AREAS RELATED TO CIRCLES

KEY POINTS

1. Circle: The set of points which are at a constant distance from a fixed point in a plane is called a circle.
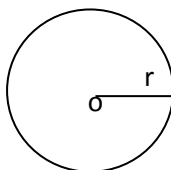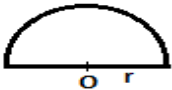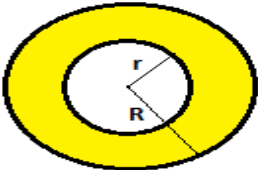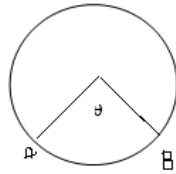

2. Circumference: The perimeter of a circle is called its circumference.
3. Secant: A line which intersects a circle at two points is called secant of the circle.
4. Arc: A continuous piece of circle is called an arc of the circle.
5. Central angle: - An angle subtended by an arc at the center of a circle is called its central angle.

6. Semi-Circle: - A diameter divides a circle into two equal arcs. Each of these two arcs is called a semi-circle.
7. Segment: - A segment of a circle is the region bounded by an arc and a chord, of a circle.
8. Sector of a circle: The region enclosed by an arc of a circle and its two bounding radii is called a sector of the circle.
9. Quadrant: - One fourth of a circle/ circular disc is called a quadrant. The central angle of a quadrant is 90^0.

S.N	NAME	FIGURE	PERIMETER	AREA
1.	Circle		$2\pi r$ or πd	πr^2
2.	Semi- circle		$\pi r + 2r$	$\frac{1}{2}\pi r^2$
3.	Ring (Shaded region)		$2\pi(r + R)$	$\pi(R^2-r^2)$
4.	Sector of a circle		$l+2r=\frac{\pi r\theta}{180°} + 2r$	$\frac{\pi r^2\theta}{360°}$ or $\frac{1}{2}lr$
5.	Area of Segment of a circle		$\frac{\pi r\theta}{180°}+2r\,\text{Sin}\frac{\theta}{2}$	$\frac{\pi r^2\theta}{360°}-\frac{1}{2}r^2\sin\theta$

a. Length of an arc AB= $\frac{\theta}{360}$ 2 πr

b. Area of major segment= Area of a circle – Area of minor segment

c. Distance moved by a wheel in
   1 rotation=circumference of the wheel

d. Number of rotation in 1 minute = Distance moved in 1 minute / circumference

LEVEL-I

1. If the perimeter of a circle is equal to that of square, then the ratio of their areas is
   i.   22/7
   ii.   14/11
   iii.   7/22
   iv.   11/14

2. The area of the square that can be inscribed in a circle of 8 cm is
   i.   256 cm²
   ii.   128cm²
   iii.   64√2cm²
   iv.   64cm²

3. Area of a sector to circle of radius 36 cm is 54 πcm² . Find the length arc of the corresponding arc of the circle is
   i.   6 πcm
   ii.   3 πcm
   iii.   5 πcm
   iv.   8 πcm

   [Ans –ii]

4. A wheel has diameter 84 cm. The number of complete revolution it will take to cover 792 m is.
   i. 100
   ii. 150
   iii. 200
   iv. 300

5. The length of an arc of a circle with radius 12cm is 10π cm. The central angle of this arc is.
   i. 120^0
   ii. 6^0
   iii. 75^0
   iv. 150^0

6. The area of a circle whose circumference π cm is
   i. $11/2$ cm²
   ii. $\pi/4$ cm²
   iii. $\pi/2$ cm²
   iv. None of these

7. In figure 'o' is the centre of a circle. The area of sector OAPB is 5/18 of the area of the circle find x.
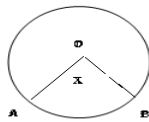
8. If the diameter of a semicircular protractor is 14 cm, then find its perimeter.
9. The diameter of a cycle wheel is 21cm. How many revolutions will it make to travel 1.98km?
10. The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 5 minutes.

