

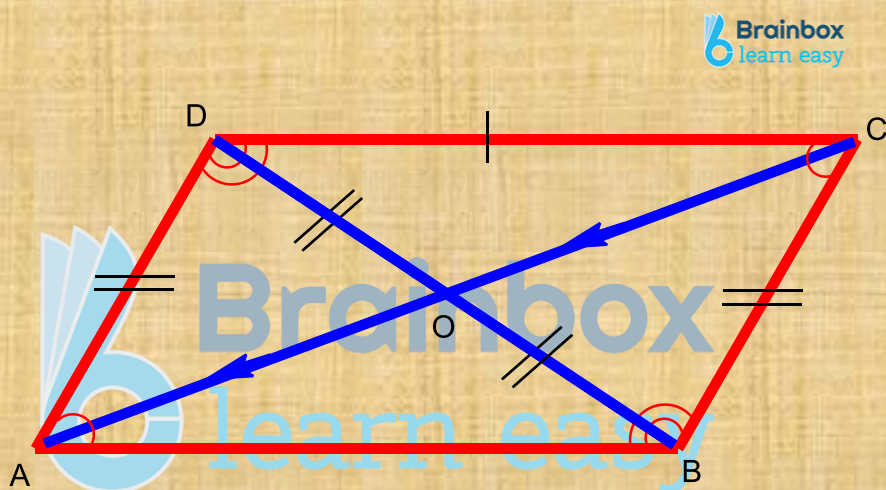
CHAPTER 03

CONSTRUCTION OF QUADRILATERALS

Different types of quadrilaterals:

Parallelogram:

A quadrilateral whose opposite sides are parallel and equal is called a 'Parallelogram'.



Properties:

- The opposite sides are parallel and equal.

i.e. $AB \parallel DC$ and $BC \parallel AD$; $AB = CD$ and $BC = AD$

- Opposite angles are equal.

i.e. $\angle A = \angle C$ & $\angle B = \angle D$

- Diagonals bisect each other.

i.e. $AO = OC$ & $BO = OD$

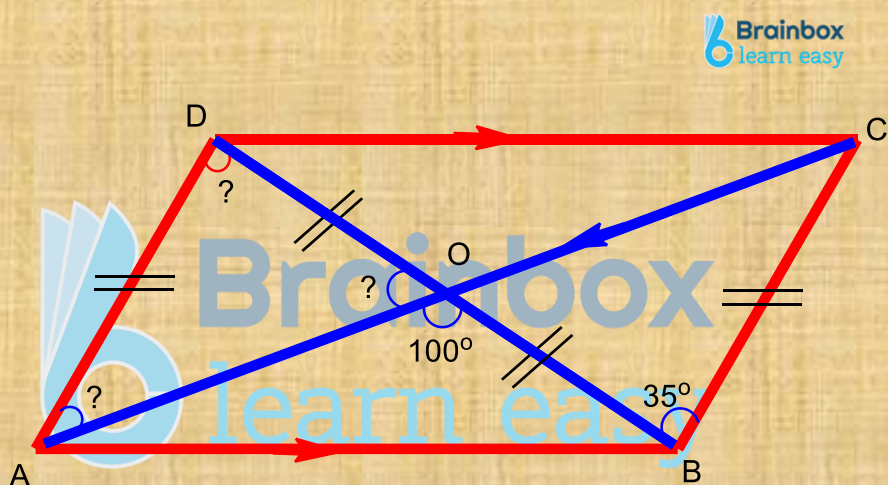
- Each diagonal divides a parallelogram into two congruent triangle.

$$\text{i.e. } \triangle ABC \cong \triangle CDA \text{ \& } \triangle BCD \cong \triangle DAB$$

Example:

In a parallelogram ABCD, $\angle AOB = 100^\circ$ and $\angle DBC = 35^\circ$. Find the measures of $\angle AOD$, $\angle BDA$ and $\angle DAC$.

Sol.



$$\angle AOB + \angle AOD = 180^\circ \text{ (Linear pair)}$$

$$\Rightarrow \angle AOD = 180^\circ - 100^\circ = 80^\circ$$

$$\angle BDA = \angle DBC = 35^\circ \text{ (Interior alternate angles)}$$

$$\angle DAC + \angle AOD + \angle ADB = 180^\circ \text{ (Sum of angles of } \triangle AOD)$$

