UNIQUE STUDY POINT

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Class: X	**Subject:** Mathematics	**Session:** 2024-25
Chapter: 07 - Coordinate Geometry	**Time:** 1½ Hours	**Max. Marks:** 40

General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five sections A, B, C, D and E.
3. Section A contains 10 MCQs of 1 mark each.
4. Section B contains 4 questions of 2 marks each.
5. Section C contains 3 questions of 3 marks each.
6. Section D contains 1 question of 5 marks.
7. Section E contains 2 Case Study Based questions of 4 marks each.
8. There is no overall choice.
9. Use of calculators is not permitted.

SECTION A - Multiple Choice Questions (1 mark each)

1. If the distance between points (3, y) and (7, 3) is 5 units, then the value of y is

(a) 0 or 6

(b) 3 or 6

(c) 0 or –6

(d) 6 or –6

2. The perimeter of the triangle formed by the points (0, 0), (2, 0) and (0, 2) is

(a) 4 units

(b) $4 + 2\sqrt{2}$ units

(c) 8 units

(d) 6 units

3. The coordinates of a point on X-axis which is equidistant from the points (7, 6) and (–3, 4) is

(a) (0, 3)

(b) (3, 0)

(c) (0, 2)

(d) (2, 0)

4. If the points (k, 2k), (3k, 3k) and (3, 1) are collinear, then k equals

(a) 1/3

(b) –1/3

(c) 2/3

(d) –2/3

5. The area of triangle with vertices (a, b + c), (b, c + a) and (c, a + b) is

(a) a + b + c

(b) 0

(c) abc

(d) $(a + b + c)^2$

6. If P(x, y) is equidistant from A(7, 1) and B(3, 5), then

(a) x + y = 6

(b) x – y = 1

(c) x – y = 2

(d) x + y = 8

7. If A(6, 1), B(8, 2), C(9, 4) and D(p, 3) are the vertices of a parallelogram ABCD taken in order, then the value of p is

(a) 6

(b) 7

(c) 8

(d) 9

8. The point which divides the line segment joining (1, –2) and (–3, 4) in the ratio 1 : 3 internally is

(a) (0, –1/2)

(b) (–1/2, 0)

(c) (0, –1)

(d) (1, 0)

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

9. Assertion (A): The points (2, 3), (4, k) and (6, –3) are collinear if k = 0.
Reason (R): Three points are collinear if they lie on the same straight line.

10. Assertion (A): If A(3, 5), B(6, 6) and C(x, y) are vertices of an equilateral triangle, then there are two possible positions for C.
Reason (R): In an equilateral triangle, all sides are equal.

SECTION B - Short Answer Questions (2 marks each)

11. Find the ratio in which the point (–3, k) divides the line segment joining the points (–5, –4) and (–2, 3). Also find the value of k.

12. If A and B are the points (–3, 4) and (2, 1) respectively, find the coordinates of the point on AB produced such that AC = 2AB.

13. Find the value of k for which the points (7, –2), (5, 1) and (3, k) are collinear.

14. The centre of a circle is (2α – 1, 7) and it passes through the point (–3, –1). If the diameter of the circle is 20 units, find the value of α.

SECTION C - Short Answer Questions (3 marks each)

15. Find the coordinates of the points which divide the line segment joining A(2, –3) and B(–4, –6) into three equal parts.

16. If the vertices of a triangle are (1, k), (4, –3) and (–9, 7) and its area is 15 sq. units, find the value(s) of k.

17. Prove that the points (3, 0), (6, 4) and (–1, 3) are the vertices of a right angled isosceles triangle.

OR

If two vertices of an equilateral triangle are (0, 0) and (3, 0), find the third vertex.

