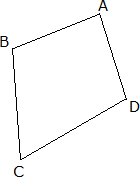
**Quadrilaterals**

# What is a quadrilateral?

A **quadrilateral** is a closed figure obtained by joining four points (with no three points collinear) in an order.

Here, ABCD is a quadrilateral.

# Parts of a quadrilateral

* + A quadrilateral has four sides, four angles and four vertices.
  + Two sides of a quadrilateral having no common end point are called its **opposite sides**.
  + Two sides of a quadrilateral having a common end point are called its **adjacent sides**.
  + Two angles of a quadrilateral having common arm are called its **adjacent angles**.
  + Two angles of a quadrilateral not having a common arm are called its **opposite angles**.
  + A **diagonal** is a line segment obtained on joining the opposite vertices.

# Angle sum property of a quadrilateral

Sum of all the angles of a quadrilateral is 360o. This is known as the **angle sum property of a quadrilateral**.

# Types of quadrilaterals and their properties:

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| **Name of a quadrilateral** | **Properties** |
| **Parallelogram**: A quadrilateral with each pair of opposite sides parallel. | 1. Opposite sides are equal. 2. Opposite angles are equal. 3. Diagonals bisect one another. |
| **Rhombus**: A parallelogram with sides of equal length. | 1. All properties of a parallelogram. 2. Diagonals are perpendicular to each other. |

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| **Rectangle**: A parallelogram with all angles right angle. | 1. All the properties of a parallelogram. 2. Each of the angles is a right angle. 3. Diagonals are equal. |
| **Square**: A rectangle with sides of equal length. | All the properties of a parallelogram, a rhombus and a rectangle. |
| **Kite**: A quadrilateral with exactly two pairs of equal consecutive sides. | 1. The diagonals are perpendicular to one another. 2. One of the diagonals bisects the other. 3. If ABCD is a kite, then  B =  D but    A   C. |
| **Trapezium**: A quadrilateral with one pair of opposite sides parallel is called trapezium. | i. One pair of opposite sides parallel. |

1. **Important facts about quadrilaterals**
   * If the non-parallel sides of trapezium are equal, it is known as **isosceles trapezium**.
   * Square, rectangle and rhombus are all parallelograms.
   * Kite and trapezium are not parallelograms.
   * A square is a rectangle.
   * A square is a rhombus.
   * A parallelogram is a trapezium.

# Properties of a parallelogram:

1. The opposite sides of a parallelogram are parallel.
2. A diagonal of a parallelogram divides it in two congruent triangles.
3. The opposite sides of a parallelogram are equal.
4. The opposite angles of a parallelogram are equal.
5. The consecutive angles (conjoined angles) of a parallelogram are supplementary.
6. The diagonals of a parallelogram bisect each other.
7. Bisectors of the angles form a rectangle.

# A quadrilateral is a parallelogram if:

1. each pair of opposite sides of a quadrilateral is equal, or
2. each pair of opposite angles is equal, or
3. the diagonals of a quadrilateral bisect other, or
4. each pair of opposite sides is equal and parallel.

# Mid-Point Theorem

The line segment joining the mid-points of any two sides of a triangle is parallel to the third side and equal to half of it.

# Converse of mid-point theorem

The line drawn through the mid-point of one side of a triangle, parallel to another side, bisects the third side.

# Formation of a new quadrilateral using the given data

* + If the diagonals of a parallelogram are equal, then it is a rectangle.
  + If the diagonals of a quadrilateral bisect each other at right angles, then it is a rhombus.
  + If the diagonals of a quadrilateral are equal and bisect each other at right angles, then it is a square.

1. If there are three or more parallel lines and the intercepts made by them on a transversal are equal, then the corresponding intercepts on any other transversal are also equal.