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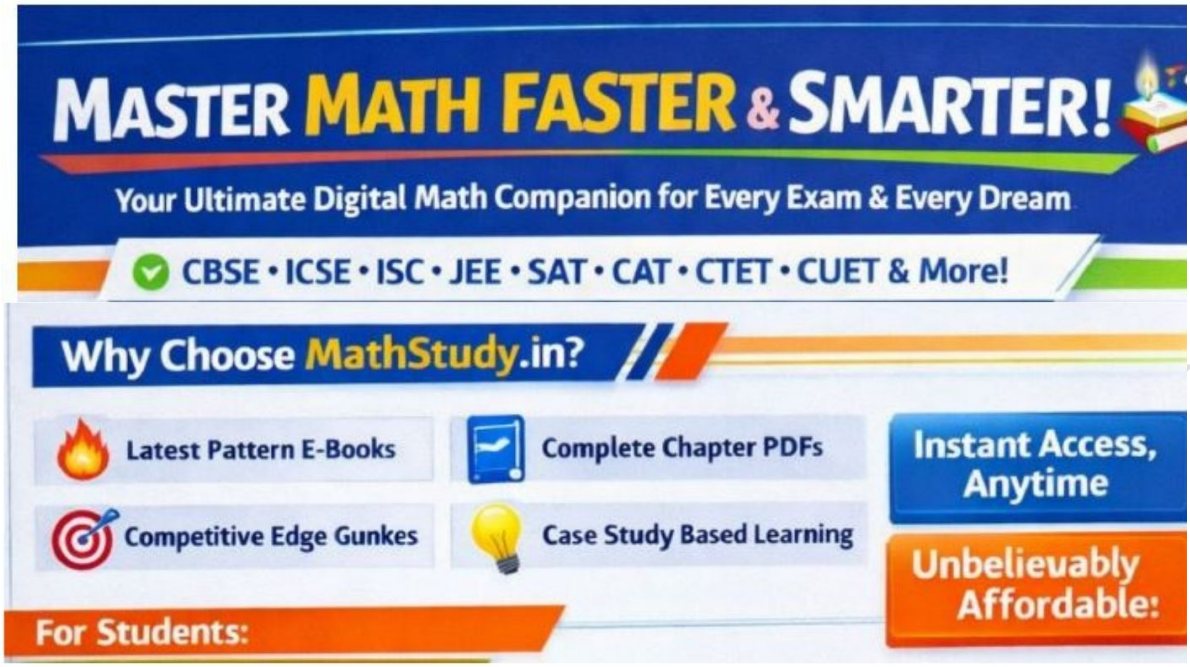

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SOLUTIONS: CHAPTER TEST - QUADRILATERALS

Mathematics | Class IX (2026/QUAD/09/002)

SECTION A: Multiple Choice Questions

1. **Answer: (a)** 75°
   In a parallelogram, opposite angles are equal. Therefore, $\angle C = \angle A = 75^\circ$.

2. **Answer: (c) Diagonals are equal**
   Diagonals of a rhombus are not necessarily equal. They are equal only if the rhombus is a square.

3. **Answer: (a) 5 cm**
   Diagonals of a parallelogram bisect each other. Point O is the midpoint of PR.
   $OP = \frac{1}{2} \times PR = \frac{1}{2} \times 10 = 5$ cm.

4. **Answer: (b) Rectangle**
   By definition, a parallelogram with all angles equal to 90° is a rectangle.

5. **Answer: (c) Rhombus**
   A parallelogram whose diagonals bisect each other at right angles is a rhombus.

6. **Answer: (a) 13 cm**
   In a rectangle, diagonals are equal. Therefore, $BD = AC = 13$ cm.

7. **Answer: (b) Supplementary**
   Adjacent (consecutive) angles of a parallelogram are supplementary (sum $= 180^\circ$).

8. **Answer: (c) Rhombus**
   A square must have angles of 90°. If the angles are not 90° but sides are equal and diagonals bisect at right angles, it is a rhombus.

