CHAPTER 3

COORDINATE GEOMETRY

(A) Main Concepts and Results

Cartesian system

Coordinate axes

Origin

Quadrants

Abscissa

Ordinate

Coordinates of a point

Ordered pair

Plotting of points in the cartesian plane:

- In the Cartesian plane, the horizontal line is called the x-axis and the vertical line is called the y-axis,
- The coordinate axes divide the plane into four parts called quadrants,
- The point of intersection of the axes is called the origin,
- Abscissa or the x-coordinate of a point is its distance from the y-axis and the ordinate or the y-coordinate is its distance from the x-axis,
- (x, y) are called the coordinates of the point whose abscissa is x and the ordinate is y,
- Coordinates of a point on the x-axis are of the form $(x, 0)$ and that of the point on the y-axis is of the form $(0, y)$,

- The coordinates of the origin are (0, 0),
- Signs of the coordinates of a point in the first quadrant are (+, +), in the second quadrant (–, +), in the third quadrant (–, –) and in the fourth quadrant (+, –).

(B) Multiple Choice Questions

Write the correct answer :

Sample Question 1: The points (other than origin) for which abscissa is equal to the ordinate will lie in

(A) I quadrant only (B) I and II quadrants

(C) I and III quadrants (D) II and IV quadrants

Solution : Answer (C)

EXERCISE 3.1

Write the correct answer in each of the following :

1. Point (–3, 5) lies in the

(A) first quadrant (B) second quadrant

(C) third quadrant (D) fourth quadrant

2. Signs of the abscissa and ordinate of a point in the second quadrant are respectively

(A) +, + (B) –, – (C) –, + (D) +, –

3. Point (0, –7) lies

(A) on the x –axis (B) in the second quadrant

(C) on the y-axis (D) in the fourth quadrant

4. Point (– 10, 0) lies

(A) on the negative direction of the x-axis

(B) on the negative direction of the y-axis

(C) in the third quadrant

(D) in the fourth quadrant

5. Abscissa of all the points on the x-axis is

(A) 0 (B) 1

(C) 2 (D) any number

6. Ordinate of all points on the x-axis is

(A) 0 (B) 1

(C) – 1 (D) any number

7. The point at which the two coordinate axes meet is called the

(A) abscissa (B) ordinate (C) origin (D) quadrant

8. A point both of whose coordinates are negative will lie in

(A) I quadrant (B) II quadrant

(C) III quadrant (D) IV quadrant

9. Points (1, – 1), (2, – 2), (4, – 5), (– 3, – 4)

(A) lie in II quadrant (B) lie in III quadrant

(C) lie in IV quadrant (D) do not lie in the same quadrant

10. If y coordinate of a point is zero, then this point always lies

(A) in I quadrant (B) in II quadrant

(C) on x - axis (D) on y - axis

11. The points (–5, 2) and (2, – 5) lie in the

(A) same quadrant (B) II and III quadrants, respectively

(C) II and IV quadrants, respectively (D) IV and II quadrants, respectively

12. If the perpendicular distance of a point P from the x-axis is 5 units and the foot of the perpendicular lies on the negative direction of x-axis, then the point P has

(A) x coordinate = – 5 (B) y coordinate = 5 only

(C) y coordinate = – 5 only (D) y coordinate = 5 or –5

13. On plotting the points O (0, 0), A (3, 0), B (3, 4), C (0, 4) and joining OA, AB, BC and CO which of the following figure is obtained?

(A) Square (B) Rectangle (C) Trapezium (D) Rhombus

14. If P (– 1, 1), Q (3, – 4), R(1, –1), S(–2, –3) and T (– 4, 4) are plotted on the graph paper, then the point(s) in the fourth quadrant are

(A) P and T (B) Q and R (C) Only S (D) P and R

15. If the coordinates of the two points are P (–2, 3) and Q(–3, 5), then (abscissa of P) – (abscissa of Q) is

(A) – 5 (B) 1 (C) – 1 (D) – 2

16. If P (5, 1), Q (8, 0), R (0, 4), S (0, 5) and O (0, 0) are plotted on the graph paper, then the point(s) on the x-axis are

(A) P and R (B) R and S (C) Only Q (D) Q and O

17. Abscissa of a point is positive in

(A) I and II quadrants (B) I and IV quadrants

(C) I quadrant only (D) II quadrant only

18. The points whose abscissa and ordinate have different signs will lie in

(A) I and II quadrants
(B) II and III quadrants
(C) I and III quadrants
(D) II and IV quadrants

