Chapter : 18. AREA OF CIRCLE, SECTOR AND SEGMENT

Exercise : 18A

Question: 1

Solution:

Given:

Difference between the circumference and the radius of circle = 37 cm

Let the radius of the circle be 'r'.

Circumference of the circle = $2\pi r$

So, Difference between the circumference and the radius of the circle = $2\pi r - r = 37$

$2\pi r - r = 37$

$2 \times \frac{22}{7} \times r - r = 37$

$\frac{44}{7} \times r - r = 37$

$r\left(\frac{44}{7} - 1\right) = 37$

$\frac{37}{7} \times r = 37$

$r = 37 \times \frac{7}{37}$

r = 7 cm

$\therefore$ Circumference of circle = $2 \times \frac{22}{7} \times 7$

= 2 × 22

= 44 cm

Hence the circumference of the circle is 44 cm.

Question: 2

Solution:

Given:

Circumference of circle = 22 cm

Let the radius of the circle be 'r'.

$\because$ Circumference of circle = $2\pi r$

$\therefore 22 = 2 \times \pi \times r$

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

$\Rightarrow 22 \times \frac{7}{22} \times \frac{1}{2} = r$ or $\frac{7}{2} = r$

or $r = \frac{7}{2}$

$\because$ Area of circle = πr^2

$\therefore$ Area of its quadrant = $\frac{1}{4}\pi r^2$

CLASS24

$= \frac{1}{4} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$

$= \frac{77}{8}$

Hence the area of the quadrant of the circle is $\frac{77}{8}$ cm.

Question: 3

Solution:

Given:

Let the two circles be C_1 and C_2 with diameters 10 cm and 24 cm respectively.

Area of circle, C = Area of C_1 + Area of C_2 ...... (i)

∵ Diameter = 2 × radius

∴ Radius of C_1, $r_1 = \frac{10}{2} = 5$ cm

and Radius of C_2, $r_2 = \frac{24}{2} = 12$ cm

∵ Area of circle = πr^2 ...... (ii)

∴ Area of $C_1 = \pi r_1^2$

$= \frac{22}{7}\ 5 \times 5$

$= \frac{22}{7} \times 25$

$= \frac{550}{7}$ cm^2

Similarly, Area of $C_2 = \pi r_2^2$

$= \frac{22}{7} \times 12 \times 12$

= 22/7 × 144

$= \frac{3168}{7}$ cm^2

∴ Using equation (i), we have

Area of C $= \frac{550}{7} + \frac{3168}{7}$

$= \frac{3718}{7}$ cm^2

Now, using equation (ii), we have

$$\pi r^2 = \frac{3718}{7}$$

$\frac{22}{7} \times r^2 = \frac{3718}{7}$

$r^2 = \frac{3718}{7} \times \frac{7}{22}$

$r^2 = 169$

$r = \sqrt{169}$

r = 13 cm

⇒ Diameter = 2 × r

= 2 × 13

= 26 cm

Hence, the diameter of the circle is 26 cm.

Question: 4

Solution:

Given:

Area of circle = 2 × Circumference of circle …… (i)

Let the radius of the circle be 'r'.

Then, the area of the circle = πr^2

and the circumference of the circle = $2\pi r$

Using (i), we have

$\pi r^2 = 2 \times 2\pi r$

$\pi r^2 = 4\pi r$

r = 4 cm

∵ Diameter = 2 × radius

∴ Diameter = 2 × 4

= 8 cm

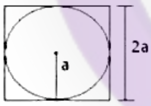
Hence, the diameter of the circle is 8 cm.

Question: 5

Solution:

Given:

Perimeter of square circumscribes a circle of radius 'a'.



Side of square = Diameter of circle

Diameter of circle = 2 × radius

= 2a

So, Side of square = 2a

∵ Perimeter of square = 4 × side

∴ Perimeter of square = 4 × 2a

= 8a

Hence, the perimeter of the square is 8a.

Question: 6

Solution:

Given:

Diameter of circle = 42 cm

⇒ Radius of circle = $\frac{42}{2}$ cm = 21 cm

Angle subtended at the centre = 60°

∵ Length of arc = $\frac{\theta}{360} \times 2\pi r$

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

= 22 cm

Hence, the length of the arc is 22 cm.

Question: 7

Solution:

Given:

Let the two circles with radii 4 cm and 3 cm be C_1 and C_2 respectively.

⇒ r_1 = 4 cm and r_2 = 3 cm

Area of circle, C = Area of C_1 + Area of C_2 …… (i)

∵ Area of circle = πr^2 …… (ii)

∴ Area of C_1 = πr_1^2

= $\frac{22}{7} \times 4 \times 4$

= $\frac{22}{7} \times 16 = \frac{352}{7}$ cm²

Similarly, Area of C_2 = πr_2^2

= $\frac{22}{7} \times 3 \times 3$

= $\frac{22}{7} \times 9 = \frac{198}{7}$ cm²

So, using (i), we have

Area of C = $\frac{352}{7} + \frac{198}{7} = \frac{550}{7}$ cm²

Now, using (ii), we have

$\pi r^2 = \frac{550}{7}$

$\frac{22}{7} \times r^2 = \frac{550}{7}$

$r^2 = \frac{550}{7} \times \frac{7}{22} = 25$

$r = \sqrt{25} = 5$

r = 5 cm

∵ Diameter = 2 × radius

∴ Diameter = 2 × 5 = 10 cm

Hence, diameter of the circle with area equal to the sum of two circles of radii 4 cm and 3cm is 10 cm.

Question: 8

Solution:

Given:

Circumference of circle = 8π

$\because$ Circumference of a circle = $2\pi r$

$\therefore 8\pi = 2\pi r$

$r = 4$

$\because$ Area of circle = πr^2

$\therefore$ Area of circle = $\pi \times 4 \times 4$

$= 16\pi$

Hence, the area of the circle is 16π.

Question: 9

Solution:

Given:

Diameter of the semicircular protractor = 14 cm

Radius of the protractor = $\frac{14}{2}$ cm = 7 cm

$\because$ Perimeter of semicircle = $\pi r + d$

$\therefore$ Perimeter of semicircular protractor = $\frac{22}{7} \times 7 + 14 = 22 + 14$

= 36 cm

Hence, the perimeter of the semicircular protractor is 36 cm.

Question: 10

Solution:

Given:

Perimeter of circle = Area of circle ...... (i)

$\because$ Perimeter of circle = $2\pi r$ and Area of circle = πr^2

$\therefore$ Using (i), we have

$2\pi r = \pi r^2$

$2 = \frac{\pi r2}{2\pi r}$

2 = r or r = 2

Hence, the radius of the circle is 2 cm.

Question: 11

Solution:

Given:

Radius of one of the circles, C_1 = 19 cm = r_1

Radius of the other circle, C_2 = 9 cm = r_2

Let the other circle be C with radius 'r'.

Circumference of C = Circumference of C_1 + Circumference of C_2 .... (i)

$\because$ Circumference of circle = $2\pi r$

$\therefore$ Circumference of $C_1 = 2\pi r_1 = 2 \times \frac{22}{7} \times 19 = \frac{836}{7}$

and Circumference of $C_2 = 2\pi r_2 = 2 \times \frac{22}{7} \times 9 = \frac{396}{7}$

Using (i), we have

$2\pi r = \frac{836}{7} + \frac{396}{7} = \frac{1232}{7}$

$2 \times \frac{22}{7} \times r = \frac{1232}{7}$

$r = \frac{1232}{7} \times \frac{7}{22} \times \frac{1}{2} = 28$

r = 28 cm

Hence, the radius of the circle is 28 cm.

Question: 12

Solution:

Given:

Radius of one of the circles, $C_1 = 8 \text{ cm} = r_1$

Radius of the other circle, $C_2 = 6 \text{ cm} = r_2$

Let the other circle be C with radius 'r'.

Area of C = Area of C_1 + Area of C_2 ...... (i)

$\because$ Area of circle = πr^2

$\therefore$ Area of $C_1 = \pi r_1^{\ 2} = \frac{22}{7} \times 8 \times 8 = \frac{1408}{7}$

and Area of $C_2 = \pi r_2^{\ 2} = \frac{22}{7} \times 6 \times 6 = \frac{792}{7}$

Using (i), we have

$\pi r^2 = \frac{1408}{7} + \frac{792}{7} = \frac{2200}{7}$

$\frac{22}{7} \times r^2 = \frac{2200}{7}$

$r^2 = \frac{2200}{7} \times \frac{7}{22} = 100$

$r^2 = 100$

$r = \sqrt{100} = 10$ or r = 10

Hence, the radius of the circle is 10 cm.

Question: 13

Solution:

Given:

Radius of circle = 6 cm

Angle of the sector = 30°

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

$= \frac{30}{360} \times 3.14 \times 6 \times 6$

$= 3 \times 3.14 = 9.42\ cm^2$

Hence, the area of the sector is $9.42\ cm^2$.

Question: 14

Solution:

Given:

Radius of circle = 21 cm

Angle subtended by the arc = 60°

$\because$ Length of arc $= \frac{\theta}{360} \times 2\pi r$

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

Hence, the length of the arc is 22 cm.

Question: 15

Solution:

Given:

Ratio of circumferences of two circles = 2:3

Let the two circles be C_1 and C_2 with radii 'r_1' and 'r_2'.

$\because$ Circumference of circle = $2\pi r$

$\therefore$ Circumference of $C_1 = 2\pi r_1$

and Circumference of $C_2 = 2\pi r_2$

$\Rightarrow \frac{2\pi r_1}{2\pi r_2} = \frac{2}{3}$

$\Rightarrow \frac{r_1}{r_2} = \frac{2}{3}$

Squaring both sides, we get

$\Rightarrow \frac{r_1^2}{r_2^2} = \frac{2^2}{3^2}$

Multiplying both sides by 'π', we get

$\Rightarrow \frac{\pi r_1^2}{\pi r_2^2} = \frac{4}{9}$

$\because$ Area of circle = πr^2

$\Rightarrow \frac{\text{Area of } C_1}{\text{Area of } C_2} = \frac{4}{9}$

Hence, the ratio between the areas of C_1 and C_2 is 4:9.

Question: 16

Solution:

Given:

Ratio of areas of two circles = 2:3

Let the two circles be C_1 and C_2 with radii 'r_1' and 'r_2'.

∵ Area of circle = πr^2

∴ Area of $C_1 = \pi r_1{}^2$

and Area of $C_2 = \pi r_2{}^2$

$\Rightarrow \frac{\pi r_1^2}{\pi r_2^2} = \frac{4}{9}$

$\Rightarrow \frac{r_1^2}{r_2^2} = \frac{4}{9}$

Taking square root on both sides, we get

$\Rightarrow \frac{r_1}{r_2} = \frac{\sqrt{4}}{\sqrt{9}}$

$\Rightarrow \frac{r_1}{r_2} = \frac{2}{3}$

Multiplying and dividing L.H.S. by 'π', we get

$\Rightarrow \frac{\pi r_1}{\pi r_2} = \frac{2}{3}$

Multiplying and dividing L.H.S. by '2', we get

$\Rightarrow \frac{2\pi r_1}{2\pi r_2} = \frac{2}{3}$

As Circumference of circle = $2\pi r$

$\Rightarrow \frac{\text{Circumference of } C_1}{\text{Circumference of } C_2} = \frac{2}{3}$

Hence, the ratio between the circumferences of C_1 and C_2 is 2:3.

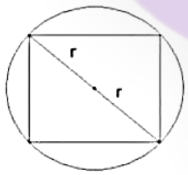
Question: 17

Solution:

Given:

A square is inscribed in a circle.

Let the radius of circle be 'r' and the side of the square be 'x'.



⇒ The length of the diagonal = 2r

∵ Length of side of square = $\frac{\text{Length of diagonal}}{\sqrt{2}}$

∴ Length of side of square = $\frac{2r}{\sqrt{2}} = \sqrt{2}r$

Area of square = side × side = x × x = $\sqrt{2}r \times \sqrt{2}r = 2r^2$

Area of circle = πr^2

Ratio of areas of circle and square = $\frac{\text{Area of circle}}{\text{Area of square}} = \frac{\pi r^2}{2r^2} = \frac{\pi}{2}$

Hence, the ratio of areas of circle and square is π:2.

Question: 18

Solution:

Given:

Circumference of circle = 8 cm

Central angle = 72°

∵ Circumference of a circle = $2\pi r$

∴ $2\pi r = 8$

$2 \times \frac{22}{7} \times r = 8$

$r = 8 \times \frac{7}{22} \times \frac{1}{2}$

$r = \frac{14}{11}$ cm

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

$= \frac{72}{360} \times \pi \times \frac{14}{11} \times \frac{14}{11}$

= 1.02 cm^2

Question: 19

Solution:

Given:

Angle made by the pendulum = 30°

Length of the arc made by the pendulum = 8.8 cm

Then the length of the pendulum is equal to the radius of the sector made by the pendulum.

Let the length of the pendulum be 'r'.

∵ Length of arc = $\frac{\theta}{360} \times 2\pi r$

∴ We have,

$\frac{\theta}{360} \times 2\pi r = 8.8$

$\frac{30}{360} \times 2 \times 3.14 \times r = 8.8$

$r = 8.8 \times \frac{360}{30} \times \frac{1}{2} \times \frac{1}{3.14}$

r = 16.8 cm

Hence, the length of the pendulum is 16.8 cm.

Question: 20

Solution:

Given:

Length of minute hand = 15 cm

Here, the length of the minute hand is equal to the radius of the sector formed by the minute hand.

Angle made by the minute hand in 1 minute = $\frac{360}{60}$ = 6°

Angle made by the minute hand in 20 minutes = 20 × 6 = 120°

Here, the area swept by the minute hand is equal to the area of the corresponding

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

$= \frac{120}{360} \times 3.14 \times 15 \times 15 = 235.5\ cm^2$

Hence, the area swept by it in 20 minutes is $235.5\ cm^2$.

Question: 21

Solution:

Given:

Angle of the sector = 56°

Area of the sector = $17.6\ cm^2$

Let the radius of the circle be 'r'.

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

$\therefore 17.6 = \frac{56}{360} \times \frac{22}{7} \times r^2$

$r^2 = \frac{360}{56} \times \frac{7}{22} \times 17.6$

$r^2 = 36$

$r = \sqrt{36}$

r = 6 cm

Hence, the radius of the circle is 6 cm.

Question: 22

Solution:

Given:

Radius of the circle = 10.5 cm

Area of the sector = $69.3\ cm^2$

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

$\therefore 69.3 = \frac{\theta}{360} \times \frac{22}{7} \times 10.5 \times 10.5$

$\theta = 69.3 \times 360 \times \frac{7}{22} \times \frac{1}{10.5} \times \frac{1}{10.5}$

$\theta = 72°$

Hence, the central angle is 72°.

Question: 23

Solution:

Given:

Radius of circle = 6.5 cm

Perimeter of sector = 31 cm

Now, Perimeter of sector = 2 × radius + Length of arc

$\because$ Length of arc = $\frac{\theta}{360} \times 2r \times 2\pi r$

$\therefore$ Perimeter of sector = $2 \times r + \frac{\theta}{360} \times 2r \times \pi$

$= 2r \times [1 + \frac{\theta}{360} \times \pi]$

$31 = 2 \times 6.5 \times [1 + \frac{\theta}{360} \times \frac{22}{7}]$

$31 = 13 \times [1 + \frac{\theta}{360} \times \frac{22}{7}]$

$\frac{31}{13} = 1 + \frac{\theta}{360} \times \frac{22}{7}$

$\frac{31}{13} - 1 = \frac{\theta}{360} \times \frac{22}{7}$

$\frac{18}{13} = \frac{\theta}{360} \times \frac{22}{7}$

$\theta = \frac{18}{13} \times 360 \times \frac{7}{22}$ .... (i)

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

$\therefore$ using (i), we have

Area = $\frac{18}{13} \times 360 \times \frac{7}{22} \times \frac{1}{360} \times \frac{22}{7} \times 6.5 \times 6.5$

$= 18 \times 3.25 = 58.5$ cm²

<u>Hence, the area of the sector is 58.5 cm².</u>

Question: 24

Solution:

Given:

Radius of circle = 17.5 cm

Length of arc = 44 cm

$\because$ Length of arc = $\frac{\theta}{360} \times 2\pi r$

$\therefore$ $44 = \frac{\theta}{360} \times 2 \times \frac{22}{7} \times 17.5$

$\theta = 44 \times 360 \times \frac{1}{2} \times \frac{7}{22} \times \frac{10}{17.5}$

$\theta = \frac{2520}{17.5} = 144^\circ$

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

$= \frac{144}{360} \times \frac{22}{7} \times 17.5 \times 17.5 = 385$ cm²

<u>Hence, the area of the sector is 385 cm².</u>

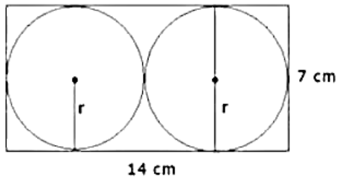
Question: 25

Solution:

Given:

Length of the rectangular cardboard = 14 cm

Breadth of the rectangular cardboard = 7 cm



∵ Area of rectangle = length × breadth

∴ Area of cardboard = 14 × 7 = 98 cm^2

Let the two circles with equal radii and maximum area have a radius of 'r' cm each.

