

Chapter : Seven

Coordinate Geometry



Competency Based Questions



Multiple Choice Questions

1. The distance of the point P(2, 3) from the x-axis is

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

Ans. (b) 3

Explanation: The distance from x-axis is equal to its ordinate i.e., 3

2. The distance between the point P(1, 4) and Q(4, 0) is

(a) 4 (b) 5 (c) 6 (d) $3\sqrt{3}$

Ans. (b) 5

Explanation: The required distance = $\sqrt{(4-1)^2 + (0-4)^2} = \sqrt{9+16} = \sqrt{25} = 5$

3. The points (-5, 1), (1, p) and (4, -2) are collinear if the value of p is

(a) 3 (b) 2 (c) 1 (d) -1

Ans. (d) -1

Explanation: The points are collinear if area of $\Delta = 0$

$$\Rightarrow \frac{1}{2} [-5(p+2) + 1(-2-1) + 4(1-p)] = 0$$

$$\Rightarrow -5p - 10 - 3 + 4 - 4p = 0 \Rightarrow -9p = +9$$

$$\therefore p = -1$$

4. The area of the triangle ABC with the vertices A(-5, 7), B(-4, -5) and C(4, 5) is

(a) 63 (b) 35 (c) 53 (d) 36

Ans. (c) 53

Explanation: Area of ΔABC

$$= \frac{1}{2} [x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$$

$$= \frac{1}{2} [-5(-5-5) - 4(5-7) + 4(7-(-5))] = \frac{1}{2} [-5(-10)$$

$$-4(-2) + 4(12)]$$

$$= \frac{1}{2} [50 + 8 + 48] = \frac{1}{2} \times 106 = 53 \text{ sq. units}$$

5. The distance of the point (α, β) from the origin is

(a) $\alpha + \beta$ (b) $\alpha^2 + \beta^2$
(c) $|\alpha| + |\beta|$ (d) $\sqrt{\alpha^2 + \beta^2}$

Ans. (d) $\sqrt{\alpha^2 + \beta^2}$

Explanation: Distance of (α, β) from origin (0, 0)

$$= \sqrt{(\alpha-0)^2 + (\beta-0)^2} = \sqrt{\alpha^2 + \beta^2}$$

6. The area of the triangle whose vertices are A(1, 2), B(-2, 3) and C(-3, -4) is

(a) 11 (b) 22 (c) 33 (d) 21

Ans. (a) 11

Explanation:

$$\text{Required Area} = \frac{1}{2} [1(3+4) - 2(-4-2) - 3(2-3)]$$

$$= \frac{1}{2} [7 + 12 + 3] = \frac{1}{2} \times 22 = 11$$

7. The line segment joining the points (3, -1) and (-6, 5) is trisected. The coordinates of point of trisection are

(a) (3, 3) (b) (-3, 3)
(c) (3, -3) (d) (-3, -3)

Ans. (b) (-3, 3)

Explanation:

Since the line segment AB is trisected

$$\therefore PB : BQ = 2 : 1$$

$$\therefore \text{Coordinates of B are } = \left(\frac{2(-6)+1(3)}{2+1}, \frac{2(5)+1(-1)}{2+1} \right)$$

$$= \left(\frac{-12+3}{3}, \frac{10-1}{3} \right) = \left(-\frac{9}{3}, \frac{9}{3} \right) = (-3, 3)$$

8. The line $3x + y - 9 = 0$ divides the line joining the points (1, 3) and (2, 7) internally in the ratio

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

Ans. (a) 3 : 4

Explanation:

Let the line $3x + y - 9 = 0$ divide the line segment joining $A(1, 3)$ and $B(2, 7)$ in the ratio $K : 1$ at point C .

The coordinates of C are $\left(\frac{2K+1}{K+1}, \frac{7K+3}{K+1}\right)$

But the point C lies on the line $3x + y - 9 = 0$

$$\therefore 3\left(\frac{2K+1}{K+1}, \frac{7K+3}{K+1}\right) - 9 = 0$$

$$\Rightarrow 6K + 3 + 7K + 3 - 9K = 0$$

$$\Rightarrow 4K - 3 = 0$$

$$\Rightarrow K = \frac{3}{4} \quad \therefore \text{Required ratio} = 3 : 4$$

9. The distance between $A(a + b, a - b)$ and $B(a - b, -a - b)$ is

- (a) $\sqrt{a^2 + b^2}$ (b) $\sqrt{a^2 - b^2}$
(c) $2\sqrt{a^2 + b^2}$ (d) $4\sqrt{a^2 + b^2}$

Ans. (c) $2\sqrt{a^2 + b^2}$

Explanation:

$$AB = \sqrt{(a-b-a-b)^2 + (-a-b-a+b)^2} = \sqrt{(-2b)^2 + (-2a)^2} \\ = \sqrt{4b^2 + 4a^2} = 2\sqrt{a^2 + b^2}$$

