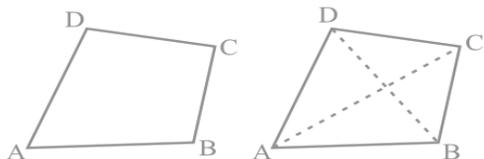


A. Introduction

-- We know that on joining three non-collinear points in pairs, the figure so obtained is a triangle. If four non-collinear points are joined in pairs, we obtain a closed figure with four sides called a quadrilateral.



-- A quadrilateral has four sides, four angles and four vertices and two diagonals. In quadrilateral ABCD, AB, BC, CD and DA are the four sides; A, B, C and D are the four vertices, $\angle A$, $\angle B$, $\angle C$ and $\angle D$ are the four angles formed at the vertices and AC and BD are the two diagonals

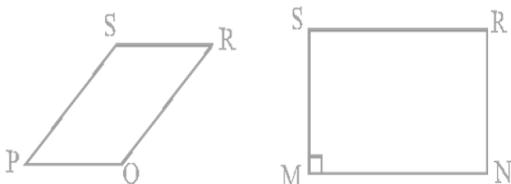
B. Angle Sum Property of a Quadrilateral

Angle Sum Property: the sum of the angles of a quadrilateral is 360° .

C. Types of Quadrilaterals

Parallelogram: The quadrilaterals where both pairs of opposite sides of are parallel.

Rhombus: The parallelogram which has all sides equal.

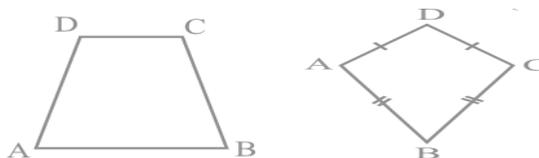


Rectangle: The parallelogram which has one of its angles a right angle.

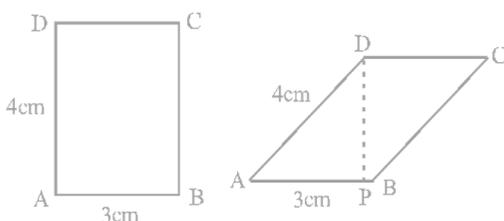
Square: The parallelogram which has one of its angle a right angle and all sides equal.

Trapezium: The quadrilateral where one pair of opposite sides are parallel.

Kite: The quadrilateral where two pairs of adjacent sides are equal.



1. A square, rectangle and rhombus are parallelograms.
2. A square is a rectangle and also a rhombus.
3. A parallelogram is a trapezium.
4. A kite is not a parallelogram.
5. A trapezium is not a parallelogram.
6. A rectangle or a rhombus is not a square.



-- We may have a rectangle and a parallelogram with same perimeter. The area of the parallelogram $AB \times PD$ is less than the area of the rectangle $AB \times BC$.

D. Properties of Parallelograms

Theorem-1 : The diagonal of a parallelogram divides it into two congruent triangles.

Theorem-2 : In parallelogram, opposite sides are equal.

Theorem-3 : If each pair of opposite sides of a quadrilateral is equal, then it is a parallelogram.

Theorem-4 : In a parallelogram, opposite angles are equal.

Theorem-5 : In a quadrilateral, each pair of opposite angles is equal, then it is a parallelogram.

Theorem-6 : The diagonals of a parallelogram bisect each other.

Theorem-7 : If the diagonals of a quadrilateral bisect each other, then it is a parallelogram.

E. Another condition for a Quadrilateral to be a Parallelogram

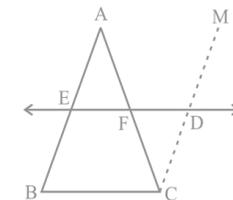
Theorem : A quadrilateral is a parallelogram if a pair of opposite sides is equal and parallel.

F. The Mid-point Theorem

Theorem : The line segment joining the mid-points of two sides of a triangle is parallel to the third side.

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

It is observed that E is the mid-point of AB, line l is passing through E and is parallel to BC and $CM \parallel BA$. By using congruence of $\triangle AEF$ and $\triangle CDF$, it is proved that $AF = CF$



-- In a parallelogram,

1. opposite sides are equal
2. opposite angles are equal
3. diagonals bisect each other

-- A quadrilateral is a parallelogram, if

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