UDAAN

2026

Areas Related to Circle

MATHS LECTURE-1

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Topics *to be covered*

A Recalling Basic Terms

B Sector of a Circle

Area of circle = πr^2

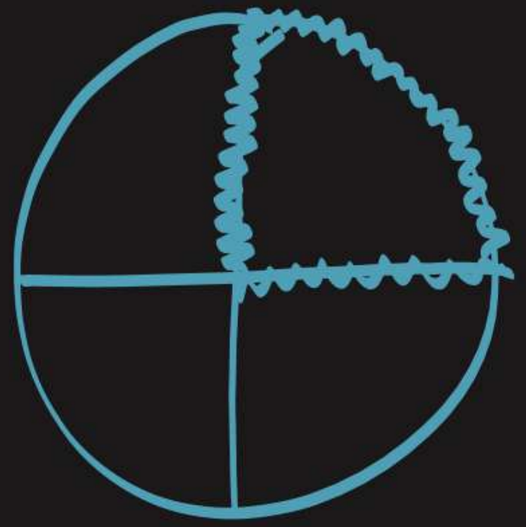
Irrational value.

$\pi \approx$ rational $\left(3.14, \frac{22}{7}\right)$

$\frac{\pi r^2}{2} = \frac{1}{2}\pi r^2$

quadrant

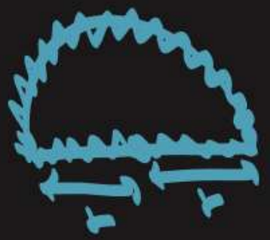
$\frac{\pi r^2}{4}$



$= \frac{2\pi r}{4} + r + r$

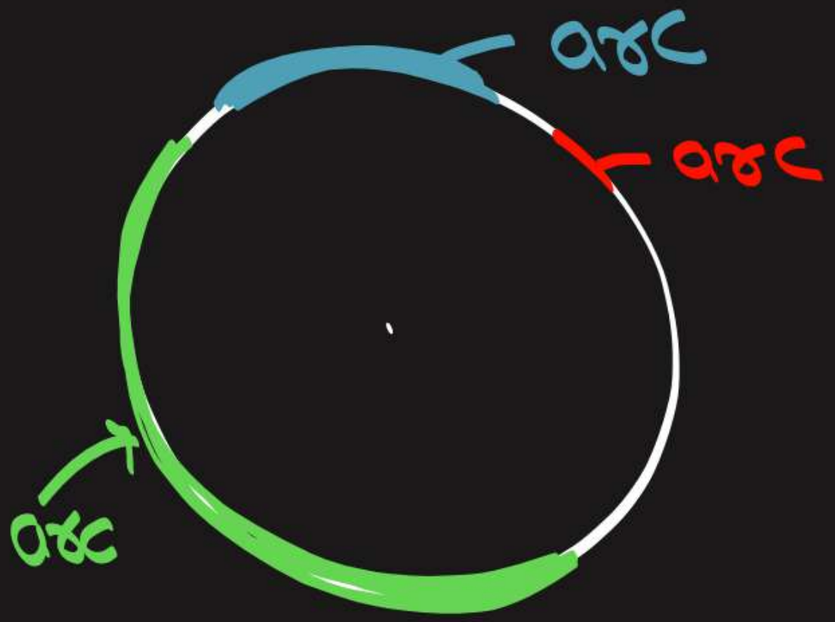
$= \frac{\pi r}{2} + 2r$

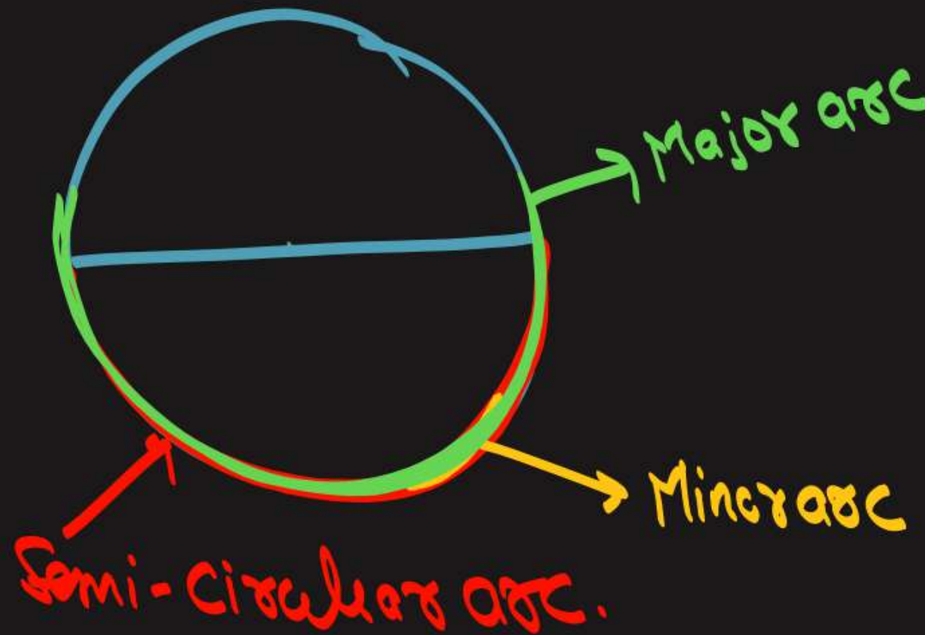
Circumference of circle $= 2\pi r$

Perimeter of semicircle $=$  $= \frac{2\pi r}{2} + r + r = \pi r + 2r$

Major and Minor Arc

- An arc of a circle whose length is less than that of a semi-circle of the same circle is called a minor arc.
- An arc of a circle whose length is greater than that of a semi-circle of the same circle is called a minor arc.