Then, 2r = 7

$r = \frac{7}{2}$ cm

∵ Area of circle = πr^2

∴ Area of two circular cut outs = $2 \times \pi r^2$

$= 2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$

= 11 × 7 = 77 cm^2

Thus, the area of remaining cardboard = 98 – 77 = 21 cm^2

Hence, the area of remaining cardboard is 21 cm^2.

Question: 26

Solution:

Given:

Side of the square = 4 cm

Radius of the quadrants at the corners = 1 cm

Radius of the circle in the centre = 1 cm

∵ 4 quadrants = 1 circle

∴ There are 2 circles of radius 1 cm

Area of square = side × side

= 4 × 4 = 16 cm^2

Area of 2 circles = $2 \times \pi r^2$

$= 2 \times \frac{22}{7} \times 1 \times 1 = \frac{44}{7}$ cm^2

∵ Area of shaded region = Area of square – Area of 2 circles

$= 16 - \frac{44}{7}$

$= \frac{112-44}{7} = \frac{68}{7}$ cm^2 = 9.7 cm^2

Hence, the area of shaded region is 9.72 cm^2.

Question: 27

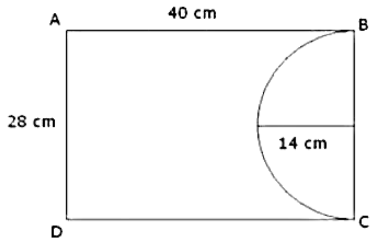
Solution:

Given:

Length of rectangular sheet of paper = 40 cm

Breadth of rectangular sheet of paper = 28 cm

Radius of the semicircular cut out = 14 cm



∵ Area of rectangle = length × breadth

∴ Area of rectangular sheet of paper = 40 × 28

= 1120 cm^2

∵ Area of semicircle = $\frac{1}{2}\pi r^2$

∴ Area of semicircular cut out = $\frac{1}{2} \times \frac{22}{7} \times 14 \times 14$

= 22 × 14 = 308 cm^2

Thus, the area of remaining sheet of paper = Area of rectangular sheet of paper – Area of semicircular cut out

= 1120 – 308 = 812 cm^2

Hence, the area of remaining sheet of paper is 812 cm^2.

Question: 28

Solution:

Given:

Side of square = 7 cm

Radius of the quadrant = 7 cm

Area of square = side × side

= 7 × 7 = 49 cm^2

∵ Area of circle = πr^2

∴ Area of a quadrant = $\frac{1}{4}\pi r^2$

= $\frac{1}{4} \times \frac{22}{7} \times 7 \times 7$

= $\frac{77}{2}$ = 38.5 cm^2

Thus, the area of shaded region = Area of square – Area of quadrant

= 49 – 38.5 = 10.5 cm^2

Hence, the area of the shaded region is 10.5 cm^2.

Question: 29

Solution:

Given:

Radius of circle = 7 cm

Let the sectors with central angles 80°, 60° and 40° be S_1, S_2, and S_3 respectively.

Then, the area of shaded region = Area of S_1 + Area of S_2 + Area of S_3 .... (i)

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

$\therefore$ Area of S_1 = $\frac{80}{360} \times \frac{22}{7} \times 7 \times 7$

$= \frac{308}{9} cm^2$

Similarly, Area of S_2 = $\frac{60}{360} \times \frac{22}{7} \times 7 \times 7$

$= \frac{154}{6} cm^2$

and Area of S_3 = $\frac{60}{360} \times \frac{22}{7} \times 7 \times 7$

$= \frac{154}{9} cm^2$

Thus, using (i), we have

Area of shaded region = $\frac{308}{9} + \frac{154}{6} + \frac{154}{9}$

$= \frac{616 + 462 + 308}{18}$

$= \frac{1386}{18} = 77 \text{ cm}^2$

Hence, the area of shaded region is 77 cm².

Question: 30

Solution:

Given:

Radius of inner circle = 3.5 cm

Radius of outer circle = 7 cm

$\angle POQ = 30°$

Let the sector made by the arcs PQ and AB be S_1 and S_2 respectively.

Then, Area of shaded region = Area of S_1 – Area of S_2 .... (i)

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

$\therefore$ Area of S_1 = $\frac{30}{360} \times \frac{22}{7} \times 7 \times 7$

$= \frac{71}{6} cm^2$

Similarly, Area of S_2 = $\frac{30}{360} \times \frac{22}{7} \times 3.5 \times 3.5$

$= \frac{77}{24} cm^2$

Thus, using (i), we have

Area of shaded region = $\frac{77}{6} - \frac{77}{24}$

$= \frac{308-77}{24}$

$= \frac{231}{24} = \frac{77}{8} cm^2$

Hence, the area of shaded region is $\frac{77}{8}$ cm².

Question: 31

Solution:

Given:

Side of square = 14 cm

Diameter of each semicircle = 14 cm

Radius of each semicircle = $\frac{14}{2}$ = 7 cm

∵ Both the semicircles have same radius.

∴ We consider one circle of radius 7 cm.

Area of shaded region = Area of square – Area of circle .... (i)

Area of square = side × side

= 14 × 14 = 196 cm²

Area of circle = πr^2

= $\frac{22}{7}$ × 7 × 7 = 22 × 7 = 154 cm²

Thus, using (i), we have

Area of shaded region = 196 – 154 = 42 cm²

Hence, the area of shaded region is 42 cm².

Question: 32

Solution:

Give:

Radius of the circle = 42 cm

Central angle of the sector = ∠AOB = 90°

Perimeter of the top of the table = Length of the major arc AB + 2 × radius.......................... (i)

Length of major arc AB = $\frac{(360-\theta)}{360} \times 2\pi r$

= $\frac{(360-90)}{360} \times 2 \times \frac{22}{7} \times 42$

= $\frac{270}{360} \times 2 \times 22 \times 6$

= $\frac{3}{4} \times 264 = 3 \times 66 = 198$ cm

Thus, using (i), we have

Perimeter of the top of the table = 198 + 2 × 42

= 198 + 84 = 282 cm

Hence, the perimeter of the top of the table is 282 cm.

Question: 33

Solution:

Given:

Side of square = 7 cm

Radius of each quadrant = 7 cm

Area of square = side × side = 7 × 7 = 49 cm^2

∵ Area of quadrant = $\frac{1}{4}\pi r^2$

∴ Area of 2 quadrants = 2 × $\frac{1}{4}$ × πr^2

= $\frac{1}{2} \times \frac{22}{7} \times 7 \times 7$

= 77 cm^2

Area of shaded region = Area of 2 quadrants – Area of square

= 77 – 49 = 28 cm^2

Hence, the area of shaded region is 28 cm^2.

Question: 34

Solution:

Given:

Radius of Circle = 3.5 cm

OD = 2 cm

∵ Area of Quadrant = $\frac{1}{4}\pi r^2$

∴ Area of Quadrant OABC = $\frac{1}{4} \times \frac{22}{7} \times 3.5 \times 3.5$

= 9.625 cm^2

∵ Area of Triangle = $\frac{1}{2}$ × Base × Height

∴ Area of Δ COD = $\frac{1}{2}$ × 3.5 × 2

= 3.5 cm^2

Area of Shaded Region = Area of Quadrant OABC – Area of Δ COD

= 38.5 – 3.5 = 35 cm^2

Hence, the area of shaded region is 35 cm^2.

Question: 35

Solution:

Given:

Side of square = 14 cm

Diameter of semi circle = 14 cm

⇒ Radius of semi circle = $\frac{14}{2}$ = 7 cm

∵ There are 2 semi circles of same radius.

∴ We consider it as one circle with radius 7 cm.

So,

Perimeter of 2 semicircles = Perimeter of circle = $2\pi r$

$= 2 \times \frac{22}{7} \times 7$

$= 2 \times 22 = 44$ cm

Perimeter of shaded region = Perimeter of 2 semicircles + 2 × Side of Square = 44 + 2 × 14 = 44 + 28 = 72 cm

Hence, the area of the shaded region is 72 cm.

Question: 36

Solution:

Given:

Radius of the circle = 7 cm

Diameter of the circle = 14 cm

Here, diagonal of square = 14 cm

∵ Side of a square = $\frac{\text{diagonal}}{\sqrt{2}}$

⇒ Side = $\frac{14}{\sqrt{2}} = 7\sqrt{2}$ cm

⇒ Area of square = side × side

$= 7\sqrt{2} \times 7\sqrt{2}$

$= 49 \times 2 = 98$ cm^2

Area of circle = πr^2

$= \frac{22}{7} \times 7 \times 7 = 22 \times 7 = 154$ cm^2

Thus, the area of the circle outside the square

= Area of circle – Area of square = 154 – 98 = 56 cm^2

Hence, the area of the required region is 56 cm^2.

Question: 37

Solution:

(i) Given:

Diameter of semicircles APB and CQD = 7 cm

⇒ Radius of semicircles APB and CQD = $\frac{7}{2}$ cm = r_1

Diameter of semicircles ARC and BSD = 14 cm

⇒ Radius of semicircles ARC and BSD = $\frac{14}{2}$ cm = 7 cm = r_2

Perimeter of APB = Perimeter of CQD

Area of APB = Area of CQD.................(i)

Perimeter of ARC = Perimeter of BSD

Area of ARC = Area of BSD .... (ii)

∵ Perimeter of semicircle = πr ....(iii)

∴ Perimeter of APB = πr_1

$= \frac{22}{7} \times \frac{7}{2} = 11$ cm

Then, using (i), we have

Perimeter of CQD = 11 cm

Now, using (iii), we have

Perimeter of ARC = πr_2

$= \frac{22}{7} \times 7 = 22$ cm

Then, using (ii), we have

Perimeter of BSD = 22 cm

Perimeter of shaded region

= (Perimeter of ARC + Perimeter of APB) + (Perimeter of BSD + Perimeter of CQD)

= (22 + 11) + (22 + 11) = 33 + 33 = 66 cm

Hence, the perimeter of the shaded region is 66 cm.

(ii) Now,

∵ Area of semicircle $= \frac{1}{2} \pi r^2$ ……………… (iv)

∴ Area of APB $= \frac{1}{2} \pi {r_1}^2$

$= \frac{1}{2} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = \frac{77}{4}$ cm²

Then, using (i), we have

Area of CQD $= \frac{77}{4}$ cm²

Now, using (iv), we have

Area of ARC $= \frac{1}{2} \pi {r_2}^2$

$= \frac{1}{2} \times \frac{22}{7} \times 7 \times 7 = 11 \times 7 = 77$ cm²

Then, by using (ii), we have

Area of BSD = 77 cm²

Area of shaded region

= (Area of ARC-Area of APB) + (Area of BSD- Area of CQD)

$= (77 - \frac{77}{4}) + (77 - \frac{77}{4})$

$= (\frac{308-77}{4}) + (\frac{308-77}{4}) = \frac{231}{4} + \frac{231}{4} = \frac{462}{4} = 115.5$ cm²

Hence, the area of the shaded region is 115.5 cm².

Question: 38

Solution:

Given:

Diameter of semicircle PSR = 10 cm

⇒ Radius of semicircle PSR $= \frac{10}{2} = 5$ cm $= r_1$

Diameter of semicircle RTQ = 3 cm

⇒ Radius of semicircle RTQ = $\frac{3}{2}$ = 1.5 cm = r_2

Diameter of semicircle PAQ = 7 cm

⇒ Radius of semicircle PAQ = $\frac{7}{2}$ = 3.5 cm = r_3

∵ Perimeter of semicircle = πr

∴ Perimeter of semicircle PSR = πr_1

= 3.14 × 5 = 15.7 cm

Similarly, Perimeter of semicircle RTQ = πr_2

= 3.14 × 1.5 = 4.71 cm

and Perimeter of semicircle PAQ = πr_3

= 3.14 × 3.5 = 10.99 cm

Perimeter of shaded region = Perimeter of semicircle PSR

+ Perimeter of semicircle RTQ

+ Perimeter of semicircle PAQ

= 15.7 + 4.71 + 10.99 = 31.4 cm

Hence, the perimeter of the shaded region is 31.4 cm.

Question: 39

Solution:

Given:

OA = Side of square OABC = 20 cm

∵ Area of square = Side × Side

∴ Area of square OABC = 20 × 20 = 400 cm^2

Now,

∵ Length of diagonal of square = $\sqrt{2}$ × Side of Square

∴ Length of diagonal of square OABC = $\sqrt{2}$ × 20 = $20\sqrt{2}$ cm

⇒ Radius of the quadrant = $20\sqrt{2}$ cm

∵ Area of quadrant = $\frac{1}{4}\pi r^2$

∴ Area of quadrant OPBQ = $\frac{1}{4}$ × 3.14 × $20\sqrt{2}$ × $20\sqrt{2}$

= $\frac{3.14}{4}$ × 400 × 2

= 3.14 × 200 = 628 cm^2

Area of shaded region = Area of quadrant OPBQ – Area of square OABC = 628 – 400 = 228 cm^2

Hence, the area of the shaded region is 228 cm^2.

Question: 40

Solution:

Given:

AO = OB

Perimeter of the figure = 40 cm .... (i)

Let the diameters of semicircles AQO and APB be 'x_1' and 'x_2' respectively.

Then, using (1), we have

AO = OB

Also, AB = AO + OB = AO + AO = 2AO

$\Rightarrow x_2 = 2x_1$

So, diameter of APB = $2x_1$

and diameter of AQO = x_1

Radius of APB = x_1

and Radius of AQO = $\frac{x_1}{2}$ .... (ii)

Perimeter of shaded region = perimeter of AQO + perimeter APB + diameter of APB .... (iii)

$\because$ Perimeter of semicircle = πr

$\therefore$ Perimeter of semicircle AQO = $\frac{22}{7} \times \frac{x_1}{2} = \frac{11x_1}{7}$ cm

Perimeter of semicircle APB = $\frac{22}{7} \times x_1 = \frac{22x_1}{7}$ cm

Now, using (iii), we have

$40 = \frac{11x_1}{7} + \frac{22x_1}{7} + x_1$

$40 = \frac{11x_1 + 22x_1 + 7x_1}{7}$

$40 \times 7 = 40x_1$

$280 = 40x_1$

$x_1 = \frac{280}{40} = 7$ cm

$\therefore$ using (ii), we have

Radius of APB = 7 cm = r_1

And Radius of AQO = $\frac{7}{2}$ cm = 3.5 cm = r_2

Now,

$\because$ Area of semicircle = $\frac{1}{2}\pi r^2$

$\therefore$ Area of semicircle APB = $\frac{1}{2}\pi {r_1}^2$

$= \frac{1}{2} \times \frac{22}{7} \times 7 \times 7 = 11 \times 7 = 77$ cm²

Similarly,

Area of semicircle APB = $\frac{1}{2}\pi {r_2}^2$

$= \frac{1}{2} \times \frac{22}{7} \times 3.5 \times 3.5 = 19.25$ cm²

Thus, Area of shaded region = Area of APB + Area of AQO

= 77 + 19.25 = 96.25 cm²

Hence, the area of the shaded region is 96.25 cm².

