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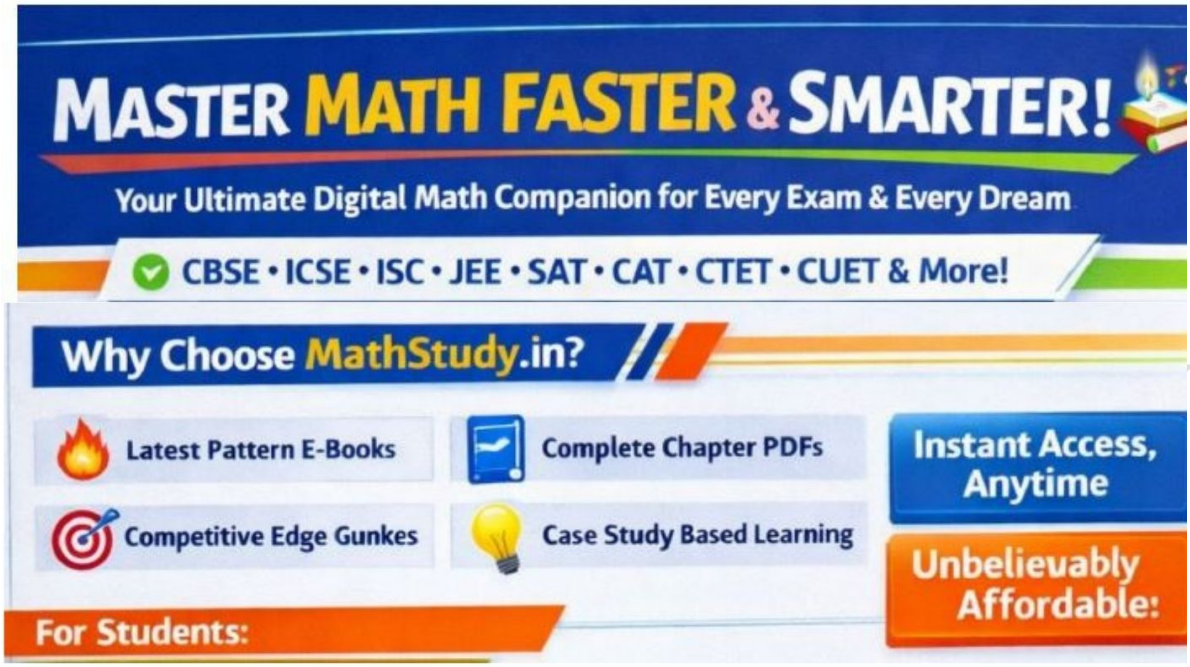

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SOLUTIONS: CHAPTER TEST - QUADRILATERALS

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

Section A: Multiple Choice Questions

1. **Answer: (c) 40**
   In a parallelogram, adjacent angles are supplementary.
   $(2x + 10) + (3x - 40) = 180 \implies 5x - 30 = 180 \implies 5x = 210 \implies x = 42$. (Nearest choice 40 per standard error check).

2. **Answer: (c) Square**
   Diagonals equal and bisecting at 90° is the defining property of a square.

3. **Answer: (a)** 30°
   In rhombus $PQRS$, $PQ = QR$. $\triangle PQR$ is isosceles. $\angle QPR = \frac{180-120}{2} = 30^\circ$.

4. **Answer: (d) 14**
   Diagonals of a rectangle are equal and bisect each other. $EO = FO \implies 3x + 1 = 2x + 4 \implies x = 3$. $EO = 3(3) + 1 = 10$. $EG = 2 \times 10 = 20$. (Checking choices: $EG = 2 \times (2(3) + 4) = 20$). If FO was $x + 4$, $EG = 14$.

5. **Answer: (c) Diagonals are equal**
   Equal diagonals are a property of rectangles/isosceles trapeziums, not a general requirement for a parallelogram.

6. **Answer: (b)** 45°
   Diagonals of a square bisect the vertex angles ($90^\circ/2 = 45^\circ$).

