CLASS – IX
MATHEMATICS
CHAPTER – 3
COORDINATE GEOMETRY

NOTES

Cartesian Co-ordinates

Rene Descartes, the great French mathematician and philosopher propounded a system of describing the position of a point in a plane. In honour of Descartes, this system used for describing the position of a point in a plane is known as the Cartesian System of Co-ordinates.

Rectangular Cartesian Co-ordinate System

To fix the position of a point P in a plane, we take two fixed perpendicular lines conventionally one horizontal and other vertical on the plane intersecting at a point. The horizontal line is called X-axis and the vertical line is called Y-axis. The plane with these two co-ordinate axes is known as the Cartesian plane. The point of intersection of the co-ordinate axes is called origin.

Quadrants

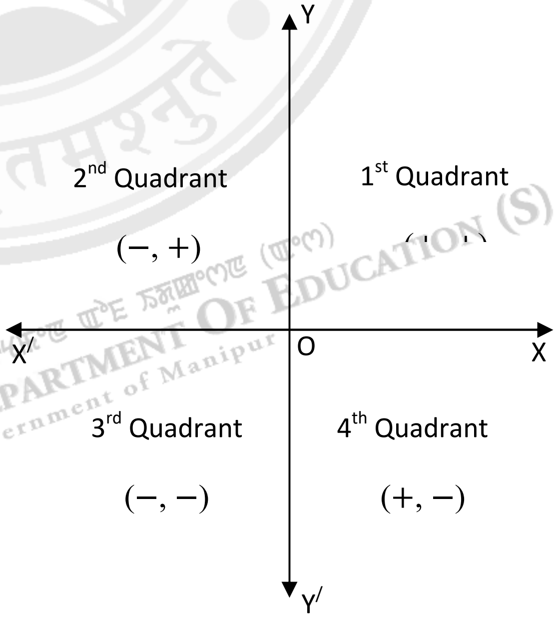
The co-ordinate axes divide the plane into four regions. Each region is called a Quadrant.

i) If a point lies in the 1st quadrant, the signs of its co-ordinates are of the form $(+, +)$.

ii) If a point lies in the 2nd quadrant, then the signs of its co-ordinates are of the form $(-, +)$.

iii) If a point lies in the 3rd quadrant, then the signs of its co-ordinates are of the form $(-, -)$.

iv) If a point lies in the 4th quadrant, then the sings of its co-ordinates are of the form $(+, -)$.



Note: (i) For a point $P(a, b)$ on the Cartesian plane, a is called the x – coordinate or abscissa and b is called the y – coordinate or ordinate of the point P.

(ii) If a point lies on the X-axis, its ordinate is zero and if a point lies on the Y-axis, its abscissa is zero.

Plotting of point on a plane:

The steps of locating a point with a given co-ordinates on a plane

Steps 1: We take the co-ordinate axes on the plane so that the origin is at a suitable position preferably at the middle of the plane

Steps 2: We choose the scale on the axes so that the point corresponding to the given co-ordinates may be shown in the plane

Steps 3: We check the sign of the abscissa. If it is positive, we take the required units starting from the origin O along the positive direction of the X-axis. If it is negative, w take required units starting from O along the negative direction of X-axis. If it is zero, it remains at O.

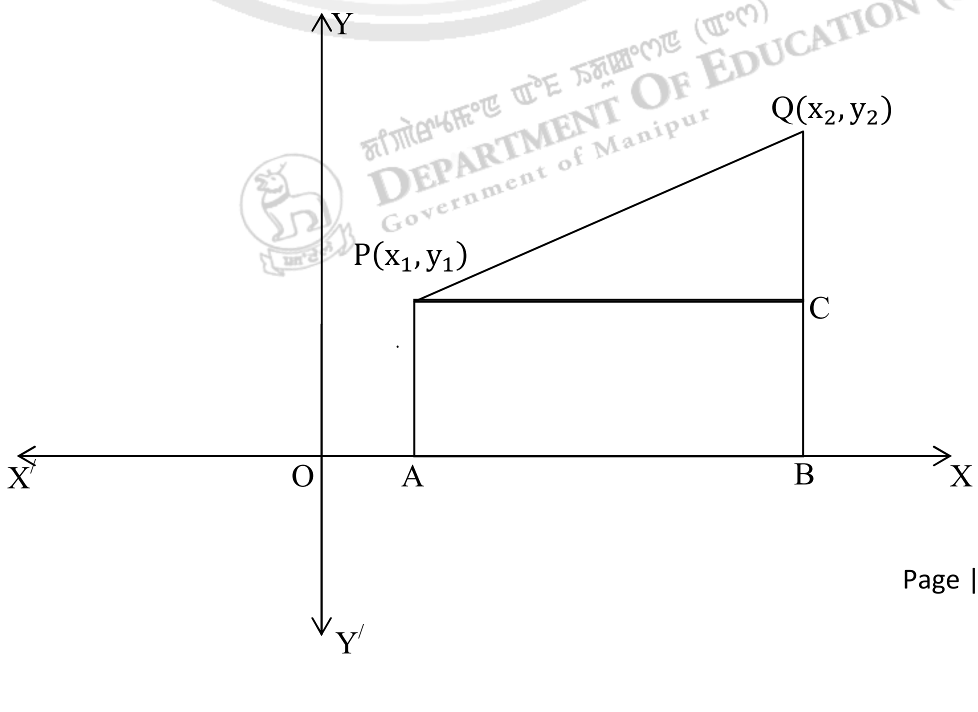
Steps 4: We name the point obtained in step 3, A (say).

Steps 5: We check the sign of the ordinate. If it is positive, we take the required units starting from A along the positive direction of the Y-axis. If it is negative, we take the required units starting from A along the negative direction of the Y-axis. If it is zero, it remains at A.

Steps 6: We name the point obtained in step 5, P (say).

Then P is the required point on the plane with the given co-ordinates.

Distance between two points:



Let XOX/ and YOY/ be the two co-ordinate axes. P (x_1, y_1) and Q(x_2, y_2) be any two points in the Cartesian plane. PA and QB are drawn perpendicular to the X- axis. PC is also drawn perpendicular to QB meeting QB at C.

We have $BC = AP = y_1$

$PC = AB = OB - OA = x_2 - x_1$

and $QC = QB - BC = QB - PA = y_2 - y_1$

In ∆PCQ, ∠PCQ= 90^0,

∴ by Pythgoras theorm, we have

$$PQ^2 = PC^2 + QC^2$$

$$\Rightarrow PQ^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$$

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

∴The distance between any two points P (x_1, y_1) and Q(x_2, y_2) is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Note:

1. The distance between any two points P (x_1, y_1) and Q(x_2, y_2) can also be taken as $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$
2. The distance of any point (x, y) from the origin O is $\sqrt{x^2 + y^2}$.

****