Mind Curve Mid-Term Test Series 2026–27

Class X | Test 03 – Answer Key

Chapters 6–7: Triangles & Coordinate Geometry

Q.No	Step-by-Step Solution	Marks per Step
SECTION – A (Q1–10, 1 mark each)		
1	**Q1** In parallelogram ABCD, the diagonals AC and BD bisect each other, so their midpoints are equal Equating x-coordinates: $\frac{x-1}{2} = \frac{3}{2} \Rightarrow x = 4$ **Answer: (b) 4**	*1 mark for the correct option.*
2	**Q2** DE‖BC ⇒ by the Basic Proportionality Theorem, $\frac{AD}{DB} = \frac{AE}{EC}$ AD = AB−BD = 2x−(x−3) = x+3; AE = AC−CE = (2x+3)−(x−2) = x+5 $\frac{x+3}{x-3} = \frac{x+5}{x-2}$ Cross-multiplying: $(x+3)(x-2) = (x+5)(x-3) \Rightarrow x^2+x-6 = x^2+2x-15 \Rightarrow x=9$ **Answer: (c) 9**	*1 mark for the correct option.*
3	**Q3** $\frac{AB}{QR} = \frac{BC}{PR} = \frac{CA}{PQ}$ Side AB (opposite C) corresponds to QR (opposite P) ⇒ C↔P Side BC (opposite A) corresponds to PR (opposite Q) ⇒ A↔Q Side CA (opposite B) corresponds to PQ (opposite R) ⇒ B↔R So reading off P,Q,R's images: P↔C, Q↔A, R↔B **Answer: (a) ΔPQR ~ ΔCAB**	*1 mark for the correct option.*
4	**Q4** Since ΔABC ~ ΔDEF, the ratio of perimeters equals the ratio of any pair of corresponding sides (BC↔EF) $\frac{\text{Perimeter}(\triangle ABC)}{\text{Perimeter}(\triangle DEF)} = \frac{BC}{EF}$ $\frac{30}{18} = \frac{9}{EF} \Rightarrow EF = \frac{9 \times 18}{30} = 5.4\ \text{cm}$ **Answer: (d) 5.4 cm**	*1 mark for the correct option.*
5	**Q5** This is the Midpoint Theorem: a line through the midpoint of one side, parallel to another side, bisects the third side **Answer: (c) 1:1**	*1 mark for the correct option.*
6	**Q6**	*1 mark for the correct option.*

Q.No	Step-by-Step Solution	Marks per Step
	D is the midpoint of BC (since AD is a median) $D = \left(\frac{6+1}{2}, \frac{5+4}{2}\right) = \left(\frac{7}{2}, \frac{9}{2}\right)$ **Answer: (c) (7/2, 9/2)**	
7	**Q7** Centroid of the triangle with vertices (a,b),(b,c),(c,a): $\left(\frac{a+b+c}{3}, \frac{b+c+a}{3}\right) = (0,0) \;\Rightarrow\; a+b+c=0$ Using the identity $a^3+b^3+c^3-3abc=(a+b+c)(a^2+b^2+c^2-ab-bc-ca)$ since a+b+c=0, the right side is 0, so $a^3+b^3+c^3-3abc=0$ **Answer: (c) 3abc**	*1 mark for the correct option.*
8	**Q8** $d=\sqrt{(a\cos\theta)^2+(a\sin\theta)^2}=\sqrt{a^2(\cos^2\theta+\sin^2\theta)}=\sqrt{a^2}=a$ **Answer: (b) a**	*1 mark for the correct option.*
9	**Q9** Assertion: the midpoint of a segment divides it in ratio 1:1 — this is TRUE by definition Reason: using the section formula, if (-3,k) divides (-5,4) to (2,3) in ratio m:n: $\frac{2m-5n}{m+n}=-3$ $2m-5n=-3m-3n \;\Rightarrow\; 5m=2n \;\Rightarrow\; m:n=2:5$ The actual ratio is 2:5, not 1:2 as the Reason claims — so the Reason is FALSE **Answer: (c) A is true but R is false**	*1 mark for the correct option.*
10	**Q10** The ratio in which line ax+by+c=0 divides the segment joining $(x_1,y_1),(x_2,y_2)$ is: $\text{Ratio} = -\frac{ax_1+by_1+c}{ax_2+by_2+c}$ For 3x+4y−7=0 and points (1,2), (−2,1): $-\frac{3(1)+4(2)-7}{3(-2)+4(1)-7}=-\frac{4}{-9}=\frac{4}{9}$ The actual ratio is 4:9, not 3:5 as the Assertion claims — so Assertion is FALSE The Reason (section formula) is a correct general statement — TRUE **Answer: (d) A is false but R is true**	*1 mark for the correct option.*
	SECTION – B (Q11–13, 2 marks each)	
11(A)	**Q11(A)** ∠DEC = ∠AEB (vertically opposite angles); ∠2 = ∠4 is given (∠EDC = ∠EBA) By AA similarity, ΔDEC ~ ΔBEA, so corresponding sides are proportional: $\frac{DE}{BE}=\frac{CE}{AE}$ $\frac{4}{4x-2}=\frac{x+1}{2x+4}$	*1 mark for identifying the similar triangles* *1 mark for the value of x.*

