1. Here, $r = 14$ cm.

Now, area of the circle $= \pi r^2$

$$= \frac{22}{\cancel{7}} \times \cancel{14}^{2} \times 14$$

$$= 616 \text{ cm}^2.$$

2. Here, circumference $= 44$ cm.

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

$\Rightarrow \quad \frac{44}{7} \times r = 44.$

$\therefore \quad r = 7$ cm

Now, area of a quadrant $= \frac{1}{4} \pi r^2.$

$$= \frac{1}{\cancel{4}_2} \times \frac{\cancel{22}^{11}}{\cancel{7}} \times \cancel{7} \times 7$$

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

3. Let d be the diameter

Then, circumference $= 21 + d$.

$\Rightarrow \pi d = 21 + d$.

$\Rightarrow \frac{22}{7} d = 21 + d$

$\Rightarrow 22d = 147 + 7d$.

$\Rightarrow 15d = 147$.

$\therefore d = 9.8$ cm.

$\therefore r = 4.9$ cm.

Now area of the circle $= \pi r^2$

$= \frac{22}{7} \times 4.9 \times 4.9$

$= 75.46 \text{ cm}^2$.

4. Area of a circle $= 1386 \text{ cm}^2$.

$\Rightarrow \pi r^2 = 1386$

$\Rightarrow \frac{22}{7} \times r^2 = 1386 \Rightarrow r = \sqrt{\frac{1386 \times 7}{22}}$

$\therefore r = 21$ cm.

Now circumference $= 2\pi r$

$= 2 \times \frac{22}{\cancel{7}} \times \cancel{21}^{3} = 132$ cm.

5. Let r_1 and r_2 be the two radii, $r_1 > r_2$.

Then, $r_1 + r_2 = 35$ — (i)

and $\pi r_1^2 - \pi r_2^2 = 770$

$\Rightarrow \pi(r_1^2 - r_2^2) = 770$

$\Rightarrow \pi(r_1 + r_2)(r_1 - r_2) = 770$

$\Rightarrow 35 \times r_1 - r_2 = \frac{770 \times 7}{22}$.

$\Rightarrow r_1 - r_2 = \frac{770 \times 7}{22 \times 35} = 7$ — (ii)

Adding (i) and (ii) we get

$2r_1 = 42$

$\therefore r_1 = 21$ cm.

Then, $r_2 = 14$ cm.

Now, circumferences are

$$2\pi r_1 = 2 \times \frac{22}{7} \times 21 = 132 \text{ cm}.$$

and $$2\pi r_2 = 2 \times \frac{22}{7} \times 14 = 88 \text{ cm}.$$

6 diameter $= 42$ cm

Now distance described in 12 sec

$$= 20 \times \pi d$$

$$= 20 \times \frac{22}{\cancel{7}} \times \overset{6}{\cancel{42}}$$

$$= 2640 \text{ cm}.$$

$\therefore$ speed of the vehicle $= \frac{2640}{12}$

$$= 220 \text{ cm/sec}.$$

$$= \frac{220}{100} \times 60 \text{ m/min}$$

$$= 132 \text{ m/min}.$$

7. Difference of the areas of the two circles with radii 10 cm and 6 cm

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

$$= \pi (10^2 - 6^2)$$

$$= \frac{22}{7} \times 64 \quad = 201.14 \text{ cm}^2.$$

Let R be the new radius.

Area of the circle with radius R $= 201.14 \text{ cm}^2$.

$$\Rightarrow \pi R^2 = 201.14.$$

$$\Rightarrow R^2 = \frac{201.14 \times 7}{22} = 63.99 = 64 \text{ (approx)}$$

$$\therefore R = 8 \text{ cm}.$$

8. Let r be the radius of the circle

Then, $2\pi r - r = 37.$

$$\Rightarrow r(2\pi - 1) = 37$$

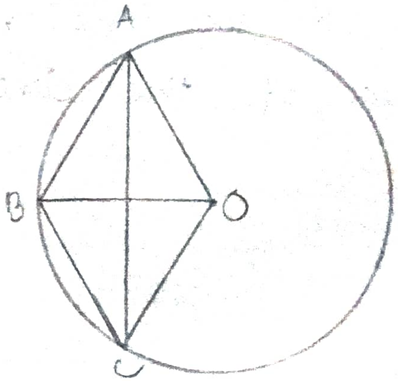
$$\Rightarrow r\left(\frac{44}{7} - 1\right) = 37. \quad \Rightarrow r \times \frac{37}{7} = 37.$$

$\therefore r = 7$ cm.

