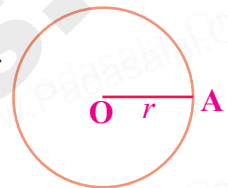


# Chapter 2

## Measurements

### Circle

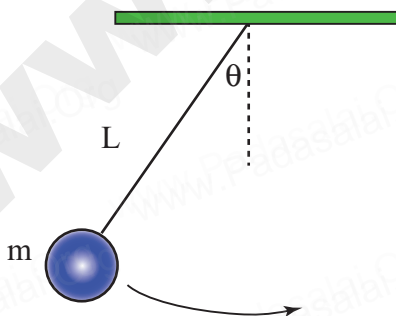
- ★ Circle is a round plane figure whose boundary (the circumference) consists of points equidistant from the fixed point (the centre).
- ★ The equidistance from the centre to the boundary is the radius (r) of the circle.
- ★ diameter =  $2 \times$  radius
- ★ All circles are similar to one another.
- ★ Distance around the circular region is called circumference or perimeter.
- ★ In circles, the ratio of the circumference to that of diameter is a constant.
- ★  $\frac{\text{circumference}}{\text{Diameter}} = \pi$  (say pi)
- ★ circumference of a circle  $C = 2\pi r$  units or  $C = \pi d$
- ★  $\pi = \frac{22}{7}$  or 3.14 approximately



### TRY THESE

(Text book Page No. 23)

1. A few real life examples of circular shapes are given below.



Can you give three more examples.

- Sol :**
- (i) One and Two rupee coins
  - (ii) Bangles
  - (iii) Mouth of Bottle

$$\begin{aligned}\text{Perimeter of the circle} &= 2\pi r \\ &= 2 \times \frac{22}{7} \times 5.6 \\ &= 35.2 \text{ cm}\end{aligned}$$

$$\begin{aligned}\text{Let the area of a square} &= 100 \text{ cm}^2 \\ a^2 &= 100 \\ a &= 10 \text{ cm}\end{aligned}$$

$$\text{Perimeter of a square} = 4a = 4 \times 10 = 40 \text{ cm}$$

Hence  $35.2 < 40$

By this example we can see that perimeter of circle  $<$  perimeter of square, having the same area.



### Think

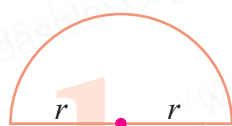
(Text book Page No. 27)

- Is the circumference of the semicircular arc and semicircular shaped disc same? Discuss.

Sol :



Semi circular arc



Semi circular disc

$$\text{Circumference of the semicircular arc} = \frac{1}{2} \times 2\pi r = \pi r \text{ units}$$

$$\begin{aligned}\text{But circumference of the semicircular disc} &= \frac{1}{2} \times 2\pi r + r + r = \pi r + 2r \\ &= r(\pi + 2) \text{ units}\end{aligned}$$

Both are not the same

- The traffic lights are circular. Why?

Sol : Because the circumference will be smaller and cost of making will be less as the outer size becomes small.

- When you throw a stone on still water in pond, ripples are circular. Why?

Sol : Waves always travel with a constant speed and so they need to be circular.

### EXERCISE 2.1

- Find the missing values in the following table for the circles with radius (r), diameter (d) and Circumference (C).

S.No.	radius (r)	diameter (d)	Circumference (C)
(i)	15 cm		
(ii)			1760 cm
(iii)		24 m	

$$\begin{aligned}\text{Area of the circular garden} &= \pi r^2 \text{ sq. units} \\ &= \frac{22}{7} \times \frac{49}{2} \times \frac{49}{2} \text{ m}^2 = 1,886.5 \text{ m}^2\end{aligned}$$

$$\begin{aligned}\text{Cost of levelling a m}^2 \text{ area} &= ₹150 \\ \therefore \text{Cost of levelling } 1886.5 \text{ m}^2 &= ₹150 \times 1886.5 = ₹2,82,975 \\ \text{Cost of levelling the flower garden} &= ₹2,82,975\end{aligned}$$

9. The floor of the circular swimming pool whose radius is 7 m has to be cemented at the rate of ₹18 per m<sup>2</sup>. Find the total cost of cementing the floor.

