UDAAN

2026

Some Applications Of Trigonometry

MATHS LECTURE-5

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Topics *to be covered*

A Questions (part 5)

#Case study

Shadow vale questions.

#QT

#Q. The angle of elevation of the top of a tower 24 m high from the foot of another tower in the same plane is 60 deg The angle of elevation of the top of the second tower from the foot of the first tower is 30 deg Find the distance between two towers and the height of the other tower Also, find the length of the wire attached to the tops of both the towers.

$\tan 30 = \frac{DC}{CB}$

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

$\frac{1}{\sqrt{3}} = \frac{8}{8\sqrt{3}}$

$8 = DC$

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

$\sqrt{3} = \frac{24}{CB}$

$CB = 24/\sqrt{3} \times \frac{\sqrt{3}}{\sqrt{3}}$

$CB = 8\sqrt{3}$

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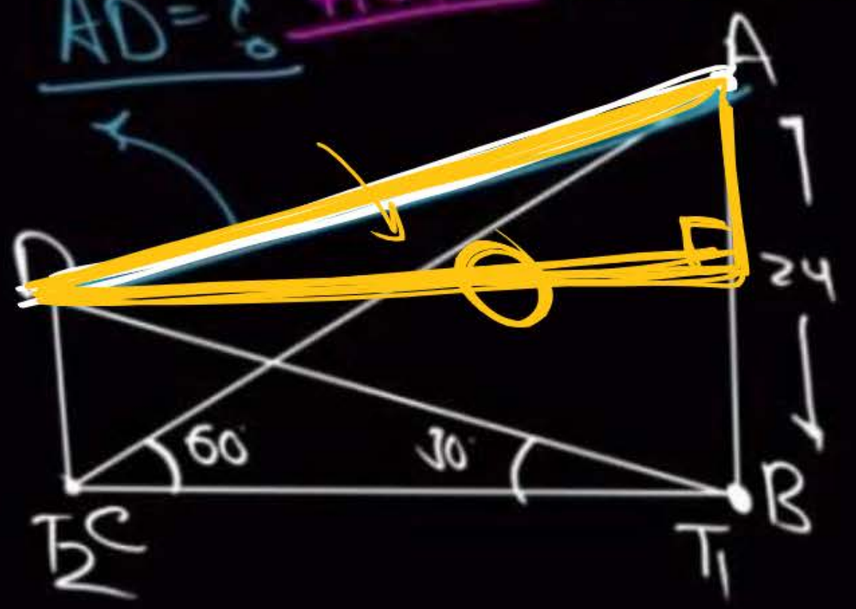
AD = ? #Gupu



#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.

To find: BD

ΔABC

$\sin 30 = \frac{P}{H} = \frac{BC}{AB}$

$\frac{1}{2} = \frac{BO + OC}{200}$

$100 = BO + 50$

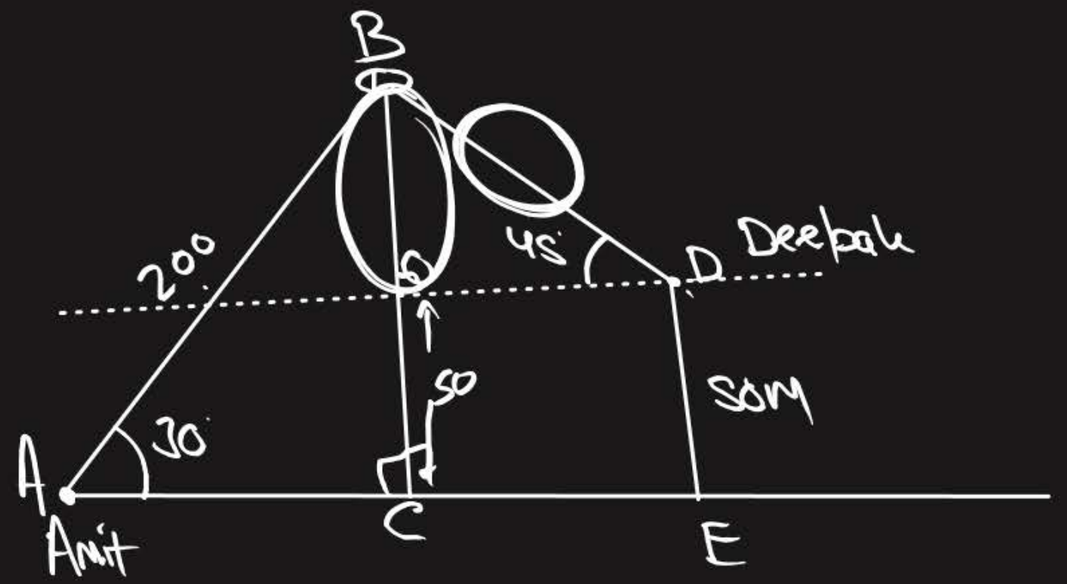
$50 = BO$

ΔBOD

$\sin 45 = \frac{P}{H} = \frac{OB}{BD}$

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

$BD = 50\sqrt{2}\,m$



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

Gi: $\tan\alpha = \frac{5}{12}$

$\tan\beta = 3/4$

To find: AB.