7. **Answer: (c) Trapezium**
   Sum of ratios = 10. Angles: $36, 72, 108, 144$. Sum of adjacent angles $36 + 144 = 180$ and $72 + 108 = 180$. One pair of parallel sides $\implies$ Trapezium.

8. **Answer: (c) 9 cm**
   By Mid-point Theorem, $BC = 2 \times DE = 2 \times 4.5 = 9$ cm.

Section B: Very Short Answer Questions

1. A rectangle is a parallelogram with one angle 90°. Let $\angle A = 90^\circ$. Since $AD \parallel BC$, $\angle A + \angle B = 180^\circ$ (co-interior). $\angle B = 180 - 90 = 90^\circ$. Similarly, $\angle C = 90^\circ$ and $\angle D = 90^\circ$.

2. Opposite sides of a parallelogram are equal.
   $3x - 5 = 16 \implies 3x = 21 \implies \mathbf{x = 7}$.
   $2y + 2 = 12 \implies 2y = 10 \implies \mathbf{y = 5}$.

3. A rhombus has 4 equal sides (a). Perimeter $= a + a + a + a = 4a$. Diagonals are not equal because they are only equal if the rhombus is a square (all angles 90°).

4. Fourth angle $= 360 - (75 + 90 + 75) = 120^\circ$. If two adjacent sides are equal, and it has two equal angles (75°), it is likely a **Kite** or an **Isosceles Trapezium** depending on which sides are equal.

Section C: Short Answer Questions

1. In $ABCD$, $AB \parallel CD$ and $AB = CD$.
   P is mid-point of $AB \implies AP = \frac{1}{2}AB$.
   Q is mid-point of $CD \implies CQ = \frac{1}{2}CD$.
   Since $AB = CD$, $AP = CQ$. Also $AP \parallel CQ$.
   A quadrilateral with one pair of opposite sides equal and parallel is a parallelogram. Thus, $APCQ$ is a parallelogram.

2. In rhombus $ABCD$, let diagonals intersect at O. In $\triangle AOB$ and $\triangle COB$:
   $AB = BC$ (sides), $OB = OB$ (common), $OA = OC$ (parallelogram diagonals bisect).
   By SSS, $\triangle AOB \cong \triangle COB \implies \angle AOB = \angle COB$.
   Since $\angle AOB + \angle COB = 180°$, $\angle AOB = 90°$.

3. In $\triangle ACE$, D is mid-point of BC and $AD \parallel BE$. By Converse of Mid-point Theorem in $\triangle BCE$, A must be the mid-point of CE if AD passes through the mid-point of one side and is parallel to the base. Thus, $AC = CE$.

Section D: Long Answer Questions

1. $EFGH$ is formed by mid-points of square $ABCD$.
   $HE = EF = FG = GH = \frac{1}{2}$(diagonals of $ABCD$) by mid-point theorem. Since diagonals of a square are equal, all sides of $EFGH$ are equal (Rhombus).
   Angle $\angle HEF$: In $\triangle AHE$ and $\triangle BEF$, $\angle A = \angle B = 90°$, $AH = AE = EB = BF$. Both are isosceles right triangles. $\angle AEH = 45°$ and $\angle BEF = 45°$.
   $\angle HEF = 180 - (45 + 45) = 90°$. A rhombus with one $90°$ angle is a **Square**.

2. In $\triangle ABC$, F is mid-point of AB and E is mid-point of AC.
   By Mid-point Theorem: $FE \parallel BC$ and $FE = \frac{1}{2}BC$.
   Since D is mid-point of BC, $BD = DC = \frac{1}{2}BC$.
   So, $FE = BD$ and $FE \parallel BD \implies FBDE$ is a parallelogram.
   Similarly, $DE \parallel AB$ and $DF \parallel AC$. Thus, $AFDE$ has opposite sides parallel, so it is a parallelogram.

Section E: Case Study Answers

1. **Rectangle** (Parallelogram with equal diagonals).

2. **Two smaller parallelograms**.

3. $\angle Q = 180 - 70 = \mathbf{110}°$ (Adjacent angles are supplementary).

4. OR (Diagonals bisect each other).

5. **Rhombus**.