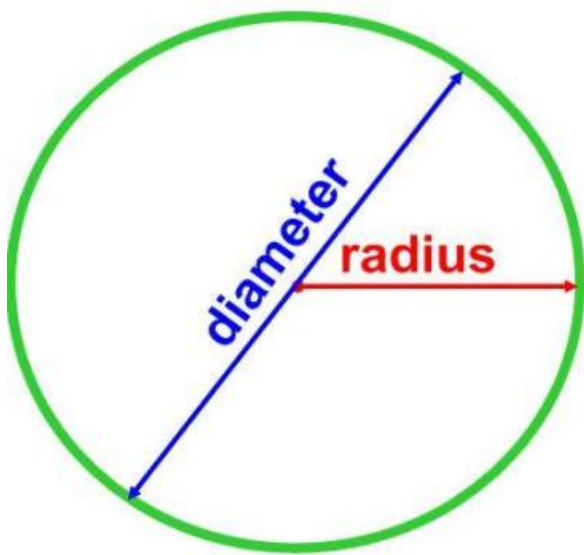


## Areas Of Circle, Sector & Segment

### Exercise 18



Area of a circle  
 $= \pi \times \text{radius}^2$

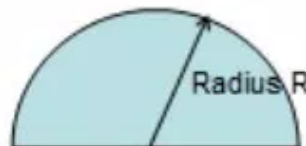
Circumference of a  
 circle  $= \pi \times \text{diameter}$

remember that the  
**diameter**  $= 2 \times \text{radius}$

### AREA OF A SEMICIRCLE

- A semicircle is just **half of a circle**. To find the area of a semicircle we just take **half of the area of a circle**.
- So, the formula for the area of a semicircle is:

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





# AREA OF A SECTOR

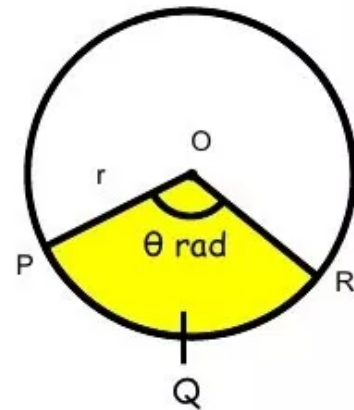
The area of a sector, A is proportional to the angle subtended at the centre of the circle.

$$\frac{\text{Area of sector OPQR}}{\text{Area of circle}} = \frac{\theta}{2\pi}$$

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

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

$$A = \frac{1}{2} r^2 \theta$$



## Measurement of area of sector of a circle in Radian

In general, if the angle of a sector,  $\theta$ , is measured in degree,

then the **area of the sector**,

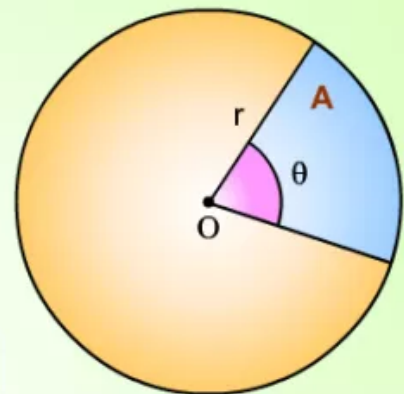
$$A = \frac{\theta}{360} \times \pi r^2$$

If  $\theta$  is measured in **radians**,

then the area of the sector,  $A = \frac{\theta}{2\pi} \times \pi r^2$

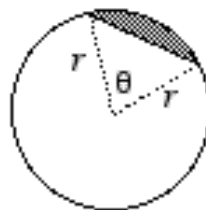
$$2\pi \text{ rad} = 360^\circ$$

$$\therefore A = \frac{1}{2} r^2 \theta$$



Segment of a Circle  
(shaded)

$$\begin{aligned} \text{Area} &= \frac{1}{2} r^2 (\theta - \sin \theta) \quad (\text{radians}) \\ &= \frac{1}{2} r^2 \left( \frac{\pi}{180} \theta - \sin \theta \right) \quad (\text{degrees}) \end{aligned}$$



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**Question 1:**

$$\text{Radius} = \frac{\text{Diameter}}{2} = \frac{35}{2} \text{ cm}$$

$$\text{Circumference of circle} = 2\pi r = \left(2 \times \frac{22}{7} \times \frac{35}{2}\right) \text{ cm} = 110 \text{ cm}$$

$$\therefore \text{Area of circle} = \pi r^2 = \left(\frac{22}{7} \times \frac{35}{2} \times \frac{35}{2}\right) \text{ cm}^2$$
$$= 962.5 \text{ cm}^2$$

**Question 2:**

$$\text{Circumference of circle} = 2\pi r = 39.6 \text{ cm}$$

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

$$r = \left(39.6 \times \frac{7}{44}\right) \text{ cm} = 6.3$$

$$r = 6.3 \text{ cm}$$

$$\text{Area of circle} = \pi r^2 = \left(\frac{22}{7} \times 6.3 \times 6.3\right) \text{ cm}^2$$
$$= 124.74 \text{ cm}^2$$

**Question 3:**

$$\text{Area of circle} = \pi r^2 = 301.84$$

$$\Rightarrow r^2 = 301.84 \times \frac{7}{22} = 96.04$$

$$r = \sqrt{96.04} \text{ cm} = 9.8 \text{ cm}$$

$$\text{Circumference of circle} = 2\pi r = \left(2 \times \frac{22}{7} \times 9.8\right) = 61.6 \text{ cm}$$

**Question 4:**

Let radius of circle be  $r$

Then, diameter =  $2r$

circumference - Diameter = 16.8

$$\Rightarrow 2\pi r - 2r = 16.8$$

$$\Rightarrow \frac{44}{7}r - 2r = 16.8$$

$$\Rightarrow \frac{30r}{7} = 16.8 \Rightarrow r = \frac{16.8 \times 7}{30} = 3.92 \text{ cm}$$

$$\text{Circumference of circle} = 2\pi r = \left(2 \times \frac{22}{7} \times 3.92\right) \text{ cm} = 24.64 \text{ cm}$$

**Question 5:**

Let the radius of circle be  $r$  cm

Then, circumference - radius = 37 cm

$$-r = 37$$

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

$$\frac{37r}{7} = 37 \Rightarrow r = \frac{37 \times 7}{37} = 7 \text{ cm}$$

$$\text{Area of circle} = \pi r^2 = \frac{22}{7} \times 7 \times 7 = 154 \text{ cm}^2$$

### Question 6:

$$\text{Area of square} = (\text{side})^2 = 484 \text{ cm}^2$$

$$\Rightarrow \text{side} = \sqrt{484} \text{ cm} = 22 \text{ cm}$$

$$\text{Perimeter of square} = 4 \times \text{side} = 4 \times 22 = 88 \text{ cm}$$

$$\text{Circumference of circle} = \text{Perimeter of square}$$

$$2\pi r = 88 \text{ cm} \Rightarrow r = \frac{88 \times 7}{2 \times 22} = 14 \text{ cm}$$

$$\text{Area of circle} = \pi r^2 = \left( \frac{22}{7} \times 14 \times 14 \right) \text{ cm}^2 = 616 \text{ cm}^2$$

### Question 7:

$$\text{Area of equilateral} = \frac{\sqrt{3}}{4} a^2 = 121\sqrt{3}$$

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

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

$$a = 22 \text{ cm}$$

$$\text{Perimeter of equilateral triangle} = 3a = (3 \times 22) \text{ cm} = 66 \text{ cm}$$

$$\text{Circumference of circle} = \text{Perimeter of circle}$$

$$2\pi r = 66$$

$$\Rightarrow \left( 2 \times \frac{22}{7} \times r \right) \text{ cm} = 66$$

$$\Rightarrow r = 10.5 \text{ cm}$$

$$\begin{aligned} \text{Area of circle} &= \pi r^2 = \left( \frac{22}{7} \times 10.5 \times 10.5 \right) \text{ cm}^2 \\ &= 346.5 \text{ cm}^2 \end{aligned}$$

### Question 8:

Let the radius of park be  $r$  meter

$$\begin{aligned}\text{Thus, } \pi r + 2r &= 90 \Rightarrow \frac{22r}{7} + 2r = 90 \\ \Rightarrow \frac{36r}{7} &= 90 \Rightarrow r = \frac{90 \times 7}{36} \\ r &= 17.5 \text{ cm}\end{aligned}$$

$$\begin{aligned}\text{Area of semicircle} &= \frac{1}{2} \pi r^2 = \left( \frac{1}{2} \times \frac{22}{7} \times 17.5 \times 17.5 \right) \text{m}^2 \\ &= 481.25 \text{ m}^2\end{aligned}$$

### Question 9:

Let the radii of circles be  $x$  cm and  $(7 - x)$  cm

Then,

$$2\pi x - [2\pi(7 - x)] = 8$$

$$2\pi x - [14\pi - 2\pi x] = 8$$

$$2\pi x - 14\pi + 2\pi x = 8$$

$$4\pi x - 14\pi = 8$$

$$2\pi x = 4 + 7\pi$$

$$2\pi x = 4 + 22$$

$$2\pi x = 26$$

Substitute the value of  $2\pi x$  in  $2\pi(7 - x)$

$$= 14\pi - 2\pi x = 14 \times \frac{22}{7} - 26$$

$$= 44 - 26 = 18 \text{ cm}$$

Circumference of the circles are 26 cm and 18 cm

### Question 10:

Area of first circle =  $\pi r^2 = 962.5 \text{ cm}^2$

$$r^2 = \left( 962.5 \times \frac{7}{22} \right) \text{cm}$$

$$r^2 = 306.25$$

$$r = 17.5 \text{ cm}$$

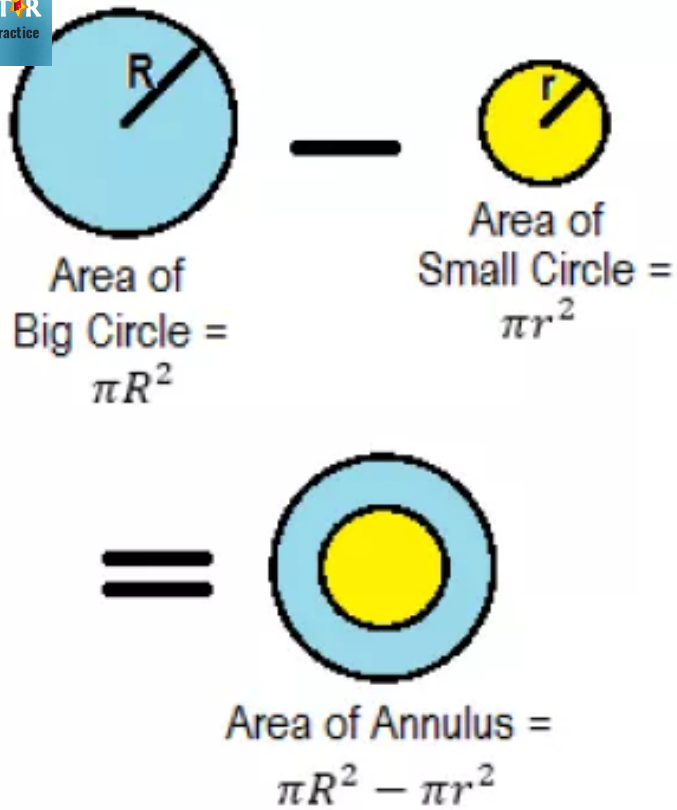
Area of second circle =  $\pi R^2 = 1386 \text{ cm}^2$

$$R^2 = \left( 1386 \times \frac{7}{22} \right) \text{cm}$$

$$R^2 = 441$$

$$\Rightarrow R = 21 \text{ cm}$$

Width of ring  $R - r = (21 - 17.5) \text{ cm} = 3.5 \text{ cm}$



**Question 11:**

$$\text{Area of outer circle} = \pi r_1^2 = \left(\frac{22}{7} \times 23 \times 23\right) \text{ cm}^2 = 1662.5$$

$$\text{Area of inner circle} = \pi r_2^2 = \left(\frac{22}{7} \times 12 \times 12\right) \text{ cm}^2 = 452.2 \text{ cm}^2$$

$$\text{Area of ring} = \text{Outer area} - \text{inner area} = (1662.5 - 452.5) \text{ cm}^2 = 1210 \text{ cm}^2$$