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

- (a) 12 (b) -6 (c) -12 (d) -4

Ans. (c) -12

Explanation: Mid-point = $\left(\frac{-6-2}{2}, \frac{5+3}{2}\right)$

$$\Rightarrow \left(\frac{a}{3}, 4\right) = (-4, 4) \therefore \frac{a}{3} = -4$$

$$\Rightarrow a = -12$$

11. If the distance between the points $(x, -1)$ and $(3, 2)$ is 5, then the value of x is

- (a) -7 or -1 (b) -7 or 1 (c) 7 or 1 (d) 7 or -1

Ans. (d) 7 or -1

Explanation: We have $\sqrt{(x-3)^2 + (-1-2)^2} = 5$

$$\Rightarrow (x-3)^2 + 9 = 25 \Rightarrow x^2 - 6x + 9 + 9 = 25$$

$$\Rightarrow x^2 - 6x - 7 = 0 \Rightarrow (x-7)(x+1) = 0$$

$$\Rightarrow x = 7 \text{ or } x = -1$$

12. The points $(1, 1)$, $(-2, 7)$ and $(3, -3)$ are

- (a) vertices of an equilateral triangle
(b) collinear
(c) vertices of an isosceles triangle
(d) none of these

Ans. (b) collinear

Explanation: Let $A(1, 1)$, $B(-2, 7)$ and $C(3, -3)$ are the given points. Then, we have

$$AB = \sqrt{(-2-1)^2 + (7-1)^2} = \sqrt{9+36} = \sqrt{45} = 3\sqrt{5}$$

$$BC = \sqrt{(3+2)^2 + (-3-7)^2} = \sqrt{25+100} = \sqrt{125} = 5\sqrt{5}$$

$$\text{and } AC = \sqrt{(3-1)^2 + (-3-1)^2} = \sqrt{4+16} = \sqrt{20} = 2\sqrt{5}$$

Clearly $BC = AB + AC$.

$\therefore A, B, C$ are collinear.

13. The coordinates of the centroid of a triangle whose vertices are $(0, 6)$, $(8, 12)$ and $(8, 0)$ is

- (a) $(4, 6)$ (b) $(16, 6)$ (c) $(8, 6)$ (d) $(16/3, 6)$

Ans. (d) $(16/3, 6)$

Explanation: The co-ordinates of the centroid of the triangle is $\left(\frac{0+8+8}{3}, \frac{6+12+0}{3}\right) = \left(\frac{16}{3}, \frac{18}{3}\right) = \left(\frac{16}{3}, 6\right)$

14. Two vertices of a triangle are $(3, -5)$ and $(-7, 4)$. If its centroid is $(2, -1)$, then the third vertex is

- (a) $(10, 2)$ (b) $(-10, 2)$
(c) $(10, -2)$ (d) $(-10, -2)$

Ans. (c) $(10, -2)$

Explanation: Let the coordinates of the third vertex be (x, y)

$$\text{then } \left(\frac{x+3-7}{3}, \frac{y-5+4}{3}\right) = (2, -1)$$

$$\Rightarrow \left(\frac{x-4}{3}, \frac{y-1}{3}\right) = (2, -1)$$

$$\Rightarrow \frac{x-4}{3} = 2, \frac{y-1}{3} = -1$$

$$\Rightarrow x-4 = 6, y-1 = -3 \Rightarrow x = 10, y = -2$$

$\therefore$ Coordinates of third vertex is $(10, -2)$

15. The area of the triangle formed by the points $A(-1.5, 3)$, $B(6, -2)$ and $C(-3, 4)$ is

- (a) 0 (b) 1 (c) 2 (d) $3/2$

Ans. (a) 0

Explanation:

$$\text{Area of } \triangle ABC = \frac{1}{2} [-1.5(-2-4) + 6(4-3) + (-3)(3+2)]$$

$$= \frac{1}{2} [9 + 6 - 15] = 0. \text{ It is a straight line.}$$

16. If the points $P(1, 2)$, $B(0, 0)$ and $C(a, b)$ are collinear, then

- (a) $2a = b$ (b) $a = -b$
(c) $a = 2b$ (d) $a = b$

Ans. (a) $2a = b$

Explanation: Area of $\triangle PBC = 0$

$$\Rightarrow \frac{1}{2} [1(0-b) + 0(b-1) + a(2-0)] = 0$$

$$\Rightarrow \frac{1}{2} [-b + 2a] = 0 \Rightarrow -b + 2a = 0$$

$$\therefore 2a = b$$

◆ **Assertion-Reason Questions**

Direction: In the following questions, 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.

1. **Assertion:** The point (0, 4) lies on y -axis.

Reason: The x -coordinate on the point on y -axis is zero.

Ans. (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Explanation: The x co-ordinate of the point (0, 4) is zero. Point (0, 4) lies on y -axis.

2. **Assertion:** Mid-points of a line segment divides line in the ratio 1 : 1.

Reason: If area of triangle is zero that means points are collinear.

Ans. (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

3. **Assertion:** Centroid of a triangle formed by the points (a, b), (b, c) and (c, a) is at origin, Then $a + b + c = 0$.