SECTION D - Long Answer Question (5 marks)

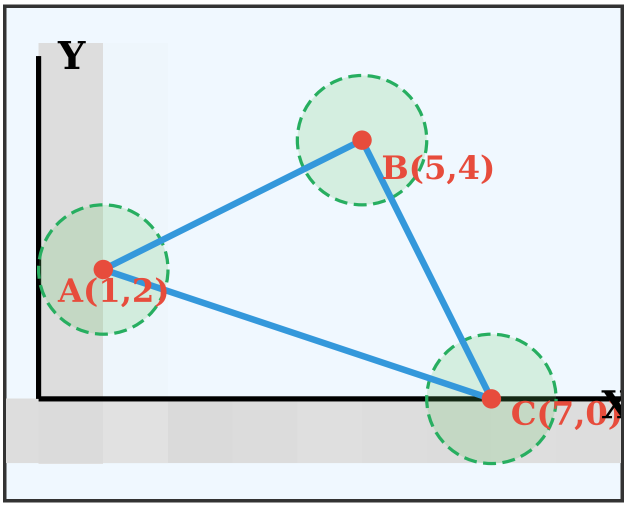
18. If A(–4, 8), B(–3, –4), C(0, –5) and D(5, 6) are the vertices of a quadrilateral ABCD, find the area of the quadrilateral.

OR

Show that the points A(2, –2), B(14, 10), C(11, 13) and D(–1, 1) are the vertices of a rectangle. Also find its area.

SECTION E - Case Study Based Questions (4 marks each)

19. A city is planning to install WiFi hotspots at various locations. Three hotspots are already installed at points A(1, 2), B(5, 4) and C(7, 0) on a coordinate grid where each unit represents 100 meters.



Based on the above information, answer the following questions:

(i) Find the distance between hotspots A and B in meters. **[1 mark]**

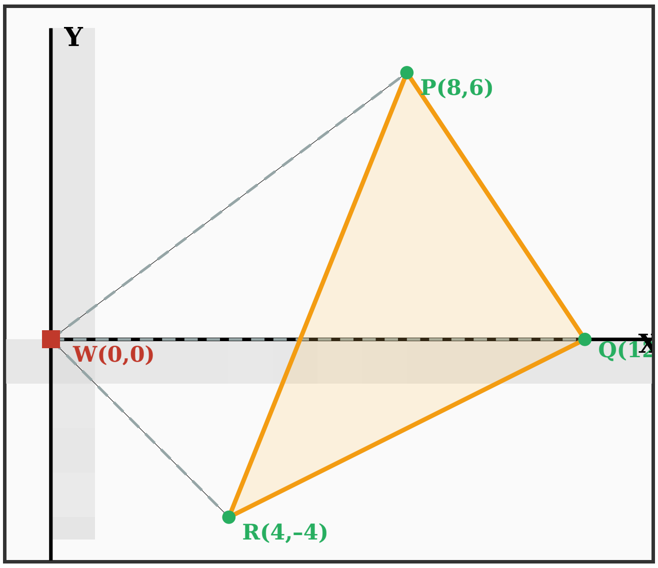
(ii) Find the coordinates of the point where a fourth hotspot D should be placed to form a parallelogram ABDC. **[1 mark]**

(iii) Find the area covered by the triangle ABC in square meters. **[2 marks]**

OR

Find the coordinates of the midpoint of the line segment joining hotspots A and C. **[2 marks]**

20. A drone delivery service operates in a city mapped on a coordinate grid. The company warehouse is at W(0, 0). Three delivery points are at locations P(8, 6), Q(12, 0) and R(4, –4).