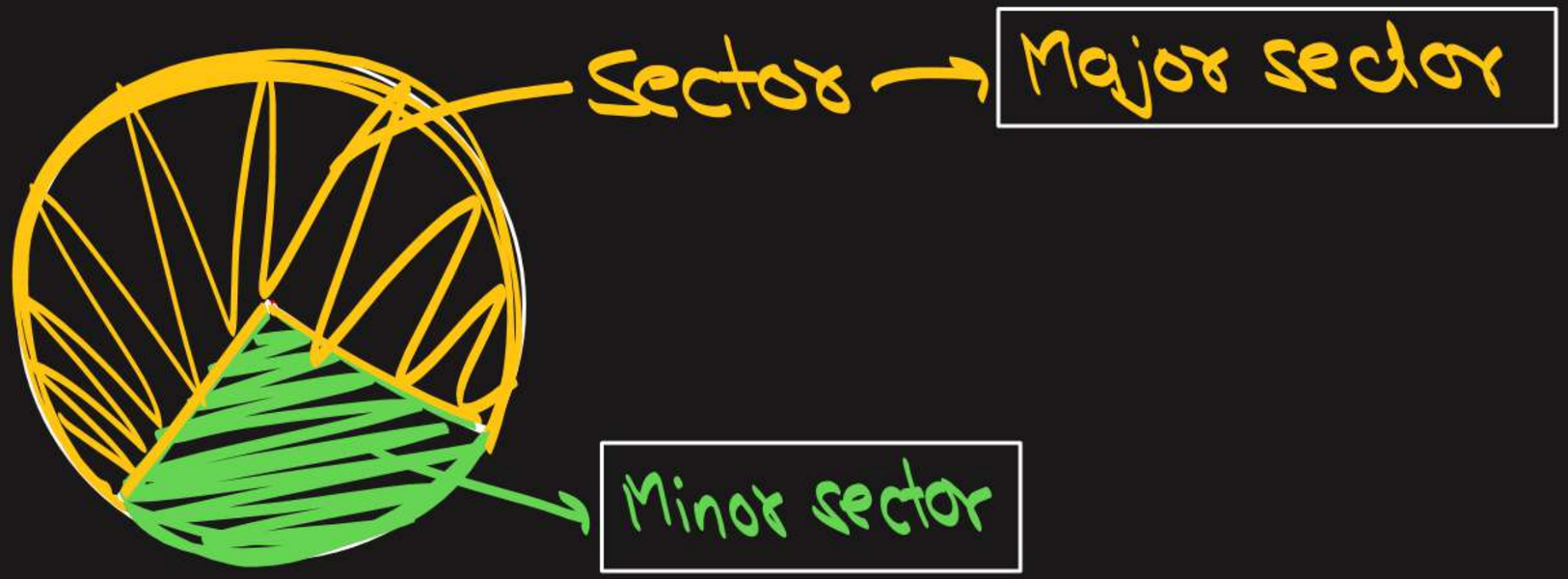




Sector of a Circle and Its Area

Sector of a circle:

- The part of the circular region enclosed by two radii and corresponding arc is called sector of a circle.



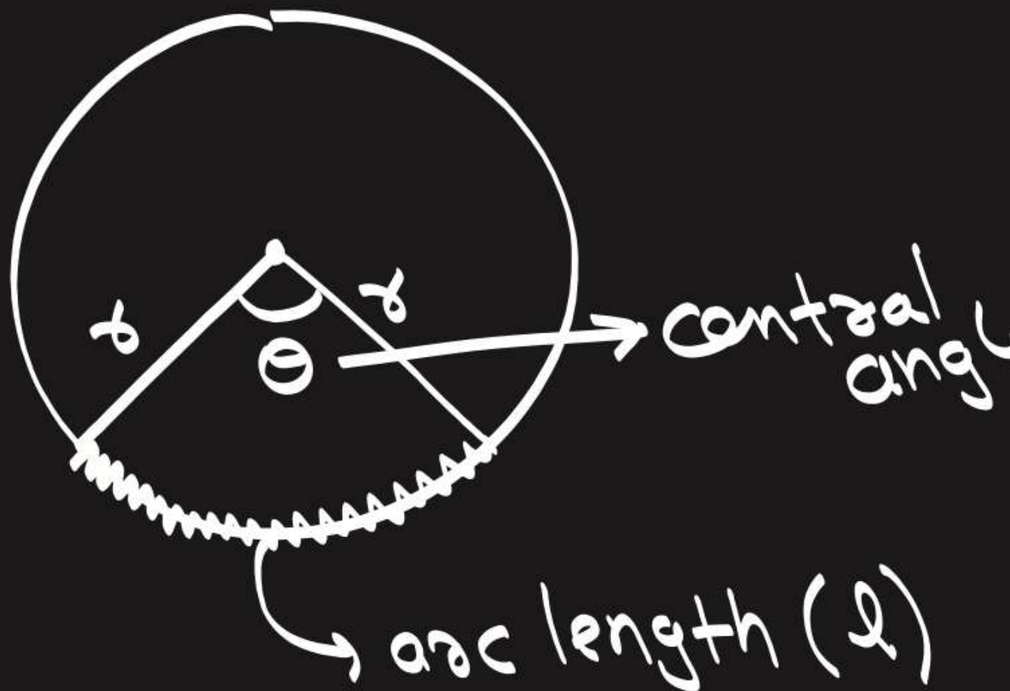
Sector of a Circle and Its Area

Minor sector :

- A sector of a circle is called a minor sector, if the minor arc of the circle is a part of its boundary.

