



# UDAAN



2026

Areas Related to Circle

MATHS

LECTURE-2

BY-RITIK SIR



# Topics *to be covered*

**A**

Remaining Questions on Sector

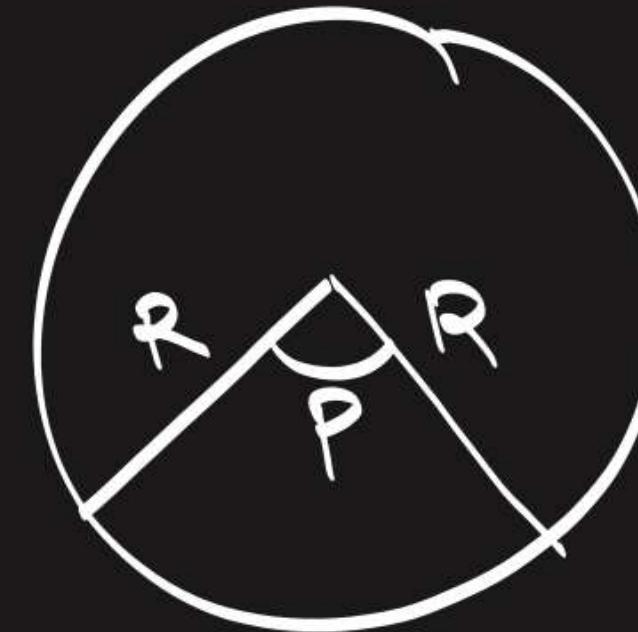
**B**

Segment of a Circle

#Q. Area of a sector of angle  $p$  (in degrees) of a circle with radius  $R$  is:

$$A = \frac{p}{360} \times \pi R^2$$

$$= \boxed{\frac{p}{360} \times \pi R^2}$$

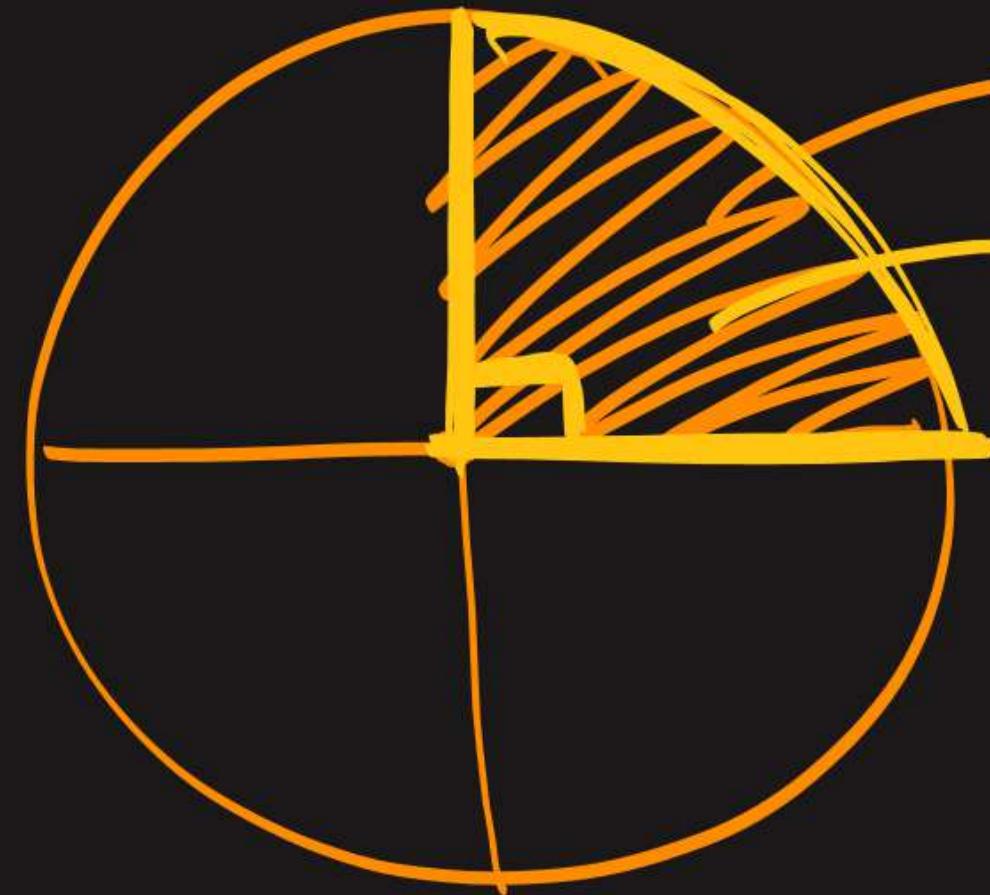


A  $\frac{p}{180} \times 2\pi R$

B  $\frac{p}{180} \times \pi R^2$

C  $\frac{p}{360} \times 2\pi R$

D  ~~$\frac{p}{720} \times 2\pi R^2$~~



Quadrant

Sector  $\alpha = 90^\circ$

#Q. A horse is tied to a peg at one corner of a square shaped grass field of side 15 m by means of a 5 m long rope. Find the area of that part of the field in which the horse can graze. Also, find the increase in grazing area if length of rope is increased to 10 m. [Use  $\pi = 3.14$ ]



CBSE 2023

Area grazed by horse when length of rope was 5m = Area of sector of radius 5m

$$= \frac{90}{360} \times \pi r^2$$

$$= \frac{1}{4} \times 3.14 \times 25 = 19.625 \text{ m}^2$$

Area grazed ( $R_{OP} = 10m$ ) =  $\frac{Q}{160} \times \pi \delta^2$

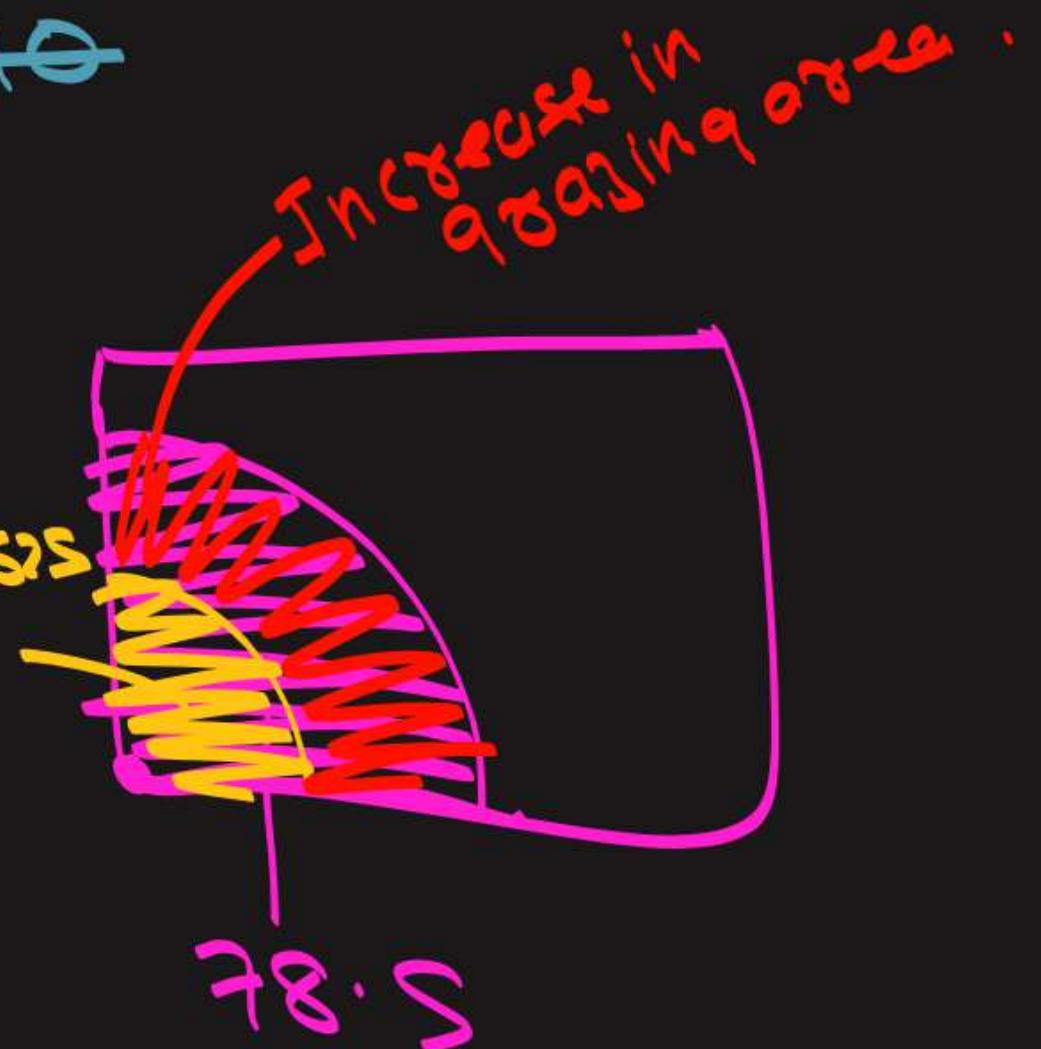
$$= \frac{90}{160} \times \frac{314}{100} \times 10 \times 10$$

$$= \frac{157}{16} \times 100$$

$$= 78.5 \text{ m}^2$$

$$\text{Increase in grazing area} = 78.5 - 19.625$$

$$= 58.875 \text{ m}^2$$



#5

#Q.

