

St. Andrews Scots Sr. Sec. School

9th Avenue, I.P. Extension, Patparganj, Delhi – 110092

Session: 2025-2026 - Worksheet

Class: VIII

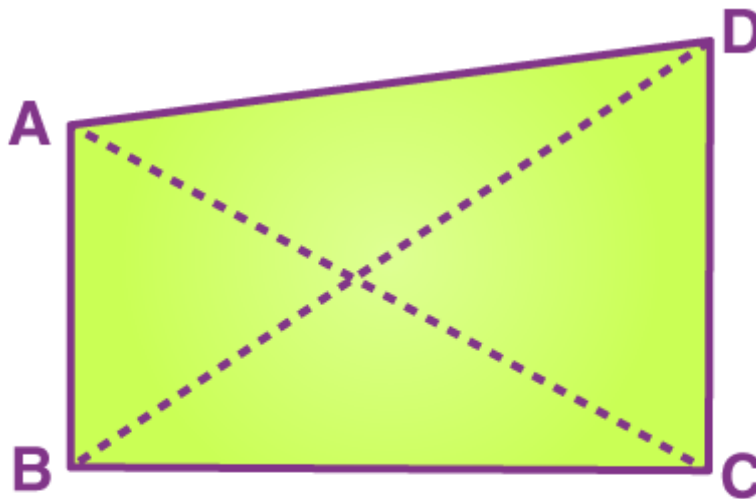
Subject: Mathematics

Topic: Under.Quadrilaterals

Worksheet No: 14

What are Quadrilaterals?

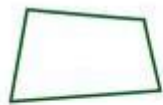
Quadrilaterals are one type of polygon which has four sides and four vertices and four angles along with 2 diagonals. There are various types of quadrilaterals.



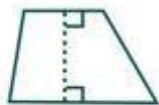
Types of Quadrilaterals

The classification of quadrilaterals are dependent on the nature of sides or angles of a quadrilateral and they are as follows:

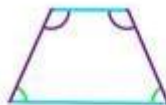
- Trapezium
- Kite
- Parallelogram
- Square
- Rectangle
- Rhombus



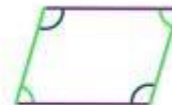
Trapezium
(Amer. Eng.)



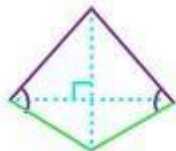
Trapezoid (Amer. Eng.)
Trapezium (Brit. Eng.)



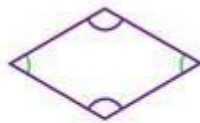
Isosceles trapezoid (Am.)
Isosceles trapezium (Br.)



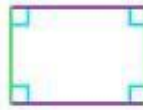
Parallelogram



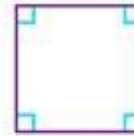
Kite



Rhombus



Rectangle



Square

The figure given below represents the properties of different quadrilaterals.

Quadrilateral	Properties	
Rectangle	4 right angles and opposite sides equal	
Square	4 right angles and 4 equal sides	
Parallelogram	Two pairs of parallel sides and opposite sides equal	
Rhombus	Parallelogram with 4 equal sides	
Trapezoid	Two sides are parallel	
Kite	Two pairs of adjacent sides of the same length	

Revisiting Geometry

As we know, Geometry is one of the branches of Mathematics, that deals with the study of different types of shapes, their properties, and how to construct lines, angles and different polygons. Geometry is

broadly classified into plane geometry(two-dimensional) and solid geometry (three-dimensional geometry).

Introduction to Curves

A **curve** is a geometrical figure obtained when a **number of points** are joined without **lifting** the pencil from the paper and **without retracing** any portion. It is basically a **line** which **need not be straight**.

The various types of curves are:

- Open curve: An **open curve** is a curve in which there is **no path** from any of its point to the **same point**.
- Closed curve: A **closed curve** is a curve that forms a **path** from any of its point to the **same point**.

A curve can be :

- A closed curve:

Closed curves



- An open curve:

Open curves



- Simple open and closed curves:

Simple curves



Open simple curve



Closed simple curve

Polygons

A simple **closed curve** made up of only **line segments** is called a **polygon**.

