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PRACTICE PAPER 07 (2023-24)

CHAPTER 07 COORDINATE GEOMETRY

(ANSWERS)

SUBJECT: MATHEMATICS **MAX. MARKS : 40**

CLASS : X **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.

(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.

(iv). There is no overall choice.

(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. If the distance between the points (4, p) and (1, 0) is 5 units, then the value of p is

(a) 4 only (b) ± 4 (c) –4 only (d) 0

Ans: (b) ± 4

$\sqrt{(4-1)^2+(p-0)^2} = 5$

$\Rightarrow 3^2 + p^2 = 5^2 \Rightarrow p^2 = 25 - 9 = 16 \Rightarrow p = \pm 4$

2. The points (2, 5), (4, – 1) and (6, – 7) are vertices of an/a

(a) isosceles triangle (b) equilateral triangle (c) right-angled triangle (d) none of these

Ans:(d) Let A(2, 5), B(4, –1) and C(6, –7)

$AB = \sqrt{(4-2)^2+(-1-5)^2} = \sqrt{40}$

$BC = \sqrt{(6-4)^2+(-7+1)^2} = \sqrt{40}$

$AC = \sqrt{(6-2)^2+(-7-5)^2} = \sqrt{160} = 2\sqrt{40}$

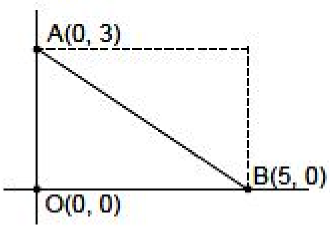
∴ AB + BC = AC.

∴ A, B and C are collinear.

3. AOBC is a rectangle whose three vertices are A(0, 3), O(0, 0) and B(5, 0). The length of its diagonal is

(a) 5 (b) 3 (c) $\sqrt{34}$ (d) 4

Ans: (c) $\sqrt{34}$

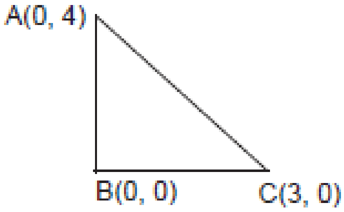


$AB = \sqrt{(5-0)^2+(0-3)^2} = \sqrt{25+9} = \sqrt{34}$

4. The perimeter of a triangle with vertices (0, 4), (0, 0) and (3, 0) is

(a) 5 (b) 12 (c) 11 (d) $7 + \sqrt{5}$

Ans: (b) 12



Perimeter of ΔABC = AB + BC + AC

$= 4 + 3 + \sqrt{4^2+3^2} = 7 + \sqrt{25} = 7 + 5 = 12$

5. The ratio in which x-axis divides the join of (2, -3) and (5, 6) is:

(a) 1: 2 (b) 3 : 4 (c) 1: 3 (d) 1: 5

Ans: (a) 1 : 2

Let P(x, 0) be the point on x-axis which divides the join of (2, -3) and (5, 6) in the ratio k : 1.

∴ By section formula,

$$P(x, 0) = \left(\frac{5k+2}{k+1}, \frac{6k-3}{k+1}\right)$$

$$\Rightarrow y = 0 \Rightarrow \frac{6k-3}{k+1} = 0 \Rightarrow 6k-3 = 0 \Rightarrow k = \frac{1}{2}$$

6. If $P\left(\frac{a}{3}, 4\right)$ is the mid-point of the line segment joining the points Q (– 6, 5) and R (–2, 3), then the value of a is

(a) –4 (b) –12 (c) 12 (d) –6

Ans: (b) –12

(b) Mid-point of QR = $\frac{-6-2}{2}, \frac{5+3}{2}$ = (– 4, 4)

$P = \left(\frac{a}{3}, 4\right)$

So, $\frac{a}{3} = -4 \Rightarrow a = -12$

7. If P(2, *p*) is the mid-point of the line segment joining the points A(6, –5) and B(–2, 11), find the value of *p*.

(a) 5 (b) 2 (c) 3 (d) 4

Ans: (c) 3

P(2, *p*) is the mid-point of A(6, –5) and B(–2, 11)

$$\therefore \left(\frac{6-2}{2}, \frac{-5+11}{2}\right) = (2, p)$$

$$\Rightarrow (2,3) = (2, p) \Rightarrow p = 3$$

8. Find the value of *k* if P(4, –2) is the mid-point of the line segment joining the points A(5*k*, 3) and B(–*k*, –7).

(a) 4 (b) 2 (c) 3 (d) 5

Ans: (b) 2

P(4, – 2) is mid-point of A(5*k*, 3) and B(– *k*, – 7)

$$\therefore \left(\frac{5k-k}{2}, \frac{3-7}{2}\right) = (4, -2)$$

$$\Rightarrow (2k, -2) = (4, -2) \Rightarrow 2k = 4 \Rightarrow k = 2.$$

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 value of y is 3, if the distance between the points P(2, -3) and Q(10, y) is 10.