Sides of a right triangular field are 25 m, 24 m and 7 m. At the three corners of the field, a cow, a buffalo and a horse are tied separately with ropes of 3.5 m each to graze in the field. Find the area of the field that cannot be grazed by these animals.

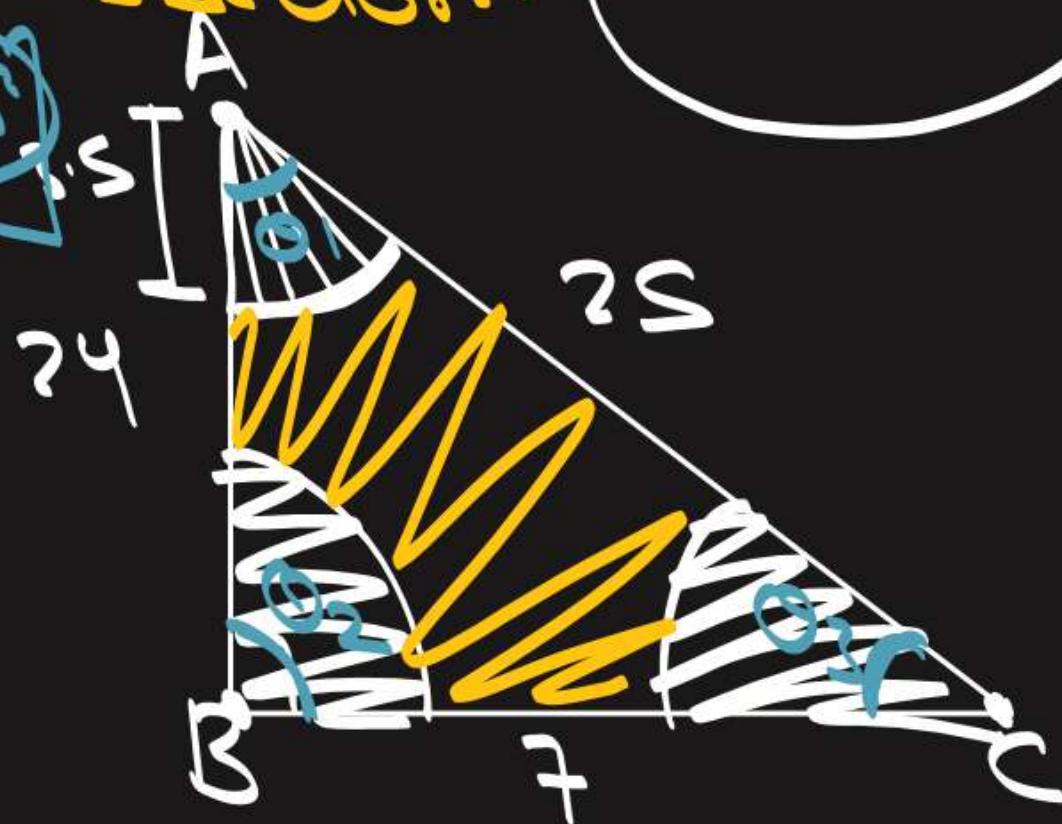
Area that cannot be grazed = Area of  $\Delta$  - Area of 3 sectors.

$$= \frac{1}{2} \times b \times h - [\cancel{\frac{\pi \times 7^2}{360}} + \cancel{\frac{\pi \times 7^2}{360}} + \cancel{\frac{\pi \times 7^2}{360}}]$$

$$= \frac{1}{2} \times 7 \times 24 - \frac{\pi \times 7^2}{360} [0_1 + 0_2 + 0_3]$$

$$= \frac{1}{2} \times 7 \times 24 - \frac{22}{7} \times \frac{35}{10} \times \frac{1}{2} \times \frac{180}{2}$$

$$= 84 - \frac{77}{4} \text{ m}^2$$



CBSE SQP 2020

#Q. Figure below, shows a sector of a circle, centre O, containing an angle  $\theta^\circ$ .

(i) Perimeter of the shaded region is  $r\left(\tan \theta + \sec \theta + \frac{\pi \theta}{180} - 1\right)$

$$\tan \theta = \frac{P}{R} = \frac{AB}{OA} = \frac{AB}{r}$$

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

$$d\tan \theta = AB$$

$$\sec \theta = \frac{H}{B} = \frac{OB}{OA}$$

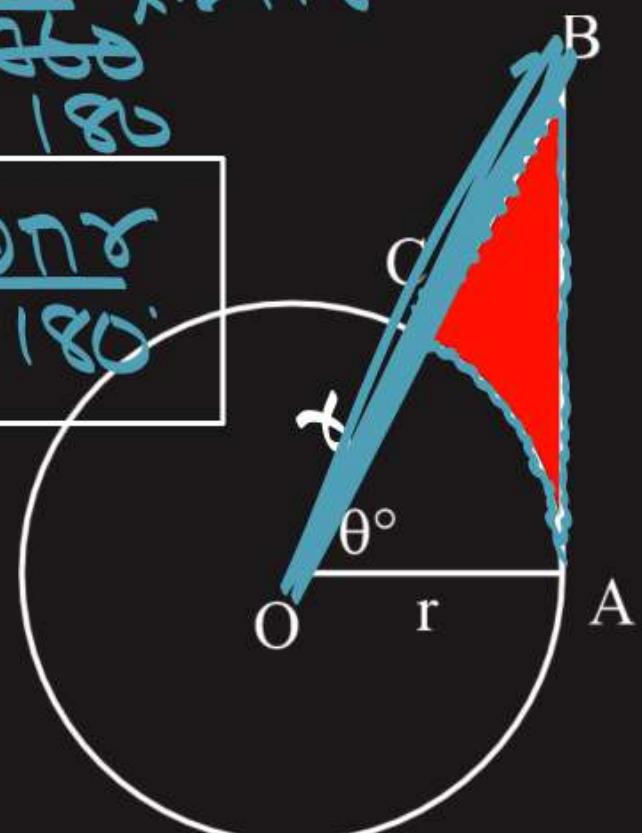
$$\sec \theta = \frac{r + CB}{r}$$

$$d\sec \theta = r + CB$$

$$d\sec \theta - r = CB$$

$$\widehat{AC} = \frac{\theta \times \pi}{180}$$

$$\widehat{AC} = \frac{\theta \pi r}{180}$$



$$P = \widehat{AC} + CB + AB$$

$$= \frac{\theta \pi r}{180} + d\sec \theta - r + d\tan \theta = r \left[ \frac{\theta \pi}{180} + \sec \theta - 1 + \tan \theta \right]$$

#Q. Figure below, shows a sector of a circle, centre O, containing an angle  $\theta^\circ$ .

