

# CLASS 9 MATHS – CHAPTER 10

## HERON'S FORMULA – ALL FORMULAE AND PROPERTIES

### Basic Terms

- **Triangle:** A polygon with three sides
- **Sides of triangle:**  $a, b, c$
- **Perimeter:** Sum of all three sides
- **Semi-perimeter:** Half of the perimeter

### Semi-Perimeter Formula

$$s = \frac{a + b + c}{2}$$

**Where:**

- $a, b, c$  = sides of the triangle
- $s$  = semi-perimeter

### Heron's Formula (Main Formula)

$$\text{Area} = \sqrt{s(s - a)(s - b)(s - c)}$$

Used when **all three sides are known**

**Where:**

- $a, b, c$  = lengths of the **three sides of the triangle**
- $s$  = semi-perimeter of the triangle

### Area of an Equilateral Triangle

$$\text{Area} = \frac{\sqrt{3}}{4} a^2$$

- All three sides of an equilateral triangle are **equal**
- Since  $a = b = c$ , the area formula becomes simpler
- This formula is derived from **Heron's Formula**

## Area of an Isosceles Triangle

If the **equal sides** = **a** and the **base** = **b**:

$$\text{Area} = \frac{b}{4} \sqrt{4a^2 - b^2}$$

Where:

- $a$  = length of equal sides
- $b$  = base of the triangle

## HERON'S FORMULA – QUICK VIEW

- ▶ Find semi-perimeter first
- ▶ Use only when height is not given
- ▶ Works for all types of triangles
- ▶ Area depends on side lengths only
- ▶ Result is always in square units