

# CHAPTER TEST: QUADRILATERALS

Mathematics — Class IX (2026/QUAD/09/001)

Time: 1.5 Hours

Max. Marks: 40

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## General Instructions:

- All questions are compulsory.
  - Section A: 8 MCQs (1 mark each).
  - Section B: 4 Very Short Answer Questions (2 marks each).
  - Section C: 3 Short Answer Questions (3 marks each).
  - Section D: 2 Long Answer Questions (5 marks each).
  - Section E: 1 Case Study with 5 MCQs (1 mark each).
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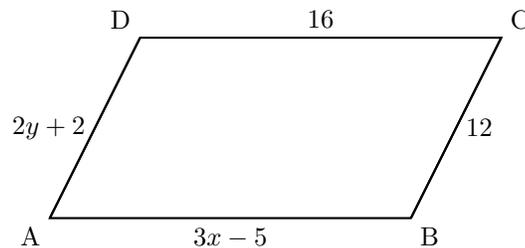
## Section A: Multiple Choice Questions ( $8 \times 1 = 8$ Marks)

1. In a parallelogram  $ABCD$ , if  $\angle A = (2x + 10)^\circ$  and  $\angle B = (3x - 40)^\circ$ , then the value of  $x$  is:
  - (a) 20
  - (b) 30
  - (c) 40
  - (d) 50
2. If the diagonals of a quadrilateral bisect each other at right angles and are equal, then the quadrilateral is a:
  - (a) Rectangle
  - (b) Rhombus
  - (c) Square
  - (d) Parallelogram
3. In a rhombus  $PQRS$ , if  $\angle PQR = 120^\circ$ , then the measure of  $\angle QPR$  is:
  - (a)  $30^\circ$
  - (b)  $45^\circ$
  - (c)  $60^\circ$
  - (d)  $90^\circ$
4. Given a rectangle  $EFGH$  where diagonals intersect at  $O$ . If  $EO = 3x + 1$  and  $FO = 2x + 4$ , the length of diagonal  $EG$  is:
  - (a) 8
  - (b) 10
  - (c) 12
  - (d) 14
5. Which of the following is NOT a sufficient condition for a quadrilateral to be a parallelogram?

- (a) Opposite sides are equal
  - (b) Opposite angles are equal
  - (c) Diagonals are equal
  - (d) Diagonals bisect each other
6. In a square  $MNOP$ , the angle between a side and a diagonal is:
- (a)  $30^\circ$
  - (b)  $45^\circ$
  - (c)  $60^\circ$
  - (d)  $90^\circ$
7. If the consecutive angles of a quadrilateral are in the ratio  $1 : 2 : 3 : 4$ , the quadrilateral is a:
- (a) Parallelogram
  - (b) Rectangle
  - (c) Trapezium
  - (d) Kite
8. In  $\triangle ABC$ ,  $D$  and  $E$  are mid-points of  $AB$  and  $AC$ . If  $DE = 4.5$  cm, then the length of  $BC$  is:
- (a) 4.5 cm
  - (b) 7 cm
  - (c) 9 cm
  - (d) 18 cm

**Section B: Very Short Answer Questions ( $4 \times 2 = 8$  Marks)**

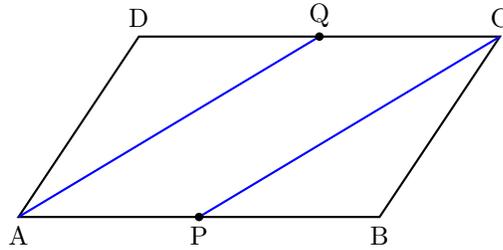
1. Show that each angle of a rectangle is a right angle, assuming the properties of a parallelogram.
2. In the following figure,  $ABCD$  is a parallelogram. Find the values of  $x$  and  $y$ .



3. Prove that the perimeter of a rhombus is  $4a$ , where  $a$  is the length of one side, and explain why its diagonals are not necessarily equal.
4. In a quadrilateral, the three angles are  $75^\circ$ ,  $90^\circ$  and  $75^\circ$ . Find the fourth angle and classify the type of quadrilateral if two adjacent sides are equal.

### Section C: Short Answer Questions ( $3 \times 3 = 9$ Marks)

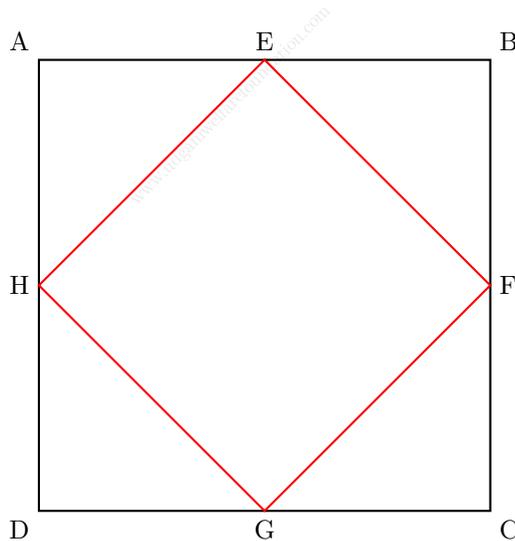
1.  $ABCD$  is a parallelogram in which  $P$  and  $Q$  are mid-points of opposite sides  $AB$  and  $CD$ . Prove that  $APCQ$  is a parallelogram.



2. Show that the diagonals of a rhombus bisect each other at right angles.
3. In a  $\triangle ABC$ ,  $AD$  is the median. A line is drawn through  $B$  parallel to  $AD$  to meet  $AC$  produced at  $E$ . Show that  $AC = CE$ .

### Section D: Long Answer Questions ( $2 \times 5 = 10$ Marks)

1.  $ABCD$  is a square and  $EFGH$  is a quadrilateral formed by joining the mid-points of the sides  $AB, BC, CD$ , and  $DA$  respectively. Prove that  $EFGH$  is also a square. Use TikZ to illustrate the nested property.



2. Prove that the line segment joining the mid-points of two sides of a triangle is parallel to the third side and is half of it. Using this theorem, if  $D, E, F$  are mid-points of sides  $BC, CA, AB$  of  $\triangle ABC$ , prove that  $AFDE$  is a parallelogram.

### Section E: Case Study ( $1 \times 5 = 5$ Marks)

#### Case Study: The Architectural Design of a Modern Truss

An architect is designing a decorative glass ceiling for a museum lobby. The structure is based on a series of metallic frames. The primary frame is a large parallelogram shaped section denoted by  $PQRS$ . To provide additional structural integrity, the architect connects the mid-points of the opposite sides  $PQ$  and  $RS$  using a reinforced beam. Furthermore, the architect discovers that for the glass panels to fit perfectly, the diagonals  $PR$  and  $QS$  must be checked for their intersection properties. During the inspection, it is found that the

diagonals are equal in length due to the specific aesthetic requirements of the building's facade. The installers must ensure that the internal angles are precisely calculated so that the weight is distributed evenly across the vertices. Understanding the geometric properties of these quadrilaterals is essential for the safety and stability of the entire museum ceiling.

1. If the diagonals  $PR$  and  $QS$  of the parallelogram  $PQRS$  are equal, the frame  $PQRS$  must be a:
2. The beams connecting the mid-points of  $PQ$  and  $RS$  divide the parallelogram into:
3. If  $\angle P = 70^\circ$ , find the measure of  $\angle Q$ :
4. In the parallelogram  $PQRS$ , if the diagonals intersect at  $O$ , then  $OP$  is always equal to:
5. If the architect decides to change the frame such that all sides are equal but the angles are not  $90^\circ$ , the frame becomes a: