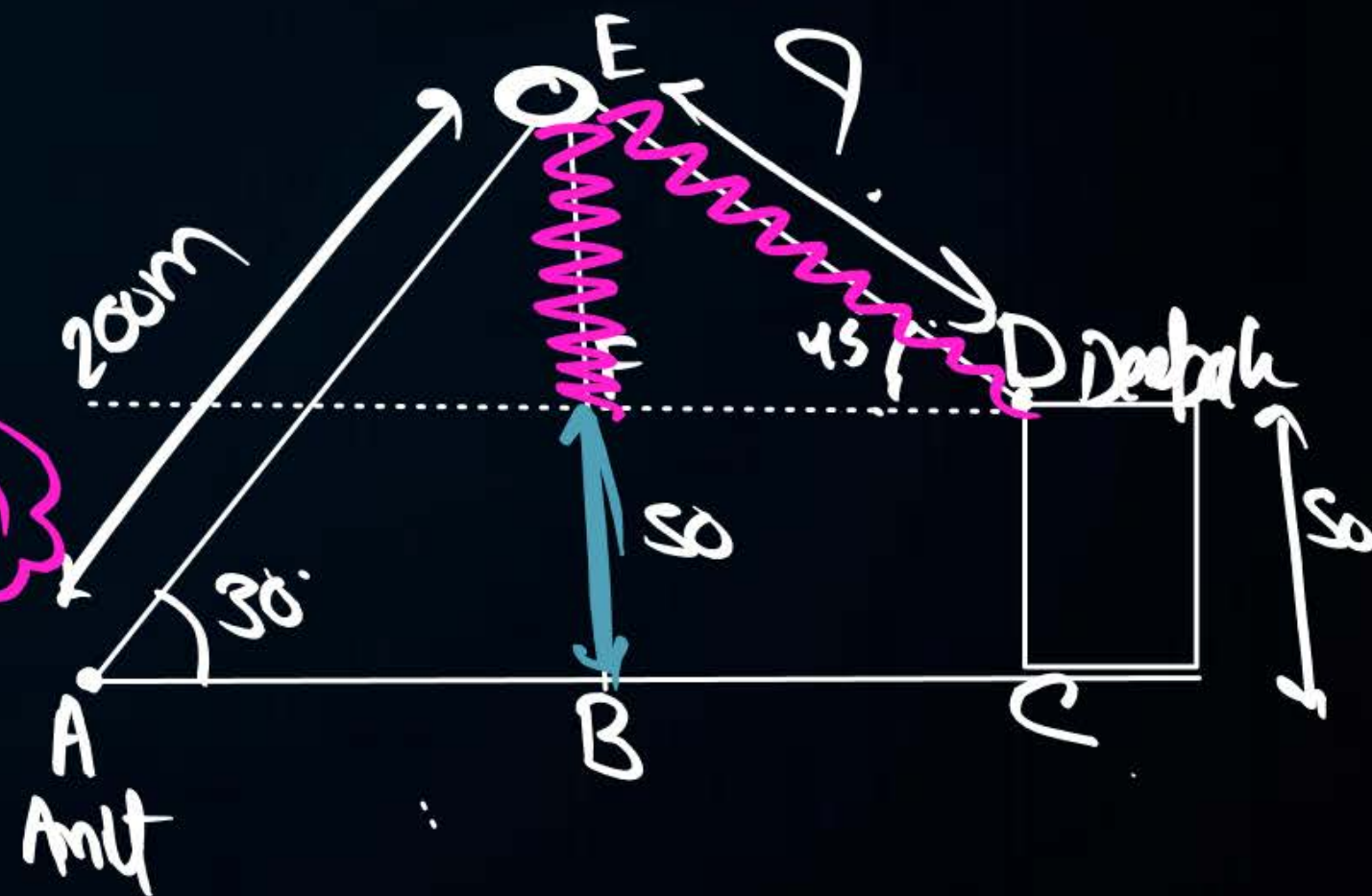
$$FE = 50\text{m}$$

$\triangle EPD$

$$\sin 45^\circ = \frac{FE}{ED}$$

$$\frac{1}{\sqrt{2}} = \frac{50}{ED}$$

$$ED = 50\sqrt{2}\text{m}$$



CASE BASED QUESTIONS



One evening, Kaushik was in a park. Children were playing cricket. Birds were singing on a nearby tree of height 80 m. He observed a bird on the tree at an angle of elevation of 45° .

When a sixer was hit, a ball flew through the tree frightening the bird to fly away. In 2 seconds, he observed the bird flying at the same height at an angle of elevation of 30° and the ball flying towards him at the same height at an angle of elevation of 60° .

