MATHEMATICS

Class-IX

Topic-3

COORDINATE GEOMETRY

INDEX

CH-03

COORDINATE GEOMETRY

A. INTRODUCTION TO COORDINATE GEOMETRY

(a) Co-ordinate system

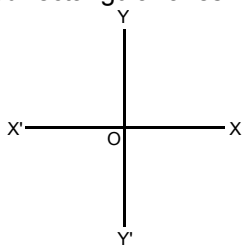
In two dimensional coordinate geometry, we use generally two types of co-ordinate system.

(i) Cartesian or Rectangular co-ordinate system : In Cartesian co-ordinate system we represent any point by **ordered pair (x,y)**, where **x** and **y** are called **X** and **Y** co-ordinate of that point respectively.

(ii) Polar co-ordinate system : In polar co-ordinate system we represent any point by ordered pair **(r, θ)** where **'r'** is called **radius vector** and **'θ'** is called **vectorial angle** of that point.

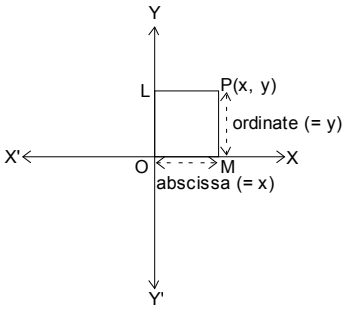
(b) Rectangular Coordinates

Take two perpendicular lines **X'OX** and **Y'OY** intersecting at the point **O**. **X'OX** and **Y'OY** are called the co-ordinate axes. **X'OX** is called the **X-axis**, **Y'OY** is called the **Y-axis** and **O** is called the origin. Lines **X'OX** and **Y'OY** are also called rectangular axes.



(i) Co-ordinates of a Point :

Let **P** be any point as shown in figure. Draw **PL** and **PM** perpendiculars on **Y- axis** and **X - axis**, respectively. The algebric length **LP (or OM)** is called the x **- coordinate** or the **abscissa of point P** and **MP** is called the **y-coordinate** or the **ordinate of point P**. A point whose abscissa is **x** and ordinate is **y** is named as the point **(x, y) or P (x, y).**



The two lines **X'OX** and **Y'OY** divide the plane into four parts called **quadrants**. **XOY, YOX', X'OY'** and **Y'OX** are, respectively, called the first, second, third and fourth quadrants. The following table shows the signs of the coordinates of points situated in different quadrants :

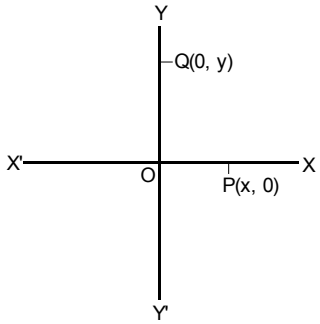
Quadrant	X - coordinate	Y - coordinate	Point
First quadrant	+	+	(+, +)
Second quadrant	–	+	(–, +)
Third quadrant	–	–	(–, –)
Fourth quadrant	+	–	(+, –)

REMARKS :

- Abscissa is the algebraic perpendicular distance of a point from **y-axis**. (i.e., positive to the right of **y-axis** or negative to the left of **y-axis**)
- **Ordinate** is positive above **x-axis** or negative below **x-axis**.
- **Abscissa** of any point on **y-axis** is zero.
- **Ordinate** of any point on **x-axis** is zero.
- Co-ordinates of the **origin** are **(0,0)**.

(ii) Points on Axes :

If point P lies on **X-axis** then clearly its distance from **X-axis** will be **zero**, therefore we can say that its **Y-coordinate** will be **zero**. Similarly if any point Q lies on **Y-axis**, then its distance from **Y-axis** will be **zero** therefore we can say its **X-coordinate** will be **zero**.



(iii) Plotting the Points :

In order to plot the points in a plane, we may use the following algorithm.

Step I : Draw two mutually perpendicular lines on the graph paper, one horizontal and other vertical.

Step II : Mark their intersection point as **O** (origin).

Step III : Choose a suitable scale on **X-axis** and **Y-axis** and mark the points on both the axis.