ΔABC

$\tan\beta = \frac{AB}{CB}$

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

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

ΔABD

$\tan\alpha = \frac{AB}{DB}$

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

$960 + 5CB = 12AB$

$960 + 5\left(\frac{4AB}{3}\right) = 12AB$

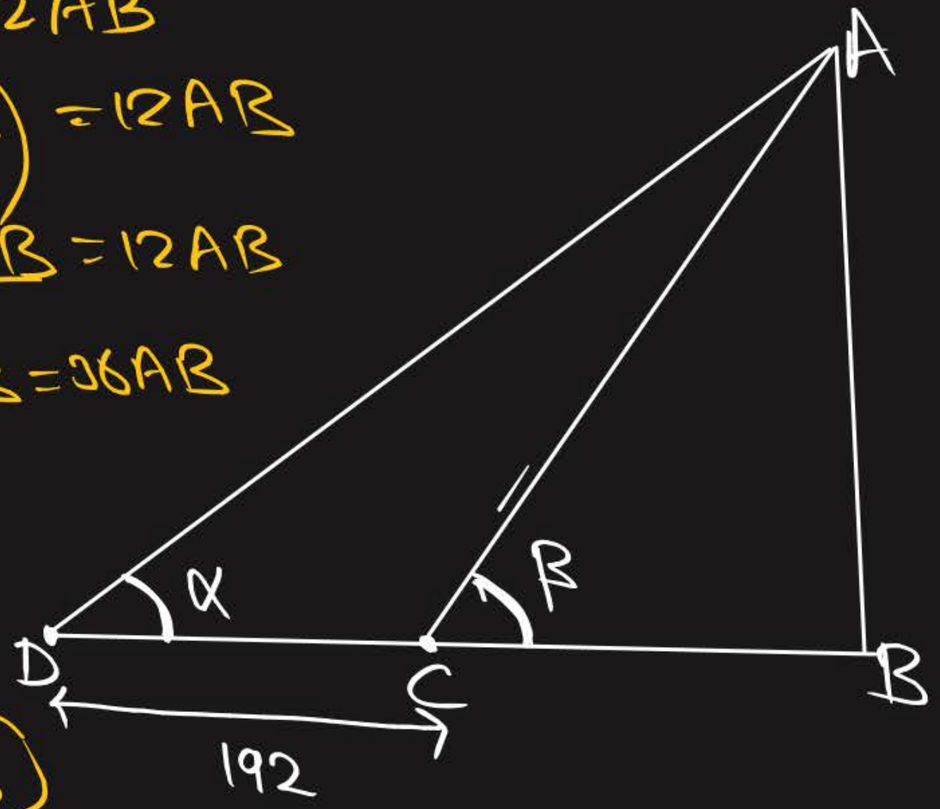
$\frac{2880 + 20AB}{3} = 12AB$

$2880 + 20AB = 36AB$

$2880 = 16AB$

$\frac{2880}{16} = AB$

$180m = AB$



CASE BASED QUESTIONS

One evening, Kaushik was in a park. Children's 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°.

Based on the above information answer the following questions.

ΔAFC

$\tan 45° = \frac{80}{AC}$

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

$AC = 80$

ΔGAB

$\tan 60° = \frac{GB}{AB}$

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

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

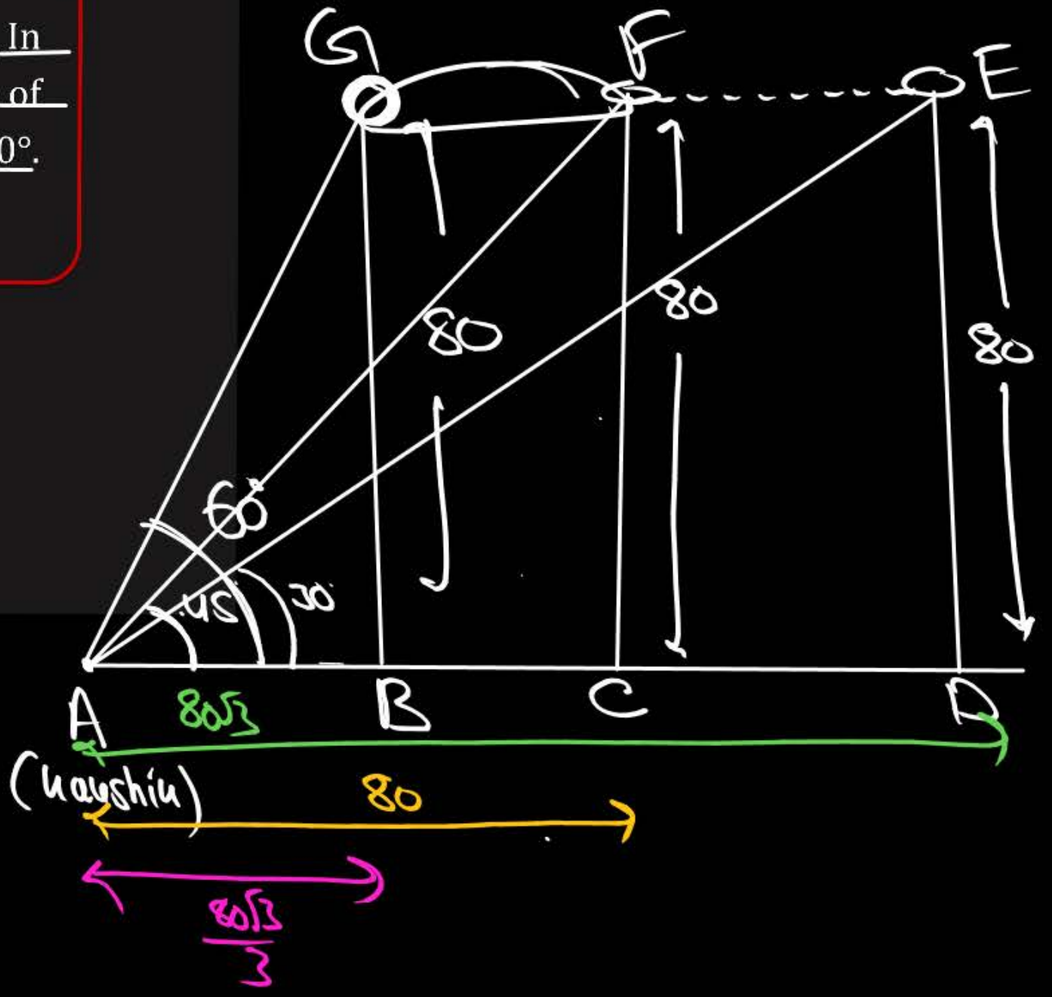
$AB = \frac{80\sqrt{3}}{3}$

ΔEAD

$\tan 30° = \frac{ED}{AD}$

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

$AD = 80\sqrt{3}$



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

$AC = ?$ ΔFAC

$\tan\theta = \frac{FC}{AC}$

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

$AC = 80m$

#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?

