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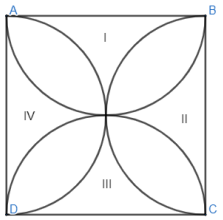
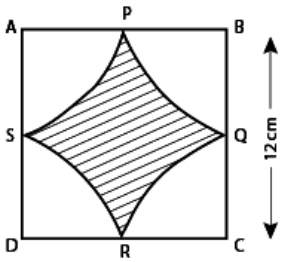
CLASS X Areas Related to the Circles Assignment

Section A: Shaded Regions in Squares & Rectangles (3 Marks)

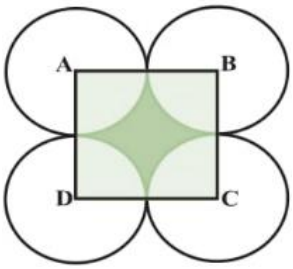
Q1. In the given figure, $ABCD$ is a square of side 14 cm . Semi-circles are drawn with each side of the square as diameter. Find the area of the shaded region. [CBSE 2013, 2016]



Q2. Find the area of the shaded region in the figure, where arcs drawn with centres A, B, C and D intersect in pairs at mid-points P, Q, R and S of the sides AB, BC, CD and DA respectively of a square $ABCD$ of side 12 cm. (Use $\pi = 3.14$). [CBSE 2018]

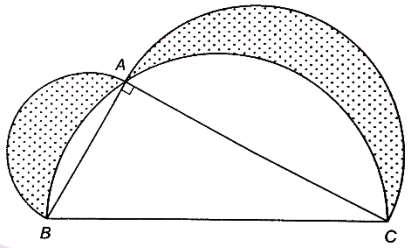


Q3. In the figure, $ABCD$ is a square of side 14 cm . With centres A, B, C and D, four circles are drawn such that each circle touches externally two of the remaining three circles. Find the area of the shaded region. [CBSE 2011, 2014, 2019]

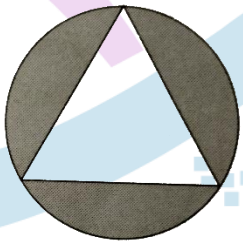


Section B: Shaded Regions in Triangles & Circles (3 Marks)

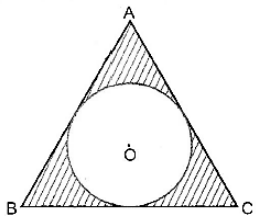
Q4. In the figure, ABC is a right-angled triangle right-angled at A. Semicircles are drawn on AB, AC and BC as diameters. Find the area of the shaded region. (Given $AB = 3$ cm, $AC = 4$ cm). [CBSE 2017, 2021]



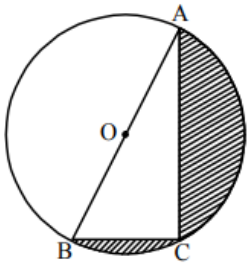
Q5. In the given figure, an equilateral triangle ABC has been inscribed in a circle of radius 6 cm . Find the area of the shaded region (the segments outside the triangle). (Use $\pi = 3.14, \sqrt{3} = 1.73$). [CBSE 2015]



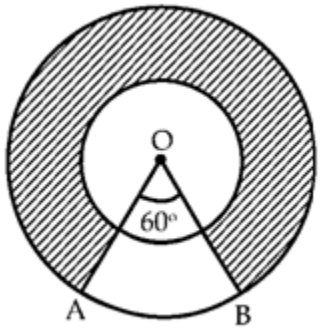
Q6. In the figure, a circle is inscribed in an equilateral triangle ABC of side 12 cm . Find the radius of the inscribed circle and the area of the shaded part (area of triangle excluding the circle). [CBSE 2014]



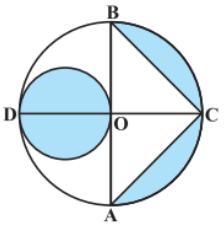
Q7. In the figure, O is the centre of a circle such that diameter $AB = 13$ cm and $AC =$ 12cm. BC is joined. Find the area of the shaded region. (Take $\pi = 3.14$). [CBSE 2016]



