CLASS IX – MATHEMATICS

Chapter Test: Orienting Yourself – The Use of Coordinates

Step-by-Step Solutions and Marking Scheme | M. M.: 40

Formulas used

Distance formula: $d = \sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$ **Mid-point:** $((x_1 + x_2)/2, (y_1 + y_2)/2)$

Section A (1 mark each)

Q	Ans	Reason
1	(B)	A point (x, 0) with x < 0 lies on the **negative x-axis**.
2	(B)	x = −2 < 0 and y = $k^2 + 1 \geq 1 > 0$ for every real k, so (−, +) → **Quadrant II**.
3	(A)	Distance from the y-axis = |x-coordinate| = |−6| = **6** units.
4	(B)	Same x-coordinate, so distance = |9 − (−2)| = **11** units.
5	(C)	$d = \sqrt{(5^2 + (-12)^2)} = \sqrt{(25 + 144)} = \sqrt{169} =$ **13** units.
6	(A)	From the figure T = (−5, 3). Reflection in the x-axis changes the sign of y only: **(−5, −3)**.
7	(A)	((−2 + 8)/2, (7 − 3)/2) = **(3, 2)**.
8	(B)	On the y-axis, x = 0: 2k − 8 = 0 ⇒ **k = 4**.
9	(B)	Squared distances from O: (3,4) → 25; (−5,1) → 26; (0,−5) → 25; (−4,−3) → 25. Largest is 26, so **(−5, 1)**.
10	(C)	A point is inside if $x^2 + y^2 < 100$. (6,8): 100 (on); (−8,−7): 113; (7,7): **98** (inside); (10,1): 101.
11	(D)	(2, 3) and (3, 2) are different points since 2 ≠ 3, so A is false. R is true (ordered pairs are equal only when x = y here). → **(D)**.
12	(A)	AB = √5, BC = √5, AC = √20 = 2√5, so AB + BC = AC: collinear, A is true; R is the test used. → **(A)**.

Section B (2 marks each)

Q.13 (2 marks)

Let the required point be P(x, 0) on the x-axis. Let A(2, 3) and B(4, −5). Since PA = PB, $PA^2 = PB^2$. **[½]**

$(x - 2)^2 + (0 - 3)^2 = (x - 4)^2 + (0 + 5)^2$ **[½]**

$x^2 - 4x + 4 + 9 = x^2 - 8x + 16 + 25 \Rightarrow -4x + 13 = -8x + 41$ **[½]**

$4x = 28 \Rightarrow x = 7$. *Check:* $PA^2 = 25 + 9 = 34 = PB^2 = 9 + 25$. **[½]**

Ans. The point is (7, 0).

Q.14 (2 marks)

(A)

P(−5, 7). Reflection in the x-axis changes the sign of y: **P′(−5, −7)**. Reflection in the y-axis changes the sign of x: **P″(5, 7)**. **[1]**

$P'P'' = \sqrt{[(5 + 5)^2 + (7 + 7)^2]} = \sqrt{(100 + 196)} = \sqrt{296} = 2\sqrt{74}$ units. **[1]**

Ans. P′(−5, −7), P″(5, 7), P′P″ = 2√74 units.

OR (B)

(−3, 5): x < 0, y > 0 → **Quadrant II** (4, −1): x > 0, y < 0 → **Quadrant IV** **[1]**

(0, −6): x = 0, y < 0 → **negative y-axis** (−2, −7): both negative → **Quadrant III** **[1]**

Q.15 (2 marks)

Let Q = (x, y). M is the mid-point of PQ, so (−4 + x)/2 = 2 and (5 + y)/2 = −3. **[1]**

−4 + x = 4 ⇒ x = 8 ; 5 + y = −6 ⇒ y = −11. **[½]**

Ans. Q = (8, −11). [½]

Q.16 (2 marks)

(A)

Distance of (9, −12) from the origin = √(81 + 144) = √225 = 15 units. **[1]**

Radius = 14 and 15 > 14, so the point lies **outside** the circle. **[1]**

OR (B)

√[(k − 2)² + (3 + 1)²] = 5 ⇒ (k − 2)² + 16 = 25 ⇒ (k − 2)² = 9. **[1]**

k − 2 = 3 or k − 2 = −3 ⇒ **k = 5 or k = −1**. **[1]**

Section C (3 marks each)

Q.17 (3 marks)

(A) A(2, 1), B(5, 4), C(−1, 4)

AB = √[(5−2)² + (4−1)²] = √(9 + 9) = √18 = 3√2 **[1]**

AC = √[(−1−2)² + (4−1)²] = √(9 + 9) = √18 = 3√2 ; BC = √[(−1−5)² + (4−4)²] = √36 = 6 **[1]**

AB = AC ⇒ isosceles. Also AB² + AC² = 18 + 18 = 36 = BC², so by the converse of the Baudhāyana–Pythagoras theorem the angle at A is 90°. **[1]**

Ans. ΔABC is an isosceles right-angled triangle (right angle at A).