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

$$\sqrt{3} = \frac{80}{AB}$$

$$AB = \frac{80}{\sqrt{3}}$$

$$AB = \frac{80\sqrt{3}}{3}$$

$$\tan 45^\circ = \frac{FC}{AC}$$

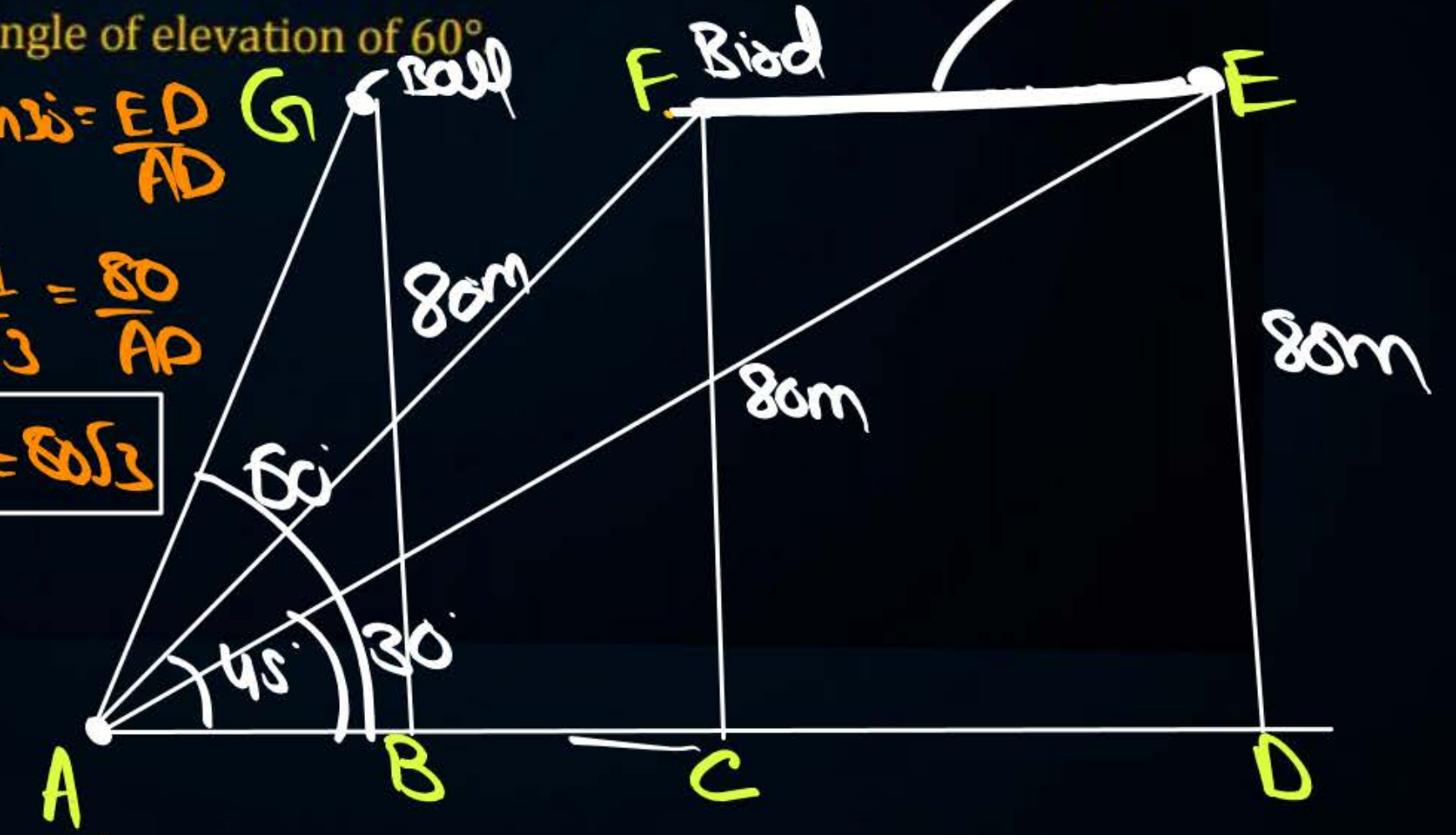
$$1 = \frac{80}{AC}$$

$$AC = 80$$

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

$$\frac{1}{\sqrt{3}} = \frac{80}{AD}$$

$$AD = 80\sqrt{3}$$



Topic : Case Based Question



#Q. At what distance from the foot of the tree was he observing the bird sitting on the tree?

$$AC = 80m$$

Topic : Case Based Question



#Q. How far did the bird fly in the mentioned time?

OR

After hitting the tree, how far did the ball travel in the sky when Kaushik saw the ball?