Major sector :

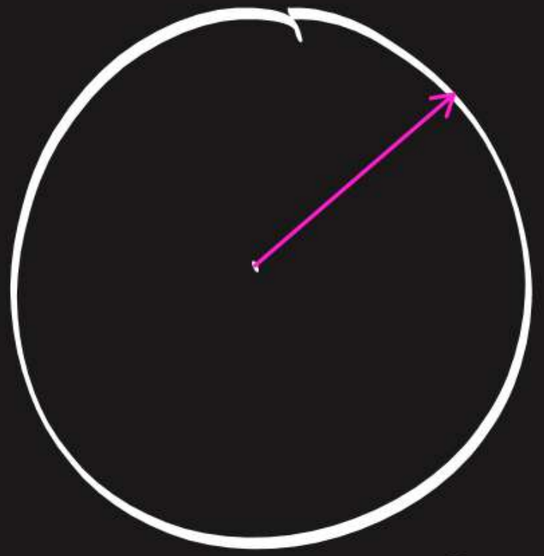
- A sector of a circle is called a major sector, if the major arc of the circle is a part of its boundary.



$$l = \frac{\theta}{360} \times 2\pi r$$

$$\text{Area of sector} = \frac{\theta}{360} \times \pi r^2$$

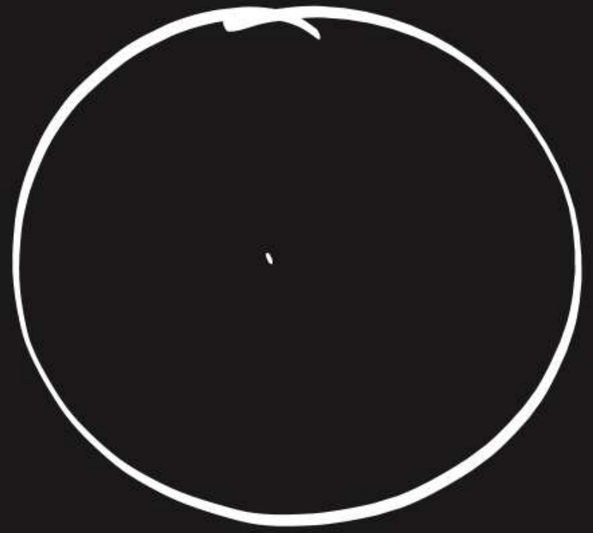
$$\text{Area of sector} = \frac{1}{2} \times l \times r$$



$360^\circ = \pi r^2$

$1^\circ = \frac{\pi r^2}{360^\circ}$

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



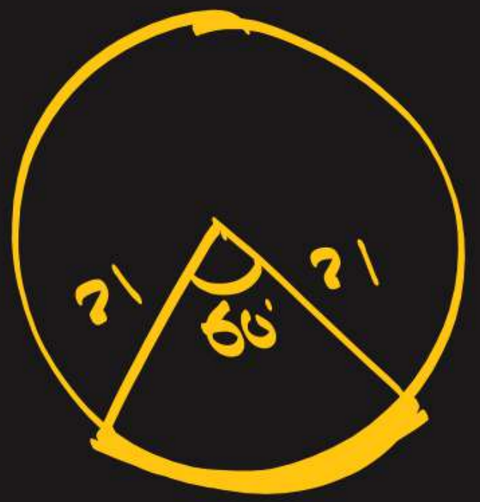
$360^\circ = 2\pi r$

$1^\circ = \frac{2\pi r}{360}$

$$\theta = \frac{\theta}{360} \times 2\pi r$$

#Q. In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find (i) the length of the arc, (ii) area of the sector formed by the arc. (Use $\pi = 22/7$)

CBSE 2013, 17, 23



(i) $l = \frac{\theta}{360} \times 2\pi r$

$= \frac{60}{360} \times 2 \times \frac{22}{7} \times 21$

$l = 22$ cm

(ii) Area $= \frac{\theta}{360} \times \pi r^2$

$= \frac{60}{360} \times \frac{22}{7} \times 21 \times 21$

$= 231$ cm^2 / 231 sq. cm

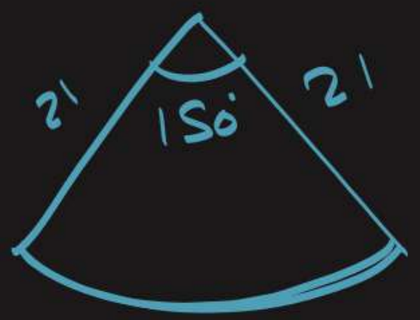
Alternate: $= \frac{1}{2} \times l \times r$

$= \frac{1}{2} \times 22 \times 21$

$= 231$ cm^2

Ans. (i) 22 cm
(ii) 231 cm^2

#Q. A sector is cut from a circle of radius 21 cm. The angle of the sector is 150°. Find the length of its arc and area.



$$l = \frac{\theta}{360} \times 2\pi r = \frac{5}{\cancel{150}} \times \cancel{2} \times \frac{22}{\cancel{7}} \times \cancel{21}^{3}$$