$AD - AC = CD$

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

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

$AC - AB = GF$

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

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

$80\left[\frac{3-\sqrt{3}}{3}\right]m = GF$

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

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

$$= \frac{20(\sqrt{3}+1)\text{ m}}{\frac{1}{30}\text{ min}}$$

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

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

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

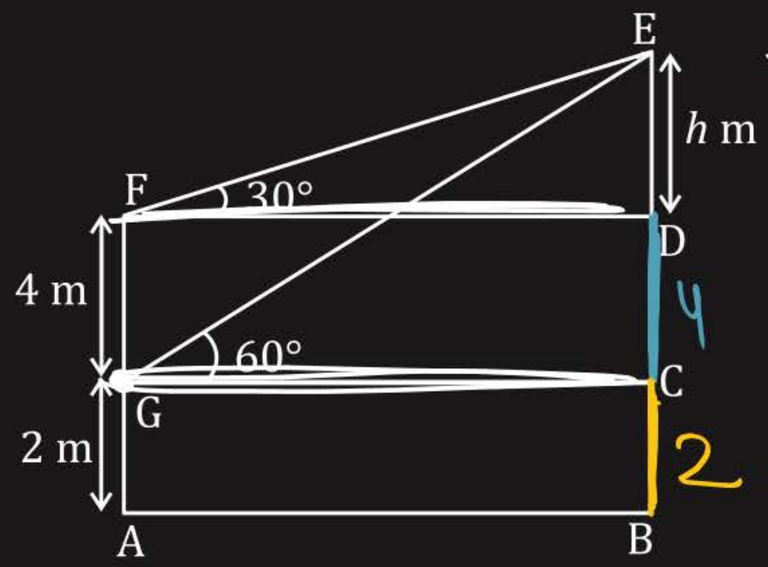
$\frac{2}{60}\text{ min} = 2\text{ s}$

$\boxed{\frac{1}{30}\text{ min} = 2\text{ s}}$

CASE BASED QUESTIONS

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 answer the following questions.



ΔFED

$\tan 30° = \frac{h}{FD}$

$\frac{1}{\sqrt{3}} = \frac{h}{FD}$

$FD = h\sqrt{3}$

$FD = 2\sqrt{3}$

ΔEGC

$\tan 60° = \frac{EC}{GC}$

$\sqrt{3} = \frac{h+4}{h\sqrt{3}}$

$3h = h + 4$

$2h = 4$

$h = 2$

#Q. Who is more closer to the balloon?

A Ankit

B Radha

C Both are at equal distance

D Can’t be determined

#Q. Value of DF is equal to:

A $h/\sqrt{3}$ m

B $h\sqrt{3}$ m

C $h/2$ m

D $2h$ m

#Q. Value of h is:

A 2

B 3

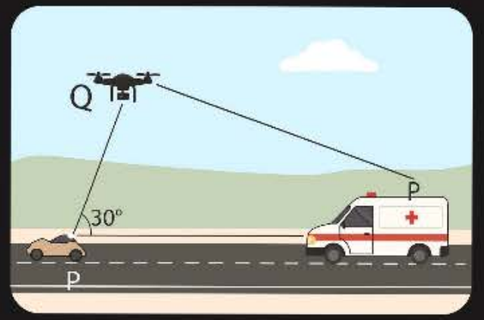
C 4

D 5

CASE BASED QUESTIONS

A drone was used to facilitate movement of an ambulance on the straight highway to a point P on the ground where there was an accident. The ambulance was travelling at the speed of 60 km/h. The drone stopped at a point Q, 100 m vertically above the point P. The angle of depression of the ambulance was found to be 30° at a particular instant.

Based on above information, answer the following questions :



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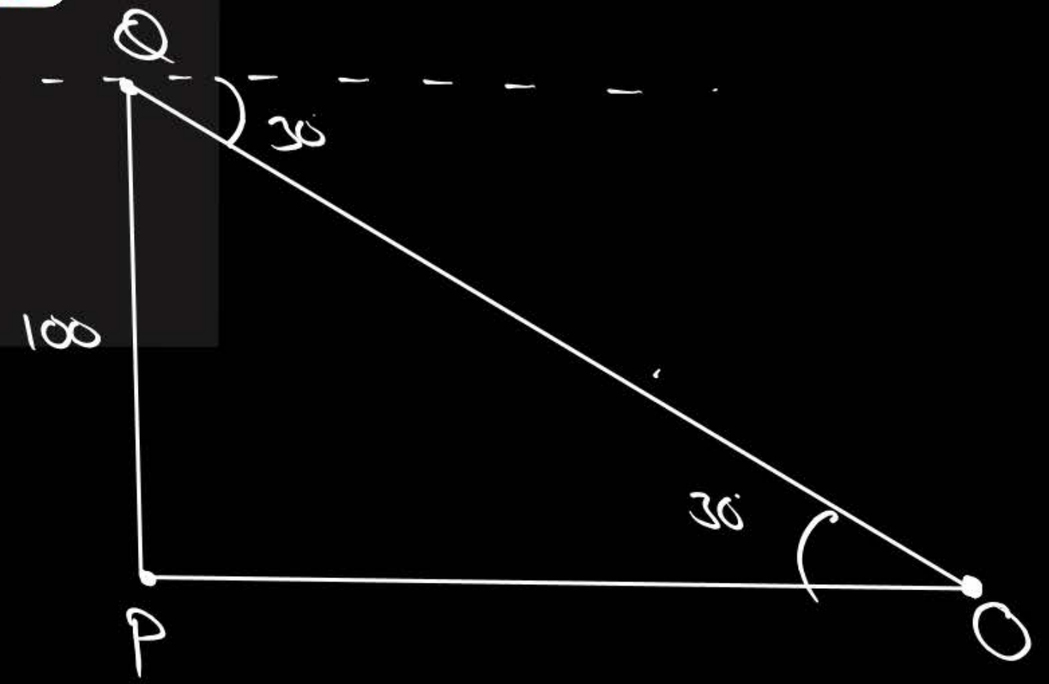
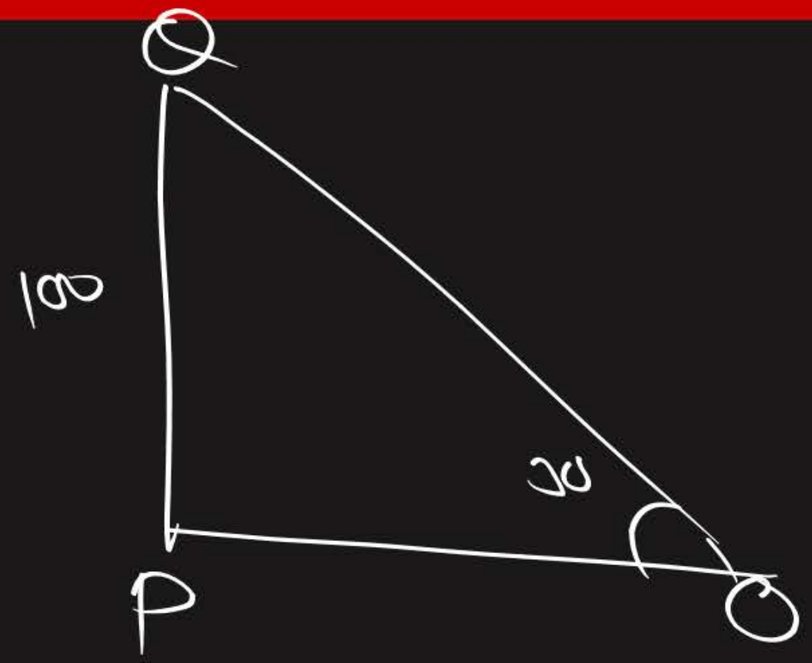