Various examples of polygons are Squares, Rectangles, Pentagons etc.

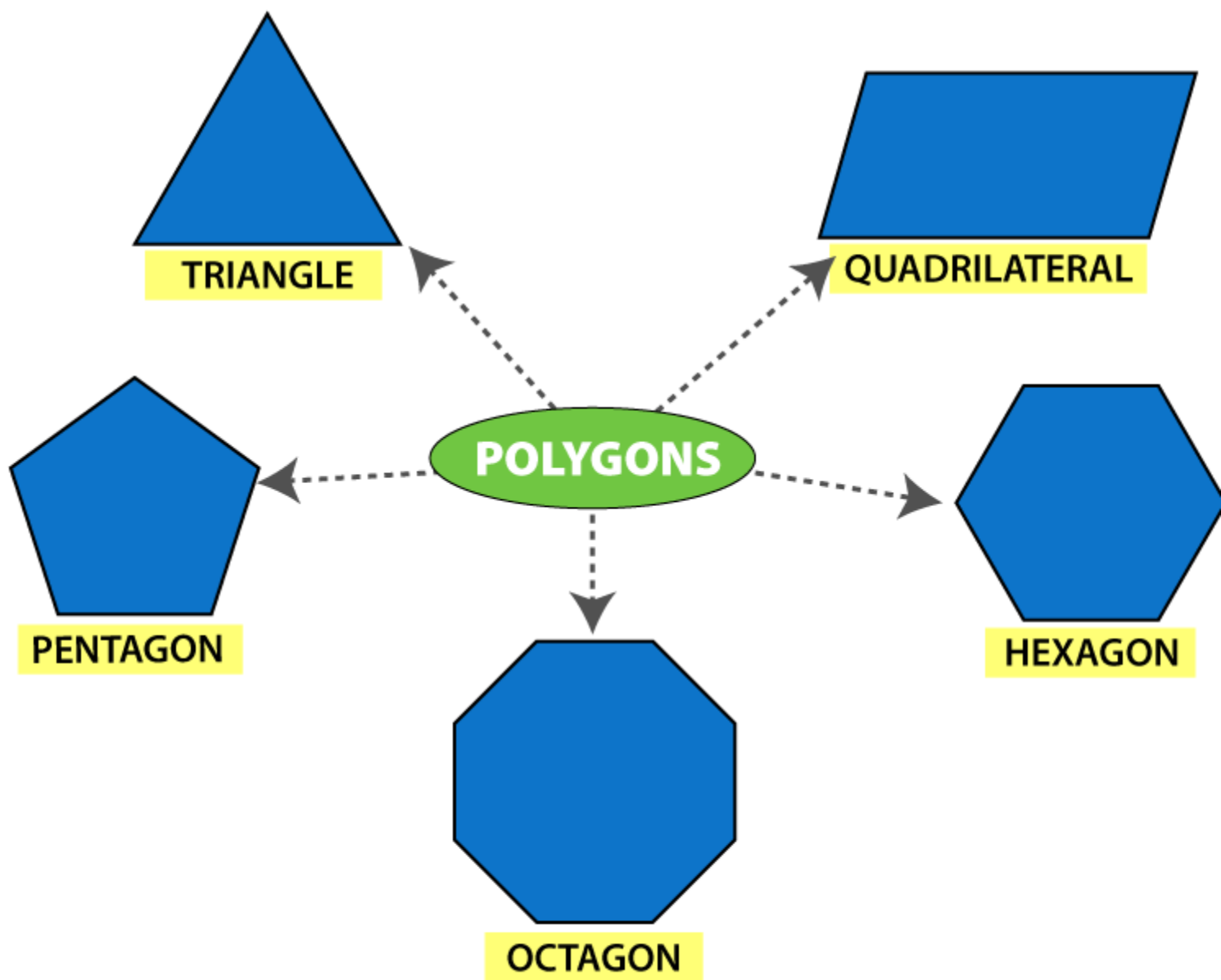
Note:

The sides of a polygon do not cross each other.