Now area of the circle $= \pi r^2$

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

9. OABC is a rhombus



In the Δ AOB

OA = OB [radii of same circle.]

OA = AB [sides of rhombus]

$\therefore$ OA = OB = AB.

Then ΔAOB is an equilateral

similarly ΔOCB is also an equilateral

Now area of rhombus $= 18\sqrt{3}$ cm^2.

$\Rightarrow$ Area of equilateral Δ (OAB + OCB) $= 18\sqrt{3}$

$\Rightarrow \cancel{2} \times \frac{\cancel{\sqrt{3}}}{\cancel{4}_2} \times OA^2 = 18\cancel{\sqrt{3}}$

$\Rightarrow OA^2 = 36$

$\therefore OA = 6$ cm.

$\therefore$ Radius of the circle $= 6$ cm.

Now perimeter of the circle $= 2\pi r$

$= 2 \times 3.14 \times 6$.

$= 37.68$ cm.

and its area $= \pi r^2 = 3.14 \times 6 \times 6$

$= 113.04$ cm^2.

16. Let r_1 and r_2 be the radii of two concentric circle whose areas are 616 cm^2 and 154 cm^2 respectively.

Then, $\pi r_1^2 = 616$ cm^2 and $\pi r_2^2 = 154$ cm^2.

$\Rightarrow r_1^2 = \dfrac{616 \times 7}{22}$. and $r_2^2 = \dfrac{154 \times 7}{22}$.

$\Rightarrow r_1 = \sqrt{\dfrac{616 \times 7}{22}}$ and $r_2 = \sqrt{\dfrac{154 \times 7}{22}}$

$\therefore r_1 = 14$ cm and $r_2 = 7$ cm.

$\therefore$ width of the circular path $= r_1 - r_2 = 14 - 7 = 7$ cm.

Again, area of the circular path between the two concentric circles

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

$$\Rightarrow \cancel{\pi}\ \frac{22}{7} \times (14^2 - 7^2).$$

$$= \frac{22}{\cancel{7}} \times \cancel{147}^{21}. \quad = 462\ cm^2.$$

11. Diameter of the circle = side of the square

$$\Rightarrow 2r = 21.$$

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

$\therefore$ Area of the possible largest circle $= \pi r^2$

$$= \frac{\cancel{22}^{11}}{\cancel{7}} \times \frac{\cancel{21}^{3}}{\cancel{2}} \times \frac{21}{2}$$

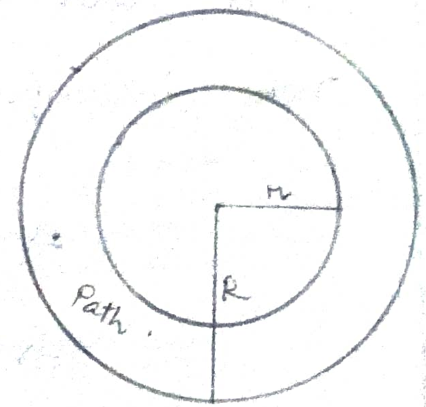
$$= \frac{693}{2}$$

$$= 346.5\ cm^2.$$

12. Here, radius of the park, r = 160 m.

Then, area of the park = πr^2 = $\frac{22}{7} \times 160 \times 160$

$= \frac{563200}{7}\ m^2$.



area of the path = $\frac{35750}{7}\ m^2$.

Let R m be the radius of the park with the path.

Now, area of the park with that of the path = $\frac{563200 + 35750}{7}\ m^2$.

$\Rightarrow \pi R^2 = \frac{598950}{7}$

$\Rightarrow \frac{22}{\cancel{7}} \times R^2 = \frac{598950}{\cancel{7}}$

$\Rightarrow R^2 = \frac{598950}{22} = 27225$.