**Question 12:**

Inner radius of the circular park = 17 m

Width of the path = 8 m

Outer radius of the circular park =  $(17 + 8)\text{m} = 25 \text{ m}$

$$\text{Area of path} = \pi[(25)^2 - (17)^2] = \text{cm}^2$$

$$= \pi(25+17)(25-17)\text{m}^2$$

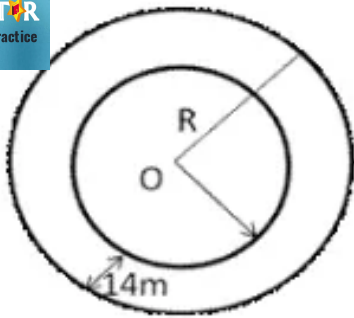
$$= \left[\frac{22}{7} \times 42 \times 8\right]\text{m}^2$$

$$\text{Area} = 1056 \text{ m}^2$$

**Question 13:**

Let the inner and outer radii of the circular tracks be  $r$  meter and  $R$  meter respectively. Then

Inner circumference = 440 meter



$$\Rightarrow 2\pi r = 440$$

$$2 \times \frac{22}{7} \times r = 440$$

$$\Rightarrow r = 70 \text{ m}$$

Since the track is 14 m wide every where.

Therefore,

$$\text{Outer radius } R = r + 14\text{m} = (70 + 14) \text{ m} = 84 \text{ m}$$

$$\text{Outer circumference} = 2\pi R$$

$$= \left(2 \times \frac{22}{7} \times 84\right) \text{ m} = 528 \text{ m}$$

$$\text{Rate of fencing} = \text{Rs. 5 per meter}$$

$$\text{Total cost of fencing} = \text{Rs. } (528 \times 5) = \text{Rs. 2640}$$

$$\text{Area of circular ring} = \pi R^2 - \pi r^2$$

$$= \pi (84^2 - 70^2) = \frac{22}{7} \times 2156 = 6776 \text{ m}^2$$

$$\text{Cost of levelling} = \text{Rs 0.25 per m}^2$$

$$\text{Cost of levelling the track} = \text{Rs}(6776 \times 0.25) = \text{Rs. 1694}$$

#### Question 14:

Let  $r$  m and  $R$  m be the radii of inner circle and outer boundaries respectively.

$$\text{Then, } 2r = 352 \text{ and } 2R = 396$$

$$r = \frac{352}{2\pi}, R = \frac{396}{2\pi}$$

$$\text{Width of the track} = (R - r) \text{ m}$$

$$= \left(\frac{396}{2\pi} - \frac{352}{2\pi}\right) \text{ m} = \left(\frac{44}{2\pi}\right) \text{ m}$$

$$= \left(\frac{44}{2} \times \frac{7}{22}\right) \text{ m} = 7 \text{ m}$$



$$\begin{aligned}
 \text{Area of the track} &= \pi(R^2 - r^2) = \pi(R+r)(R-r) \\
 &= \left[ \pi \left( \frac{352}{2\pi} + \frac{396}{2\pi} \right) \times 7 \right] \text{m}^2 \\
 &= \left[ \left( \pi \times \frac{748}{2\pi} \right) \times 7 \right] \text{m}^2 = (374 \times 7) \text{m}^2 \\
 &= 2618 \text{ m}^2
 \end{aligned}$$

**Question 15:**

$$\text{Area of rectangle} = (120 \times 90)$$

$$= 10800 \text{ m}^2$$

$$\text{Area of circular lawn} = [\text{Area of rectangle} - \text{Area of park excluding circular lawn}]$$

$$= [10800 - 2950] \text{ m}^2 = 7850 \text{ m}^2$$

$$\text{Area of circular lawn} = 7850 \text{ m}^2$$

$$\Rightarrow \pi r^2 = 7850 \text{ m}^2$$

$$3.14 \times r^2 = 7850 \text{ m}^2$$

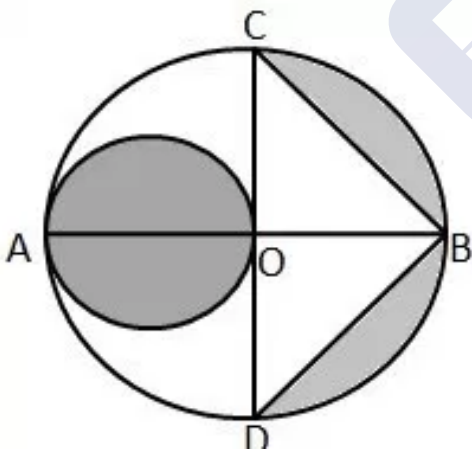
$$r^2 = \left( \frac{7850}{3.14} \right) \text{m}^2$$

$$= 2500 \text{ m}^2$$

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

$$\text{or } r = 50 \text{ m}$$

Hence, radius of the circular lawn = 50 m

**Question 16:**

Area of the shaded region = (area of circle with OA as diameter) + (area of semicircle  $\Delta DBC$ ) - (area of  $\Delta BCD$ )

$$\text{Area of circle with OA as diameter} = \pi r^2$$

$$= \left( \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \right) \text{cm}^2$$

$$= 38.5 \text{ m}^2$$



$$= 7 \text{ cm}, CD = AB = 14 \text{ cm}$$

$$\text{Area of semicircle } \triangle DBC = \frac{1}{2} \pi r^2 - \left( \frac{1}{2} \times \frac{22}{7} \times 7 \times 7 \right) \text{ cm}^2$$

$$= 72$$

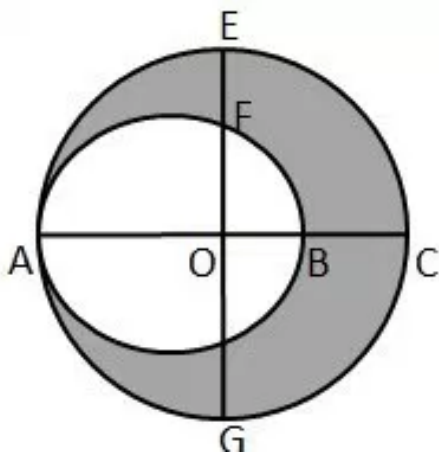
$$\text{Area of } \triangle BCD = \frac{1}{2} \times DC \times OB$$

$$= \frac{1}{2} \times 14 \times 7$$

$$= 49 \text{ cm}^2$$

$$\text{Area of shaded region} = (38.5 + 77 - 49)$$

$$= 66.5 \text{ cm}^2$$

**Question 17:**

$$\text{Diameter of bigger circle} = AC = 54 \text{ cm}$$

$$\text{Radius of bigger circle} = \frac{AC}{2}$$

$$= \left( \frac{54}{2} \right) \text{ cm} = 27 \text{ cm}$$

$$\text{Diameter AB of smaller circle} = AC - BC = 54 - 10 = 44 \text{ cm}$$

$$\text{Radius of smaller circle} = \frac{44}{2} \text{ cm} = 22 \text{ cm}$$

$$\text{Area of bigger circle} = \pi R^2 = \left( \frac{22}{7} \times 27 \times 27 \right) \text{ cm}^2$$

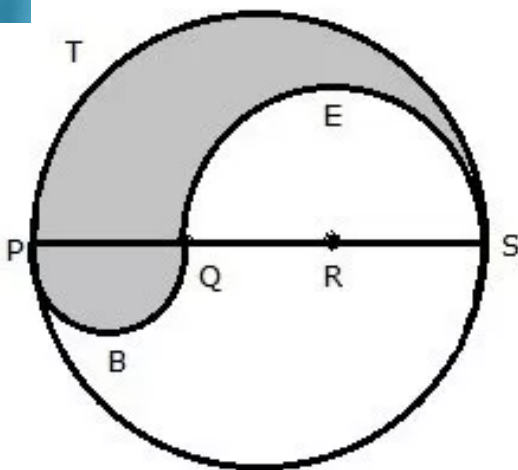
$$= 2291.14 \text{ cm}^2$$

$$\text{Area of smaller circle} = \pi r^2 = \left( \frac{22}{7} \times 22 \times 22 \right) \text{ cm}^2$$

$$= 1521.11 \text{ cm}^2$$

$$\text{Area of shaded region} = \text{area of bigger circle} - \text{area of smaller circle}$$

$$= (2291.14 - 1521.11) \text{ cm}^2 = 770 \text{ cm}^2$$

**Question 18:**

$$PS = 12 \text{ cm}$$

$$PQ = QR = RS = 4 \text{ cm}, QS = 8 \text{ cm}$$

$$\text{Perimeter} = \text{arc PTS} + \text{arc PBQ} + \text{arc QES}$$

$$= (\pi \times 6 + \pi \times 2 + \pi \times 4) \text{ cm}$$

$$= 12\pi \text{ cm}$$

$$= 12\pi = 12 \times 3.14 \text{ cm}$$

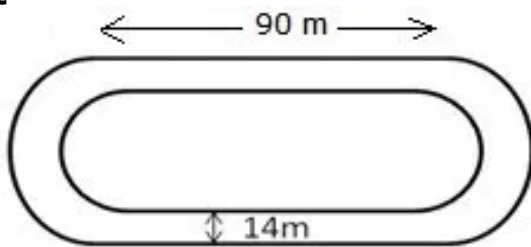
$$= 37.68 \text{ cm}$$

Area of shaded region = (area of the semicircle PBQ) + (area of semicircle PTS) - (Area of semicircle QES)

$$= \left[ \frac{1}{2} \pi \times (2)^2 + \frac{1}{2} \times \pi \times (6)^2 - \frac{1}{2} \times \pi \times (4)^2 \right] \text{ cm}^2$$

$$= [2\pi + 18\pi - 8\pi] = 12\pi \text{ cm}^2 = (12 \times 3.14) \text{ cm}^2$$

$$= 37.68 \text{ cm}^2$$

**Question 19:**

Length of the inner curved portion

$$= (400 - 2 \times 90) \text{ m}$$

$$= 220 \text{ m}$$

Let the radius of each inner curved part be  $r$

$$\text{Then, } \frac{22}{7} \times r = 110 \text{ m}$$

$$r = \left( 110 \times \frac{7}{22} \right) \text{ m} = 35 \text{ m}$$

Inner radius = 35 m, outer radius =  $(35 + 14) = 49 \text{ m}$

Area of the track = (area of 2 rectangles each  $90 \text{ m} \times 14 \text{ m}$ ) + (area of circular ring with  $R = 49 \text{ m}$ ,  $r = 35 \text{ m}$ )

$$= \left[ 2 \times 90 \times 14 + \frac{22}{7} \{ (49)^2 - (35)^2 \} \right] \text{ m}^2$$

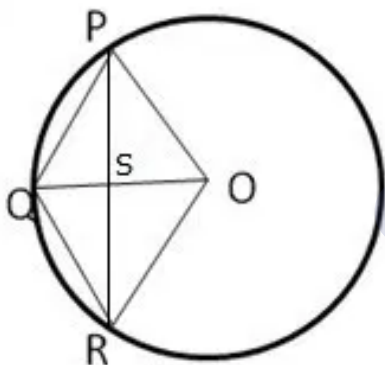
$$= \left[ 2520 + \frac{22}{7} (49 + 35)(49 - 35) \right] \text{ m}^2$$

$$= [2520 + 3696] \text{ m}^2 = 6216 \text{ m}^2$$

Length of outer boundary of the track

$$= \left[ 2 \times 90 + 2 \times \frac{22}{7} \times 49 \right] \text{ m} = 488 \text{ m}$$

**Question 20:**



$$OP = OR = OQ = r$$

Let OQ and PR intersect at S

We know the diagonals of a rhombus bisect each other at right angle.



