AREA RELATED TO CIRCLES

A1. Let the radius of the circle be r cm

Circumference of circle $= 2\pi r$

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

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

$$\Rightarrow \quad r = 14 \text{ cm}$$

Area of circle $= \pi r^2$

$$= \frac{22}{7} \times 14 \times 14 = 616 \text{ cm}^2$$

Hence, area of circle is 616 cm^2 **Ans.**

A2. Let the radius of the protactor be r cm.

Perimeter = 72 cm (given)

$$\Rightarrow \quad \pi r + 2r = 72$$

$$\Rightarrow \quad \frac{22}{7} \times r + 2r = 72$$

$$\Rightarrow \quad \frac{22r + 14r}{7} = 72$$

$$\Rightarrow \quad 36r = 72 \times 7$$

$$\Rightarrow \quad r = \frac{72 \times 7}{36}$$

$$\Rightarrow \quad r = 14 \text{ cm}$$

diameter $= 2r = 2 \times 14 = 28$ cm.

Hence, diameter of protactor is 28 cm. **Ans.**

A3. We have

Diameter of wheel = 84 cm

$$\Rightarrow \quad 2r = 84$$

$$\Rightarrow \quad r = \frac{84}{2} = 42 \text{ cm}$$

Circumference of a wheel $= 2\pi r$

$$= 2 \times \frac{22}{7} \times 42 = 264 \text{ cm}$$

Distance covered by a wheel in 1 minute $= \frac{39{\cdot}6 \times 1000 \times 100}{60}$ cm $= 66000$ cm

Number of revolutions in 1 minute $= \frac{66000}{264} = 250$

Hence, number of revolutions in 1 minute = 250 **Ans.**

A4. Join BD Then. BD is the diameter of the circle

$\therefore$ BD $= 2r$ units.

Diagonal of square $= \sqrt{2} \times$ side

$$\Rightarrow \quad \sqrt{2} \times \text{side} = 2r$$

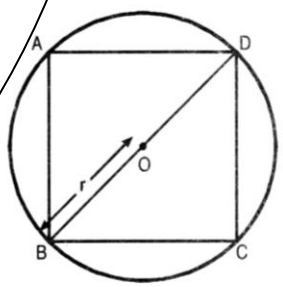
$$\Rightarrow \quad \text{side} = \frac{2r}{\sqrt{2}} = \sqrt{2}\, r$$

$\therefore$ Area of square $= (\text{side})^2$

Area of square $= (\sqrt{2}\, r)^2 = 2r^2$

and Area of circle $= \pi r^2$

Area of square : Area of circle $= 2r^2 : \pi r^2$



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

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

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

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

Hence area of square : Area of circle = 7 : 11 **Ans.**

A5. $\because$ In 60 minutes, minute hand describes angle = 360°

$\therefore$ In 5 minutes, minute hand describes angle = $\frac{360}{60} \times 5 = 30°$

Now $r = \sqrt{21}$ cm and $\theta = 30°$

$\therefore$ Area describes by the minute hand between

6 : 00 am to 6 : 05 am $= \frac{\theta}{360°} \pi r^2$

$$= \frac{30}{360} \times \frac{22}{7} \times (\sqrt{21})^2$$

$$= \frac{1}{12} \times \frac{22}{7} \times 21$$

$$= \frac{22}{4} = 5{\cdot}5 \text{ cm}^2.$$

Hence, area describes by minute hand = 5·5 cm². **Ans.**

A6. We have

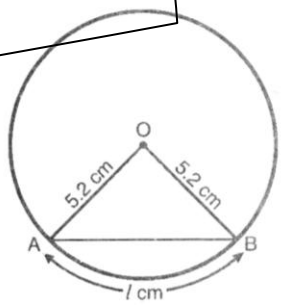
Perimeter of the circle = 16·4 cm

$\therefore$ OA + OB + Arc AB = 16·4

$\Rightarrow$ 5·2 + 5·2 + l = 16·4

$\Rightarrow$ l = 16·4 − 10·4

$\Rightarrow$ l = 6 cm

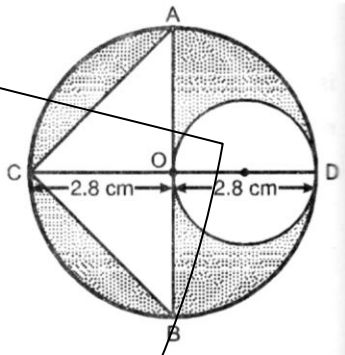


Area of the sector $= \frac{1}{2} \times l \times r$

$$= \frac{1}{2} \times 6 \times 5{\cdot}2 = 15{\cdot}6 \text{ cm}^2$$

Hence, area of the sector = 15·6 cm². **Ans.**

A7.