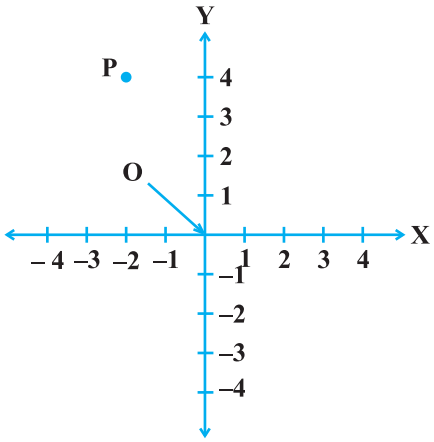

Fig. 3.1

19. In Fig. 3.1, coordinates of P are

(A) (– 4, 2) (B) (–2, 4)
(C) (4, – 2) (D) (2, – 4)

20. In Fig. 3.2, the point identified by the coordinates (–5, 3) is

(A) T (B) R
(C) L (D) S

21. The point whose ordinate is 4 and which lies on *y*-axis is

(A) (4, 0) (B) (0, 4)
(C) (1, 4) (D) (4, 2)

22. Which of the points P(0, 3), Q(1, 0), R(0, – 1), S(–5, 0), T(1, 2) do not lie on the *x*-axis?

(A) P and R only
(B) Q and S only
(C) P, R and T
(D) Q, S and T

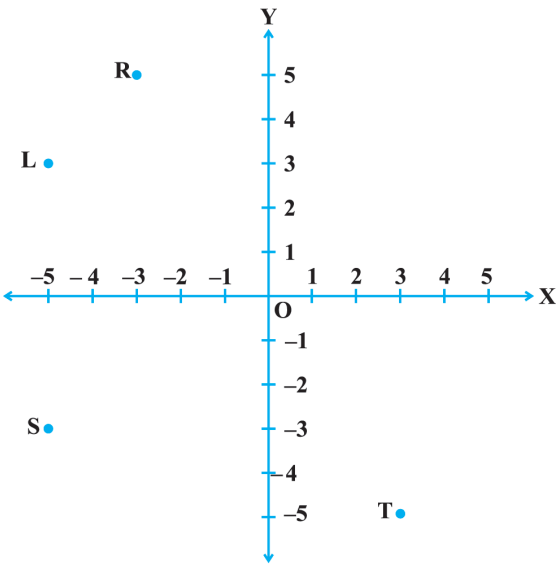

Fig. 3.2

23. The point which lies on *y*-axis at a distance of 5 units in the negative direction of *y*-axis is

(A) (0, 5) (B) (5, 0)
(C) (0, – 5) (D) (– 5, 0)

24. The perpendicular distance of the point P (3, 4) from the *y*-axis is

(A) 3 (B) 4
(C) 5 (D) 7

(C) Short Answer Questions with Reasoning

Sample Question 1 : Write whether the following statements are **True** or **False**? Justify your answer.

(i) Point (0, –2) lies on *y*-axis.

(ii) The perpendicular distance of the point (4, 3) from the *x*-axis is 4.

Solution :

(i) True, because a point on the *y*-axis is of the form (0, *y*).

(ii) False, because the perpendicular distance of a point from the *x*-axis is its ordinate. Hence it is 3, not 4.

EXERCISE 3.2

1. Write whether the following statements are True or False? Justify your answer.

(i) Point (3, 0) lies in the first quadrant.

(ii) Points (1, –1) and (–1, 1) lie in the same quadrant.

(iii) The coordinates of a point whose ordinate is $-\frac{1}{2}$ and abscissa is 1 are $-\frac{1}{2}, 1$.

(iv) A point lies on *y*-axis at a distance of 2 units from the *x*-axis. Its coordinates are (2, 0).

(v) (–1, 7) is a point in the II quadrant.

(D) Short Answer Questions

Sample Question 1 : Plot the point P (– 6, 2) and from it draw PM and PN as perpendiculars to *x*-axis and *y*-axis, respectively. Write the coordinates of the points M and N.

Solution :

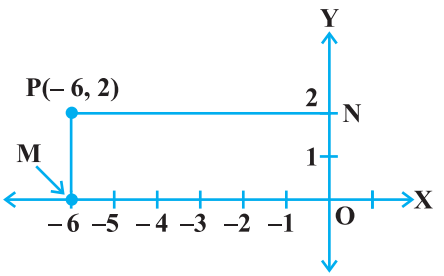

Fig. 3.3

From the graph, we see that M(– 6, 0) and N(0, 2).