Therefore we have

$$OS = \frac{1}{2}r \text{ and } \angle OSR = 90^\circ$$

$$\therefore SR = \sqrt{OR^2 - OS^2}$$

$$= \sqrt{r^2 - \frac{r^2}{4}} = \frac{\sqrt{3}r}{2}$$

$$\therefore PR = 2 \times SR = \sqrt{3}r$$

$$\text{Area of rhombus} = \frac{1}{2} \times OQ \times PR$$

$$= \frac{1}{2} \times r \times \sqrt{3}r = \frac{\sqrt{3}r^2}{2}$$

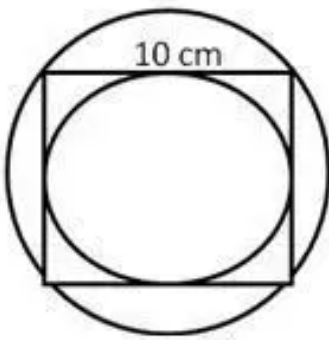
$$\therefore \frac{\sqrt{3}r^2}{2} = 32\sqrt{3} \Rightarrow r^2 = \frac{32\sqrt{3}}{\sqrt{3}} \times 2 = 64 \text{ cm}$$

$$r = 8 \text{ cm}$$

**Question 21:**

Diameter of the inscribed circle = Side of the square = 10 cm

Radius of the inscribed circle = 5 cm



Diameter of the circumscribed circle

= Diagonal of the square

=  $(\sqrt{2} \times 10)$  cm

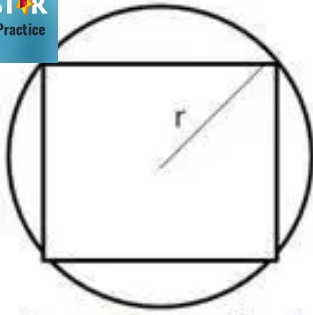
Radius of circumscribed circle =  $5\sqrt{2}$  cm

(i) Area of inscribed circle =  $\left(\frac{22}{7} \times 5 \times 5\right) = 78.57 \text{ cm}^2$

(ii) Area of the circumscribed circle =  $\left(\frac{22}{7} \times 5\sqrt{2} \times 5\sqrt{2}\right) = 157.14 \text{ cm}^2$

**Question 22:**

Let the radius of circle be  $r$  cm



Then diagonal of square = diameter of circle =  $2r$  cm

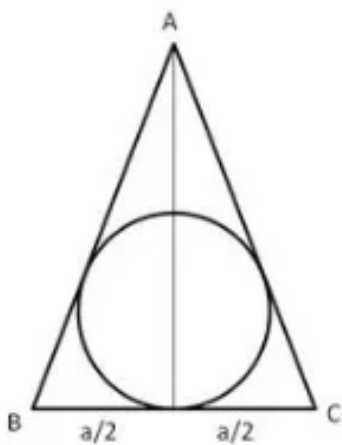
Area of the circle =  $\pi r^2$  cm<sup>2</sup>

$$\begin{aligned}\text{Area of square} &= \frac{1}{2} \times (\text{diagonal})^2 \\ &= \frac{1}{2} \times 4r^2 = 2r^2 \text{ cm}^2\end{aligned}$$

$$\text{Ratio} = \frac{\text{Area of circle}}{\text{Area of square}} = \frac{\pi r^2}{2r^2} = \frac{\pi}{2} = (\pi : 2)$$

### Question 23:

Let the radius of circle be  $r$  cm



$$\text{Then, } \pi r^2 = 154$$

$$\Rightarrow r^2 = \left(154 \times \frac{7}{22}\right)$$

$$\Rightarrow r = 7 \text{ cm}$$

Let each side of the triangle be  $a$  cm

height be  $h$  cm

$$\text{Then, } r = \frac{h}{3}$$

$$\Rightarrow h = 3r = 21 \text{ cm}$$

$$h = \sqrt{a^2 - \frac{a^2}{4}} = \frac{\sqrt{3a^2}}{2} = \frac{\sqrt{3}a}{2} = 21$$

$$a = \frac{42}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 14\sqrt{3} \text{ cm}$$

$$\begin{aligned} \text{Perimeter} &= 3a = (3 \times 14 \times \sqrt{3}) = (42 \times 1.73) \text{ cm} \\ &= 72.66 \text{ cm} \end{aligned}$$

**Question 24:**

Radius of the wheel = 42 cm

$$\text{Circumference of wheel} = 2\pi r = \left(2 \times \frac{22}{7} \times 42\right) = 264 \text{ cm}$$

Distance travelled = 19.8 km = 1980000 cm

$$\text{Number of revolutions} = \frac{1980000}{264} = 7500$$

**Question 25:**

Radius of wheel = 2.1 m

$$\text{Circumference of wheel} = 2\pi r = \left(2 \times \frac{22}{7} \times 2.1\right) = 13.2 \text{ m}$$

Distance covered in one revolution = 13.2 m

$$\begin{aligned} \text{Distance covered in 75 revolutions} &= (13.2 \times 75) \text{ m} = 990 \text{ m} \\ &= \frac{990}{1000} \text{ km} \end{aligned}$$

$$\text{Distance a covered in 1 minute} = \frac{99}{100} \text{ km}$$

$$\text{Distance covered in 1 hour} = \frac{99}{100} \times 60 \text{ km} = 59.4 \text{ km}$$

**Question 26:**

Distance covered by the wheel in 1 revolution

$$= \left( \frac{4.95 \times 1000 \times 100}{2500} \right) \text{ cm} = 198 \text{ cm}$$

The circumference of the wheel = 198 cm

Let the diameter of the wheel be  $d$  cm

$$\text{Then, } \pi d = 198 \Rightarrow \frac{22}{7} \times d = 198$$

$$\Rightarrow d = \frac{198 \times 7}{22} = 63 \text{ cm}$$

Hence diameter of the wheel is 63 cm

**Question 27:**

$$\text{Radius of the wheel} = r = \frac{60}{2} = 30 \text{ cm}$$

$$\text{Circumference of the wheel} = 2\pi r = \left(2 \times \frac{22}{7} \times 30\right) = \frac{1320}{7} \text{ cm}$$

Distance covered in 140 revolution



$$\left( \frac{1320}{7} \times 140 \right) \text{ cm} = (1320 \times 20) \text{ cm}$$

$$= 26400 \text{ cm} = \frac{26400}{100} \text{ m} = 264 \text{ m} = \frac{264}{1000} \text{ km}$$

Distance covered in one hour =  $\frac{264}{1000} \times 60 = 15.84 \text{ km}$

**Question 28:**

Distance covered by a wheel in 1 minute

$$= \left( \frac{72.6 \times 1000 \times 100}{60} \right) \text{ cm} = 121000 \text{ cm}$$

Circumference of a wheel =  $2\pi r = \left( 2 \times \frac{22}{7} \times 70 \right) = 440 \text{ cm}$

Number of revolution in 1 min =  $\frac{121000}{440} = 275$

**Question 29:**

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

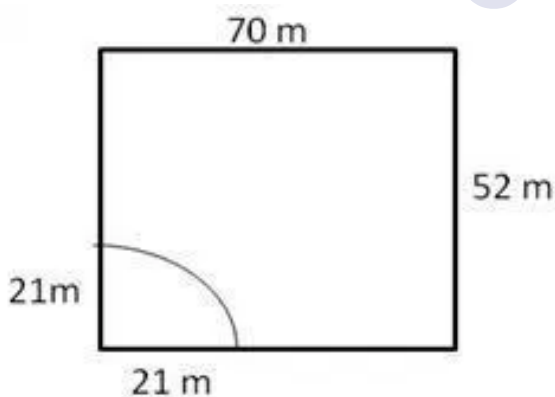
Circumference of circle =  $2\pi r = 22$

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

$$\Rightarrow r = \frac{22 \times 7}{2 \times 22} = 3.5 \text{ cm}$$

$$\text{Area of quadrant} = \frac{1}{4} \pi r^2 = \left( \frac{1}{4} \times \frac{22}{7} \times 3.5 \times 3.5 \right) \text{ cm}^2$$

$$= 9.625 \text{ cm}^2$$

**Question 30:**

Area which the horse can graze = Area of the quadrant of radius 21 m

$$= \left( \frac{1}{4} \times \frac{22}{7} \times 21 \times 21 \right) \text{ m}^2$$

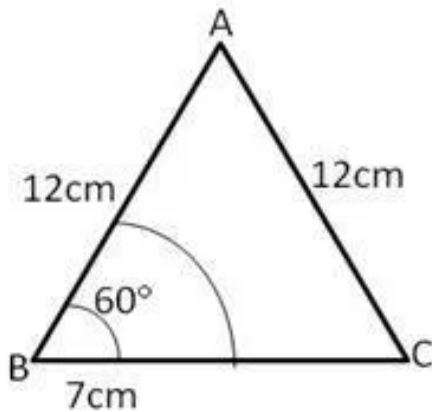
$$= 346.5 \text{ m}^2$$



$$\begin{aligned} \text{Area ungrazed} &= [(70 \times 52) - 346.5] \text{ m}^2 \\ &= 3293.5 \text{ m}^2 \end{aligned}$$

