## **Coordinate Geometry**

(1) Number line: It is a line on which numbers are marked at definite intervals. *For Example*:



On the number line, distances from a fixed point are marked in equal units' positively in one direction and negatively in the other direction.

*Origin:* It is the point from which the distances are marked in positive and negative direction. In the figure, 0 denotes the origin.

(2) Cartesian System: It is the system of fixing a point with the help of two measurements which are vertical and horizontal lines.



(i) The figure above shows a Cartesian system formed by combining a vertical and horizontal line.(ii) The horizontal line X'X is called the x-axis and the vertical line YY' is called the y-axis.

(iii) Origin : It is the point where X'X and Y'Y intersect each other. It is denoted by O.
(iv) The positive numbers lie on the directions OX and OY, hence, OX and OY are called the positive directions of the x-axis and y-axis respectively. And the negative numbers lie on the directions OX' and OY', hence, OX' and OY' are called the negative directions of the x-axis respectively.



(v) Here, the axes divide the plane into four parts. These four parts are called the quadrants.(vi) Relationship between signs of coordinates of a point and the quadrant of a point:

(a) If a point is in the 1st quadrant, then the point will be in the form (+, +), since the 1st quadrant is enclosed by the positive x – axis and the positive y – axis.

(b) If a point is in the 2nd quadrant, then the point will be in the form (-, +), since the 2nd quadrant is enclosed by the negative x – axis and the positive y – axis.

(c) If a point is in the 3rd quadrant, then the point will be in the form (-, -), since the 3rd quadrant is enclosed by the negative x – axis and the negative y – axis.

(d) If a point is in the 4th quadrant, then the point will be in the form (+, -), since the 4th quadrant is enclosed by the positive x – axis and the negative y – axis.



(vii) The plane is also called as Cartesian plane or coordinate plane or xy-plane. And the axes are called the coordinate axes.

## (3) Co-ordinates of a point:

(i) Consider the figure given below to understand the coordinates of a point.



(ii) For the given point A, it is observed that it is obtained after moving 2 units on x-axis and 3 units on y-axis.

(iii) X – coordinate: It is the perpendicular distance from y-axis measured along the x-axis. For the point A, it is +2. It is also called the abscissa.

(iv) Y – coordinate: It is the perpendicular distance from x-axis measured along the y-axis. For the point A, it is +3. It is also called the ordinate.

(v) The coordinates are stated in the brackets, the x-coordinate comes first then the y-cordinate. Hence, coordinates of point A are (2, 3).

(vi) The coordinates of origin are (0, 0). It has zero distance from both the axes so that its abscissa and ordinate are both zero.

*Note: The coordinates of each point in Cartesian system is unique. For example.* Write the coordinates of the points marked on the axes.



## From the figure,

(i) The coordinates of point A are (4, 0).

(ii) The coordinates of point B are (0, 3).

(iii) The coordinates of point C are (-5, 0).

(iv) The coordinates of point D are (0, -4).

(v) The coordinates of point E are (2/3, 0).

## (4) Plotting a Point in the Plane if its Coordinates are given:

To plot any given point (a, b), the distance of this point from the y – axis along the positive x – axis is 'a' units and the distance of the point from the x – axis along the positive y – axis is 'b' units. Hence, starting from the origin 0, we count 'a' units on the positive x – axis and mark the corresponding point. And starting from this point, we move in the positive direction of the y – axis and count b units and mark the corresponding point.

*For example*. Locate points (5, 0), (0, 5), (5, 2), (-3, 5), (-3, -5) and (5, -3) in the Cartesian plane. (i) The location of given different points is shown in the Cartesian plane below.

(ii) Here, scale is 1 cm = 1 unit for both x-axis and y-axis.