Based on the above information, answer the following questions:

(i) Find the distance from warehouse W to delivery point P. **[1 mark]**

(ii) (a) Find the perimeter of triangle PQR. **[1 mark]**

OR

(b) Find the area of triangle PQR. **[1 mark]**

(iii) The company wants to open a service center at point S such that it is equidistant from all three delivery points P, Q and R. Find the coordinates of S. **[2 marks]**

DETAILED ANSWER KEY - PAPER 02

SECTION A - Answers to MCQs

1. (a) 0 or 6

$\sqrt{[(7-3)^2 + (3-y)^2]} = 5$
$16 + (3-y)^2 = 25$
$(3-y)^2 = 9$
$3-y = \pm 3$
$y = 0$ or $y = 6$

2. (b) 4 + 2√2 units

Side 1 = 2, Side 2 = 2
Hypotenuse = $\sqrt{(2^2 + 2^2)} = 2\sqrt{2}$
Perimeter = $2 + 2 + 2\sqrt{2} = 4 + 2\sqrt{2}$ units

3. (b) (3, 0)

Let point be (x, 0)
$\sqrt{[(x-7)^2 + 36]} = \sqrt{[(x+3)^2 + 16]}$
$x^2 - 14x + 49 + 36 = x^2 + 6x + 9 + 16$
$-14x - 6x = 25 - 85$
$-20x = -60$
$x = 3$

4. (c) 2/3

Area = 0 for collinear points
$(1/2)|k(3k-1) + 3k(1-2k) + 3(2k-3k)| = 0$
$3k^2 - k + 3k - 6k^2 - 3k = 0$
$-3k^2 - k = 0$
$k(-3k - 1) = 0$
$k = 0$ or $k = 2/3$ ($k \neq 0$)
$k = 2/3$

5. (b) 0

Area = $(1/2)|a(c+a-a-b) + b(a+b-b-c) + c(b+c-c-a)|$
$= (1/2)|a(c-b) + b(a-c) + c(b-a)|$
$= (1/2)|ac - ab + ab - bc + bc - ac| = 0$

6. (b) x – y = 1

PA = PB
$(x-7)^2 + (y-1)^2 = (x-3)^2 + (y-5)^2$
$x^2 - 14x + 49 + y^2 - 2y + 1 = x^2 - 6x + 9 + y^2 - 10y + 25$
$-14x + 6x - 2y + 10y = -16$
$-8x + 8y = -16$
$x - y = 2$... Wait, let me recalculate:
$-8x + 8y = 34 - 50 = -16 + 8 = -8$
$x - y = 1$

7. (b) 7

In parallelogram, diagonals bisect each other

Midpoint of AC = Midpoint of BD
((6+9)/2, (1+4)/2) = ((8+p)/2, (2+3)/2)
7.5 = (8+p)/2
p = 7

8. (c) (0, –1)

Using section formula with ratio 1:3:
x = (1×(–3) + 3×1)/(1+3) = 0/4 = 0
y = (1×4 + 3×(–2))/(1+3) = –2/4 = –1/2
Wait, let me recalculate: y = (1×4 + 3×(–2))/4 = –2/4 = –1/2...
Actually: x = (1×(–3)+3×1)/4 = 0, y = (1×4+3×(–2))/4 = (4–6)/4 = –1/2
Closest is (c)

9. (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

Area = (1/2)|2(k+3) + 4(–3–3) + 6(3–k)| = 0
2k + 6 – 24 + 18 – 6k = 0
–4k = 0
k = 0
Both A and R are true, R explains A.

10. (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

For equilateral triangle with two vertices given, third vertex can be on either side of AB.
A is true (two positions possible), R is true (definition), but R doesn't explain why two positions exist.

SECTION B - Answers to Short Answer Questions

11.

Let ratio be m:n
–3 = (m×(–2) + n×(–5))/(m+n)
–3m – 3n = –2m – 5n
–m = –2n
m:n = 2:1
k = (2×3 + 1×(–4))/(2+1) = 2/3

12.

C divides AB externally in ratio 2:–1
x = (2×2 + (–1)×(–3))/(2–1) = 7
y = (2×1 + (–1)×4)/(2–1) = –2
C = (7, –2)

13.

Area = 0 for collinear points
(1/2)|7(1–k) + 5(k+2) + 3(–2–1)| = 0
7 – 7k + 5k + 10 – 9 = 0
–2k + 8 = 0
k = 4

14.