Q.No	Step-by-Step Solution	Marks per Step
	$4(2x+4) = (x+1)(4x-2) \;\Rightarrow\; 8x+16 = 4x^2+2x-2$ $4x^2-6x-18=0 \;\Rightarrow\; 2x^2-3x-9=0$ $x = \dfrac{3 \pm \sqrt{9+72}}{4} = \dfrac{3 \pm 9}{4}$ x = 3 or x = −1.5 (rejected, length can't be negative) **Answer: x = 3**	
11(B)	**Q11(B)** In ΔRPQ and ΔRTS: ∠RPQ = ∠RTS (given) ∠PRQ = ∠TRS (same angle at R, common to both triangles, since S lies on PR and T lies on QR) By AA similarity criterion, ΔRPQ ~ ΔRTS **Answer: ΔRPQ ~ ΔRTS (proved by AA similarity)**	*1 mark for identifying the two equal angles* *1 mark for the AA conclusion.*
12	**Q12** Vertices: (0,4), (0,0), (3,0) $\sqrt{4^2}=4, \quad \sqrt{3^2}=3, \quad \sqrt{3^2+4^2}=5$ Sides are 4, 3, and 5 **Answer: Perimeter = 4+3+5 = 12 units**	*1 mark for finding all three side lengths* *1 mark for the perimeter.*
13(A)	**Q13(A)** ∠PRQ = ∠STQ (given) and ∠Q is common to ΔQTS and ΔQRP By AA similarity, ΔQTS ~ ΔQRP, so ST/PR = QT/QR ST divides QR in ratio 2:3, so $\dfrac{QT}{QR} = \dfrac{2}{5}$ $\dfrac{ST}{PR} = \dfrac{QT}{QR} \;\Rightarrow\; ST = 20 \times \dfrac{2}{5} = 8 \text{ cm}$ **Answer: ST = 8 cm**.	*1 mark for identifying ΔQTS ~ ΔQRP* *1 mark for the length of ST.*
13(B)	**Q13(B)** Let R be the point of intersection of line CP and line AQ Since PQ‖AB and AQ‖CB, the alternate/corresponding angles formed give ∠RAP = ∠RCA and ∠ARP = ∠CRA (common angle at R) By AA similarity, ΔRAP ~ ΔRCA So RA/RC = RP/RA (corresponding sides of similar triangles) Cross-multiplying: RA^2 = RP × RC, i.e. AR^2 = PR × CR **Answer: AR^2 = PR × CR (proved using ΔRAP ~ ΔRCA)**	*1 mark for identifying the similar triangles from the parallel conditions* *1 mark for the proportion* *1 mark for the final result.*
SECTION – C (Q14–15, 3 marks each)		
14(A)	**Q14(A)** The x-axis has y=0. Using the section formula with ratio m:n from (-4,-6) to (-1,7): $\dfrac{7m-6n}{m+n} = 0 \;\Rightarrow\; m:n = 6:7$ Substituting m:n=6:7 into the x-coordinate: $x = \dfrac{6(-1)+7(-4)}{6+7} = \dfrac{-34}{13}$	*1 mark for finding the ratio* *1 mark for the y-coordinate check* *1 mark for the point of division.*