$\therefore R = 165$ m.

$\therefore$ width of the path = $R - r$ = $165 - 160$

$= 5$ m.

13. Total cost of fencing the circular field = ₹3960

Then, circumference of the circular field $= \dfrac{\text{total cost of fencing}}{\text{cost of fencing of 1m}}$.

$$\Rightarrow 2\pi r = \frac{3960}{18} \text{ m}.$$

$$\Rightarrow 2 \times \frac{22}{7} \times r = \frac{3960}{18} = 220$$

$$\Rightarrow r = \frac{220 \times 7}{2 \times 22} = 35\text{m}.$$

Now, area of the circular field $= \pi r^2$

$$= \frac{22}{\cancel{7}} \times \cancel{35}^{5} \times 35$$

$$= 3850 \text{ m}^2.$$

$\therefore$ Total cost of levelling the field $= 3850 \times 6$

$$= ₹\ 23,100.$$

19. Here, radius of the inner edge, $r = 21$ cm.

radius of the outer edge, $R = 21 + 7$

$= 28$ cm.

$\therefore$ Area of grass planted $= \pi (R^2 - r^2)$.

$= \frac{22}{7} \times (28^2 - 21^2)$

$= \frac{22}{7} \times 343$

$= 1078\ m^2$

$\therefore$ Total cost of planting $=$ ₹ 1078×4

$=$ ₹ 4312.

Exercise : 12.2

1. Here, radius, $r = 6.5$ cm

and $2r + s = 21$

$\Rightarrow s = 21 - 2 \times 6.5$.

$\Rightarrow s = 8$ cm.

$\therefore$ Area of the sector $= \frac{1}{2} rs = \frac{1}{2} \times 6.5 \times 8$

$= 26 \text{ cm}^2$.

2. Radius $= 6$ cm

Area of sector $= 18\frac{6}{7} \text{ cm}^2$

$\Rightarrow \frac{\pi r^2 \theta}{360} = \frac{132}{7} \Rightarrow \frac{22 \times 6 \times 6}{\cancel{7} \times \cancel{360}_{10}} \times \theta = \frac{132}{\cancel{7}}$.

$\Rightarrow 22\theta = 132 \times 10$

$\Rightarrow \theta = \frac{132 \times 10}{22} = 60°$

$\therefore$ The reqd. sectorial angle is $60°$.

3. Here, circumference = 176

$\Rightarrow 2\pi r = 176$

$\Rightarrow 2 \times \frac{22}{7} \times r = 176.$

$\therefore r = \frac{176 \times 7}{2 \times 22} = 28$ cm.

Now area of the sector $= \frac{\pi r^2 \theta}{360} = \frac{22 \times 28 \times 28 \times 45}{7 \times 360}$

$= 308 \text{ cm}^2.$

4. radius = 21 cm

Area of the sector = 462.

$\Rightarrow \frac{\pi r^2 \theta}{360} = 462 \Rightarrow \frac{22 \times 21 \times 21 \times \theta}{7 \times 360} = 462.$

$\Rightarrow \theta = \frac{462 \times 7 \times 360}{22 \times 21 \times 21} = 120°.$

$\therefore$ Length of the arc $= \frac{\pi r \theta}{180} = \frac{22 \times 21 \times 120}{7 \times 180} = 44$ cm.

5. Radius $= 5.6$ cm.

and arc length, $s = 8.8$.

Now using $s = r\theta$

$\Rightarrow \theta = \left(\frac{s}{r}\right)^c$

$\Rightarrow \theta = \left(\frac{8.8}{5.6} \times \frac{180}{\pi}\right)^\circ = \left(\frac{8.8}{5.6} \times \frac{7 \times 180}{22}\right)^\circ = 90^\circ.$

$\therefore \theta = 90^\circ$

Thus, the area of sector $= \frac{1}{2} \times r \times s$

$= \frac{1}{2} \times 5.6 \times 8.8 = 24.64 \text{ cm}^2.$

6. Length of the minute hand = radius of circle = 4.2 cm.

Sectorial angle subtended by the minute hand in 20 min $= 120^\circ$.

