Chapter-Areas Related to Circles

Q1.

A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the corresponding minor segment and hence find the area of the major segment

Q2.

Area of a sector of a circle of radius 14 cm is 154 cm^2. Find the length of the corresponding arc of the sector

Q3.

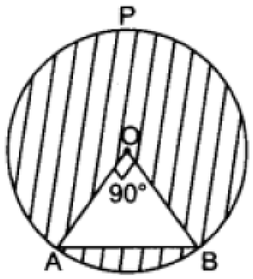
Two circular beads of different sizes are joined together such that the distance between their centres is 14 cm. The sum of their areas is 130π cm^2. Find the radius of each bead.

Q4.

A chord of a circle of radius 14 cm subtends an angle of 120° at the centre. Find the area of the corresponding minor segment of the circle.

Q5.

Find the area of the major segment APB in figure of a circle of radius 35 cm and ∠AOB = 90°.



Q6.

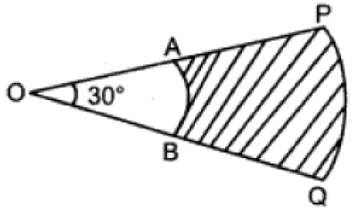
Find the area of a quadrant of a circle, where the circumference of circle is 44cm

Q7.

The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 10 minutes

Q8.

In figure, PQ and AB are respectively the arcs of two concentric circles of radii 7 cm and 3.5 cm and centre O. If ∠POQ = 30°, then find the area of the shaded region.



Q9.

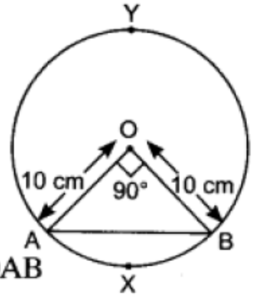
.A park is of the shape of a circle of diameter 7 m. It is surrounded by a path of width of 0.7 m. Find the expenditure of cementing the path. If its cost is Rs.110 per sq. m.

Q10

A wire when bent in the form of an equilateral triangle encloses an area of $121\sqrt{3}$ cm^2. If the wire is bent in the form of a circle, find the area enclosed by the circle. Use $\pi = \frac{22}{7}$.

Solutions

Q1.



$$\text{Area of circle} = \pi r^2 = \frac{22}{7} \times 10 \times 10 = \frac{2200}{7}\ \text{cm}^2$$

$$\text{Area of sector OAXB} = \frac{\pi r^2\theta}{360^\circ} = \frac{22}{7} \times \frac{10 \times 10 \times 90^\circ}{360^\circ} = \frac{550}{7}\ \text{cm}^2$$

$$\text{Area of } \Delta OAB = \frac{1}{2}r^2 = \frac{1}{2} \times 10 \times 10 = 50\ \text{cm}^2$$

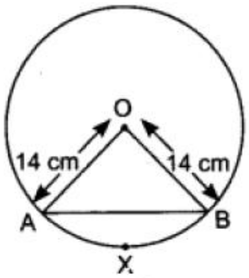
Now, area of minor segment AXB = area of sector OAXB – area of ΔOAB

$$= \frac{550}{7} - 50 = \frac{550 - 350}{7} = \frac{200}{7}\ \text{cm}^2$$

Area of major segment AYB = area of circle – area of minor segment AXB

$$= \frac{2200}{7} - \frac{200}{7} = \frac{2000}{7}\ \text{cm}^2$$

Q2.



Given: Area of sector OAXB = 154 cm^2

$$\Rightarrow \quad \frac{\pi r^2\theta}{360^\circ} = 154$$

$$\Rightarrow \quad \frac{22}{7} \times \frac{14 \times 14 \times \theta}{360} = 154$$

$$\Rightarrow \quad \theta = \frac{154 \times 7 \times 360}{22 \times 14 \times 14} \Rightarrow \theta = 90^\circ$$

Now, length of arc AXB $= \frac{2\pi r\theta}{360^\circ} = 2 \times \frac{22}{7} \times 14 \times \frac{90^\circ}{360^\circ} = 22$ cm

Q3.

Let the radii of the circles are r_1 and r_2.

$$r_1 + r_2 = 14 \qquad \ldots(1)$$

Sum, of their areas,

$$\pi(r_1^2 + r_2^2) = 130\pi$$

$$r_1^2 + r_2^2 = 130 \qquad \ldots(2)$$

Now

$$(r_1 + r_2)^2 = r_1^2 + r_2^2 + 2r_1 r_2$$

$$(14)^2 = 130 + 2r_1 r_2$$

$$2r_1 r_2 = 196 - 130 = 66$$

$$(r_1 - r_2)^2 = r_1^2 + r_2^2 - 2r_1 r_2$$

$$= 130 - 66 = 64$$

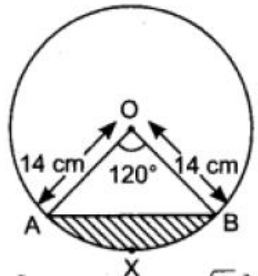
Thus

$$r_1 - r_2 = 8 \qquad \ldots(3)$$

From (1) and (3), we get

$$2r_1 = 22 \Rightarrow r_1 = 11 \text{ cm}$$

Q4.



