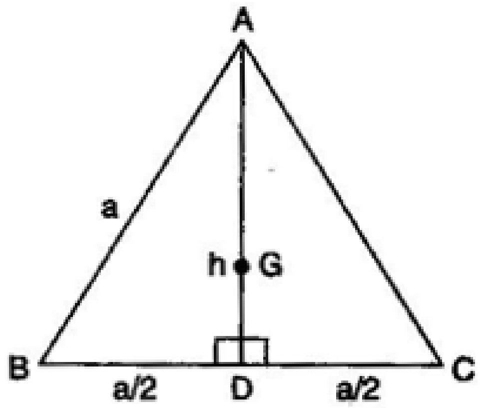
Exercise 12.3



$$= \pi(32)^2 - \frac{\sqrt{3}}{4}a^2 \quad \text{.........(i)}$$

$\because$ G is the centroid of the equilateral triangle.

$\therefore$ radius of the circumscribed circle = $\frac{2}{3}h$ cm

According to the question, $\frac{2}{3}h = 32$

$\Rightarrow h = 48$ cm

Now, $a^2 = h^2 + \left(\frac{a}{2}\right)^2$

$$\Rightarrow a^2 = h^2 + \frac{a^2}{4}$$

$$\Rightarrow a^2 - \frac{a^2}{4} = h^2$$

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

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

$\Rightarrow \quad a^2 = \frac{4(48)^2}{3} = 3072$

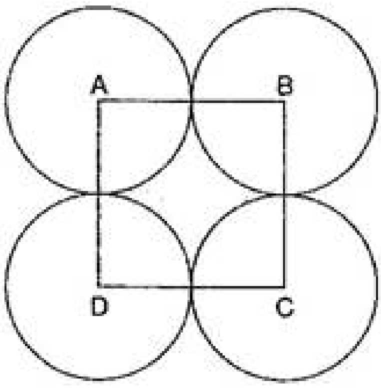
$\Rightarrow \quad a = \sqrt{3072}$

$\therefore$ Required area = $\pi(32)^2 - \frac{\sqrt{3}}{4} \times 3072$ [From eq. (i)]

$= \frac{22}{7} \times 1024 - 768\sqrt{3}$

$= \left(\frac{22528}{7} - 768\sqrt{3}\right) cm^2$

Q7. In figure ABCD is a square of side 14 cm. With centers A, B, C and D, four circles are drawn such that each circle touches externally two of the remaining three circles. Find the area of the shaded region.

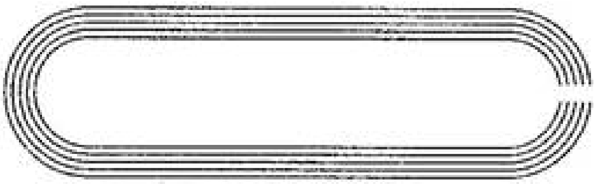


Ans. Area of shaded region = Area of square – 4 $\times$ Area of sector

$= 14 \times 14 - 4 \times \frac{90^\circ}{360^\circ} \times \frac{22}{7} \times \left(\frac{14}{2}\right)^2$

$= 196 - \frac{22}{7} \times 7 \times 7 = 196 - 154 = 42\ cm^2$

Q8. Figure depicts a racing track whose left and right ends are semicircular.



The distance between the two inner parallel line segments is 60 m and they are each 106 m long. If the track is 10 m wide, find:

(i) the distance around the track along its inner edge.

(ii) the area of the track.

Ans. (i) Distance around the track along its inner edge

$$= 106 + 106 + 2 \times \left[\frac{180^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times \left(\frac{60}{2} \right) \right]$$

$$= 212 + 60 \times \frac{22}{7} = 212 + \frac{1320}{7} = \frac{2804}{7} \text{ m}$$