Question: 41

Solution:

Given:

Circumference of circle = 44 cm

Let the radius of the circle be 'r' cm

∵ Circumference of circle = 2πr

∴ 44 = 2πr

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

$r = 22 \times \frac{7}{22} = 7$ cm

Now, Area of quadrant = $\frac{1}{4} \times \pi r^2$

$= \frac{1}{4} \times \frac{22}{7} \times 7 \times 7$

$= \frac{11 \times 7}{2} = \frac{22}{7} = 38.5$ cm²

<u>Hence, the area of the quadrant is 38.5 cm².</u>

Question: 42

Solution:

Given:

Side of square = 14 cm

Let the radius of each circle be 'r' cm

Then, 2r + 2r = 14 cm

4r = 14 cm

$r = \frac{14}{4} = \frac{7}{2}$

Area of square = side × side = 14 × 14 = 196 cm²

∵ Area of circle = πr^2

∴ Area of 4 circles = $4 \times \pi r^2$

$= 4 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$

= 22 × 7 = 154 cm²

Area of shaded region = Area of the square – Area of 4 circles

= 196 - 154

= 42 cm²

<u>Hence, the area of the shaded region is 42 cm².</u>

Question: 43

Solution:

Given:

Length of rectangle = 8 cm

Breadth of rectangle = 6 cm

Area of rectangle = length × breadth

$= 8 \times 6 = 48\ cm^2$

Consider Δ ABC,

By Pythagoras theorem,

$AC^2 = AB^2 + BC^2$

$= 8^2 + 6^2 = 64 + 36 = 100$

$AC = \sqrt{100} = 10$ cm

⇒ Diameter of circle = 10 cm

Thus, radius of circle $= \frac{10}{2} = 5$ cm

Let the radius of circle be r = 5 cm

Then, Area of circle $= \pi r^2$

$= \frac{22}{7} \times 5 \times 5 = \frac{22 \times 25}{7} = \frac{550}{7} = 78.57\ cm^2$

Area of shaded region = Area of circle – Area of rectangle

= 78.57 - 48

$= 30.57\ cm^2$

Hence, the area of shaded region is $30.57\ cm^2$.

Question: 44

Solution:

Given:

Perimeter of square = Circumference of circle...................... (i)

Area of Square $= 484 m^2$

Let the side of square be 'x' cm.

∵ Area of Square = side × side

∴ 484 = x × x

$x^2 = 484$

$x = \sqrt{484} = 22$cm

∵ Perimeter of square = 4 × side

= 4 × 22 = 88 cm

∴ Using (i), we have

Circumference of circle = 88 cm

Also, Circumference of Circle $= 2\pi r$

$2\pi r = 88$

$2 \times \frac{22}{7} \times r = 88$

$r = 88 \times \frac{1}{2} \times \frac{7}{22}$

r = 2 × 7 = 14 cm

Area of Circle = $\pi r^2 = \frac{22}{7} \times 14 \times 14$

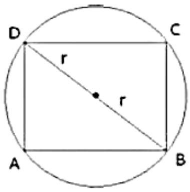
$= 22 \times 2 \times 14 = 616\ cm^2$

Hence, the area of Circle is $616\ cm^2$.

Question: 45

Solution:

Given: Radius of circle = r



Diagonal of Square = 2r

∵ Side of Square = $\frac{\text{length of diagonal}}{\sqrt{2}}$

∴ Side = $\frac{2r}{\sqrt{2}} = \sqrt{2}r$

Area of Square = Side × Side

$= \sqrt{2}r \times \sqrt{2}r$

$= 2r^2$

Hence, the area of square is '$2r^2$' square units.

Question: 46

Solution:

Given:

Rate of fencing a circular field = Rs. 25/m

Cost of fencing a circular field = Rs. 5500

Rate of ploughing the field = $50p/m^2$ = Rs. $0.5/m^2$

Let the radius of circular field be 'r' and the length of the field fenced be 'x' m.

Then, 25 × x = 5500

$x = \frac{5500}{25} = 220$ m

∵ Circumference of circular field = $2\pi r$

∴ $220 = 2\pi r$

$220 = 2 \times \frac{22}{7} \times r$

$r = \frac{220 \times 7}{2 \times 22}$

r = 35 m

Area of the circular field = πr^2

$= \frac{22}{7} \times 35 \times 35$

$= 22 \times 5 \times 35$

$= 3850 m^2$

Now, cost of ploughing the field = Rate of ploughing the field × Area of the field = 0.5 × 3850

= Rs. 1925

Hence, the cost of Ploughing the field is Rs. 1925.

Question: 47

Solution:

Given:

Length of the rectangular park = 120 m

Breadth of the rectangular park = 90 m

Area of the park excluding the circular lawn = $2950 m^2$

Area of the rectangular park = length × breadth

= 120 × 90

$= 10800 m^2$

Area of circular lawn = Area of rectangular park – Area of park excluding the lawn

= 10800 – 2950

$= 7850 m^2$

∵ Area of circle = πr^2

∴ $7850 = 3.14 \times r^2$

$r^2 = \frac{7850}{3.14} = 2500$

$r = \sqrt{2500} = 50$ m

Hence, the radius of the circular lawn is 50m.

Question: 48

Solution:

Given:

$OP = 21 \text{ m} = r_1$

$OR = 14 \text{ m} = r_2$

Let the quadrants made by outer and inner circles be Q_1 and Q_2, with radius r_1 and r_2 respectively.

Then, Area of flower bed = Area of Q_1 – Area of Q_2

∵ Area of Quadrant = $\frac{1}{4}\pi r^2$

∴ Area of $Q_1 = \frac{1}{4}\pi r_1^2$

$= \frac{1}{4} \times \frac{22}{7} \times 21 \times 21$

$= \frac{693}{2} m^2$

Similarly, Area of $Q_2 = \frac{1}{4}\pi r_2^2$

$= \frac{1}{4} \times \frac{22}{7} \times 14 \times 14$

$= \frac{308}{2} m^2$

Thus, Area of flower bed = $\frac{693}{2} - \frac{308}{2}$

$= \frac{385}{2} = 192.5\ m^2$

Hence, the area of the flower bed is $192.5\ m^2$.

Question: 49

Solution:

Given:

AC = 54 cm

BC = 10 cm

⇒ AB = AC-BC = 54-10 = 44 cm

Radius of bigger circle = $\frac{AC}{2} = \frac{54}{2} = 27\ cm = r_1$

Radius of Smaller circle = $\frac{AB}{2} = \frac{44}{2} = 22\ cm = r_2$

∵ Area of Circle = πr^2

∴ Area of Bigger Circle = πr_1^2

$= \frac{22}{7} \times 27 \times 27$

$= \frac{16038}{7} cm^2$

Similarly, Area of Smaller Circle = πr_2^2

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

$= \frac{10648}{7} cm^2$

Area of shaded region = Area of Bigger Circle – Area of Smaller Circle = $\frac{16038}{7} - \frac{10648}{7} = \frac{5390}{7} = 770\ cm^2$

Hence, Area of Shaded Region is $770\ cm^2$.

Question: 50

Solution:

Given:

AB ∥ CD

∠BCD = 90°

AB = BC = 3.5 cm = EC

DE = 2 cm

DC = DE + EC = 2 + 3.5 = 5.5 cm

Area of Trapezium = $\frac{1}{2} \times$ Sum of Parallel Sides × h

$= \frac{1}{2} \times (AB + DC) \times BC$

$= \frac{1}{2} \times (3.5 + 5.5) \times 3.5$

$= \frac{1}{2} \times 9 \times 3.5$

$= 15.75\ cm^2$

Area of Quadrant BFEC $= \frac{1}{4} \times \pi r^2 = \frac{1}{4} \times \frac{22}{7} \times 3.5 \times 3.5$

$= 9.625\ cm^2$

Thus, Area of remaining part of metal sheet

= Area of Trapezium – Area of Quadrant BFEC

$= 15.75 - 9.625 = 6.125\ cm^2$

Hence, the area of the remaining part of metal sheet is $6.125\ cm^2$.

Question: 51

Solution:

Given:

Radius of Circle = 35 cm

$\angle AOB = 90°$

$\because$ Area of Sector $= \frac{\theta}{360°} \times \pi r^2$

$= \frac{90}{360} \times \frac{22}{7} \times 35 \times 35$

$= \frac{1925}{2} cm^2$

$\because$ Δ AOB is right-angled triangle.

$\therefore$ Area of Δ AOB $= \frac{1}{2} \times OA \times OB$

$= \frac{1}{2} \times 35 \times 35$

$= \frac{1225}{2} cm^2$

Now, Area of Minor Segment ACB

= Area of Sector – Area of ΔAOB

$= \frac{1925}{2} - \frac{1225}{2} = \frac{700}{2} = 350\ cm^2$

Area of Circle $= \pi r^2$

$= \frac{22}{7} \times 35 \times 35$

$= 22 \times 5 \times 35$

$= 3850\ cm^2$

Thus, Area of Major Segment = Area of Circle – Area of Minor Segment = 3850 – 350 = 3500 cm^2

Hence, the area of the major segment is 3500 cm^2.

Exercise : 18B

Question: 1
Solution:

In order to solve such type of questions we basically need to find the radius of the give circle and simply use it to find the area of the given circle.

Given the circumference or perimeter of the circle = 39.6 cm.

And we know, Perimeter or circumference of circle = $2\pi r$

Where, r = Radius of the circle

Therefore, $2\pi r = 39.6$

$$\Rightarrow r = \frac{39.6}{2\pi}$$

(put value of $\pi = 22/7$)

$$\Rightarrow r = \frac{39.6}{2 \times \frac{22}{7}}$$

On rearranging we get,

$$\Rightarrow r = \frac{39.6 \times 7}{2 \times 22}$$

$$\Rightarrow r = \frac{277.2}{44}$$

$\Rightarrow$ r = 6.3 cm

So, the radius of the circle = 6.3 cm

And we also know, Area of the circle = πr^2

Where, r = radius of the circle

$\Rightarrow$ Area of the circle = $\pi(6.3)^2$

(putting value of r)

$$= \frac{22}{7}(6.3^2)$$

$$= \frac{22}{7}(6.3 \times 6.3)$$

$$= \frac{22}{7} \times 39.69$$

= 22×5.67

= 124.74 cm^2

The area of the circle = 124.74 cm^2.

Question: 2

Given the area of the circle = 98.56 cm^2

And we also know, Area of the circle = πr^2

Therefore, $\pi r^2 = 98.56$

$$\Rightarrow r^2 = \frac{98.56}{\pi}$$

(put value of $\pi = 22/7$)

$\Rightarrow r^2 = \frac{98.56}{\frac{22}{7}}$

On rearranging we get,

$\Rightarrow r^2 = \frac{98.56 \times 7}{22}$

$\Rightarrow r^2 = \frac{689.92}{22}$

$\Rightarrow r^2 = 31.36$

$\Rightarrow r = \sqrt{31.36}$

$\Rightarrow$ r = 5.6 cm

So, the radius of the circle = 5.6 cm

And we know, Perimeter of circle = $2\pi r$

(put value of r)

$\Rightarrow$ Circumference or Perimeter of circle = $2\pi(5.6)$

$= 2 \times \frac{22}{7} \times 5.6$ (put $\pi = \frac{22}{7}$)

$= \frac{2 \times 22 \times 5.6}{7}$

$= \frac{246.4}{7}$

= 35.2 cm

The circumference or perimeter of the circle is 35.2 cm

Question: 3

Given, the circumference of a circle exceeds its diameter by 45 cm.

$\Rightarrow$ Circumference of circle = Diameter of circle + 45

Let 'd' = diameter of the circle

$\Rightarrow$ Circumference = d + 45 $\rightarrow$ eqn1

And we know, Circumference of a circle = $2\pi r \rightarrow$ eqn2

Where r = radius of circle

Also, we know that the radius of the circle is half of its diameter.

$\Rightarrow r = \frac{d}{2} \rightarrow$ eqn3

Put value of circumference in equation 1 from equation 2

$\Rightarrow 2\pi r = d + 45 \rightarrow$ eqn4

Put value of r in equation 4 from equation 3

$\Rightarrow 2\pi\left(\frac{d}{2}\right) = d + 45$

$\Rightarrow \pi d = d + 45$

$\Rightarrow \pi d - d = 45$

$\Rightarrow (\pi - 1)d = 45$ (taking d common from L.H.S)

$\Rightarrow d = \frac{45}{\pi - 1}$ (now put $\pi = \frac{22}{7}$)

$$\Rightarrow d = \frac{45}{\frac{22}{7} - 1}$$

$$\Rightarrow d = \frac{45}{\frac{22-7}{7}}$$ (taking 7 as LCM in denominator)

$$\Rightarrow d = \frac{45}{\frac{15}{7}}$$

On rearranging, we get

$$\Rightarrow d = \frac{45 \times 7}{15}$$

$$\Rightarrow d = \frac{315}{15}$$

$\Rightarrow d = 21$ cm

Therefore, the diameter of the circle is 21 cm.

Thus, the radius of the circle $r = \frac{d}{2}$ (from equation 3)

$$\therefore r = \frac{21}{2}$$

$\Rightarrow r = 10.5$ cm

Now put the value of r in equation 2, we get

$\Rightarrow$ Circumference or Perimeter of circle $= 2\pi(10.5)$ (put $\pi = \frac{22}{7}$)

$$= 2 \times \frac{22}{7} \times 10.5$$

$$= \frac{2 \times 22 \times 10.5}{7}$$

$$= \frac{462}{7}$$

= 66 cm

The circumference of the circle is 66 cm.

Question: 4

Let the square be of side 'a' cm and radius of the circle be 'r'

Given the area enclosed by the square = 484 cm^2

Also, we know that Area of square = Side × Side

Area of the square = a^2

$\Rightarrow a^2 = 484$

$\Longrightarrow a = \sqrt{484}$

$\Rightarrow a = 22$ cm

Therefore, side of square, 'a' is 22 cm.

Also, circumference of the circle = Perimeter of square → eqn1

Perimeter of square = 4 × side

Perimeter of square = 4×22

⇒ Perimeter of square = 88 cm → eqn2

Also, we know, Circumference of circle = 2πr → eqn3

Put values in equation 1 from equation 2 & 3, we get

$2\pi r = 88$

$\Longrightarrow r = \frac{88}{2\pi}$ (put $\pi = \frac{22}{7}$)

$\Longrightarrow r = \frac{88}{2 \times \frac{22}{7}}$

On rearranging,

$\Longrightarrow r = \frac{88 \times 7}{2 \times 22}$

$\Longrightarrow r = \frac{616}{44}$

$\Rightarrow r = 14$ cm

So, the radius 'r' of the circle is 14 cm.

Area of circle = πr^2

Where r = radius of the circle

$= \pi(14^2)$

$= \frac{22}{7} \times 14 \times 14$ (put $\pi = \frac{22}{7}$)

$= \frac{22 \times 14 \times 14}{7}$

= 4312/7

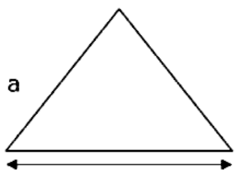
= 616 cm^2

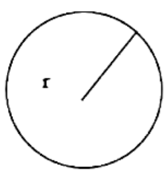
Area of the circle is 616 cm^2.

Question: 5

Solution:

In this question the wire is first bent in the shape of equilateral triangle and then same wire is bent to form a circle. The point to be noticed is that the same wire is used both the times which implies that the **perimeter of equilateral triangle and that of circle will be equal.**





Let the equilateral triangle be of side ‘a’ cm and radius of the circle be ‘r’.

Given: Area enclosed by equilateral triangle = $123\sqrt{3}$ cm²

Also, we know that Area of equilateral triangle $= \frac{\sqrt{3}}{4}a^2$

Where ‘a’ = side of equilateral triangle

$$\Rightarrow \frac{\sqrt{3}}{4}a^2 = 121\sqrt{3}$$

$$\Rightarrow a^2 = \frac{121\sqrt{3}}{\frac{\sqrt{3}}{4}}$$

$$\Rightarrow a^2 = \frac{121\sqrt{3} \times 4}{\sqrt{3}}$$

$$\Rightarrow a^2 = \frac{484\sqrt{3}}{\sqrt{3}}$$

$\Rightarrow a = \sqrt{484}$

$\Rightarrow$ **a = 22 cm**

Therefore, side of equilateral triangle, ‘a’ is 22 cm.