**Sol :** Radius of the circular swimming pool  $r = 7$  m

$$\begin{aligned}\text{Area of the circular swimming pool } A &= \pi r^2 \text{ sq. units} \\ &= \frac{22}{7} \times 7 \times 7 \text{ m}^2 = 154 \text{ m}^2\end{aligned}$$

$$\begin{aligned}\text{Cost of cementing a m}^2 \text{ floor} &= ₹18. \\ \text{Cost of cementing } 154 \text{ m}^2 \text{ floor} &= ₹18 \times 154 = ₹2,772\end{aligned}$$

### OBJECTIVE TYPE QUESTIONS

10. The formula used to find the area of the circle is  
(i)  $4\pi r^2$  (ii)  $\pi r^2$  (iii)  $2\pi r^2$  (iv)  $\pi r^2 + 2r$  [Ans: (ii)  $\pi r^2$ ]
11. The ratio of the area of a circle to the area of its semicircle is  
(i) 2 : 1 (ii) 1 : 2 (iii) 4 : 1 (iv) 1 : 4 [Ans : (i) 2 : 1]
12. Area of a circle of radius 'n' units is  
(i)  $2\pi r^p$  sq. units (ii)  $\pi m^2$  sq. units  
(iii)  $\pi r^2$  sq. units (iv)  $\pi n^2$  sq. units [Ans : (iv)  $\pi n^2$  sq. units]

### ADDITIONAL QUESTIONS

1. The circumference of two circles are on the ratio 5 : 6. Find the ratio of their areas.

**Sol :** Let the radii of the given circles be  $r_1$  and  $r_2$ .

Let their circumference be  $C_1$  and  $C_2$  respectively

$$C_1 = 2\pi r_1 \text{ and } C_2 = 2\pi r_2$$

$$\text{Since } C_1 : C_2 = 5 : 6$$

$$\therefore (2\pi r_1) : (2\pi r_2) = 5 : 6$$

$$\frac{2\pi r_1}{2\pi r_2} = \frac{5}{6} \Rightarrow \frac{r_1}{r_2} = \frac{5}{6}$$

### Area of Pathways

- ★ Area of the circular path = Area of the outer circle – Area of the inner circle
- ★ Area of the circular pathway =  $\pi R^2 - \pi r^2 = \pi(R^2 - r^2)$  sq. units  
where R and r are radius of the outer and inner circles respectively.
- ★ Area of the rectangular path = Area of the outer rectangle – Area of the inner rectangle  
=  $LB - lb$  sq. units  
where L, B and l, b are the length and breadth of outer and inner rectangles respectively.

## Unit 2



### TRY THESE

(Text book Page No. 35)

- (i) If the outer radius and inner radius of the circles are respectively 9 cm and 6 cm, find the width of the circular pathway.

**Sol :** Radius of the outer circle  $R = 9$  cm

Radius of the inner circle  $r = 6$  cm

$$\begin{aligned}\text{Width of the circular pathway} &= \text{Radius of the outer circle} \\ &\quad - \text{Radius of the inner circle} \\ &= (9 - 6) \text{ cm} = 3 \text{ cm}\end{aligned}$$

$$\text{Width of the circular pathway} = 3 \text{ cm}$$

- (ii) If the area of the circular pathway is 352 sq.cm and the outer radius is 16 cm, find the inner radius.

**Sol :**

$$\begin{aligned}\text{Given outer radius } R &= 16 \text{ cm} \\ \text{Area of the circular pathway} &= \pi R^2 - \pi r^2 \\ \text{Area of the circular pathway} &= 352 \text{ sq. cm} \\ \pi R^2 - \pi r^2 &= 352 \text{ cm}^2 \\ \pi(R^2 - r^2) &= 352 \\ 16^2 - r^2 &= \frac{352 \times 7}{22} \\ 16^2 - r^2 &= 16 \times 7 \\ 16^2 - r^2 &= 112 \\ 16^2 - 112 &= r^2 \\ r^2 &= 256 - 112 \\ r^2 &= 144 \\ r &= 12 \text{ cm}\end{aligned}$$

Inner radius  $r = 12$  cm

- (iii) If the area of the inner rectangular region is 15 sq.cm and the area covered by the outer rectangular region is 48 sq.cm, find the area of the rectangular pathway.

**Sol :**

$$\begin{aligned}\text{Area of the outer rectangle} &= 48 \text{ sq.cm} \\ \text{Area of the inner rectangle} &= 15 \text{ sq.cm}\end{aligned}$$

9. A circular path has to be constructed around a circular ground. If the areas of the outer and inner circles are  $1386 \text{ m}^2$  and  $616 \text{ m}^2$  respectively, find the width and area of the path.

