CHAPTER 14

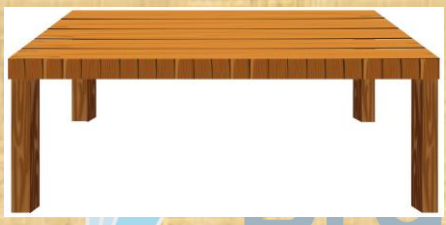
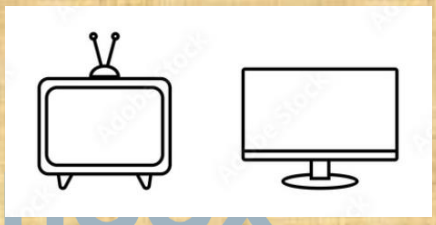
Understanding 2D and 3D Shapes

QUADRILATERALS

As you already know, a Polygon with 4 sides is called as QUADRILATERAL.

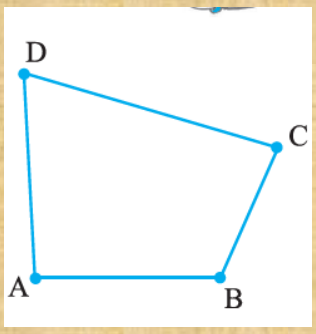
The surface of the table, window, TV screen, envelope, as shown here are the examples of quadrilateral.

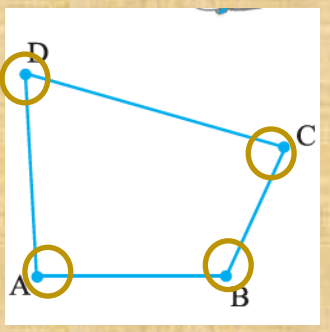
Let us know observe the properties of quadrilaterals.

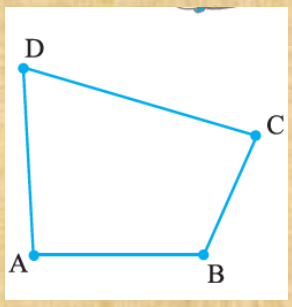



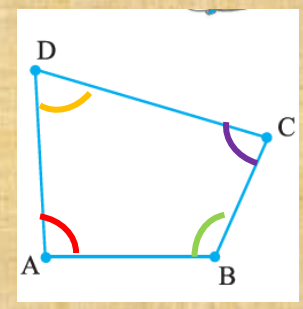
- In the adjoining figure, ABCD is a quadrilateral WHERE A, B, C and D are the four vertices of the quadrilateral.
- A quadrilateral has four sides that connects the vertices. They are AB, BC, CD and DA.
- An angle is formed when two line segments at a vertex.
- The four angles of this quadrilateral are

∠BAD, ∠ABC, ∠BCD, ∠ADC.









A QUADRILATERAL is a polygon with 4 sides.

ABCD is a quadrilateral.

Four Vertices: A, B, C and D.

Four Sides: AB, BC, CD AND DA.

Four Angles: ∠BAD, ∠ABC, ∠BCD, ∠ADC.

The DIAGONAL OF A QUADRILATERAL IS THE LINE JOINING THE OPPOSITE VERTICES.

In the given quadrilateral, the vertex A is opposite to C and vertex B is opposite to D. (Circle these vertices when the voice says so)

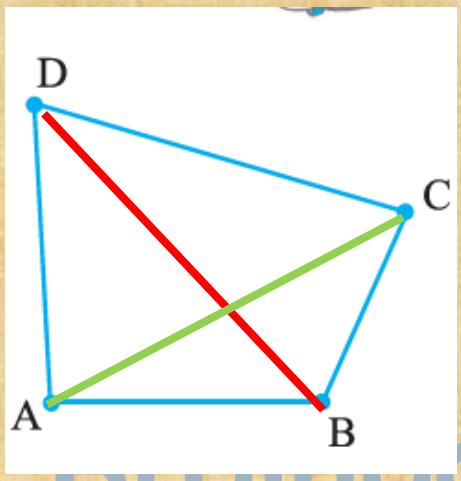
When we join these opposite vertices, we get the two diagonals BD AND AC.

You must be wondering, why we need the diagonals!

Well, when you buy a phone, you will look for the size!

Here the size of the phone is the length across the opposite vertices of the phone.

Similarly, when you say 14-inch laptop, it is the length of the screen across its diagonals.



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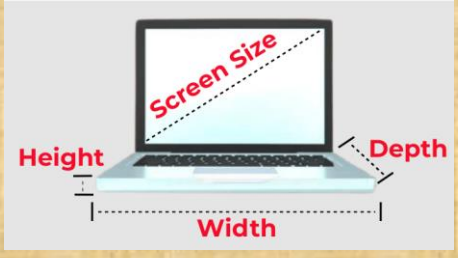
In the given quadrilateral,

BD AND AC are the two diagonals.



