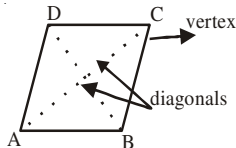


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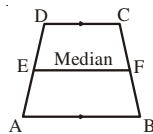
QUADRILATERALS

- **Quadrilateral:-** A plane, closed, geometric figure with four sides.



- **Elements of a Quadrilateral.**
 Four sides- AB, BC, CD and DA
 Four angles- $\angle A, \angle B, \angle C, \angle D$
 Two diagonals- AC and BD
 Four vertices- A, B, C and D

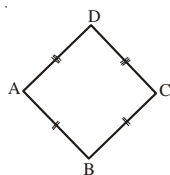
- **Types of Quadrilaterals**
- **Trapezium:** When one pair of opposite sides of quadrilateral is parallel, then it is called a trapezium.



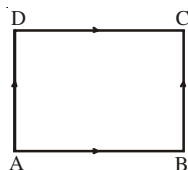
In figure. $AB \parallel DC$, AB and DC are called bases of the trapezium.

If non-parallel sides of a trapezium are equal, then it is called an isosceles trapezium.

- **Kite:** When two pairs of adjacent sides of a quadrilateral are equal, then it is called a kite.

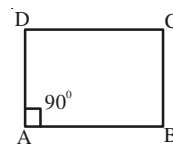


- **Parallelogram:** When both the pairs of opposite sides of a quadrilateral are parallel, then it is called a parallelogram.

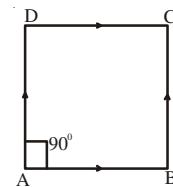


$AB \parallel DC$ and $AD \parallel BC$

- **Rectangle :** It is a special type of parallelogram when one of its angles is right angle.



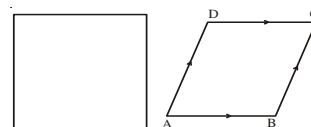
- **Square:** When all the four sides of a parallelogram are equal and one of its angles is 90° , then it is called a square.



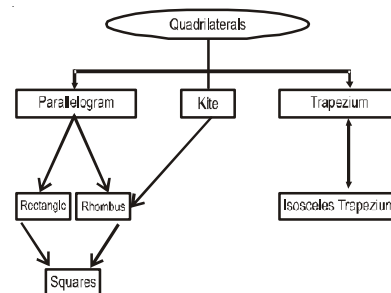
In $\square ABCD$

$AB = BC = CD = DA$ and $\angle A = 90^\circ$.

- **Rhombus :** When all four sides of a parallelogram are equal, then it is called a rhombus.



- **Types of quadrilaterals**

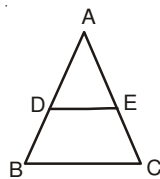


Properties of different types of quadrilaterals:

<p>1. Parallelogram</p>	<p>The opposite sides are equal.</p> <p>The opposite angles are equal.</p> <p>The diagonals bisect each other and each of them divides the parallelogram into two triangles of equal area.</p>
<p>2. Rhombus</p>	<p>All sides are equal.</p> <p>Opposite angles are equal</p> <p>Diagonals of a rhombus are unequal and bisect each other at right angles.</p>
<p>3. Rectangle</p>	<p>Opposite sides are equal.</p> <p>Each angle is a right angle.</p> <p>Diagonals are equal and bisect each other.</p>
<p>4. Square</p>	<p>All sides are equal.</p> <p>Each of the angles measures 90°.</p> <p>Diagonals are equal and bisect each other at right angles.</p>

Mid-Point Theorem:

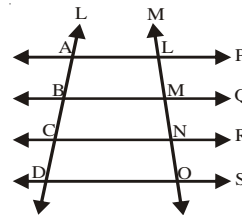
- In a triangle the line-segment joining the mid points of any two sides is parallel to the third side and is half of it.



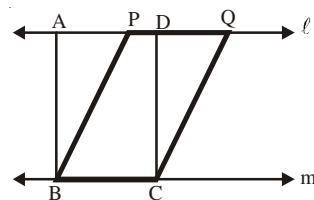
In $\triangle ABC$ if D and E are the mid-points of AB and AC respectively then $DE \parallel BC$ and

$$DE = \frac{1}{2} BC.$$

- The line drawn through the mid point of one side of a triangle parallel to the another side, bisects the third side.
- If there are three or more parallel lines and the intercepts made by them on a transversal are equal, the corresponding intercepts made on any other transversal are also equal e.g. if $AB = BC = CD$ then $LM = MN = NO$.



