Class 8 Mathematics

Chapter 3: Understanding Quadrilaterals

From Notes Book

Introduction to Polygons

- A **polygon** is a closed figure made up of straight-line segments.
- Examples: Triangle, Quadrilateral, Pentagon, Hexagon, etc.

Classification of Polygons Based on Sides:

- **3 sides:** Triangle
- **4 sides:** Quadrilateral
- **5 sides:** Pentagon
- **6 sides:** Hexagon

Key Terms:

1. **Diagonal:** A line segment joining two non-adjacent vertices of a polygon.
   Example: In a quadrilateral, the diagonals are the lines joining opposite corners.
2. **Convex Polygon:** A polygon where no interior angle is greater than 180°.
3. **Concave Polygon:** A polygon with at least one interior angle greater than 180°.

Understanding Quadrilaterals

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

Types of Quadrilaterals:

1. **Parallelogram:** Opposite sides are equal and parallel.
2. **Rectangle:** Opposite sides are equal, and all angles are 90°.

3. **Square:** All sides are equal, and all angles are 90°.
4. **Rhombus:** All sides are equal, but angles are not 90°.
5. **Trapezium:** A quadrilateral with one pair of parallel sides.
6. **Kite:** Two pairs of adjacent sides are equal.

Properties of Quadrilaterals:

- The sum of the interior angles of a quadrilateral is always 360°.

Example: If three angles of a quadrilateral are 90°, 80°, and 70°, find the fourth angle.
Solution:

1. Sum of angles = 360°
2. Fourth angle = 360° - (90° + 80° + 70°) = 360° - 240° = 120°

Angle Sum Property of Polygons

The sum of the interior angles of a polygon with n sides is given by: **(n - 2) × 180°**

Example: Find the sum of the interior angles of a hexagon (6 sides). Solution:

1. Formula: (n - 2) × 180°
2. Substitute n = 6: (6 - 2) × 180° = 4 × 180° = 720°

Exterior Angle Property:

- The sum of the exterior angles of any polygon is always 360°.

Special Quadrilaterals and Their Properties

1. **Parallelogram:**
    - Opposite sides are equal and parallel.
    - Opposite angles are equal.
    - Diagonals bisect each other.
2. **Rectangle:**
    - Opposite sides are equal and parallel.
    - All angles are 90°.

- Diagonals are equal and bisect each other.

3. **Square:**
   - All sides are equal.
   - All angles are 90°.
   - Diagonals are equal and bisect each other at 90°.
4. **Rhombus:**
   - All sides are equal.
   - Opposite angles are equal.
   - Diagonals bisect each other at 90° but are not equal.
5. **Trapezium:**
   - Only one pair of sides is parallel.

Practice Questions

1. Fill in the blanks: a) A quadrilateral with one pair of parallel sides is called a _____. b) The sum of the interior angles of a polygon with 5 sides is _____. c) Diagonals of a rhombus _____ each other at _____ degrees.
2. Solve the following:

   a) Three angles of a quadrilateral are 110°, 95°, and 85°. Find the fourth angle.

   b) The sum of three interior angles of a pentagon is 300°. Find the measure of the remaining two angles if they are equal.

3. True or False:

   a) A square is also a rectangle.

   b) All parallelograms are rhombuses.

   c) The diagonals of a rectangle are perpendicular.

Key Points to Remember

1. A polygon is a closed figure made of straight lines.
2. The sum of the interior angles of a polygon with n sides is (n - 2) × 180°.
3. The sum of the exterior angles of any polygon is always 360°.
4. Special quadrilaterals like squares, rectangles, and parallelograms have unique properties related to their sides, angles, and diagonals.