Classification of Polygons on the Basis of Number of Sides / Vertices

Polygons are classified according to the number of sides they have. The following lists the different types of polygons based on the number of sides they have:

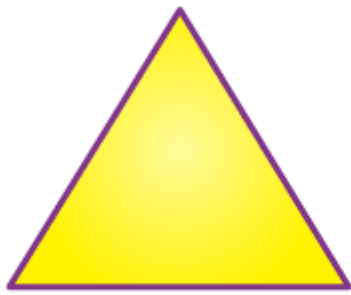
- When there are three sides, it is **triangle**
- When there are four sides, it is **quadrilateral**
- When there are five sides, it is **pentagon**
- When there are six sides, it is **hexagon**
- When there are seven sides, it is **heptagon**
- When there are eight sides, it is **octagon**
- When there are nine sides, it is **nonagon**
- When there are ten sides, it is **decagon**



© Byjus.com

Diagonals

A **diagonal** is a line segment connecting two **non-consecutive vertices** of a **polygon**.



Triangle
3 sides
0 diagonals



Quadrilateral
4 sides
2 diagonals



Pentagon
5 sides
5 diagonals

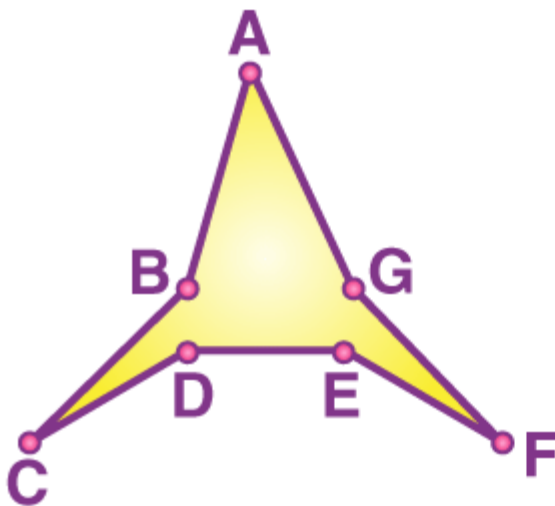


Hexagon
6 sides
9 diagonals

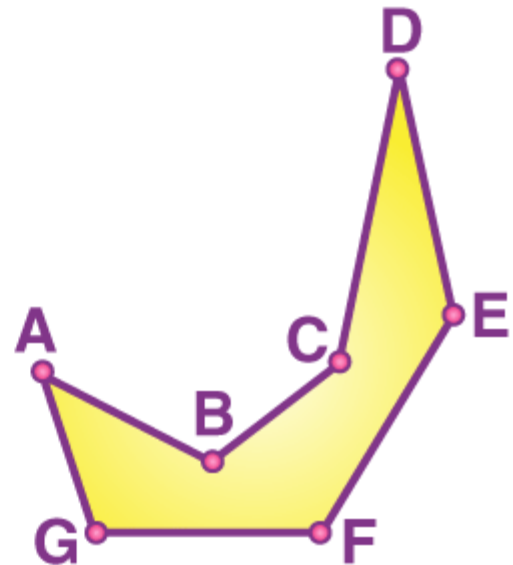
Polygons on the Basis of Shape

Polygons can be classified as **concave** or **convex** based on their shape.

- A **concave** polygon is a polygon in which at least one of its **interior angles** is **greater than 90°** . Polygons that are **concave** have at least **some portions of their diagonals** in their **exterior**.
- A **convex** polygon is a polygon with all its **interior angle less than 180°** . Polygons that are **convex** have **no portions** of their **diagonals** in their **exterior**.



