

## Exe-17

### Quadrilateral Definition

A **quadrilateral** is a plane figure made with four Straight line segments closing in a space

A quadrilateral is a 4-sided Closed plane figure.

\*

Every quadrilateral has 4 vertices, 4 angles, and 4 sides

\*

The total of its interior angles = 360 degrees

### Types of Quadrilaterals

There are many types of quadrilaterals. As the word 'Quad' means four, all these types of a quadrilateral have four sides, and the sum of angles of these shapes is 360 degrees.

\*

Trapezium

\*

Parallelogram

\*

Squares

\*

Rectangle

\*

Rhombus

\*

Kite

### Square Properties

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\*

All the sides of the square are of equal measure

\*

The sides are parallel to each other

\*

All the interior angles of a square are at 90 degrees (i.e., right angle)

\*

The diagonals of a square perpendicular bisect each other

### Rectangle Properties

\*

The opposite sides of a rectangle are of equal length

\*

The opposite sides are parallel to each other

\*

All the interior angles of a rectangle are at 90 degrees.

\*

The diagonals of a rectangle bisect each other.

#### **Rhombus Properties**

\*

All the four sides of a rhombus are of the same measure

\*

The opposite sides of the rhombus are parallel to each other

\*

opposite angles are of the same measure

\*

The sum of any two adjacent angles of a rhombus is equal to 180 degrees

\*

diagonals perpendicularly bisect each other

#### **Parallelogram Properties**

\*

The opposite side of the parallelogram are of the same length

\*

opposite sides are parallel to each other

\*

The diagonals of a parallelogram bisect each other

\*

opposite angles are of equal measure

\*

The sum of two adjacent angles of a parallelogram is equal to 180 degrees

#### **Properties of Trapezium**

\*

Only one pair of the opposite side of a trapezium is parallel to each other

\*

The two adjacent sides of a trapezium are supplementary (180 degrees)

\*

diagonals of a trapezium bisect each other in the same ratio

#### **Properties of Kite**

\*

pair of adjacent sides of a kite are of the same length

\*

The largest diagonal of a kite bisect the smallest diagonal

\*

Only one pair of opposite angles are of the same measure.

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### **EX- 17**

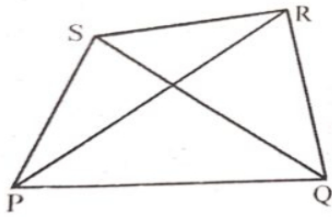
#### **Question 2:**

In the adjoining figure, PQRS is a quadrilateral.

(i) Name a pair of its adjacent sides.

(ii) Name a pair of its opposite sides.

- (iii) Name a pair of its adjacent angles.
- (iv) Name a pair of its opposite angles.
- (v) Name its diagonals.



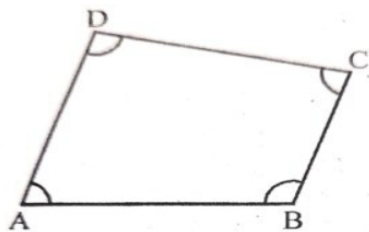
**Answer :**

- (i) The adjacent sides are :  
PQ and PS
- (ii) The opposite sides are :  
PQ and RS
- (iii) The adjacent angle are :  
 $\angle P$  and  $\angle Q$
- (iv) Name a pair of its opposite angles.  
 $\angle P$  and  $\angle R$
- (v) Name its diagonals.  
PR and SQ

**Question 3:**

- (i) How many pairs of adjacent sides does a quadrilateral have ?
- (ii) How many pairs of opposite sides does a quadrilateral have ?
- (iii) How many pairs of adjacent angles docs a quadrilateral have ?
- (iv) How many pairs of opposite angles does a quadrilateral have?
- (v)How many diagonals does a quadrilateral have ?

**Answer :**



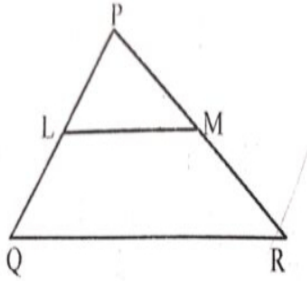
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- (i) (AB, BC), (BC, CD), (CD, DA) and (DA, AB) are four pairs of adjacent sides of the quadrilateral ABCD.
- (ii) (AB, CD) and (AD, BC) are two pairs of opposite sides of the quadrilateral ABCD.
- (iii)  $\angle A, \angle B, \angle C, \angle D$  and  $\angle D, \angle A$  are four pairs of adjacent angles of the quadrilateral ABCD.
- (iv)  $\angle A, \angle C$  and  $\angle B, \angle D$  are two pairs of opposite angles of the quadrilateral ABCD.

v) AC and BD are the two diagonals of the quadrilateral ABCD.

**Question 5:**

In the adjoining figure, L and M are points on the sides PQ and PR respectively, of  $\triangle PQR$  such that  $LM \parallel QR$ . What special name would you give to the quadrilateral LQRM?



**Answer :**

Trapezium.

**Question 6:**

Let ABCD be a parallelogram. What special name would you give it, when :

(i)  $AB = AD$  ?

