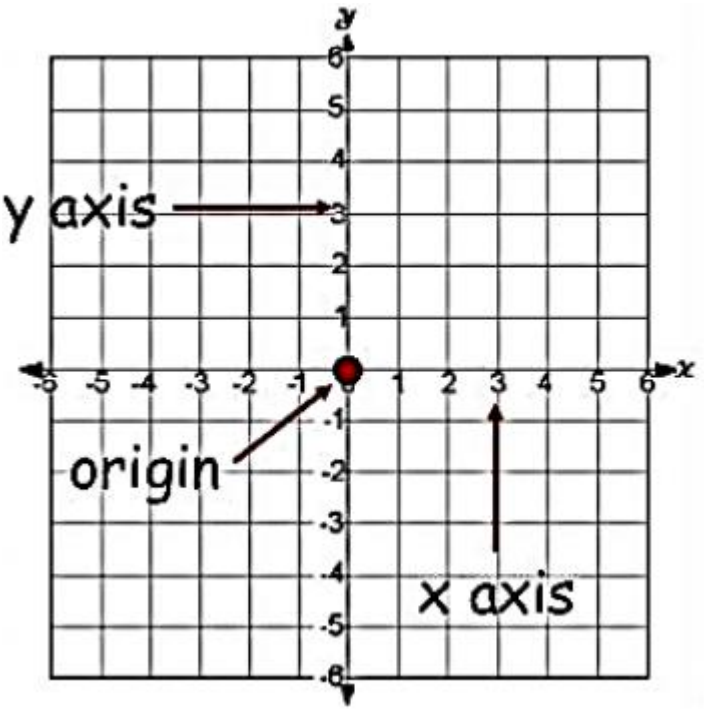
Chapter- 3

# CO-ORDINATE GEOMETRY

**STUDY NOTES**

**Cartesian System**

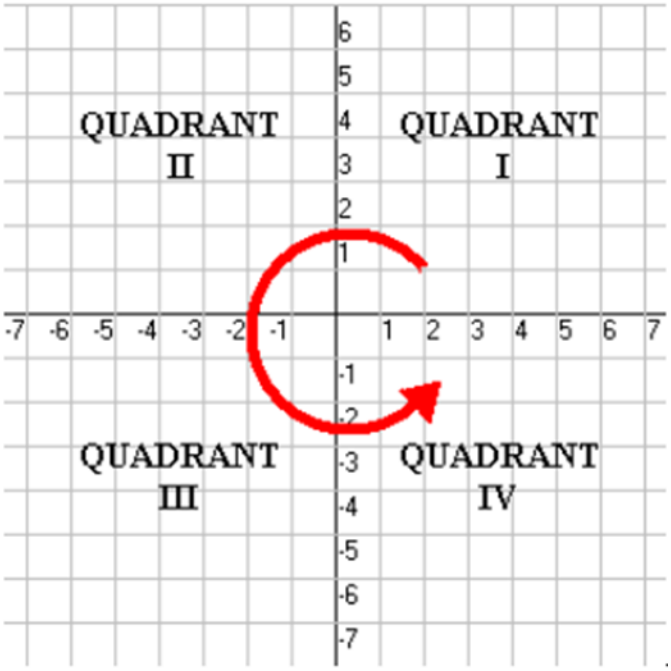
If we take two number lines, one horizontal and one vertical, and then combine them in such a way that they intersect each other at their zeroes, and then they form a **Cartesian Plane.**




- The horizontal line is known as **the x-axis** and the vertical line is known as the **y-axis**.
- The point where these two lines intersects each other is called the **origin**. It is represented as 'O'.
- OX and OY are the positive directions as the positive numbers lie in the right and upward direction.
- Similarly, the left and the downward directions are the negative directions as all the negative numbers lie there.