Reason: Centroid of a $\triangle ABC$ with vertices $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$ is given by

$$\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3} \right).$$

Ans. (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Explanation:

$$\text{As we know, Centroid of a triangle} = \left(\frac{a+b+c}{3}, \frac{b+c+a}{3} \right)$$

$$= \left(\frac{a+b+c}{3}, \frac{b+c+a}{3} \right) = (0, 0)$$

$$\therefore a + b + c = 0$$

4. **Assertion:** The value of y is 6, for which the distance between the points $P(2, -3)$ and $Q(10, y)$ is 10.

Reason: Distance between two given points $A(x_1, y_1)$ and $B(x_2, y_2)$ is given by

$$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Ans. (d) Assertion (A) is false but Reason (R) is true.

Explanation:

Given. $PQ = 10$

Using distance formula, $PQ^2 = (10)^2 = 100$

...[Squaring both side

$$(10 - 2)^2 + (y + 3)^2 = 100$$

$$\Rightarrow (y + 3)^2 = 100 - 64 = 36 \Rightarrow y + 3 = 6$$

$$\therefore y = 6 - 3 = 3 \quad \text{or} \quad y = -6 - 3 = -9$$

5. **Assertion:** The area of the triangle with vertices $(-5, -1)$, $(3, -5)$, $(5, 2)$, is 32 square units.

Reason: The point (x, y) divides the line segment joining the points (x_1, y_1) and (x_2, y_2) in the ratio $k : 1$ externally then

$$x = \frac{kx_2 + x_1}{k + 1}, \quad y = \frac{ky_2 + y_1}{k + 1}$$

Ans. (c) Assertion (A) is true but Reason (R) is false.

Explanation: We have, $(-5, -1)$, $(3, -5)$, $(5, 2)$

$$\text{Area of } \Delta = \frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$$