Thus, area of the sector $= \frac{\pi r^2 \theta}{360} = \frac{22 \times \overset{0.6}{\cancel{4.2}} \times 4.2 \times \overset{2}{\cancel{120}}}{\cancel{7} \times \underset{6}{\cancel{360}}}$

$= 18.48 \text{ cm}^2.$

7. i) Here, $r = 14$ cm $\quad \theta = 30°$.

Then, area of the sector $= \frac{\pi r^2 \theta}{360} = \frac{22 \times \cancel{14}^{2} \times 14 \times \cancel{30}}{\cancel{7} \times \cancel{360}_{12}}$

$= 51.33 \text{ cm}^2$.

8. Let R and r be the radii of the larger and smaller circle respectively.

Then, difference in their areas of sectors

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

$= \frac{\pi \theta}{360} \left(\frac{R^2 - r^2}{360} \right) = \frac{\pi \theta}{360} \left(\frac{36 - 16}{360} \right)$

$= 3.14 \times 60 \times \frac{20}{360} = 10.47 \text{ cm}^2$ (approx).

9. (i) $r = 6.3$ cm, $\theta = 90°$.

Then length of the arc $= \frac{\pi r \theta}{180} = \frac{\cancel{22}^{11} \times 6.3 \times \cancel{90}}{7 \times \cancel{180}_{2}} = 9.9$ cm

i) area of sector $= \frac{1}{2} \times r \times s$ $= \frac{1}{2} \times 6.3 \times 9.9$

$= 31.19 \text{ cm}^2$ (approx)

ii) area of minor segment $= \frac{r^2}{2}\left[\frac{\pi\theta}{180} - \sin\theta\right]$

$= \frac{r^2}{2}\left[\frac{\cancel{22}^{\,11} \times \cancel{90}}{7 \times \cancel{180}_{\,2}} - 1\right]$

$= \frac{\cancel{6.3}^{\,0.9} \times 6.3}{\cancel{2}} \times \frac{\cancel{4}^{\,2}}{\cancel{7}}$

$= 11.34 \text{ cm}^2$.

and area of major segment = area of circle − ar. of minor segment

$= \pi r^2 - 11.34$

$= \frac{22}{7} \times 6.3 \times 6.3 - 11.39$

$= 124.74 - 11.39 = 113.40 \text{ cm}^2$.

iii) perimeter of the sector AOB $= 2r + s$

$= 2 \times 6.3 + 9.9$

$= 12.6 + 9.9$

$= 22.5$ cm.

10. Here, $r = 12$ cm.

For major sector. $\theta = 270°$.

i) area of major sector $= \frac{\pi r^2 \theta}{360} = \frac{3.14 \times \cancel{12}^{3} \times 12 \times \cancel{270}^{3}}{\cancel{360}_{9}}$

$= 339.12 \text{ cm}^2$

ii) area of minor segment $= \frac{r^2}{2}\left[\frac{\pi\theta}{180} - \sin\theta\right]$.

$= \frac{144}{2}\left[\frac{3.\cancel{14}^{1.57} \times \cancel{90}}{\cancel{180}_{2}} - \sin 90\right]$

$= 72 \times (1.57 - 1)$

$= 72 \times 0.57 = 41.04 \text{ cm}^2$.

11. Here, $r = 18$ cm, $\theta = 120°$.

i) area of minor sector $= \frac{\pi r^2 \theta}{360} = \frac{3.14 \times 18 \times \cancel{18}^{3} \times \cancel{120}^{2}}{3\cancel{60}_{6}}$

$= 339.12 \text{ cm}^2$.

ii) area of major segment, $= \frac{r^2}{2}\left[\frac{\pi(360-120)}{180} + \sin 120°\right]$

$= 18^2 \left[\frac{3.14 \times \cancel{240}^{12}}{\cancel{360}_{63}} + \frac{\sin 60^\circ}{2}\right]$

$= 324 \left[\frac{6.28}{3} + \frac{\sqrt{3}}{4}\right] = 3.24 \times 2.525$

$= 818.1$ (approx).

