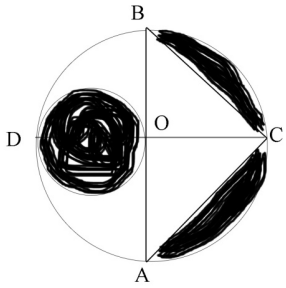
DAY 6

1. In the given figure, AB and PQ are perpendicular diameters of the circle whose centre is O and radius OA = 7cm. Find the area of shaded portion. [Ex 12.3, Q7]

Sol:- Radius OA of larger circle $(R) = 7$ cm

i.e. Diameter of smaller circle $= 7$ cm $\therefore$ radius of smaller circle $(r) = \frac{7}{2}$ cm

Now



Area of shaded region $= \left(\begin{matrix}\textbf{Area of}\\ \textbf{smaller circle}\end{matrix}\right)$

$+\left[\left(\begin{matrix}\textbf{Area of}\\ \textbf{semi circle ACBA}\end{matrix}\right) - \textbf{ar}\Delta\textbf{ABC}\right]$

$= \pi r^2 + \left[\frac{1}{2}\pi R^2 - \frac{1}{2} \times AB \times OC\right]$

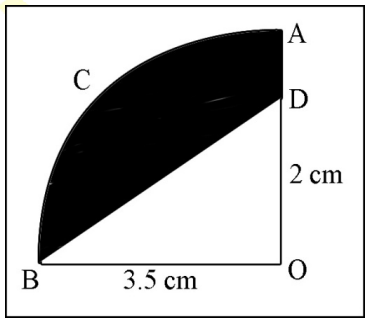
$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} + \left[\frac{1}{2} \times \frac{22}{7} \times 7 \times 7 - \frac{1}{2} \times 14 \times 7\right]$

$= \frac{77}{2} + [77 - 49] = \frac{77}{2} + 28 = 38.5 + 28 = 66.5$ $\boldsymbol{cm^2}$

2. In the figure, OACB represents a quadrant of circle of radius 3.5 cm with centre O.

i) Calculate the area of quadrant OACB

ii) Given OD=2cm. Calculate the area of shaded portion. [Ex 12.3, Q12]



Sol:- i) Radius of the quadrant $(r) = 3.5 = \frac{35}{10} = \frac{7}{2}$ cm

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

$= \frac{1}{4} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = \frac{77}{8}$ $\boldsymbol{cm^2}$

ii) **Area of shaded portion** $=$ **(Area of quadrant OACB)**

$-ar$**(right** Δ**OBD)**

$= \frac{77}{8} - \frac{1}{2} \times OB \times OD = \frac{77}{8} - \frac{1}{2} \times \frac{7}{2} \times 2$

$= \frac{77}{8} - \frac{7}{2} = \frac{77-28}{8} = \frac{49}{8}$ $\boldsymbol{cm^2}$

3. In the figure, a square OABC is inscribed in a quadrant OPBQ. If OA=20 cm, find the area of the shaded region. (Use $\pi = 3.14$) [Ex 12.3, Q13]

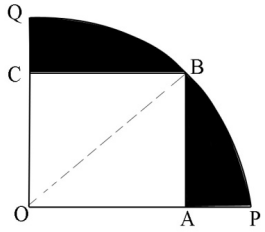
Sol:- Side of square OABC $= 20$ cm

Now radius of quadrant OPBQ (r) = Diagonal of square = OB

In right ΔOAB,

$OB^2 = OA^2 + AB^2 = 20^2 + 20^2 = 400 + 400 = 800$

$\Rightarrow \quad OB = \sqrt{800} = \sqrt{20 \times 20 \times 2} = 20\sqrt{2}$



Area of shaded portion = (Area of quadrant OPBQ) − (Area of square OABC)

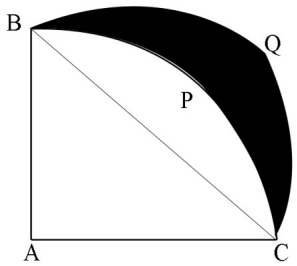
$$= \frac{1}{4}\pi r^2 - (\text{side})^2$$
$$= \frac{1}{4} \times 3.14 \times 20\sqrt{2} \times 20\sqrt{2} - 20 \times 20$$
$$= 628 - 400 = 228\ \boldsymbol{cm^2}$$

4. ABC is a quadrant of a circle of radius 14cm with AC as diameter, a semi-circle is drawn. Find the area of the shaded portion. [Ex 12.3, Q15]

Sol:- radius of quadrant ACPB $(r) = 14cm$ and Diameter of semi circle BQC = BC

In right ΔABC,

$$BC^2 = AB^2 + AC^2 = 14^2 + 14^2 = 196 + 196 = 392$$
$$\Rightarrow \quad BC = \sqrt{392} = \sqrt{14 \times 14 \times 2} = 14\sqrt{2}$$
$$\therefore \quad \text{radius of semi circle BQC (R)} = \frac{BC}{2} = 7\sqrt{2}$$

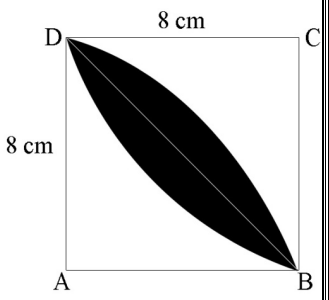


Area of shaded portion = $ar(\Delta ABC)$
+(Area of semi circle BQC) − (Area of quadrant ACPB)

$$= \frac{1}{2} \times AB \times AC + \frac{1}{2}\pi R^2 - \frac{1}{4}\pi r^2$$
$$= \frac{1}{2} \times 14 \times 14 + \frac{1}{2} \times \frac{22}{7} \times 7\sqrt{2} \times 7\sqrt{2} - \frac{1}{4} \times \frac{22}{7} \times 14 \times 14$$
$$= 98 + 154 - 154 = 98\ \boldsymbol{cm^2}$$

5. Calculate the area of the designed region in the given figure common between the two quadrants of circles of radius 8 *cm* each. [Ex 12.3, Q16]

Sol:- Designed part of the diagram can be divided into two parts in two minor segments with radius $\boldsymbol{r = 8\ cm}$ and $\boldsymbol{\theta = 90^0}$ as shown in the next figures



Now Area of designed Portion = 2 × Area of minor segment

$$= 2 \times \left(\frac{\pi r^2 \theta}{360^0} - \frac{1}{2} r^2 \sin\theta\right)$$
$$= 2 \times \left(\frac{22}{7} \times 8 \times 8 \times \frac{90^0}{360^0} - \frac{1}{2} \times 8 \times 8 \times \sin 90^0\right)$$
$$= 2 \times \left(\frac{352}{7} - 32 \times 1\right) = 2 \times \left(\frac{352}{7} - 32\right)$$
$$= 2 \times \left(\frac{352-224}{7}\right) = 200 \times \frac{128}{7} = \frac{256}{7}\ \boldsymbol{cm^2}$$