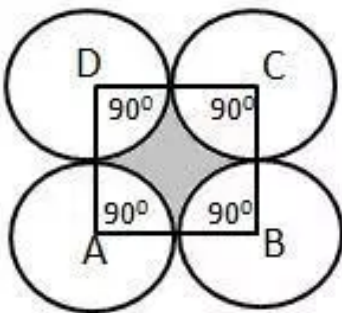
**Question 31:**

Each angle of equilateral triangle is  $60^\circ$



$$\begin{aligned} \text{Area which cannot be grazed} &= (\text{area of equilateral } \triangle ABC) \\ &\quad - (\text{area of the sector with } r = 7\text{m}, \theta = 60^\circ) \\ &= \left[ \frac{\sqrt{3}}{4} \times (12)^2 - \frac{22}{7} \times (7)^2 \times \frac{60}{360} \right] \text{ m}^2 \\ &= \left[ (\sqrt{3} \times 12 \times 3) - \frac{(22 \times 7)}{6} \right] \\ &= 62.35 - 25.66 \text{ m}^2 \\ &= 36.68 \text{ m}^2 \end{aligned}$$

Area that the horse cannot graze is  $36.68 \text{ m}^2$

**Question 32:**

Each side of the square is 14 cm

$$\begin{aligned} \text{Then, area of square} &= (14 \times 14) \text{ cm}^2 \\ &= 196 \text{ cm}^2 \end{aligned}$$

Thus, radius of each circle 7 cm

$$\text{Required area} = \text{area of square ABCD} - 4 (\text{area of sector with } r = 7 \text{ cm}, \theta = 90^\circ)$$



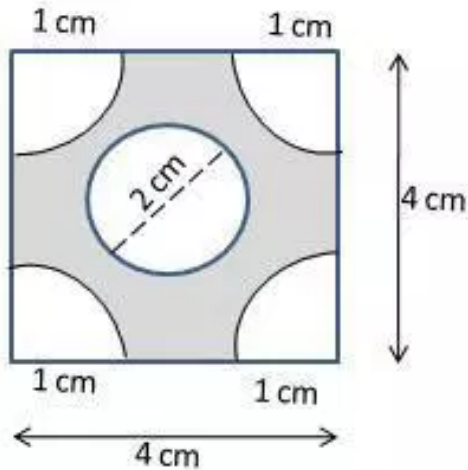
$$= \left[ 196 - 4 \times \frac{22}{7} \times 7 \times 7 \times \frac{90}{360} \right] \text{cm}^2$$

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

$$= 42 \text{ cm}^2$$

Area of the shaded region =  $42 \text{ cm}^2$

### Question 33:



Area of square =  $(4 \times 4) \text{ cm}^2$

=  $16 \text{ cm}^2$

Area of four quadrant corners

$$= 4 \left[ \frac{1}{4} \pi^2 \right]$$

$$= \pi^2$$

$$= (\pi \times 1 \times 1) \text{ cm}^2$$

$$= 3.14 \text{ cm}^2$$

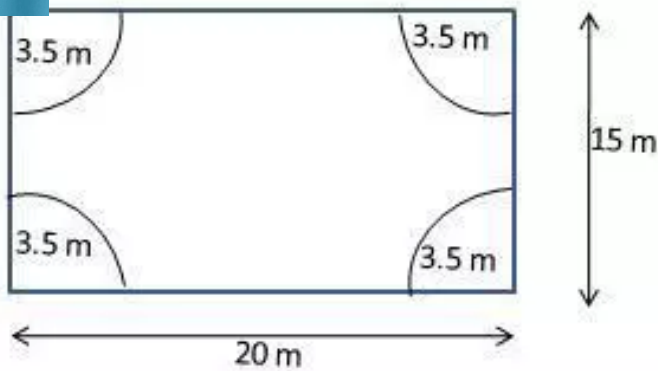
Radius of inner circle =  $2/2 = 1 \text{ cm}$

Area of circle at the center =  $\pi r^2 = (3.14 \times 1 \times 1) \text{ cm}^2$

=  $3.14 \text{ cm}^2$

Area of shaded region = [area of square – area of four corner quadrants – area of circle at the centre]

=  $[16 - 3.14 - 3.14] \text{ cm}^2 = 9.72 \text{ cm}^2$

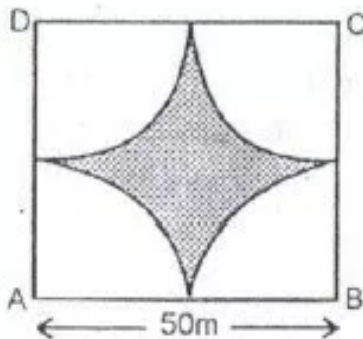
**Question 34:**

Area of rectangle =  $(20 \times 15) \text{ m}^2 = 300 \text{ m}^2$

Area of 4 corners as quadrants of circle

$$\begin{aligned}
 &= 4 \times \left( \frac{1}{4} \pi r^2 \right) \\
 &= \left[ \frac{22}{7} \times 3.5 \times 3.5 \right] \text{m}^2 \\
 &= 38.5 \text{ m}^2
 \end{aligned}$$

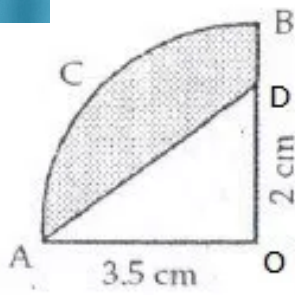
Area of remaining part = (area of rectangle - area of four quadrants of circles)  
 $= (300 - 38.5) \text{ m}^2 = 261.5 \text{ m}^2$

**Question 35:**

Ungrazed area

$$\begin{aligned}
 &= \text{shaded area} \\
 &= \left[ (50 \times 50) - \frac{4 \times \pi \times (25)^2 \times 90}{360} \right] \text{m}^2 \\
 &= [2500 - 3.14 \times 25 \times 25] \text{m}^2 \\
 &= [2500 - 1962.5] \text{m}^2 \\
 &= 537.5 \text{ m}^2
 \end{aligned}$$

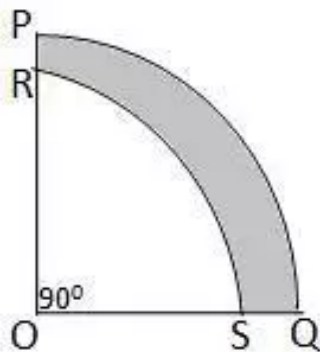
# **Question 36:**



Shaded area = (area of quadrant) – (area of DAOD)

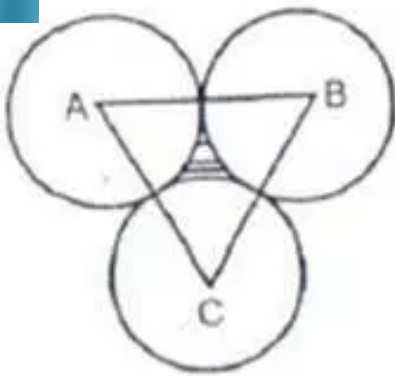
$$\begin{aligned}
 &= \left[ \frac{1}{4} \pi^2 - \frac{1}{2} \times h \times b \right] \\
 &= \left[ \frac{1}{4} \times \frac{22}{7} \times 3.5 \times 3.5 - \frac{1}{2} \times 2 \times 3.5 \right] \text{cm}^2 \\
 &= (9.625 - 3.5) \text{cm}^2 = 6.125 \text{cm}^2
 \end{aligned}$$

# **Question 37:**



Area of flower bed = (area of quadrant OPQ) – (area of the quadrant ORS)

$$\begin{aligned}
 &= \left[ \frac{1}{4} \pi_1^2 - \frac{1}{4} \pi_2^2 \right] \\
 &= \left[ \frac{1}{4} \times \frac{22}{7} \times 21 \times 21 - \frac{1}{4} \times \frac{22}{7} \times 14 \times 14 \right] \text{m}^2 \\
 &= [346.5 - 154] \text{m}^2 = 192.5 \text{m}^2
 \end{aligned}$$

**Question 38:**

Let A, B, C be the centres of these circles. Join AB, BC, CA

Required area = (area of  $\triangle ABC$  with each side  $a = 12$  cm)  $- 3$ (area of sector with  $r = 6$ ,  $\theta = 60^\circ$ )

$$= \left[ \frac{\sqrt{3}}{4} \times (12)^2 - 3 \times \left( 3.14 \times (6)^2 \times \frac{60}{360} \right) \right]$$

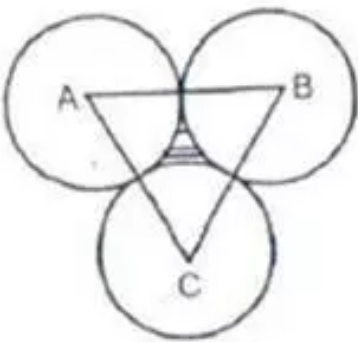
$$= \left[ \frac{\sqrt{3}}{4} \times 12 \times 12 - 3 \times 3.14 \times 6 \right] \text{ cm}^2$$

$$= (36 \times 1.73 - 56.52) \text{ cm}^2$$

$$= (62.28 - 56.52) \text{ cm}^2$$

$$= 5.76 \text{ cm}^2$$

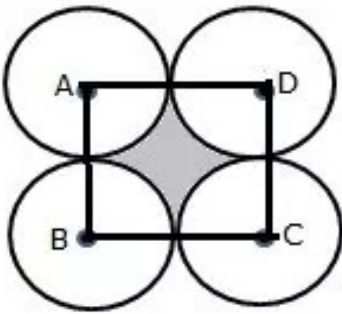
The area enclosed =  $5.76 \text{ cm}^2$

**Question 39:**

Let A, B, C be the centers of these circles. Join AB, BC, CA

Required area = (area of  $\triangle ABC$  with each side 2)  $- 3$ [area of sector with  $r = 2$  cm,  $\theta = 60^\circ$ ]

$$\begin{aligned}
 &= \left[ \frac{\sqrt{3}}{4} \times (2a)^2 - \frac{3\pi a^2 \times 60}{360} \right] \\
 &= (1.73a^2 - 1.57a^2) \\
 &= 0.16a^2 \\
 &= \frac{16}{100}a^2 \\
 &= \left( \frac{4}{25}a^2 \right) \text{sq. unit}
 \end{aligned}$$

**Question 40:**

Let A, B, C, D be the centres of these circles

Join AB, BC, CD and DA

Side of square = 10 cm

Area of square ABCD

$$= (10 \times 10) \text{ cm}^2$$

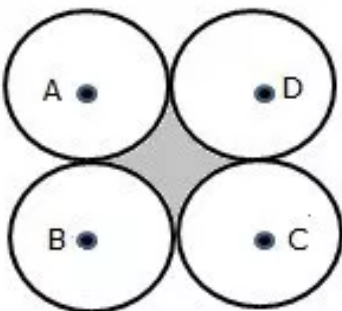
$$= 100 \text{ cm}^2$$

$$\begin{aligned}
 \text{Area of each sector} &= \left( \pi^2 \times \frac{\theta}{360} \right) = 3.14 \times 5 \times 5 \times \frac{90}{360} \\
 &= 19.625 \text{ cm}^2
 \end{aligned}$$

Required area = [area of sq. ABCD - 4(area of each sector)]

$$= (100 - 4 \times 19.625) \text{ cm}^2$$

$$= (100 - 78.5) = 21.5 \text{ cm}^2$$

**Question 41:**

Required area = [area of square - areas of quadrants of circles]