$$= \frac{1}{2} |-5(-5 - 2) + 3(2 + 1) + 5(-1 + 5)|$$

$$= \frac{1}{2} |35 + 9 + 20| = \frac{1}{2} \times 64 = 32 \text{ Sq. unit}$$

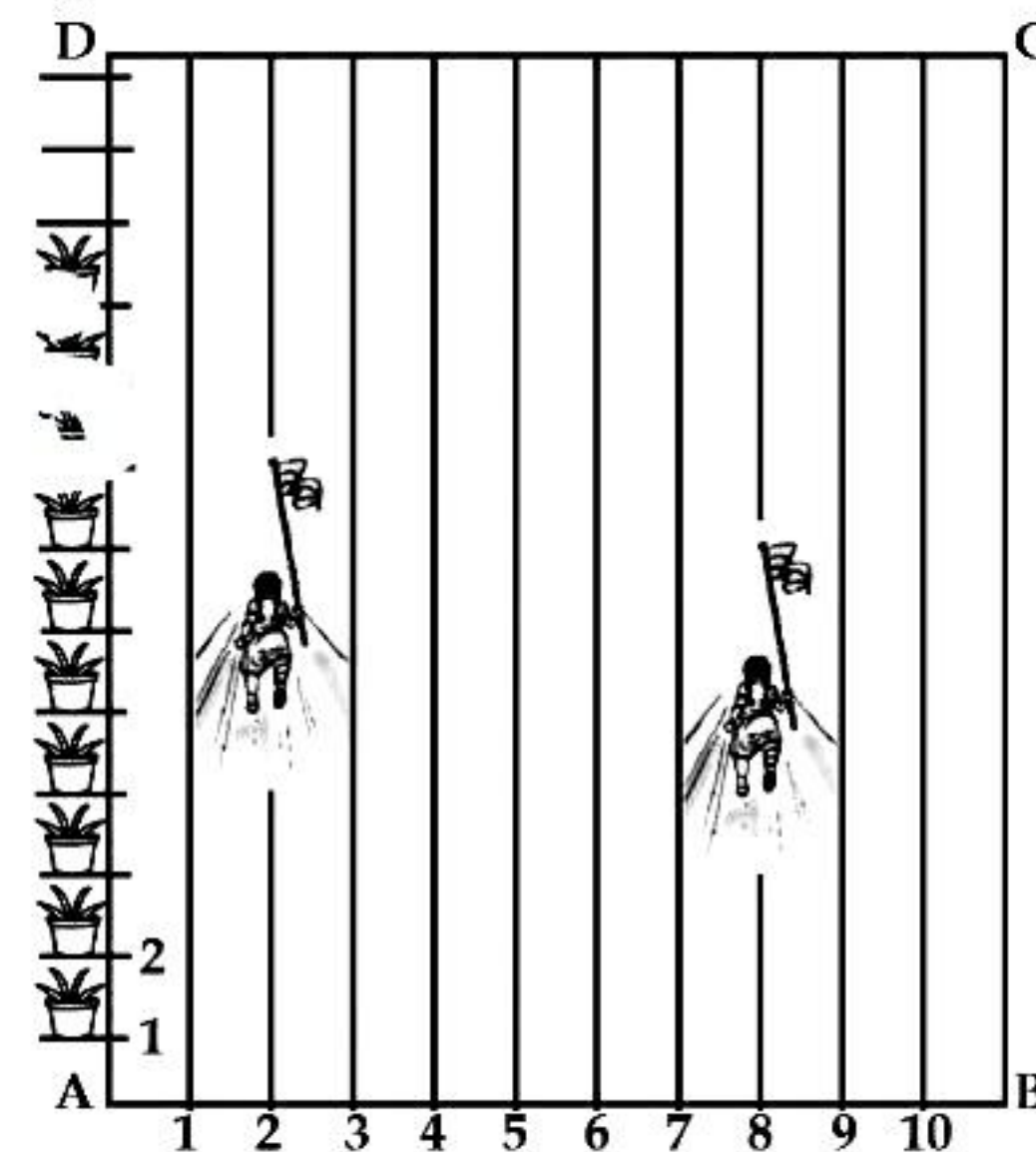
Now, Section formula (externally),

$$x = \frac{kx_2 - x_1}{k - 1} \quad \text{and} \quad y = \frac{ky_2 - y_1}{k - 1}$$

◆ Case Based Questions

Important: The students must, first of all mark the points given in the question with their coordinates.

I. 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 flowerpots have been placed at a distance of 1 m from each other along AD, as shown in the given figure. Niharika runs $\frac{1}{4}$ th the 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 a red flag.



(i) Find the position of green flag.

(a) (2, 25) (b) (2, 0.25) (c) (25, 2) (d) (0, -25)

Ans. (a) (2, 25) Explanation: 2 and $\frac{1}{4}$ th of 100

(ii) Find the position of red flag.

(a) (8, 0) (b) (20, 8) (c) (8, 20) (d) (8, 0.2)

Ans. (c) (8, 20) Explanation: 8 and $\frac{1}{5}$ th of 100

(iii) What is the distance between both the flags?

(a) $\sqrt{41}$ (b) $\sqrt{11}$ (c) $\sqrt{61}$ (d) $\sqrt{51}$

Ans. (c) $\sqrt{61}$

Explanation: We have, (2, 25) (8, 20)

Using distance formula = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$$= \sqrt{(8 - 2)^2 + (20 - 25)^2} = \sqrt{36 + 25} = \sqrt{61}$$

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

(a) (5, 22.5) (b) (10, 22)

(c) (2, 8.5) (d) (2.5, 20)

Ans. (a) (5, 22.5)

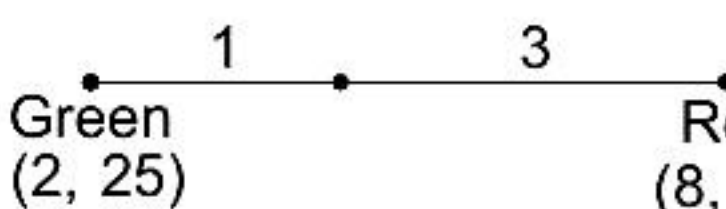
Explanation: Use mid-point formula $= \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}$

$$= \frac{2+8}{2}, \frac{25+20}{2} = \left(\frac{10}{2}, \frac{45}{2} \right) = (5, 22.5)$$

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

- (a) (3.5, 24) (b) (0.5, 12.5)
(c) (2.25, 8.5) (d) (25, 20)

Ans. (a) (3.5, 24)

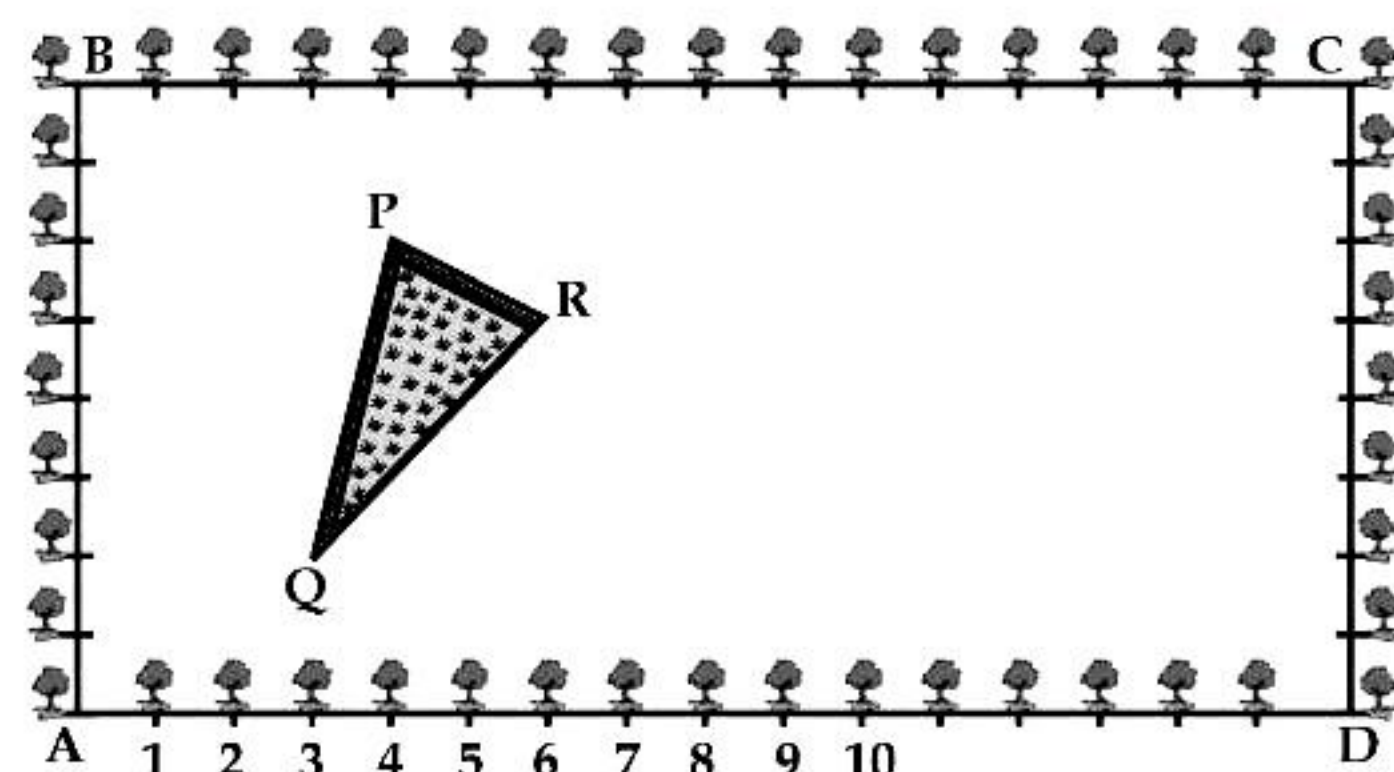
Explanation: 

