

CHAPTER 12

Areas Related to Circles

Area and Perimeter of a circle and its special parts:

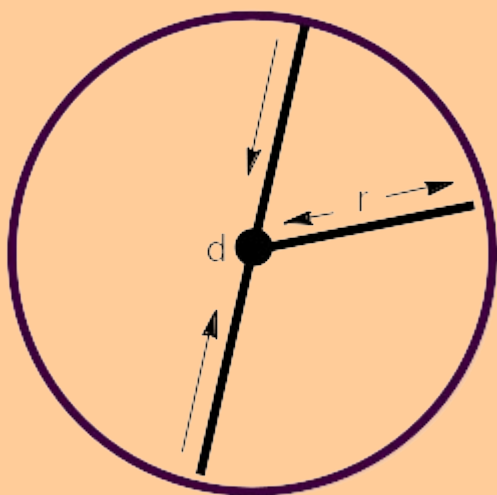
Definition of circle:

Circle is defined as the locus of a point, which moves in a plane such that its distance from a fixed point is always same.

The diagram of circle is shown in the figure.

Area of circle = πr^2

In terms of diameter area is $\frac{\pi d^2}{4}$, where $r = \frac{d}{2}$



Perimeter of circle $P = 2\pi r = \pi d$

Another name for perimeter of circle is circumference.

Semi – circle:

The diameter of a circle divides it into two equal parts. Each of these parts is known as semi – circle.

i.e. Half of circle.



$$\text{Area of semi – circle} = \frac{\pi r^2}{2} = \frac{\pi d^2}{8}$$

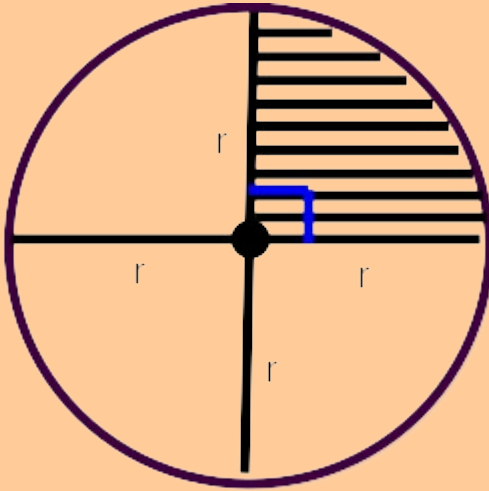
$$\text{Perimeter/Circumference of semicircle} = r(\pi + 2)$$

i.e. The sum of half of the circumference of the circle and its diameter.

Quadrant:

The half of a semicircle is a quadrant.

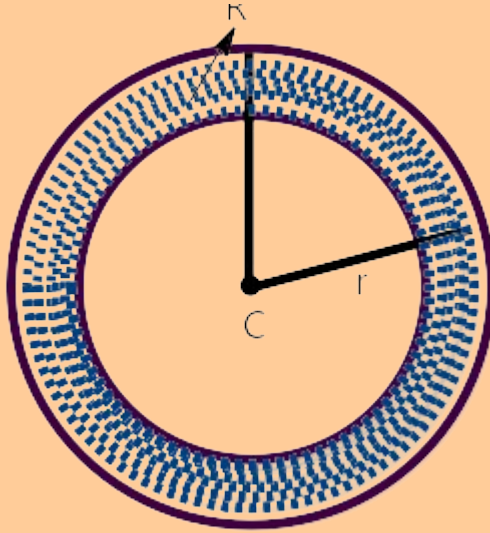
$$\text{Area of Quadrant} = \frac{\pi r^2}{4} = \frac{\pi d^2}{16}$$



$$\text{Perimeter/Circumference of quadrant} = r \left(\frac{\pi}{2} + 2 \right)$$

Circular ring:

When two circles have same centre but different radii, then a ring is formed.



Area of circular ring = $\pi(R^2 - r^2)$

$$= \pi(R + r)(R - r)$$

$$= \pi(R + r)W$$

Where, W = Width of ring

r = Radius of inner circle

R = Radius of outer circle

Perimeter of circular ring = $2\pi(R + r)$

i.e. The sum of perimeter of inner circle and outer circle.

- Distance covered by a wheel in one revolution =
Circumference of the wheel.

- No. of revolutions made by a wheel in one minute distance covered in 1 minute/Circumference of the wheel.

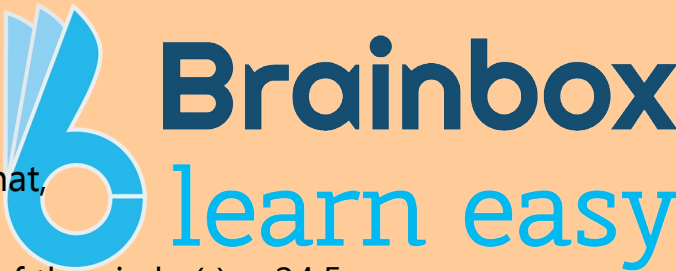
Example:

Let the radius of the circle be 24.5 cm. Find the following.

- Circumference of the circle
- Area of the circle
- Area of the semicircle
- Perimeter of quadrant of the circle

Sol.

Given that,



Radius of the circle (r) = 24.5 cm

- Circumference of the circle = $2\pi r$

$$= 2 \times \frac{22}{7} \times \cancel{24.5}^{3.5}$$

$$= 2 \times 22 \times 3.5$$

$$= 44 \times 3.5$$

The circumference of the circle = 154 cm

- The area of the circle = πr^2

$$= \frac{22}{7} \times (24.5)^2$$

$$= \frac{22}{7} \times 24.5 \times 24.5$$

$$= \frac{22}{7} \times \cancel{24.5}^{3.5} \times 24.5$$

$$= 22 \times 3.5 \times 24.5$$

$$= 22 \times 85.75$$

$$\text{Area of circle} = 1,886.5 \text{ cm}^2$$

- Area of semicircle = $\frac{1}{2} \times \text{Area of the circle}$

$$= \frac{1}{2} (1886.5)$$

$$\text{Area of semicircle} = 943.25 \text{ cm}^2$$

- Area of the quadrant of the circle = $\left(2 + \frac{\pi}{2}\right) r$

$$= \left(2 + \frac{\cancel{22}^{11}}{\cancel{14}_7} \right) \times 24.5$$

$$= \frac{25}{\cancel{7}} \times \cancel{24.5}^{3.5}$$

$$= 25 \times 3.5$$

Area of the quadrant of the circle = 87.5 cm