(ii)  $\angle ABC = 90^\circ$

(iii)  $AB = AD$  and  $\angle ABC = 90^\circ$  ?

**Answer :**

In a  $\parallel$  gm ABCD

(i)  $AB = AD$ ,

then ABCD is a rhombus

(ii)  $\angle ABC = 90^\circ$

Then, ABCD is a rectangle.

(iii)  $AB = AD$  and  $\angle ABC = 90^\circ$ ,

then ABCD is square.

**Question 7:**

**Question 8:**

Three angles of a quadrilateral measure  $36^\circ$ ,  $78^\circ$  and  $116^\circ$  respectively. Find the measure of the fourth angle.

**Answer :**

We know that :

Sum of 4 angles of a quadrilateral =  $360^\circ$

But sum of three angles =  $36^\circ + 78^\circ + 116^\circ = 230^\circ$

So, Fourth angle =  $360^\circ - 230^\circ = 130^\circ$

Hence, measure of fourth angle =  $130^\circ$

**Question 9:**

The measures of the angles of a quadrilateral are in the ratio 2 : 4 : 5 : 7. Find the measure of each of its angles.

**Answer :**

Ratio of four angles of a quadrilateral = 2 : 4 : 5 : 7

Let these angles be =  $2x$ ,  $4x$ ,  $5x$ ,  $7x$

Then,  $2x + 4x + 5x + 7x = 360^\circ$

$18x = 360^\circ$

$x = 360^\circ/18$

=  $20^\circ$

So, that

First angle =  $2x = 2 \times 20^\circ$

=  $40^\circ$

Second angle =  $4x = 4 \times 20^\circ$

=  $80^\circ$

Third angle =  $5x = 5 \times 20^\circ$

=  $100^\circ$

Fourth angle =  $7x = 7 \times 20^\circ$

=  $140^\circ$

**Question 11:**

Two angles of a quadrilateral are of measures  $75^\circ$  and  $117^\circ$  respectively and the other two angles are equal. Find the measure of each of the equal angles.

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**Answer :**

Sum of 4 angles of quadrilateral =  $360^\circ$

Sum of two angles  $75^\circ + 117^\circ = 192^\circ$

Sum of other two angles =  $360^\circ - 192^\circ$   
=  $168^\circ$

But each of these two angles are equal

So,

Measure of each equal angle =  $(168^\circ/2) = 84^\circ$

**Question 12:**

A quadrilateral has three acute angles, each measuring  $75^\circ$ . What is the measure of its fourth angle ?

**Answer :**

Three acute angles of a quadrilateral are  $75^\circ$  each.

So, Sum of three angles  $3 \times 75^\circ = 225^\circ$

But sum of 4 angles =  $360^\circ$  So, Fourth angle =  $360^\circ - 225^\circ$   
=  $135^\circ$

**Question 13:**

The lengths of two adjacent sides of a parallelogram are 7 cm and 5 cm respectively. Find the perimeter of the parallelogram.

**Answer :**

Perimeter of parallelogram =  $2(\text{sum of its sides})$

=  $2(7\text{cm} + 5\text{cm})$

=  $2 \times 12 \text{ cm}$

=  $24 \text{ cm}$

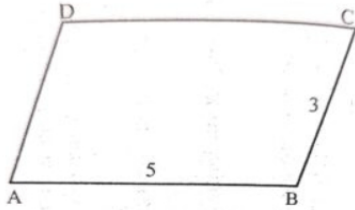
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**Question 14:**

Two sides of a parallelogram are in the ratio 5:3 and its perimeter is 48 cm. Find the length of each of its sides.

**Answer :**

ABCD is a parallelogram in which  $AB : BC = 5 : 3$



But perimeter = 48 cm

So,  $2(5x + 3x) = 48$

$2 \times 8x = 48 = 16x = (48/16) = 3 \text{ cm}$

So,

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$AB = 5x = 5 \times 3 = 15 \text{ cm}$

$BC = 3x = 3 \times 3 = 9 \text{ cm}$

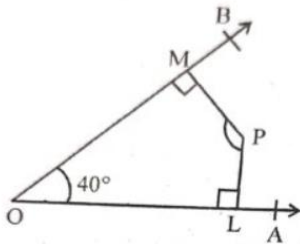
But  $CD = AB$  and  $AD = BC$

So, that  $CD = 15 \text{ cm}$

and  $AD = 9 \text{ cm}$

**Question 16:**

In the adjoining figure, P is a point in the interior of  $\angle AOB$ . If  $PL \perp OA$  and  $PM \perp OB$  and  $\angle AOB = 40^\circ$ , find the measure of  $\angle LPM$ .



**Answer :**

From the figure, we see that OLPM is a quadrilateral in which  $\angle O = 40^\circ$ ,

$\angle L = 90^\circ$ ,

$\angle M = 90^\circ$

So,  $\angle O + \angle OLP + \angle LPM + \angle PMO$

$= 360^\circ = 40^\circ + 90^\circ + \angle LPM + 90^\circ$

$= 360^\circ$

$= 220^\circ + \angle LPM = 360^\circ$

$\Rightarrow LPM = 360 - 220$

$\Rightarrow LMP = 140 .$

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