Also, circumference of the circle = Perimeter of equilateral triangle → eqn1

Perimeter of equilateral triangle = 3 × side

= 3 × 22

= 66 cm → eqn2

Also, we know Circumference of circle = $2\pi r$ → eqn3

Put values in equation 1 from equation 2 & 3, we get

$2\pi r = 66$

$$\Rightarrow r = \frac{66}{2\pi}$$

(put $\pi = 22/7$)

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

On rearranging,

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

$$\Rightarrow r = \frac{462}{44}$$

$\Rightarrow$ **r = 10.5 cm**

So, the radius ‘r’ of the circle is 10.5 cm.

Area of circle = πr^2

Where r = radius of the circle

$\Rightarrow$ Area of circle = $\pi(10.5^2)$

$$\Rightarrow \text{Area of circle} = \frac{22}{7} \times 10.5 \times 10.5 \ (\text{put } \pi = \frac{22}{7})$$

$= \frac{22 \times 10.5 \times 10.5}{7}$

$= \frac{2425.5}{7}$

= 346.5 cm²

Area of the circle is 346.5 cm².

Question: 6

Length of chain = 108 m

Length of chain = Perimeter or circumference of semicircle

Therefore, Circumference or Perimeter of semicircle = 108 m

Also, Circumference or Perimeter of semicircle = πr

Where r = radius of semicircle

⇒ πr = 108

$\Rightarrow r = \frac{108}{\pi}$

(put π = 22/7)

$\Rightarrow r = \frac{108}{\frac{22}{7}}$

On rearranging,

$\Rightarrow r = \frac{108 \times 7}{22}$

$\Rightarrow r = \frac{756}{22}$

⇒ r = 34.46 m

Therefore, radius of semicircle is 34.36 m

As, Area of semicircle $= \frac{\pi r^2}{2} \rightarrow$ eqn1

Put value of 'r' in equation 1, we get

Area of semicircle $= \frac{\pi(34.36^2)}{2}$

(put π = 22/7)

$= \frac{\frac{22}{7} \times 34.36 \times 34.36}{2}$

On rearranging,

$= \frac{22 \times 34.3636 \times 34.3636}{7 \times 2}$

$= \frac{25973.4112}{14}$

= 1855.63 m²

The area of the semicircular park is 1855.63 m².

Question: 7

Given Sum of the radius of the circles = 7 cm

the difference of their circumference = 8 cm

Let the radius one circle be 'r_1' cm and other be 'r_2' cm and circumference be 'C_1' and 'C_2' respectively.

Also, circumference of circle = $2\pi r$

Where r = radius of the circle

$C_1 = 2\pi r_1$ and $C_2 = 2\pi r_2$

$r_1 + r_2 = 7 \rightarrow$ eqn1

$C_1 - C_2 = 8 \rightarrow$ eqn2

(Note: Her it is considered that $r_1 > r_2$)

We can rewrite equation 2 as,

$2\pi r_1 - 2\pi r_2 = 8$

$\Rightarrow 2\pi(r_1 - r_2) = 8$

(taking 2π common from L.H.S)

$$\Rightarrow r_1 - r_2 = \frac{8}{2\pi} \rightarrow \text{eqn3}$$

$$\Rightarrow r_1 - r_2 = \frac{8}{2 \times \frac{22}{7}}$$

$$\Rightarrow r_1 - r_2 = \frac{8 \times 7}{44}$$

$$\Rightarrow r_1 - r_2 = \frac{56}{44}$$

$$\Rightarrow r_1 - r_2 = \frac{14}{11}$$

$$\Rightarrow r_1 = \frac{14}{11} + r_2 \rightarrow \text{eqn3}$$

Put the value of r_1 from equation 3 in equation 1

$$\frac{14}{11} + r_2 + r_2 = 7$$

$$\Rightarrow \frac{14}{11} + 2r_2 = 7$$

$$\Rightarrow 2r_2 = 7 - \frac{14}{11}$$

$$\Rightarrow 2r_2 = \frac{77 - 14}{11}$$

(taking 11 as LCM on R.H.S)

$$\Rightarrow 2r_2 = \frac{63}{11}$$

$$\Rightarrow r_2 = \frac{63}{2 \times 11}$$

$$\Rightarrow r_2 = \frac{63}{22}\ \text{cm}$$

Put value of r_2 in equation 3

$\therefore r_1 = \frac{14}{11} + \frac{63}{22}$ (from equation 3)

$\Rightarrow r_1 = \frac{28+63}{22}$ (taking 22 as LCM on R.H.S)

$\Rightarrow r_1 = \frac{91}{22}$ cm

$\therefore C_1 = 2\pi\left(\frac{91}{22}\right)$

(by putting value of r_1)

$\Rightarrow C_1 = 2 \times \frac{22}{7} \times \frac{91}{22}$

$= \frac{2 \times 22 \times 91}{7 \times 22}$

$= \frac{2 \times 91}{7}$

= 182/7

= 26 cm

$C_2 = 2\pi\left(\frac{63}{22}\right)$ (by putting value of r_2)

$\Rightarrow C_1 = 2 \times \frac{22}{7} \times \frac{63}{22}$

$= \frac{2 \times 22 \times 63}{7 \times 22}$

$= \frac{2 \times 63}{7}$

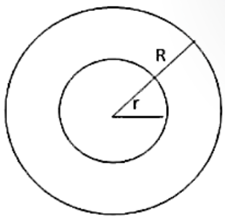
= 126/7

= 18 cm

The circumference of circles are 26 cm and 18 cm.

Question: 8

Consider the ring as shown in the figure below,



The inner radius of ring is 'r' and the outer radius is 'R'.

Area of inner Circle = πr^2 and Area of outer Circle = πR^2

Where r = 12 cm and R = 23 cm

Area of ring = Area of outer circle – Area of inner circle

Area o ring = $\pi R^2 - \pi r^2$ (put values of r & R)

$\Rightarrow$ Area of ring = $\pi(23^2) - \pi(12^2)$

$\Rightarrow$ Area of ring = $\pi(23^2 - 12^2)$ (taking π common from R.H.S)

$\Rightarrow$ Area of ring = $\pi(529 - 144)$

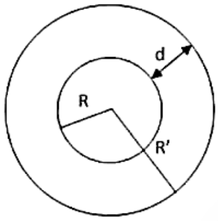
$= \frac{22 \times 385}{7}$

$= \frac{8470}{7}$

$= 1210\ cm^2$

Area of ring is $1210\ cm^2$.

Question: 9



Given radius of circular park = R = 17 m

Width of the circular path outside the park = d = 8 m

Therefore, the radius of the outer circle = R' = R + d

Outer radius = R' = 17 + 8

R' = 25 m

Area of inner circle = πR^2 and,

Area of outer circle = $\pi R'^2$

Area of path = Area of outer circle – Area of inner circle

$= \pi R'^2 - \pi R^2$ (put values of R' & R)

$= \pi(25^2) - \pi(17^2)$

$= \pi(25^2 - 17^2)$ (taking π common from R.H.S)

$= \pi(625 - 289)$

$\Longrightarrow$ Area of path $= \frac{22}{7} \times 336$

(put $\pi = 22/7$)

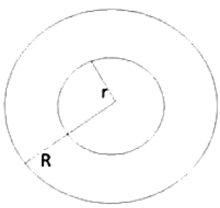
= 7392/7

$= 1056\ m^2$

The area of the path is $1056\ m^2$.

Question: 10

Consider the race track as shown below,



The inner and outer radius of track is 'r' cm and 'R' cm respectively.

Let inner and outer circumference be 'C_1' and C_2' respectively.

$C_1 = 352$ m and $C_2 = 396$ m.

We know,

Circumference of circle = $2\pi r$

Where r = radius of the circle

$C_1 = 2\pi r$ and $C_2 = 2\pi R$

$\Rightarrow 2\pi r = 352$ and $2\pi R = 396$

$$\Rightarrow r = \frac{352}{2\pi} \text{ and } R = \frac{396}{2\pi} \left(\text{put } \pi = \frac{22}{7}\right)$$

$$\Rightarrow r = \frac{352}{2 \times \frac{22}{7}} \text{ and } R = \frac{396}{2 \times \frac{22}{7}}$$

On rearranging,

$$\Rightarrow r = \frac{352 \times 7}{2 \times 22} \text{ and } R = \frac{396 \times 7}{2 \times 22}$$

$$\Rightarrow r = \frac{2464}{44} \text{ and } R = \frac{2772}{44}$$

$\Rightarrow$ r = 56 m and R = 63 m

So, the width of the race track = R – r,

$\Rightarrow$ Width of the race track = 63 – 56

$\Rightarrow$ Width of the race track = 7 m

Area of race track = area of outer circle – area of inner circle

$\Rightarrow$ Area of track = $\pi R^2 - \pi r^2$ (put values of r and R)

$\Rightarrow$ Area of track = $\pi(63^2) - \pi(56^2)$

$\Rightarrow$ Area of track = $\pi(63^2 - 56^2)$ (taking π common from R.H.S)

$\Rightarrow$ Area of track = $\pi(3969 - 3136)$

$\Rightarrow$ Area of track = $\pi \times 833$

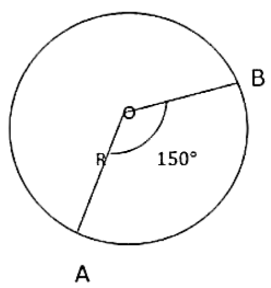
$$\Rightarrow \text{Area of track} = \frac{22}{7} \times 833 \left(\text{put } \pi = \frac{22}{7}\right)$$

= 22×119

= 2618 m^2

The width of tack is 7 m and area of track is 2618 m^2.

Question: 11



Consider the circle shown above,

Given radius of the circle = R = 21 cm → eqn1

And angle of the sector = θ = 150°→ eqn2

Length of arc of a sector $= \frac{\theta}{360} \times 2\pi R \rightarrow$ eqn3

Where 'R' = radius of sector (or circle)

θ = angle subtended by the arc on the centre of the circle

Put the values of R and θ from equation 1 and 2 in equation 3

$\Rightarrow$ Length of arc $= \frac{150}{360} \times 2\pi(21)$ (put $\pi = \frac{22}{7}$)

$= \frac{150}{360} \times 2 \times \frac{22}{7} \times 21$

$= \frac{150 \times 2 \times 22 \times 21}{360 \times 7}$

= 138600/2520

= 55 cm

Area of a sector $= \frac{\theta}{360} \times \pi R^2 \rightarrow$ eqn4

Where 'R' = radius of sector (or circle)

θ = angle subtended by the arc on the centre of the circle

Put the values of R and θ from equation 1 and 2 in equation 3

$\Rightarrow$ Area of sector $= \frac{150}{360} \times \pi(21^2)$ (put $\pi = \frac{22}{7}$)

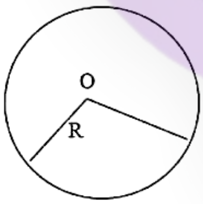
$= \frac{150 \times 22 \times 21 \times 21}{360 \times 7}$

= 1455300/2520

= 577.5 cm^2

The length of arc is 55 cm and area of sector is 577.5 cm^2.

Question: 12



Consider the circle shown above,

We know , Area of sector $= \frac{\theta}{360} \times \pi R^2 \rightarrow$ eqn1

Where R = radius of the circle and θ = central angle

Given R = 10.5 cm and Area of sector = 69.3 cm^2

Let the angle subtended at centre = θ

Put the values of R and area of sector in equation 1

$\Rightarrow 69.3 = \frac{\theta}{360} \times \pi(10.5^2)$ (put $\pi = \frac{22}{7}$)

$\Rightarrow 69.3 = \frac{\theta}{360} \times \frac{22}{7} \times 10.5 \times 10.5$

$\Rightarrow 69.3 = \frac{\theta \times 22 \times 10.5 \times 10.5}{360 \times 7}$

$\Rightarrow 69.3 = \frac{\theta \times 2425.5}{2520}$

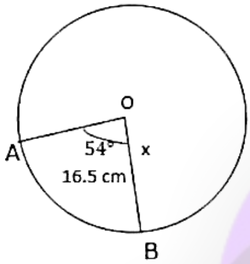
$\Rightarrow \frac{69.3 \times 2520}{2425.5} = \theta$

$\Rightarrow \frac{174636}{2425.5} = \theta$

$\Rightarrow \theta = 72^{\circ}$

The central angle of the sector is 72°.

Question: 13



Consider the Circle shown above,

We know, Length of arc of sector $= \frac{\theta}{360} \times 2\pi R \rightarrow$ eqn1

Where R = radius of circle and θ = central angle of the sector

Given, Length of arc = ℓ = 16.5 cm and θ = 54°. Let the radius be x cm

Put the values of ℓ and θ in equation 1

$\Rightarrow 16.5 = \frac{54}{360} \times 2\pi x$ (put $\pi = \frac{22}{7}$)

$\Rightarrow 16.5 = \frac{54 \times 2 \times 22 \times x}{360 \times 7}$

$\Rightarrow 16.5 = \frac{2376 \times x}{2520}$

On rearranging

$\Rightarrow \frac{16.5 \times 2520}{2376} = x$

$\Rightarrow \frac{41580}{2376} = x$

$\Rightarrow x = 17.5$ cm

Also, we know circumference of the circle = $2\pi R$

$\Rightarrow$ Circumference of the circle = $2\pi x$ (put value of x in this equation)

$\Rightarrow$ Circumference of the circle = $2\pi(17.5)$

$\Rightarrow$ Circumference of the circle $= 2 \times \frac{22}{7} \times 17.5$ (put $\pi = \frac{22}{7}$)

$= \frac{2 \times 22 \times 17.5}{7}$

$= \frac{770}{7}$

$\Rightarrow$ Circumference of the circle = 110 cm

Also, we know Area of the circle = πR^2

⇒ Area of the circle = πx^2

⇒ Are of the circle = $\pi(17.5^2)$

$$\Rightarrow \text{Area of the circle} = \frac{22}{7} \times 17.5 \times 17.5 \ (\text{put } \pi = \frac{22}{7})$$

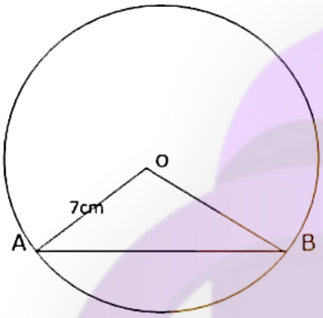
$$\Rightarrow \text{Area of the circle} = \frac{22 \times 17.5 \times 17.5}{7}$$

$$\Rightarrow \text{Area of the circle} = \frac{6737.5}{7}$$

⇒ Area of the circle = 962.5 cm^2

The radius of circle is 17.5 cm, circumference is 110 cm and area is 962.5 cm^2

Question: 14



Consider the above figure,

From here we can conclude that the portion or the segment below the chord AB is the minor segment and the segment above AB is major segment.