#Q. Represent the above situation with the help of a diagram.

#Q. Find the distance between the ambulance and the site of accident (P) at a particular instant. (Use $\sqrt{3} = 1.73$)



$PO = ?$

$$\tan 30° = \frac{QP}{PO}$$

$$\frac{1}{\sqrt{3}} = \frac{100}{PO}$$

$$PO = 100\sqrt{3}\,m$$

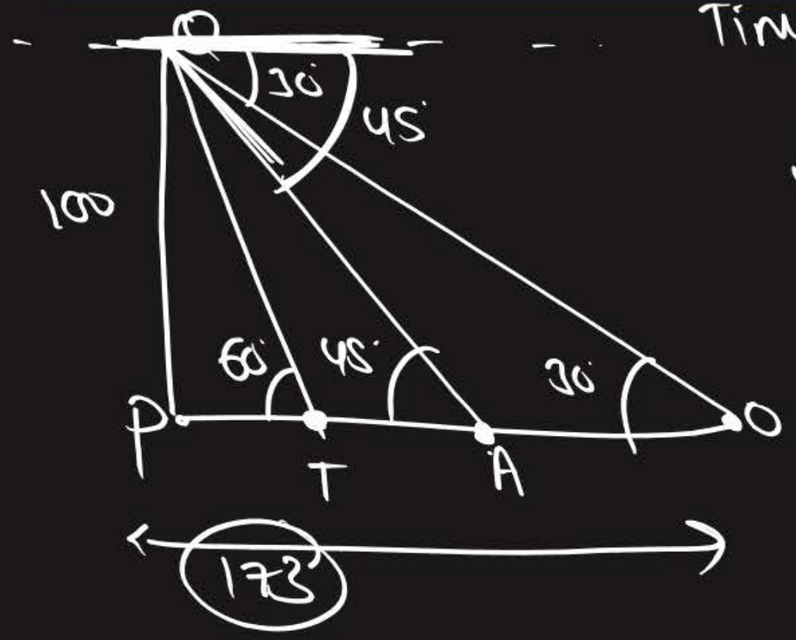
$$PO = 100 \times 1.73$$

$$= 173\,m$$

#Q. Find the time (in seconds) in which the angle of depression changes from 30° to 45°.

OR

How long (in seconds) will the ambulance take to reach point P from a point T on the highway such that angle of depression of the ambulance at T is 60° from the drone?



Time of OA

$\tan 45° = \frac{OP}{PA}$

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

$PA = 100m$

$PA + AO = PO$

$100 + AO = 173$

$AO = 73$

$T = D/S$

$T = \frac{73/1}{50/3} = 219/50 = 4.38$ Seconds

60 km/h

$\left(60 \times \frac{5}{18}\right)$ m/s

$\frac{50}{3}$ m/s

$\times 5/18$

km/h → m/s

$\times 18/5$

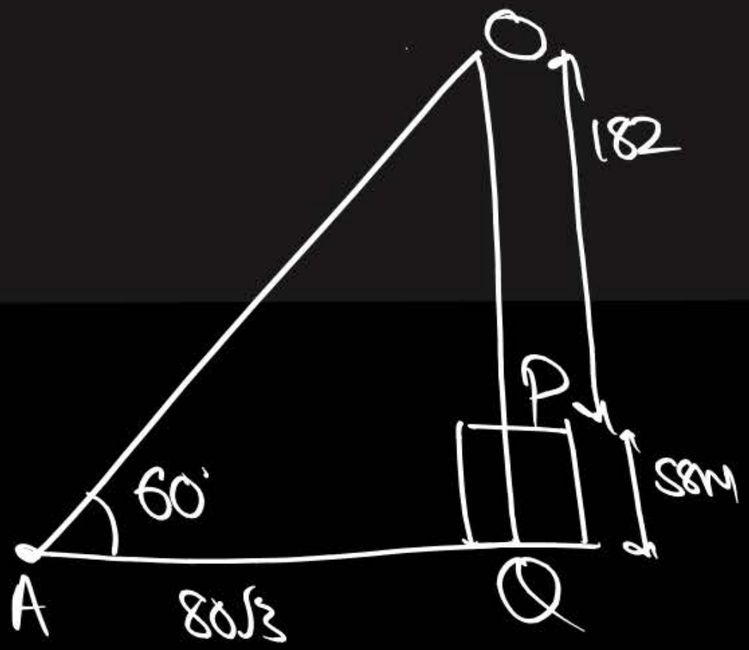
m/s → km/h

CASE BASED QUESTIONS

The Statue of Unity situated in Gujarat is the world's largest Statue which stands over a 58 m high base. As part of the project, a student constructed an inclinometer and wishes to find the height of Statue of Unity using it.

He noted following observations from two places:

Situation-I: The angle of elevation of the top of Statue from Place A which is $80\sqrt{3}$m away from the base of the Statue is found to be 60°.



