Fundamental Facts

Perimeter is the total length around a closed figure when it is expanded into a linear form. It is measured in units such as centimetres (cm), meters (m), inches (in), or feet (ft).

The perimeter of a regular polygon (a polygon with all sides and angles equal) is calculated as:

$$\text{Perimeter} = \text{Number of sides} \times \text{Length of one side}$$

For a quadrilateral, the perimeter is the sum of the lengths of all four sides.

Units of perimeter correspond to the units of the sides measured.

Introduction

Perimeter: The distance covered along the boundary of a closed figure when you go around it once. It is the length of the boundary.

A *regular polygon* is a closed figure with all sides and angles equal.

Formulas for perimeter of common shapes:

- Rectangle: $P = 2 \times (l + b)$, where l is length and b is breadth.
- Square: $P = 4 \times s$, where s is the side length.
- Equilateral triangle: $P = 3 \times s$, where s is the side length.

Area: The amount of surface enclosed by a closed figure.

Formulas for area of common shapes:

- Rectangle: $A = l \times b$
- Square: $A = s \times s = s^2$

Perimeter

Perimeter is the total distance around the boundary of a closed figure.

Applications of perimeter include:

- Fencing a field.
- Building a compound wall around a house.

- Preparing a sports track.

Perimeter of a Rectangle

Sum of all sides:

$$P = l + b + l + b = 2(l + b)$$

Perimeter of Regular Shapes

Regular polygons have all sides and angles equal.

Examples: Square, equilateral triangle, regular pentagon.

Formulas:

- Square: $P = 4 \times s$
- Equilateral triangle: $P = 3 \times s$
- Regular pentagon: $P = 5 \times s$

Example 1

Problem: Akshi wants to put lace all around a rectangular table cloth that is 3 m long and 2 m wide. Find the length of the lace required.

Solution:

Given:

- Length $l = 3$ m
- Breadth $b = 2$ m

Length of lace required = Perimeter of the table cloth

$$P = 2(l + b) = 2(3 + 2) = 2 \times 5 = 10 \text{ m}$$

Therefore, 10 meters of lace is required.

Area

Area is the amount of surface enclosed by a closed figure.

To estimate area by counting squares on grid paper, use these conventions:

- Ignore portions less than half a square.
- Count portions more than half a square as one full square.
- If exactly half a square, count as $\frac{1}{2}$ square unit.

Area of a Rectangle

Formula:

$$A = l \times b$$

Area of a Square

Formula:

$$A = s \times s = s^2$$

Keywords

- **Perimeter:** Distance covered along the boundary of a closed figure.
- **Area:** Amount of surface enclosed by a closed figure.

Example 2

Problem: A floor is 5 m long and 4 m wide. A square carpet of side 3 m is laid on the floor. Find the area of the floor that is not carpeted.

Solution:

Floor dimensions:

- Length $l = 5$ m
- Width $w = 4$ m

Area of floor:

$$A_{floor} = l \times w = 5 \times 4 = 20 \text{ m}^2$$

Carpet side length $s = 3$ m

Area of carpet:

$$A_{carpet} = s^2 = 3 \times 3 = 9 \text{ m}^2$$

Area of floor not carpeted:

$$A_{not\ carpeted} = A_{floor} - A_{carpet} = 20 - 9 = 11 \text{ m}^2$$

Practice Set

Level 1 – Easy

- Find the perimeter of a square with side 6 cm.
- Calculate the area of a rectangle with length 8 m and breadth 3 m.
- Find the perimeter of an equilateral triangle with side 5 cm.

Level 2 – Moderate

- A rectangular garden is 15 m long and 10 m wide. Find the length of the fence required to surround the garden.
- A square room has side 12 m. Find the area of the room.
- Find the area of a rectangular field measuring 25 m by 18 m.

Level 3 – Challenging

- A rectangular plot is 40 m long and 30 m wide. A path 2 m wide is constructed all around inside the plot. Find the area of the path.
- A square park has a perimeter of 200 m. Find its area.
- A triangular field is equilateral with side 20 m. Find its perimeter and area.

Answer Key

Level 1 – Easy

- Perimeter of square = $4 \times 6 = 24$ cm
- Area of rectangle = $8 \times 3 = 24$ m^2
- Perimeter of equilateral triangle = $3 \times 5 = 15$ cm

Level 2 – Moderate

- Fence length = Perimeter of garden = $2(15 + 10) = 2 \times 25 = 50$ m
- Area of room = $12 \times 12 = 144$ m^2
- Area of field = $25 \times 18 = 450$ m^2

Level 3 – Challenging

- Area of path:
  - Outer area = $40 \times 30 = 1200$ m^2
  - Inner dimensions = $40 - 2 \times 2 = 36$ m and $30 - 2 \times 2 = 26$ m
  - Inner area = $36 \times 26 = 936$ m^2
  - Area of path = Outer area - Inner area = $1200 - 936 = 264$ m^2
- Square park side = $\frac{200}{4} = 50$ m, area = $50^2 = 2500$ m^2
- Equilateral triangle perimeter = $3 \times 20 = 60$ m
- Area of equilateral triangle = $\frac{\sqrt{3}}{4}s^2 = \frac{\sqrt{3}}{4} \times 20^2 = 100\sqrt{3} \approx 173.21$ m^2

Quick Reference

Shape	Perimeter	Area
Rectangle	$2(l+b)$	$l \times b$
Square	$4s$	s^2
Equilateral Triangle	$3s$	$\frac{\sqrt{3}}{4}s^2$
Regular Pentagon	$5s$	Not covered

Glossary

- **Perimeter:** The total length around the boundary of a closed figure.
- **Area:** The measure of the surface enclosed within a closed figure.
- **Regular Polygon:** A polygon with all sides and all angles equal.
- **Equilateral Triangle:** A triangle with all three sides equal.
- **Square:** A regular quadrilateral with four equal sides and four right angles.
- **Rectangle:** A quadrilateral with opposite sides equal and four right angles.