Area of shaded portion

$= \text{Area of sector OAXB} - \text{area of } \Delta OAB$

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

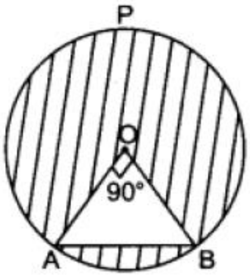
$= \frac{22}{7} \times 14 \times 14 \times \frac{120}{360} - \frac{1}{2} \times 14 \times 14 \times \sin 120^\circ$

$= \frac{616}{3} - 7 \times 14 \times \frac{\sqrt{3}}{2}$ $\left[\text{as } \sin 120^\circ = \frac{\sqrt{3}}{2}\right]$

$= 205.33 - 7 \times 7 \times 1.73$

$= 205.33 - 84.77 = 120.56 \text{ cm}^2$

Q5.



Solution:

Radius of circle $= 35$ cm

$\angle AOB = 90^\circ$

Area of sector OAB $= \frac{\pi r^2 \theta}{360^\circ}$

$= \frac{22}{7} \times 35 \times 35 \times \frac{90^\circ}{360^\circ} = \frac{1925}{2} \text{ cm}^2$

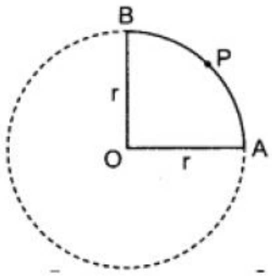
Area of minor segment $=$ area of sector OAB – area of ΔOAB

$= \frac{1925}{2} - \frac{1}{2} \times 35 \times 35 = \frac{1925}{2} - \frac{1225}{2} = \frac{700}{2} = 350 \text{ cm}^2$

Area of major segment APB $=$ area of circle – area of minor segment

$= \frac{22}{7} \times 35 \times 35 - 350 = 3500 \text{ cm}^2$

Q6.



Let r be the radius of the circle.

Given: Circumference $= 44$ cm

$\Rightarrow$ $2\pi r = 44$

$\Rightarrow$ $2 \times \frac{22}{7} \times r = 44 \Rightarrow r = \frac{44 \times 7}{22 \times 2} = 7$ cm

Now, area of quadrant OAPB $= \frac{\pi r^2}{4} = \frac{1}{4} \times \frac{22}{7} \times 7 \times 7 = 38.5\ \text{cm}^2$

Q7.

In 1 hour, the minute hand rotates 360°.

In 10 minutes, minute hand will rotate $= \frac{360°}{60} \times 10 = 60°$

Therefore, the area swept by the minute hand in 10 minute will be the area of a sector of 60° in a circle of 14 cm radius.

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

$$\text{Area of sector of angle } 60° = \frac{60°}{360°} \times \frac{22}{7} \times 14 \times 14 = \frac{308}{3} = 102.67\ \text{cm}^2$$

$\therefore$ The area swept by the minute hand in 10 minutes is 102.67 cm²

Q8.

Solution:

Radius of bigger circle $= R = 7$ cm

Radius of smaller circle $= r = 3.5$ cm

$\theta = 30°$

Area of shaded region = Area of sector OPQ – Area of sector OAB

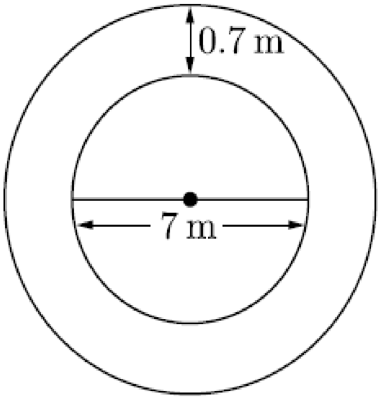
$$= \frac{\theta}{360°} \times \pi R^2 - \frac{\theta}{360°} \times \pi r^2$$

$$= \frac{\theta}{360°} \pi (R^2 - r^2)$$

$$= \frac{30°}{360°} \times \frac{22}{7} [7^2 - (3.5)^2]$$

$$= \frac{22}{84} \times (49 - 12.25) = \frac{22}{84} \times 36.75 = 9.625\ \text{cm}^2$$

Q9.



The inner diameter of park $= 7$ m

$$\text{radius } = \frac{7}{2} = 3.5 \text{ m}$$

$$\text{Width of path } = 0.7 \text{ m}$$

Radius of park with path

$$= 3.5 + 0.7 = 4.2 \text{ m}$$

$$\text{Area of the path } = \pi(4.2)^2 - \pi(3.5)^2$$

$$= \frac{22}{7}(17.64 - 12.25)$$

$$= \frac{22}{7} \times 5.39 = 22 \times 0.77$$

$$= 16.94 \text{ m}^2$$

Cost of the cementing the path

$$= 16.94 \times 110$$

$$= Rs. 1863.40$$

Q10

Let l be length of wire. If it is bent in the form of an equilateral triangle, side of triangle will be $\frac{l}{3}$.
Area enclosed by the triangle,

$$\frac{\sqrt{3}}{4} \times \left(\frac{l}{3}\right)^2 = 121\sqrt{3}$$

$$\frac{1}{4} \times \left(\frac{l}{3}\right)^2 = 121$$

$$\frac{1}{2} \times \frac{l}{3} = 11$$

$$l = 66 \text{ cm}$$

Same wire is bent in the form of circle. Thus circumference of circle will be 66.

$$2\pi r = 66$$

$$r = \frac{66}{2\pi} = \frac{66}{2 \times \frac{22}{7}} = \frac{21}{2}$$

Area enclosed by the circle

$$\pi r^2 = \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} = \frac{693}{2} = 346.5 \text{ cm}^2$$

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