Convex

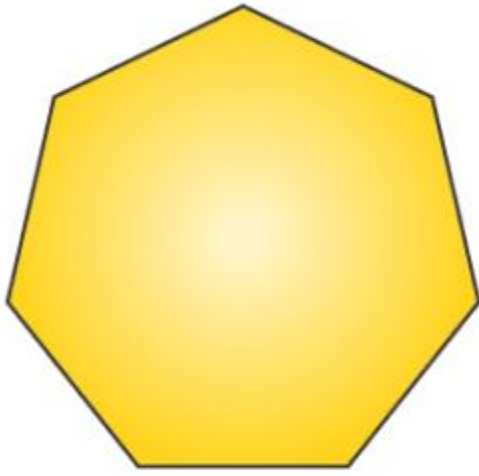


Concave

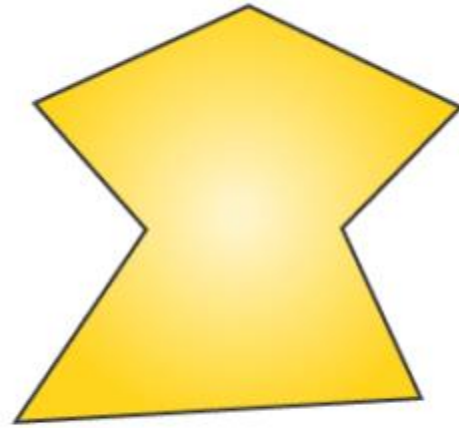
Polygons on the Basis of Regularity

Polygons can also be classified as **regular polygons** and **irregular polygons** on the basis of regularity.

- When a polygon is both **equilateral** and **equiangular** it is called as a regular polygon. In a regular polygon, all the sides and all the angles are equal. Example: Square
- A polygon which is not regular i.e. it is not equilateral and equiangular, is an irregular polygon. Example: Rectangle