**Quadrants of the Cartesian Plane**

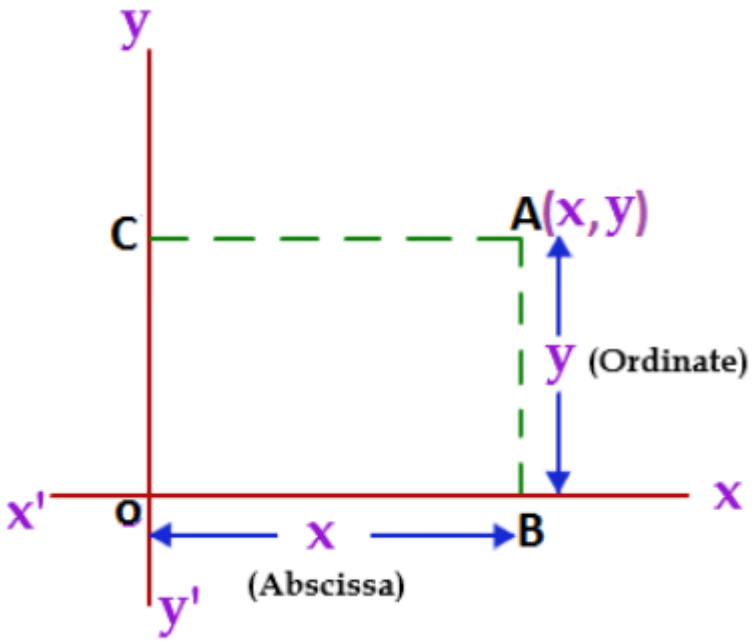
The Cartesian plane is dividing into four quadrants named as **Quadrant I, II, III, and IV** anticlockwise from OX.




**Coordinates of a Point**

To write the coordinates of a point we need to follow these rules-

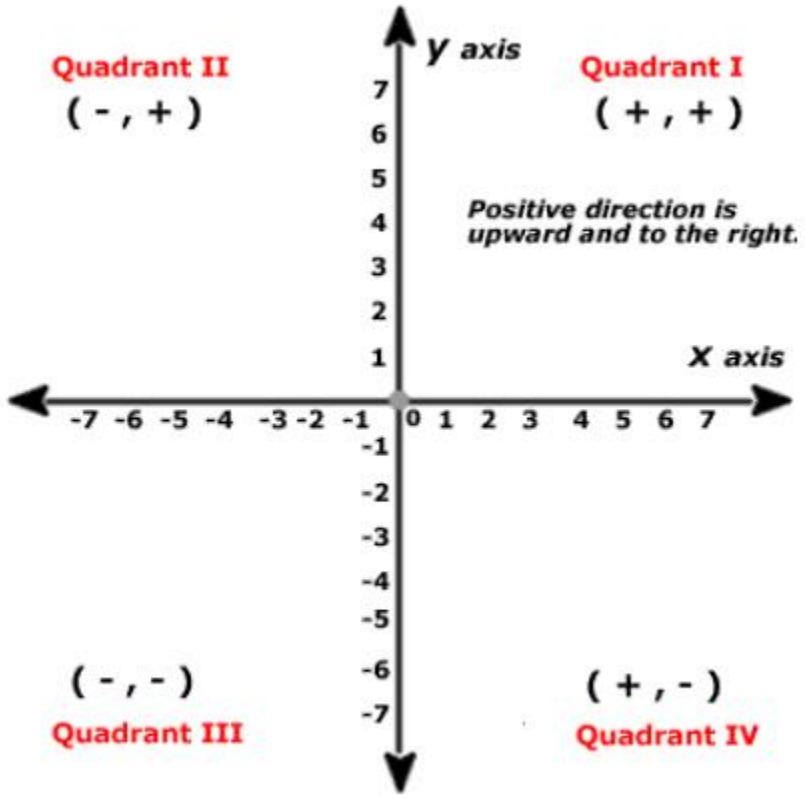
- The **x - coordinate** of a point is marked by drawing perpendicular from the y-axis measured a length of the x-axis .It is also called the **Abscissa.**
- The **y - coordinate** of a point is marked by drawing a perpendicular from the x-axis measured a length of the y-axis .It is also called the **Ordinate.**
- While writing the coordinates of a point in the coordinate plane, the x - coordinate comes first, and then the y - coordinate. We write the coordinates in brackets.