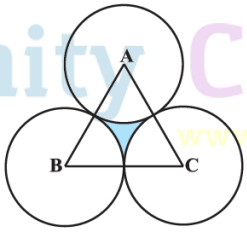
Q8. In the given figure, two concentric circles with centre O have radii 21 cm and 42 cm . If $\angle AOB = 60°$, find the area of the shaded region. [CBSE 2017, 2019]



Q9. In the 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. [CBSE 2012, 2013, 2018]



Q10. The area of an equilateral triangle ABC is $17320.5\ \text{cm}^2$. 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. Find the area of the shaded region. (Use $\pi = 3.14, \sqrt{3} = 1.73205$). [CBSE 2015, 2019]



Answer Key Hints

1. Area = $84\ \text{cm}^2$. Hint: Area = 2 (Area of Square) - 4(Area of Semicircle)? No. Better method: Area = Area of Square - [Area of Square -2 (Semicircles)] × 2. Simplified: Area of 4 leaves = 4 × (Quadrant - Triangle). Or 8 × (Segment).
2. Area = $30.96\ \text{cm}^2$. Hint: Area of Square $-4 \times$ Area of Quadrant. Side = 12, so radius = 6. Area = $144 - 4 \times \frac{1}{4} \times 3.14 \times 36 = 144 - 113.04$.
3. Area = 42 cm ^{2}. Hint: Area of Square - Area of 4 Quadrants. Radius = 7 cm. $196 - \pi(7)^2 = 196 - 154 = 42$.
4. Area = $6\ \text{cm}^2$. Hint: Area of shaded region = Area of $\triangle ABC$. (This is a standard property: Area of lunes = Area of triangle). $1/2 \times 3 \times 4 = 6$.
5. Area = $66.54\ \text{cm}^2$. Hint: Area of Circle - Area of Eq. Triangle. Radius $R = 6$. Side of triangle $a = R\sqrt{3} = 6\sqrt{3} \cdot \pi(36) - \frac{\sqrt{3}}{4}(6\sqrt{3})^2$.
6. Radius = $2\sqrt{3}$ cm. Area = $24.64\ \text{cm}^2$ (approx). Hint: Radius of incircle $r = \frac{a}{2\sqrt{3}} = \frac{12}{2\sqrt{3}} = 2\sqrt{3}$. Area $\triangle$ - Area Circle.

7. Area = $36.33\ \text{cm}^2$. Hint: $\triangle ABC$ is right angled at C (angle in semicircle). $BC = \sqrt{13^2 - 12^2} = 5$. Area shaded = Area Semicircle - Area $\triangle ABC$. $\frac{1}{2}\pi(6.5)^2 - \frac{1}{2}(12)(5)$.

8. Area = $3465\ \text{cm}^2$. Hint: Area of Ring Sector = $\frac{\theta}{360}\pi(R^2 - r^2) \cdot \frac{300}{360}\pi(42^2 - 21^2)$ (Shaded is usually the major part or minor part, read question context. If shaded is the sector itself: $\frac{60}{360}$. If shaded is the track part: $\frac{60}{360}$. . .). Correction: Usually it asks for the region inside the angle or the reflex. Assuming region inside the reflex $(360 - 60 = 300)$ or just the slice: If slice: $\frac{1}{6} \times \frac{22}{7} \times (1764 - 441) = \frac{1}{6} \times 22 \times 189 = 693$. Note: Check specific year image. If reflex: $693 \times 5 = 3465$.

9. Area = $66.5\ \text{cm}^2$. Hint: Area Small Circle + Area of 2 Segments. Small Circle radius = $7/2 = 3.5$. Area = $\pi(3.5)^2$. Segments Area = Area Semicircle - Area $\triangle ABC$ (Base 14, Height 7). Total = $38.5 + (77 - 49) = 66.5$.

10. Area = $1620.5\ \text{cm}^2$. Hint: Area $\triangle -3 \times$ Area of Sector. Side $a = 200$. Radius $r = 100$.

$$17320.5 - 3 \times \frac{60}{360} \times 3.14 \times 10000.17320.5 - 15700 = 1620.5.$$