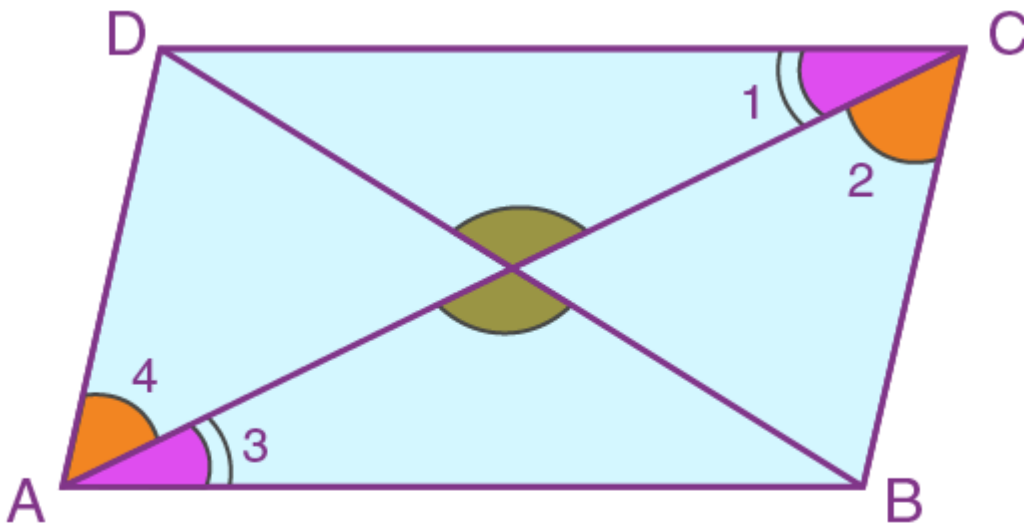
Regular



Irregular

Angle Sum Property of a Polygon

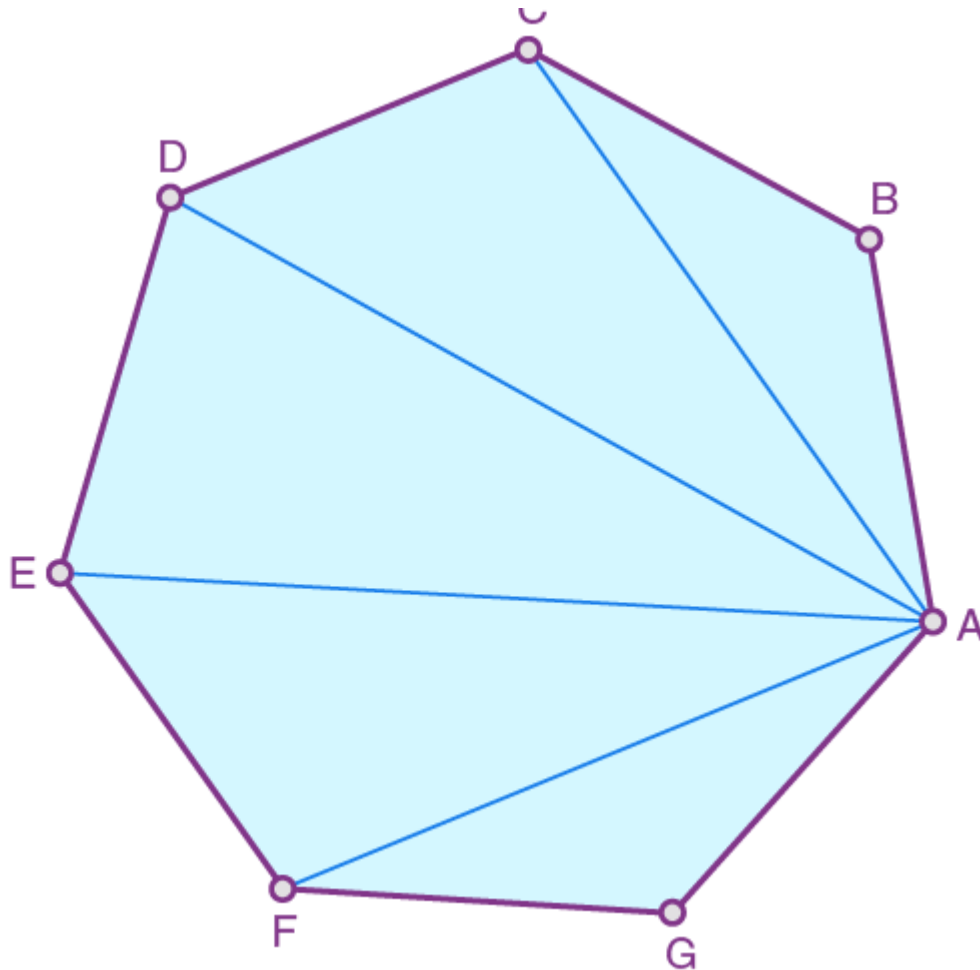
According to the **angle sum property** of a polygon, the **sum of all the interior angles** of a polygon is equal to $(n-2) \times 180^\circ$, where n is the number of sides of the polygon.



As we can see for the above quadrilateral, if we join one of the diagonals of the quadrilateral, we get two triangles.

The sum of all the interior angles of the two triangles is equal to the sum of all the interior angles of the quadrilateral, which is equal to $360^\circ = (4-2) \times 180^\circ$.

So, if there is a polygon which has n sides, we can make $(n - 2)$ non-overlapping triangles which will perfectly cover that polygon.



The **sum of the interior angles of the polygon** will be equal to the **sum of the interior angles of the triangles** = $(n-2) \times 180^\circ$.

Sum of Measures of Exterior Angles of a Polygon

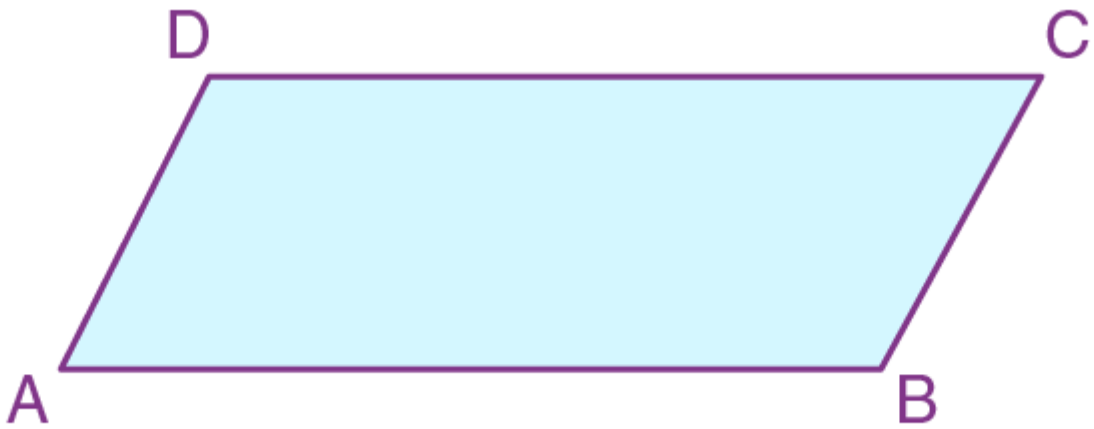
The **sum** of the measures of the **external angles** of any **polygon** is **360°** .