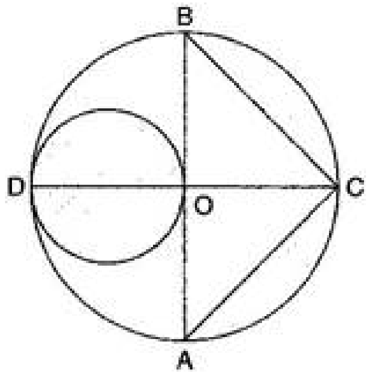
(ii) Area of track =

$$106 \times 10 + 106 \times 10 + 2 \times \left[\frac{1}{2} \times \frac{22}{7} (30 + 10)^2 - \frac{1}{2} \times \frac{22}{7} (30)^2 \right]$$

$$= 1060 + 1060 + \frac{22}{7} \left[(40)^2 - (30)^2 \right]$$

$= 2120 + \frac{22}{7} \times 700 \ = 4320 \, m^2$

Q9. In figure, AB and CD are two diameters of a circle (with centre O) perpendicular to each other and OD is the diameter of the smaller circle. If OA = 7 cm, find the area of the shaded region.



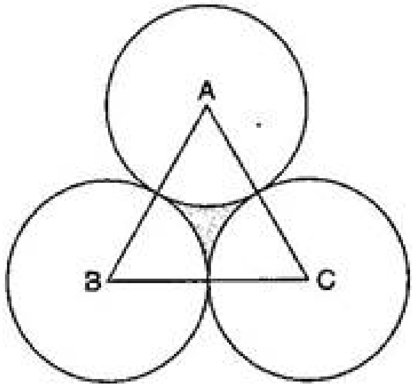
Ans. Area of shaded region = Area of circle + Area of semicircle ACB – Area of Δ ACB

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

$$= \frac{77}{2} + 187 - 49 \ = \frac{133}{2} \ = 66.5 \, cm^2$$

Q10. The area of an equilateral triangle ABC is **17320.5 cm^2** . With each vertex of the triangle as centre, a circle is drawn with radius equal to half the length of the side of the triangle (see figure). Find the area of the shaded region.

$\left(\text{Use } \pi = 3.14 \text{ and } \sqrt{3} = 1.73205\right)$



Ans. Area of equilateral triangle = $\frac{\sqrt{3}}{4}a^2$ = 17320.5

$\Rightarrow\ a^2 = \frac{17320.5\times4}{\sqrt{3}}$

$\Rightarrow\ a^2 = \frac{17320.5\times4}{1.73205}$

$\Rightarrow\ a^2 = 40000$

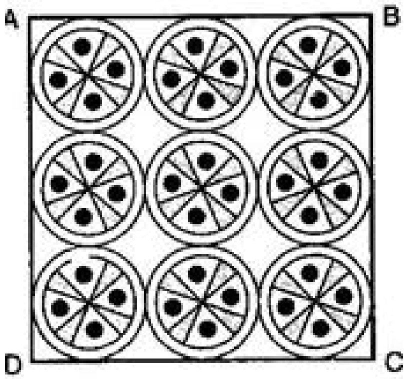
$\Rightarrow\ a = 200$ cm

Area of shaded region = Area of

Δ ABC $- 3\left[\frac{60^\circ}{360^\circ}\times3.14\times\left(\frac{200}{2}\right)^2\right]$

= 17320.5 – 15700 = $1620.5\ cm^2$

Q11. On a square handkerchief, nine circular designs each of radius 7 cm are made (see figure). Find the area of the remaining portion of the handkerchief.

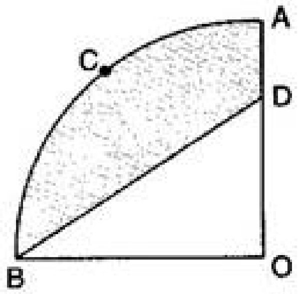


Ans. Area of remaining portion of handkerchief = Area of square ABCD – Area of 9 circular designs

$= 42\times42-9\times\frac{22}{7}\times7\times7$

$= 1764 - 1386 = 378\ cm^2$

Q12. In figure, OACB is a quadrant of a circle with centre O and radius 3.5 cm. If OD = 2 cm, find the area of the:



(i) quadrant OACB

(ii) shaded region

Ans. (i) Area of quadrant OACB =

$\frac{90^\circ}{360^\circ}\times\frac{22}{7}\times(3.5)^2$

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