Reason (R): Distance between two points is given by $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

(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.
Ans: (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
For y = 3
Distance PQ $= \sqrt{(10-2)^2 + (y+3)^2} = \sqrt{8^2 + 6^2} = \sqrt{64+36} = \sqrt{100} = 10$ units

10. Assertion (A): The point (–1, 6) divides the line segment joining the points (–3, 10) and (6, –8) in the ratio 2 : 7 internally.

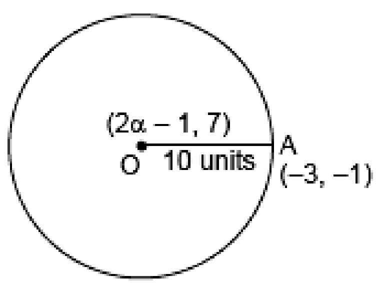
Reason (R): Given three points, i.e. A, B, C form an equilateral triangle, then AB = BC = AC.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
(b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.
Ans: (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Find the point on *y*-axis which is equidistant from the points (5, – 2) and (–3, 2).
Ans: Let point on *y*-axis be (0, *a*)
Now distance of this point from (5, –2) is equal to distance from point (–3, 2)
i.e., $\sqrt{5^2 + (-2-a)^2} = \sqrt{3^2 + (a-2)^2}$
Squaring and simplifying, we get
$25 + 4 + a^2 + 4a = 9 + a^2 + 4 - 4a \Rightarrow 8a = -16 \Rightarrow a = -2$
Hence, the required point is (0, –2)

12. 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, then find the value of α.
Ans: Here, OA = 10 units



$\Rightarrow$ OA = $\sqrt{(2\alpha - 1 + 3)^2 + (7+1)^2}$

$\Rightarrow$ 10 = $\sqrt{4\alpha^2 + 4 + 8\alpha + 64}$

Squaring 100 = $4\alpha^2 + 8\alpha + 68$

$\Rightarrow 4\alpha^2 + 8\alpha - 32 = 0 \Rightarrow \alpha^2 + 2\alpha - 8 = 0$

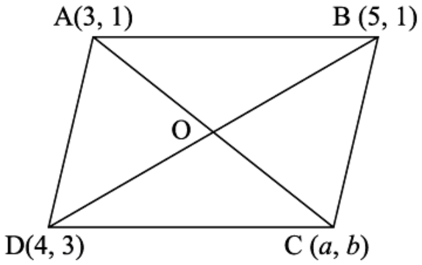
$\Rightarrow \alpha^2 + 4\alpha - 2\alpha - 8 = 0 \Rightarrow \alpha(\alpha + 4) - 2(\alpha + 4) = 0 \Rightarrow (\alpha + 4)(\alpha - 2) = 0$

$\therefore\ \alpha = -4, \alpha = 2$

13. Points A(3, 1), B(5, 1), C(a, b) and D(4, 3) are vertices of a parallelogram ABCD. Find the values of a and b.

Ans:

ABCD is a parallelogram.



Since, the diagonals of a parallelogram bisect each other.

$\therefore \left(\frac{3+a}{2}, \frac{1+b}{2}\right) = \left(\frac{4+5}{2}, \frac{3+1}{2}\right)$

$\Rightarrow \frac{3+a}{2} = \frac{9}{2} \quad \Rightarrow 3 + a = 9$

$\Rightarrow \quad a = 6$

and $\frac{1+b}{2} = \frac{4}{2} \Rightarrow 1 + b = 4 \Rightarrow b = 3$

Hence, $a = 6$ and $b = 3$.

14. If the point C (–1, 2) divides the line segment AB in the ratio 3 : 4, where the coordinates of A are (2, 5), find the coordinates of B.

Ans:

$\frac{3 \times x + 4 \times 2}{3+4} = -1 \quad \Rightarrow \quad \frac{3x+8}{7} = -1$

$3x + 8 = -7 \quad \Rightarrow \quad 3x = -15$

$x = -5$

$\frac{3 \times y + 4 \times 5}{3+4} = 2 \quad \Rightarrow \quad \frac{3y+20}{7} = 2$

$3y + 20 = 14 \quad \Rightarrow \quad 3y = 14 - 20$

$3y = -6 \quad \Rightarrow \quad y = -2$

$\therefore$ Coordinates of B are (–5, –2).