We have

Radius of bigger circle (R) = 2·8 cm

AB = CD = 5·6 cm (given)

CO = OD = AO = BO = $\frac{5{\cdot}6}{2}$ = 2·8 cm

Since AB and CD are perpendicular to each other

Therefore in right Δ AOC, we have

$AC^2 = CO^2 + AO^2$

$\Rightarrow$ $AC^2 = 2{\cdot}8^2 + 2{\cdot}8^2$

$\Rightarrow$ $AC^2 = 2 \times 2{\cdot}8^2$

$\Rightarrow$ $AC = 2{\cdot}8\sqrt{2}$

Now $AC = BC = 2{\cdot}8\sqrt{2}$ cm

$\angle ACB = 90°$ [Angle in a semicircle is 90°]

Area of shaded region = Bigger circle area − (ΔACB area + Smaller circle area)

$$= \pi R^2 - \left(\frac{1}{2} \times AC \times BC + \pi r^2\right)$$

$$= \frac{22}{7} \times 2{\cdot}8^2 - \left(\frac{1}{2} \times 2{\cdot}8\sqrt{2} \times 2{\cdot}8\sqrt{2} + \frac{22}{7} \times 1{\cdot}4^2\right)$$

$$= 24{\cdot}64 - (7{\cdot}84 + 6{\cdot}16)$$

$$= 24{\cdot}64 - 14$$

$$= 10{\cdot}64 \text{ cm}^2$$

Hence, area of shaded region = 10·64 cm². **Ans.**

A8. We have

$AB = 6$ cm, $BC = 10$ cm

In right ΔABC

$BC^2 = AB^2 + AC^2$ [By Pythagoras theorem]

$\Rightarrow 10^2 = 6^2 + AC^2$

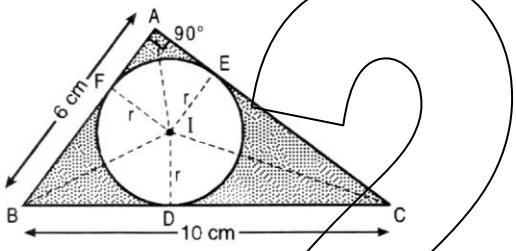
$\Rightarrow AC^2 = 10^2 - 6^2$

$\Rightarrow AC^2 = (10 + 6)(10 - 6)$

$\Rightarrow AC^2 = 16 \times 4$

$\Rightarrow AC^2 = 64$

$\Rightarrow AC = \sqrt{64} = 8$cm



Draw $ID \perp BC$, $IE \perp AC$ and $IF \perp AB$

Area of $\Delta ABC = \frac{1}{2} \times AB \times AC$

$= \frac{1}{2} \times 6 \times 8$

$= 24$ cm^2

Again area of ΔABC = Area of ΔIBC + Area of ΔIAC + Area of IAB

$\Rightarrow 24 = \frac{1}{2} \times 10 \times r + \frac{1}{2} \times 8 \times r + \frac{1}{2} \times 6 \times r$

$\Rightarrow 24 = 5r + 4r + 3r$

$\Rightarrow 12r = 24$

$\Rightarrow r = \frac{24}{12} = 2$cm

Area of shaded region = Area of ΔABC − Area of circle

$= 24 - \pi r^2$

$= 24 - 3{\cdot}14 \times (2)^2$

$= 24 - 3{\cdot}14 \times 4$

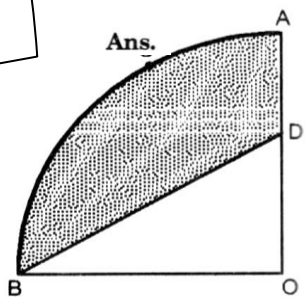
$= 24 - 12{\cdot}56$

$= 11{\cdot}44$ cm^2.

Hence, area of shaded region = $11{\cdot}44$ cm^2.

A9. We have

Radius of a quadrant $= 3{\cdot}5$ cm and $OD = 2$ cm



(i) Area of quadrant $OACB = \frac{1}{4} \times \pi \times (3{\cdot}5)^2$

$= \frac{1}{4} \times \frac{22}{7} \times 3{\cdot}5 \times 3{\cdot}5$

$= \frac{77}{8}$ cm^2.

(ii) In right ΔBOD, we have

$OB = 3{\cdot}5$ cm, and $OD = 2$ cm

Area of $\Delta OBD = \frac{1}{2} \times 3{\cdot}5 \times 2$

$= 3{\cdot}5$ cm^2 $= \frac{7}{2}$ cm^2

Area of shaded region = quadrant area − area of ΔBOD

$= \frac{77}{8} - \frac{7}{2}$

$= \frac{77 - 28}{8} = \frac{49}{8}$ cm^2.

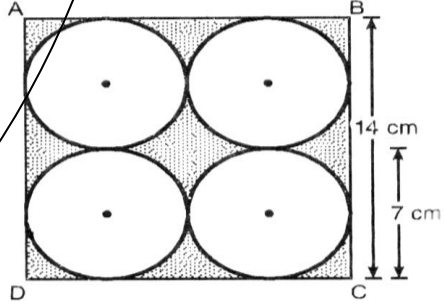
Hence, area of quadrant $= \frac{77}{8}$ cm^2 and area of shaded region $= \frac{49}{8}$ cm^2. **Ans.**

A10. We have

side of the square $= 14$ cm.

$\therefore$ Diameter of each circle $= \frac{14}{2} = 7$ cm

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



Area of shaded region

= Area of square − 4 × area of circle

$= 14 \times 14 - 4 \times \pi r^2$.

$= 196 - 4 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$

$= 196 - 22 \times 7$

$= 196 - 154$

$= 42$ cm^2.

Hence, area of shaded region = 42 cm^2. **Ans.**