OR (B) A(−3, 8), B(9, −1); AP : PB = 1 : 2 and AQ : QB = 2 : 1

Step 1: AB is divided in three equal parts. The shift from A to B is (9 − (−3), −1 − 8) = (12, −9). One-third of it is (4, −3). **[1]**

P = A + (4, −3) = (−3 + 4, 8 − 3) = **(1, 5)** **[1]**

Q = P + (4, −3) = **(5, 2)**. *Check:* Q + (4, −3) = (9, −1) = B (verified). **[1]**

Q.18 (3 marks)

(A) A(−3, −1), B(0, 1), C(6, 5)

AB = √(3² + 2²) = √13 **[1]**

BC = √(6² + 4²) = √52 = 2√13 ; AC = √(9² + 6²) = √117 = 3√13 **[1]**

AB + BC = √13 + 2√13 = 3√13 = AC, so A, B, C are collinear. AB : BC = √13 : 2√13 = **1 : 2**. **[1]**

OR (B)

Let the point be P(0, y). Since PA = PB for A(5, −2), B(−3, 2): PA² = PB². **[1]**

(0 − 5)² + (y + 2)² = (0 + 3)² + (y − 2)² ⇒ 25 + y² + 4y + 4 = 9 + y² − 4y + 4 **[1]**

8y = −16 ⇒ y = −2. *Check:* PA = √(25 + 0) = 5, PB = √(9 + 16) = 5 (verified). **[½]**

Ans. The point is (0, −2). [½]

Section D (5 marks each)

Q.19 (5 marks)

(A) A(2, −1), B(5, 3), C(1, 6), D(−2, 2)

AB = √[(5−2)² + (3+1)²] = √(9 + 16) = 5 **[½]**

BC = √[(1−5)² + (6−3)²] = √(16 + 9) = 5 **[½]**

CD = √[(−2−1)² + (2−6)²] = √(9 + 16) = 5 **[½]**

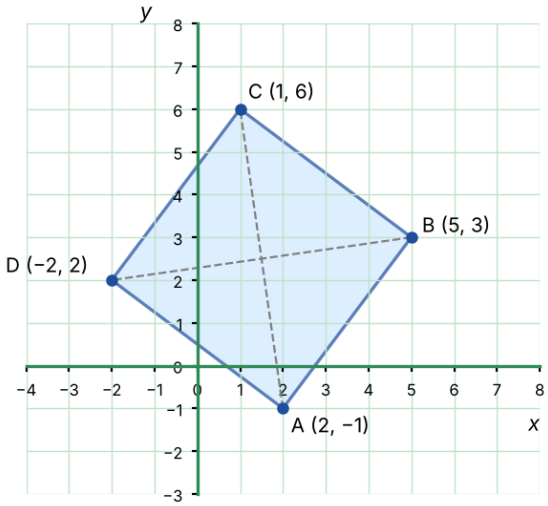
DA = √[(2+2)² + (−1−2)²] = √(16 + 9) = 5 **[½]**

All four sides are equal, so ABCD is a rhombus. [1]

AC = √[(1−2)² + (6+1)²] = √(1 + 49) = √50 ; BD = √[(−2−5)² + (2−3)²] = √(49 + 1) = √50 **[1]**

The diagonals AC = BD are equal; a rhombus with equal diagonals is a **square**. [1]

Area = (side)² = 5² = **25 square units**. [1] *(Check: ½ × d² = ½ × 50 = 25 (verified))*



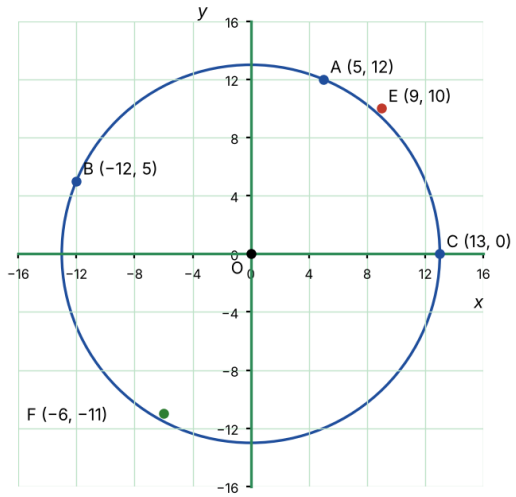
OR (B) O(0, 0); A(5, 12), B(−12, 5), C(13, 0)

OA = √(25 + 144) = √169 = 13 ; OB = √(144 + 25) = 13 ; OC = √(169 + 0) = 13 **[2]**

A, B, C are all at the same distance 13 from O, so they lie on a circle with centre O and **radius 13 units**. [1]

(ii) OE = √(81 + 100) = √181 > 13 ⇒ E(9, 10) lies **outside** the circle. **[1]**

