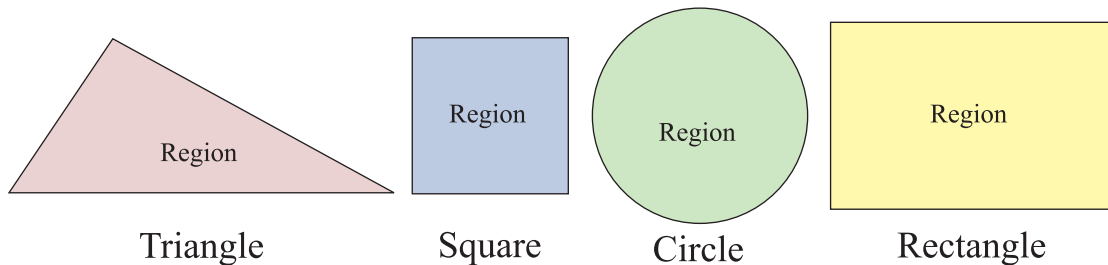## 8.1 Perimeter and Area

8.1.1 Recognition of Region of a Closed Figure

Region of a closed figure comprises of the surface enclosed by the boundary and the boundary of the figure itself.

The regions of the different closed figures are given below:

| Triangle | Square | Circle | Rectangle |

8.1.2 Differentiation Between Perimeter and Area of a Region

Perimeter

Perimeter is the distance around a closed figure. In other words the length of the boundary of the closed figure is known as the perimeter of the figure. Since the perimeter is a distance, it is measured in cm, m and km.

Area is the quantity that expresses the extent of a two dimensional figure. Area is measured in square units i.e. cm^2, m^2 and km^2.

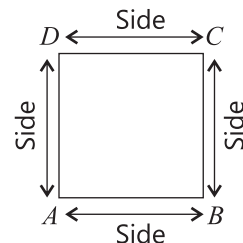## 8.1.3 Writing the Formula for Perimeter and Area of a Square and a Rectangle

- **Perimeter**

(i) Perimeter of a square

We know that a square has four sides of equal length. To find the perimeter of the square, we add the lengths of four sides of a square i.e;

Perimeter of a square = side + side + side + side = 4 × side

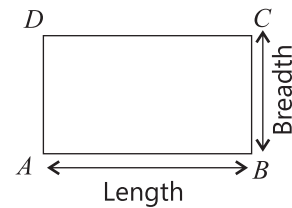∴ **Formula for perimeter of a square = 4 × side unit**

Example   Find the perimeter of a square whose length of a side is 5cm.

Solution   Length of a side $= 5$cm

Perimeter of the square $= 4 \times$ side

$= 4 \times 5$

$= 20$cm

(ii)   Perimeter of a Rectangle

We know that a rectangle has 2 equal lengths and 2 equal breadths. To find the perimeter of a rectangle, we add the measures of four sides i.e.,

Perimeter of the rectangle $=$ Length $+$ Breadth $+$ Length $+$ Breadth

$=$ Length $+$ Length $+$ Breadth $+$ Breadth

$= 2$ (Length) $+ 2$(Breadth)

$= 2$ (Length $+$ Breadth)

$\therefore$ **Formula for perimeter of a rectangle $= 2$ (Length + Breadth) unit**

Example

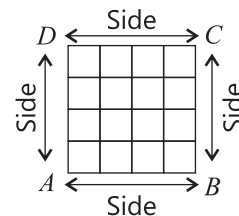Find the perimeter of a rectangle whose length is 5cm and breadth is 4cm.

Solution   Length of the rectangle $= 5$cm

Breadth of the rectangle $= 4$cm

Perimeter of the rectangle $= 2$(Length $+$ Breadth)

$= 2(5 + 4)$

$= 2(9)$

$= 18$cm

•   Area

(i)   Area of a Square

The area is the product of length and breadth. In a square length of each side is equal i.e.

length $=$ breadth $=$ side

Area of a square $=$ side $\times$ side

$\therefore$ **Formula for the area of a square $=$ side $\times$ side   (unit)^2**

Example   Find the area of a square whose length of a side is 3cm.