Also we know,

Area of minor segment = Area of sector – Area of ΔAOB → eqn1

Now, Area of sector $= \frac{\theta}{360} \times \pi R^2$ → eqn2

Where R = radius of the circle and θ = central angle of the sector

Given, R = 7 cm and θ = 90°

Putting these values in the equation 2, we get

$$\text{Area of sector} = \frac{90}{360} \times \pi(7^2) \ (\text{put } \pi = \frac{22}{7})$$

$$= \frac{90}{360} \times \frac{22}{7} \times 7 \times 7$$

$$= \frac{90 \times 22 \times 7 \times 7}{360 \times 7}$$

$$= \frac{97020}{2520}$$

⇒ Area of sector = 38.5 cm^2→ eqn3

Area of ΔAOB = 1/2 × base × height

$$\text{NOTE : In general Area of } \triangle \text{ AOB} = \frac{1}{2} \times OA \times OB \times \sin\theta$$

As triangle is isosceles therefore height and base both are 7 cm.

$$\Rightarrow \text{Area of } \triangle AOB = 1/2 \times 7 \times 7 = \frac{49}{2}$$

$= 24.5\ cm^2 \rightarrow$ eqn4

Putting values of equation 2 and 4 in equation 1 we get

Area of minor segment = 38.5 – 24.5

⇒ Area of minor segment = $14\ cm^2$

Area of major segment = πR^2 – Area of minor segment → eqn5

Put the value of R, and Area of minor segment in equation 5

$= \pi(7^2) - 14$

$= 49\pi - 14$

$\Rightarrow$ Area of major segment $= \frac{22}{7} \times 49 - 14$ (put $\pi = \frac{22}{7}$)

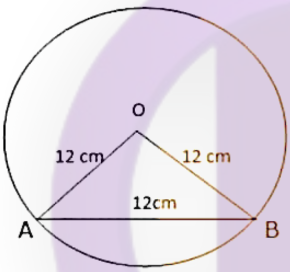
= (22×7) - 14

= 154 - 14

$= 140\ cm^2$

Area of minor segment is $14\ cm^2$ and of major segment is $140\ cm^2$.

Question: 15



Consider the figure shown above.

In this, the triangle AOB is an equilateral triangle as all the sides are equal; therefore, it is obvious that the central angle of the sector is 60 degrees. Now by simply applying the formula of length of an arc, we can easily calculate the length of arc of the sector AOB.

Given Radius of circle = R = 12 cm,

Length of chord AB = 12 cm

∴ Central angle = $\theta = 60°$ (∵ ΔAOB is an equilateral triangle)

Length of arc $= \frac{\theta}{360} \times 2\pi(R) \rightarrow$ eqn1

Where R = radius of the circle and θ = central angle of the sector

Put the values of R and θ in equation 1

$\Rightarrow$ Length of minor arc $= \frac{60}{360} \times 2\pi(12)$ (put $\pi = 3.14$)

$= \frac{60}{360} \times 2 \times 3.14 \times 12$

$= \frac{60 \times 2 \times 3.14 \times 12}{360}$

$= \frac{2 \times 3.14 \times 12}{6}$

= 2×3.14×2

= 12.56 cm

Now, Length of major arc = 2πR – Length of minor arc

⇒ Length of major arc = 2π(12) – 12.56 (put π = 3.14)

⇒ Length of major arc = (2×3.14×12) – 12.56

⇒ Length of major arc = 75.36 – 12.56

⇒ Length of major arc = 62.8 cm

Now, Area of minor segment = Area of sector – Area of triangle → eqn1

$\therefore$ Area pf sector $= \frac{\theta}{360} \times \pi R^2$ (put the values of R and θ)

$= \frac{60}{360} \times \pi(12^2)$

$= \frac{60}{360} \times 3.14 \times 144$

= 75.36 cm^2→ eqn2

Area of triangle $= \frac{\sqrt{3}}{4} \times a^2$ (put a = 12 cm)

$= \frac{\sqrt{3}}{4} \times (12^2)$

$\Longrightarrow$ Area of triangle $= \frac{\sqrt{3}}{4} \times 144$

⇒ Area of triangle = 1.73×36

⇒ Area of triangle = 62.28 cm^2→ eqn3

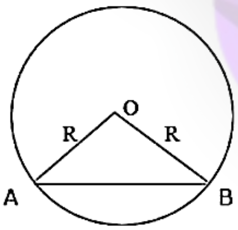
Put the values of equation 2 and 3 in equation 1,

∴ Area of minor segment = 75.36 – 62.28

= 13.08 cm^2

Length of major arc is 62.8 cm and of minor arc is 12.56 cm and area of minor segment is 13.08 cm^2.

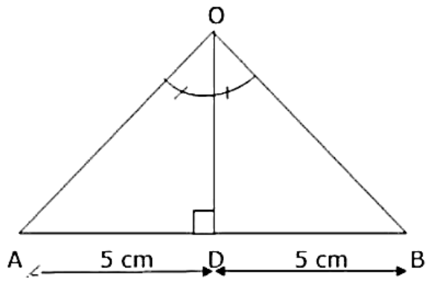
Question: 16



Consider the figure shown above.

In this, the triangle AOB is an isosceles triangle. So here we will construct a perpendicular bisector from O on AB and as this triangle is isosceles therefore this perpendicular will also act as median and angle bisector.

Therefore,



Draw a perpendicular bisector from O which meets AB at D and bisects AB, as ABO is an isosceles triangle therefore OD acts as a median.

So, consider right angle triangle AOD right angled at D

$\sin\theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}}$

Let ∠AOD = θ ⇒ Perpendicular = AD and Hypotenuse = AO = R

Given Radius of circle = R = $5\sqrt{2}$ cm

Length of chord AB = 10 cm, AD = 5 cm

$\sin\theta = \frac{AD}{AO}$ (put values of AD and AO)

$\Rightarrow \sin\theta = \frac{5}{5\sqrt{2}} = \frac{1}{\sqrt{2}}$

$\Rightarrow \sin\theta = \sin 45°$

(as $\sin 45° = \frac{1}{\sqrt{2}}$)

$\Rightarrow \theta = 45°$

$\therefore \angle AOD = 45°$

Thus we can say $\angle AOB = 90°$ (As $\angle AOD = \frac{1}{2}\angle AOB$)

Area of minor segment = Area of sector – Area of right angle triangle

→ eqn1

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

Where R = radius of the circle and θ = central angle of the sector

Area of sector $= \frac{90}{360} \times \pi\left(\left(5\sqrt{2}\right)^2\right)$ (put $\pi = 3.14$)

$= \frac{90}{360} \times 3.14 \times 50$

$= \frac{3.14 \times 50}{4}$

∴ Area of sector = 39.25 cm^2

Area of right angle triangle = 1/2 × base × height

As this is isosceles right-angle triangle

∴ height = base = $5\sqrt{2}$ cm

Area of right angle triangle = $1/2 \times 5\sqrt{2} \times 5\sqrt{2} = \frac{50}{2} = 25$ cm^2

Put the value of area of sector and area of right angle triangle in equation 1,

⇒ Area of minor segment = 39.25 -25

= 14.25 cm^2

Area of major segment = πR^2 – area of minor segment

Area of major segment $= \pi\left(\left(5\sqrt{2}\right)^2\right) - 14.25$

$= 3.14 \times 5\sqrt{2} \times 5\sqrt{2} - 14.25$

⇒ Area of major segment = 157 – 14.25 = 142.75 cm^2

Area of major segment is 142.75 cm^2 and of minor segment is 14.25 cm^2.

Question: 17

Given R = 42 cm and central angle of sector = 120°

Area of minor segment = Area of sector – Area of triangle → eqn1

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

Where R = radius of the circle and θ = central angle of the sector

Area of sector $= \frac{120}{360} \times \pi(42^2)$ (put $\pi = \frac{22}{7}$)

$= \frac{120}{360} \times \frac{22}{7} \times 1764$

∴ Area of sector = 1848 cm^2

Area of right angle triangle = 1/2×base×height×sin θ

Where θ = central angle of the sector

Area of triangle $= \frac{1}{2} \times 42 \times 42 \times \sin 120°$

(put the value $\sin 120° = \frac{\sqrt{3}}{2}$)

Area of triangle = 1/2×42×42×√3/2

Area of triangle = (42×42×√3)/4

(put √3 = 1.73)

Area of triangle $= \frac{42 \times 42 \times 1.73}{4}$

= 762.93 cm^2

Put the values of area of triangle and area of sector in equation 1

⇒ Area of minor segment = 1848 – 762.93

= 1085.07 cm^2

Area of major segment = πR^2 – Area of minor segment

Put the value of area of minor segment and R in above equation

= $\pi(42^2)$ – 1085.07

⇒Area of major segment = 22/7×42×42-1085.07

(put π = 22/7)

⇒ Area of major segment = 5544 – 1085.07

∴ Area of major segment = 4458.93 cm^2

Area of major segment is 4458.93 cm^2 and of minor segment is 1085.07 cm^2.

Question: 18

Area of minor segment = Area of sector – Area of triangle → eqn1

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

Where R = radius of the circle and θ = central angle of the sector

Area of sector $= \frac{60}{360} \times \pi(30^2)$ (put $\pi = 3.14$)

Area of sector $= \frac{60}{360} \times 3.14 \times 900$

Area of sector $= \frac{3.14 \times 900}{6}$

∴ Area of sector = 471 cm^2

Area of right angle triangle $= \frac{\sqrt{3}}{4} \times a^2$

Where a = side of the triangle

Area of triangle = $\sqrt{3}/4 \times 30 \times 30$

Area of triangle = $\sqrt{3}/4 \times 900$

Area of triangle = $(900 \times \sqrt{(3)})/4$

(put $\sqrt{3}$ = 1.732)

Area of triangle = $(1.732 \times 900)/4$

∴ Area of triangle = 389.7 cm^2

Put the values of area of triangle and area of sector in equation 1

Area of minor segment = 471 – 389.7

⇒ Area of minor segment = 81.3 cm^2

Area of major segment = πR^2 – Area of minor segment

Put the value of area of minor segment and R in above equation

⇒ Area of major segment = $\pi \times (30^2)$ – 81.3 (put π = 3.14)

⇒ Area of major segment = $3.14 \times 30 \times 30$ – 81.3

⇒ Area of major segment = 2826 – 81.3

= 2744.7 cm^2

Area of major segment is 2744.7cm^2 and of minor segment is 81.3 cm^2.

Question: 19

Solution:

Given radius of circle = R = 10.5 cm

Let the area of major sector be 'A_1' and that of minor sector be 'A_2'

$\therefore, A_2 = \frac{A_1}{5} \rightarrow$ eqn1

We know, Area of circle = Area of major sector + Area of minor sector

⇒ Area of circle = $A_1 + A_2$

⇒ Area of circle $= A_1 + \frac{A_1}{5}$ → eqn2 (from equation 1)

We also know, Area of circle = πR^2

Where R = radius of circle, put value of area of circle in equation 2.

$\Rightarrow \pi(10.5^2) = \frac{5A_1 + A_1}{5}$

(taking 5 as L.C.M on R.H.S)

$\Rightarrow \pi \times 10.5 \times 10.5 = \frac{6A_1}{5}$

$\Rightarrow \frac{22}{7} \times 10.5 \times 10.5 = \frac{6A_1}{5}$

$\Rightarrow \frac{22 \times 10.5 \times 10.5}{7} = \frac{6A_1}{5}$

$\Rightarrow 22 \times 10.5 \times 1.5 = \frac{6A_1}{5}$

$\Rightarrow 346.5 = \frac{6A_1}{5}$

$\Rightarrow \frac{5 \times 346.5}{6} = A_1$

= 288.75 cm^2

The area of major sector is 288.75 cm^2.

Question: 20

Length of short/hour hand = r = 4 cm

Length of long/minute hand = R = 6 cm

∴ The perimeter of circle traced by short hand = p = $2\pi r$ → eqn1

∴ The perimeter of circle traced by Long hand = P = $2\pi R$ → eqn2

Now put the value of 'r' and 'R' in the equation 1 and 2 respectively.

⇒ p = $2\pi(4)$ & P = $2\pi(6)$ (put $\pi = 3.14$)

⇒ p = 2×3.14×4 & P = 2×3.14×6

∴ p = 25.12 cm & P = 37.68 cm

Therefore, distance covered by short hand in one rotation = 25.12 cm

Distance covered by long hand in one rotation = 37.68 cm

Number of rotation of short hand in one day = 2

Number of rotation of long hand in one day = 24

Therefore number of rotation of small hand in two days = 4

Number of rotation of long hand in two days = 48

Total distance covered by long hand in 2 days = P × no. of rotations in 2 days

⇒ Total distance covered by long hand in 2 days = 37.68×48

⇒ Total distance covered by long hand in 2 days = 1808.64 cm → eqn3

Total distance covered by short hand in 2 days = p × no. of rotations in 2 days

⇒ Total distance covered by short hand in 2 days = 25.12×24

⇒ Total distance covered by short hand in 2 days = 100.48 cm → eqn4

Now total distance covered by tip of both hands in 2 days = eqn3 + eqn4

⇒ Total distance covered by both hands in 2 days = 1808.64 + 100.48

⇒ Total distance covered by both hands in 2 days = 1909.12 cm

The distance covered by both hands tip in 2 days is 1909.12 cm

Question: 21

So, we know Circumference of a circle = 2πR → eqn1

Where R = radius of the circle

Given Circumference of the circle = 88 cm, θ = 90°

Put the given values in equation 1

$88 = 2 \times \frac{22}{7} \times R \; (\pi = \frac{22}{7})$

$\Rightarrow 88 = \frac{2 \times 22 \times R}{7}$

⟹ 88 = (44×R)/7

⟹ 88 = 44R/7

⟹ (88×7)/44 = R

⟹ 616/44 = R

⇒ R = 14 cm

Now we know Area of a sector $= \frac{\theta}{360} \times \pi R^2$

Put the values of R and θ in the above equation

$\Rightarrow$ Area of quadrant $= \frac{90}{360} \times \pi(14^2)$

$= \frac{90}{360} \times \frac{22}{7} \times 14 \times 14$

$= \frac{90 \times 22 \times 14 \times 14}{360 \times 7}$

$= \frac{22 \times 14 \times 14}{4 \times 7} = \frac{4312}{28}$

= 154 cm^2.

The area of quadrant is 154 cm^2.

Question: 22

Initial radius = r = 16 cm

Increased radius = R = 23 cm

Additional ground available = Area of new ground – Initial area → eqn1

Initial area of ground = $\pi(r^2)$

⇒ Initial area of ground = $\pi(16^2)$

⇒ Initial area of ground = 256π → eqn2

Area of new ground = πR^2

⇒ Area of new ground = $\pi(23^2)$

⇒ Area of new ground = 529π → eqn3

Now put the values of equation 2 and 3 in equation 1

⇒ Additional area of ground available = $529\pi - 256\pi$

⇒ Additional area available = $(529 - 256)\pi$ (Taking π common)

⇒ Additional ground available = 273π

$\Rightarrow$ Additional ground available $= 273 \times \frac{22}{7}$

(put $\pi = \frac{22}{7}$)

$= (22 \times 273)/7$

$= 6006/7$

$= 858\ cm^2$

The additional ground available is $858\ cm^2$.

Question: 23

Given length of rectangular field = ℓ = 70 m

Breadth of rectangular field = b = 52 m

∴ Area of the field = $\ell \times b$

⇒ Area of the field = 70×52

⇒ Area of the field = $3640\ m^2$

We know in a rectangle all the angles are 90 degrees.

∴ Area available for grazing = area of quadrant

⇒ Area of quadrant/sector $= \frac{\theta}{360} \times \pi R^2$

Where R = radius of circle & θ = central angle

Given R = 21 m and θ = 90°

$\Rightarrow$ Area available for grazing $= \frac{\theta}{360} \times \pi R^2$

Put the given values in the above equation,

$\Rightarrow$ Area available for grazing $= \frac{90}{360} \times \pi(21^2)$

(put π = 22/7)

$= \frac{90}{360} \times \frac{22}{7} \times 441$

$= \frac{90 \times 22 \times 441}{360 \times 7}$

= (22×63)/4

= 1386/4

⇒ Area available for grazing = 346.5 m^2

Area left ungrazed = Area of field – Area available for grazing

⇒ Area left ungrazed = 3640 – 346.5

⇒ Area left ungrazed = 3293.5 m^2

The area available for grazing is 346.5 m^2 and area left ungrazed is 3293.5 m^2.

Question: 24

Given the side of field = a = 12 m

∴ Area of field = Area of equilateral triangle

$\Rightarrow$ Area of field $= \frac{\sqrt{3}}{4} \times a^2$

$\Rightarrow$ Area of field $= \frac{1.732}{4} \times (12^2)$

$\Rightarrow$ Area of field $= \frac{1.732 \times 144}{4}$

⇒ Area of field = 62.352 m^2

We know in an equilateral triangle all the angles are 60 degrees.