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$\tan 60° = \frac{OQ}{AQ}$

$\sqrt{3} = \frac{OP + PQ}{80\sqrt{3}}$

$240 = OP + 58$

$OP = 182m$

Situation-II: The angle of elevation of the top of Statue from a Place B which is 40 m including above the ground is found to be 30° and entire height of the Statue the base is found to be 240 m.

Based on given information, answer the following questions:

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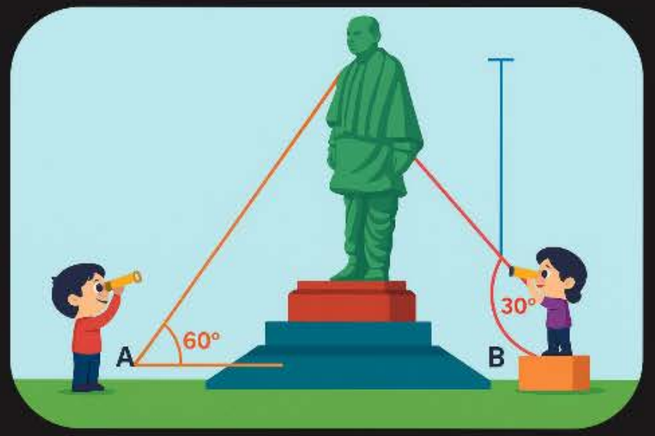


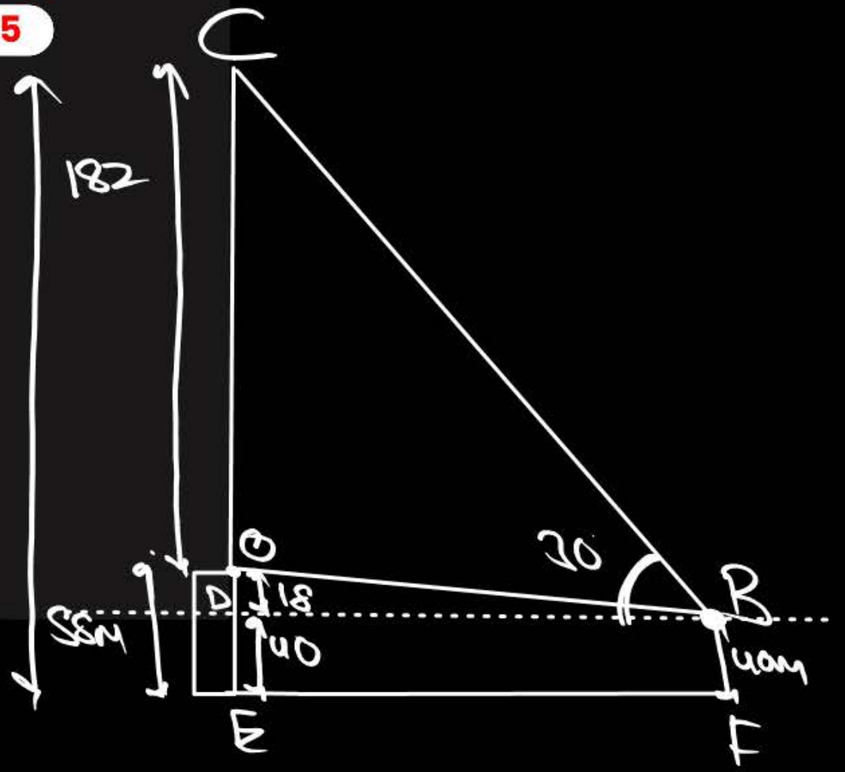
To find: DB

ΔCBD

$\tan 30° = \frac{CD}{DB}$

$\frac{1}{\sqrt{3}} = \frac{200}{DB}$

$DB = 200\sqrt{3}$ m



#Q. Represent the Situation – I with the help of a diagram.

#Q. Represent the Situation – II with the help of a diagram.

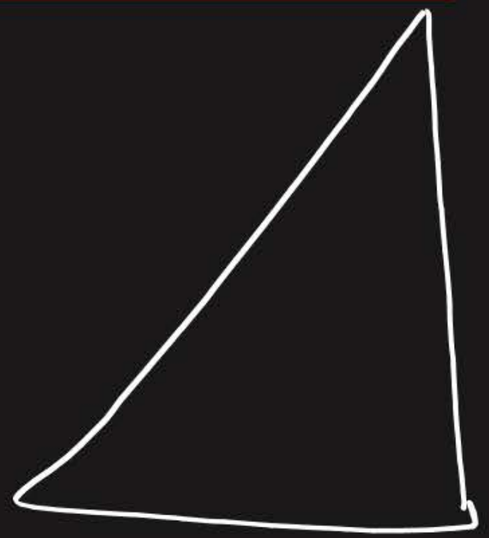
#Q. Calculate the height of Statue excluding the base and also find the height including the base with the help of Situation – I.

OR

Find the horizontal distance of point B (Situation – II) from the Statue and the value of tan α, where α is the angle of elevation of top of base of the Statue from point B.

∴ H of statue excluding the base = 182

H of statue including " " = 240.

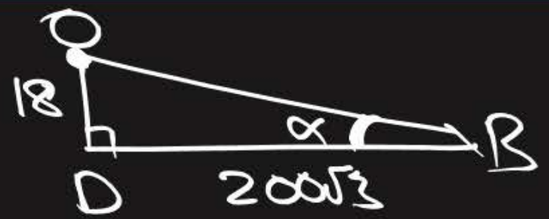


#Q. Calculate the height of Statue excluding the base and also find the height including the base with the help of Situation – I.

OR

Find the horizontal distance of point B (Situation – II) from the Statue and the value of tan α, where α is the angle of elevation of top of base of the Statue from point B.

$\tan\alpha = \frac{?}{?}$



$\tan\alpha = \frac{OD}{DB}$

$\tan\alpha = \frac{18}{200\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{18\sqrt{3}}{200 \cdot 3} = \frac{6\sqrt{3}}{200} = \boxed{\frac{3\sqrt{3}}{100}}$

CASE BASED QUESTIONS

India gate (formerly known as All India war memorial) is located near Karthavya path. (formerly Rajpath) at New Delhi. It stands as a memorial to 74187 soldiers of Indian Army, who gave their life in the first world war. This 42m tall structure was designed by Sir Edwin Lutyens in the style of Roman triumphal arches. A student Shreya of height 1 m visited India Gate as a part of her study tour.