(ii) Area of the shaded region is  $\frac{r^2}{2} \left( \tan \theta - \frac{\pi \theta}{180} \right)$

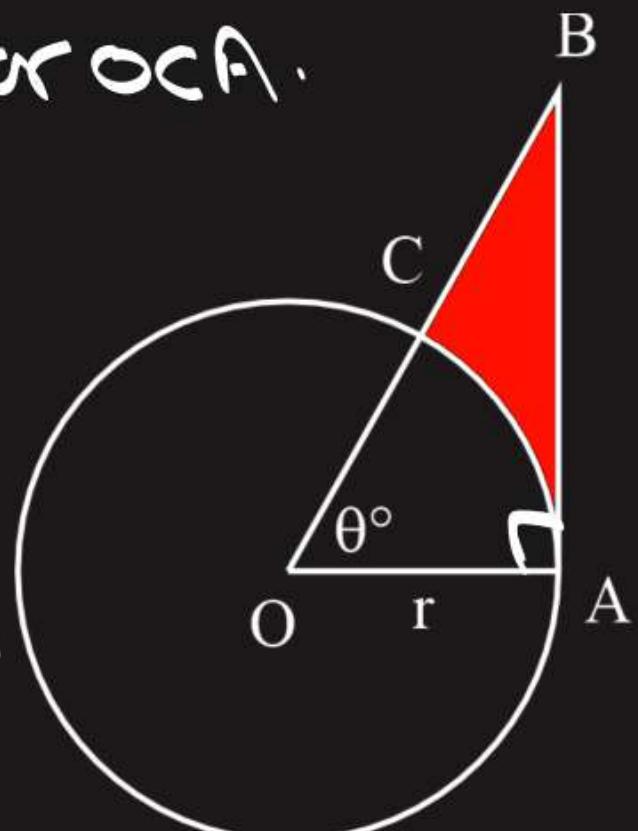
Area of shaded region = Area of  $\triangle ABO$  - Area of sector  $OCA$ .

$$= \frac{1}{2} \times r \times AB - \frac{\theta}{360} \times \pi r^2$$

$$= \frac{1}{2} \times r \times r \tan \theta - \frac{\theta}{360} \times \pi r^2$$

$$= \frac{1}{2} r^2 \cdot \tan \theta - \frac{\theta}{360} \times \pi r^2$$

$$= \frac{r^2}{2} \left[ \tan \theta - \frac{\theta \pi}{180} \right]$$



#Q. Find the area of the largest triangle that can be inscribed in a semi-circle of radius  $r$  units.

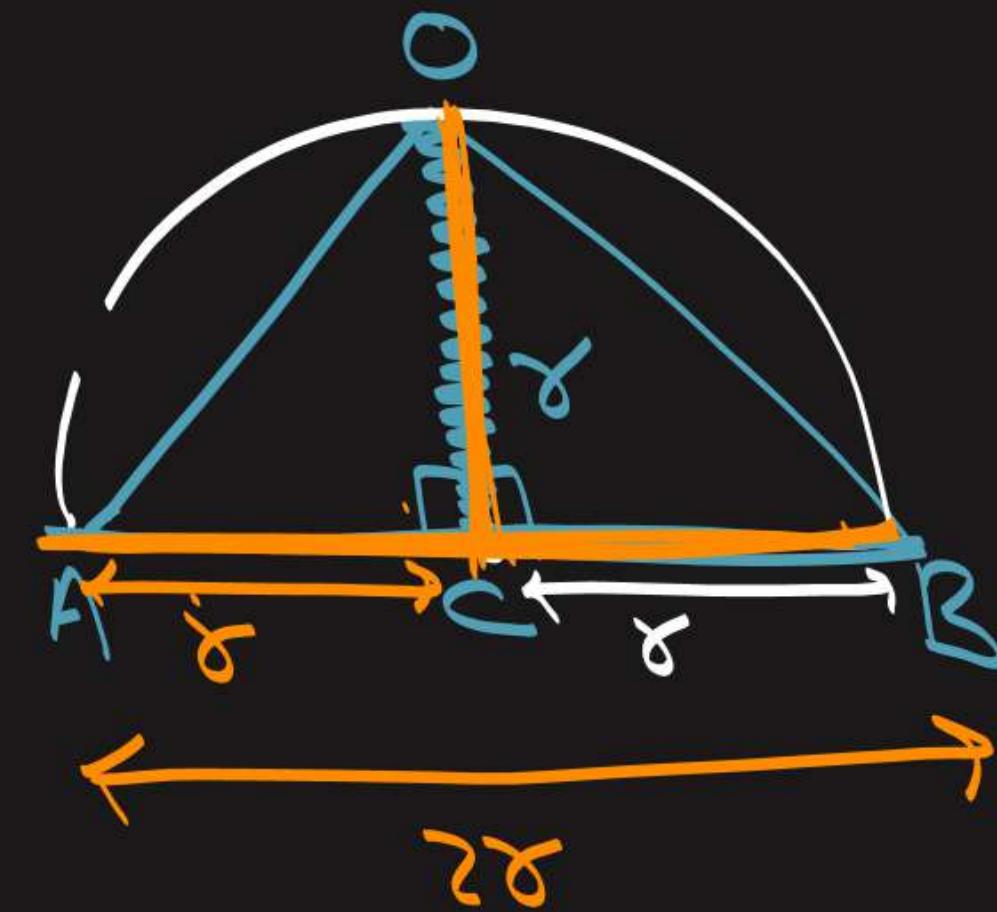
$$= \frac{1}{2} \times b \times h$$

$$= \frac{1}{2} \times AB \times OC$$

$$= \frac{1}{2} \times 2r \times r$$

$$= r^2 \text{ Sq.units}$$

CBSE 2015



Ans.  $r^2$



# Segment of a Circle and Its Area

## Segment of a circle :

- The part of the circular region enclosed between a chord and the corresponding arc is called a segment of a circle.





## Segment of a Circle and Its Area

### ~~Minor segment :~~

- If the boundary of a segment is a minor arc of a circle, then the corresponding segment is called a minor segment.

### ~~Major segment :~~

- If the boundary of a segment is a major arc of a circle, then the corresponding segment is called a major segment.

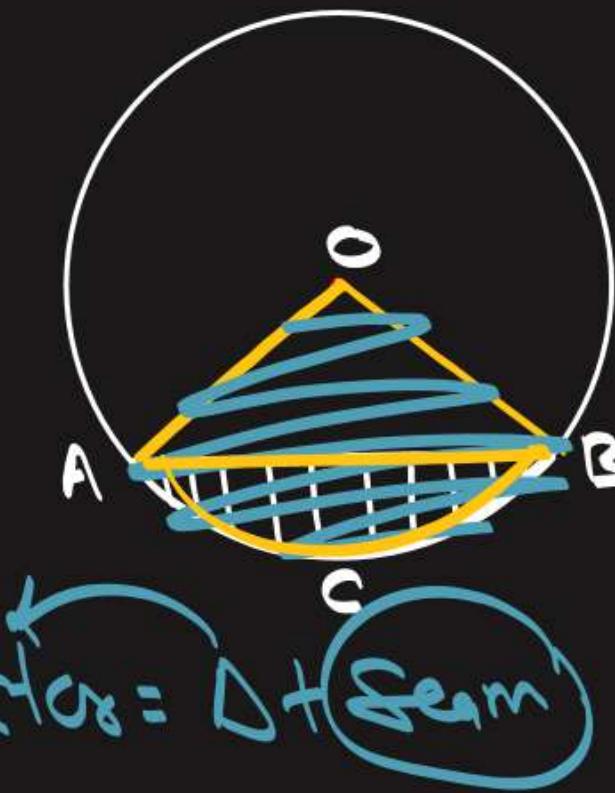
**Segment** → Minor Segment

Area of  $\triangle ACB$  = Area of sector  $OACB$   
 - Area of  $\triangle OAB$

Right  $\Delta$   
 $\downarrow$   
 $\frac{1}{2} \times b \times h$

Equilateral  $\Delta$   
 $\downarrow$   
 $\sqrt{3} \times (\text{side})^2$

Triqo.  
 $\downarrow$



Area of Major Segment = Area of circle  
 - Area of Minor segment.

#Q. A chord AB of a circle of radius 15 cm makes an angle of  $60^\circ$  at the centre of the circle. Find the area of the major and minor segments.  
 (Take  $\pi = 3.14, \sqrt{3} = 1.73$ )

$$\text{Area of Minor segment } ACB = \text{Area of sector } OACB - \text{Area of } \triangle OAB.$$