Solution   Length of side = 3cm

$$\text{Area} = \text{side} \times \text{side}$$
$$= 3 \times 3 \quad = 9\text{cm}^2$$

(ii)   Area of a Rectangle

The area of a rectangle can be calculated with the help of product of length and breadth.

∴ Formula for the area of a rectangle = Length × Breadth (unit)^2

Example

Find the area of a rectangle whose length is 12cm and breadth is 8cm.

Solution

Length of the rectangle = 12cm

Breadth of the rectangle = 8cm

Area of the rectangle = Length × Breadth

$$= 12 \times 8 = 96\text{cm}^2$$

8.1.4   Application of formulas to find Perimeter and Area of a Square and a Rectangular Region

Example 1

Find the perimeter and area of a square whose side is 12cm.

Solution

Length of the side = 12cm

Perimeter of the square = 4 × side

$$= 4 \times 12$$
$$= 48\text{cm}$$

Area of the square = side × side

$$= 12 \times 12$$
$$= 144\text{cm}^2$$

Example 2 Find the perimeter and area of a rectangle whose length is 12cm and breadth is 8cm.

Solution   Length of the rectangle = 12cm

Breadth of the rectangle = 8cm

Perimeter of the rectangle = 2(Length + Breadth)

$$= 2(12 + 8) = 2(20)$$

$$= 40cm$$

Area of the rectangle = Length × Breadth

$$= 12 \times 8 = 96cm^2$$

Exercise 8.1

1. Find the perimeter and area of the square shaped figures whose length of one side is given below:

    (i) 3cm **(ii)** 7cm **(iii)** 9cm **(iv)** 10cm **(v)** 11cm
    (vi) 17cm **(vii)** 2.5cm **(viii)** 3.6cm **(ix)** 18cm

2. Find the perimeter and area of each rectanglar shaped figure whose length and breadth are given below:

    (i) Length = 12cm , Breadth = 8cm **(ii)** Length = 9cm , Breadth = 3cm

    (iii) Length = 6cm , Breadth = 4cm **(iv)** Length = 12cm , Breadth = 7cm

    (v) Length = 7.5cm, Breadth = 3.5cm **(vi)** Length = 15.5cm, Breadth = 4.5cm

8.1.5 Solution of Appropriate Problems of Perimeter and Area

Example 1 The length of a square shaped room is 5 metre. Find the cost of flooring at the rate of Rs.900 per square metre.

Solution Length of the room = 5m

Area of the room = side × side

$$= 5 \times 5 = 25m^2$$

Cost of flooring $1m^2$ = Rs.900

Cost of flooring $25m^2$ = 25 × 900

$$= Rs. 22,500$$

Example 2 The Length of the side of a square shaped field is 17m.

Find the cost of fencing it at the rate of Rs.10 per meter.

Solution   Length of the field $= 17$m

Perimeter of the field $= 4 \times$ side

$= 4 \times 17 = 68$m

The cost of fencing 1m $=$ Rs.10

The cost of fencing 68m $= 68 \times 10$

$=$ Rs.680

Example 3   The length of a rectangular field is 120m and its breadth

is 80m. Find the cost of:

(a)   fencing it at the rate of Rs.100 per metre and

(b)   Ploughing it at the rate of Rs.10 per square metre.

Solution (a)   Length of the field $= 120$m

Breadth of the field $= 80$m

Perimeter of the field $= 2$(Length +Breadth)

$= 2(120 + 80)$

$= 2(200) = 400$m

The cost of fencing 1m $=$ Rs.100

The cost of fencing 400m $= 400 \times 100$

$=$ Rs. 40,000

(b)   Area of the field $=$ length $\times$ breadth

$= 120 \times 80$

$= 9600$m^2

The cost of ploughing 1m$^2 =$ Rs. 10

The cost of ploughing 9600m$^2 = 9600 \times 10$

$=$ Rs. 96,000

Example 4 The perimeter of a square shaped field is 20m. Find the area of the field.