Sample Question 2 : From the Fig. 3.4, write the following:

(i) Coordinates of B, C and E

(ii) The point identified by the coordinates (0, – 2)

(iii) The abscissa of the point H

(iv) The ordinate of the point D

Solution :

(i) B = (–5, 2), C(–2, –3), E = (3, –1)

(ii) F

(iii) 1

(iv) 0

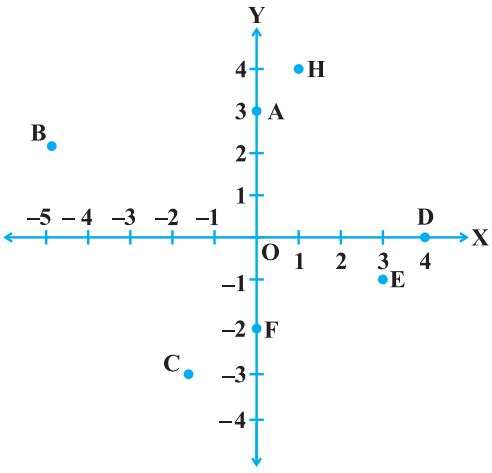

Fig. 3.4

EXERCISE 3.3

1. Write the coordinates of each of the points P, Q, R, S, T and O from the Fig. 3.5.

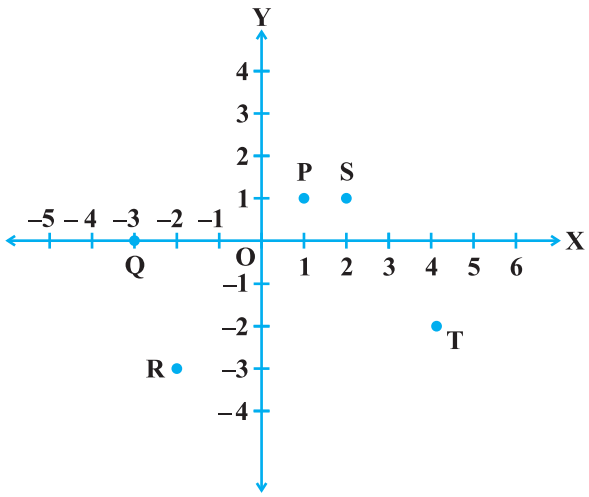

Fig. 3.5

2. Plot the following points and write the name of the figure obtained by joining them in order:

P(– 3, 2), Q (– 7, – 3), R (6, – 3), S (2, 2)

3. Plot the points (x, y) given by the following table:

x	2	4	– 3	– 2	3	0
y	4	2	0	5	– 3	0

4. Plot the following points and check whether they are collinear or not :

(i) (1, 3), (– 1, – 1), (– 2, – 3)

(ii) (1, 1), (2, – 3), (– 1, – 2)

(iii) (0, 0), (2, 2), (5, 5)

5. Without plotting the points indicate the quadrant in which they will lie, if

(i) ordinate is 5 and abscissa is – 3

(ii) abscissa is – 5 and ordinate is – 3

(iii) abscissa is – 5 and ordinate is 3

(iv) ordinate is 5 and abscissa is 3

6. In Fig. 3.6, LM is a line parallel to the y-axis at a distance of 3 units.

(i) What are the coordinates of the points P, R and Q?

(ii) What is the difference between the abscissa of the points L and M?

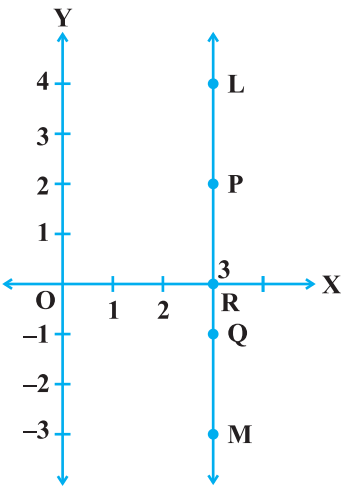

Fig. 3.6

7. In which quadrant or on which axis each of the following points lie?

(– 3, 5), (4, – 1), (2, 0), (2, 2), (– 3, – 6)

8. Which of the following points lie on y-axis?

A (1, 1), B (1, 0), C (0, 1), D (0, 0), E (0, – 1), F (– 1, 0), G (0, 5), H (– 7, 0), I (3, 3).

9. Plot the points (x, y) given by the following table. Use scale 1 cm = 0.25 units

x	1.25	0.25	1.5	– 1.75
y	– 0.5	1	1.5	– 0.25

10. A point lies on the x-axis at a distance of 7 units from the y-axis. What are its coordinates? What will be the coordinates if it lies on y-axis at a distance of –7 units from x-axis?