Properties of Parallelograms

The following are the important properties of parallelogram:

1. The opposite sides of a parallelogram are equal and congruent.
2. Diagonals of a parallelogram bisect each other.
3. The diagonals of parallelogram bisect each other and produce two congruent triangles
4. The opposite angles of a parallelogram are congruent.

Elements of a Parallelogram



- There are **four sides** and **four angles** in a parallelogram.
- The **opposite sides** and **opposite angles** of a parallelogram are **equal**.
- In the parallelogram ABCD, the sides $\overline{AB}$ and $\overline{CD}$ are **opposite sides** and the sides $\overline{AB}$ and $\overline{BC}$ are **adjacent sides**.
- Similarly, $\angle ABC$ and $\angle ADC$ are **opposite angles** and $\angle ABC$ and $\angle BCD$ are **adjacent angles**.

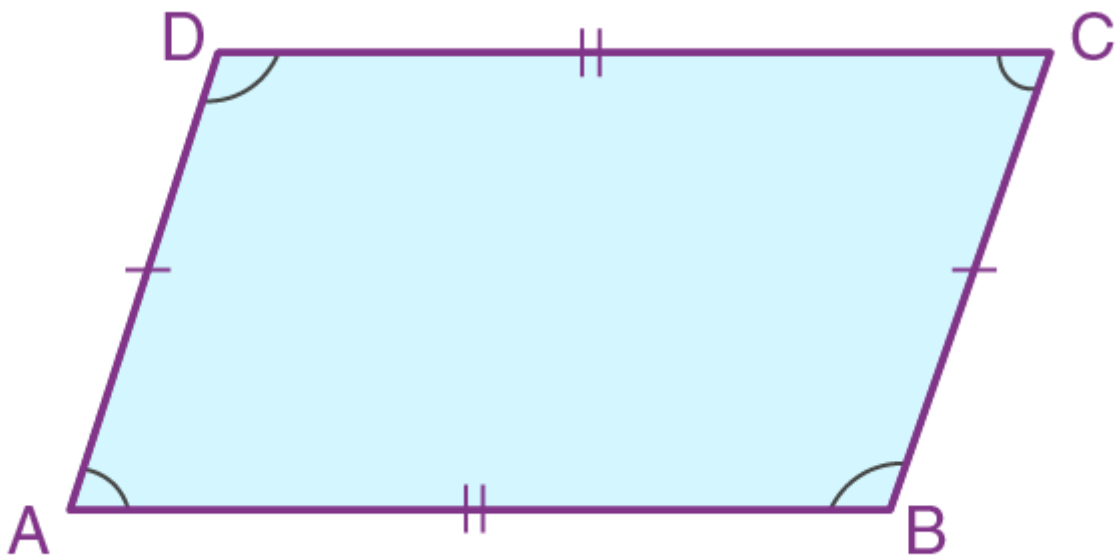
Angles of a Parallelogram

The **opposite angles** of a parallelogram are **equal**.