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Show that the points A(1, 2), B(5, 4), C(3, 8) and D (–1, 6) are the vertices of a square.

Ans: A(1, 2), B (5, 4),C(3, 8) and D (–1, 6)

AB = $\sqrt{4^2 + 2^2} = \sqrt{16+4} = \sqrt{20}$; BC = $\sqrt{(-2)^2 + (4)^2} = \sqrt{4+16} = \sqrt{20}$

CD = $\sqrt{(-4)^2 + (-2)^2} = \sqrt{16+4} = \sqrt{20}$; DA = $\sqrt{(-2)^2 + (4)^2} = \sqrt{4+16} = \sqrt{20}$

Here AB = BC = CA = DA

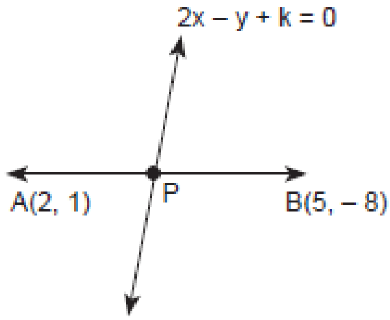
AC = $\sqrt{2^2 + 6^2} = \sqrt{40}$ and BD = $\sqrt{(-6)^2 + (2)^2} = \sqrt{36+4} = \sqrt{40}$

All sides of quadrilateral are equal and diagonals are equal.

$\therefore$ ABCD is square.

16. Point P divides the line segment joining the points A(2, 1) and B(5, –8) such that $\frac{AP}{AB} = \frac{1}{3}$. If P lies on the line $2x - y + k = 0$, find the value of k.

Ans:



P is the point of intersection of line segment AB and line $2x - y + k = 0$.

Such that $\frac{AP}{AB} = \frac{1}{3} \Rightarrow$ 3AP = AB

$\Rightarrow$ 3AP = AP + PB $\Rightarrow$ 2AP = PB

$\Rightarrow \frac{AP}{PB} = \frac{1}{2} \Rightarrow$ AP : PB = 1 : 2

$\Rightarrow$ P divides the join of A(2, 1) and B(5, – 8) in the ratio 1 : 2.

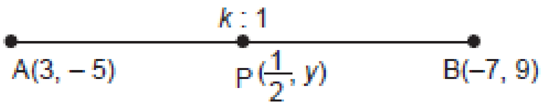
$\therefore$ Coordinates of point P are $\left(\frac{5+4}{1+2}, \frac{2-8}{1+2}\right)$ i.e., P (3, – 2)

As point P lies on the line $2x - y + k = 0$

$\therefore$ $6 + 2 + k = 0 \Rightarrow k = -8$

17. If point $\left(\frac{1}{2}, y\right)$ lies on the line segment joining the points A(3, –5) and B(–7, 9), then find the ratio in which P divides AB. Also find the value of y.

Ans:



Let P divides AB in the ratio k : 1.

$\therefore \left(\frac{-7k+3}{k+1}, \frac{9k-5}{k+1}\right) = \left(\frac{1}{2}, y\right)$

$\Rightarrow \frac{-7k+3}{k+1} = \frac{1}{2}$

$\Rightarrow -14k + 6 = k + 1$

$\Rightarrow -15k = -5 \Rightarrow k = \frac{1}{3}$.

$\therefore$ Ratio is k : 1, i.e., $\frac{1}{3}$: 1 $\Rightarrow$ 1 : 3

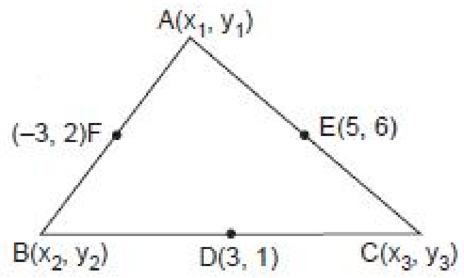
and $y = \frac{9k-5}{k+1} = \frac{9 \times \frac{1}{3} - 5}{\frac{1}{3} + 1} = \frac{-6}{4} = \frac{-3}{2}$

SECTION – D

Questions 18 carry 5 marks.

18. Find the vertices of a triangle, the mid-points of whose sides are (3, 1), (5, 6) and (– 3, 2).

Ans: Let the vertices of ΔABC be A(x_1, y_1), B(x_2, y_2) and C(x_3, y_3).