Let the side = 2a unit and radius = a units



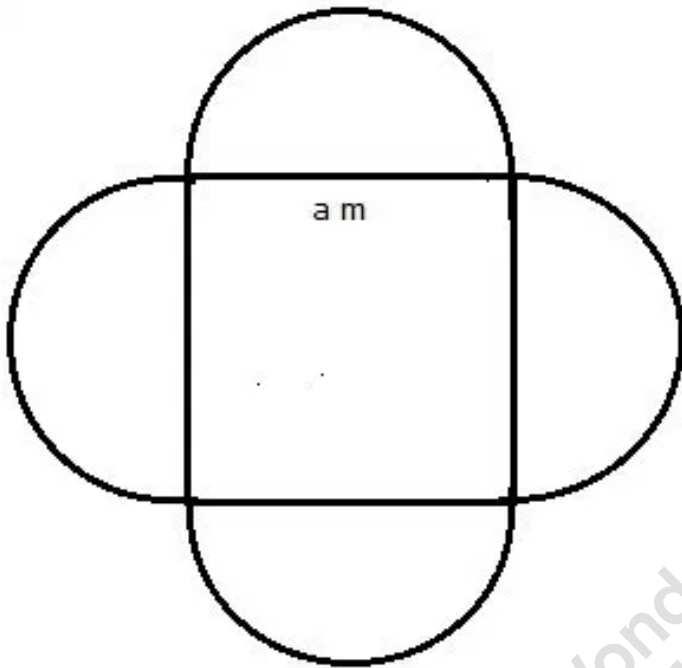
Area of square = (side  $\times$  side) =  $(2a \times 2a)$  sq. units =  $4a^2$  sq. units

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

$$\text{Area of 4 quadrants} = 4 \times \frac{1}{4} \pi r^2 = \pi r^2 = \frac{22}{7} \times a \times a = \frac{22}{7} a^2 \text{ sq. unit}$$

$$\text{Required area} = \left( 4a^2 - \frac{22}{7} a^2 \right) \text{ sq. unit} = \frac{6a^2}{7}$$

### Question 42:



Let the side of square =  $a$  m

$$\text{Area of square} = (a \times a) \text{ cm} = a^2 \text{ m}^2$$

$$\therefore a^2 = 1600$$

$$a = \sqrt{1600} \text{ m}$$

$$a = 40 \text{ m}$$

Side of square = 40 m

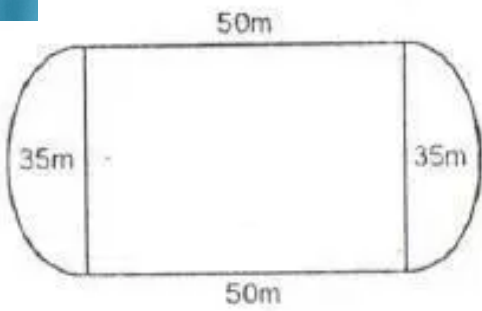
Therefore, radius of semi circle = 20 m

$$\begin{aligned} \text{Area of semi circle} &= \frac{1}{2} \pi r^2 = \left( \frac{1}{2} \times 3.14 \times 20 \times 20 \right) \text{ m}^2 \\ &= 628 \text{ m}^2 \end{aligned}$$

$$\text{Area of four semi circles} = (4 \times 628) \text{ m}^2 = 2512 \text{ m}^2$$

Cost of turfing the plot of area  $1 \text{ m}^2$  = Rs. 1.25

$$\begin{aligned} \text{Cost of turfing the plot of area } 2512 \text{ m}^2 &= \text{Rs. } (1.25 \times 2512) \\ &= \text{Rs. } 3140 \end{aligned}$$

**Question 43:**

Area of rectangular lawn in the middle

$$= (50 \times 35) = 1750 \text{ m}^2$$

$$\text{Radius of semi circles} = \frac{35}{2} = 17.5 \text{ m}$$

**Area of two semicircles = 2(area of semi circle)**

$$= \left[ 2 \left( \frac{1}{2} \pi r^2 \right) \right] \text{m}^2$$

$$= \left( 2 \times \frac{1}{2} \times \frac{22}{7} \times 17.5 \times 17.5 \right) \text{m}^2$$

$$= 962.5 \text{ m}^2$$

Area of lawn = (area of rectangle + area of semi circle)

$$= (1750 + 962.5) \text{ m}^2 = 2712.5 \text{ m}^2$$

**Question 44:**

Area of plot which cow can graze when  $r = 16 \text{ m}$  is  $\pi r^2$

$$= \left( \frac{22}{7} \times 10.5 \times 10.5 \right)$$

$$= 804.5 \text{ m}^2$$

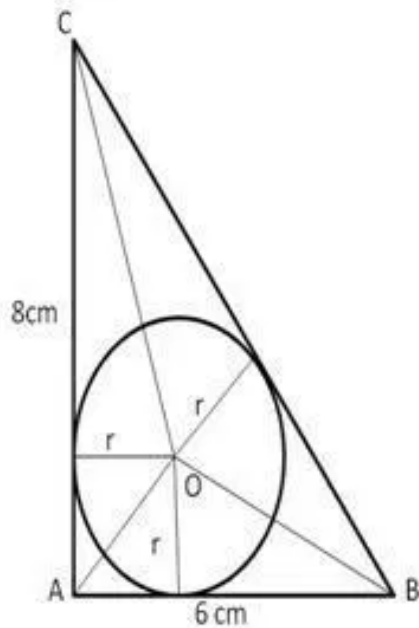
Area of plot which cow can graze when radius is increased to  $23 \text{ m}$

$$= \left( \frac{22}{7} \times 23 \times 23 \right)$$

$$= 1662.57 \text{ m}^2$$

Additional ground = Area covered by increased rope – old area

$$= (1662.57 - 804.5) \text{ m}^2 = 858 \text{ m}^2$$

**Question 45:**

Given: ABC is right angled at A with AB = 6 cm and AC = 8 cm

$$BC = \sqrt{AB^2 + AC^2} = \sqrt{(6)^2 + (8)^2} \text{ cm}$$
$$= \sqrt{36 + 64} \text{ cm}$$

$$BC = \sqrt{100} \text{ cm} = 10 \text{ cm}$$

Let us join OA, OB and OC

$$\text{ar}(\triangle AOC) + \text{ar}(\triangle OAB) + \text{ar}(\triangle BOC) = \text{ar}(\triangle ABC)$$

$$\Rightarrow \left(\frac{1}{2} \times 8 \times r\right) + \left(\frac{1}{2} \times 6 \times r\right) + \left(\frac{1}{2} \times 10 \times r\right)$$
$$= \frac{1}{2} \times 6 \times 8$$

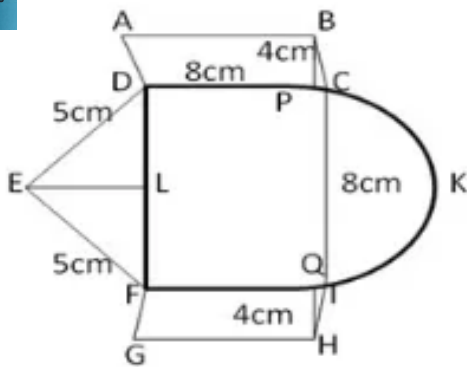
$$4r + 3r + 5r = 24$$

$$12r = 24$$

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

$$\text{Radius} = 2 \text{ cm}$$

### Question 46:



Given  $BP \perp CD$ ,  $HQ \perp FI$  and  $EL \perp DF$ ,  
 $DC = 8$  cm,  $BP = HQ = 4$  cm and  $DE = EF = 5$  cm  
 Area of parallelogram  $ABCD = BP \times DC$

$$= 4 \times 8 = 32 \text{ cm}^2$$

Area of parallelogram  $FGHI = FI \times HQ$

$$= 8 \times 4 = 32 \text{ cm}^2$$

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

$$= \frac{1}{2} \times 3.14 \times (4)^2 = 25.12 \text{ cm}^2$$

Area of isosceles  $\triangle DEF = \frac{1}{4} b \sqrt{4a^2 - b^2}$

$$= \frac{1}{4} (8) \sqrt{4(5)^2 - (8)^2} = 2\sqrt{100 - 64}$$

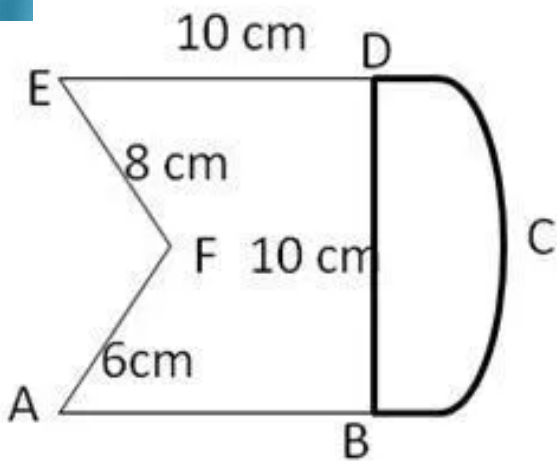
$$= 2\sqrt{36} = 12 \text{ cm}^2$$

Area of square  $CDFI = (\text{side})^2 = (8)^2 = 64 \text{ cm}^2$

Area of whole figure = area of  $\parallel^{\text{gm}} ABCD$  + area of  $\parallel^{\text{gm}} FGHI$   
 + area of semi-circle  $CKI$  + area of  $\triangle DEF$   
 + area of square  $CDFI$

$$= (32 + 32 + 25.12 + 12 + 64) \text{ cm}^2$$

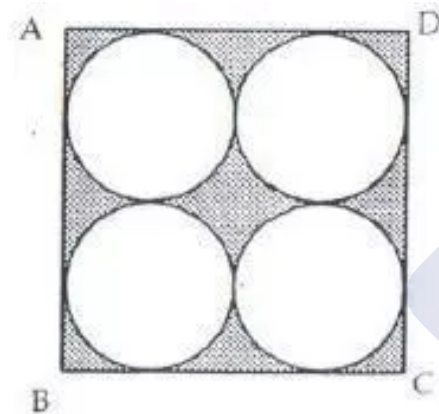
$$= 165.12 \text{ cm}^2$$

**Question 47:**

Area of region ABCDEFA = area of square ABDE + area of semi circle BCD – area of  $\triangle AFE$

$$= \left[ 10 \times 10 + \frac{1}{2} \times 3.14 \times 5 \times 5 - \frac{1}{2} \times 6 \times 8 \right] \text{cm}^2$$

$$= [100 + 39.25 - 24] \text{cm}^2 = 115.25 \text{ cm}^2$$

**Question 48:**

Side of the square ABCD = 14 cm

Area of square ABCD =  $14 \times 14 = 196 \text{ cm}^2$

Radius of each circle =  $\frac{14}{4} = 3.5 \text{ cm}$

Area of the circles =  $4 \times \text{area of one circle}$

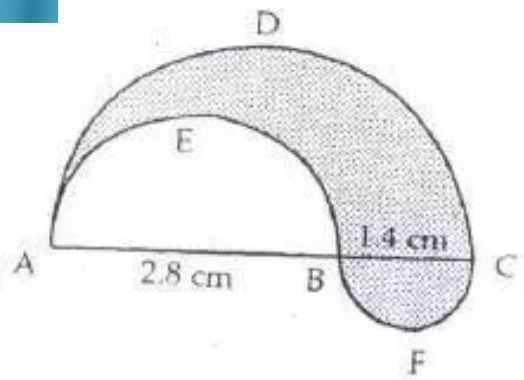
$$= 4 \times \pi (3.5)^2$$

$$= 4 \times \frac{22}{7} \times 3.5 \times 3.5$$

$$= 154 \text{ cm}^2$$

Area of shaded region = Area of square – area of 4 circles  
 $= 196 - 154 = 42 \text{ cm}^2$