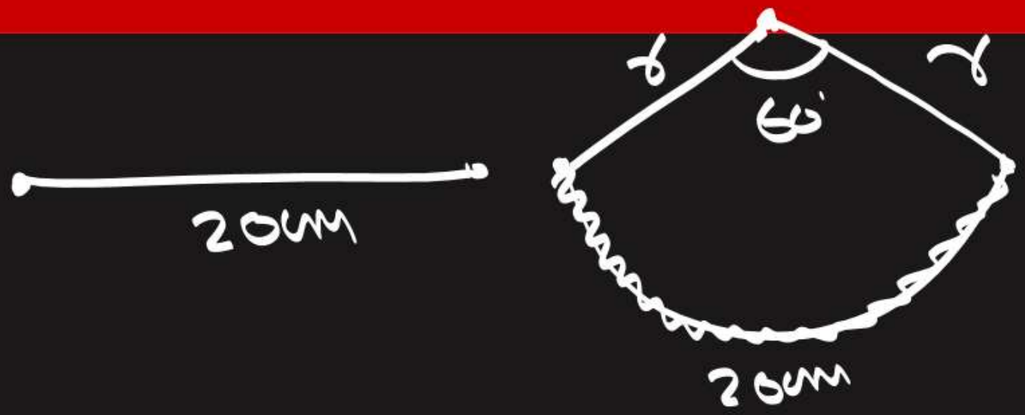
$$= 55 \text{ cm}$$

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

$$= \frac{1}{2} \times 55 \times 21$$

$$= \frac{1155}{2} = 577.5 \text{ cm}^2$$

#Q. A piece of wire 20 cm long is bent into the form of an arc of a circle subtending an angle of 60 at its centre. Find the radius of the circle.



$$l = \frac{\theta}{360} \times 2\pi r$$

$$20 = \frac{60}{360} \times 2 \times \frac{22}{7} \times r$$

$$\frac{10}{\frac{3 \times 20 \times 7}{22}} = r$$

$$19.09 \text{ cm} = r$$

#Q. Area of a sector of a circle of radius 36 cm is 54π cm^2. Find the length of the corresponding arc of the sector.

Area $= 54\pi cm^2 = A$

Radius $= 36cm = r$

$l = l_0$

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

$54\pi = \frac{1}{2} \times l \times 36^{18}$

$\frac{54\pi}{18} = l$

$3\pi = l$

$\therefore l = 3\pi cm$

#Q. A car has two wipers which do not overlap. Each wiper has a blade of length 25 cm sweeping through an angle of 115. Find the total area cleaned at each sweep of the blades.

CBSE 2019, 23

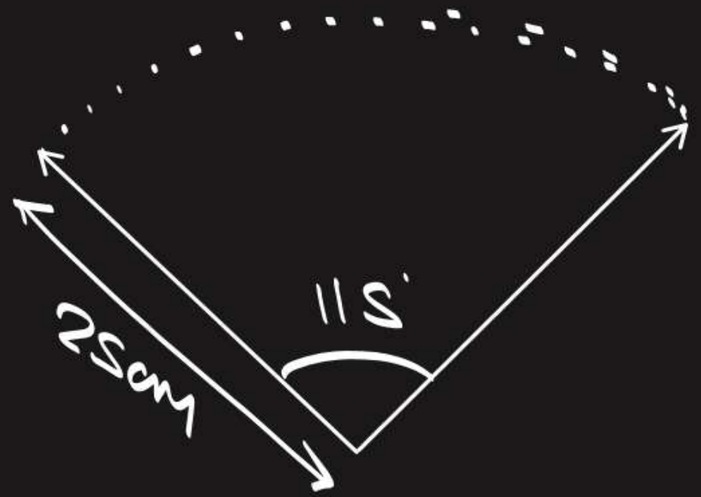
Area cleaned at each sweep of the blades

$= 2 \times$ Area of sector

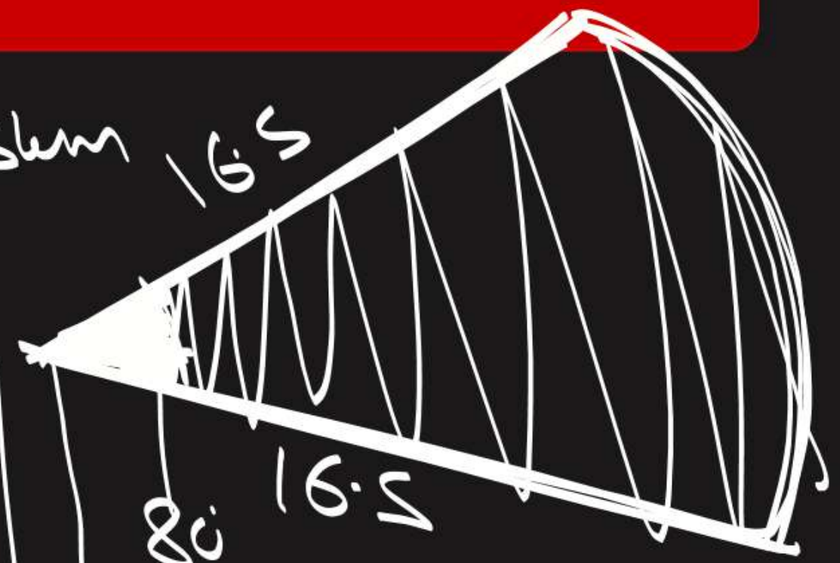
$= 2 \times \frac{\theta}{360} \times \pi r^2$

$= 2 \times \frac{23}{360} \times \frac{22}{7} \times 25 \times 25$

$= \frac{253 \times 625}{18 \times 7} = \frac{158125}{126} = \boxed{1254.96 \text{ cm}^2}$



#Q. To warn ships for underwater rocks, a light house throws a red coloured light over a sector of 80 angle to a distance of 16.5 km. Find the area of the sea over which the ships are warned. (Use $\pi = 3.14$)