LEVEL – II

1. Find the area of the shaded region in the figure if AC=24 cm ,BC=10 cm and o is the center of the circle (use $\pi = 3.14$)
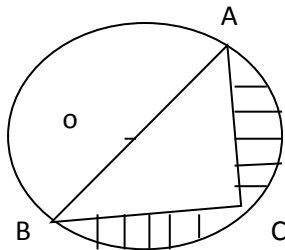
2. The inner circumference of a circular track is 440m. The track is 14m wide. Find the diameter of the outer circle of the track.   [Take π =22/7]
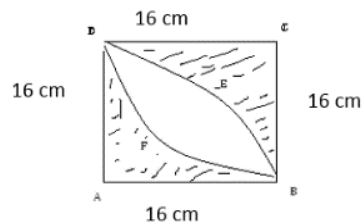
3. Find the area of the shaded region.
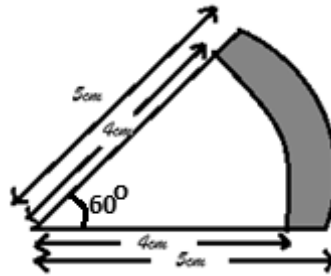
4. A copper wire when bent in the form of a square encloses an area of 121 cm^2. If the same wire is bent into the form of a circle, find the area of the circle (Use π=22/7)

5. A wire is looped in the form of a circle of radius 28cm. It is rebent into a square form. Determine the side of the square (use $\pi = 22/7$)

LEVEL-III

1. Three horses are tethered with 7 m long ropes at the three corners of a triangular field having sides 20 m, 34 m 42 m. Find the area of the plot.

   i.   Grazed by horses

   ii. Remains ungrazed by horses

2. Calculate the area of shaded region in given figure where ABCD is square of side 16 cm.

3. ABC is a quadrant of circle of radius 14 cm and a semi-circle is drawn with BC as diameter. Find the area of Shaded region.
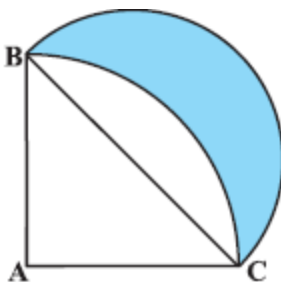
4. The length of a minor arc is 2/9 of the circumference of the circle. Write the measure of the angle subtended by the arc at the centre of the circle.

5. The area of an equilateral triangle is 49√3 cm². Taking each angular point as centre, circle is drawn with radius equal to half the length of the side of the triangle. Find the area of triangle not included in the circles.
[Take √3=1.73]

SELF EVALUATION

1. Two circles touch externally the sum of the areas is 130 π cm² and distance between there centre is 14 cm. Find the radius of circle.
2. Two circle touch internally. The sum of their areas is 116 π cm² and the distance between their centres is 6 cm. Find the radii of circles.
3. A pendulum swings through an angle of 30^0 and describes an arc 8.8 cm in length. Find length of pendulum.
4. The side of a square is 10 cm find the area of circumscribed and inscribed the circle.
5. An Umbrella has 8 ribs which are equally spaced. Assume Umbrella to be flat circle of radius 45 cm find the area between two consecutive ribs of umbrella.
6. Find the area of the segment AYB shown in given Fig. , If radius of the circle is 21 cm and angle AOB = 120^0. [use π= 22/7]

Value Based Question

Q1. A child prepare a poster on " save energy" on a square sheet whose each side measure 60 cm. at each corner of the sheet, she draw a quadrant of radius 17.5 cm in which she shows the ways to save energy at the centre. She draws a circle of diameter 21 cm and writes a slogan in it. Find the area of remaining sheet.
(a) Write down the four ways by which the energy can be saved.
(b) Write a slogan on save energy.

Q2. A birthday cake is circular in shape. This cake is equally divided among six friends where radius of the cake is 60 cm.
i.   Find the area of each piece of cake.
ii.   Which value is depicted by the friends?

ANSWER
LEVEL-I

1. (ii). 14/11
2. (ii). 128 cm^2
3. (ii) 3π cm
4. (iv) 300
5. (iv) 150^0
6. (ii)π/4
7. 100^0
8. 36 cm
9. 6000
10. 154/3 cm^2

LEVEL- II

1. 145.33 cm^2
2. D= 160 m
3. 4.71 cm^2
4. 154 cm^2
5. 44 cm

LEVEL- III

1. (i) 77 m^2
   (ii) 59 m^2
2. 109.7 cm^2
3. 98 cm^2
4. 80^0
5. 777 cm^2

SELF EVALUATION

1. 11 cm and 3 cm
2. 4 cm and 10 cm
3. 16.8 cm
4. 50 π cm^2, 25 π cm^2
5. 794.81 cm^2

VALUE BASED QUESTION

1. Area of Remaining sheet = 2292.19 cm^2
   A). Write four ways to save energy
   B). Write a slogan to save energy
   C). Write importance to save energy.

2. I) Area of each piece = 1884 cm^2
   ii) 1/6