12 Here, $r = 6$ cm, $\theta = 60^\circ$.

i) area of minor segment $= \frac{r^2}{2}\left[\frac{\pi\theta}{180} - \sin\theta\right]$

$= 18 \left(\frac{3.14 \times \cancel{60}}{\cancel{180}_{3}} - \frac{\sqrt{3}}{2}\right)$

$= 18 \times 0.181$

$= 3.26$ (approx).

ii) area of major segment $= \pi r^2 - 3.26$.

$= 3.14 \times 36 - 3.26$.

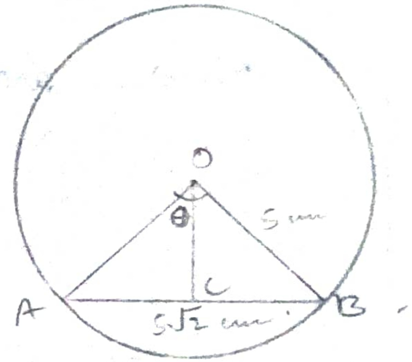
$= 109.78$ (approx).

13. Here,

$OA = OB = 5\,cm.$

$AB = 5\sqrt{2}$

A perpendicular is drawn from O to AB intersecting at C.



Then, $AC = BC = \frac{5\sqrt{2}}{2}$ cm.

Now, $\frac{AC}{OA} = \sin\theta$

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

$\Rightarrow \frac{1}{\sqrt{2}} = \sin\theta \Rightarrow \sin 45^\circ = \sin\theta$

$\therefore \theta = 45^\circ.$

$\therefore \angle AOB = 90^\circ.$

Then, area of major segment $= r^2\left[\frac{\pi(360-90)}{360} + \frac{\sin\theta}{2}\right]$

$= 5^2\left[3.14\times\frac{3}{4} + \frac{1}{2}\right] = 25\times\frac{11.42}{4}$

$= 71.375\ cm^2. = 71.38\ cm^2$ (approx)

14. diameter $= 12\,cm$

$\therefore$ radius $= 6\,cm$ and $\theta = 30°$.

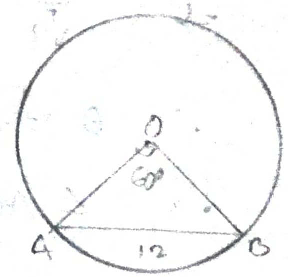
Now, area of minor segment $= \frac{r^2}{2}\left[\frac{\pi\theta}{180} - \sin\theta\right]$

$= 18\left[\frac{\cancel{22}^{11} \times \cancel{30}}{7 \times \cancel{180}_{63}} - \frac{1}{2}\right]$

$= 18 \times \frac{1}{42} = 0.43\,cm^2$ (approx)

15. Since the chord subtends an angle $60°$ at the centre, the triangle OAB is equilateral

$\therefore r = 12\,cm$.



Then, area of minor segment

$= \frac{r^2}{2}\left[\frac{\pi\theta}{180} - \sin\theta\right]$

$= 72\left[\frac{3.14 \times \cancel{60}}{\cancel{180}_3} - \frac{\sqrt{3}}{2}\right]$

$= 72\left(\frac{6.28 - 5.19}{6}\right) = 72 \times \frac{1.09}{6} = 13.08\,cm^2$

and area of major segment

$= \pi r^2 - 13.08.$

$= 3.14 \times 144 - 13.08.$

$= 452.16 - 13.08$

$= 439.08 \text{ cm}^2.$

16 Since the triangle is an equilateral the angle so formed is 60°.

Then i) area of the field that the cow can graze

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

$= \frac{3.14 \times 21 \times 21 \times 60}{360} = 230.79 \text{ m}^2.$

ii) area of the field remain ungrazed

$=$ area of equilateral triangle $- 230.79.$

$= \frac{\sqrt{3}}{\cancel{4}} \times \cancel{48}^{12} \times 48 - 230.79.$

$= 1.73 \times 12 \times 48 - 230.79$

$= 765.69 \; m^2.$

iii) area of the field grazed if the length of rope is increased to 35m.

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

$= \frac{3.14 \times 35 \times 35 \times 60}{360} = 648.08 \; m.$

$\therefore$ increase in the grazing area

$= 6418.08 - 230.79$

$= 410.29 \; m^2.$