Area and Perimeter of Plane Figures

Introduction

1. The perimeter of a plane figure is the length of its boundary.

   The unit of perimeter is the same as the unit of length, i.e. cm, m, mm, etc.

2. The area of a plane figure is the measure of the surface enclosed by its boundary.

   The unit of area is cm^2, m^2, mm^2, etc.

Area and Perimeter of Triangles

$$\text{Area of a triangle} = \frac{1}{2} \times \text{Base} \times \text{Height}$$

$$\text{Perimeter} = \text{Sum of three sides of a triangle}$$

Equilateral Triangle

$$\text{Area} = \frac{\sqrt{3}}{4} \times (\text{Side})^2$$

Isosceles Triangle

$$\text{Area} = \frac{1}{4} \times b \times \sqrt{4a^2 - b^2}, \quad \text{where } a = \text{length of each equal side}, \ b = \text{length of base}$$

Heron's Formula for area of any Triangle

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}, \quad \text{where } a, b, c = \text{three sides of a triangle}$$

$$\text{And, semi-perimeter, } s = \frac{a+b+c}{2}$$

Area and Perimeter of Quadrilaterals

Case 1: When one diagonal and perpendiculars to this diagonal from the remaining vertices are given

$$\text{Area} = \frac{1}{2} \times \text{One diagonal} \times \text{Sum of lengths of the perpendiculars drawn on it}$$

$$\text{from the remaining vertices}$$

Case 2: When two diagonals of a quadrilateral cut each other at right angles

$$\text{Area} = \frac{1}{2} \times \text{Product of diagonals}$$

Rectangle

$$\text{Area} = \text{Length} \times \text{Breadth} = l \times b$$
$$\text{Perimeter} = 2\left(\text{Length} + \text{Breadth}\right) = 2\left(l + b\right)$$
$$\text{Length of diagonal, } d = \sqrt{l^2 + b^2}$$

Square

$$\text{Area} = \left(\text{Side}\right)^2 = a^2$$
$$\text{Perimeter} = 4 \times \text{Side} = 4a$$
$$\text{Length of diagonal, } d = \sqrt{a^2 + a^2} = \sqrt{2} \times a$$

Parallelogram

$$\text{Area} = \text{Base} \times \text{Height}$$

Rhombus

$$\text{Area} = \frac{1}{2} \times \text{Product of diagonals}$$

Trapezium

$$\text{Area} = \frac{1}{2} \times \text{Sum of parallel sides} \times \text{Distance between parallel sides}$$

Area and Circumference of a Circle

$$\text{Area} = \pi r^2 \quad (r = \text{radius})$$
$$\text{Circumference} = 2\pi r$$
$$\text{Area of semi-circle} = \frac{1}{2} \times \pi r^2$$
$$\text{Diameter} = 2 \times \text{radius}$$