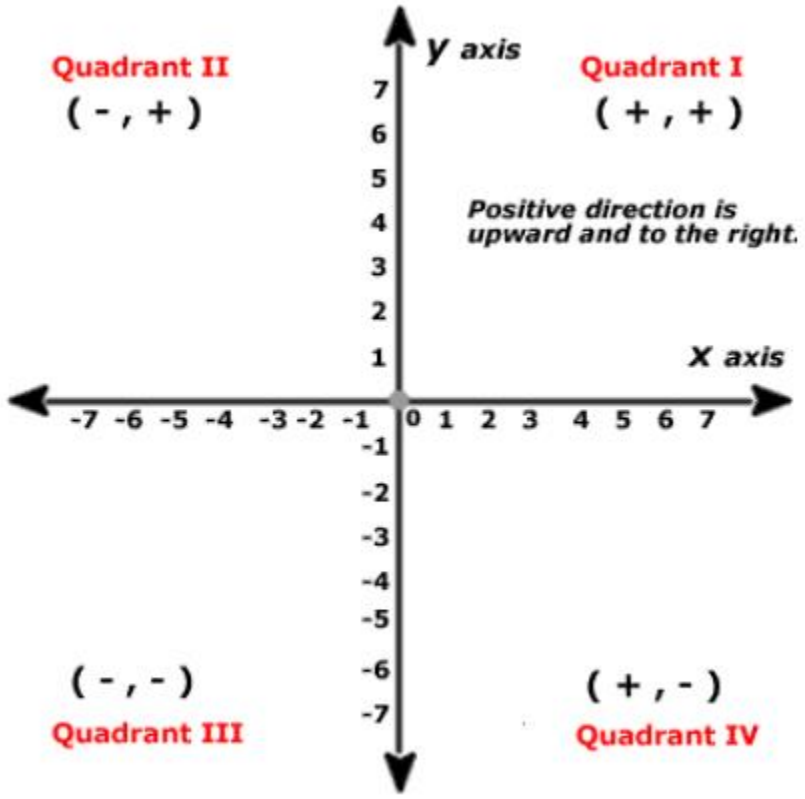

In the above figure, OB = CA = x coordinate (Abscissa), and CO = AB = y coordinate (Ordinate).

We write the coordinate as (x, y).

**Remark:** As the origin O has zero distance from the x-axis and the y-axis so its abscissa and ordinate are zero. Hence the **coordinate of the origin is (0, 0)**.




| Quadrant | Coordinate | Sign in the quadrant |
|---|---|---|
| I | (+, +) | 1st quadrant is enclosed by the positive x-axis and the positive y-axis. |
| II | (-, +) | 2nd quadrant is enclosed by the negative x-axis and the positive y-axis. |
| III | (-, -) | 3rd quadrant is enclosed by the negative x-axis and the negative y-axis. |
| IV | (+, -) | 4th quadrant is enclosed by the positive x-axis and the negative y-axis |




Steps to plot the point (2, 3) on the Cartesian plane -

- First of all, we need to draw the Cartesian plane by drawing the coordinate axes with 1 unit = 1 cm.
- To mark the x coordinates, starting from 0 moves towards the positive x-axis and count to 2.
- To mark the y coordinate, starting from 2 moves upwards in the positive direction and count to 3.
- Now this point is the coordinate (2, 3)

Likewise, we can plot all the other points, like (-3, 1) and (-1.5,-2.5) in the right site figure.

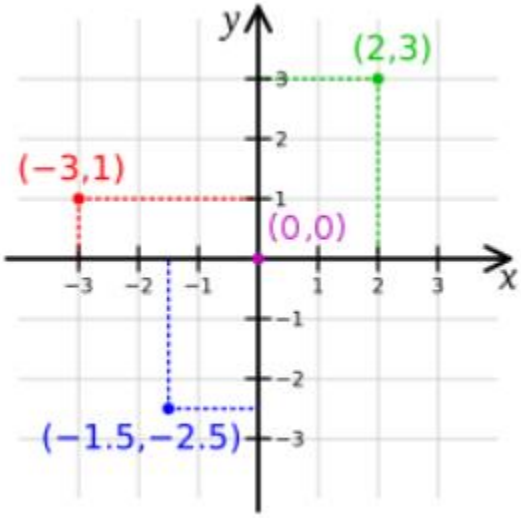
**Is the coordinates (x, y) = (y, x)?**

Let x = (-4) and y = (-2)

So (x, y) = (- 4, – 2)

(y, x) = (- 2, - 4)

Let's mark these coordinates on the Cartesian plane.



You can see that the positions of both the points are different in the Cartesian plane. So,

**If x ≠ y, then (x, y) ≠ (y, x), and (x, y) = (y, x), if x = y.**

**Example:**

Plot the points (6, 4), (- 6,- 4), (- 6, 4) and (6,- 4) on the Cartesian plane.

**Solution:**

As you can see in (6, 4) both the numbers are positive so it will come in the first quadrant.

For x coordinate, we will move towards the right and count to 6.

Then from that point go upward and count to 4.

Mark that point as the coordinate (6, 4).