**Sol :**

$$\begin{aligned} \text{Area of the outer circle} &= 1386 \text{ m}^2 \\ \pi R^2 &= 1386 \text{ m}^2 \\ \text{Area of the inner circle} &= 616 \text{ m}^2 \\ \pi r^2 &= 616 \text{ m}^2 \\ \text{Area of the path} &= \text{Area of outer circle} - \text{Area of the inner circle} \\ &= 1386 \text{ m}^2 - 616 \text{ m}^2 \\ \text{Area of the path} &= 770 \text{ m}^2 \\ \text{Also } \pi R^2 &= 1386 \\ R^2 &= \frac{1386 \times 7}{22} \\ R^2 &= 63 \times 7 \\ R^2 &= 9 \times 7 \times 7 \\ R^2 &= 3^2 \times 7^2 \\ R &= 3 \times 7 \\ \text{Outer Radius } R &= 21 \text{ m} \\ \text{Again } \pi r^2 &= 616 \\ \frac{22}{7} \times r^2 &= 616 \\ r^2 &= 28 \times 7 \\ r^2 &= 4 \times 7 \times 7 \\ r^2 &= 2^2 \times 7^2 \\ r &= 2 \times 7 \\ \text{Inner radius } r &= 14 \text{ m} \\ \text{Width of the path} &= \text{Outer radius} - \text{Inner radius} \\ &= 21 - 14 \\ \text{Width of the path} &= 7 \text{ m} \end{aligned}$$

10. A goat is tethered with a rope of length 45 m at the centre of the circular grass land whose radius is 52 m. Find the area of the grass land that the goat cannot graze.

**Sol :** Length of the rope = 45 m = Radius of the inner circle  
 $\therefore$  Area of the circular area that the goat graze =  $\pi r^2$  sq. units

$$\begin{aligned} &= \frac{22}{7} \times 45 \times 45 \text{ m}^2 \\ &= 6364.28 \text{ m}^2 \\ \text{Radius of the gross land} &= 52 \text{ m} \end{aligned}$$



$$\text{Area of inner small rectangle} = \frac{19}{2} \times \frac{13}{2} \text{ m}^2$$

$$= 61.75 \text{ cm}^2$$

$$(i) \quad \text{Area of the path} = \text{Area of the outer rectangle} \\ - \text{Area of 4 inner small rectangles}$$

$$= 300 - 4(61.75)$$

$$= 300 - 247$$

$$= 53 \text{ m}^2$$

$$\text{Area of the paths} = 53 \text{ m}^2$$

$$(ii) \quad \text{Area of the remaining portion of the field}$$

$$= \text{Area of the outer rectangle} - \text{Area of the paths}$$

$$= 300 - 53 \text{ m}^2$$

$$= 247 \text{ m}^2$$

$$\text{Area of the remaining portion} = 247 \text{ m}^2$$

$$(iii) \quad \text{Cost of constructing } 1 \text{ m}^2 \text{ road} = ₹10$$

$$\therefore \text{Cost of constructing } 53 \text{ m}^2 \text{ road} = ₹10 \times 53 = ₹530$$

$$\therefore \text{Cost of constructing road} = ₹530$$

## UNIT TEST

**Time: 1 hr**

**SECTION A**

**Max Marks : 25**

### I. Fill in the blanks.

**5 × 1 = 5**

- The diameter of a circle is 14 cm. Its area is \_\_\_\_\_  $\text{cm}^2$ .
- The radius of a circle is 1 cm, then the perimeter of its semi-circle is \_\_\_\_\_ cm.
- Perimeter of a semicircle is \_\_\_\_\_
- The length and breadth of a rectangle are 3.5 cm and 2.2 cm respectively, then its area is \_\_\_\_\_  $\text{cm}^2$ .
- The area of a rectangle is  $150 \text{ cm}^2$ . If its breadth 10 cm, then its length \_\_\_\_\_ cm.

### II. Answer the following questions.

**5 × 3 = 15**

- What is the area of a circle whose circumference is 31.3 cm?
- Find the area of a circular disc whose circumference is 88 cm.
- The circumference of a circle is 12.56 cm, find its diameter.
- The radius of a circular park is 7 m. Find its area.
- Find the circumference of a circle, whose diameter is 21 cm.