Verification of Properties of Parallelogram

A parallelogram is a quadrilateral in which both pairs of opposite sides are parallel.

Properties of a Parallelogram to Verify:

Property	Method of Verification
1. Opposite sides are equal	Measure the length of opposite sides using a scale
2. Opposite angles are equal	Use a protractor to measure angles
3. Diagonals bisect each other	Measure the diagonals and check if they meet at the midpoint
4. Adjacent angles are supplementary	Add adjacent angles and check if their sum is 180°

Theoretical Understanding:

i. Opposite Sides Are Equal:

Let ABCD be a parallelogram.

If AB = CD and AD = BC, then opposite sides are equal.

You can check by using a ruler or coordinate geometry.

ii. Opposite Angles Are Equal:

If $\angle A = \angle C$ and $\angle B = \angle D$, the opposite angles are equal.

Measure using a protractor or apply angle properties.

iii. Diagonals Bisect Each Other:

Draw diagonals AC and BD. They intersect at point O.

If AO = OC and BO = OD, then diagonals bisect each other.

iv. Adjacent Angles Are Supplementary:

Check $\angle A + \angle B = 180^{\circ}$ and $\angle C + \angle D = 180^{\circ}$

If true, adjacent angles are supplementary.

Example 1:

In parallelogram PQRS, side PQ = 6 cm, side QR = 4 cm. Find the lengths of the opposite sides.

Solution:

In a parallelogram:

Opposite sides are equal.

So,

PS = QR = 4 cm

QR = 6 cm \rightarrow Opposite side = PQ = 6 cm

Answer: PS = 4 cm, SR = 6 cm

Example 2:

In parallelogram ABCD, the diagonals AC and BD intersect at point O. If AC = 8 cm and BD = 10 cm, verify whether diagonals bisect each other.

Solution:

If diagonals bisect each other, then AO = OC and BO = OD.

Given:

AC = 8 cm \Rightarrow AO = OC = $\frac{8}{2}$ = 4 cm

$$BD = 10 \text{ cm} \Rightarrow BO = OD = \frac{10}{2} = 5 \text{ cm}$$

Answer: Diagonals bisect each other as AO = OC = 4 cm and BO = OD = 5 cm

Summary Points:

- A parallelogram has symmetrical properties which can be verified by measurement or calculation.
- Opposite sides and angles are equal.
- Diagonals bisect each other.
- Adjacent angles are supplementary.
- These properties help in identifying and solving questions related to parallelograms.