ODM EDUCATIONAL GROUP
Changing your Tomorrow

AREAS RELATED TO CIRCLES
PPT-4

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 12
CHAPTER NAME : AREAS RELATED TO CIRCLES

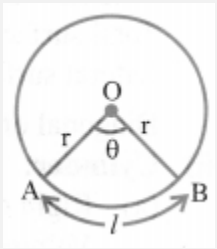
Website: www.odmegroup.org
Email: info@odmps.org
Toll Free: 1800 120 2316
Sishu Vihar, Infocity Road, Patia, Bhubaneswar- 751024

PREVIOUS KNOWLEDGE TEST

Length of an Arc and Area of Sector

(i) The length of an arc of a sector of an angle θ is given by, $\frac{2\pi R\theta}{360^0}$

The area of the sector $A = \frac{\theta}{360°} \times \pi r^2$ e θ is given by,



Area of Segment

i) Area of segment APB = Area (sector OAPB) – Area(ΔOAB)
This is the area of minor segment.
∴ area of major segment AQB = πr^2 – Area of minor segment APB

(ii) If θ is the central angle, then the area of segment APB

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

LEARNING OUTCOME

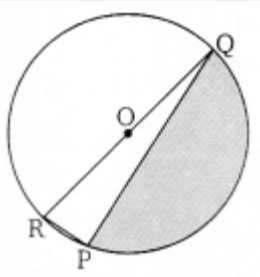
1 .Students will be able to find the area of combined plane figures.

2.Students will be able to identify angle subtended by the sector at the Centre.

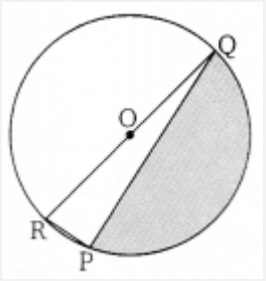
3. Students will be able to apply the knowledge of Area of sector and segment of a circle in solving real life problems..

Area of combined plane figures
https://youtu.be/KwfYxUPpJEY {9.54}

1. Find the area of the shaded region in the given figure, if PQ = 24 cm, PR = 7 cm and O is the centre of the circle)



1. Find the area of the shaded region in the given figure, if PQ = 24 cm, PR = 7 cm and O is the centre of the circle)



In ΔPQR, $\angle QPR = 90°$ (angle in semicircle)

and $QR^2 = PQ^2 + RP^2$

(as Δ QPR is a right angled triangle)

$\therefore OR^2 = (24)^2 + (7)^2 = 576 + 49$

$\Rightarrow QR^2 = 625\ cm^2$

$\Rightarrow QR = \sqrt{625}\ cm^2$

$\Rightarrow QR = 25$

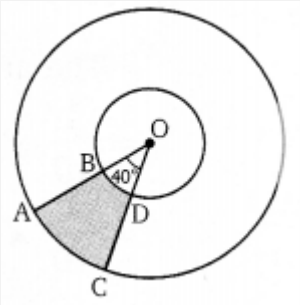
Area of the shaded region = Area of the semicircle − Area of the triangle

$$= \frac{1}{2}\pi r^2 - \text{area of } \Delta PQR = \frac{1}{2} \times \frac{22}{7} \times \left(\frac{25}{2}\right)^2 - \frac{1}{2} \times PR \times QP$$

$$= \frac{22}{7} \times \frac{25 \times 25}{2 \times 4} - \frac{1}{2} \times 7 \times 24 = \frac{22 \times 625}{28 \times 2} - 84 = \frac{13750 - 4704}{56}$$

$$= \frac{9046}{56} = \frac{4523}{28} = 161.54\ cm^2$$

2. Find the area of the shaded region in the given figure, ¡f radii of the two concentric circles with centre O are 7 cm and 14 cm respectively and ∠AOC = 40°



2. Find the area of the shaded region in the given figure, ¡f radii of the two concentric circles with Centre O are 7 cḿ and 14 cm respectively and ∠AOC = 40°

The Radius of smaller circle = 7cm

Angle of sector (θ) = 40°

∴ Area of smaller sector BOD

$$= \frac{\theta}{360^\circ} \times \pi r^2 = \frac{40^\circ}{360^\circ} \times \frac{22}{7} \times 7 \times 7$$

$$= \frac{1}{9} \times 22 \times 7 = \frac{154}{9} \text{ cm}^2.$$

∴ Area of bigger sector AOC

$$= \frac{40^\circ}{360^\circ} \times \frac{22}{7} \times 14 \times 14$$

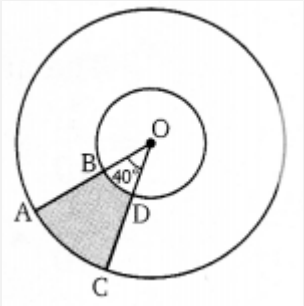
$$= \frac{1}{9} \times 22 \times 28 = \frac{616}{9} \text{ cm}^2.$$

∴ Area of shaded region

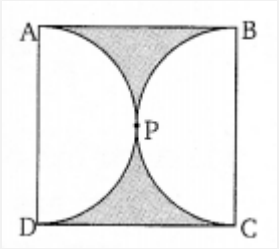
= Area of bigger sector AOC

− Area of smaller sector BOD

$$= \frac{616}{9} - \frac{154}{9} = \frac{462}{9} = \mathbf{\frac{154}{3}} \textbf{ cm}^2.$$



3. Find the area of the shaded region in the given figure, if ABCD is a square of side 14 cm and APD and BPC are semicircles.



3. Find the area of the shaded region in the given figure, if ABCD is a square of side 14 cm and APD and BPC are semicircles.