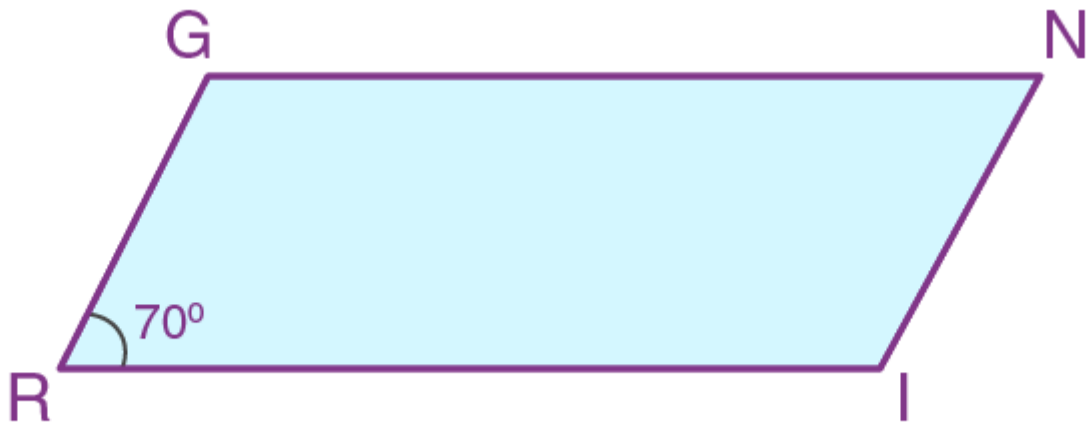
In the parallelogram ABCD, $\angle ABC = \angle ADC$ and $\angle DAB = \angle BCD$.

The **adjacent angles** in a parallelogram are **supplementary**.

$\therefore$ In the parallelogram ABCD, $\angle ABC + \angle BCD = \angle ADC + \angle DAB = 180^\circ$.



For example,



In the given parallelogram (RING), $\angle R = 70^\circ$. Now, we have to find the remaining angles.

As we know, the opposite angles of a parallelogram are equal, we can write:

$$\angle R = \angle N = 70^\circ.$$

And we know, the adjacent angles of a parallelogram are supplementary, we get

$$\angle R + \angle I = 180^\circ$$

$$\text{Hence, } \angle I = 180^\circ - 70^\circ = 110^\circ$$

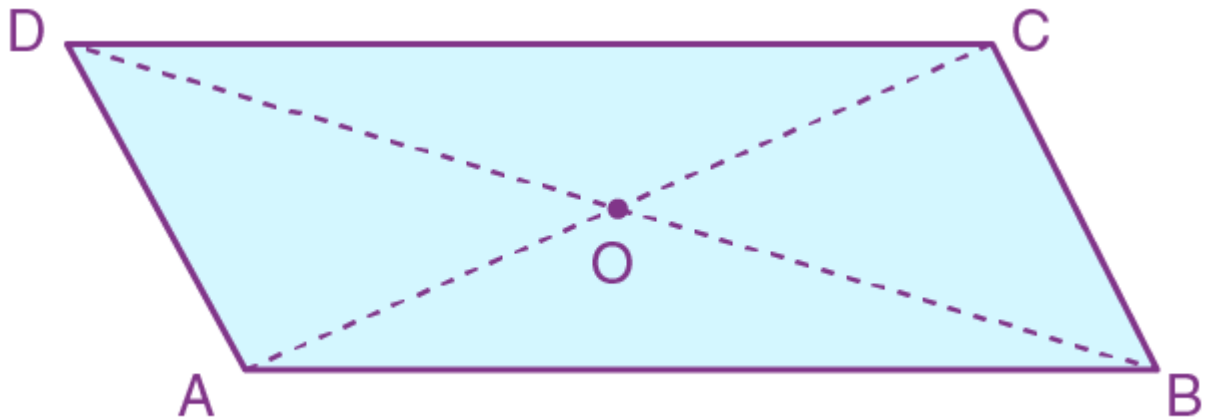
Therefore, $\angle I = \angle G = 110^\circ$ [Since $\angle I$ and $\angle G$ are opposite angles]

Hence the angles of a parallelogram are $\angle R = \angle N = 70^\circ$ and $\angle I = \angle G = 110^\circ$.

