

Understanding Quadrilaterals



Simple Curve

A simple curve is a curve that does not cross itself.

Types of Simple Curve

Open curve (e.g. a wavy line), Closed curve (e.g. a circle or triangle).

Adjacent Sides: The two sides of a polygon that meet at a common vertex.

Example: In rectangle ABCD, sides AB and BC are adjacent.

Diagonal: It is a line segment joining two non-adjacent vertices of a polygon.

Example: In a square ABCD, AC and BD are diagonals.

Interior and Exterior Angle: An interior angle lies inside a polygon at a vertex, while an exterior angle is formed outside the polygon by extending a side.

Angle Sum Property: It states that the sum of interior angles of a polygon with n sides is $(n - 2) \times 180^\circ$.

Example: Sum of interior angles of quadrilateral $= (4 - 2) \times 180^\circ = 360^\circ$

Polygon: A polygon is a closed figure formed by three or more line segments that do not cross each other.

Types of polygon

Triangle (3 sides), Quadrilateral (4 sides), Pentagon (5 sides), etc.

General Polygon Formulas

1. **Sum of Interior Angles of a Polygon:** $\text{Sum} = (n - 2) \times 180^\circ$

Where n = number of sides

2. **Measure of Each Interior Angle (Regular Polygon):** Each interior angle $= \frac{(n-2) \times 180^\circ}{n}$

3. **Sum of Exterior Angles of Any Polygon:** $\text{Sum} = 360^\circ$

4. **Each Exterior Angle (Regular Polygon):** Each exterior angle $= \frac{360^\circ}{n}$

5. **Number of Diagonals in a Polygon:** $\text{Diagonals} = \frac{n(n-3)}{2}$

Quadrilateral

A quadrilateral is a polygon with four sides, four angles, and four vertices.

Example: Square, rectangle, trapezium are all quadrilaterals.

Types of Quadrilaterals

1. **Square:** A square has all four sides equal and all angles equal to 90° .

Example: A chessboard square.

2. **Rectangle:** A rectangle has opposite sides equal and all angles equal to 90° .

Example: A book or screen.

3. **Rhombus:** A rhombus has all sides equal but angles are not necessarily 90° .

Example: Diamond symbol ($\diamond$) on playing cards.

4. **Parallelogram:** A parallelogram has opposite sides equal and parallel, and opposite angles equal.

Example: A slanted rectangle or a tile pattern.

5. **Trapezium:** A trapezium has one pair of opposite sides parallel.

Example: A bridge ramp or a table with slanted legs.

6. **Kite:** A kite has two pairs of adjacent sides equal and one pair of opposite angles equal.

Example: A flying kite.

Practice Questions

1. The sum of three angles of a quadrilateral is 270° . Find the fourth angle.

Sol: The sum of the interior angles of a quadrilateral is 360° .

Let the fourth angle be x .

$$270^\circ + x = 360^\circ$$

$$x = 360^\circ - 270^\circ$$

$$x = 90^\circ$$

2. Find the number of diagonals in a hexagon.

Sol: A hexagon has 6 sides.

Number of diagonals in a polygon: $\frac{n(n-3)}{2}$

Substituting $n=6$:

$$\frac{6(6-3)}{2}$$

$$\frac{6 \times 3}{2} = 9$$

3. Each interior angle of a regular polygon is 120° . How many sides does it have?

Sol: For a regular polygon,

$$\text{Interior Angle} = \frac{(n-2) \times 180^\circ}{n}$$

Given:

$$\frac{(n-2) \times 180}{n} = 120$$

$$180n - 360 = 120n$$

$$60n = 360$$

$$n = 6$$

4. Find the exterior angle of a regular pentagon.

Sol: Each exterior angle = $\frac{360^\circ}{n}$

where n = number of sides.

$$\text{Exterior angle of a regular pentagon} = \frac{360^\circ}{5} = 72^\circ$$