**Question 49:**



$$\text{Diameter } AC = 2.8 + 1.4 \\ = 4.2 \text{ cm}$$

$$\text{Radius } r_1 = \frac{4.2}{2} = 2.1 \text{ cm}$$

$$\text{Length of semi-circle } ADC = \pi r_1 = \pi \times 2.1 = 2.1 \pi \text{ cm}$$

$$\text{Diameter } AB = 2.8 \text{ cm}$$

$$\text{Radius } r_2 = 1.4 \text{ cm}$$

$$\text{Length of semi-circle } AEB = \pi r_2 = \pi \times 1.4 = 1.4 \pi \text{ cm}$$

$$\text{Diameter } BC = 1.4 \text{ cm}$$

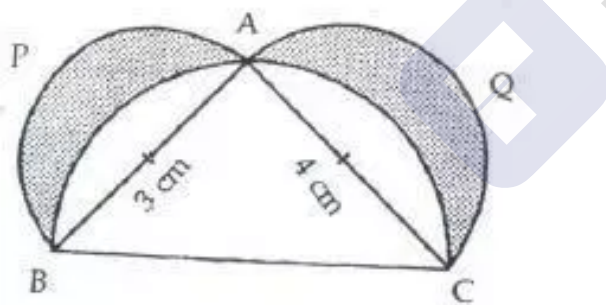
$$\text{Radius } r_3 = \frac{1.4}{2} = 0.7 \text{ cm}$$

$$\text{Length of semi-circle } BFC = \pi \times 0.7 = 0.7 \pi \text{ cm}$$

$$\text{Perimeter of shaded region} = 2.1 + 1.4 + 0.7 = 4.2 \pi \text{ cm}$$

$$= 4.2 \times \frac{22}{7} = 13.2 \text{ cm}$$

**Question 50:**



$$\text{Area of shaded region} = \text{Area of } \triangle ABC + \text{Area of semi-circle } APB + \text{Area of semi-circle } AQC - \text{Area of semicircle } BAC$$

$$\text{Now, Area of } \triangle ABC = \frac{1}{2} \times 3 \times 4 = 6 \text{ cm}^2 \text{ --- (1)}$$

$$\text{Area of semi-circle } APB = \frac{1}{2} \pi r^2 = \frac{1}{2} \pi \times \left(\frac{3}{2}\right)^2 = \frac{9}{8} \pi \text{ --- (2)}$$

$$\begin{aligned} \text{Area of semi-circle } AQC &= \frac{1}{2} \pi r^2 \\ &= \frac{1}{2} \pi \left(\frac{4}{2}\right)^2 = 2\pi \text{ cm}^2 \text{ --- (3)} \end{aligned}$$

ther in  $\triangle ABC$ ,  $\angle A = 90^\circ$

$$\therefore BC^2 = AB^2 + AC^2 = 9 + 16 = 25$$

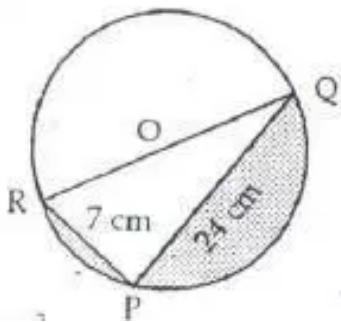
$$\therefore BC = 5$$

$$\text{Area of semi-circle BAC} = \frac{1}{2} \pi \left(\frac{5}{2}\right)^2 = \frac{25}{8} \pi \text{ -- (4)}$$

Adding (1), (2), (3) and subtracting (4)

$$\begin{aligned} \therefore \text{Area of shaded region} &= 6 + \frac{9}{8} \pi + 2\pi - \frac{25}{8} \pi \\ &= 6 + \frac{25}{8} \pi - \frac{25}{8} \pi = 6 \text{ cm}^2 \end{aligned}$$

**Question 51:**



In  $\triangle PQR$ ,  $\angle P = 90^\circ$ ,  $PQ = 24 \text{ cm}$ ,  $PR = 7 \text{ cm}$

$$\begin{aligned} \therefore QR^2 &= RP^2 + PQ^2 = 7^2 + 24^2 \\ &= 49 + 576 = 625 \end{aligned}$$

$$\therefore QR = 25 \text{ cm}$$

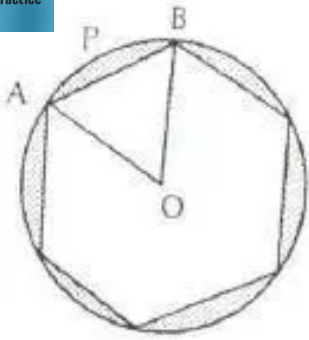
Area of semicircle

$$\begin{aligned} &= \frac{1}{2} \times \pi \times \left(\frac{25}{2}\right)^2 \\ &= \frac{1}{2} \times 3.14 \times \frac{25 \times 25}{4} \text{ cm}^2 \\ &= \frac{625 \times 3.14}{8} = 245.31 \text{ cm}^2 \end{aligned}$$

$$\text{Area of } \triangle PQR = \frac{1}{2} \times 7 \times 24 \text{ cm}^2 = 84 \text{ cm}^2$$

$$\text{Shaded area} = 245.31 - 84 = 161.31 \text{ cm}^2$$

### Question 52:



ABCDEF is a hexagon.

$\angle AOB = 60^\circ$ , Radius = 35 cm

Area of sector AOB

$$= \pi r^2 \times \frac{60^\circ}{360^\circ} = \frac{\pi \times 35 \times 35}{6} \text{ cm}^2$$

$$= \frac{3.14 \times 35 \times 35}{6} \text{ cm}^2$$

$$= 641.083 \text{ cm}^2$$

Area of  $\triangle AOB = \frac{\sqrt{3}}{4} \times r^2 = \frac{\sqrt{3}}{4} \times 35 \times 35 \text{ cm}^2$

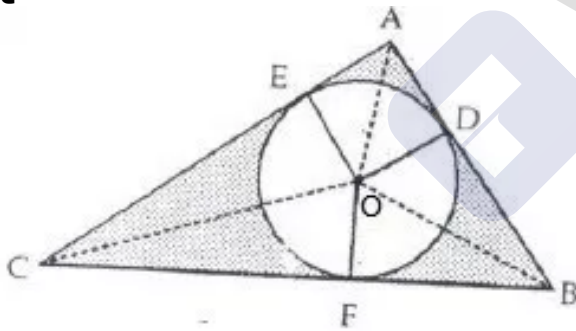
$$= 530.425 \text{ cm}^2$$

Area of segment APB =  $(641.083 - 530.425) \text{ cm}^2 = 110.658 \text{ cm}^2$

Area of design (shaded area) =  $6 \times 110.658 \text{ cm}^2 = 663.948 \text{ cm}^2$

$$= 663.95 \text{ cm}^2$$

### Question 53:



In  $\triangle ABC$ ,  $\angle A = 90^\circ$ , AB = 6cm, BC = 10 cm

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

$$\therefore AC^2 = BC^2 - AB^2 = 10^2 - 6^2 = 100 - 36 = 64$$

$$\therefore AC = 8 \text{ cm}$$

Area of  $\triangle ABC = \frac{1}{2} \times AC \times AB = \frac{1}{2} \times 8 \times 6 \text{ cm}^2 = 24 \text{ cm}^2$



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Let  $r$  be the radius of circle of centre O

$$\text{Area of } \triangle OCB = \frac{1}{2} \times 10 \times r \text{ cm}^2 = 5r \text{ cm}^2$$

$$\text{Area of } \triangle OAB = \frac{1}{2} \times 6 \times r \text{ cm}^2 = 3r \text{ cm}^2$$

$$\text{Area of } \triangle OCA = \frac{1}{2} \times 8 \times r \text{ cm}^2 = 4r \text{ cm}^2$$

$$\text{Area of } (\triangle OCB + \triangle OAB + \triangle OCA) = \text{Area of } \triangle ABC$$

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

$$\text{or } 12r = 24 \therefore r = 2 \text{ cm}$$

$$\therefore \text{Area of incircle} = \pi r^2 = 3.14 \times 2 \times 2 \text{ cm}^2$$

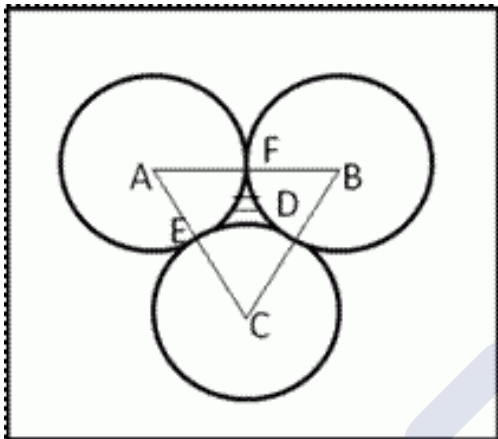
$$= 12.56 \text{ cm}^2$$

$$\Rightarrow \text{Shaded area} = \text{Area of } \triangle ABC - \text{Area of incircle}$$

$$= (24 - 12.56) \text{ cm}^2 = 11.44 \text{ cm}^2$$

#### Question 54:

Area of equilateral triangle ABC =  $49\sqrt{3} \text{ cm}^2$



Let  $a$  be its side

$$\therefore \frac{\sqrt{3}}{4} a^2 = 49\sqrt{3}$$

$$\text{or } a^2 = 49 \times 4$$

$$\therefore a = 7 \times 2$$

$$\Rightarrow a = 14 \text{ cm}$$

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

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

$$= \frac{11 \times 7}{3} \text{ cm}^2 = \frac{77}{3} \text{ cm}^2$$

Area of sector BDF = Area of sector CDE = Area of sector AEF

Sum of area of all the sectors

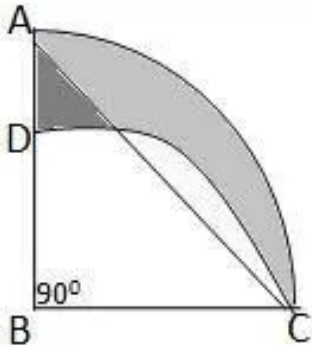
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$$\frac{1}{2} \times 3 \text{ cm}^2 = 77 \text{ cm}^2$$

$$\begin{aligned} \text{Shaded area} &= \text{Area of } \triangle ABC - \text{sum of area of all sectors} \\ &= 49\sqrt{3} - 77 = (84.77 - 77.00) \text{ cm}^2 \\ &= 7.77 \text{ cm}^2 \end{aligned}$$