Using Section Formula, $\frac{mx_2 + nx_1}{m+n}, \frac{my_2 + ny_1}{m+n}$

$$= \left[\frac{1(8) + 3(2)}{1+3}, \frac{1(20) + 3(25)}{1+3} \right] = \left[\frac{8+6}{4}, \frac{20+75}{4} \right]$$

= 3.5, 24 (approx.)

- II. The class X students of a school in krishnagar have been allotted a rectangular plot of land for their gardening activity. Saplings of Gulmohar are planted on the boundary at a distance of 1 m from each other. There is a triangular grassy lawn in the plot as shown in the figure. The students are to sow seeds of flowering plants on the remaining area of the plot.



- (i) Taking A as origin, find the coordinates of P.

- (a) (4, 6) (b) (6, 4) (c) (0, 6) (d) (4, 0)

Ans. (a) P(4, 6)

- (ii) What will be the coordinates of R, if C is the origin?

- (a) (8, 6) (b) (3, 10) (c) (10, 3) (d) (0, 6)

Ans. (c) R(10, 3)

- (iii) What will be the coordinates of Q, if C is the origin?

- (a) (6, 13) (b) (-6, 13) (c) (-13, 6) (d) (13, 6)

Ans. (d) Q(13, 6)

- (iv) Calculate the area of the triangle if A is the origin.

- (a) 4.5 (b) 6 (c) 8 (d) 6.25

Ans. (a) 4.5

Explanation:

Taking A as origin, we have P(4, 6), Q(3, 2), R(6, 5)

$$\text{Area of } \Delta = \frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$$

$$= \frac{1}{2} |4(2 - 5) + 3(5 - 6) + 6(6 - 2)|$$

$$= \frac{1}{2} |-12 - 3 + 24| = \frac{9}{2} = 4.5 \text{ sq. unit}$$

- (v) Calculate the area of the triangles if C is the origin

- (a) 8 (b) 5 (c) 6.25 (d) 4.5

Ans. (d) 4.5

Explanation:

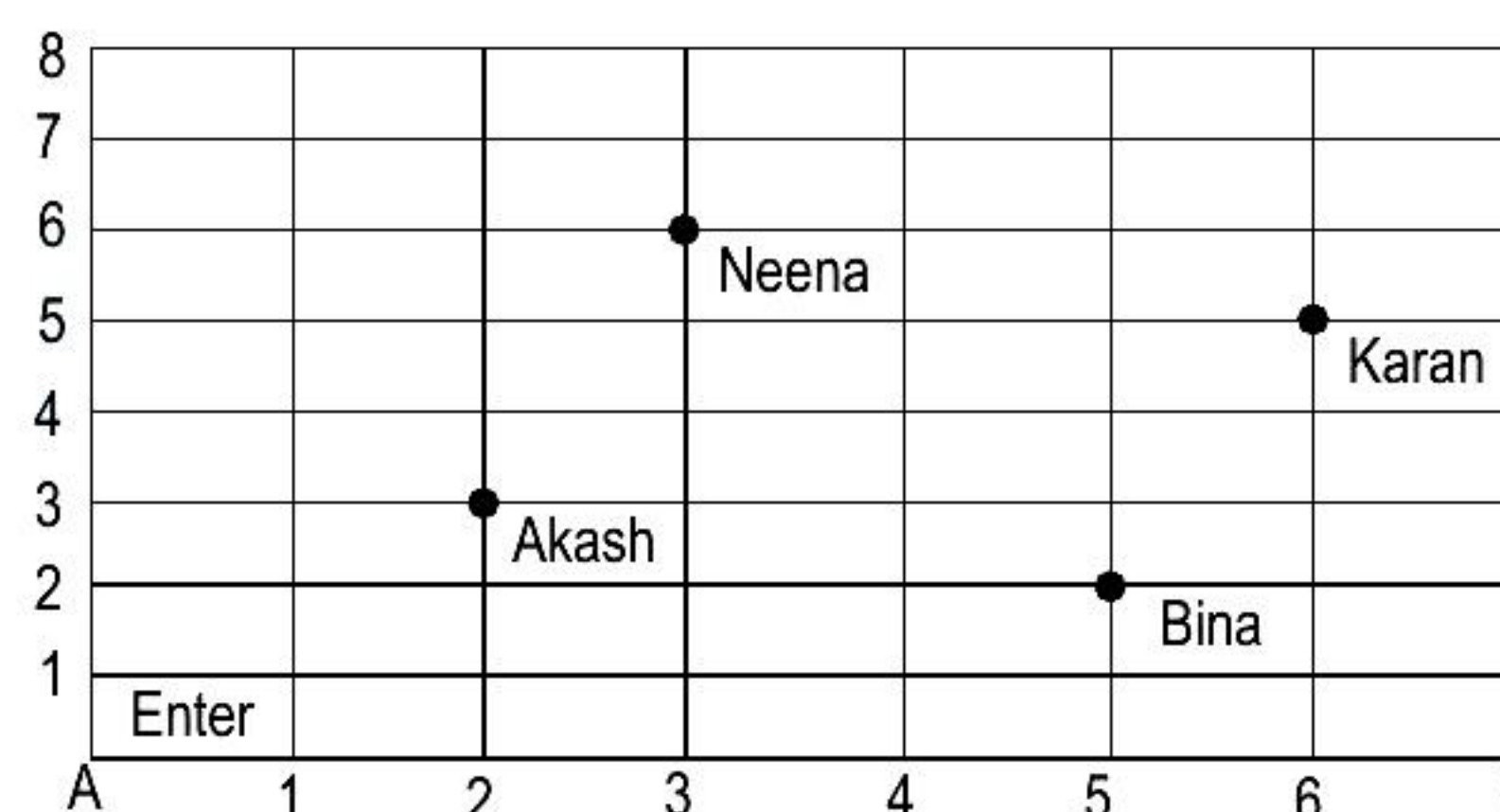
Taking C as origin, we have P(12, 2), Q(13, 6), R(10, 3)

$$\text{Area of } \Delta = \frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$$

$$= \frac{1}{2} |12(6 - 3) + 13(3 - 2) + 10(2 - 6)|$$

$$= \frac{1}{2} |36 + 13 - 40| = \frac{9}{2} = 4.5 \text{ sq. unit}$$

- III. Karan went to the Lab near to his home for COVID 19 test along with his family members. The seats in the waiting area were as per the norms of distancing during this pandemic (as shown in the given figure). His family members took their seats surrounded by the circular do area.



- (i) Considering A as the origin, what are the coordinates of A?

- (a) (0, 1) (b) (1, 0) (c) (0, 0) (d) (-1, -1)

Ans. (c) A(0, 0)

- (ii) What is the distance between Neena(N) and Karan(K)?

- (a) 10 units (b) $2\sqrt{5}$ units
(c) $\sqrt{10}$ units (d) $\sqrt{8}$ units

Ans. (c) $\sqrt{10}$ units

Explanation: We have, Neena (3, 6) and Karan (6, 5)

Using Distance formula,

$$NK = \sqrt{(6-3)^2 + (5-6)^2} = \sqrt{9+1} = \sqrt{10}$$

- (iii) What are the coordinates of seat of Akash?

- (a) (2, 3) (b) (3, 2) (c) (0, 3) (d) (2, 0)

Ans. (a) Akash(2, 3)

- (iv) What will be the coordinates of a point exactly between Akash (A) and Binu (B) where a person can be seated?

- (a) (3.5, 2.5) (b) (2.5, 5) (c) (10, 5) (d) (1.5, 0.5)

Ans. (a) (3.5, 2.5)