<table>
<tr><th>Q.No</th><th>Step-by-Step Solution</th><th>Marks per Step</th></tr>
<tr><td></td><td>Answer: Ratio = 6:7; point of division = (−34/13, 0)</td><td></td></tr>
<tr><td>14(B)</td><td>Q14(B)
Midpoint of A(3,4) and B(k,7):
$P = \left(\frac{3+k}{2}, \frac{11}{2}\right)$
This point lies on 2x+2y+1=0:
$2\left(\frac{3+k}{2}\right) + 2\left(\frac{11}{2}\right) + 1 = 0 \;\Rightarrow\; (3+k) + 11 + 1 = 0$
k+15=0 ⇒ k=−15
Answer: k = −15</td><td>1 mark for the midpoint
1 mark for substituting into the line equation
1 mark for the value of k.</td></tr>
<tr><td>15</td><td>Q15
In ΔAOB and ΔCOD: ∠AOB = ∠COD (vertically opposite angles)
Given AO/BO = CO/DO, rearranged: AO/CO = BO/DO (two pairs of sides proportional)
By SAS similarity, ΔAOB ~ ΔCOD
So ∠OAB = ∠OCD (corresponding angles of similar triangles)
These are alternate angles formed by transversal AC with lines AB and CD, so AB∥CD
Since one pair of opposite sides (AB, CD) is parallel, ABCD is a trapezium
Answer: ABCD is a trapezium (proved: AB∥CD)</td><td>1 mark for identifying ΔAOB ~ ΔCOD (SAS)
1 mark for the alternate-angles argument
1 mark for the conclusion.</td></tr>
<tr><td colspan="3">SECTION – D (Q16–17, 4 marks each)</td></tr>
<tr><td>16</td><td>Q16
<u>(i) & (ii)</u>
At the same time of day, all objects and their shadows form similar triangles, so height/shadow is the same ratio for every object
Using Vijay's house: $\frac{\text{Height}}{\text{Shadow}} = \frac{20}{10} = 2$
$\text{Height of tower} = 2 \times 50 = 100 \text{ m}$
$\text{Height of Ajay's house} = 2 \times 20 = 40 \text{ m}$
Answer: Height of tower = 100 m; height of Ajay's house = 40 m

<u>(iii)(a)</u>
Since heights are fixed, the ratio of any two objects' shadows equals the ratio of their heights:
$\frac{\text{Tower height}}{\text{Vijay's house height}} = \frac{100}{20} = 5$
$\text{Shadow of tower} = 5 \times 12 = 60 \text{ m}$
Answer: 60 m