**CBSE 2017**

$\triangle OAB$  is equilateral

$$OA = OB$$

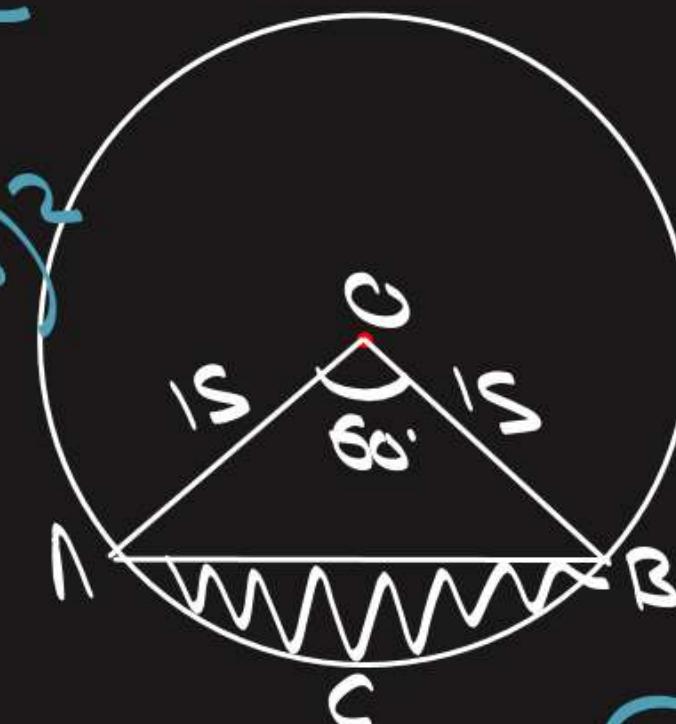
$$\angle ODA = \angle OAB = x$$

In As.p,

$$x + x + 60^\circ = 180^\circ$$

$$x = 60^\circ$$

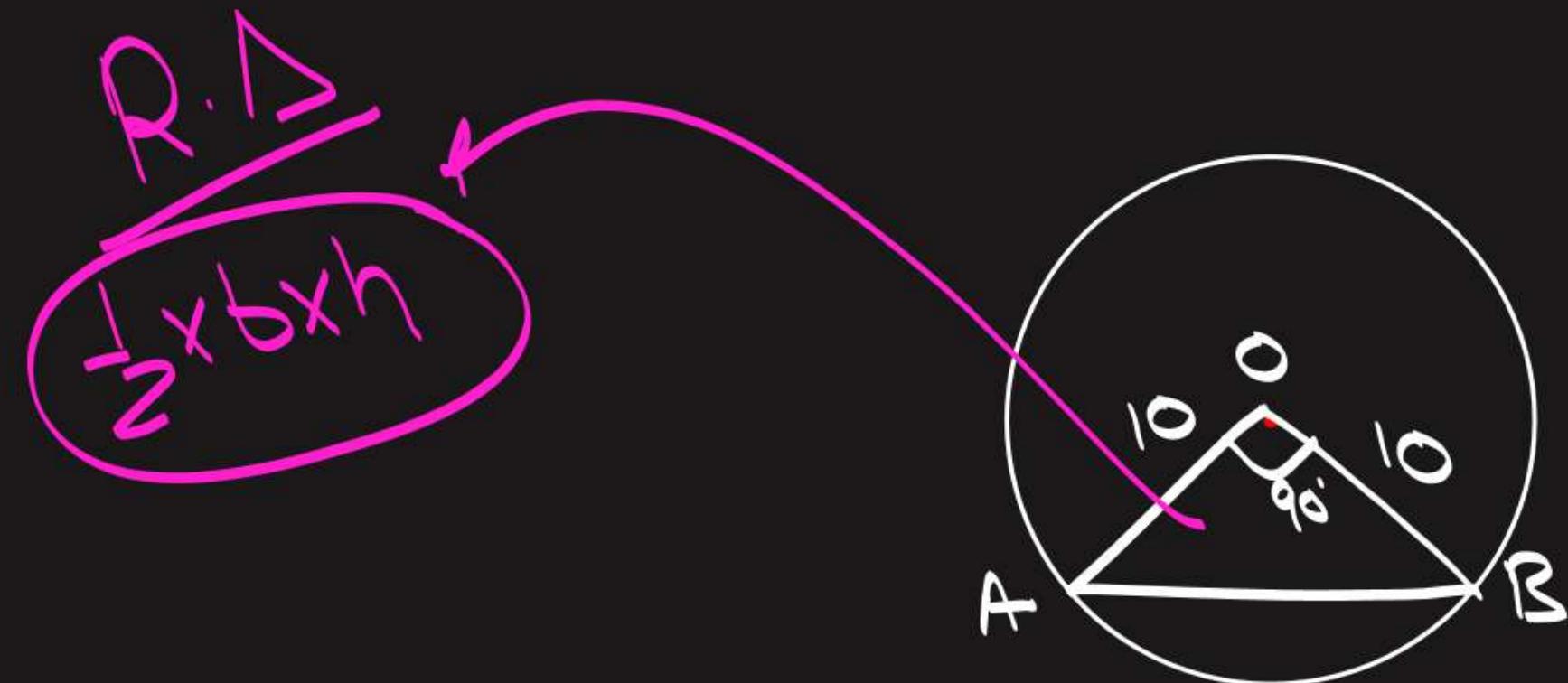
$$\begin{aligned} \text{Area} &= \frac{\theta}{360} \times \pi r^2 - \frac{\sqrt{3}}{4} (side)^2 \\ &= \frac{60}{360} \times \frac{15^2}{100} \times 15 \times 15 - \frac{\sqrt{3}}{4} (15)^2 \\ &= 225 \left[ \frac{15^2}{360} - \frac{\sqrt{3}}{4} \right] \\ &= 225 [0.523 - 0.433] = 225 \times 0.0905 = 203.625 \text{ cm}^2 \end{aligned}$$

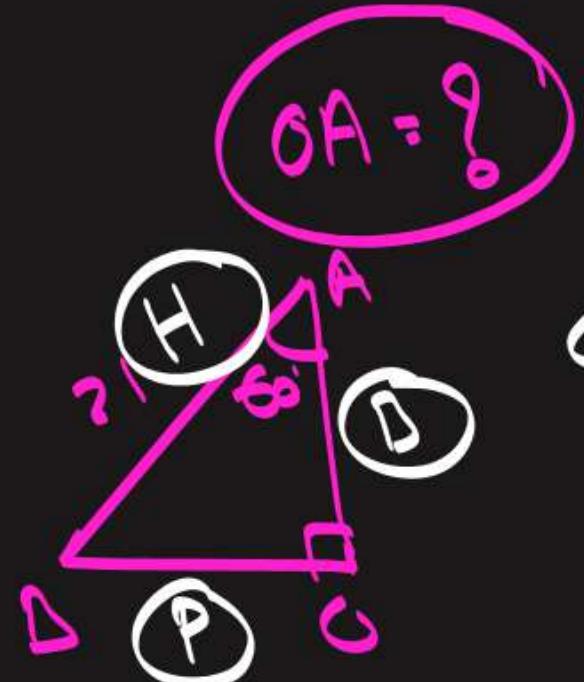
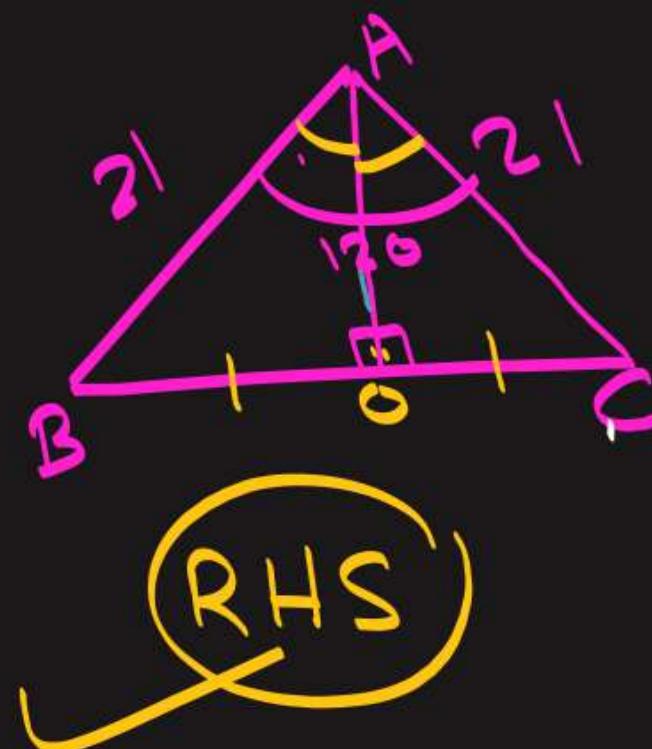


Area of Major Segment =  $\pi r^2 - 20.3625$

#Q. A chord AB of a circle of radius 10 cm makes a right angle at the centre of the circle. Find the area of the major and minor segment (Take  $\pi = 3.14$ )