Let D(3, 1), E(5, 6) and F(– 3, 2) be the mid-points of BC, CA and AB respectively.

Then $\frac{x_2 + x_3}{2} = 3 \Rightarrow x_2 + x_3 = 6$ ...(i)

$\frac{y_2 + y_3}{2} = 1 \Rightarrow y_2 + y_3 = 2$ ...(ii)

$\frac{x_3 + x_1}{2} = 5 \Rightarrow x_3 + x_1 = 10$ ...(iii) and $\frac{y_3 + y_1}{2} = 6 \Rightarrow y_1 + y_3 = 12$ ...(iv)

$\frac{x_1 + x_2}{2} = -3 \Rightarrow x_1 + x_2 = -6$ ...(v) and $\frac{y_1 + y_2}{2} = 2 \Rightarrow y_1 + y_2 = 4$ ...(vi)

Adding (i), (iii) and (v), we get

$2(x_1 + x_2 + x_3) = 10 \Rightarrow x_1 + x_2 + x_3 = 5$ ...(vii)

Subtracting (i), (iii), (v) separately from (vii), we get $x_1 = -1$, $x_2 = -5$, $x_3 = 11$

Adding (ii), (iv) and (vi), we get

$2(y_1 + y_2 + y_3) = 18 \Rightarrow y_1 + y_2 + y_3 = 9$ ...(viii)

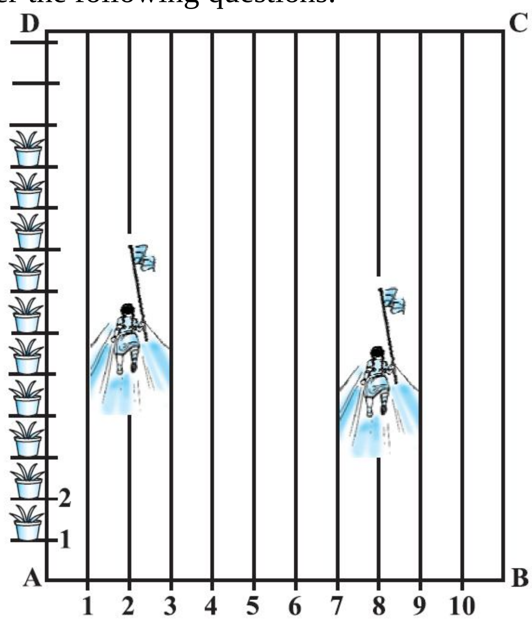
Subtracting (ii), (iv) and (vi) separately from (viii), we get $y_1 = 7$, $y_2 = -3$, $y_3 = 5$.

Hence, the vertices of the triangle ABC are A(– 1, 7), B(– 5, – 3) and C(11, 5).

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. In order to conduct sports day activities in your school, lines have been drawn with chalk powder at a distance of 1 m each in a rectangular shaped ground ABCD. 100 flower pots have been placed at the distance of 1 m from each other along AD, as shown in the following figure. Niharika runs $(\frac{1}{4})$th distance AD on the 2nd line and posts a green Flag. Preet runs $(\frac{1}{5})$ th distance AD on the eighth line and posts are red flags. Taking A as the origin AB along x-axis and AD along y-axis, answer the following questions:



(i) Find the coordinates of the green flag. (1)

(ii) Find the distance between the two flags. (1)

(iii) If Rashmi has to post a blue flag exactly halfway between the line segment joining the two flags, where should she post her flag? (2)

OR

(iii) If Joy has to post a flag at one fourth distance from the green flag, in the line segment joining the green and red flags, then where should he post his flag? (2)

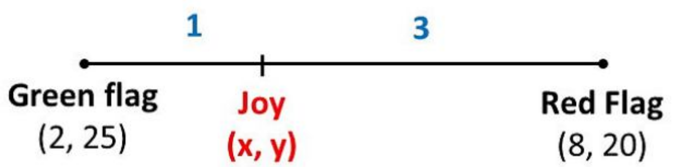
Ans: (i) Position of the red flag is $\left(2, \frac{1}{4} \times 100\right) = (2, 25)$

(ii) Distance between the two flags = $\sqrt{(36+25)} = \sqrt{61}\, cm$

(iii) Position of the blue flag = $\left(\frac{2+8}{2}, \frac{25+20}{2}\right)$

$= (5, 22.5)$

OR



$$x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2} = \frac{1 \times 8 + 3 \times 2}{1 + 3} = \frac{8 + 6}{4} = \frac{14}{4} = \mathbf{3.5}$$

