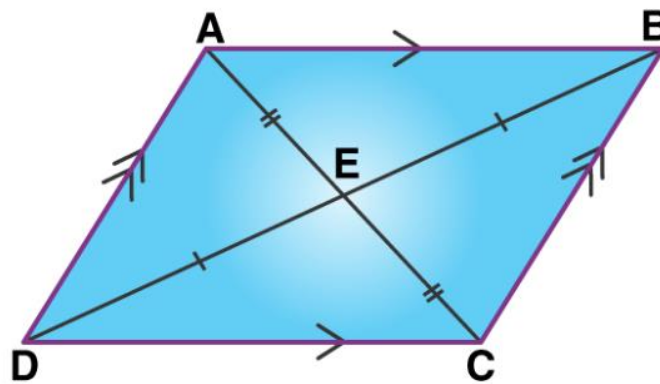# PARALLELOGRAMS

A **parallelogram** is a special type of quadrilateral where opposite sides are both parallel and equal in length. Parallelograms are an essential topic in geometry because they have unique properties that can be used to solve problems involving angles, sides, and diagonals. Let's dive into the details of what makes parallelograms special.

Definition of a Parallelogram

A **parallelogram** is a four-sided polygon (**quadrilateral**) that satisfies the following conditions:

1. Both pairs of opposite sides are **parallel**.
2. Both pairs of opposite sides are **equal in length**.

Examples of Parallelograms:
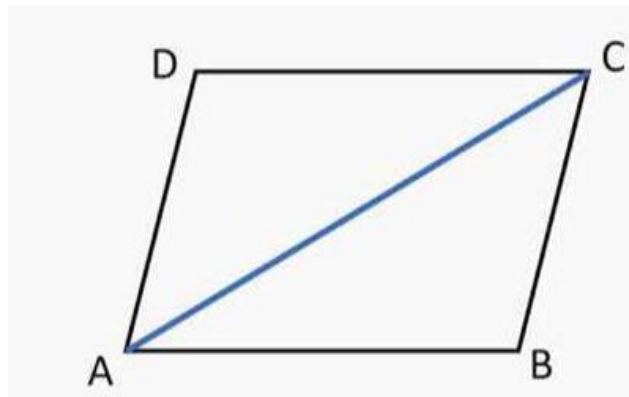
- Rectangle
- Rhombus
- Square

Properties of Parallelograms

Parallelograms have several important properties. These properties apply to all parallelograms, regardless of whether they are rectangles, rhombuses, or squares.

1. Opposite Sides are Equal

If a quadrilateral is a parallelogram, then:

AB = CD and AD = BC

This means that opposite sides have the same length.

2. Opposite Angles are Equal

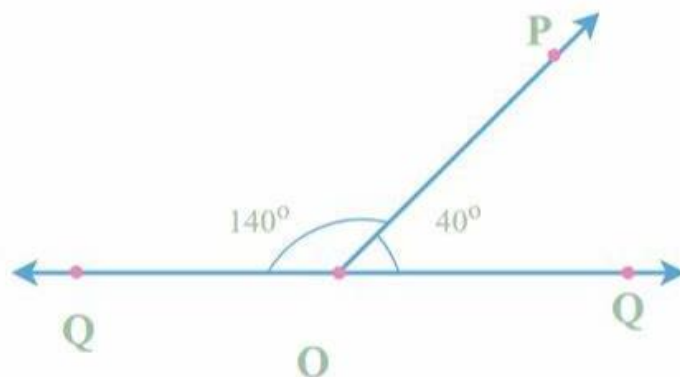The angles that are opposite each other in a parallelogram are congruent:

∠A=∠C and ∠B=∠D

3. Consecutive Angles are Supplementary

Any two angles that are next to each other (consecutive angles) add up to 180∘:

∠A+∠B =180∘, ∠B+∠C = 180∘, and so on

4. Diagonals Bisect Each Other

The diagonals of a parallelogram cut each other into two equal parts:

AO=CO and BO=DO

Where O is the point where the diagonals intersect.

5. Each Diagonal Divides the Parallelogram into Two Congruent Triangles

When you draw a diagonal in a parallelogram, it creates two triangles that are identical in size and shape.

Congruent Triangles

$$\triangle ABC \cong \triangle EFG$$