

CLASS 10 · HOTS · OLYMPIAD PREPARATION · SHORT NOTES

Chapter 11: HOTS: Areas Related to Circles (Class 10)

Topic-wise short notes with solved examples

Higher order thinking questions on areas related to circles for Class 10: sectors, arcs, segments, rings, clock hands and combined figures, each with a full solution.

1 Solved HOTS questions

- Formulas: circumference $2\pi r$, area πr^2 . For a sector of angle θ : arc length = $\frac{\theta}{360} \times 2\pi r$ and area = $\frac{\theta}{360} \times \pi r^2$. Area of a segment = area of the sector – area of the triangle. Take $\pi = \frac{22}{7}$ unless told otherwise.

Example 1.1 A circle is drawn inside a square of side 14 cm so that it touches all four sides. Find the area of the part of the square outside the circle.

SOLUTION

The radius of the circle is 7 cm, so its area is $\frac{22}{7} \times 49 = 154$ square cm.

The area of the square is $14 \times 14 = 196$.

The area outside the circle is $196 - 154$.

42 square cm

Example 1.2 The minute hand of a clock is 14 cm long. Find the area swept by it in 5 minutes.

SOLUTION

In 5 minutes the minute hand turns through $\frac{5}{60} \times 360^\circ = 30^\circ$.

The area is $\frac{30}{360} \times \frac{22}{7} \times 14 \times 14 = \frac{1}{12} \times 616$.

$\frac{154}{3}$ square cm, about 51.3 square cm

Example 1.3 A sector of a circle of radius 21 cm has an angle of 60° . Find the length of its arc and its area.

SOLUTION

Arc length = $\frac{60}{360} \times 2 \times \frac{22}{7} \times 21 = \frac{1}{6} \times 132 = 22$ cm.

Area = $\frac{1}{6} \times \frac{22}{7} \times 21 \times 21 = \frac{1}{6} \times 1386 = 231$ square cm.

Arc 22 cm and area 231 square cm

Example 1.4 A circular track is a ring. The circumference of the inner edge is 352 m and that of the outer edge is 396 m. Find the width of the track.

SOLUTION

Let the radii be r and R . $2\pi r = 352$ and $2\pi R = 396$, so $2\pi(R - r) = 44$.

$$2\pi = \frac{44}{7}, \text{ so } R - r = 44 \div \frac{44}{7} = 7.$$

7 m

Example 1.5 A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the minor segment (use $\pi = 3.14$).

SOLUTION

$$\text{Area of the sector} = \frac{90}{360} \times 3.14 \times 100 = 78.5 \text{ square cm.}$$

The triangle formed by the radii and the chord has area $\frac{1}{2} \times 10 \times 10 = 50$ square cm.

The segment is the sector minus the triangle: $78.5 - 50$.

28.5 square cm