CBSE Sample Paper 2026

#GPH

#Q. What is the angle of elevation from Shreya's eye to the top of India Gate, if she is standing at a distance of 41m away from the India Gate?

#GPM

#Q. If Shreya observes the angle of elevation from her eye to the top of India Gate to be 60°, then how far is the she standing from the base of the India Gate?

#GPH

#Q. If the angle of elevation from Shreya's eye changes from 45° to 30°, when she moves some distance back from the original position. Find the distance she moves back.

OR

If Shreya moves to a point which is at a distance of $41/\sqrt{3}$ m from the India Gate, then find the angle of elevation made by her eye to the top of India Gate.

#GPM

#Q. A ladder makes an angle of 60° with the ground when placed against a wall. If the foot of the ladder is 2 m away from the wall, then the length of the ladder (in meters) is

A $4/\sqrt{3}$

B $4\sqrt{3}$

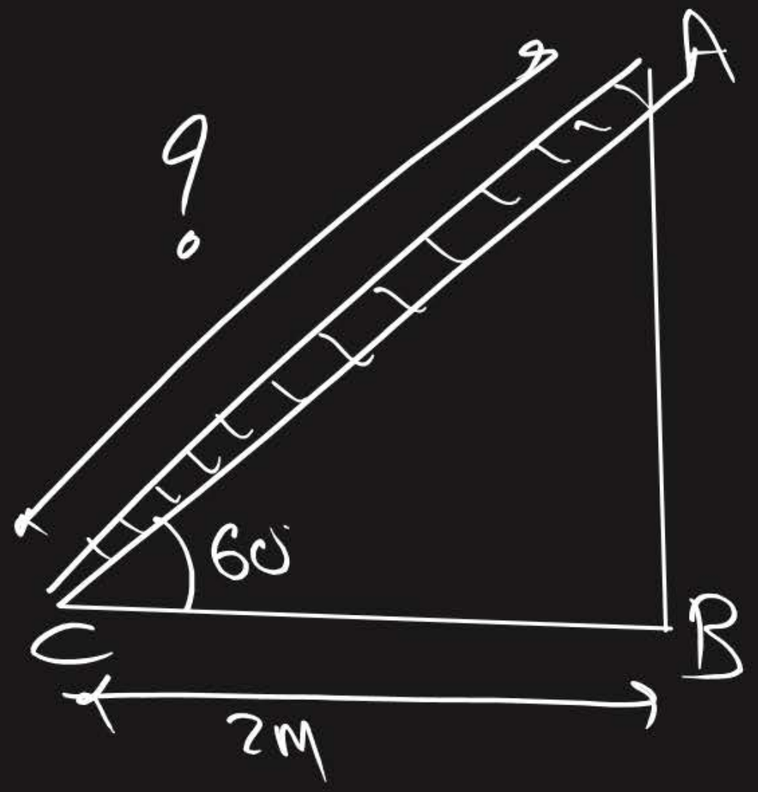
C $2\sqrt{2}$

D 4

$\cos 60^\circ = B/H$

$\frac{1}{2} = \frac{2}{AC}$

$AC = 4m$



#Q. A lamp post $5\sqrt{3}$ m high casts a shadow 5 m long on the ground. The Sun's elevation at this moment is

A 30°

B 45°

C 60°

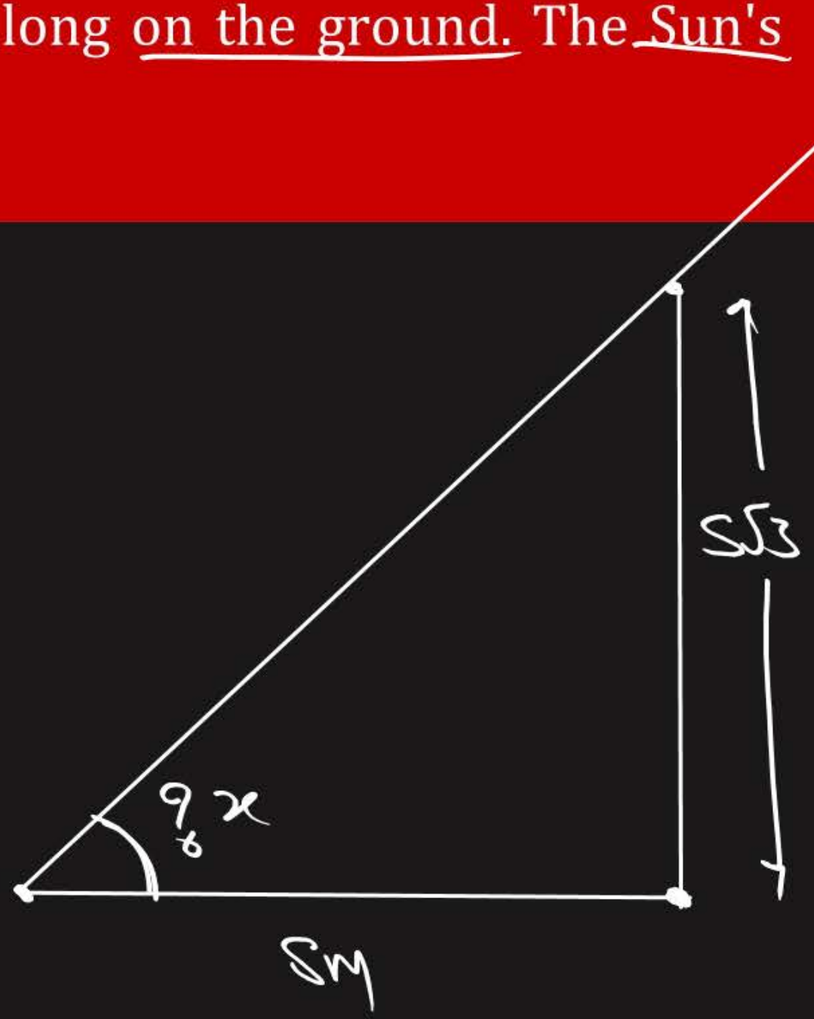
D 90°

$\tan x = \frac{5\sqrt{3}}{5}$

$\tan x = \sqrt{3}$

$\tan x = \tan 60$

$x = 60$



#Q. If the height of a vertical pole is $\sqrt{3}$ times the length of its shadow on the ground, then the angel of elevation of the Sun at that time is:

A. 30°

B. 60°

C. 45°

D. 75°

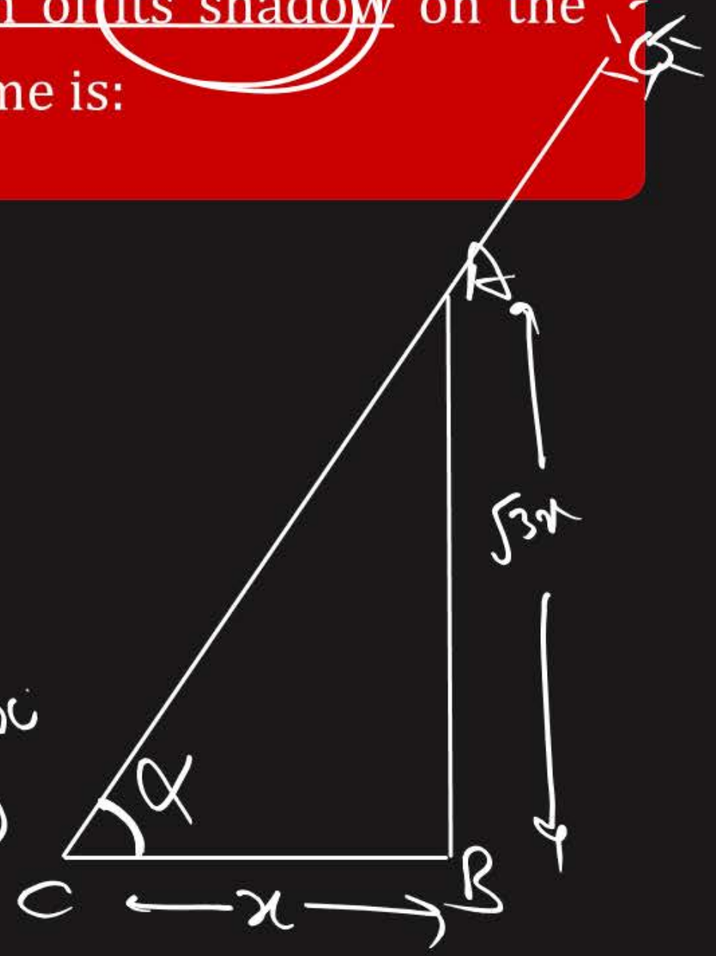
$$\tan\alpha = \frac{P}{B}$$

$$\tan\alpha = \frac{\sqrt{3}x}{x}$$

$$\tan\alpha = \sqrt{3}$$

$$\tan\alpha = \tan 60^\circ$$

$$\alpha = 60^\circ$$



#Q. At certain time of the day, the length of the shadow of a tower is equal to its height. Then the Sun's altitude at that time is:

A 30°

B 60°

C 90°

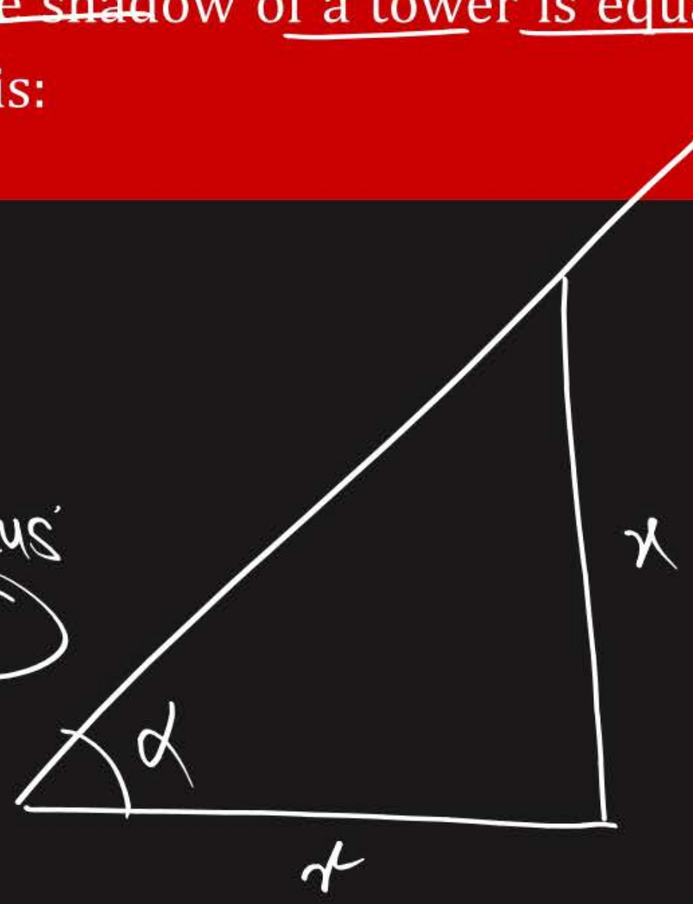
D 45°

$\tan\alpha = \frac{x}{x}$

$\tan\alpha = 1$

$\tan\alpha = \tan 45^\circ$

$\alpha = 45^\circ$



#Q. Find the length of the shadow on the ground of a pole of height 18 m when angle of elevation θ of the sun is such that $\tan\theta = \frac{6}{7}$.