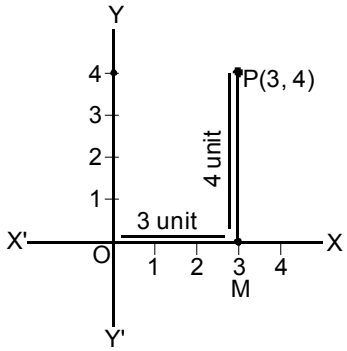
Step IV : Obtain the coordinates of the point which is to be plotted. Let the point be **P(a,b)**. To plot this point start from the origin and move **'a'** units along **OX** or **OX'** according as **'a'** is positive or negative respectively. Suppose we arrive at point **M**. From point **M** move vertically upward or downward **'b'** through units according as **'b'** is positive or negative. The point where we arrive finally is the required point **P (a, b)**.

Solved Examples

Example. 1

Plot the point (3, 4) on a graph paper.

Sol. Let x'ox and y'oy be the coordinate axis. Here given point is P(3,4), first we move 3 units along ox as 3 is positive then we arrive at point M. Now from M we move vertically upward as 4 is positive. Then we arrive at P(3,4).



Example. 2

Write the quadrants for the following points.

(i) A (3, 4) **(ii)** B (– 2, 3) **(iii)** C (– 5,– 2)
(iv) D (4, – 3) **(v)** E (– 5,– 5)

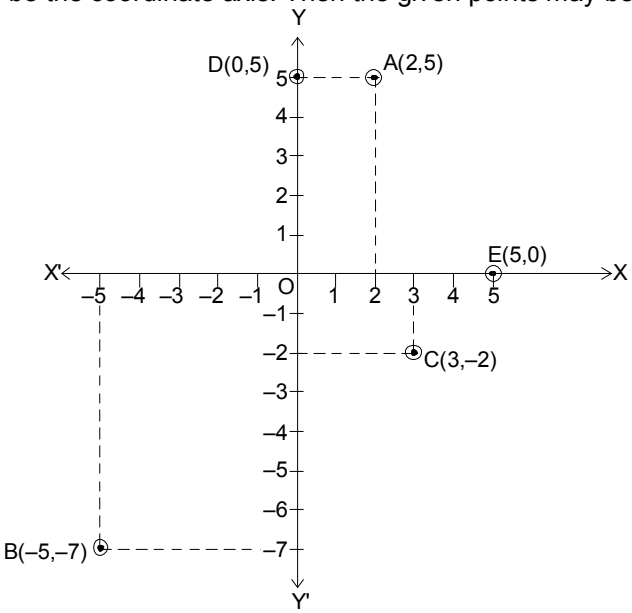
Sol.
(i) Here both coordinates are positive therefore point A lies in I^{st} quadrant.
(ii) Here x is negative and y is positive therefore point B lies in II^{nd} quadrant.
(iii) Here both coordinates are negative therefore point C lies in III^{rd} quadrant.
(iv) Here x is positive and y is negative therefore point D lies in IV^{th} quadrant.
(v) Here both coordinates are negative therefore point E lies in III^{rd} quadrant.

Example. 3

Plot the following points on the graph paper and also specify the quadrants or co-ordinate axes in which they lies :

(i) A (2, 5) **(ii)** B (– 5,– 7) **(iii)** C (3, – 2)
(iv) D (0, 5) **(v)** E (5, 0)

Sol. Let XOX' and YOY' be the coordinate axis. Then the given points may be plotted as given below :



(i) Here, both coordinates are positive therefore point A lies in Ist quadrant.
(ii) Here both coordinates are negative therefore point B lies in IIIrd quadrant.
(iii) Here x coordinate is positive and y coordinate is negative therefore point C lies in IVth quadrant.
(iv) Here x coordinate is zero and y coordinate is positive therefore point D lies on positive y- axis.
(v) Here x is positive and y is zero therefore point E lies on positive x - axis.