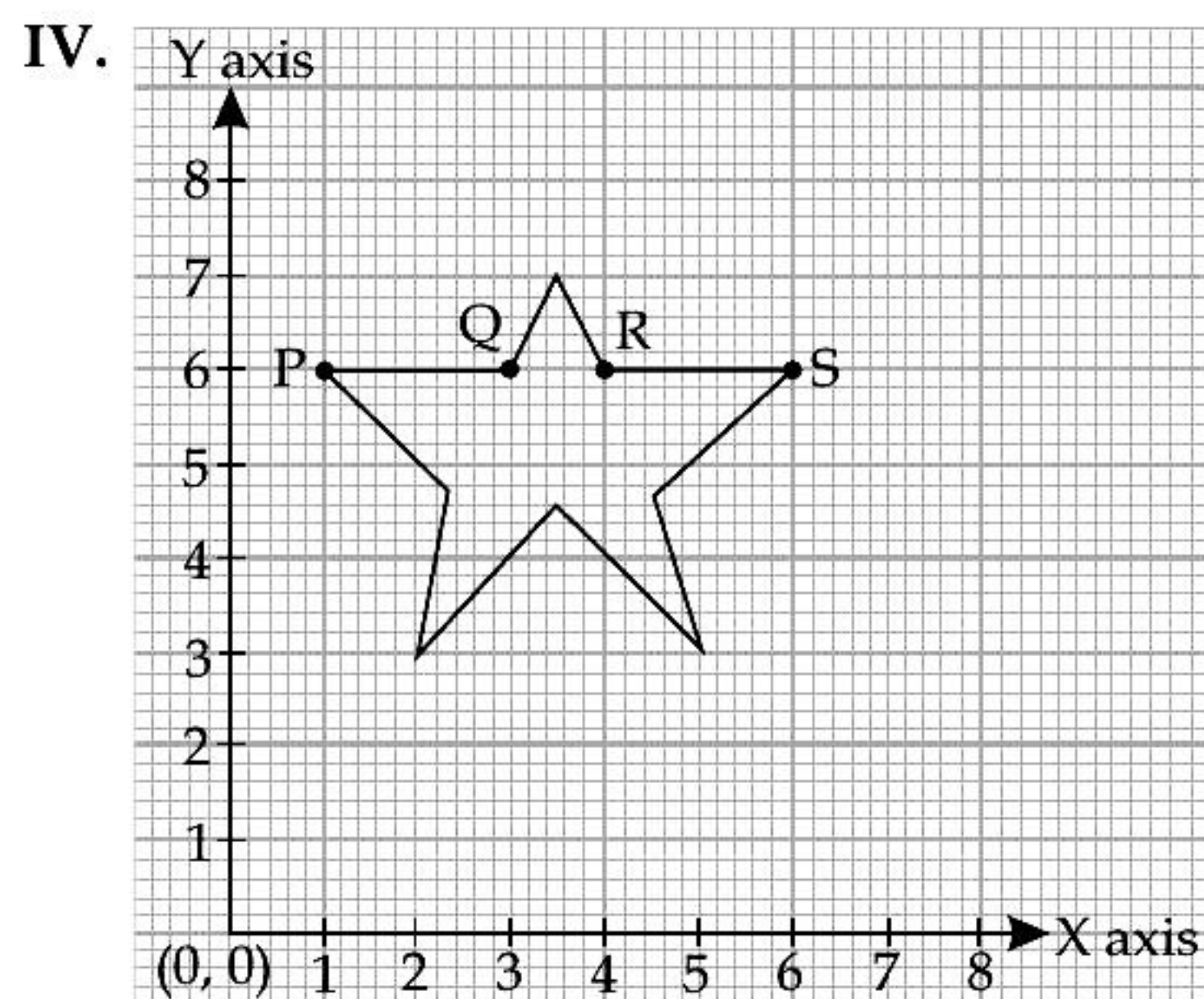
Explanation: We have, A(2, 3) and B(5, 2)

Mid point of AB = $\left(\frac{2+5}{2}, \frac{3+2}{2}\right) = (3.5, 2.5)$

(v) Determine the shape of the figure we get on joining the points where Karan's family members are seated.

- (a) Rectangle (b) Square
(c) Parallelogram (d) Rhombus

Ans. (c) Parallelogram



Observe the given picture which shows a star shape on a Cartesian plane. Answer the following questions:

(i) What are the coordinates of point P?

- (a) (6, 1) (b) (1, 6) (c) (6, 6) (d) (0, 6)

Ans. (b) P(1, 6)

(ii) What is not true for points P, Q, R and S?

- (a) points P, Q, R and S are collinear.
(b) ordinates of points P, Q, R and S are same.
(c) PS = 6 units (d) PQ = RS

Ans. (c) PS = 6 units

(iii) What is the distance between P and Q?

- (a) 5 units (b) 2 units (c) 4 units (d) $\sqrt{2}$

Ans. (b) 2 units

Explanation: We have, P(1, 6) and Q(3, 6)

Using Distance formula, PQ = $\sqrt{(3-1)^2 + (6-6)^2} = \sqrt{4} = 2$

(iv) What will be the coordinates of a point exactly between P and S?