11. Find the coordinates of the point

(i) which lies on x and y axes both.

(ii) whose ordinate is – 4 and which lies on y-axis.

(iii) whose abscissa is 5 and which lies on x-axis.

12. Taking 0.5 cm as 1 unit, plot the following points on the graph paper :

A (1, 3), B (– 3, – 1), C (1, – 4), D (– 2, 3), E (0, – 8), F (1, 0)

(E) Long Answer Questions

Sample Question 1 : Three vertices of a rectangle are (3, 2), (– 4, 2) and (– 4, 5). Plot these points and find the coordinates of the fourth vertex.

Solution : Plot the three vertices of the rectangle as A(3, 2), B(– 4, 2), C(– 4, 5) (see Fig. 3.7).

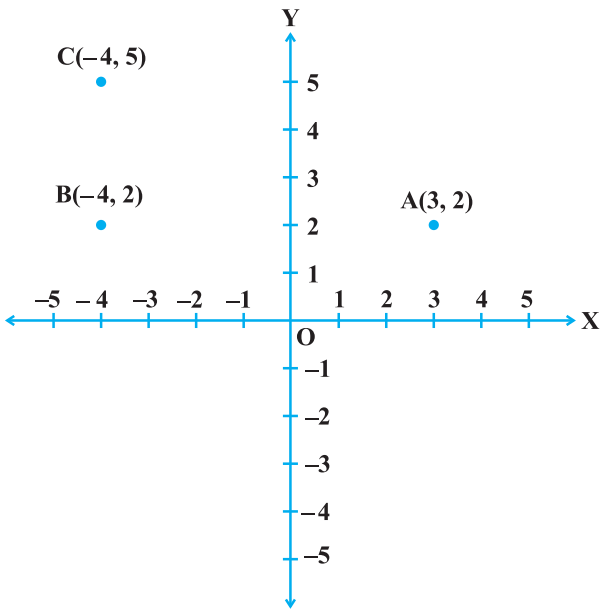

Fig. 3.7

We have to find the coordinates of the fourth vertex D so that ABCD is a rectangle.

Since the opposite sides of a rectangle are equal, so the abscissa of D should be equal to abscissa of A, i.e., 3 and the ordinate of D should be equal to the ordinate of C, i.e., 5.

So, the coordinates of D are (3, 5).

EXERCISE 3.4

1. Points A (5, 3), B (– 2, 3) and D (5, – 4) are three vertices of a square ABCD. Plot these points on a graph paper and hence find the coordinates of the vertex C.

2. Write the coordinates of the vertices of a rectangle whose length and breadth are 5 and 3 units respectively, one vertex at the origin, the longer side lies on the *x*-axis and one of the vertices lies in the third quadrant.

3. Plot the points P (1, 0), Q (4, 0) and S (1, 3). Find the coordinates of the point R such that PQRS is a square.

4. From the Fig. 3.8, answer the following :

(i) Write the points whose abscissa is 0.

(ii) Write the points whose ordinate is 0.

(iii) Write the points whose abscissa is – 5.

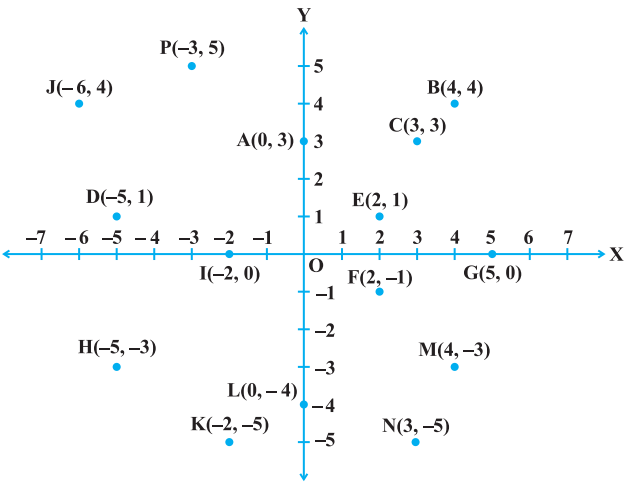

Fig. 3.8

5. Plot the points A (1, – 1) and B (4, 5)

(i) Draw a line segment joining these points. Write the coordinates of a point on this line segment between the points A and B.

(ii) Extend this line segment and write the coordinates of a point on this line which lies outside the line segment AB.