Check Your Level

1. Write down the quadrants in which the following points lie.

(a) (3, –7) **(b)** (–3, 7) **(c)** (– 2, –9) **(d)** (6, 0)
(e) (–2, 0) **(f)** (0, 8) **(g)** (4, 7)

2. What is the distance of the point (8, 3) from the
(i) x-axis **(ii)** y axis?

3. What is the distance of the point (4, 7) from the point (11, 7)?

4. What is the distance of the point (9, 8) from the point (9, – 12)?

5. What will be the figure obtained when the points A(4, 3), B(4, – 3), C(– 2, – 3) and D(– 2, 3) are connected in order? Plot the points.

Answers

1. **(a)** IV quadrant **(b)** II quadrant **(c)** III quadrant
(d) on positive x axis **(e)** on Negative x axis
(f) on Positive y axis **(g)** I quadrant
2. **(i)** 3 **(ii)** 8 **3.** 7 **4.** 20
5. Rectangle

Exercise Board Level

TYPE (I) : VERY SHORT ANSWER TYPE QUESTIONS : [01 MARK EACH]

1. Point (–3, 5) lies in which quadrant ?

2. What are the signs of the abscissa and ordinate of a point in the second quadrant ?

3. Find the abscissa of all the points on the y-axis ?

4. Find the quadrant of a point whose both the coordinates are negative ?

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

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

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

8. The points whose abscissa and ordinate have different signs will lie in which quadrant ?

9. Find the point whose ordinate is 4 and which lies on y-axis ?

10. Find the perpendicular distance of the point P (3, 4) from the y-axis ?

TYPE (II) : SHORT ANSWER TYPE QUESTIONS : [02 MARKS EACH]

11. 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.

12. 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)

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

x	2	4	–3	–2	3	0
y	4	2	0	5	–3	0

14. 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)

15. 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

16. 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).

17. 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 ?

18. 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.

19. 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)

TYPE (III) : LONG ANSWER TYPE QUESTIONS: **[03 MARK EACH]**

20. 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.

21. 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.

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

Exercise-1

SUBJECTIVE QUESTIONS

Subjective Easy, only learning value problems

Section (A) : Definltion of Current, Current Densities, Drift

A-1. Plot the points in the plane if its co-ordinates are given as A (5, 0), B (0, 3), C (7, 2), D (– 4, 3), E (– 3, – 2) and F(3, –2). Also find the quadrant or co-ordinate axes on which they lies.

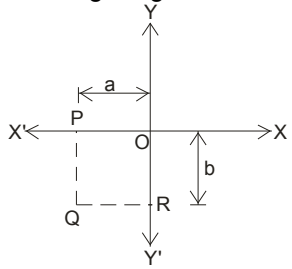
A-2. Plot the following pairs of numbers as points in the Cartesian plane.

x	– 3	– 2.5	8	4	0	– 5
y	5	0	3.5	8	– 2	– 1

A-3. Plot the points and find out the quadrants or axis on which the following point lies :

(i) P (– 7, 6) **(ii)** Q (0, 5.5) **(iii)** R $\left(-\frac{3}{2}, -2.5\right)$ **(iv)** S (6, –9)

A-4. In the figure given below, determine :



(i) Abscissa of point Q **(ii)** Ordinate of point Q
(iii) Coordinate of point Q

A-5. Write the coordinates of a point :
(a) above x-axis, lying on y-axis and at a distance of 6 units.
(b) lying on x-axis to the left of origin and at distance of 3 units.

A-6. With rectangular axes, plot the points O (0, 0), A (4, 0) and C (0, 6). Find the coordinates of the fourth point B such that OABC forms a rectangle.

A-7. Plot the points P (–3, 1) and Q (2, 1) in a rectangular coordinate system and find all possible coordinates of other two vertices of a square having P and Q as two adjacent vertices.