CBSE 2016





$$\cos 60^\circ = \frac{OA}{OB}$$

$$\frac{1}{2} = \frac{OA}{OB}$$

$$\frac{\sqrt{3}}{2} = OA$$

$$\sin 60^\circ = \frac{OP}{OB}$$

$$\frac{\sqrt{3}}{2} = \frac{OB}{\sqrt{3}}$$

$$\frac{\sqrt{3}}{2} = OB$$

CPCT

$\angle DAO = \angle CAO$   
 $BO = CO$

Area of  $\triangle ABC$

$$= \frac{1}{2} \times b \times h$$

$$= \frac{1}{2} \times BC \times OA$$

$$= \frac{1}{2} \times 2\sqrt{3} \times \frac{\sqrt{3}}{2}$$

$$= \boxed{3\sqrt{3}}$$

$$BC = 2 \cdot BO \\ = 2 \cdot \frac{\sqrt{3}}{2} \\ = \boxed{2\sqrt{3}}$$

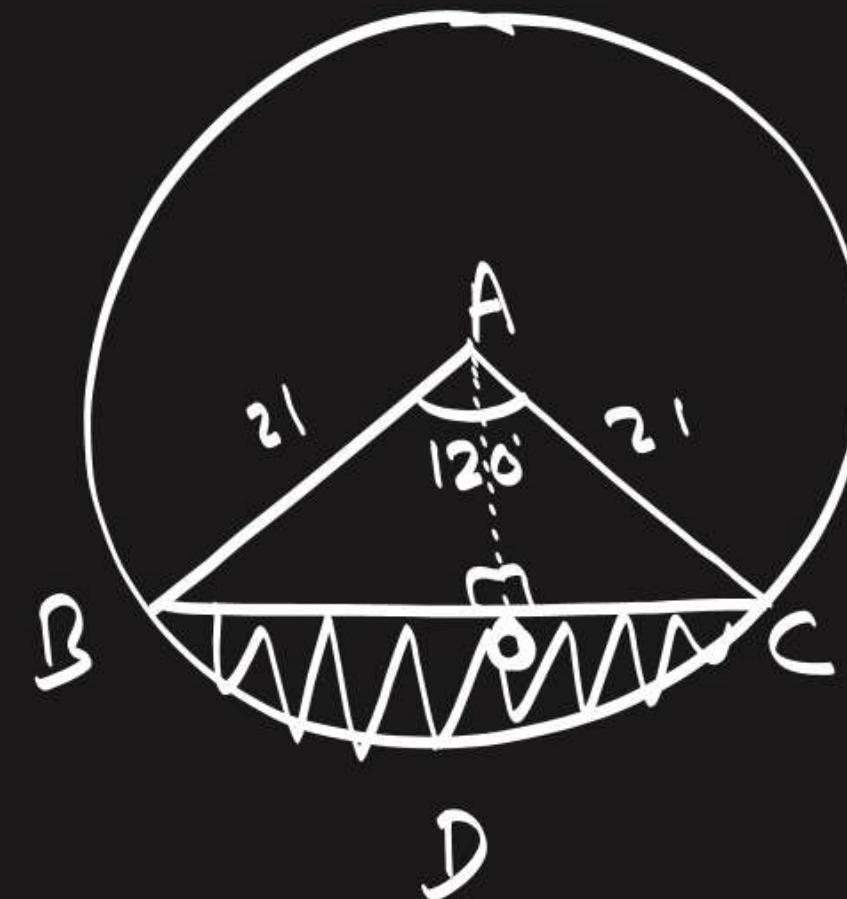
#Q. Find the area of the segment of circle, given that the angle of the sector  $120^\circ$  and the radius of the circle is 21 cm (Take  $\pi = 22/7$ )

$$= \text{Area of sector} - \text{Area of } \triangle$$

$$= \frac{\theta}{360} \times \pi r^2 - \frac{441\sqrt{3}}{4}$$

$$= \frac{120}{360} \times \frac{22}{7} \times 21 \times 21$$

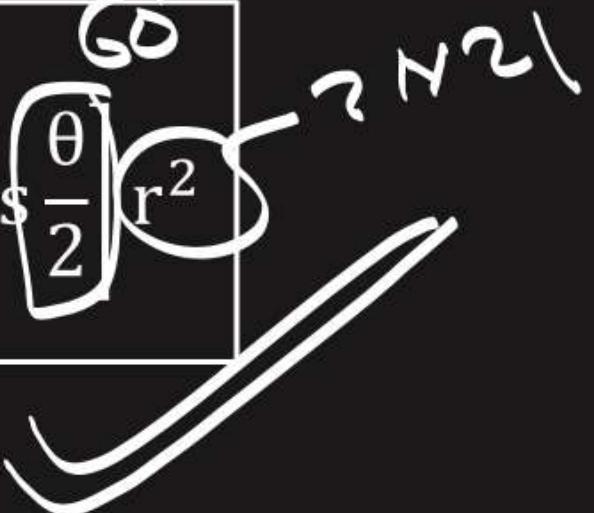
$$= [462 - \frac{441\sqrt{3}}{4}] \text{ cm}^2$$





## Area of Segment

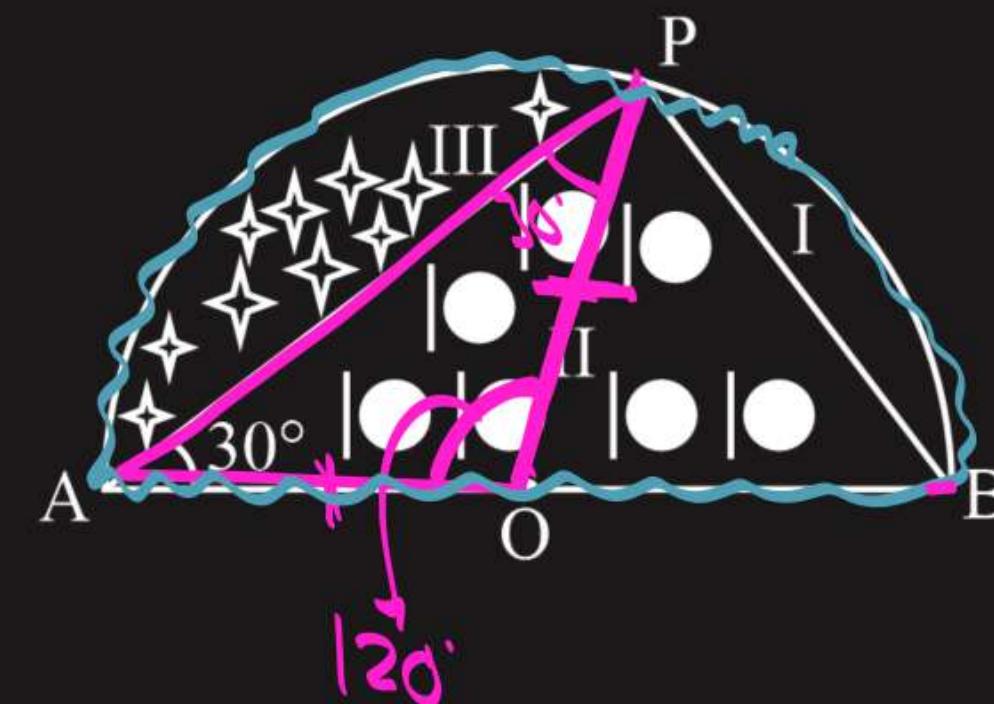
$$\text{Area of Segment} = \left[ \frac{\pi \theta}{360} - \sin \frac{\theta}{2} \cos \frac{\theta}{2} \right] r^2$$



#Q. Anurag purchased a farmhouse which is in the form of a semicircle of diameter 70 m. He divides it into three parts by taking a point P on the semicircle in such a way that  $\angle PAB = 30^\circ$  as shown in the following figure, where O is the centre of the semicircle.