∴ Area available for grazing = Area of the sector

Area of quadrant/sector $= \frac{\theta}{360} \times \pi R^2$

Where R = radius of circle and θ = central angle of sector

Given R = 7 m and θ = 60°

Put the given values in the above equation,

$\Rightarrow$ Area available for grazing $= \frac{60}{360} \times \pi(7^2) \left(\text{put } \pi = \frac{22}{7}\right)$

$\Rightarrow$ Area available for grazing $= \frac{60}{360} \times \frac{22}{7} \times 49$

$\Rightarrow$ Area available for grazing $= \frac{60 \times 22 \times 49}{360 \times 7}$

$\Rightarrow$ Area available for grazing $= \frac{22 \times 7}{6}$

$\Rightarrow$ Area available for grazing $= \frac{154}{6}$

⇒ Area available for grazing = 25.666 m^2

Area that cannot be grazed = Area of field – Area available for grazing

⇒ Area that cannot be grazed = 62.352 – 25.666

⇒ Area that cannot be grazed = 36.686 m^2

The area that cannot be grazed is 36.656 m^2.

Question: 25

Given the side of field which is in shape of square = a = 50 m

∴ Area of the field = Area of Square

⇒ Area of field = a^2

⇒ Area of field = (50^2)

⇒ Area of field = 2500 m^2

We know in an square all the angles are 90 degrees.

∴ Area available for grazing for one cow = area of sector/quadrant

Area of quadrant/sector $= \frac{\theta}{360} \times \pi R^2$

Where R = radius of circle & θ = central angle of sector

Given R = 25 m & θ = 90°

$\Rightarrow$ Area available for grazing for one cow $= \frac{\theta}{360} \times \pi R^2$

Put the given values in the above equation,

$\Rightarrow$ Area available for grazing for one cow $= \frac{90}{360} \times \pi(25^2)$ (put $\pi = 3.14$)

$\Rightarrow$ Area available for grazing for one cow $= \frac{90}{360} \times 3.14 \times 625$

$\Rightarrow$ Area available for grazing for one cow $= \frac{90 \times 3.14 \times 625}{360}$

$\Rightarrow$ Area available for grazing for one cow $= \frac{3.14 \times 625}{4}$

$\Rightarrow$ Area available for grazing for one cow $= \frac{1962.5}{4}$

⇒ Area available for grazing for one cow = 490.625 m^2

⇒ Area available for 4 cows = 4 × Area available for one cow

⇒ Area available for 4 cows = 4 × 490.625

⇒ Area available for 4 cows = 1962.5 m^2

Area left ungrazed = Area of field – Area available for grazing for 4 cows

⇒ Area that cannot be grazed = 2500 – 1962.5

$\Rightarrow$ Area that cannot be grazed $= 2500 - 1962.5$

⇒ Area that cannot be grazed = 537.5 m^2

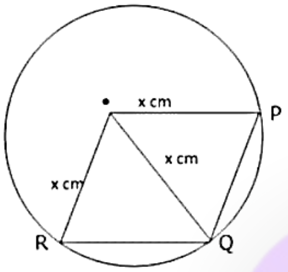
The area left ungrazed is 537.5 m^2.

Question: 26

Given Area of OPQR $= 32\sqrt{3}\ cm^2$

Let the radius of the circle = x cm

Now join OQ



Consider ΔOQR,

OQ = OR = RQ = x cm

⇒ ΔOQR is an equilateral triangle

∴ Area of ΔOQR = Area of an equilateral triangle $= \frac{\sqrt{3}}{4} \times a^2 \rightarrow$ eqn 1

Where a = side of equilateral triangle

Also we know OQ is a diagonal of rhombus OPQR and as in a parallelogram diagonal divides it into two equal area or halves , similarly OQ is also dividing the rhombus into two equal areas therefore,

⇒ Area of ΔOQR = Area of ΔOPQ → eqn2

Area of OPQR = Area of ΔOQR + Area of ΔOPQ

Area of OPQR = 2 × Area of ΔOQR (from eqn2) → eqn3

Put the values of area of OPQR and equation 1 in equation 3

$$\Rightarrow 32\sqrt{3} = 2 \times \frac{\sqrt{3}}{4} \times a^2 \text{ (put } a = x\text{)}$$

$$\Rightarrow 32\sqrt{3} = \frac{2\sqrt{3}}{4} \times x^2$$

$$\Rightarrow 32\sqrt{3} = \frac{\sqrt{3}}{2} \times x^2$$

$$\Rightarrow \frac{32\sqrt{3} \times 2}{\sqrt{3}} = x^2$$

$$\Rightarrow 64 = x^2$$

$$\Rightarrow x = \pm\sqrt{64}$$

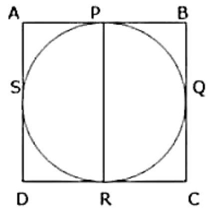
$$\Rightarrow x = \pm 8$$

As every quadratic equation has two roots, similarly $x^2 = 64$ also have two roots
-8. As we know that 'x' represents radius of circle therefore it cannot be a negativ
we discard the negative root.

Therefore radius of the circle = x = 8 cm.

The radius of circle is 8 cm.

Question: 27

(i) 

Consider the above figure, Join PR,

Now PR = Diameter of the inscribed circle

Also, PR = BC = 10 cm.

So, PR = 10 cm

$\therefore$ radius of inscribed circle $= r = \frac{PR}{2}$

$\Rightarrow r = \frac{10}{2}$

$\Rightarrow r = 5$ cm

$\therefore$ Area of inscribed circle = πr^2 (put value of r in this equation)

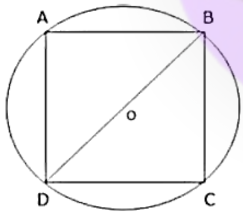
$\Rightarrow$ Area of inscribed circle = $\pi(5^2)$

$\Rightarrow$ Area of inscribed circle $= \frac{22}{7} \times 25$ (put $\pi = \frac{22}{7}$)

$\Rightarrow$ Area of inscribed circle $= \frac{22 \times 25}{7}$

$\Rightarrow$ Area of inscribed circle = 78.57 cm^2

The area of inscribed circle is 78.57 cm^2.

(ii) 

Consider the above figure, O is the centre of circle and ABCD is a square inscribed. Now OB and OD are radii of circle.

Consider ΔDBC right angled at c (as C is a vertex of square)

$\therefore$ Apply Pythagoras theorem in triangle DBC

$Hypotenuse^2 = Perpendicular^2 + Base^2$

In triangle DBC, hypotenuse = DB,

perpendicular = BC and

base = DC

$\Rightarrow BD^2 = BC^2 + DC^2$

Put the values of BC and DC i.e. 10 cm

$\Rightarrow BD^2 = 10^2 + 10^2$

$\Rightarrow BD^2 = 200$

$\Rightarrow BD = \sqrt{200}$

$\Rightarrow BD = 10\sqrt{2}$ cm

Now radius of circle = half of BD

$\therefore$ radius of circle $= r = \frac{BD}{2}$

$\Rightarrow r = (10\sqrt{2})/2$

$\Rightarrow r = 5\sqrt{2}$ cm

Hence Area of circumscribing circle = πr^2

$\Rightarrow$ Area of circumscribing circle = $3.14 \times 5\sqrt{2} \times 5\sqrt{2}$

(put $\pi = 3.14$ and $r = 5\sqrt{2}$ cm)

$\Rightarrow$ Area of circumscribing circle = 3.14×50

$\Rightarrow$ Area of circumscribing circle = 157 cm^2

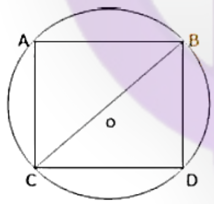
Area of circumscribing circle is 157 cm^2.

Question: 28

Consider the figure shown below where O is centre of circle, join BC which passes through O, let the side of square be 'a' and radius of circle be 'r'.

Now we know OB and OC are radius of circle

So, OB = OC = r



Consider ΔBDC right angled at D

$\therefore H^2 = P^2 + B^2$ (pythagoras theorem)

$\Rightarrow BC^2 = BD^2 + DC^2 \rightarrow$ eqn1

And we know BC = OC + OB

BC = 2r and BD = DC = a (put these values in eqn1)

$\Rightarrow (2r)^2 = a^2 + a^2$

$\Rightarrow 4r^2 = 2a^2$

$\Rightarrow r^2 = \frac{2a^2}{4}$

$\Rightarrow r^2 = \frac{a^2}{2} \rightarrow$ eqn2

Area of inscribed square = side × side

Areaa of inscribed square = a × a

Area of inscribed square = $a^2 \rightarrow$ eqn3

Area of circumscribing circle = πR^2 where R = radius of circle

$\Rightarrow$ Area of circumscribing circle = $\pi r^2 \rightarrow$ eqn4

Ratio of area of circumscribing cirle to that of inscribed circle

$$= \frac{\text{area of circle}}{\text{area of square}}$$

Put the values from equation 3 & 4 in above equation

$$\text{Ratio} = \frac{\pi r^2}{a^2}$$

$$\Rightarrow \text{Ratio} = \frac{\pi \times \frac{a^2}{2}}{a^2}$$

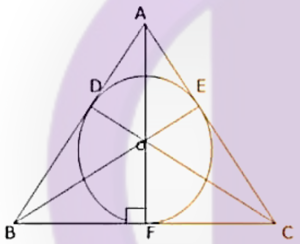
(from eqn 2)

$$\Rightarrow \text{Ratio} = \frac{\pi \times a^2}{2 \times a^2} = \frac{\pi}{2}$$

So, Ratio is $\pi : 2$

The ratio is $\pi:2$

Question: 29



Consider the figure shown above, AF, BE and CD are perpendicular bisector.

Now we know that the point at which all three perpendiculars meet is called incentre, so O is the incentre, thus O divides all three perpendiculars in a ratio 2:1.

Let AB = BC = CA = a cm

Therefore let AF = h cm

$\Rightarrow \angle AFC = 90°$ and $OF = 1/3 \times AF$

$\Rightarrow OF = h/3$ cm (putting value of OF)

$\Rightarrow h = 3 \times OF \rightarrow$ eqn1

And we can see from figure that OF = radius of circle

Now let radius of circle be = r cm

$\therefore$ Area of circle = πR^2

where R = radius of circle

Given area of circle = 154 cm^2

$\Rightarrow \pi r^2 = 154$

$$\Rightarrow \frac{22}{7} \times r^2 = 154 \text{ (put } \pi = \frac{22}{7})$$

$$\Rightarrow r^2 = \frac{154 \times 7}{22}$$

$\Longrightarrow r^2 = 49$

$\Rightarrow r = 7$ cm

Therefore OF = 7 cm

$\Rightarrow h = 3 \times 7$ (from eqn 1)

$\Rightarrow h = 21$ cm

we know area of an equilateral triangle = $\frac{\sqrt{3}}{4} \times a^2$

where a = side of triangle

Also, Area of triangle = 1/2 ×base×height

Equating both the areas we get,

$$\frac{\sqrt{3}}{4} \times a^2 = \frac{1}{2} \times BC \times AF$$

Put the values of BC and AF

$$\Longrightarrow \frac{\sqrt{3}}{4} \times a^2 = \frac{1}{2} \times a \times h$$

$$\Longrightarrow \frac{\sqrt{3}}{4} \times a^2 = \frac{1}{2} \times a \times 21$$

(putting value of h = 21 cm)

$$\Longrightarrow \frac{\sqrt{3}}{4} \times a = \frac{21}{2}$$

$$\Longrightarrow a = \frac{21 \times 4}{2 \times \sqrt{3}}$$

(rationalize it)

$$\Longrightarrow a = \frac{21 \times 4 \times \sqrt{3}}{2 \times \sqrt{3} \times \sqrt{3}}$$

$$\Longrightarrow a = \frac{42 \times \sqrt{3}}{3}$$

$\Longrightarrow a = 14\sqrt{3}$ cm

∴ Perimeter of equilateral triangle = 3×side of triangle

$\Longrightarrow$ Perimeter of Δ ABC = $3 \times 14\sqrt{3}$ (put $\sqrt{3} = 1.73$)

$\Rightarrow$ Perimeter of ΔABC = 42×1.73

$\Rightarrow$ Perimeter of ΔABC = 72.66 cm

The perimeter of triangle is 72.66 cm

Question: 30

Given radius of wheel = r = 42 cm

Circumference of wheel = 2πR where R = radius of the wheel

= 2π(42) (putting value of r)

$$\text{Circumference of wheel} = \frac{2 \times 22 \times 42}{7} = 264 \text{ cm}$$

Therefore distance covered in one revolution = 264 cm

Total distance covered = 19.8 km = 1980000 cm

Total number of revolutions = n

Distance covered on 1 revolution ×no. of revolutions = Total distance

264×n = 1980000

$\Rightarrow n = \frac{1980000}{264}$

⇒ n = 7500

Total number of revolutions is 7500.

Question: 31

Given radius of wheel = R = 2.1m

Number of revolutions in one minute = 75

Number of revolutions in 1 hour = 75×60

Number of revolutions in 1 hour = 45000

Distance covered in one revolution = Circumference of wheel

Distance covered in 1 revolution = 2πR (where R = radius of wheel)

Distance covered n 1 revolution = 2π(2.1)

Distance covered in one revolution $= 2 \times \frac{22}{7} \times 2.1$ (put $\pi = \frac{22}{7}$)

= 13.2 m

So, distance covered in 4500 revolutions = 4500×distance covered in 1

Distance covered in 4500 revolution = 4500× 13.2

Distance covered in 4500 revolutions = 59400 m = 59.4 km

∴ Distance covered in 1 hour = 59.4 km

Hence speed of the locomotive = 59.4 km/hr

The speed of locomotive is 59.4 km/hr

Question: 32

Let the diameter of the wheel be 'd' cm

Total distance covered in 250 revolutions = 49.5 km = 495000 m

distance covered in one revolution $= \frac{495000}{2500}$

⇒ Distance covered in one revolution = 198 cm → eqn1

Also, Distance covered in one revolution = circumference of wheel

∴ Distance covered in one revolution = πD where d = diameter of wheel

Distance covered in one revolution $= \frac{22 \times d}{7}$ → eqn2 $\left(\text{put } \pi = \frac{22}{7}\right)$

Equate equation 1 and 2 we get,

$\frac{22 \times d}{7} = 198$

$\Rightarrow d = \frac{198 \times 7}{22}$

⇒ d = 9×7

$\Longrightarrow$ d = 63 cm

The diameter of the wheel is 63 cm.

Question: 33

Given diameter of wheel = d = 60 cm

Number of revolutions in one minute = 140

Number of revolutions in one hour = 140×60

Number of revolutions in one hour = 8400

Distance covered in one revolution = circumference of wheel

⇒ Distance covered in one revolution = πd

Distance covered in one revolution $= \frac{22}{7} \times 60$ (put $\pi = \frac{22}{7}$ and value of d)

= 188.57 cm

Distance covered in one hour = Distance in 1 revolution × no. of revolutions

⇒ Total distance covered in one hour = 188.57× 8400

⇒ Total distance covered in one hour = 1583988 cm = 15.839 km

∴ speed with which boy is cycling = 15.839 km/hr

The speed with which boy is cycling is 15.839 km/hr

Question: 34

Given diameter of wheel of bus = d = 140 cm

So radius of wheel $= R = \frac{d}{2} = \frac{140}{2} = 70$ cm

Speed of bus = 72.6 km/hr

∴ Distance covered by bus in one hour = 72.6 km = 7260000 cm

So distance covered by wheels in one minute $= \frac{7260000}{60}$

Distance covered in one minute = 121000 cm → eqn1

Let the number of revolutions made by wheel per minute = x

Distance covered by wheel in one revolution = circumference of wheel = 2πR

Distance covered by wheel in one revolution = 2π(70)

(putting value of R)

$= 2 \times \frac{22}{7} \times 70 \left(\text{putting value of R and } \pi = \frac{22}{7}\right)$

$= \frac{2 \times 22 \times 70}{7}$

= 2×22×10 = 440 cm

∴ Total distance = No. of revolution× Distance covered in1 revolution

On putting the required values we get,

121000 = 440×(x)

$\Longrightarrow x = \frac{121000}{440}$

⇒ x = 275

Number of revolutions made per minute is 275.