OBJECTIVE QUESTIONS

Single Choice Objective, straight concept/formula oriented

Section (A) : Definition of Current, Current Densities, Drift

A-1. The abscissa of a point is distance of that point from :
(A) X-axis (B) Y-axis (C) Origin (D) None of these

A-2. The y co-ordinate of a point is distance of that point from :
(A) X-axis (B) Y-axis (C) Origin (D) None of these

A-3. If both co-ordinates of any point are negative then that point will lie in :
(A) First quadrant (B) Second quadrant (C) Third quadrant (D) Fourth quadrant

A-4. If the abscissa of any point is zero then that point will lie :
(A) on X-axis (B) on Y-axis (C) at origin (D) None of these

A-5. The distance of the point (3, 5) from X-axis is :
(A) $\sqrt{35}$ (B) 3 (C) 5 (D) None of these

A-6. Position of point (– 6, 0) on graph paper is :
(A) OY' (B) OX'
(C) in the second quadrant (D) in the fourth quadrant

A-7. Point (0,4) lies :
(A) In I quadrant (B) On x axis (C) On y axis (D) In IV quadrant

A-8. The points (-5,2) and (2,–5) lie in the :
(A) same quadrants (B) II and III quadrants respectively
(C) II and IV quadrants respectively (D) IV and III quadrants respectively

A-9. Which of the following points lie on the negative side of x -axis ?
(A) (–4,0) (B) (– 3, 2) (C) (0, – 4) (D) (5, –7)

A-10. Ordinate of a point is negative in :
(A) III and IV quadrant (B) III quadrant only (C) II and III quadrant (D) IV quadrant only

Answer Key

BOARD LEVEL EXERCISE

TYPE (I)

1. Second Quadrant **2.** (– , +) **3.** 0 **4.** Third Quadrant

5. On x-axis **6.** Q & R **7.** 1

8. Second & Fourth Quadrants **9.** (0 , 4) **10.** 3

TYPE (II)

11. M(– 6, 0) and N(0, 2). **12.** Trapezium PQRS.

14. **(i)** Yes **(ii)** No **(iii)** Yes

15. **(i)** Second Quadrant **(ii)** Third Quadrant
(iii) Second Quadrant **(iv)** First Quadrant

16. C , D , E, G **17.** (7 , 0) & (0 – 7)

18. **(i)** (0 , 0) **(ii)** (0 , – 4) **(iii)** (5 , 0)

TYPE (III)

20. (0, 0), (– 5, 0) , (0, – 3) & (– 5, – 3) **21.** (4, 3) **22.** (3, 5)

EXERCISE - 1

SUBJECTIVE QUESTIONS

Section (A)

A-1. A (5, 0) : Here x is positive and y co-ordinate is zero. So, A lies on positive x - axis.
B (0, 3) : Here x co-ordinate is zero and y coordinate is positive. So, B lies on positive y - axis.
C (7, 2) : Here both coordinates are positive therefore point C lies in I^{st} quadrant.
D (– 4, 3) : Here x is negative and y co-ordinate is positive therefore point D lies in II^{nd} quadrant.
E (– 3, – 2) : Here both coordinates are negative therefore point E lies in III^{rd} quadrant.
F (3, – 2) : Here x is positive and y co-ordinate is negative therefore point F lies in IV^{th} quadrant.

A-3. P (– 7, 6) : Here x is negative and y co-ordinate is positive. So, P lies in II^{nd} quadrant.
Q (0, 5.5) : Here x co-ordinate is zero and y coordinate is positive. So, Q lies on positive y - axis.
R (– 1.5, – 2.5) : Here both coordinates are negative therefore point R lies in III^{rd} quadrant.
S (6, – 9) : Here x is positive and y co-ordinate is negative therefore point S lies in IV^{th} quadrant.

A-4. **(i)** Abscissa of point Q = – a
(ii) Ordinate of point Q = – b
(iii) Co - ordinate of point Q = (– a, – b)

A-5. **(a)** Coordinate of point above x - axis, lying on y - axis and at a distance of 6 units is (0, 6).
(b) Coordinate of point lying on x - axis to the left of origin and at distance of 3 units is (– 3, 0).

A-6. (4, 6).

A-7. R' (2, – 4) and S' (– 3, – 4). or
R (2, 6) and S (– 3, 6)

OBJECTIVE QUESTIONS

Section (A)

A-1. (B) **A-2.** (A) **A-3.** (C) **A-4.** (B) **A-5.** (C)

A-6. (B) **A-7.** (C) **A-8.** (C) **A-9.** (A) **A-10.** (A)