Area of sea = Area of sector of $r = 16.5$ km

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

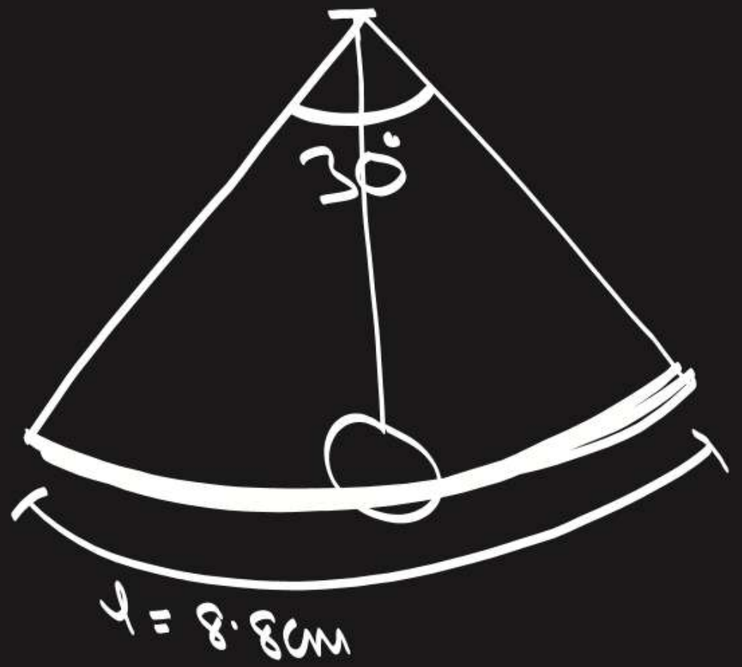
$$= \frac{\cancel{80}^{2}}{\cancel{360}_{\cancel{4}\times\cancel{9}_{1}}} \times \frac{314}{100} \times \frac{\cancel{165}^{55}}{\cancel{10}_{1}} \times \frac{\cancel{165}^{55}}{\cancel{10}}$$

$$= \frac{2 \times 55 \times 55 \times 314}{10000} = \frac{1899700}{10000} = \boxed{189.970 \text{ km}^2}$$

Ans. 189.97 km^2

#Q. A pendulum swings through an angle of 30° and describes an arc 8.8 cm in length. Find the length of the pendulum. [Use $\pi = 22/7$]

$r = ?$



#Q. AB and CD are respectively arcs of two concentric circles of radii 21 cm and 7 cm and centre O. If $\angle AOB = 30°$, find the area of the shaded region.

CBSE 2012

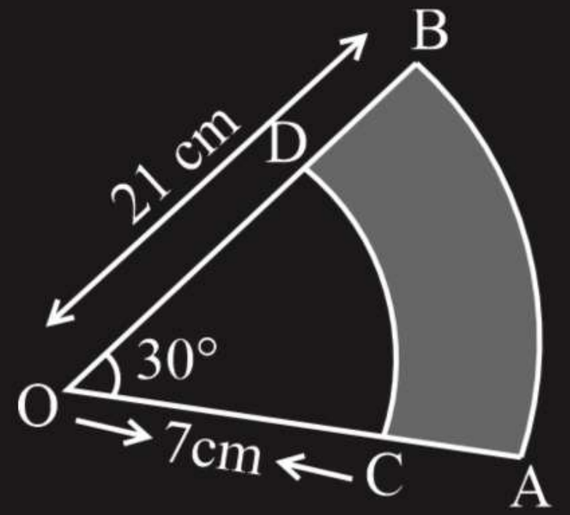
Area of shaded part ABDC = Area of sector OBA - Area of sector ODC

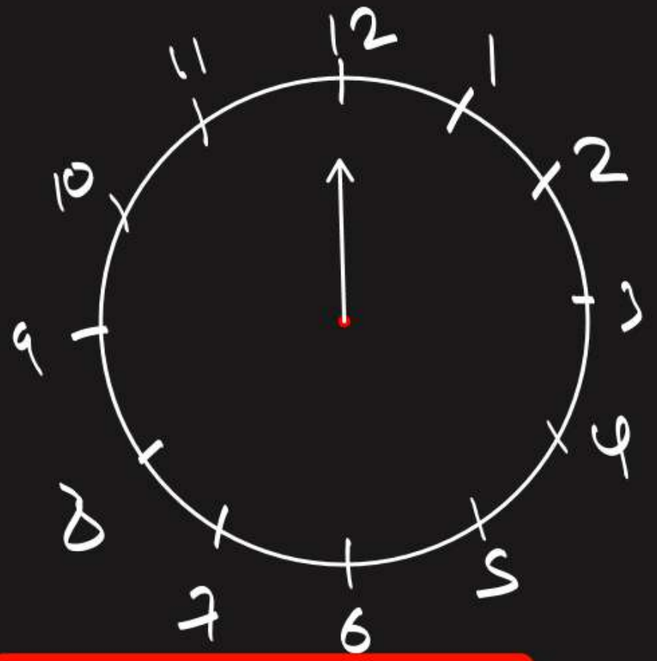
$$= \frac{\theta}{360} \times \pi R^2 - \frac{\theta}{360} \times \pi r^2$$

$$= \frac{\theta}{360} \times \pi \left[R^2 - r^2\right]$$

$$= \frac{30}{360} \times \frac{22}{7} \left[21^2 - 7^2\right]$$

$$= \frac{11}{42} \left[21-7\right]\left[21+7\right] = \frac{11}{42} \times 14 \times 28 = \frac{308}{3}\ cm^2$$