### Question 55:



In  $\triangle ABC$ ,  $\angle B = 90^\circ$ ,  $AB = 48 \text{ cm}$ ,  $BC = 14 \text{ cm}$

$$\begin{aligned} \therefore AC^2 &= AB^2 + BC^2 = 48^2 + 14^2 \\ &= 2304 + 196 = 2500 \end{aligned}$$

$$\therefore AC = 50 \text{ cm}$$

$$\text{Area of } \triangle ABC = \frac{1}{2} \times 48 \times 14 \text{ cm}^2 = 336 \text{ cm}^2$$

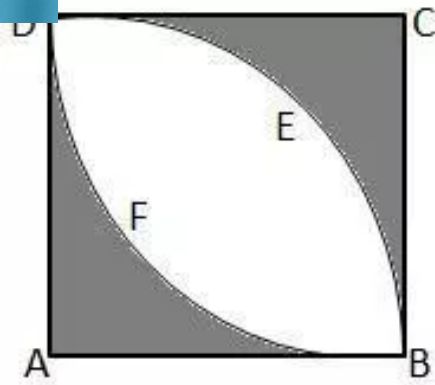
Area of semi-circle APC

$$\begin{aligned} &= \frac{1}{2} \pi r^2 = \frac{1}{2} \times \frac{22}{7} \times 25 \times 25 \text{ cm}^2 \\ &= \frac{11 \times 625}{7} \text{ cm}^2 = \frac{6875}{7} \text{ cm}^2 \\ &= 982.14 \text{ cm}^2 \end{aligned}$$

Area of quadrant BDC with radius 14 cm

$$= \frac{1}{4} \times \frac{22}{7} \times 14 \times 14 \text{ cm}^2 = 154 \text{ cm}^2$$

$$\begin{aligned} \text{Shaded area} &= \text{Area of } \triangle ABC + \text{Area of semi-circle APC} - \text{Area of quadrant BDC} \\ &= (336 + 982.14 - 154) \text{ cm}^2 \\ &= (1318.14 - 154) \text{ cm}^2 = 1164.14 \text{ cm}^2 \end{aligned}$$

**Question 56:**

Radius of quadrant ABED = 16 cm

$$\text{Its area} = \frac{1}{4} \times \frac{22}{7} \times 16 \times 16 \text{ cm}^2$$

$$\begin{aligned} \text{Area of } \triangle ABD &= \left( \frac{1}{2} \times 16 \times 16 \right) \text{ cm}^2 \\ &= 128 \text{ cm}^2 \end{aligned}$$

Area of segment DEB

$$= \frac{11 \times 128}{7} - 128$$

$$= 128 \left( \frac{11-7}{7} \right) \text{ cm}^2 = \frac{128 \times 4}{7} \text{ cm}^2 = \frac{512}{7} \text{ cm}^2$$

$$\text{Area of segment DFB} = \frac{512}{7} \text{ cm}^2$$

$$\text{Total area of segments} = 2 \times \frac{512}{7} \text{ cm}^2 = \frac{1024}{7} \text{ cm}^2$$

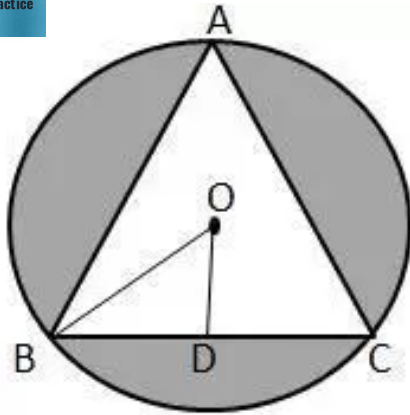
Shaded area = Area of square ABCD - Total area of segments

$$= \left( 16 \times 16 - \frac{1024}{7} \right) \text{ cm}^2$$

$$= \left( 256 - \frac{1024}{7} \right) \text{ cm}^2 = \frac{1792 - 1024}{7} \text{ cm}^2$$

$$= \frac{768}{7} \text{ cm}^2 = 109.7 \text{ cm}^2$$

**Question 57:**



Radius of circular table cover = 70 cm

$$\text{Area of the circular cover} = \pi r^2 = \frac{22}{7} \times 70 \times 70 \text{ cm}^2 = 15400 \text{ cm}^2$$

$$\text{In } \Delta BOD, \angle D = 90^\circ, \angle OBD = 30^\circ$$

$$\therefore \frac{BD}{OB} = \cos 30^\circ = \frac{\sqrt{3}}{2}$$

$$\Rightarrow BD = OB \cos 30^\circ$$

$$= 70 \times \frac{\sqrt{3}}{2} \text{ cm}$$

$$= 35\sqrt{3} \text{ cm}$$

$$\Rightarrow BC = 2BD = 2 \times 35\sqrt{3} = 70\sqrt{3}$$

$$\text{Area of } \Delta ABC = \frac{\sqrt{3}}{4} \times a^2 = \frac{\sqrt{3}}{4} \times 70\sqrt{3} \times 70\sqrt{3}$$

[ $\because \Delta ABC$  is equilateral]

$$= \frac{4900 \times 3 \times \sqrt{3}}{4} \text{ cm}^2 = 1225 \times 3 \times \sqrt{3}$$

$$= 3675\sqrt{3} \text{ cm}^2 = 6365.1 \text{ cm}^2$$

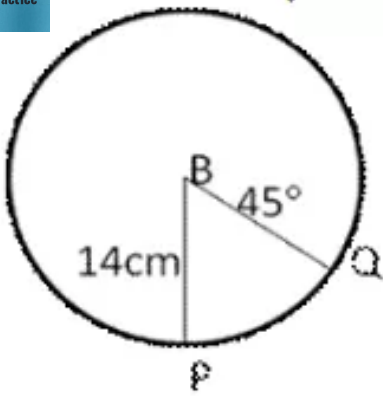
$$\begin{aligned} \text{Shaded area} &= \text{Area of circle} - \text{Area of } \Delta ABC \\ &= (15400 - 6365.1) \end{aligned}$$

**Question 58:**

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



14 cm and  $\theta = 45^\circ$



$$\begin{aligned}\therefore \text{Area of sector} &= \left( \frac{\pi \times 14 \times 14 \times 45}{360} \right) \text{cm}^2 \\ &= (24.5\pi) \text{cm}^2 \\ &= \left( 24.5 \times \frac{22}{7} \right) \text{cm}^2 = 77 \text{ cm}^2\end{aligned}$$

**Question 59:**

Length of the arc =  $\frac{2\pi r\theta}{360}$ ,  $r = 21 \text{ cm}$ ,  $\theta = 150^\circ$

$$= \left( \frac{2\pi \times 21 \times 150}{360} \right) \text{cm} = (17.5\pi) \text{cm}$$

$$\text{Length of arc} = \left( 17.5 \times \frac{22}{7} \right) \text{cm} = 55 \text{ cm}$$

$$\text{Area of the sector} = \frac{\pi r^2 \theta}{360} = \left( \frac{\pi \times 21 \times 21 \times 150}{360} \right) \text{cm}^2$$

$$= \left( \frac{22}{7} \times 183.75 \right) \text{cm}^2 = 577.5 \text{ cm}^2$$

**Question 60:**

Length of arc of circle = 44 cm

Radius of circle = 17.5 cm

$$\text{Area of sector} = \frac{1}{2}lr = \left( \frac{1}{2} \times 44 \times 17.5 \right) \text{cm}^2$$

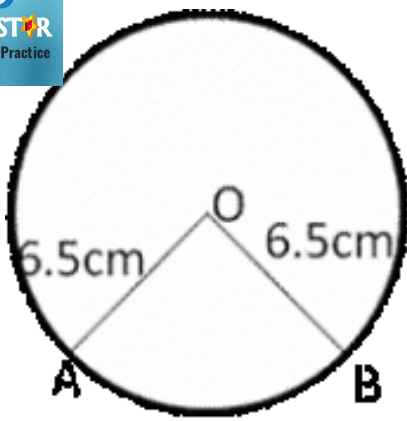
$$= (22 \times 17.5) \text{cm}^2 = 385 \text{ cm}^2$$

**Question 61:**

Let sector of circle is OAB

Perimeter of a sector of circle = 31 cm

OA + OB + length of arc AB = 31 cm



$$6.5 + 6.5 + \text{arc AB} = 31 \text{ cm}$$

$$\text{arc AB} = 31 - 13$$

$$= 18 \text{ cm}$$

$$\text{Area of circle} = \frac{1}{2}lr$$

$$= \frac{1}{2} \times 18 \times 6.5 = 58.5 \text{ cm}^2$$

**Question 62:**

$$\text{Area of the sector of circle} = \frac{\pi^2\theta}{360} = 69.3$$

$$\text{Radius} = 10.5 \text{ cm}$$

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

$$\Rightarrow \theta = \frac{69.3 \times 360 \times 7}{10.5 \times 10.5 \times 22} = 72^\circ$$

**Question 63:**

$$\text{Length of the pendulum} = \text{radius of sector} = r \text{ cm}$$

$$\text{Arc length} = 8.8 \Rightarrow 2 \times \frac{22}{7} \times r \times \frac{30}{360} = 8.8$$

$$\Rightarrow r = \frac{8.8 \times 7 \times 360}{2 \times 22 \times 30} = 16.8 \text{ cm}$$

**Question 64:**

$$\text{Length of arc} = \frac{2\pi r\theta}{360} = 16.5 \text{ cm}$$

$$2 \times \frac{22}{7} \times r \times \frac{54^\circ}{360^\circ} = 16.5$$

$$r = \frac{16.5 \times 7 \times 360}{2 \times 22 \times 54} = 17.5 \text{ cm}$$

Circumference of circle =  $2\pi r$ 

$$\left(2 \times \frac{22}{7} \times 17.5\right) = 110 \text{ cm}$$

Area of circle =

$$\pi r^2 = \left(\frac{22}{7} \times 17.5 \times 17.5\right) \text{ cm}^2$$

$$= 962.5 \text{ cm}^2$$

**Question 65:**Circumference of circle =  $2\pi r$ 

$$2\pi r = 88 \Rightarrow r = \frac{88 \times 7}{2 \times 22} = 14 \text{ cm}$$

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

$$= \left(\frac{22}{7} \times 14 \times 14 \times \frac{72}{360}\right) \text{ cm}^2 = 123.2 \text{ cm}^2$$