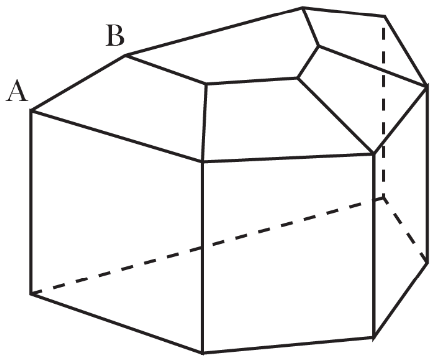
$$y = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2} = \frac{1 \times 20 + 3 \times 25}{1 + 3} = \frac{20 + 75}{4} = \frac{95}{4} = \mathbf{23.75}$$

Required point is (3.5, 23.75)

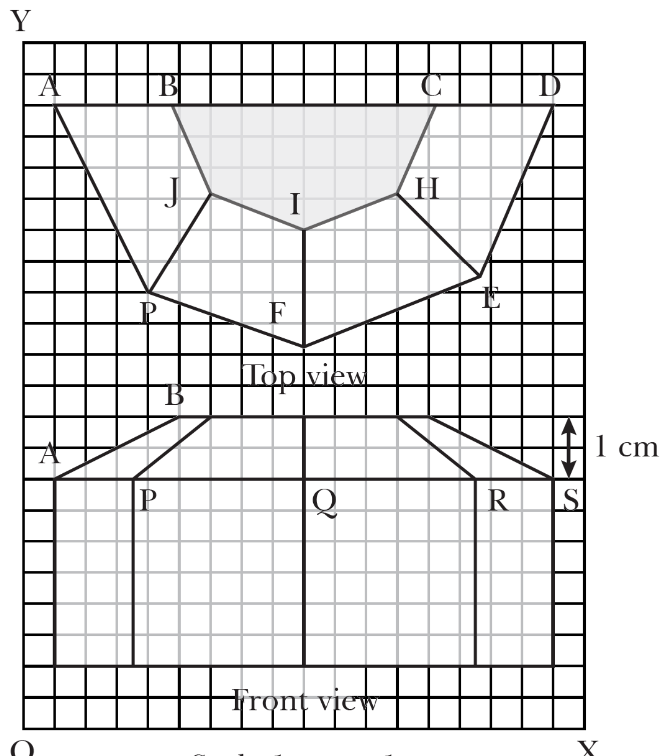
20. The diagrams show the plans for a sun room. It will be built onto the wall of a house. The four walls of the sunroom are square clear glass panels. The roof is made using

• Four clear glass panels, trapezium in shape, all the same size

• One tinted glass panel, half a regular octagon in shape



Not to scale



Scale 1 cm = 1m

Refer to Top View for (i) only:
(i) Find the mid-point of the segment joining the points J (6, 17) and I (9, 16). (1)
Refer to Front View for (ii) to (iii):
(ii) Find the distance between the points A and S. (1)
(iii) Find the co-ordinates of the point which divides the line segment joining the points A and B in the ratio 1:3 internally. (2)

OR

(iii) If a point (x,y) is equidistant from the Q(9,8) and S(17,8),then find the relation between x and y. (2)

Ans: (i) Mid-point of JI = $\left(\frac{6+9}{2}, \frac{17+16}{2}\right) = \left(\frac{15}{2}, \frac{33}{2}\right)$

(ii) Distance between A and S = 16 boxes.
(iii) Coordinates of A and B are (1, 8) and (5, 10) respectively.
Coordinates of point dividing AB in the ratio 1 : 3 internally are:
$$x = \frac{1\times5+3\times1}{1+3}, y = \frac{1\times10+3\times8}{1+3} \Rightarrow x = \frac{8}{4} = 2, y = \frac{34}{4} = 8.5$$
Co-ordinates of required points be (2, 8.5)

OR

(iii) Let P (x,y) is equidistant from the Q(9,8) and S(17,8) then we have
PQ = PS ⇒ $PQ^2 = PS^2$
$\Rightarrow (x-9)^2 + (y-8)^2 = (x-17)^2 + (y-8)^2$
$\Rightarrow (x-9)^2 = (x-17)^2$
$\Rightarrow x^2 - 18x + 81 = x^2 - 34x + 289$
$\Rightarrow 34x - 18x + 81 - 289 = 0$
$\Rightarrow 16x - 208 = 0$
$\Rightarrow x - 13 = 0$