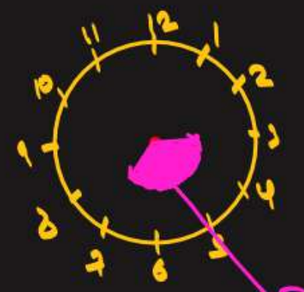


Minute hand

60 min = 360°

1 min = $\frac{360}{60}$

1 min = 6°

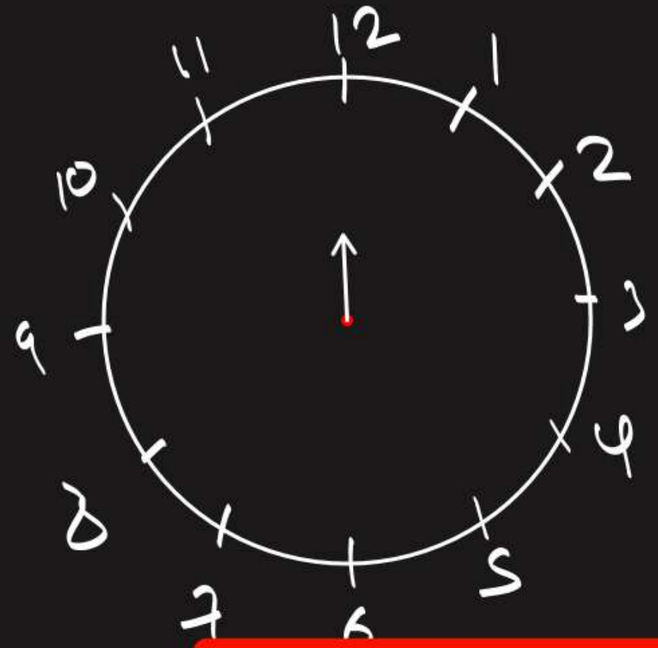


Ex. 20 min = ? degree.

1 min = 6°

20 min = (20 × 6)°

= 120°



Hour hand

12 hr = 360°

1 hr = $\frac{360}{12}$

1 hr = 30°

#Q. The length of minute hand of a clock is 14 cm. Find the area swept by the minute hand in one minute. [Use $\pi = 22/7$]

G: length of minute hand = 14cm

ToF: Area swept by minute hand in 1 min.

Angle described by minute hand in 60 min = 360°

" " " " " " 1 min = 6°

Area swept = Area of sector of r = 14cm and angle 6°

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

$$= \frac{6}{360} \times \frac{22}{7} \times 14 \times 14 = \frac{22 \times 14}{30} = 10.26\,cm^2$$

#Q. The minute hand of a clock is 10 cm long. Find the area of the face of the clock described by the minute hand between 9 A.M. and 9:35 A.M.

Angle of sector = 210°

1 min = 6°

35 min = (35 × 6)°

= 210°

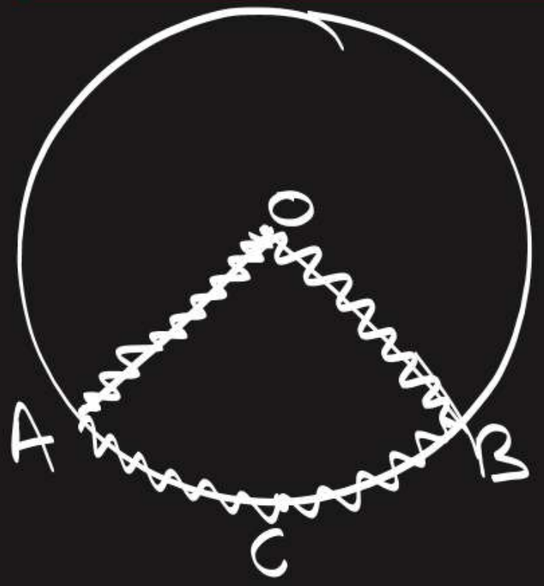
r = 10 cm

CBSE 2020

Find the distance covered by the tip of minute hand.

arc length.

#Q. The perimeter of a sector of a circle of radius 5.2 cm is 16.4 cm. Find the area of the sector.



Perimeter of sector = $OA + \overset{\frown}{AB} + OB$

$= r + l + r$

$= \boxed{2r + l}$

$16.4 = 2(5.2) + l$

$16.4 = 10.4 + l$

$\boxed{6\text{cm} = l}$

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

$= \frac{1}{2} \times 6 \times 5.2 = \boxed{15.6\text{cm}^2}$

#HOT

#Q. A brooch is made with silver wire in the form of a circle with diameter 35 mm. The wire also used in making 5 diameters which divide the circle into 10 equal sectors as shown in figure. Find: (i) the total length of the silver wire required (ii) the area of each sector of the brooch.

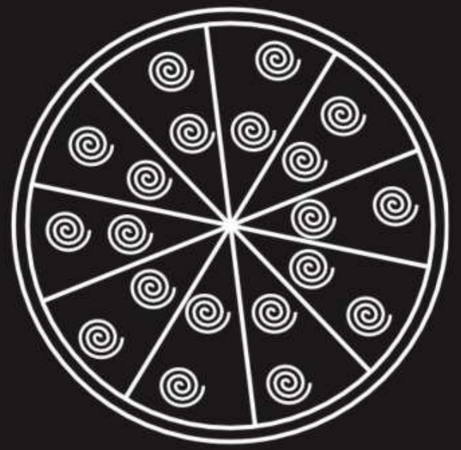
(i) Total length = Circumference of circle + length of 5 diameter.