Solution   Perimeter of the field $= 20$m

$$4 \times \text{side} = 20\text{m}$$

$$\text{side} = \frac{20}{4} = 5\text{m}$$

Area of the field $=$ side $\times$ side

$$= 5 \times 5 = 25\text{m}^2$$

Example 5 The perimeter of a rectangular orchard is 250m. If the length is 75m, find the breadth of the orchard.

Solution   Perimeter of the orchard $= 250$m

i.e. $2(\text{Length} + \text{Breadth}) = 250$m

$\therefore$ Length $+$ Breadth $= 125$m

Length of the orchard $= 75$m

$\therefore$ $75 + \text{Breadth} = 125$

$\Rightarrow$ Breadth $= 125 - 75$

$$= 50\text{m}$$

Exercise 8.2

1.   The perimeter of a square shaped room is 8m. Find the area of the room.

2.   The perimeter of a rectangular garden is 400m. If its length is 125m, then find the area of the garden.

3.   Find the cost of laying a carpet in a square shaped room of side 8 metre at the rate of Rs.150 per square metre.

4.   The perimeter of a square room is 40m. Find the cost of flooring it at the rate of Rs.12 per square metre.

5.   The length of a playground is 36m and breadth is 24m. Find the cost of leveling it at the rate of Rs. 125 per square metre. Also find the cost of fencing it at the rate of Rs.100 per metre.

6. A garden is 48m long and 32m wide. Find the cost of leveling it at the rate of Rs. 60 per square metre. Also find the cost of fencing around it at the rate of Rs. 50 per metre.

7. Find the cost of flooring a rectangular hall at the rate of Rs. 60 per square metre. The length and breadth of the hall is 15 metres and 10 metres respectively.

Review Exercise 8

1. Four possible options have been given. Encircle the correct one.

   (i)   The region of a figure consists of:

        (a) surface and boundary   (b) surface and area

        (c) area and perimeter   (d) surface and dimensions

   (ii)   The length of the side of a square is 3 cm. What is the perimeter of the square?

        (a) 3 cm   (b) 12 cm   (c) 9 cm   (d) 9 cm^2

   (iii)   What is the area of a square with length of side as 4 cm?

        (a) 16 cm   (b) 8 cm   (c) 16 cm^2 (d) 4 cm^2

   (iv)   The dimensions of a rectangular region are 8 cm and 4 cm. What is the area of this rectangular region?

        (a) 32 cm   (b) 12 cm   (c) 12 cm^2 (d) 32 cm^2

   (v)   The perimeter of a square is 20 cm. What is the length of its side?

        (a) 5 cm   (b) 25 cm^2 (c) 20 cm^2 (d) 4 cm

   (vi)   What is the area of a rectangle whose length is 10 cm and breadth is 5 cm?

        (a) 50 cm   (b) 50 cm^2 (c) 30 cm   (d) 30 cm^2

   (vii) What will be the length of side of a square with 32 cm as its perimeter?

        (a) 32 cm   (b) 8 cm   (c) 8 cm^2 (d) 4 cm

(viii) The distance around a figure is called:
    (a) surface   (b) area
    (c) perimeter   (d) region

Summary

- The region of a closed figure comprises of the surface enclosed by the boundary and the boundary of the figure itself.

- Perimeter is the distance around a closed figure or the boundary of the closed figure is the perimeter of the figure.

- The unit of measure of the perimeter is usually cm, m or km.

- Area is the quantity that expresses the extend of a two dimensional figure.

- The unit of measure of area is usually cm^2, m^2 or km^2.

- The formula of perimeter of a square is 4 × side (unit).

- The formula of perimeter of a rectangle is 2(length + breadth) unit.

- Area of a square is:

$$\text{Area} = \text{side} \times \text{side (unit)}^2$$

- Area of a rectangle is:

$$\text{Area} = \text{length} \times \text{breadth (unit)}^2$$