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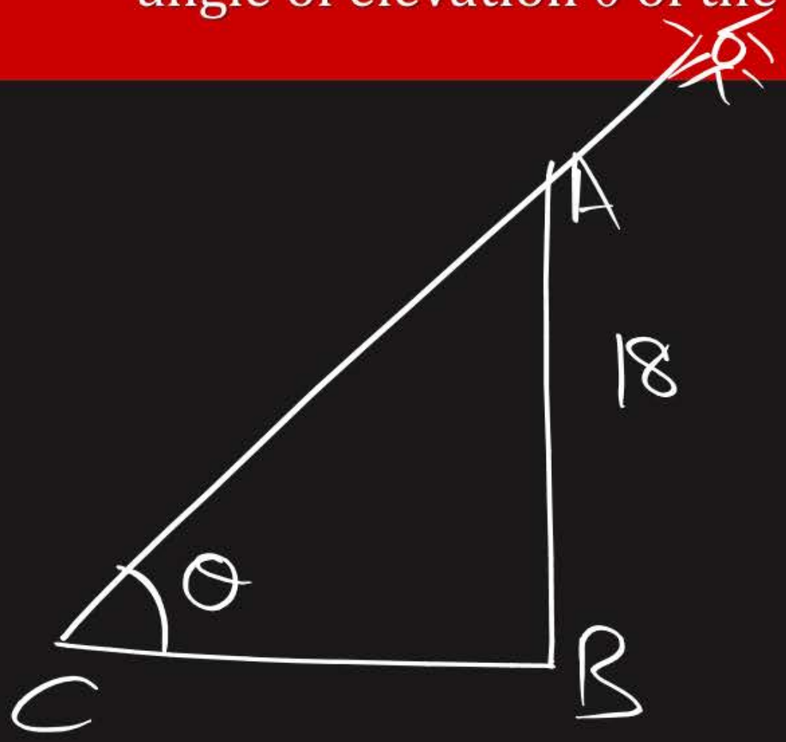

$\tan\theta = \frac{AB}{BC}$

$\frac{6}{7} = \frac{18}{BC}$

$BC = 21$ m

#Q. The tops of two towers of height x and y, standing on level ground, subtend angles of 30° and 60° respectively at the centre of the line joining their feet, then find x : y.

#Gpy

CBSE 2015

#Q. A 1.5 m tall boy is walking away from the base of a lamp post which is 12 m high, at the speed of 2.5 m/sec. Find the length of his shadow after 3 seconds.

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#Yaad dilana.
#Triangles.

#Notes

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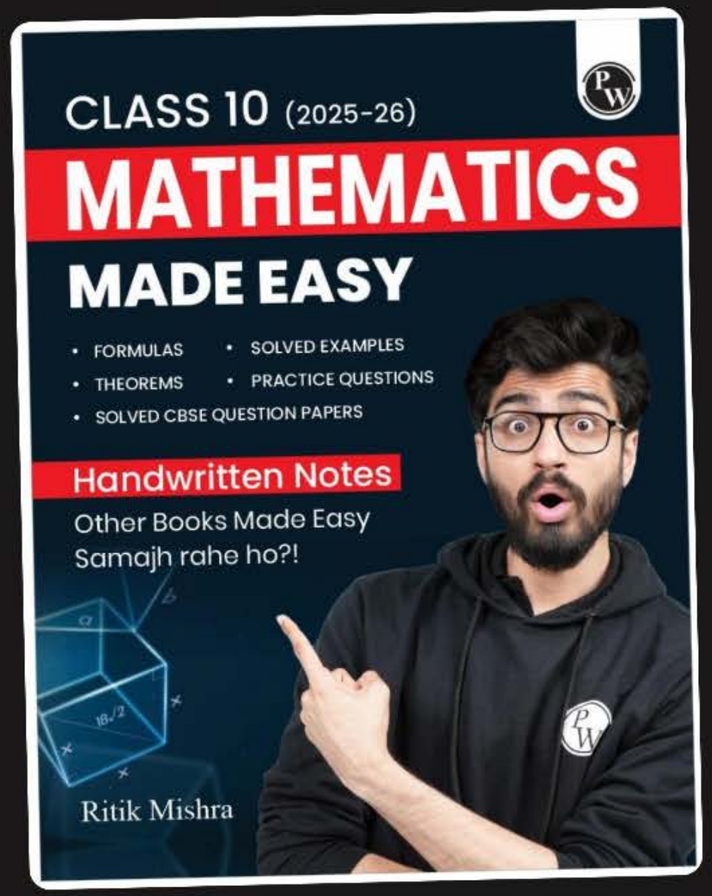

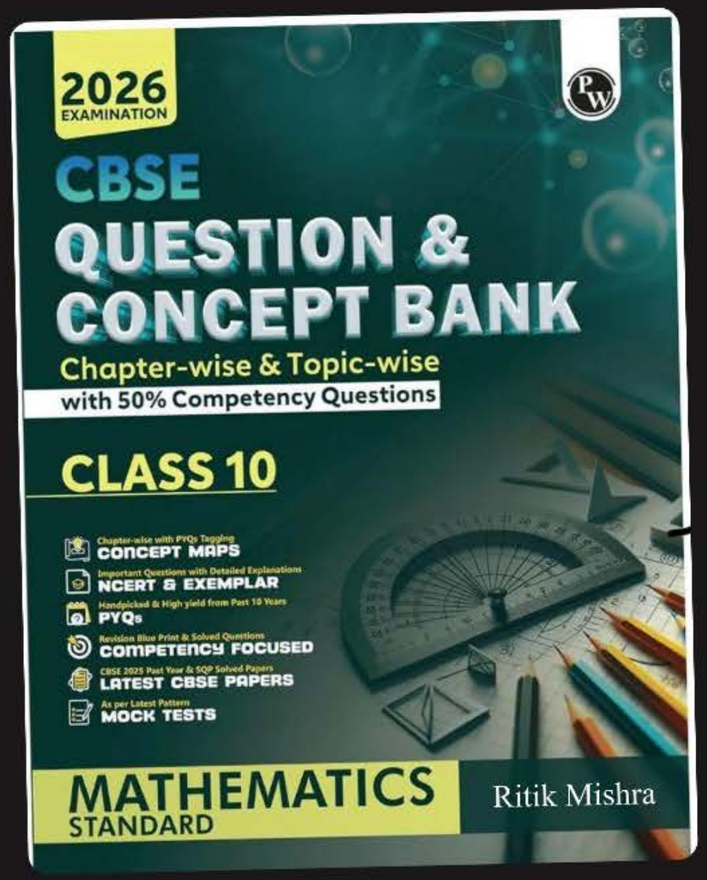

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