$= 2\pi r + 5d$

$= 2 \times \frac{22}{7} \times \frac{35}{2} + 5 \times 35$

$= 110 + 175$

$= \boxed{285 \text{ mm}}$



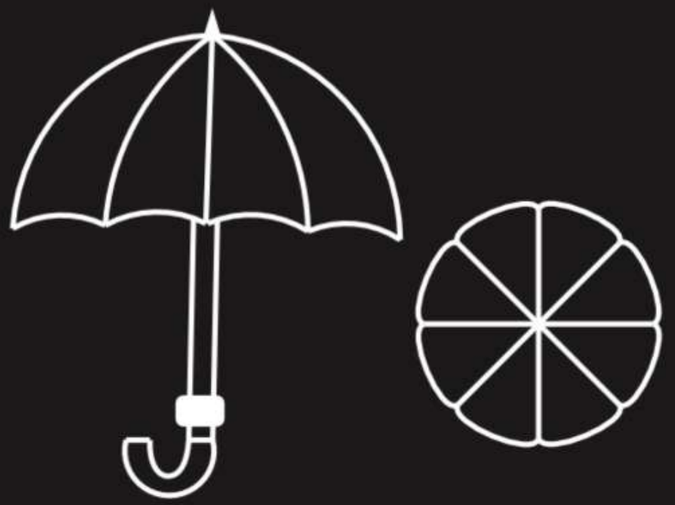
(ii) Area $= \frac{\theta}{360} \times \pi r^2$

$\theta = \frac{360}{10} = 36°$

#Gpk

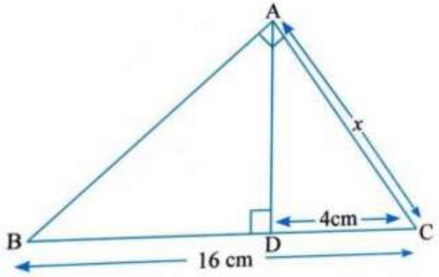
#Q. An umbrella has 8 ribs which are equally spaced. Assuming umbrella to be a flat circle of radius 45 cm. Find the area between the two consecutive ribs of the umbrella.

#GPL



Hornework From the Question Bank

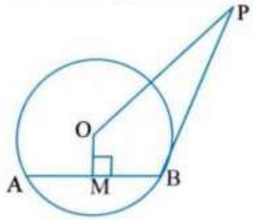
9. In the given figure, in ΔABC, $AD \perp BC$ and $\angle BAC = 90°$. If $BC = 16$ cm and $DC = 4$ cm, then the value of x is:



(a) 4 cm (b) 5 cm (c) 8 cm (d) 3 cm

29. Prove that $\left(5\sqrt{3}+\frac{2}{3}\right)$ is an irrational number given that $\sqrt{3}$ is an irrational number.

27. In the given figure, PB is a tangent to the circle with centre O at B. AB is a chord of the circle of length 24 cm and at a distance of 5 cm from the centre of the circle. If the length PB of the tangent is 20 cm, find the length of OP.



15. The line represented by $\frac{x}{4}+\frac{y}{6}=1$, intersects x-axis and y-axis respectively at P and Q. The coordinates of the mid-point of line segment PQ are:

(a) (2, 3) (b) (3, 2) (c) (2, 0) (d) (0, 3)

Homework From the Question Bank

31. (*a*) If the mid-point of the line segment joining the points A (3, 4) and B (k, 6) is P (x, y) and $x + y - 10 = 0$, find the value of k.

34. (*a*) The sum of the third term and the seventh term of an AP is 6 and their product is 8. Find the sum of the first sixteen terms of the AP.

OR

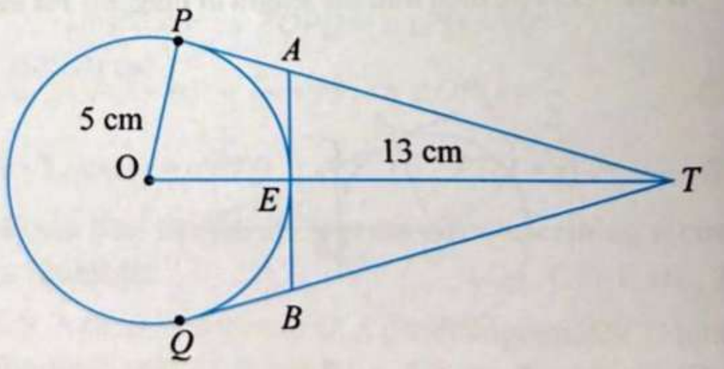
(*b*) The minimum age of children eligible to participate in a painting competition is 8 years. It is observed that the age of the youngest boy was 8 years and the ages of the participants, when seated in order of age, have a common difference of 4 months. If the sum of the ages of all the participants is 168 years, find the age of the eldest participant in the painting competition.

3. (*a*) O is the point of intersection of the diagonals AC and BD of a trapezium $ABCD$ with $AB \| DC$. Through O, a line segment PQ is drawn parallel to AB meeting AD in P and BC in Q, then prove that $OP = OQ$.

OR

(*b*) A street light bulb is fixed on a pole 6 m, above the level of the street. If a woman of height 1.5 m casts a shadow of 3 m, then find how far she is away from the base of the pole.

3. In the figure given below, O is the centre of a circle of radius 5 cm, T is a point such that $OT = 13$ cm and OT intersects the circle at E. If AB is the tangent to the circle at E, find the length of AB.