$AC = AB + BC$

$80 = \frac{80\sqrt{3}}{3} + BC$

$80 - \frac{80\sqrt{3}}{3} = BC$

$\frac{240 - 80\sqrt{3}}{3} = BC$

$AD = AC + CD$

$80\sqrt{3} = 80 + CD$

$80\sqrt{3} - 80 = CD$

$80(\sqrt{3} - 1)m = CD$

Topic : Case Based Question



#Q. What is the speed of the bird in m/min if it had flown $20(\sqrt{3} + 1)$ m

$$S = \frac{D}{T}$$
$$S = \frac{20(\sqrt{3}+1)\text{m}}{\frac{2}{60}\text{min}}$$

$$S = \frac{20(\sqrt{3}+1) \times 60}{2}$$

$$S = 600(\sqrt{3}+1)\text{m/min}$$



$$T = 2\text{Sec}$$

$$1\text{min} = 60\text{Sec}$$

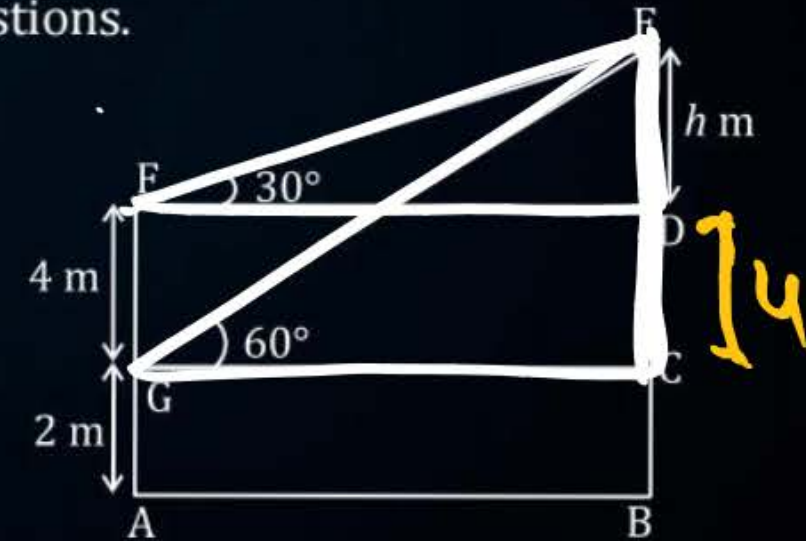
$$\frac{1}{60}\text{min} = 1\text{Sec}$$

$$\frac{2}{60}\text{min} = 2\text{Sec}$$

Observation of Balloon

There are two windows in a house. First window is at the height of 2 m above the ground and other window is 4 m vertically above the lower window. Ankit and Radha are sitting inside the two windows at points G and F respectively. At an instant, the angles of elevation of a balloon from these windows are observed to be 60° and 30° as shown below.

Based on the above information the following questions.



DEFD

$$\tan 30^\circ = \frac{ED}{FD}$$

$$\frac{1}{f_3} = \frac{h}{FD}$$

$$FD = h\nu$$

DECG

$$\tan 60^\circ = \frac{FC}{GC}$$

~~$$J_3 = \frac{ED + DC}{FD}$$~~

$$J_3 = \frac{h+4}{FD}$$

$$\sqrt{3}FD = h + y$$

$$\sqrt{3}(h\sqrt{3}) = h + u$$

$$3h = h + 4$$

$$3h - h = 4$$

$$2h = 4$$

$$h = 2m$$

$$FD = \underline{h53}$$

$\{FD = 253\text{ m}\}$

Topic : Case Based Question



#Q. Who is more closer to the ballon?

- ☐ A Ankit
- ☒ B Radha
- ☐ C Both are at equal distance
- ☐ D Can't be determined