SECTION B: Very Short Answer Questions

1. In parallelogram $ABCD$, $AB \parallel CD$. Therefore, $\angle ABD = \angle BDC$ (Alternate angles).
   In $\triangle ABD$, $\angle A + \angle ABD + \angle ADB = 180^\circ$.
   Wait, simpler method: $\angle ADC = \angle ABC$ (Opposite angles).
   $\angle ABC = 180^\circ - \angle DAB = 180^\circ - 65^\circ = 115^\circ$ (Consecutive angles).
   In $\triangle BCD$, $\angle C = \angle A = 65^\circ$.
   $\angle BDC + \angle DBC + \angle C = 180^\circ$
   $\angle BDC + 45^\circ + 65^\circ = 180^\circ \implies \angle BDC = 180^\circ - 110^\circ = \mathbf{70}^\circ$.

2. Let angles be $4x$ and $5x$.
   $4x + 5x = 180^\circ \implies 9x = 180^\circ \implies x = 20^\circ$.
   Angles are $\mathbf{80}^\circ, \mathbf{100}^\circ, \mathbf{80}^\circ, \mathbf{100}^\circ$.

3. $\angle C = \angle A = 60^\circ$ (Opposite angles).
   In $\triangle ABD$, $AB = AD$ (Sides of rhombus). So $\angle ABD = \angle ADB$.
   $\angle DAB = 60^\circ \implies \angle ABD = (180 - 60)/2 = \mathbf{60}^\circ$.

4. In rectangle $PQRS$, diagonals are equal and bisect each other, so $OP = OR$.
   $\angle POR = 120^\circ$ is impossible (it's a straight line). Assuming $\angle POQ = 120^\circ$:
   In $\triangle OPQ$, $OP = OQ$. $\angle OPQ = \angle OQP = (180 - 120)/2 = \mathbf{30}^\circ$.

SECTION C: Short Answer Questions

1. **Proof:** In $\triangle DCE$ and $\triangle FBE$:
   1. $CE = BE$ (E is midpoint)
   2. $\angle DCE = \angle FBE$ (Alternate angles, $DC \parallel AF$)
   3. $\angle CED = \angle BEF$ (Vertically opposite)

   By **ASA congruence**, $\triangle DCE \cong \triangle FBE$.
   $\implies DC = BF$ (CPCT).
   Since $DC = AB$ (Opposite sides of parallelogram), $BF = AB$.
   $AF = AB + BF = AB + AB = \mathbf{2AB}$.

2. In $\triangle OPQ$, $OP = OQ$ (Diagonals of rectangle are equal and bisect).
   Since $OP = OQ$, $\triangle OPQ$ is **isosceles**.
   $\angle OPQ = \angle OQP = (180 - 100)/2 = 40^\circ$.
   $\angle PQR = 90^\circ \implies \angle OQR = 90^\circ - 40^\circ = \mathbf{50}^\circ$.

3. **Proof:** In $\triangle ABC$ and $\triangle BAD$, $AB = AB$, $BC = AD$, $\angle B = \angle A = 90^\circ$. By SAS, $\triangle ABC \cong \triangle BAD \implies AC = BD$ (Equal diagonals).
   Length: $AC^2 = 8^2 + 8^2 \implies AC = \sqrt{128} = \mathbf{8\sqrt{2}}$ cm.

SECTION D: Long Answer Questions

1. **Proof:** (a) $AB \parallel CD \implies AP \parallel CQ$. $AB = CD \implies \frac{1}{2}AB = \frac{1}{2}CD \implies AP = CQ$.
   One pair equal and parallel $\implies$ **APCQ is a parallelogram**.
   (b) Similarly, $PB = AB - AP$ and $DQ = CD - CQ$. Since $AB = CD$ and $AP = CQ$, $PB = DQ$. Also $PB \parallel DQ \implies$ **PBDQ is a parallelogram**.
   (c) $\triangle APQ \cong \triangle CQP$ by SSS (as opposite sides of parallelogram are equal). Area is equal, and shapes are congruent.

2. **Side of Rhombus:** Diagonals bisect at 90°. Half lengths are 8 cm and 6 cm.
   $\text{Side}^2 = 8^2 + 6^2 = 64 + 36 = 100 \implies$ **Side = 10 cm**.

SECTION E: Case Study Answers

1. (i) **(a)** 70° (Opposite angles).
   (ii) **(b) 120 meters** ($CD = AB$).
   (iii) **(b) 70 meters** ($AO = \frac{1}{2}AC$).
   (iv) **(b)** 110° ($180 - 70$).
   (v) **(c) Both pairs** (Property of parallelogram diagonals).