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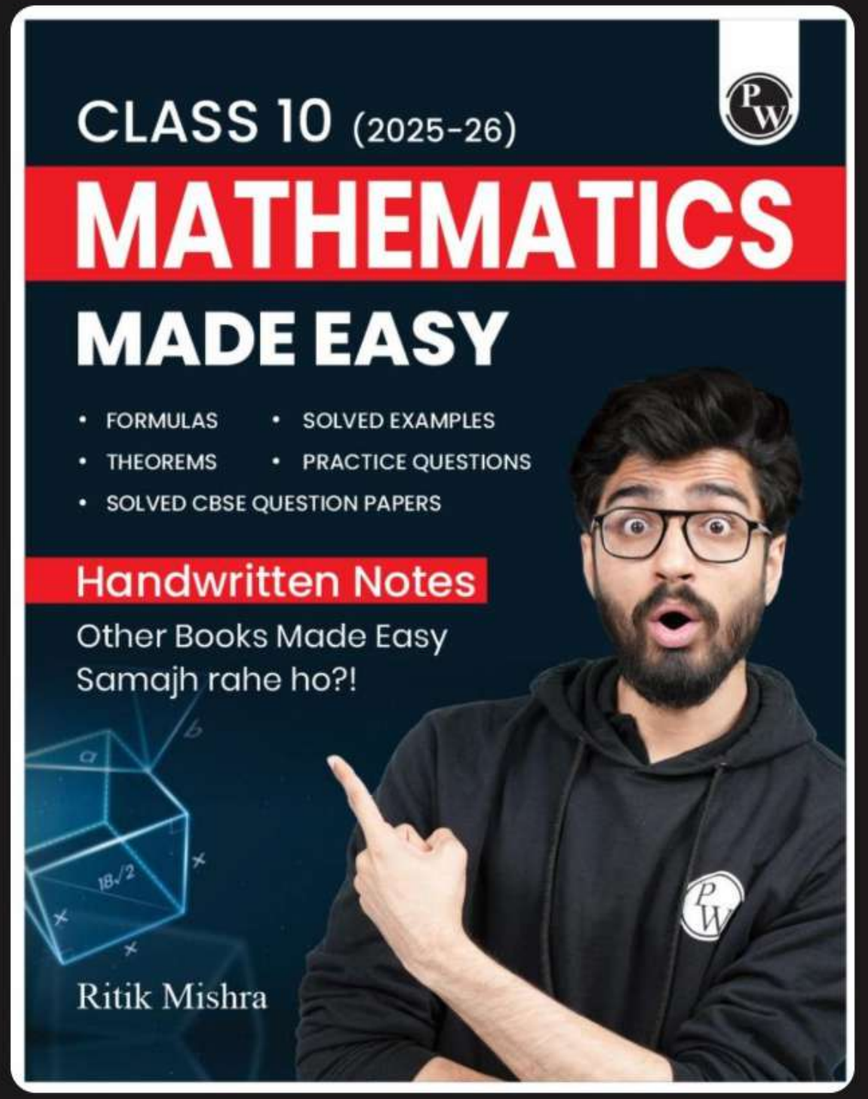

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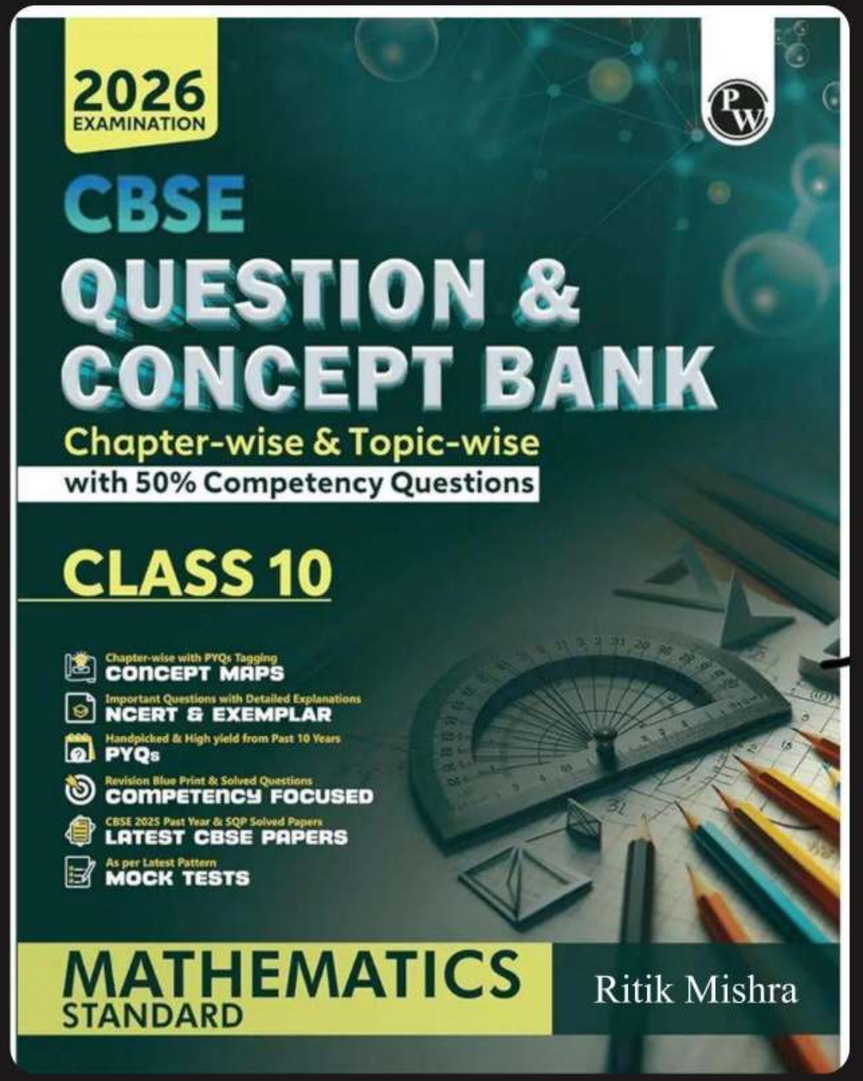

WORK HARD
DREAM BIG
NEVER GIVE UP

RITIK SIR

JOIN MY OFFICIAL TELEGRAM CHANNEL

Thank You