**Question 66:**Angle described by the minute hand in 60 minutes  $\theta = 360^\circ$ 

Angle described by minute hand in 20 minutes

$$= \left(\frac{360}{60} \times 20\right) = 120^\circ$$

Required area swept by the minute hand in 20 minutes

= Area of the sector (with  $r = 15 \text{ cm}$  and  $\theta = 120^\circ$ )

$$= \left(\frac{\pi^2 \theta}{360^\circ}\right) \text{ cm}^2 = \left(3.14 \times 15 \times 15 \times \frac{120^\circ}{360^\circ}\right)$$

$$= 235.5 \text{ cm}^2$$

**Question 67:** $\theta = 56^\circ$  and let radius is  $r \text{ cm}$ 

$$\text{Area of sector} = \frac{\pi^2 \theta}{360^\circ} = 17.6 \text{ cm}^2$$

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

$$r^2 = \left( \frac{17.6 \times 360 \times 7}{22 \times 56} \right) \text{cm}^2$$

$$r^2 = 36 \text{ cm}^2 \Rightarrow r = \sqrt{36} \text{ cm} = 6 \text{ cm}$$

Hence radius = 6cm

### Question 68:

$$\frac{\text{Area of sector with } \theta = 150^\circ}{\text{Area of the circle}} = \frac{\pi \times (6)^2 \times \frac{150}{360}}{\pi \times (6)^2}$$

$$= \frac{150}{360} = \frac{5}{12}$$

$$\text{Required ratio} = \left( 36\pi \times \frac{90}{360} \right) : \left( 36\pi \times \frac{120}{360} \right) : \left( 36\pi \times \frac{150}{360} \right)$$

$$= \frac{1}{4} : \frac{1}{3} : \frac{5}{12} = 3 : 4 : 5$$

### Question 69:

In 2 days, the short hand will complete 4 rounds

∴ Distance travelled by its tip in 2 days

= 4(circumference of the circle with  $r = 4 \text{ cm}$ )

=  $(4 \times 2 \times 4) \text{ cm} = 32 \text{ cm}$

In 2 days, the long hand will complete 48 rounds

∴ length moved by its tip

= 48(circumference of the circle with  $r = 6 \text{ cm}$ )

=  $(48 \times 2 \times 6) \text{ cm} = 576 \text{ cm}$

∴ Sum of the lengths moved

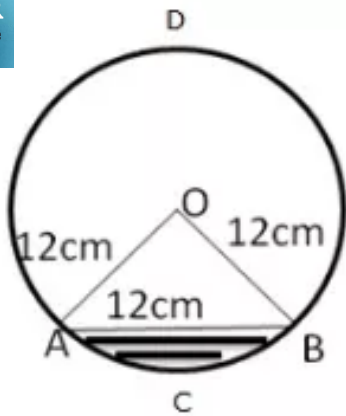
=  $(32 + 576) = 608 \text{ cm}$

=  $(608 \times 3.14) \text{ cm} = 1909.12 \text{ cm}$

### Question 70:

$\triangle OAB$  is equilateral.

So,  $\angle AOB = 60^\circ$



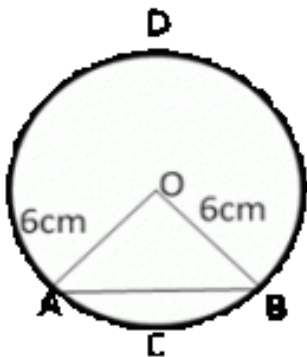
$$\begin{aligned}\text{arc ACB} &= \left( 2\pi \times 12 \times \frac{60}{360} \right) \text{ cm} \\ &= 4\pi \text{ cm} \\ &= (4 \times 3.14) \text{ cm} \\ &= 12.56 \text{ cm}\end{aligned}$$

Length of arc BDA =  $(2\pi \times 12 - \text{arc ACB}) \text{ cm}$   
 $= (24\pi - 4\pi) \text{ cm} = (20\pi) \text{ cm}$   
 $= (20 \times 3.14) \text{ cm} = 62.8 \text{ cm}$   
 Area of the minor segment ACBA

$$\begin{aligned}&= \left[ \pi \times (12)^2 \times \frac{60}{360} - \frac{\sqrt{3}}{4} \times (12)^2 \right] \text{ cm}^2 \\ &= \left( 3.14 \times 12 \times 12 \times \frac{60}{360} - \frac{1.73}{4} \times 12 \times 12 \right) \text{ cm}^2 \\ &= (75.36 - 62.28) \text{ cm}^2 = 13.08 \text{ cm}^2\end{aligned}$$

### Question 71:

Let AB be the chord of circle of centre O and radius = 6 cm such that  $\angle AOB = 90^\circ$



Area of sector = OACBO



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

$$= \left( \frac{22}{7} \times 6 \times 6 \times \frac{90}{360} \right) \text{ cm}^2$$

$$= 28.29 \text{ cm}^2$$

$$\text{Area of } \triangle AOB = \frac{1}{2} r^2 \sin \theta = \left( \frac{1}{2} \times 6 \times 6 \times \sin 90^\circ \right) = 18 \text{ cm}^2$$

Area of minor segment ACBA  
 = (area of sector OACBO) - (area of  $\triangle OAB$ )  
 =  $(28.29 - 18) \text{ cm}^2 = 10.29 \text{ cm}^2$   
 Area of major segment BDAB

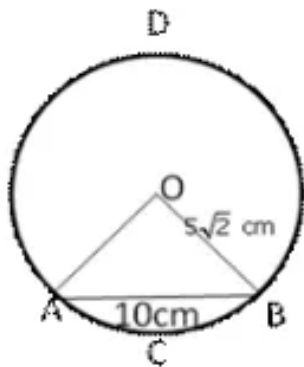
$$= (\text{area of circle}) - (\text{area of minor segment})$$

$$= \left[ \left( \frac{22}{7} \times 6 \times 6 \right) - 10.29 \right] \text{ cm}^2$$

$$= (113.14 - 10.29) \text{ cm}^2 = 102.85 \text{ cm}^2$$

**Question 72:**

Let  $OA = 5\sqrt{2} \text{ cm}$ ,  $OB = 5\sqrt{2} \text{ cm}$   
 And  $AB = 10 \text{ cm}$



$$\text{Then, } OA^2 + OB^2 = AB^2$$

$$\Rightarrow \angle AOB = 90^\circ$$

Area of the sector OACBO

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

$$= \left( 3.14 \times (5\sqrt{2}) \times (5\sqrt{2}) \times \frac{90}{360} \right) \text{ cm}^2$$

$$= 39.25 \text{ cm}^2$$

$$\text{Area of } \triangle AOB = \frac{1}{2} r^2 \sin \theta = \left( \frac{1}{2} \times 5\sqrt{2} \times 5\sqrt{2} \times \sin 90^\circ \right)$$

5 cm<sup>2</sup>

Area of minor segment = (area of sector OACBO) – (area of ΔOAB)

$$= (39.25 - 25) \text{ cm}^2 = 14.25 \text{ cm}^2$$

Area of the major segment BDAB

= area of circle – area of minor segment

$$= \left( \frac{22}{7} \times 5\sqrt{2} \times 5\sqrt{2} - 14.25 \right) \text{ cm}^2$$

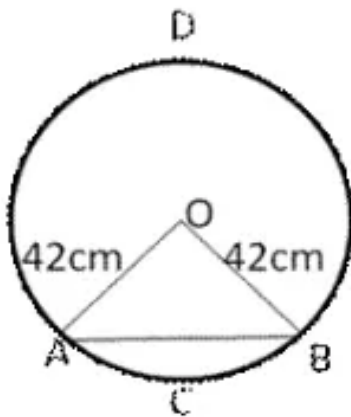
$$= \left( \frac{1100}{7} - 14.25 \right) \text{ cm}^2 = (157 - 14.25) \text{ cm}^2$$

$$= 142.75 \text{ cm}^2$$

**Question 73:**

Area of sector OACBO

$$= \frac{\pi r^2 \theta}{360} \text{ cm}^2 = \left( \frac{22}{7} \times 42 \times 42 \times \frac{120}{360} \right) \text{ cm}^2 = 1848 \text{ cm}^2$$



$$\text{Area of } \Delta OAB = \frac{1}{2} r^2 \sin \theta$$

$$= \left( \frac{1}{2} \times 42 \times 42 \times \sin 120^\circ \right)$$

$$= \left( 21 \times 42 \times \frac{\sqrt{3}}{2} \right) \text{ cm}^2$$

$$= (21 \times 21 \times 1.73) \text{ cm}^2 = 762.93 \text{ cm}^2$$

Area of minor segment ACBA

$$= (\text{area of sector OACBO}) - (\text{area of the } \Delta OAB)$$

$$= (1848 - 762.93) \text{ cm}^2 = 1085.07 \text{ cm}^2$$

Area of major segment BADB

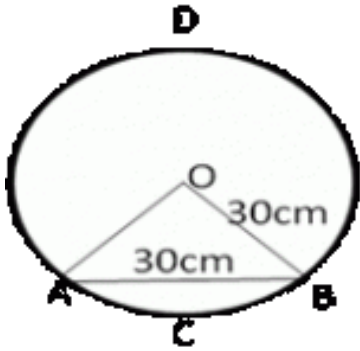
$$= (\text{area of the circle}) - (\text{area of minor segment})$$

$$= \frac{22}{7} \times 42 \times 42 - 1085.07$$

$$= (5544 - 1085.07) \text{ cm}^2 = 4458.93 \text{ cm}^2$$

**Question 74:**

AB be the chord of circle of centre O and radius = 30 cm such that  $\angle AOB = 60^\circ$



Area of the sector OACBO

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

$$= \left( 3.14 \times 30 \times 30 \times \frac{60}{360} \right) \text{ cm}^2$$

$$= 471 \text{ cm}^2$$

$$\text{Area of } \triangle OAB = \frac{1}{2} r^2 \sin \theta = \left( \frac{1}{2} \times 30 \times 30 \times \sin 60^\circ \right) \text{ cm}^2$$

$$= \left( \frac{1}{2} \times 30 \times 30 \times \frac{\sqrt{3}}{2} \right) \text{ cm}^2 = (225\sqrt{3}) \text{ cm}^2$$

$$= (225 \times 1.73) \text{ cm}^2 = 389.25 \text{ cm}^2$$

Area of the minor segment ACBA

$$= (\text{area of the sector OACBO}) - (\text{area of the } \triangle OAB)$$

$$= (471 - 389.25) \text{ cm}^2 = 81.75 \text{ cm}^2$$

Area of the major segment BADB

$$= (\text{area of circle}) - (\text{area of the minor segment})$$

$$= [(3.14 \times 30 \times 30) - 81.75] \text{ cm}^2 = 2744.25 \text{ cm}^2$$

**Question 75:**

Let the major arc be x cm long

Then, length of the minor arc =  $\frac{1}{5}x$  cm

$$\text{Circumference} = \left( x + \frac{1}{5}x \right) \text{ cm} = \frac{6x}{5} \text{ cm}$$

$$\frac{6x}{5} = 2 \times \frac{22}{7} \times \frac{21}{2} \Rightarrow x = 55 \text{ cm}$$

$$\text{Required area} = \left( \frac{1}{2} \times 55 \times \frac{21}{2} \right) \text{ cm}^2$$

$$\left[ \text{Area} = \frac{1}{2} r l \right]$$

$$= 288.75 \text{ cm}^2$$

### Question 76:

Radius of the front wheel = 40 cm =  $\frac{2}{5}$  m

$$\text{Circumference of the front wheel} = \left( 2\pi \times \frac{2}{5} \right) \text{ m} = \frac{4\pi}{5} \text{ m}$$

Distance moved by it in 800 revolution

$$= \left( \frac{4\pi}{5} \times 800 \right) \text{ m} = (640\pi) \text{ m}$$

$$\text{Circumference of rear wheel} = (2\pi \times 1) \text{ m} = (2\pi) \text{ m}$$

$$\text{Required number of revolutions} = \left( \frac{640\pi}{2\pi} \right) = 320$$