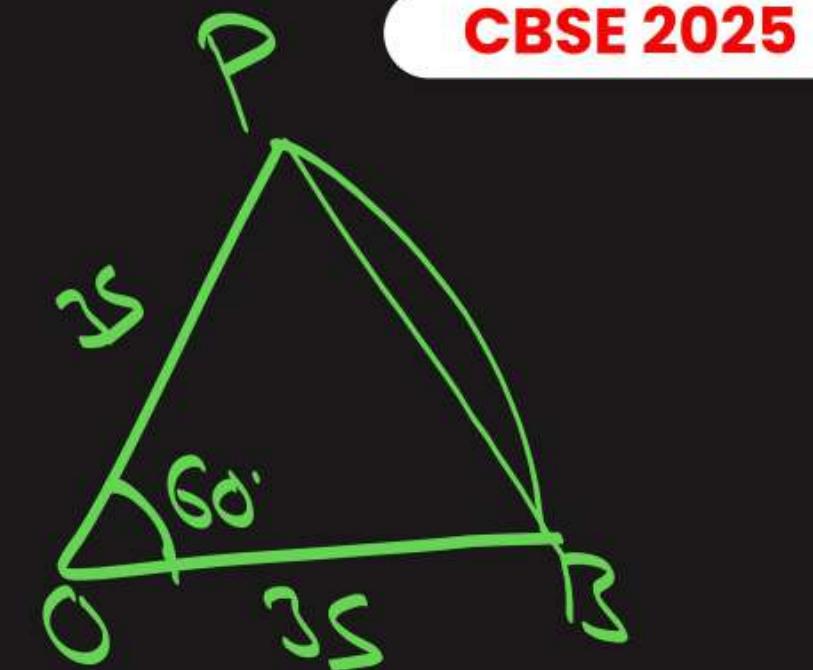
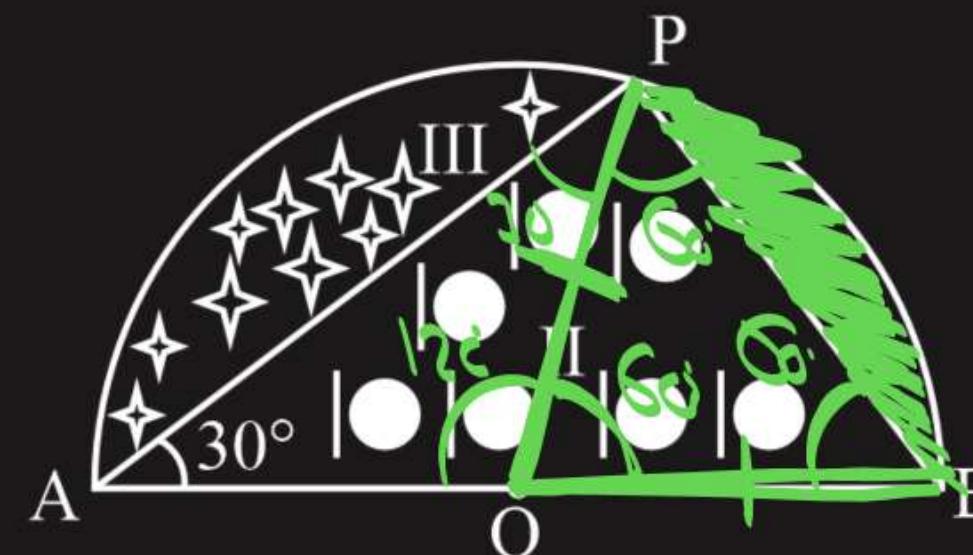
In part I, he planted saplings of Mango tree, in part II, he grew tomatoes and in part III, he grew oranges.

**CBSE 2025**



#Q. Anurag purchased a farmhouse which is in the form of a semicircle of diameter 70 m. He divides it into three parts by taking a point P on the semicircle in such a way that  $\angle PAB = 30^\circ$  as shown in the following figure, where O is the centre of the semicircle.

In part I, he planted saplings of Mango tree, in part II, he grew tomatoes and in part III, he grew oranges.

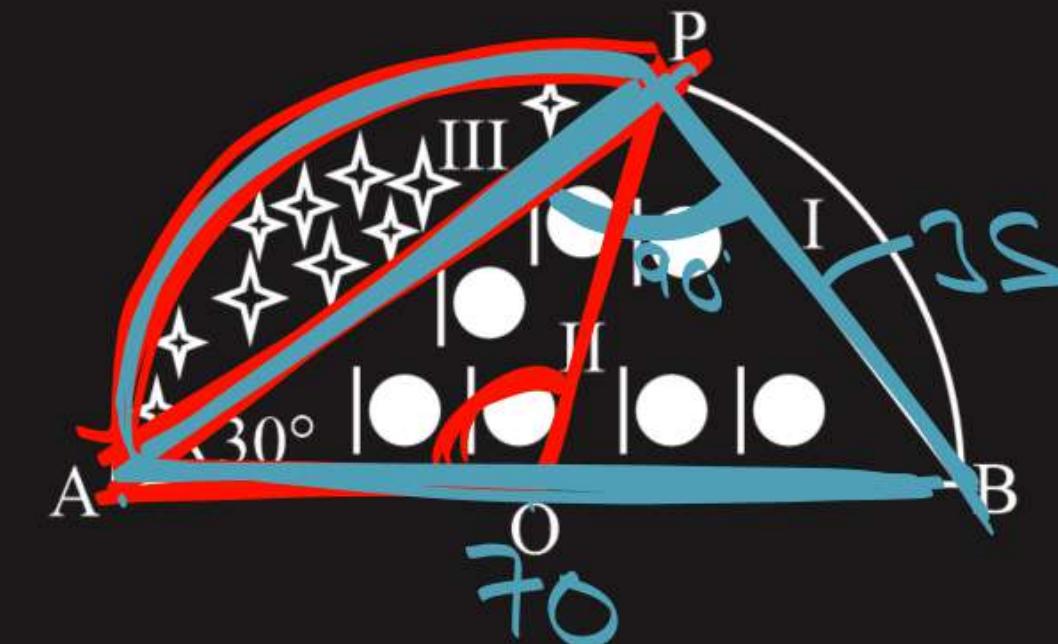


CBSE 2025

#Q. Anurag purchased a farmhouse which is in the form of a semicircle of diameter 70 m. He divides it into three parts by taking a point P on the semicircle in such a way that  $\angle PAB = 30^\circ$  as shown in the following figure, where O is the centre of the semicircle.

In part I, he planted saplings of Mango tree, in part II, he grew tomatoes and in part III, he grew oranges.

$$\begin{aligned}
 & \text{(iii) (b)} \widehat{AP} + \widehat{AP} \\
 & \widehat{AP} = \frac{\theta}{360^\circ} \times 2\pi r \\
 & = \boxed{\frac{120}{360} \times 2 \times 22 \times 35}
 \end{aligned}$$



CBSE 2025

Based on given information, answer the following questions.

- (i) What is the measure of  $\angle \text{POA}$ ?  $120^\circ$
- (ii) Find the length of wire needed to fence entire piece of land.
- (iii) (a) Find the area of region in which saplings of Mango tree are planted.  
(b) Find the length of wire needed to fence the region III.



Perimeter

$$= \pi r + 2r$$

 $=$ 

$$\theta = 35$$

#Q. The Olympic symbol comprising five interlocking rings represents the union of the five continents of the world and the meeting of athletes from all over the world at the Olympic games. In order to spread awareness about Olympic games, students of Class-X took part in various activities organised by the school. One such group of students made 5 circular rings in the school lawn with the help of ropes. Each circular ring required 44 m of rope.

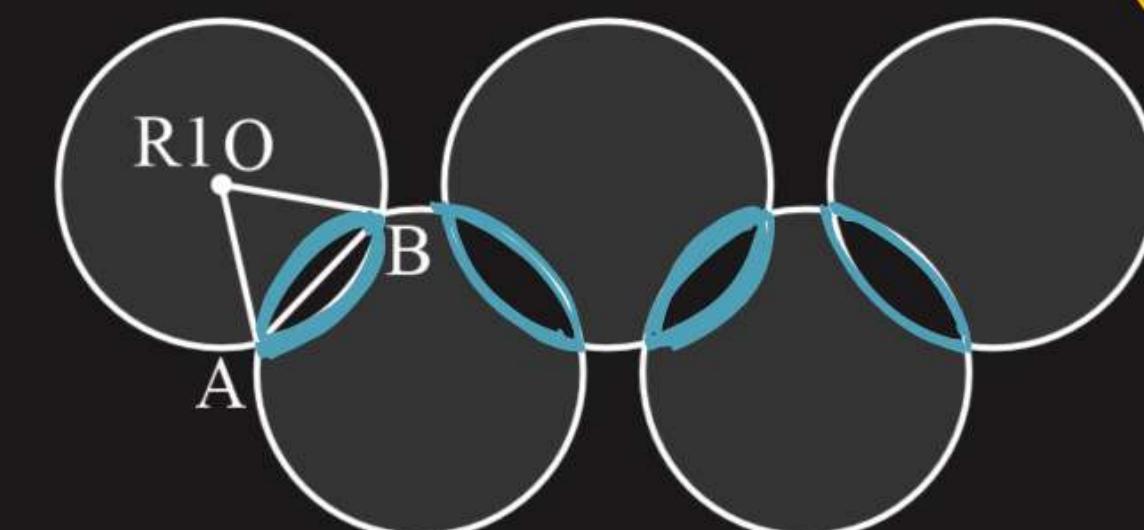
Also, in the shaded regions as shown in the figure, students made rangoli showcasing various sports and games. It is given that  $\triangle OAB$  is an equilateral triangle and all unshaded regions are congruent.