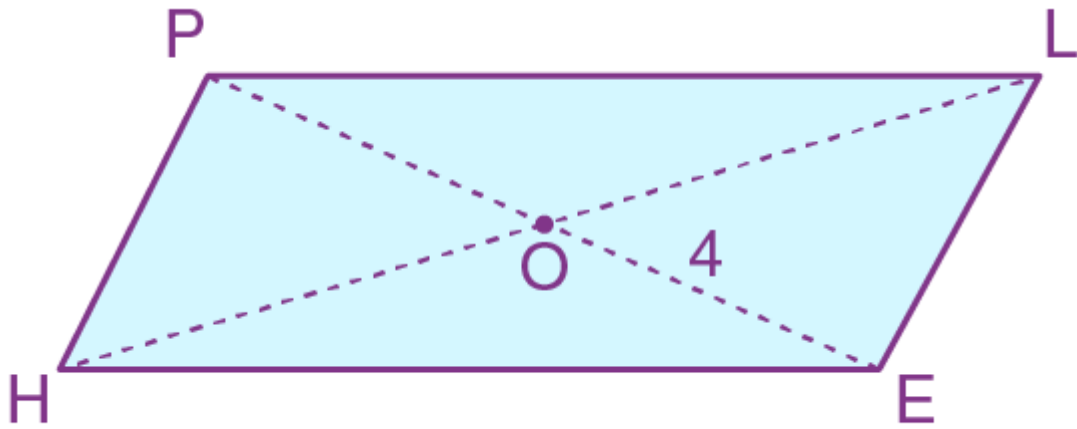
Diagonals of a Parallelogram

The **diagonals** of a parallelogram **bisect** each other at the point of intersection.

In the parallelogram ABCD given below, $OA = OC$ and $OB = OD$.



Consider an example, if $OE = 4\text{cm}$ and HL is five more than PE, find the measure of OH.



Given that, $OE = 4$ cm and hence, $OP = 4$ cm [Since $OE = OP$]

Hence $PE = OE + OP = 4\text{ cm} + 4\text{ cm} = 8$ cm

Also given that, HL is 5 more than PE,

Hence, $HL = 5 + 8 = 13$ cm.

Therefore, $OH = HL/2 = 13/2 = 6.5$ cm

Therefore, the measurement of OH is 6.5 cm

Properties of Special Parallelograms

Rectangle

A **rectangle** is a **parallelogram** with **equal angles** and each angle is **equal to 90°** .

Properties:

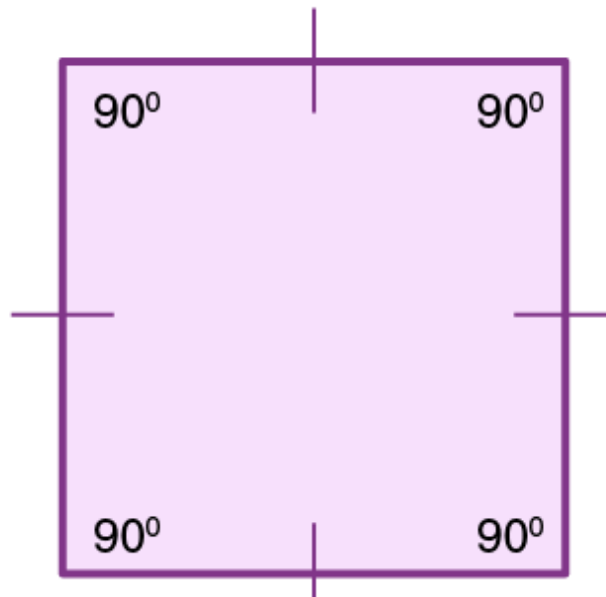
- **Opposite sides** of a rectangle are **parallel** and **equal**.
- The length of **diagonals** of a rectangle is **equal**.
- All the **interior angles** of a rectangle are **equal to 90°** .
- The **diagonals** of a rectangle **bisect** each other at the point of intersection.



Square

A **square** is a **rectangle** with **equal sides**. All the properties of a rectangle are also true for a square. In a square the diagonals:

- bisect one another
- are of equal length
- are perpendicular to one another



Rhombus

Rhombus is one of the special cases of parallelogram. In Rhombus, all the sides are equal and the opposite sides are also equal.