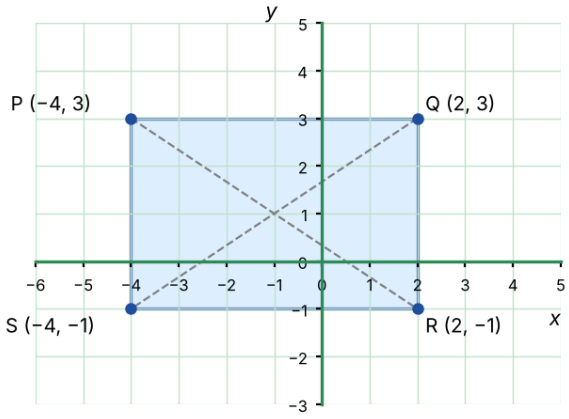
OF = √(36 + 121) = √157 < 13 ⇒ F(−6, −11) lies **inside** the circle. **[1]**



Q.20 (5 marks)

(A) P(−4, 3), Q(2, 3), R(2, −1), S(−4, −1)

Plotting: correct scale with axes labelled [1]; all four points plotted accurately [1]. Joining P→Q→R→S→P gives the figure below. **[2]**



PQ and SR are horizontal, QR and PS are vertical, so every angle is 90° and opposite sides are equal: PQRS is a **rectangle**. [½]

PQ = |2 − (−4)| = 6 units ; QR = |3 − (−1)| = 4 units. **[½]**

Perimeter = 2(6 + 4) = **20 units** [½] Area = 6 × 4 = **24 square units** [½]

PR = √[(2 + 4)² + (−1 − 3)²] = √(36 + 16) = √52 = **2√13 units** [1] *(Check: SQ = √(36 + 16) = √52 too.)*

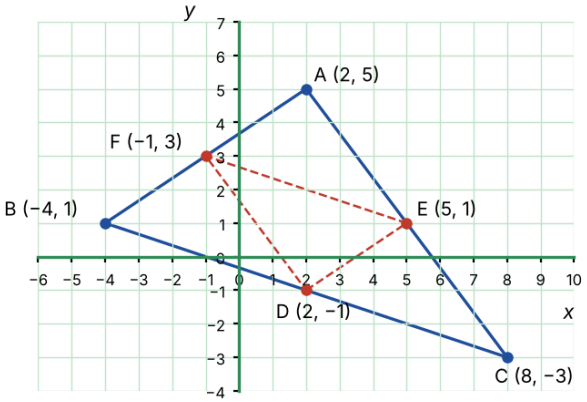
OR (B) D(2, −1), E(5, 1), F(−1, 3) are the mid-points of BC, CA, AB. Let A(x_1, y_1), B(x_2, y_2), C(x_3, y_3).

Mid-point formula gives: $x_2 + x_3 = 4$, $x_3 + x_1 = 10$, $x_1 + x_2 = -2$ and $y_2 + y_3 = -2$, $y_3 + y_1 = 2$, $y_1 + y_2 = 6$. **[1]**

Adding the x-equations: $2(x_1 + x_2 + x_3) = 12 \Rightarrow x_1 + x_2 + x_3 = 6$. Then $x_1 = 6 - 4 = 2$, $x_2 = 6 - 10 = -4$, $x_3 = 6 - (-2) = 8$. **[1½]**

Adding the y-equations: $2(y_1 + y_2 + y_3) = 6 \Rightarrow$ sum = 3. Then $y_1 = 3 - (-2) = 5$, $y_2 = 3 - 2 = 1$, $y_3 = 3 - 6 = -3$. **[1½]**

Ans. A(2, 5), B(−4, 1), C(8, −3). [1] ***Check: mid-point of BC = (2, −1) = D (verified), of CA = (5, 1) = E (verified), of AB = (−1, 3) = F (verified).***



Section E (4 marks)

Q.21 (4 marks)

O(0, 0), L(6, 8), C(−8, 6); 1 unit = 10 m

(i) OL = √(6² + 8²) = √100 = 10 units = 10 × 10 m = **100 metres**. **[1]**

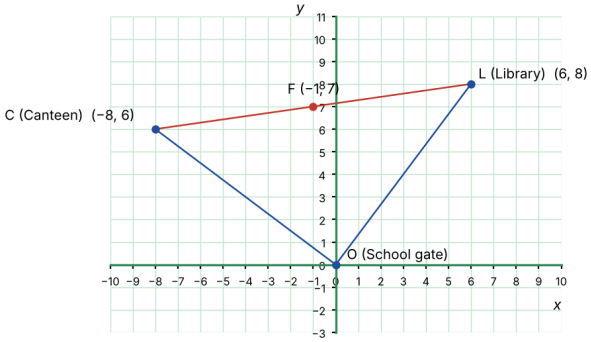
(ii) OL = 10 units (from part i) and OC = √[(−8)² + 6²] = √100 = 10 units. Since OL = OC, the Library and the Canteen are equidistant from the gate (both 100 m). **[1]**

(iii) (A) LC = √[(−8 − 6)² + (6 − 8)²] = √(196 + 4) = √200 = 10√2 units [1]

Distance = 10 × 1.41 = 14.1 units = 14.1 × 10 m = **141 metres**. [1]

OR (iii) (B) F = ((6 − 8)/2, (8 + 6)/2) = **(−1, 7)** [1]

OF = √[(−1)² + 7²] = √50 = **5√2 units** (≈ 7.07 units ≈ 70.7 m). [1]



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