$$2\pi d = 44$$

$$\pi d = 22$$

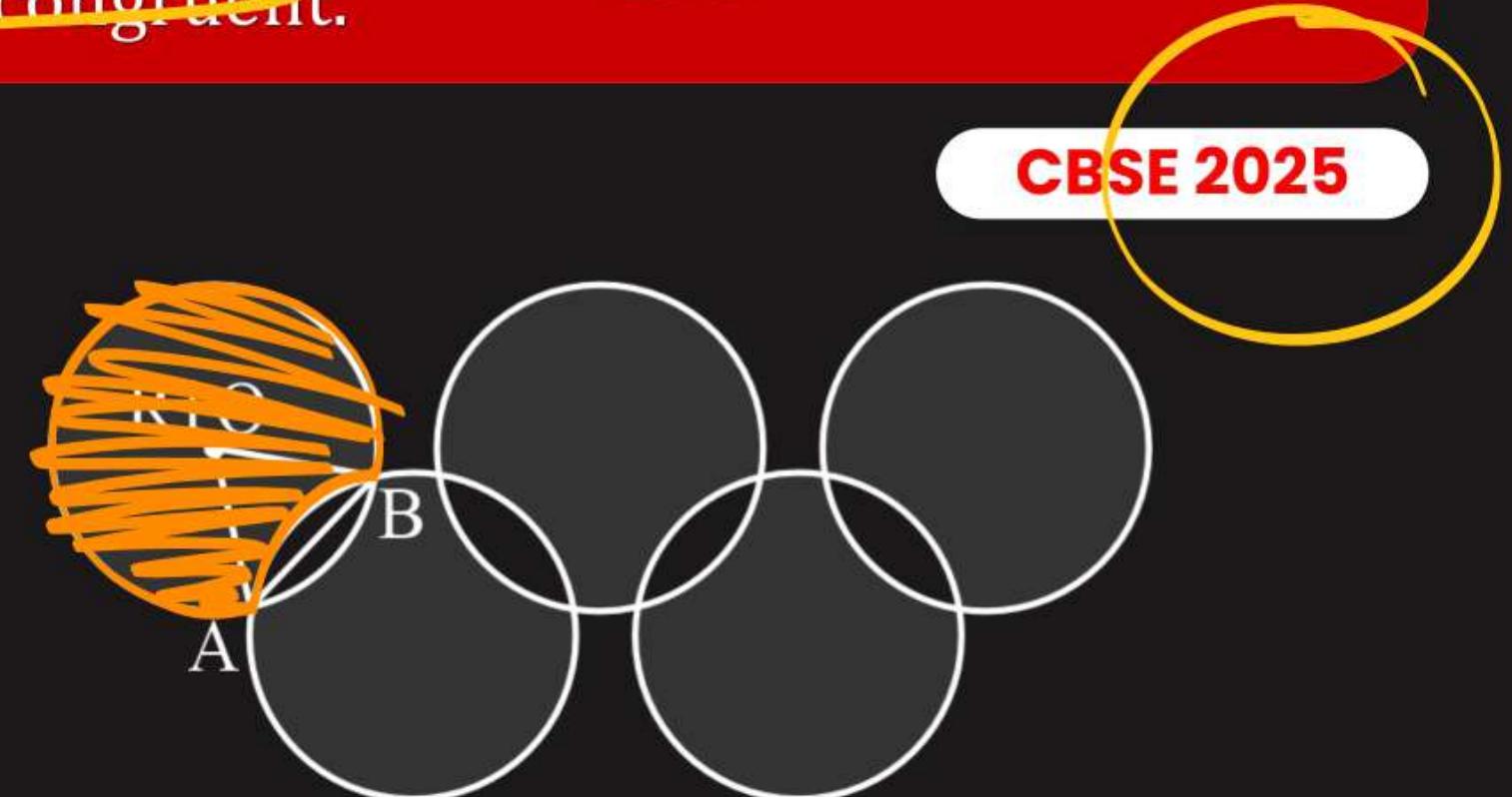
$$2\pi r = 22$$

$$r = 3.5$$



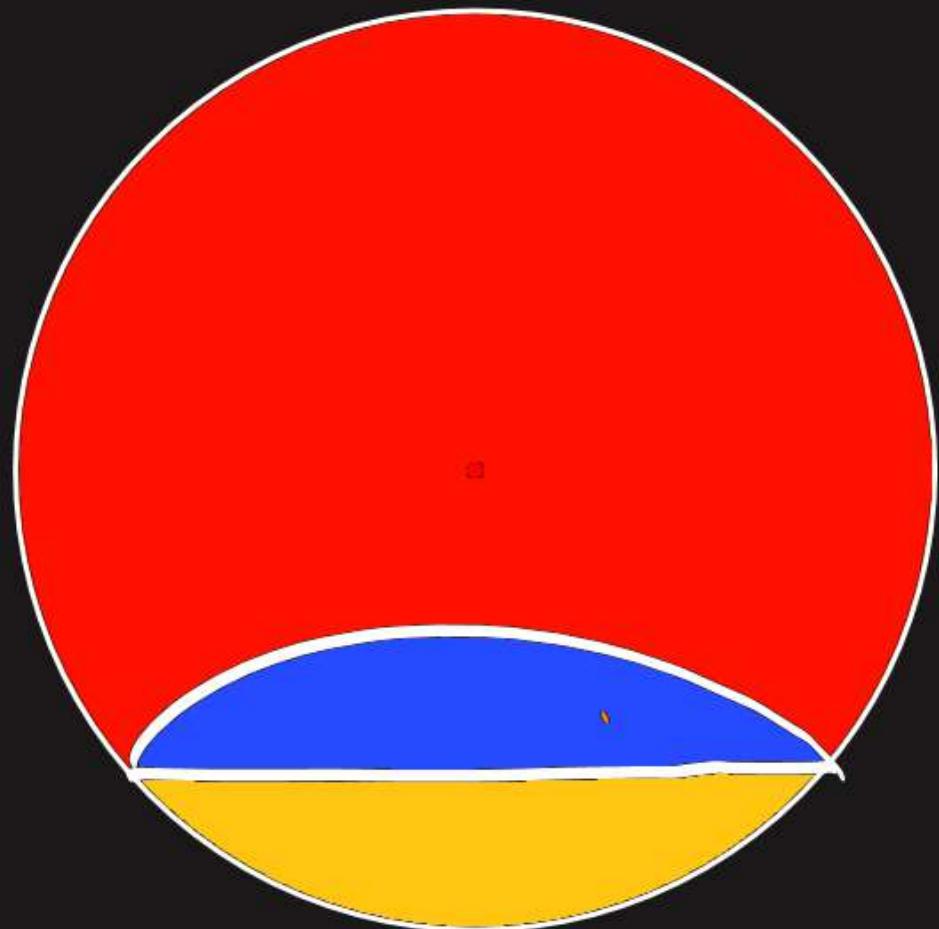
**CBSE 2025**

#Q. The Olympic symbol comprising five interlocking rings represents the union of the five continents of the world and the meeting of athletes from all over the world at the Olympic games. In order to spread awareness about Olympic games, students of Class-X took part in various activities organised by the school. One such group of students made 5 circular rings in the school lawn with the help of ropes. Each circular ring required 44 m of rope. Also, in the shaded regions as shown in the figure, students made rangoli showcasing various sports and games. It is given that  $\triangle OAB$  is an equilateral triangle and all unshaded regions are congruent.



**CBSE 2025**

P  
W



A. of circle

? Area of Segment



Sector

-  $\Delta$

Parallelogram  
 $\Delta$ .

Based on given information, answer the following questions.

- (i) Find the radius of each circular ring.  $\delta = 3\text{m}$
- (ii) What is the measure of  $\angle AOB$ ?  $60^\circ$
- (iii) (a) Find the area of shaded region  $R_1$ .
- (b) Find the length of rope around the unshaded regions.

$$\begin{aligned} &= \text{length of arc } \times \\ &= \frac{\theta}{360} \times 2\pi r \\ &= \frac{60}{360} \times 2 \times 22 \times 7 \times 8 \end{aligned}$$



# Homework From the Question Bank

5. On a golf course, three holes  $A(-6, -1)$ ,  $B$  and  $C(9, -4)$  lie on a straight line in that order. The distance between  $B$  and  $C$  is two times that between  $B$  and  $A$ .

Rahul strikes the ball, which is at point  $P(2, 3)$ , such that it goes in the hole  $B$ .

- Find the coordinates of hole  $B$ .
- Find the shortest distance covered by the ball.

Show your steps.

(Ap) (CBSE CFPQ, 2023)

1. Prove that  $\frac{\tan^2 A}{\tan^2 A - 1} + \frac{\operatorname{cosec}^2 A}{\sec^2 A - \operatorname{cosec}^2 A} = \frac{1}{1 - 2\cos^2 A}$

5. The shadow of a tower when the angle of elevation of the sun is  $30^\circ$  is found to be 20 m longer than when the angle of elevation is  $60^\circ$ .

- Find the height of the tower.
- Find the length of the shadow of the building when the angle of elevation of the sun was  $30^\circ$ .

Draw a rough figure and show your work.

5. Sides  $AB$  and  $AC$  and median  $AD$  to  $\triangle ABC$  are respectively proportional to sides  $PQ$  and  $PR$  and median  $PM$  of another triangle  $PQR$ . Show that  $\triangle ABC \sim \triangle PQR$ . (Un)

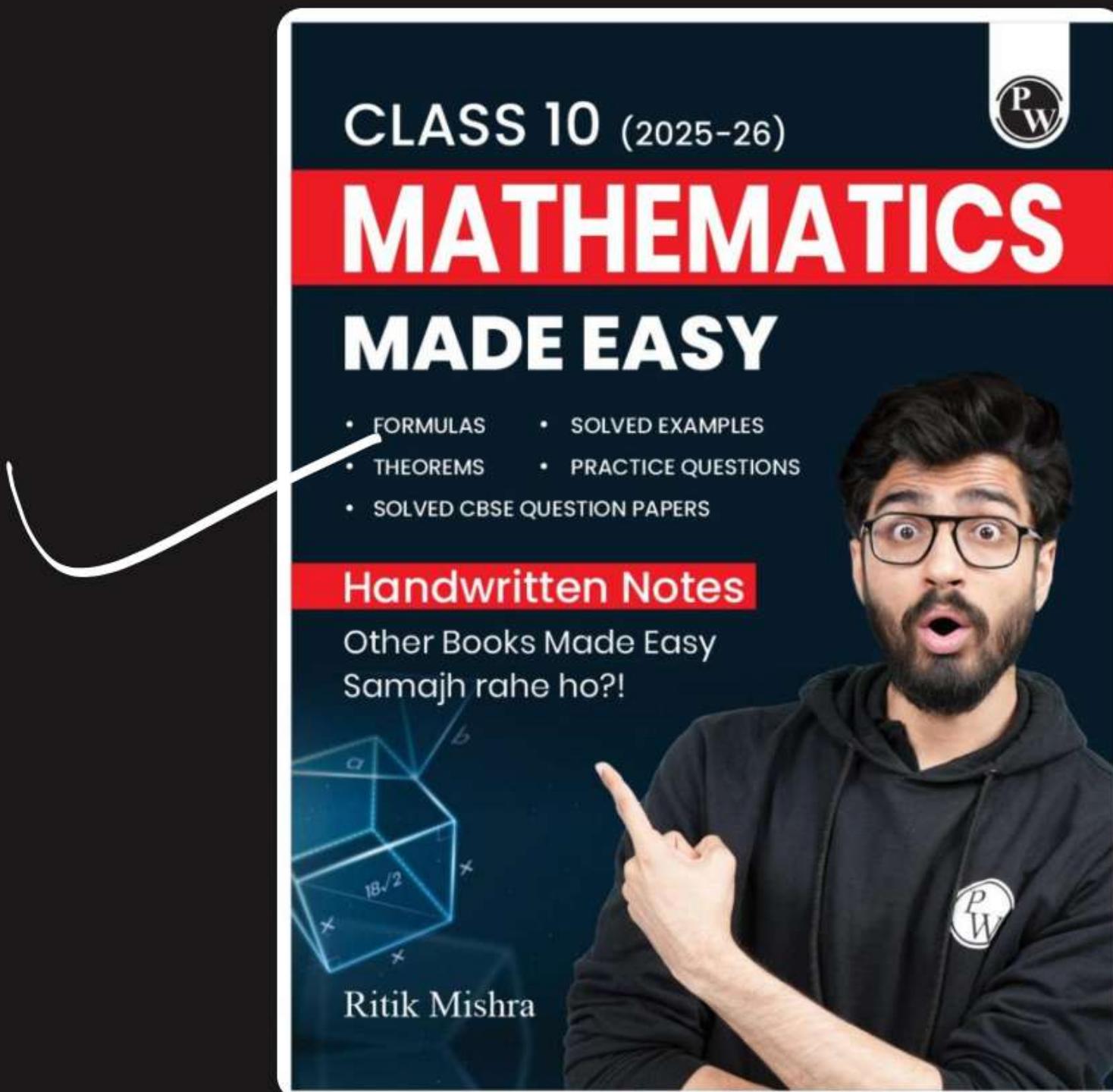
2. If  $AD$  and  $PM$  are medians of triangles  $ABC$  and  $PQR$ , respectively where  $\triangle ABC \sim \triangle PQR$ , prove that  $\frac{AB}{PQ} = \frac{AD}{PM}$

(Cr) (CBSE DL, 2023)

2. If the 10th term of an AP is 52 and 16th term is 82, then find the 32nd term and the general term of AP. (Cr)

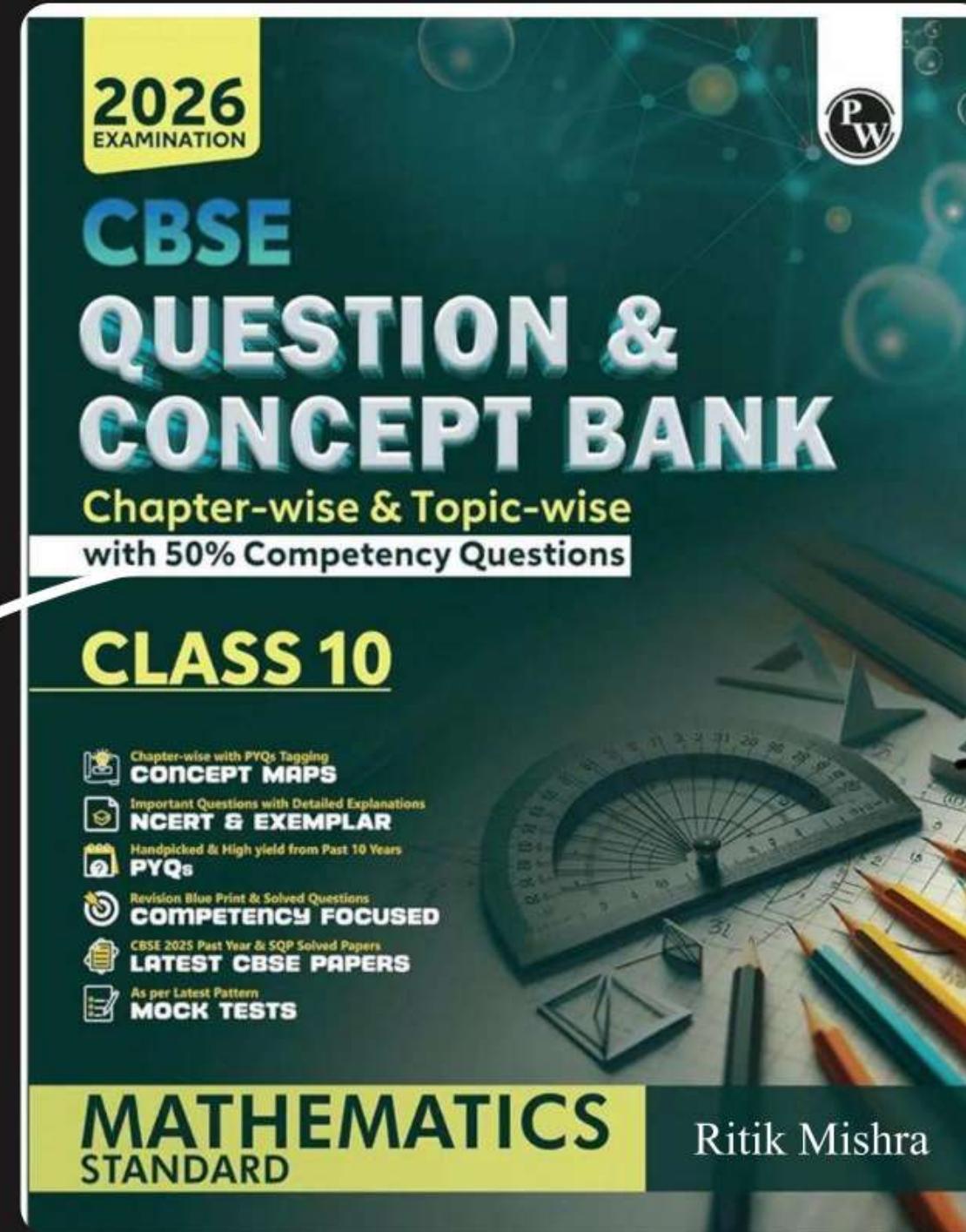
4. At present Asha's age (in years) is 2 more than the square of her daughter Nisha's age. When Nisha grows to her mother's present age, Asha's age would be one year less than 10 times the present age of Nisha. Find the present ages of both Asha and Nisha. (Re) (NCERT Exemplar)

Available on PW Store, Amazon, Flipkart





Available on PW Store, Amazon, Flipkart



**WORK HARD  
DREAM BIG  
NEVER GIVE UP**





# RITIK SIR

JOIN MY OFFICIAL TELEGRAM CHANNEL





Thank  
*You*