Question: 35

Given diameter of front wheel = d = 80 cm

so, Radius of front wheel = r = d/2 = 80/2 = 40 cm

Diameter of rear wheel = D = 2 m = 200 cm

so, Radius of front wheel $= R = \frac{D}{2} = \frac{200}{2} = 100$ cm

Distance covered by wheel in 1 revolution = Circumference of wheel

⇒ Distance covered by front wheel = 2πr = 2π(40)

⇒ Distance covered by front wheel = 80π

∴ Distance covered by front wheel in 800 revolutions = 80π×800

⇒ Distance covered by front wheel in 800 revolutions = 6400π → eqn1

Similarly

⇒ Distance covered by rear wheel = 2πR = 2π(100)

⇒ Distance covered by rear wheel = 200π → eqn2

Let the number of revolutions made by rear wheel to cover 6400π cm be "x"

∴ (x)×200π = 6400π (from eqn1 and eqn2)

$\Rightarrow x = \frac{64000\pi}{200\pi}$

⟹ x = 64000/200

⇒ x = 320

Number of revolution made by rear wheel to cover the distance covered by front wheel in 800 revolutions is 320.

Question: 36

Given side of square = a = 14 cm

Central angle of each sector formed at corner = θ = 90°

So, radius of 4 equal circles = r = a/2 = 14/2

∴ Radius of 4 circles = r = 7 cm

Area of quadrant formed at each corner $= \frac{\theta}{360} \times \pi R^2$

where R = radius of circle

$\Rightarrow$ Area of one quadrant $= \frac{90}{360} \times \pi(7^2)$

$= \frac{49\pi}{4}\ cm^2 \rightarrow$ eqn1

Area of all the 4 quadrant = 4 × Area of one quadrant

$= 4 \times \frac{49\pi}{4}$ (from eqn 1)

⇒ Area of all 4 quadrants = 49π → eqn2

Also, Area of square = side×side = a×a = a^2 = 14^2 (putting value of side of square

⇒ Area of square = 196 cm^2→ eqn3

∴ Area of shaded region = Area of square – Area of all 4 quadrants

⇒ Area of shaded region = 196 – 49π (fromeqn3 and eqn2)

$\Longrightarrow$ Area of shaded region $= 196 - \left(49 \times \frac{22}{7}\right)$ (put $\pi = \frac{22}{7}$)

= 196 – (7×22)

= 196 – 154

= 42 cm^2

The area of shaded region is 42 cm^2.

Question: 37

Given radius of each circle = r = 5 cm

Central angle of each sector formed at corner = θ = 90°

Side of square ABCD = a = 2×r = 2×5 = 10 cm

Area of quadrant formed at each corner $= \frac{\theta}{360} \times \pi R^2$

where R = radius of circle

$\Longrightarrow$ Area of one quadrant $= \frac{90}{360} \times \pi(5^2)$

(putting value of r and θ)

$= \frac{25\pi}{4}$ cm^2 → eqn1

Area of all 4 quadrants = 4×Area of one quadrant

$= 4 \times \frac{25\pi}{4}$ (from eqn 1)

⇒ Area of all 4 quadrants = 25π → eqn2

Area of square = side×side = a×a = a^2

⇒ Area of square = 10^2 (putting value of side of square)

⇒ Area of square = 100 cm^2→ eqn3

Area of shaded region = Area of square – Area of all 4 quadrants

Area of shaded region = 100 – 25π (from eqn3 and eqn2)

= 100 – (25×3.14) (put π = 3.14)

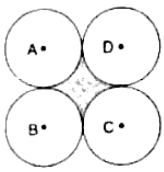
= 100 – 78.5

= 21.5 cm^2

The area of shaded region is 21.5 cm^2.

Question: 38

Solution:



Here, first we join the centre of all adjacent circles then the distance between the circles touching each other is equal to the side of the square formed by joining the centre of adjacent circles. Therefore, we can say that the side of the square equal to the twice of the radius of circle. Now by simply calculating the area of the 4 quadrants and then subtracting it from the area of the square we can easily calculate the area of the shaded region.

Given radius of each circle = "a" units

Central angle of each sector formed at corner = $\theta = 90°$

Side of square ABCD = $2 \times a$ units

Area of quadrant formed at each corner $= \frac{\theta}{360} \times \pi R^2$

where R = radius of circle

$\Rightarrow$ Area of one quadrant $= \frac{90}{360} \times \pi(a^2)$

$\Rightarrow$ Area of one quadrant $= \frac{\pi a^2}{4}$ sq. units $\rightarrow$ eqn1

$\therefore$ Area all 4 quadrants = $4 \times$ Area of one quadrant

$\Rightarrow$ Area of all the 4 quadrant $= 4 \times \frac{\pi a^2}{4}$ (from eqn 1)

$= \pi a^2$ sq. units $\rightarrow$ eqn2

Area of square = side×side = $2a \times 2a = 4a^2$

$\Rightarrow$ Area of square = $4a^2$ sq. units $\rightarrow$ eqn3

Area of shaded region = Area of square – Area of all 4 quadrants

$\Rightarrow$ Area of shaded region = $4a^2 - \pi a^2$ (from eqn3 and eqn2)

$\Rightarrow$ Area of shaded region $= 4a^2 - \left(a^2 \times \frac{22}{7}\right)$ (put $\pi = \frac{22}{7}$)

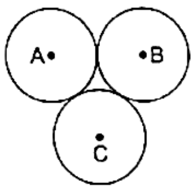
$\Rightarrow$ Area of the shaded region $= 4a^2 - \frac{22a^2}{7}$

$\Rightarrow$ Area of shaded region $= \frac{28a^2 - 22a^2}{7}$

$\Rightarrow$ Area of shaded region $= \frac{6a^2}{7}$ sq. units

Area of shaded region is $\frac{6a^2}{7}$ sq. units

Question: 39



Consider the above figure,

Here, first we join the center of all adjacent circles then the distance between the center of circles touching each other is equal to the side of an equilateral triangle formed by joining the center of adjacent circles. Therefore, we can say that the side of the equilateral triangle is equal to the twice of the radius of circle. Now by simply calculating the area of the 3 sectors and then subtracting it from the area of the equilateral triangle we can easily calculate the area of the enclosed region.

Given radius of each circle = r = 6 cm

Central angle of each sector = θ = 60° (∵ ΔABC is equilateral)

Side of equilateral ΔABC = a = 2×r = 2×6

∴ Side of equilateral ΔABC = a = 12 cm

Area of sector formed at each corner $= \frac{\theta}{360} \times \pi R^2$ where R = radius of circle

$\Rightarrow$ Area of one sector $= \frac{60}{360} \times \pi(6^2)$

$\Rightarrow$ Area of one sector $= \frac{36\pi}{6}$ cm^2

⇒ Area of one sector = 6π cm^2→ eqn1

Area of all the 3 sector = 3×Area of one sector

= 3×6π (from eqn1)

= 18π cm^2→ eqn2

Area of equilateral ΔABC $= \frac{\sqrt{3}}{4} \times a^2 = \frac{\sqrt{3}}{4} \times (12^2)$

$\Rightarrow$ Area of equilateral ΔABC $= \frac{\sqrt{3} \times 144}{4}$

$\Rightarrow$ Area of equilateral ΔABC $= 36\sqrt{3}$ cm^2 → eqn3

Area of enclosed region = Area of equilateral ΔABC – Area of all 3 sectors

⟹ Area of enclosed region = 36√3-18π (from eqn 3 and eqn 2)

⟹ Area of enclosed region = (36×1.732)-(18×3.14)

(put π = 3.14 &√3 = 1.732)

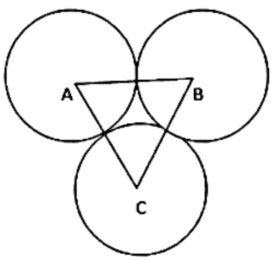
= 62.352 - 56.52

= 5.832 cm^2

The area of enclosed region is 5.832 cm^2.

Question: 40

Consider the figure shown below



Here, first we join the center of all adjacent circles then the distance between the center of circles touching each other is equal to the side of an equilateral triangle formed by joining the center of adjacent circles. Therefore, we can say that the side of the equilateral tr[illegible] to the twice of the radius of circle. Now by simply calculating the area of the 3 sec[illegible] subtracting it from the area of the equilateral triangle we can easily calculate the area of the enclosed region.

CLASS24

Given radius of each circle = "a" units

Central angle of each sector = $\theta = 60°$ ($\because \Delta ABC$ is equilateral)

Side of equilateral $\Delta ABC = 2 \times a$ units

Area of sector formed at each corner $= \frac{\theta}{360} \times \pi R^2$

$\Rightarrow$ Area of one sector $= \frac{60}{360} \times \pi(a^2)$

$\Rightarrow$ Area of one sector $= \frac{\pi a^2}{6}$ sq. units $\rightarrow$ eqn1

$\therefore$ Area of all 3sectors = 3×Area of one sector

$\Rightarrow$ Area of all the 3 sector $= 3 \times \frac{\pi a^2}{6}$ (from eqn 1)

$= \frac{\pi a^2}{2}$ sq.units $\rightarrow$ eqn2

Area of equilateral $\Delta ABC = \frac{\sqrt{3}}{4} \times (2a)^2$

$= \frac{\sqrt{3} \times 4a^2}{4}$

$= a^2\sqrt{3}$ sq.units $\rightarrow$ eqn3

Area of enclosed region = Area of equilateral ΔABC – Area of all 3 sectors

$\Rightarrow$ Area of enclosed region $= a^2\sqrt{3} - \frac{\pi a^2}{2}$ (from eqn 3 and eqn 2)

$= a^2 \times 1.73 - \frac{3.14 \times a^2}{2}$

$= \frac{a^2 \times 1.73 \times 2 - 3.14 \times a^2}{2}$

$= \frac{(3.46 - 3.14)a^2}{2}$

(taking a^2 common)

$\Rightarrow$ Area of the enclosed region $= \frac{0.32a^2}{2}$

$= \frac{32a^2}{200}$

$= \frac{4a^2}{25}$ sq.units

Area of the enclosed region is $\frac{4a^2}{25}$ sq. units

Question: 41

Solution:

Here in order to find the area of the shaded region we have to calculate the area, or the quadrant shown and subtract it from the area of the trapezium. And in order to find the area of the quadrant we have to calculate the radius of the sector EAB by the area of trapeziu

Given Area of trapezium ABCD = 24.5 cm^2 → eqn1

AD ∥ BC, AD = 10 cm, BC = 4 cm, ∠DAB = 90°

We also now Area of trapezium $= \frac{1}{2} \times$ (sum of parallel sides) × height

Area of trapezium $= \frac{1}{2} \times (AD + BC) \times AB \rightarrow$ eqn2

Putting the values in equation 2, we get,

$$24.5 = \frac{1}{2} \times (10 + 4) \times AB$$

$$\Rightarrow 24.5 = \frac{14 \times AB}{2}$$

$$\Rightarrow 24.5 = 7AB$$

$$\Rightarrow AB = \frac{24.5}{7}$$

⇒ AB = 3.5 cm

Therefore radius of the sector EAB = r = 3.5 cm

Area of quadrant EAB $= \frac{\theta}{360} \times \pi R^2$ where R = radius of the sector

$$\Rightarrow \text{Area of quadrant EAB} = \frac{90}{360} \times \pi(3.5^2) \left(\text{put } \pi = \frac{22}{7}\right)$$

$$\Rightarrow \text{Area of the quadrant} = \frac{90}{360} \times \frac{22}{7} \times 3.5 \times 3.5$$

$$\Rightarrow \text{Area of the quadrant EAB} = \frac{22 \times 3.5 \times 3.5}{4 \times 7}$$

$$\Rightarrow \text{Area of the quadrant EAB} = \frac{269.5}{28}$$

⇒ Area of the quadrant EAB = 9.625 cm^2 → eqn3

∴ Area of shaded region = Area of trapezium – Area of quadrant EAB

⇒ Area of shaded region = 24.5 – 9.625 (putting values from eqn1 and eqn3)

⇒ Area of shaded region = 14.875 cm^2

Question: 42

Given AB = 30 m, AD = 55 m, BC = 45 m

$\theta_A = 90°, \theta_B = 90°, \theta_C = 120°, \theta_D = 60°$

Radius of each sector = r = 14 m

(i) total area of 4 sectors

Area of sector $= \frac{\theta_i}{360} \times \pi R^2 \rightarrow$ eqn1

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

Area of sector at corner A $= \frac{90}{360} \times \pi \times 14^2$ (putting values in eqn 1)

Area of sector at corner A $= \frac{196\pi}{4}$

Area of sector at corner A = 49π m^2→ eqn2

As we know that central angle at A and B are both 90 degrees and radius is also same i.e. 14 m therefore the area of the sector at B will be exactly same as that of sector at A.

∴ Area of sector at corner B = Area of sector at corner A

⇒ Area of sector at corner B = 49π → eqn3

Similarly,

Area of sector $= \frac{\theta_C}{360} \times \pi R^2$

Area of sector at corner C $= \frac{120}{360} \times \pi \times 14^2$ (putting values in eqn 1)

Area of sector at corner C $= \frac{196\pi}{3}$

Area of sector at corner C = 65.33π m^2→ eqn4

Similarly,

Area of sector $= \frac{\theta_D}{360} \times \pi R^2$

Area of sector at corner D $= \frac{60}{360} \times \pi \times 14^2$ (putting values in eqn 1)

Area of sector at corner D $= \frac{196\pi}{6}$

Area of sector at corner D = 32.67π → eqn5

Total area of 4 sectors = eqn2 + eqn3 + eqn4 + eqn5

⇒ Total area of 4 sectors = 49π + 49π + 65.33π + 32.67π

⇒ Total area of 4 sectors = 196π

Total area of 4 sectors $= 196\pi$

Total area of 4 sectors $= 196 \times \frac{22}{7}$ $\left(\text{put } \pi = \frac{22}{7}\right)$

∴ Total area of 4 sectors = 616 m^2

Total area of 4 sectors is 616 m^2.

(ii) Area of the remaining portion

Here in order to find the area of the remaining portion of the trapezium we have to subtract the area of the 4 sectors from the area of the trapezium.

Area of trapezium $= \frac{1}{2} \times$ (sum of parallel sides) × height

Area of trapezium $= \frac{1}{2} \times (AD + BC) \times AB$

On putting the values,

Area of trapezium $= \frac{1}{2} \times (55 + 45) \times 30$

$= \frac{100 \times 30}{2}$

= 50×30

Area of trapezium = 1500 $m^2 \rightarrow$ eqn1

Area of remaining portion = Area of trapezium – Area of the 4 sectors

⇒ Area of remaining portion = 1500 – 616 (from eqn1 and part (i))

∴ Area of remaining portion = 884 m^2

The area of the remaining portion is 884 m^2.

Question: 43

Area of shaded region can be calculated by subtracting the area of minor sector at vertex B from the sum of areas of the major sector at O and area of equilateral triangle.

Given Radius of circle at O = r = 6 cm

Side of equilateral triangle = a = 12 cm

Central angle at O = 360 -60 = 300°

Central angle at B = 60°

Area of the equilateral triangle = $\frac{\sqrt{3}}{4} \times a^2$

where a = side of equilateral triangle

Area of the equilateral triangle = $\sqrt{3}/4 \times (12)^2$ (putting the value of a)

Area of the equilateral triangle = $(144\times\sqrt{3})/4$

Area of the equilateral triangle = $36\sqrt{3}$ $cm^2 \rightarrow$ eqn1

Area of sector = $\theta/360\times\pi R^2$ where r = radius of the sector

Area of minor sector at B = $60/360\times\pi\times(6^2)$ (given)

∴ Area of minor sector at B = 6π $cm^2 \rightarrow$ eqn2

Similarly,

Area of major sector at O $= \frac{300}{360} \times \pi(6^2)$

∴ Area of major sector at O = 30π $cm^2 \rightarrow$ eqn3

Area of shaded region = eqn1 + eqn3 – eqn2

On putting values

⇒ Area of shaded region = $36\sqrt{3} + 30\pi - 6\pi$

Area of shaded region = $36\sqrt{3} + 24\pi$

(put π = 3.14 and $\sqrt{3}$ = 1.73

∴ Area of shaded region = $(36\times1.73) + (24\times3.14)$

⇒ Area of shaded region = 62.28 + 75.36

∴ Area of shaded region = 137.64 cm^2

Area of the shaded region is 137.64 cm^2.