- (a) (6, 3.5) (b) (3.5, 6) (c) (7, 12) (d) (7, 6)

Ans. (b) (3.5, 6)

Explanation: We have, P(1, 6) and S(6, 6)

Mid-point of PS = $\left(\frac{1+6}{2}, \frac{6+6}{2}\right) = (3.5, 6)$

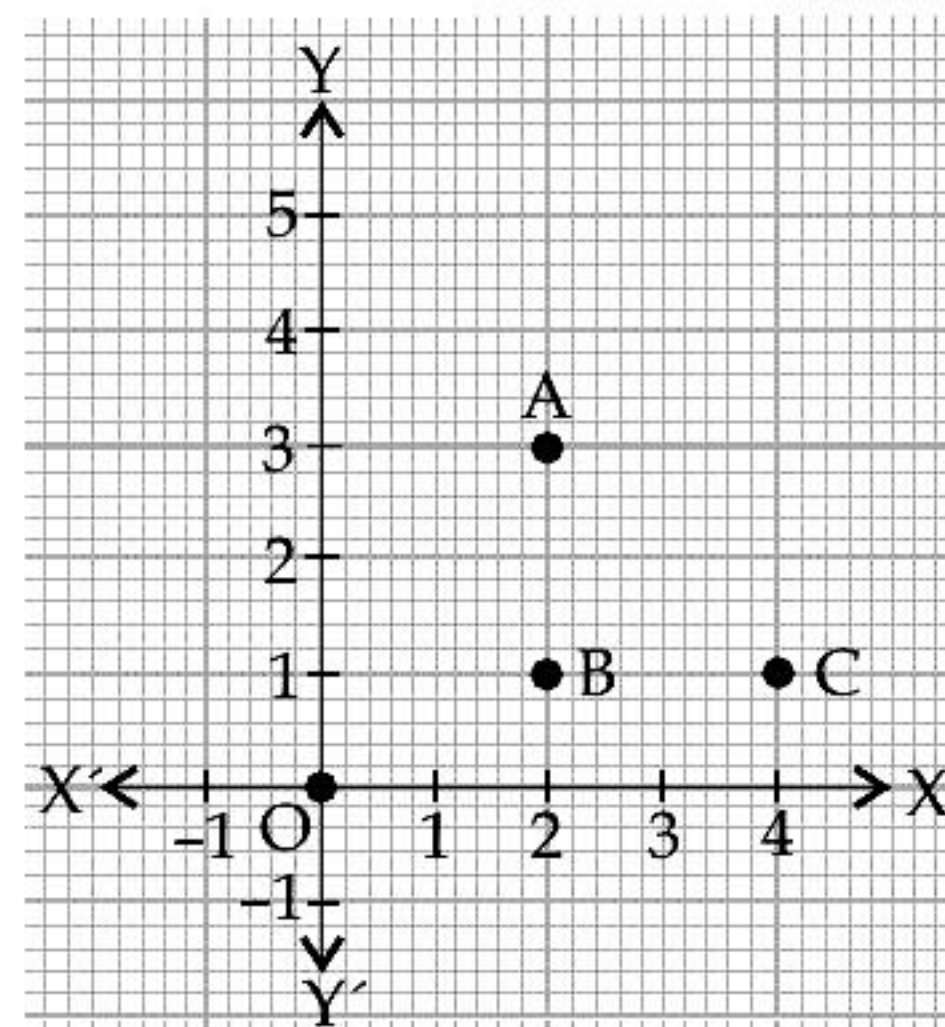
(v) The mid-point of line segment PQ divides it in the ratio:

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

Ans. (b) 1 : 1

V. Alia and Shagun are friends living on the same street in Patel Nagar. Shagun's house is at the

intersection of one street with another street on which there is a library. They both study in the same school and that is not far from Shagun's house.



Suppose the school is situated at the point O, i.e., the origin. Alia's house is at A. Shagun's house is at B and library is at C.

Based on the above information answer the following questions:

(i) How far is Alia's house from Shagun's house?

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

Ans. (d) 2 units

Explanation: AB = $\sqrt{(2-2)^2 + (1-3)^2} = 2$

(ii) How far is the library from Shagun's house?

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

Ans. (b) 2 units

Explanation: BC = $\sqrt{(4-2)^2 + (1-1)^2} = 2$

(iii) How far is the library from Alia's house?

- (a) 2 units (b) 3 units
(c) 4 units (d) None of these

Ans. (d) None of these

Explanation: Required distance = AC

= $\sqrt{(4-2)^2 + (1-3)^2} = \sqrt{2^2 + 2^2} = 2\sqrt{2}$ units

(iv) Which of the following is true?

- (a) ABC forms a scalene triangle.
(b) ABC forms an isosceles triangle.
(c) ABC forms an equilateral triangle.
(d) None of these.

Ans. (b) ABC forms an isosceles triangle.

Explanation: Since AB = BC $\neq$ AC, therefore $\triangle ABC$ is an isosceles triangle.

(v) How far is the school from Alia's house than Shagun's house?

- (a) $\sqrt{13}$ (b) $\sqrt{5}$
(c) $\sqrt{13} + \sqrt{5}$ (d) $\sqrt{13} - \sqrt{5}$

Ans. (d) $\sqrt{13} - \sqrt{5}$

Explanation: Distance between OA and OB = $\sqrt{13} - \sqrt{5}$

Where, OA = $\sqrt{2^2 + 3^2} = \sqrt{4+9} = \sqrt{13}$ units

OB = $\sqrt{2^2 + 1^2} = \sqrt{5}$ units