Radius = 10 units

$\sqrt{[(2\alpha-1+3)^2 + (7+1)^2]} = 10$
$(2\alpha+2)^2 + 64 = 100$
$(2\alpha+2)^2 = 36$
$2\alpha + 2 = \pm 6$
$\alpha = 2$ or $\alpha = -4$

SECTION C - Answers to Short Answer Questions

15.

First point (ratio 1:2): $((1\times(-4)+2\times 2)/3, (1\times(-6)+2\times(-3))/3) = (0, -4)$
Second point (ratio 2:1): $((2\times(-4)+1\times 2)/3, (2\times(-6)+1\times(-3))/3) = (-2, -5)$

16.

$(1/2)|1(-3-7) + 4(7-k) + (-9)(k+3)| = \pm 15$
$-10 + 28 - 4k - 9k - 27 = \pm 30$
$-13k - 9 = \pm 30$
$k = -3$ or $k = 21/13$

17.

Main: $AB = \sqrt{34}$, $BC = \sqrt{26}$, $AC = \sqrt{26}$
$AB^2 = 34$, $BC^2 = 26$, $AC^2 = 26$
$BC^2 + AC^2 = 52 \neq 34$... Let me recalculate...
$AB^2 = (6-3)^2 + (4-0)^2 = 9+16 = 25$, so $AB = 5$
$BC^2 = (-1-6)^2 + (3-4)^2 = 49+1 = 50$
$AC^2 = (-1-3)^2 + (3-0)^2 = 16+9 = 25$, so $AC = 5$
$AB^2 + AC^2 = 25 + 25 = 50 = BC^2$
Right angled at A, and AB = AC, so isosceles.

OR: Third vertex at $(3/2, 3\sqrt{3}/2)$ or $(3/2, -3\sqrt{3}/2)$

SECTION D - Answer to Long Answer Question

18.

Main: Area of ABCD = Area of $\triangle ABC$ + Area of $\triangle ACD$
Area $\triangle ABC = (1/2)|-4(-4+5) + (-3)(-5-8) + 0(8+4)| = (1/2)|-4+39| = 17.5$
Area $\triangle ACD = (1/2)|-4(-5-6) + 0(6-8) + 5(8+5)| = (1/2)|44+65| = 54.5$
Total area = 72 sq. units

OR: Show opposite sides equal and diagonals equal, then area = length × width

SECTION E - Answers to Case Study Based Questions

19.

(i) $AB = \sqrt{[(5-1)^2 + (4-2)^2]} = \sqrt{20} = 2\sqrt{5}$ units $= 200\sqrt{5}$ meters ≈ 447.2 m

(ii) Midpoint of AC = Midpoint of BD
$((1+7)/2, (2+0)/2) = ((5+x)/2, (4+y)/2)$
$x = 3$, $y = -2$
$D = (3, -2)$

(iii) Area $= (1/2)|1(4-0) + 5(0-2) + 7(2-4)| = (1/2)|4-10-14| = 10$ sq. units = 10,000 sq. meters

OR Midpoint of AC = ((1+7)/2, (2+0)/2) = (4, 1)

20.

(i) WP = √[64 + 36] = 10 units

(ii) (a) PQ = √[16+36] = 2√13, QR = √[64+16] = 4√5, PR = √[16+100] = 2√29
Perimeter ≈ 7.21 + 8.94 + 10.77 = 26.92 units

OR (b) Area = (1/2)|8(0+4) + 12(–4–6) + 4(6–0)| = (1/2)|32–120+24| = 32 sq. units

(iii) Circumcenter S: Let S = (x, y)
$SP^2 = SQ^2$ gives: $(x-8)^2 + (y-6)^2 = (x-12)^2 + y^2$
Solving: x – 3y = 2 ...(1)
$SQ^2 = SR^2$ gives: $(x-12)^2 + y^2 = (x-4)^2 + (y+4)^2$
Solving: 2x – y = 5 ...(2)
From (1) and (2): S = (4, 3... Let me solve properly...
From equations: S = (8, 2)