$$\sin 60^\circ = \frac{h+4}{GE} \quad \sin 30^\circ = \frac{h}{FE}$$

$$\frac{\sqrt{3}}{2} = \frac{2+4}{GE} \quad \frac{1}{2} = \frac{2}{FE}$$

$$GE = \frac{12}{\sqrt{3}}$$

$$FE = 4m$$

$$GE = \frac{12\sqrt{3}}{3}$$

$$GE = 4\sqrt{3}m$$

Topic : Case Based Question



#Q. Value of DF is equal to

- A** $\frac{h}{\sqrt{3}}$ m
- B** $h\sqrt{3}$ m
- C** $h/2$ m
- D** $2h$ m

Topic : Case Based Question



#Q. Value of h is

☒ **A** 2

☐ **B** 3

☐ **C** 4

☐ **D** 5

Topic : Case Based Question



#Q. Height of the balloon from the ground is

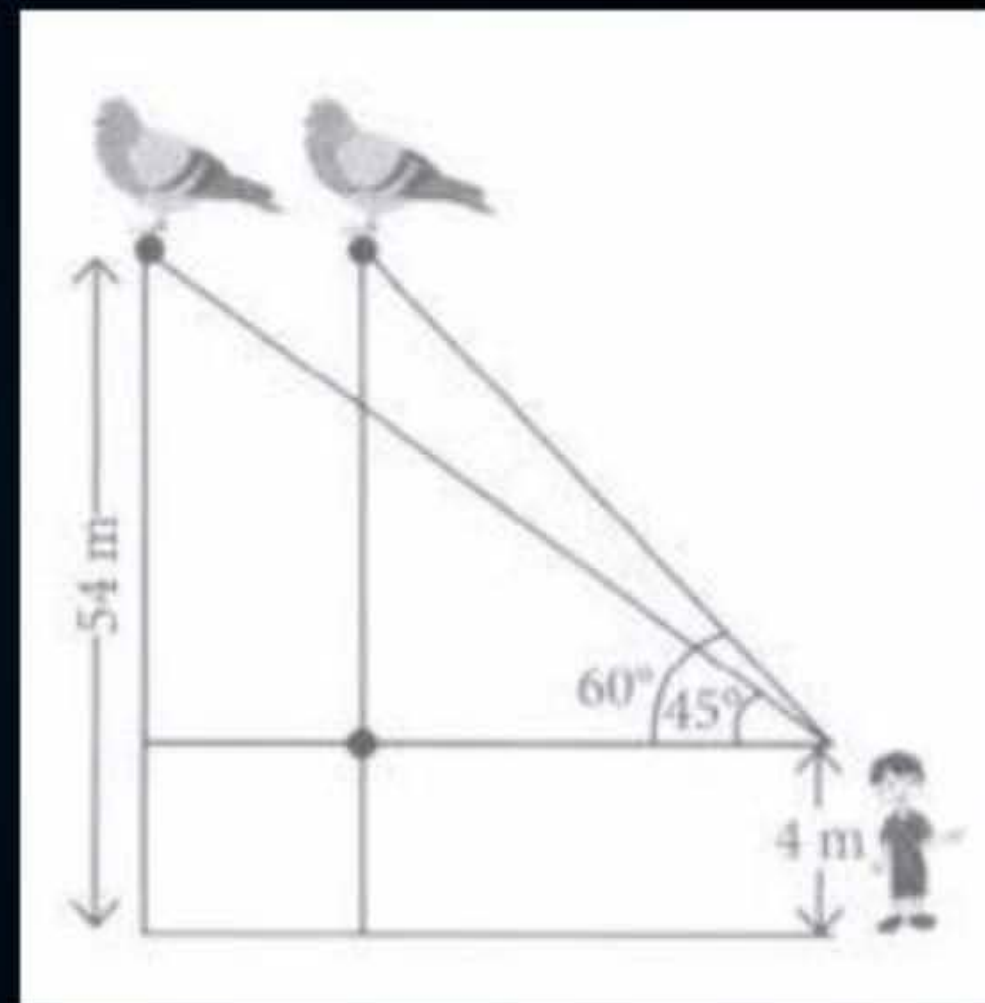
- ☐ A 4 m
- ☐ B 6 m
- ☒ C 8 m
- ☐ D 10 m

CASE BASED QUESTIONS

Flying Pigeon

A boy 4 m tall spots a pigeon sitting on the top of a pole of height 54 m from the ground. The angle of elevation of the pigeon from the eyes of boy at any instant is 60° . The pigeon flies away horizontally in such a way that it remained at a constant height from the ground. After 8 seconds, the angle of elevation of the pigeon from the same point is 45° .

Based on the above information, answer the following questions. (Take $\sqrt{3} = 1.73$)



#Q. Find the distance of first position of the pigeon from the eye of the boy.

- A** 54 m
- B** 100 m
- C** $\frac{100}{\sqrt{3}}$ m
- D** $100\sqrt{3}$ m

How

#Q. If the distance between the position of pigeon increases, then the angle of elevation

- A** Increases
- B** Decreases
- C** Remains Unchanged
- D** Can't Say

H.W

#Q. Find the distance between the position of pigeon increases, then the angle of elevation

- A** 50 m
- B** $\frac{50}{\sqrt{3}}$ m
- C** $50\sqrt{3}$ m
- D** $60\sqrt{3}$ m

How

#Q. How much distance the pigeon covers in 8 seconds?

- A** 12.13 m
- B** 19.60 m
- C** 21.09 m
- D** 26.32 m

Hw

Topic : Case Based Question



#Q. Find the speed of the pigeon.

- A** 2.63 m/sec
- B** 3.88 m/sec
- C** 6.7 m/sec
- D** 9.3 m/sec

How



THANK
YOU