Question: 44

Here in order to find the area of the shaded region we have to subtract the area of the semicircle and the triangle from the area of the rectangle.

Given AB = 80 cm, BC = 70 cm, DE = 42 cm, ∠AED = 90°

Here we see that the triangle AED is right angle triangle, therefore, we can apply Pythagoras theorem i.e.

$H^2 = P^2 + B^2$ (pythagoras theorem)

$AD^2 = DE^2 + AE^2$

$\Rightarrow 70^2 = 42^2 + AE^2$ (putting the given values)

$\Rightarrow 4900 = 1764 + AE^2$

$\Rightarrow 4900 - 1764 = AE^2$

$\Rightarrow 3136 = AE^2$

$AE = \sqrt{3136}$

$\therefore$ AE = 56 cm

Area of ΔAED = 1/2×AE×DE

(Area of triangle = 1/2×base×height)

On putting values we get,

Area of ΔAED = 1/2×56×42

⇒ Area of ΔAED = 28×42

∴ Area of ΔAED = 1176 cm^2→ eqn1

Area of semicircle $= \dfrac{\pi R^2}{2}$

Here radius of semicirle $= \dfrac{BC}{2} = \dfrac{70}{2}$

R = 35 cm

∴ Area of semicircle $= \dfrac{\pi \times 35^2}{2}$

Area of semicircle $= \dfrac{22 \times 1225}{2 \times 7}$ (putting $\pi = \dfrac{22}{7}$)

⇒ Area of semicircle = 11×175

∴ Area of semicircle = 1925 cm^2→ eqn2

Area of rectangle = ℓ×b (ℓ = length of rectangle, b = breadth of rectangle)

⇒ Area of rectangle = 80×70 = 5600 cm^2→ eqn3

Area of shaded region = Area of rectangle – Area of semicircle – Area of Δ

⇒ Area of shaded region = 5600 -1925 – 1176 (fromeqn1, eqn2 and eqn3)

∴ Area of shaded region = 2499 cm^2

Area of the shaded region is 2499 cm^2.

Question: 45

Here in order to find the area of the shaded region (region excluding the triangle) we have to subtract the area of the triangle from the area of the rectangle and then add the area of the semicircle.

Given AB = 20 cm, DE = 12 cm, AE = 9 cm and ∠AED = 90°

Here we see that the triangle AED is right angle triangle, therefore, we can apply Pythagoras theorem i.e.

$H^2 = P^3 + B^2$ (pythagoras theorem)

$AD^2 = DE^2 + AE^2$

$AD^2 = DE^2 + AE^2$

$AD^2 = 12^2 + 9^2$ (putting given values)

$\Rightarrow AD^2 = 144 + 81$

$\Rightarrow AD^2 = 225$

$\Rightarrow AD = \sqrt{225}$

$\therefore AD = 15$ cm

Area of $\Delta AED = 1/2 \times AE \times DE$

(Area of triangle = 1/2×base×height)

On putting values we get,

$$\text{Area of } \Delta AED = \frac{1}{2} \times 9 \times 12$$

$\Rightarrow$ Area of $\Delta AED = 9 \times 6$

$\therefore$ Area of $\Delta AED = 54\ cm^2 \rightarrow$ eqn1

$$\text{Area of semicircle} = \frac{\pi R^2}{2}$$

Here radius of semicircle = BC/2 = 15/2

$\Rightarrow R = 7.5$ cm

$$\therefore \text{ Area of semicircle} = \frac{\pi \times 7.5^2}{2}$$

$$\text{Area of semicircle} = \frac{3.14 \times 56.25}{2} \text{ (putting } \pi = 3.14)$$

$\Rightarrow$ Area of semicircle = 1.07×56.25

$\therefore$ Area of semicircle = 88.3125 $cm^2 \rightarrow$ eqn2

Area of rectangle = $\ell \times b$

(ℓ = length of rectangle, b = breadth of rectangle)

$\Rightarrow$ Area of rectangle = 20×15

(putting the values of ℓ & b)

$\therefore$ Area of rectangle = 300 $cm^2 \rightarrow$ eqn3

Area of shaded region = Area of rectangle + Area of semicircle – Area of Δ

$\Rightarrow$ Area of shaded region = 300 + 88.3125 – 53 (from eqn1, eqn2, eqn3)

$\therefore$ Area of shaded region = 334.3125 cm^2

Area of shaded region is 334.3125 cm^2.

Question: 46

Here in order to find the area of the shaded region (region excluding the area of segment AC and quadrant OCD) can be calculated by subtracting the area of triangle and quadrant OBD from the area of the circle.

Given AC = 24 cm, AB = 7 cm and ∠BOD = 90°

Here we see that the triangle ACB is right angle triangle, therefore, we can apply Pythagoras theorem i.e.

$H^2 = P^2 + B^2$ (pythagoras theorem)

$BC^2 = AC^2 + AB^2$

$\Rightarrow BC^2 = 24^2 + 7^2$ (putting the given values)

$\Rightarrow BC^2 = 576 + 49$

$\Rightarrow BC^2 = 625$

$BC = \sqrt{625}$

$\therefore BC = 25$ cm

Area of $\Delta ACB = 1/2 \times AB \times AC$ (Area of triangle = $1/2 \times$ base $\times$ height)

On putting values we get,

Area of $\Delta ACB = \frac{1}{2} \times 7 \times 24$

$\Rightarrow$ Area of $\Delta AED = 7 \times 12$

$\therefore$ Area of $\Delta AED = 84\ cm^2 \rightarrow$ eqn1

Area of circle = πR^2 (R = radius of circle)

Here radius of cicrle $= \frac{BC}{2} = \frac{25}{2}$ (because ABCD is a rectangle)

$\Rightarrow R = 12.5$ cm

$\therefore$ Area of circle = $\pi \times 12.5^2$

$\Rightarrow$ Area of circle = 156.25×3.14 (put $\pi = 3.14$)

$\therefore$ Are of circle = $490.625\ cm^2 \rightarrow$ eqn2

Are of quadrant OBD $= \frac{\theta}{360} \times \pi R^2$

Area of quadrant OBD $= \frac{90}{360} \times \pi \times 12.5^2$ (put $\pi = 3.14$)

Area of quadrant $= \frac{3.14 \times 156.25}{4}$

$\Rightarrow$ Area of quadrant OBD = $122.65625\ cm^2 \rightarrow$ eqn3

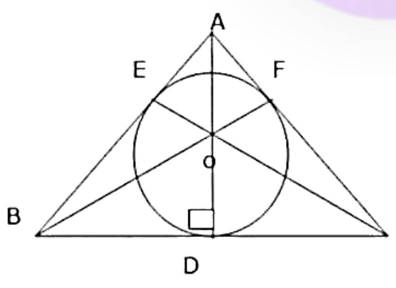
Area of shaded region = Area of circle – Area of quadrant – Area of Δ

$\Rightarrow$ Area of shaded region = $490.625 - 84 - 122.65625$ (from eqn1, 2 and 3)

$\Rightarrow$ Area of shaded region = $283.96875\ cm^2$

Area of shaded region is $283.96875\ cm^2$.

Question: 47



As AD = BF = CE = h

Consider ΔADB, $\angle ADB = 90°$, BD = 6 cm

$AB^2 = AD^2 + BD^2$ (Phythagoras theorem)

$12^2 = AD^2 + 6^2$ (putting the given values)

$144 = AD^2 + 36$

$144 - 36 = AD^2$

$AD^2 = 108$

$AD = \sqrt{108}$

$AD = \sqrt{9 \times 3 \times 4}$

$AD = 6\sqrt{3}$ cm

so, $h = 6\sqrt{3}$ cm

We also know that a point O will divide each median in a ratio of 2:1

So, $OD = \frac{h}{3}$

$OD = \frac{6\sqrt{3}}{3}$

$OD = 2\sqrt{3}$ cm

$\therefore$ radius of the circle $= r = 2\sqrt{3}$ cm

Area of the circle = πr^2

Area of the circle $= \pi \times (2\sqrt{3})^2$ (putting the value of r)

$\therefore$ Area of the circle = 12π cm^2 → eqn1

Area of $\Delta ABC = \frac{\sqrt{3}}{4} \times a^2$ where a = side of equilateral triangle

Area of $\Delta ABC = \frac{\sqrt{3}}{4} \times 12^2$

Area of $\Delta ABC = \frac{144 \times \sqrt{3}}{4}$

Area of $\Delta ABC = 36\sqrt{3}$ cm^2 → eqn2

Area of shaded region = area of triangle – area of circle

Area of the shaded regiom $= 36\sqrt{3} - 12\pi$ (put $\pi = 3.14$ & $\sqrt{3} = 1.73$)

⇒ Area of the shaded region = (36×1.73) – (12×3.14)

⇒ Area of the shaded region = 62.28 -37.68

$\therefore$ Area of the shaded region = 24.6 cm^2

The radius of the circle is $2\sqrt{3}$ cm and area of shaded region is 24.6 cm^2.

Question: 48

Here we will first find the sides of equilateral triangle ant then subtract the area of the triangle from the area of the circle.

Given radius of circle = r = 42 cm

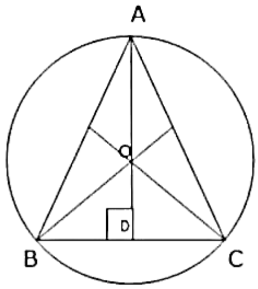
$\therefore$ Area of the circle = πR^2, where R = radius of the circle

⇒ Area of the circle = $\pi(42^2)$

$\therefore$ Area of circle $= \frac{22}{7} \times 1764 \left(\text{putting } \pi = \frac{22}{7}\right)$

$\Rightarrow$ Area of the circle = 22×252

$\therefore$ Area of the circle = 5544 $cm^2 \rightarrow$ eqn1



Consider the figure shown,

In ΔABD, ∠ADB = 90°

$\therefore AB^2 = AD^2 + BD^2 \rightarrow$ eqn2 (Pythagoras theorem)

Let the sides of the equilateral triangle = a cm

And as we know AD is a median therefore it will bisect the side BC into two equal parts i.e.

BD = DC → eqn3

Also, BC = BD + DC

⇒ BC = BD + BD (from eqn3)

⇒ a = 2BD (BC = a)

$BD = \frac{a}{2}$ cm

So, $a^2 = AD^2 + \left(\frac{a}{2}\right)^2$ (putting values of AC and BD in eqn2)

$\Rightarrow a^2 = AD^2 + \frac{a^2}{4}$

$\Rightarrow a^2 - \frac{a^2}{4} = AD^2$

$\Rightarrow \frac{4a^2 - a^2}{4} = AD^2$

$\Rightarrow \frac{3a^2}{4} = AD^2$

$\Rightarrow AD = \sqrt{\frac{3a^2}{4}}$

$\Rightarrow AD = \frac{a\sqrt{3}}{2}$ cm → eqn4

Now, we also know that the point 'O' which is the intersection of all the three medians i.e. centroid of the triangle. Also we know that the centroid divides the median in the ratio 2:1.

So, we can say that $AO = \frac{2AD}{3}$

Also, we know AO = radius = r = 42 cm

$\therefore 42 = \frac{2AD}{3}$

$\Rightarrow \frac{42 \times 3}{2} = AD$

$\Rightarrow AD = 63$ cm

Putting the value in equation 4,

$63 = \frac{a\sqrt{3}}{2}$

$\Rightarrow \frac{63 \times 2}{\sqrt{3}} = a$

$\Rightarrow \frac{126}{\sqrt{3}} = a$

$\Rightarrow \frac{126 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} = a$ (rationalizing L.H.S)

$\Rightarrow \frac{126\sqrt{3}}{3} = a$

$\Rightarrow a = 42\sqrt{3}$ cm

o, area of equilateral triangle ABC $= \frac{\sqrt{3}}{4} \times a^2$ (where a = side of triangle)

$\Rightarrow$ Area of triangle ABC $= \frac{\sqrt{3}}{4} \times (42\sqrt{3})^2$ (putting the value of a)

$\Rightarrow$ Area of triangle ABC $= \frac{\sqrt{3}}{4} \times (1764 \times 3)$

$\Rightarrow$ Area of triangle ABC $= \frac{\sqrt{3}}{4} \times 5292$

$\Rightarrow$ Area of triangle ABC $= 1323\sqrt{3}\ cm^2 \rightarrow$ eqn5

Area of covered by design = Area of circle – Area of triangle ABC

Area covered by design $= 5544 - 1323\sqrt{3}$ (from eqn1 and eqn5)

$\Rightarrow$ Area covered by design $= 5544 - (1323 \times 1.73)$ (putting $\sqrt{3} = 1.73$)

$\Rightarrow$ Area covered by design = 5544 – 2288.79

$\therefore$ Area covered by design = 3255.21 cm^2

Area covered by design is 3255.21 cm^2.

Question: 49

We know perimeter of a sector = Length of its arc + 2R $\rightarrow$ eqn1

Where R = radius of the sector.

Perimeter = 25 cm

Also, length of arc of sector $= \frac{\theta}{360} \times 2\pi R$

$\theta = 90°$

$\therefore 25 = \frac{90}{360} \times 2\pi R + 2R$ (putting the values in eqn1)

$\Rightarrow 25 = \frac{2\pi R}{4} + 2R$

$\Rightarrow 25 = \frac{\pi R}{2} + 2R$

$\Rightarrow 25 \frac{\pi R + 4R}{2}$ (taking 2 as L. C. M on R. H. S)

$\Rightarrow 25 \times 2 = (\pi + 4)R$ (taking R common)

$\Rightarrow 50 = \left(\frac{22}{7} + 4\right)R \left(\text{putting } \pi = \frac{22}{7}\right)$

$\Rightarrow 50 = \left(\frac{22 + 28}{7}\right)R$ (taking 7 as L. C. M onR. H. S)

$\Rightarrow 50 \times 7 = 50R$

$\Rightarrow \frac{50 \times 7}{50} = R$

$\Rightarrow R = 7$ cm → eqn2

Area odf a secotor $= \frac{\theta}{360} \times \pi R^2$

$\Rightarrow$ Area of quadrant $= \frac{90}{360} \times \pi(7^2)$ (putting the value of θ amd R)

$\Rightarrow$ Area of the quadrant $= \frac{49\pi}{4} \left(\text{put } \pi = \frac{22}{7}\right)$

$\Rightarrow$ Area of the quadrant $= \frac{49 \times 22}{4 \times 7}$

$\Rightarrow$ Area of the quadrant $= \frac{7 \times 11}{2}$

∴ Area of the quadrant = 38.5 cm^2

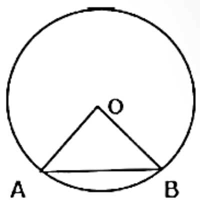
Area of the quadrant is 38.5 cm^2.

Question: 50

Given the radius of the circle = 42 cm

Central angle of the sector = θ = 90°

Area of the minor segment = Area of sector – area of the right angle triangle



Area of the sector $= \frac{\theta}{360} \times \pi R^2$

Area of the sector $= \frac{90}{360} \times \pi(10^2)$ (putting the values of θ and R)

$\Rightarrow$ Area of the sector $= \frac{100\pi}{4}$ (put $\pi = 3.14$)

$\Rightarrow$ Area of the sector $= \frac{100 \times 3.14}{4}$

⇒ Area of the sector = 25×3.14

∴ Area of the sector = 78.5 cm^2→ eqn1

Area of triangle $= \frac{1}{2} \times \text{base} \times \text{height}$

$\Longrightarrow$ Area of triangle $= \frac{1}{2} \times 10 \times 10$

$\therefore$ Area of triangle = 50 $cm^2 \rightarrow$ eqn2

Area of the minor segment = 78.5 – 50 (from eqn1, eqn2)

$\therefore$ Area of the minor segment = 28.5 cm^2

Area of the minor segment is 28.5 cm^2.