<u>(iii)(b) — OR</u>
$\frac{\text{Ajay's house height}}{\text{Tower height}} = \frac{40}{100} = \frac{2}{5}$
$\text{Shadow of Ajay's house} = \frac{2}{5} \times 40 = 16 \text{ m}$
Answer: 16 m</td><td>1 mark for the height of the tower
1 mark for the height of Ajay's house
2 marks for (iii)(A) or (iii)(B).</td></tr>
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Q.No	Step-by-Step Solution	Marks per Step
17	**Q17** **(i)** A(9,5), B(−3,−1): $AB = \sqrt{(9-(-3))^2 + (5-(-1))^2} = \sqrt{144+36} = \sqrt{180} = 6\sqrt{5}$ **Answer: Distance = 6√5 units** **(ii)** E is the midpoint of A(9,5) and C(5,−5): $E = \left(\frac{9+5}{2}, \frac{5+(-5)}{2}\right) = (7,\ 0)$ **Answer: E = (7, 0)** **(iii)(a)** D is the midpoint of B(−3,−1) and C(5,−5): $D = \left(\frac{-3+5}{2}, \frac{-1+(-5)}{2}\right) = (1,\ -3)$ Distance from A(9,5) to D(1,−3): $AD = \sqrt{(9-1)^2 + (5-(-3))^2} = \sqrt{64+64} = \sqrt{128} = 8\sqrt{2}$ **Answer: Distance = 8√2 units** **(iii)(b) — OR** P and Q trisect BA (BP=PQ=QA), so P is 1/3 of the way from B to A, and Q is 2/3 of the way $P = B + \frac{1}{3}(A-B) = (1,\ 1)$ $Q = B + \frac{2}{3}(A-B) = (5,\ 3)$ Given P=(1,a) matches P=(1,1), and Q=(b,3) matches Q=(5,3) **Answer: a = 1, b = 5**	*1 mark for the bank–hospital distance* *1 mark for E* *2 marks for (iii)(A) or (iii)(B).*
SECTION – E (Q18–19, 5 marks each)		
18(A)	**Q18(A)** D, E, F are midpoints of AB, BC, AC, so: A+B=2D, B+C=2E, A+C=2F Adding all three: 2(A+B+C) = 2(D+E+F), so A+B+C = D+E+F $A + B + C = D + E + F = (8,\ 11)$ $A = (8,11) - 2E = (8,11) - (8,6) = (0,\ 5)$ $B = (8,11) - 2F = (8,11) - (4,14) = (4,\ -3)$ $C = (8,11) - 2D = (8,11) - (4,2) = (4,\ 9)$ **Answer: A = (0,5), B = (4,−3), C = (4,9)**	*1 mark for A+B+C=D+E+F* *1 mark each for A, B, C (3 marks).*
18(B) — OR	**Q18(B)** Let the third vertex be (x,y). Side length of the equilateral triangle: $\text{side} = \sqrt{3^2 + (\sqrt{3})^2} = \sqrt{12} = 2\sqrt{3}$ Both distances from (x,y) must equal this side length:	*1 mark for the two distance equations* *2 marks for solving them* *2 marks for both valid third vertices.*

Q.No	Step-by-Step Solution	Marks per Step
	$x^2 + y^2 = 12, \qquad (x-3)^2 + (y-\sqrt{3})^2 = 12$ Subtracting and simplifying: $3x + \sqrt{3}\,y = 6 \;\Rightarrow\; y = \sqrt{3}(2-x)$ Substituting back into $x^2+y^2=12$: $x^2 + 3(2-x)^2 = 12 \;\Rightarrow\; 4x^2 - 12x = 0 \;\Rightarrow\; x = 0 \text{ or } x = 3$ $x=0$ gives $y=2\sqrt{3}$; $x=3$ gives $y=-\sqrt{3}$ **Answer:** $(0,\, 2\sqrt{3}) \;\text{ or }\; (3,\, -\sqrt{3})$	
19	**Q19** PART 1 — Basic Proportionality Theorem: Given: ΔABC with DE∥BC, D on AB, E on AC. To prove: AD/DB = AE/EC Construction: Join BE and CD; draw EM⊥AB and DN⊥AC Area(ADE)/Area(BDE) = (½·AD·EM)/(½·DB·EM) = AD/DB, and similarly: $\frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle BDE)} = \frac{AD}{DB}$ $\frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle DEC)} = \frac{AE}{EC}$ ΔBDE and ΔDEC have the same base DE and lie between the same parallels DE and BC, so Area(BDE)=Area(DEC) Therefore: $\frac{AD}{DB} = \frac{AE}{EC}$ PART 2 — Application to the trapezium: Let ABCD be a trapezium with AB∥DC, diagonals AC and BD meeting at O, and a line through O parallel to AB meeting AD at E and BC at F Since AB∥DC, ΔAOB ~ ΔCOD (AA: vertical angles at O, alternate angles from AB∥DC) So: $\frac{AO}{OC} = \frac{BO}{OD}$ Applying the BPT proved in Part 1 to ΔABD (line EO∥AB, cutting AD at E and BD at O): $\frac{AE}{ED} = \frac{BO}{OD}$ Applying BPT to ΔABC (line FO∥AB, cutting BC at F and AC at O): $\frac{BF}{FC} = \frac{AO}{OC}$ Combining these three relations: $\frac{AE}{ED} = \frac{BF}{FC}$ **Answer: AE/ED = BF/FC (hence proved — the non-parallel sides are divided in the same ratio)**	*3 marks for the BPT proof* *2 marks for the trapezium application.*