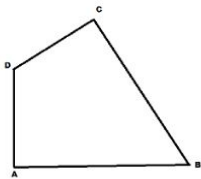


Quadrilaterals

A closed plane figure formed by four line segments is a quadrilateral. A quadrilateral is also known as a polygon with four sides and four vertices or corners.



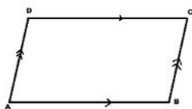
A quadrilateral ABCD has
four sides: AB, BC, CD and DA
four angles: $\angle A$, $\angle B$, $\angle C$ and $\angle D$

There are many kinds of quadrilaterals. Such as:

1. Parallelogram

Quadrilaterals having opposite sides parallel is known as a parallelogram.

In the figure $AB \parallel CD$ and $AD \parallel BC$. So, ABCD is a parallelogram.



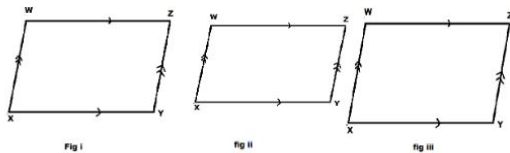
Theorems with parallelogram:

Theorem 1

The opposite sides of a parallelogram are congruent.

Verification:

Draw three parallelograms of different sizes as shown below:



Measure the sides and complete the table below:

| Figure | WZ | XY | Result | WX | ZY | Result |
|--------|----|----|-----------|----|----|-----------|
| (i) | | | $WZ = XY$ | | | $WX = ZY$ |
| (ii) | | | | | | |
| (iii) | | | | | | |

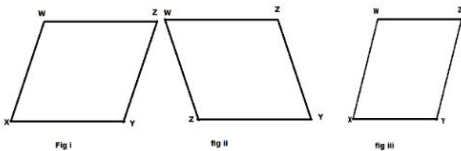
Conclusion: Opposite sides of a parallelogram are equal.

Theorem 2

The opposite angles of a parallelogram are congruent.

Verification:

Draw three parallelograms of different sizes.



Measure the opposite angles and complete the table below:

| Figure | $\angle W$ | $\angle Y$ | Result | $\angle X$ | $\angle Z$ | Result |
|--------|------------|------------|-----------------------|------------|------------|-----------------------|
| (i) | | | $\angle W = \angle Y$ | | | $\angle X = \angle Z$ |
| (ii) | | | | | | |
| (iii) | | | | | | |

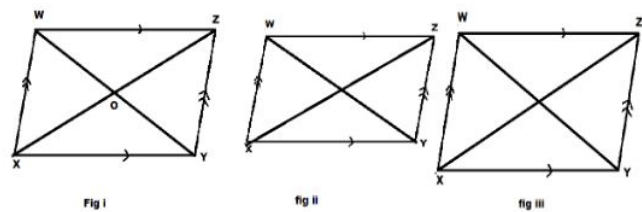
Conclusion: The opposite angles of a parallelogram are congruent.

Theorem 3

The diagonals of a parallelogram bisect each other.

Verification:

Draw three parallelograms of different sizes. Join the diagonals WY and XZ.



Measure the segments of the diagonals and complete the table below:

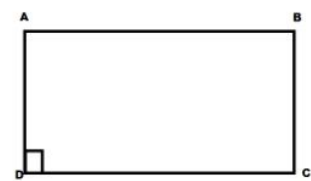
| Figure | WO | YO | Result | XO | ZO | Result |
|--------|----|----|---------|----|----|---------|
| (i) | | | WO = YO | | | XO = ZO |
| (ii) | | | | | | |
| (iii) | | | | | | |

Conclusion: Diagonals of the parallelogram bisect each other.

2. Rectangle

The rectangle is a parallelogram with all angles 90°. Opposite sides are parallel and of equal length. It is also known as an equiangular parallelogram.

Diagonal created in a rectangle are also congruent.

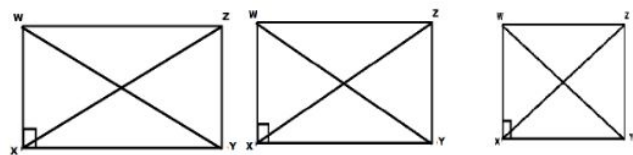


Theorem

The diagonals of a rectangle are congruent.

Verification:

Draw three rectangles of different sizes. Join the diagonals WY and XZ.



Measure the diagonals WY and XZ with the ruler and complete the following table.

| Figure | WX | XZ | Result |
|--------|----|----|---------|
| (i) | | | WX = XZ |
| (ii) | | | |
| (iii) | | | |

Conclusion: The diagonals of the rectangle are congruent.

3. Square

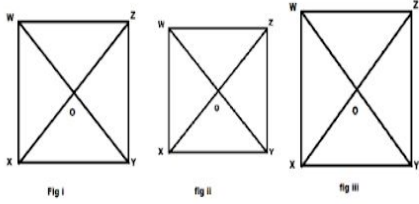
Square is also a parallelogram with all sides and angles equal. It is also known as an equilateral and equiangular parallelogram. In another word, a square is a rectangle having adjacent sides equal. The diagonal of square bisects each other at right angles.

Theorem

The diagonals of a square bisect each other at right angles.

Verification:

Draw three squares of different sizes. Join the diagonals WY and XZ which intersect at O. Since a square is a parallelogram, the diagonals bisect each other i.e $WO = YO$ and $XO = ZO$.



Measure the angles between the diagonals and complete the following table.

Figure $\angle WOX$ $\angle YOZ$ $\angle WOZ$ $\angle XOY$ Result

- (i) $\angle WOX = \angle YOZ = \angle WOZ = \angle XOY = 90^\circ$
(ii)
(iii)

Conclusion: The diagonals of a square bisect each other at right angles.