ABCD is a square

Given: side of the square = 14 cm

Area of the square = $(\text{side})^2 = (14)^2 = 196\ \text{cm}^2$

Radius of the semicircle APD = $\frac{1}{2}$ (side of square) = $\frac{1}{2} \times 14 = 7$ cm

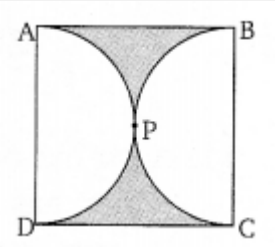
$$\text{Area of the semicircle APD} = \frac{1}{2}\pi r^2 = \frac{1}{2} \times \frac{22}{7} \times 7 \times 7 = 11 \times 7 = 77\ \text{cm}^2$$

Similarly, area of the semicircle BPC = $77\ \text{cm}^2$

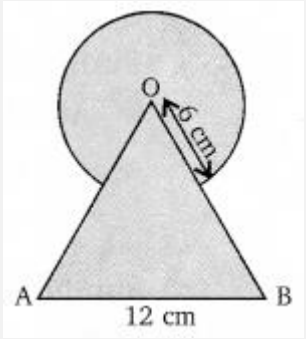
Total area of both the semicircles = $77 + 77 = 154\ \text{cm}^2$

Area of the shaded region = Area of square − area of both semicircles

$= 196 - 154 = 42\ \text{cm}^2$



4. Find the area of the shaded region in the figure, where a circular arc of radius 6 cm has been drawn with vertex O of an equilateral triangle OAB of side 12 cm as Centre.



4. Find the area of the shaded region in the figure, where a circular arc of radius 6 cm has been drawn with vértex O of an equilateral triangle OAB of side 12 cm as Centre.

Area of the equilateral triangle OAB

$$= \frac{\sqrt{3}}{4}(\text{Side})^2$$

$$= \frac{\sqrt{3}}{4} \times 12 \times 12 = 36\sqrt{3} \text{ cm}^2$$

Angle of sector, $\theta = 60°$ [Given]

Area of the major sector of the circle

$= \pi r^2$ – Area of the minor sector

$$= \pi \times 6 \times 6 - \pi \times 6 \times 6 \times \frac{60°}{360°}$$

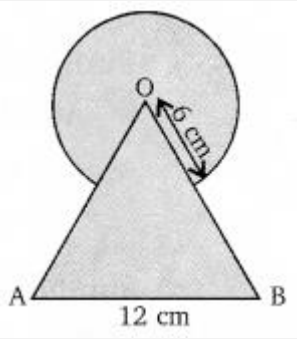
$$= 36\pi - 6\pi = 30\pi = 30 \times \frac{22}{7} = \frac{660}{7} \text{ cm}^2$$

Area of the shaded region

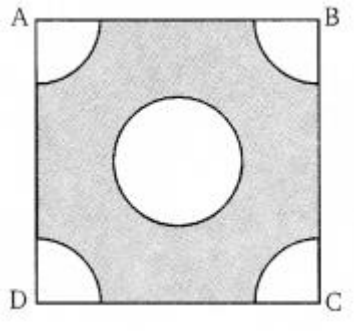
= Area of the major sector of the circle

+ Area of the triangle

$$= \left(\frac{660}{7} + 36\sqrt{3}\right) \text{cm}^2.$$



5. From each corner of a square of side 4 cm a quadrant of a circle of radius 1 cm is cut and also a circle of diameter 2 cm is cut as shown in the figure. Find the area of the remaining portion of the square.



5. From each corner of a square of side 4 cm a quadrant of a circle of radius 1 cm is cut and also a circle of diameter 2 cm is cut as shown in the figure. Find the area of the remaining portion of the square.

side of the square ABCD = 4 cm

Area of the square ABCD = $4 \times 4 = 16\ cm^2$

Radius of the quadrant at corner = 1 cm

Area of the quadrant at each corner $= \frac{\pi r^2 \theta}{360^\circ} = \frac{22}{7} \times \frac{1 \times 1 \times 90^\circ}{360^\circ} = \frac{22}{28}\ cm^2$

Now, area of the 4 sectors at each corner $= \frac{4 \times 22}{28} = \frac{22}{7}\ cm^2$

Area of the circle at the centre of the square having (radius $= \frac{2}{2} = 1$ cm)

$= \pi r^2 = \frac{22}{7}(1)^2 = \frac{22}{7}\ cm^2$

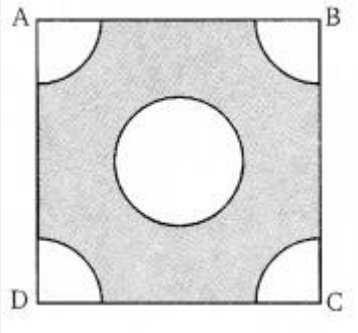
Total area to be cut out from square = Area of the 4 sectors + Area of the circle at the centre

$= \frac{22}{7} + \frac{22}{7} = \frac{44}{7}\ cm^2$

$\therefore$ Area of the remaining portion = Area of the square – Area to be cut from square

$= 16 - \left(\frac{44}{7}\right) = 16 - \frac{44}{7}$

$= \frac{112 - 44}{7} = \frac{68}{7}\ cm^2$



HOME ASSIGNMENT:Ex-12.3 Q1 to Q6 AHA

1. From each corner of a square of side 10 cm a quadrant of a circle of radius 1 cm is cut and also a circle of diameter 2 cm is cut. Find the area of the remaining portion of the square.

ODM EDUCATIONAL GROUP
Changing your Tomorrow

THANKING YOU

ODM EDUCATIONAL GROUP