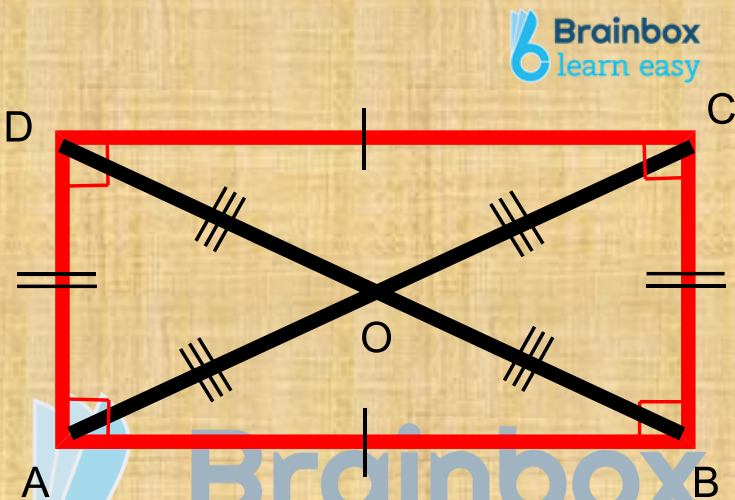
$$\Rightarrow \angle DAC + 80^\circ + 35^\circ = 180^\circ$$

$$\Rightarrow \angle DAC = 180^\circ - (80^\circ + 35^\circ) = 65^\circ$$

The measure of $\angle AOD = 80^\circ$, $\angle BDA = 35^\circ$ and $\angle DAC = 65^\circ$

Rectangle:

A rectangle is a parallelogram with all angles equal to 90° .



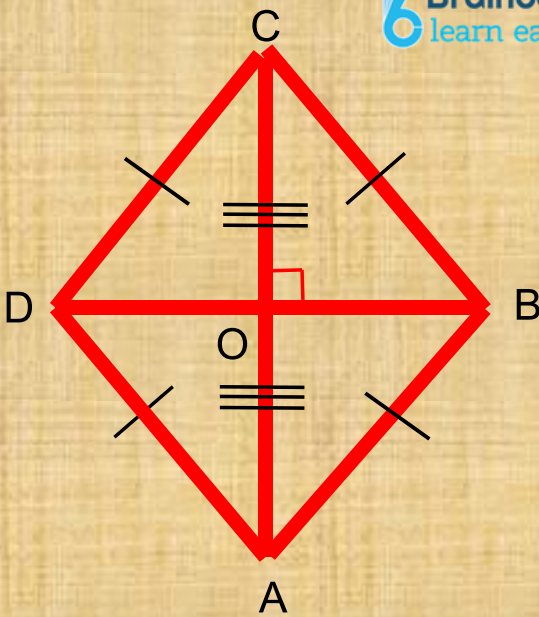
Properties:

A rectangle has all the properties of a parallelogram. Additionally, it has the following two properties.

- Each angle is 90° . i.e. $\angle A = \angle B = \angle C = \angle D = 90^\circ$.
- The diagonals are equal. i.e. $AC = BD$.

Rhombus:

A parallelogram in which all the four sides are equal is called a rhombus.

**Properties:**

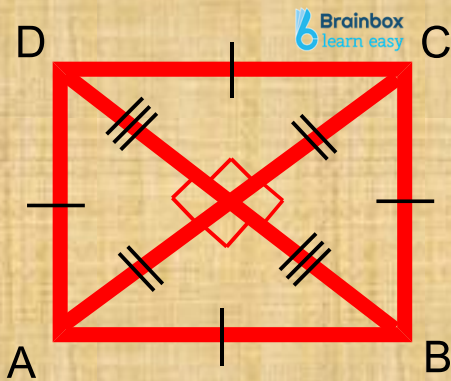
A rhombus has all the properties of a parallelogram. Additionally, it has the following two properties.

- All the sides of a rhombus are equal. i.e. $AB = BC = CD = AD$.
- The diagonals bisect each other at right angles.

$$AC \perp BD$$

Square:

A square is a rhombus with each angle equal to 90° . Thus, each rhombus is a parallelogram and a rectangle is a rhombus.



Properties:

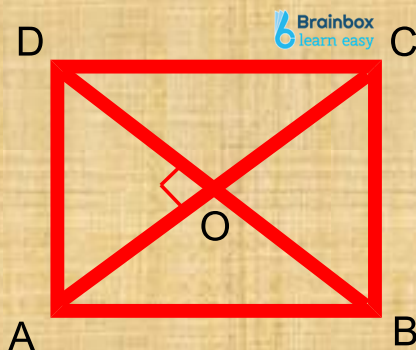
A square has all the properties of a rhombus. In addition, it has the following two properties.

- Each angle is 90° .
- The diagonals are equal.

Example:

If the length of a diagonal of square is 6 cm. Find the length of the side of the square.

Sol.



If $AC = 6$ cm

$$AO = 3 \text{ cm}$$

$$DO = 3 \text{ cm}$$

As diagonals of a square are perpendicular to each other.

In right $\triangle AOD$, we have

$$AO^2 + DO^2 = AD^2 \text{ (By Pythagoras theorem)}$$

$$\Rightarrow 3^2 + 3^2 = AD^2$$

$$\Rightarrow 18 = AD^2$$

$$\Rightarrow AD = \sqrt{18}$$

$$\therefore AD = 3\sqrt{2} \text{ cm}$$