- In this quadrilateral, you may note that the angles are next to each other and opposite to each other.

The angles next to each are adjacent angles. They are

- ∠A, ∠B
- ∠B, ∠C

- ∠C, ∠D
- ∠D, ∠A

The opposite angles are,

- ∠A, ∠C
- ∠B, ∠D

Similarly there adjacent sides and opposite sides

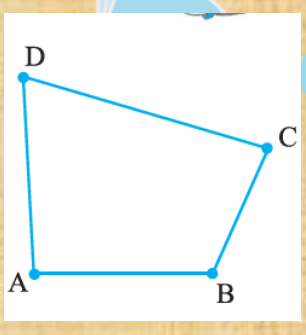
AB and BC,

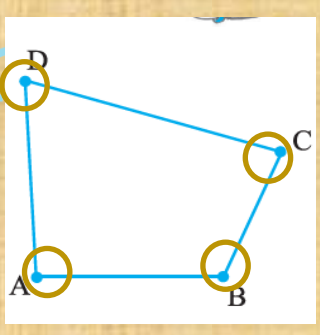
AB and BC

BC and CD and so on…are adjacent sides and the opposite sides are

AB and CD

AD and BC





Adjacent Angles:

∠A, ∠B

∠B, ∠C

∠C, ∠D

∠D, ∠A

The adjacent sides are,

AB and AD,

AB and BC

BC, CD, and so on…

SPECIAL TYPES OF QUADRILATERAL

Quadrilaterals can be further classified based on their side, angle and diagonal properties.

They are:

Parallelogram

Rectangle

Rhombus

Square

Trapezium

Kite

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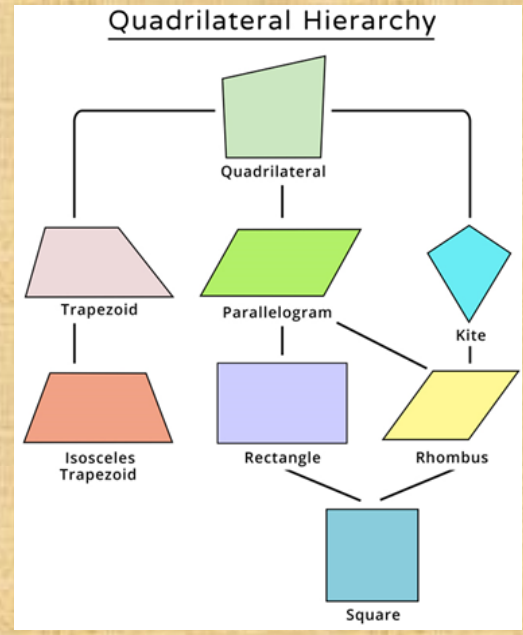
We shall be identifying properties of these quadrilaterals based on

- Sides
- Angles
- Diagonals



A **PARALLELOGRAM**

- A parallelogram is a quadrilateral with 2 pairs of opposite sides that are parallel and equal.

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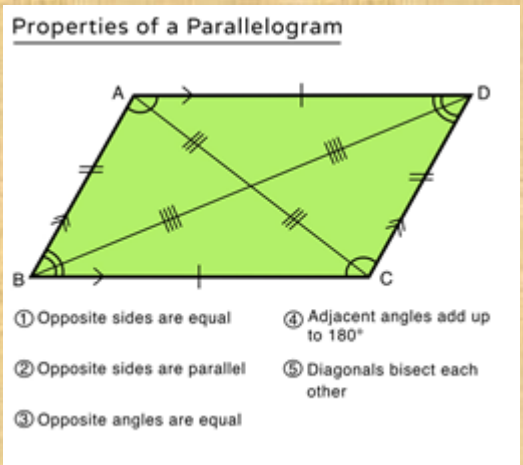
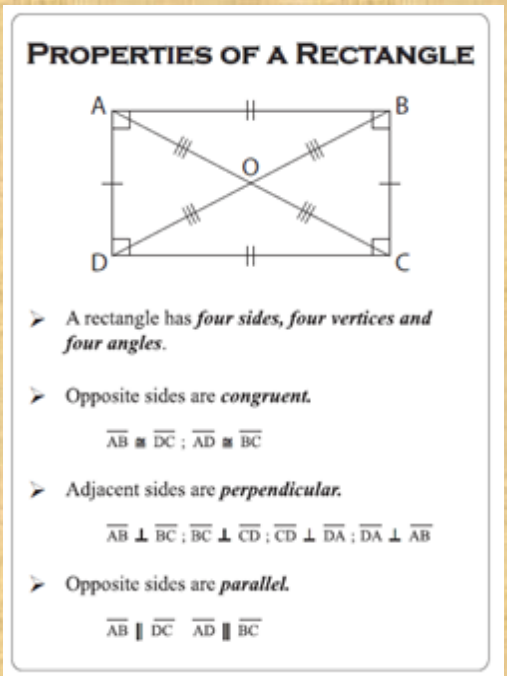
Sides	Angles	Diagonals
opposite sides are parallel and equal AB = CD BC = AD	Opposite angles are equal $\angle$ **A,** $= \angle$ **C** $\angle$ **B** $= \angle$ **D** Adjacent angles are supplementary (add up to 180) ° $\angle$ **A** + $\angle$ **D = 180°** $\angle$ **C** + $\angle$ **B = 180°** **Similarly other pairs of adjacent angles.**	Diagonals bisect each other. AC & BD are the diagonals that intersect at 0. AO = OC BO = OD