- Parallelograms on the same base (or equal bases) and between the same parallels are equal in the area. If $l \parallel m$ then

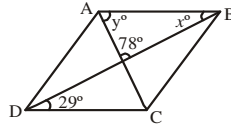


area of \parallel gram ABCD = area of \parallel gram PBCQ

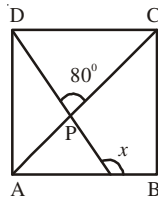
- Triangles on the same base (or equal bases) and between the same parallels are equal in area.
- Triangles on equal bases having equal areas have their corresponding altitudes equal.

CHECK YOUR PROGRESS:

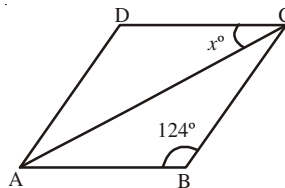
1. In parallelogram, ABCD find the value of x and y-



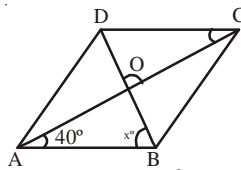
- A. $29^\circ, 73^\circ$ B. $23^\circ, 78^\circ$ C. $23^\circ, 23^\circ$ D. $29^\circ, 78^\circ$
 2. Three angles of a quadrilateral measure $54^\circ, 110^\circ$ and 86° . The measure of the fourth angle is:
 A. 86° B. 54° C. 110° D. 250°
 3.. In figure, ABCD is a square. If $\angle DPC = 80^\circ$, then value of x is



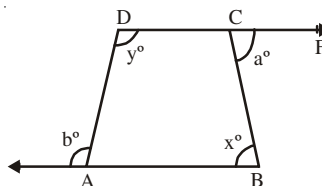
- A. 125° B. 130° C. 120° D. 115°
 4. In figure ABCD is a rhombus. If $\angle ABC$ is 124° , then the value of x is



- A. 26° B. 28° C. 25° D. 27°
 5. In figure ABCD is a rhombus whose diagonals intersect at O. If $\angle OAB = 40^\circ$ and $\angle ABO = x^\circ$, then $x = ?$



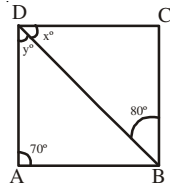
- A. 50° B. 35° C. 40° D. 45°
 6. The length of the diagonals of a rhombus are 24 cm and 18 cm respectively. Find the length of each side of the rhombus.
 7. Prove that the sum of all the four angles of a quadrilateral is 360° .
 8. The angles of a quadrilateral are in the ratio 3 : 5 : 9 : 13. Find all the angles of the quadrilateral.
 9. The sides BA and DC of \square ABCD are produced in figure. Prove that $x + y = a + b$.



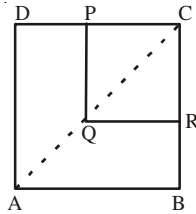
10. Show that the diagonals of a square are equal and bisect each other at right angles.

STRETCH YOURSELF

1. In figure ABCD is a parallelogram in which $\angle DAB = 70^\circ$, $\angle DBC = 80^\circ$. Find x and y



2. ABCD and PQRC are rectangles where Q is the mid point of AC. Prove that (i) $DP = PC$



(ii) $PR = \frac{1}{2} AC$

3. If D, E and F are the mid-points of the sides BC, CA and AB respectively of an equilateral triangle ABC. Prove that $\triangle DEF$ is also an equilateral triangle.

4. ABC is a triangle right angled at C. A line through the mid point M of hypotenuse AB and parallel to BC intersects AC at D. Show that
 (i) D is the mid point of AC.
 (ii) $MD \perp AC$
 (iii) $CM = AM = \frac{1}{2} AB$
5. Prove that the line segment joining the mid points of any two sides of a triangle is parallel to the third side and equal to half of it.

ANSWER

CHECK YOUR PROGRESS :

1. A
2. C
3. A
4. B
5. A
6. 15cm
8. $36^\circ, 60^\circ, 108^\circ, 156^\circ$

STRETCH YOURSELF :

1. $x = 30^\circ, y = 80^\circ$