A rectangle is a parallelogram with each interior angle equal to 90 degree.

Since a rectangle is parallelogram, it has all the properties of a parallelogram.

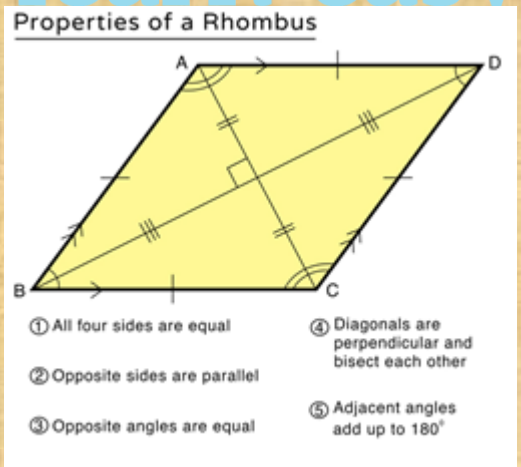
Sides	Angles	Diagonals
opposite sides are parallel and equal AB = CD BC = AD	All angles are right angles**A, = ∠ C = ∠B = ∠D = 90°** Adjacent angles are supplementary (add up to 180) ° **∠A + ∠D = 180°** **∠ C +∠B = 180°** **Similarly other pairs of adjacent angles.**	Diagonals are equal and bisect each other. AC & BD are the diagonals that intersect at 0. AO = OC = BO = OD



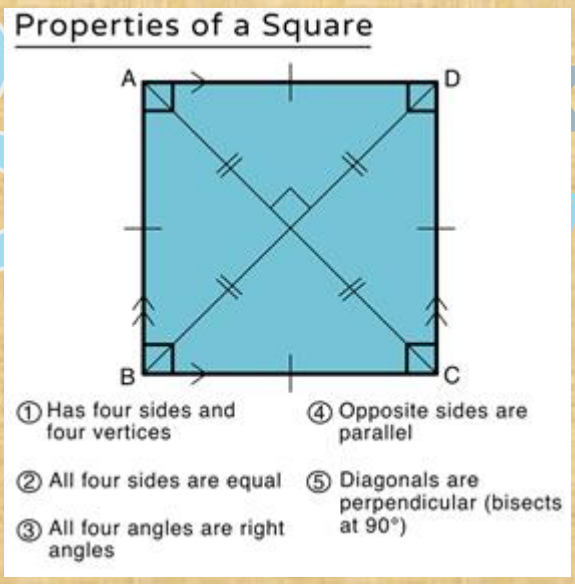
A **RHOMBUS**

A RHOMBUS is a parallelogram that has all sides with equal lengths.

The diagonals bisect each other at right angles.



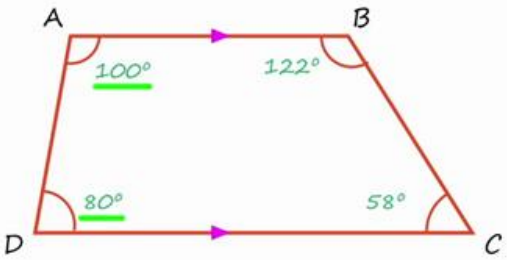
Sides	Angles	Diagonals
opposite sides are parallel and equal AB = CD BC = AD	Opposite angles are equal $\angle$ **A,** $= \angle$ **C** $\angle$ **B** $= \angle$ **D** Adjacent angles are supplementary (add up to 180)° $\angle$ **A** + $\angle$ **D = 180°** $\angle$ **C** + $\angle$ **B = 180°** **Similarly other pairs of adjacent angles.**	Diagonals bisect each other at right angles Diagonals bisect interior angles. AC & BD are the diagonals that intersect at 0. AO = OC and BO = OD



A **TRAPEZIUM**

A TRAPEZIUM is a quadrilateral with exactly one pair of parallel sides.

What is a trapezium?



Trapezium

- 4-sided figure (quadrilateral)
- 1 pair of sides are parallel
- sum of angle pairs between parallel lines is 180°

$\angle DAB + \angle ADC = 180°$

$\angle A$

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