

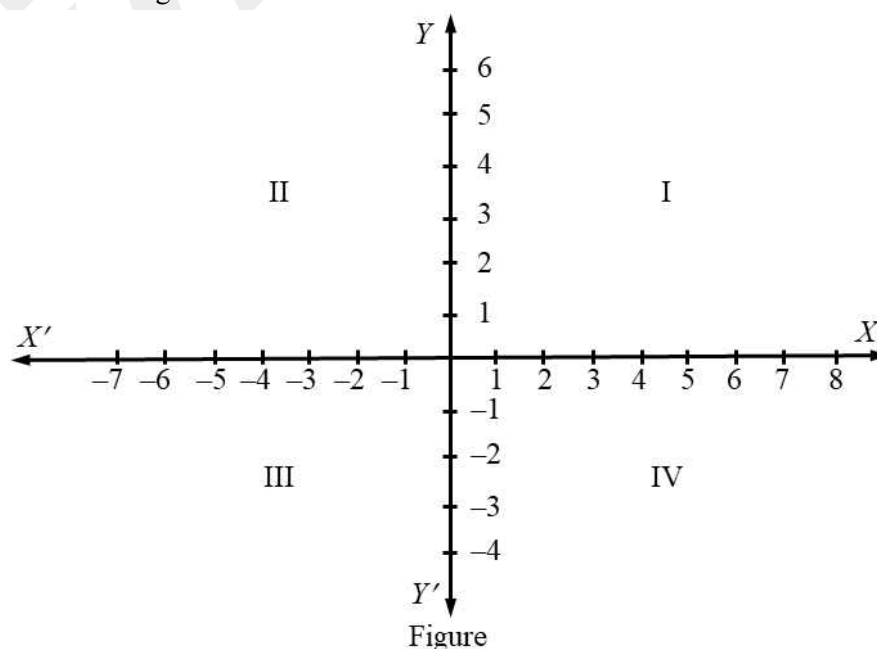
MATHEMATICS

CLASS NOTES FOR CBSE

Chapter 03. Coordinate Geometry

01. Cartesian Coordinate Axes

Cartesian Coordinate Axes Let $X'OX$ and $Y'OY$ be two mutually perpendicular lines through a point O in the plane of a graph paper as shown in Figure. The line $X'OX$ is called the x -axis or axis of x the line $Y'OY$ is known as the y -axis or axis of y , and the two lines $X'OX$ and $Y'OY$ taken together are called the coordinate axes or the axes of coordinates. The point O is called the origin.



Quadrants In Figure, the coordinate axes $X'OX$ and $Y'OY$ divide the plane of the graph paper into four regions XOY , $X'OY$, $X'OY'$ and $Y'OY'$ these four regions are called the quadrants. The regions XOY , $X'OY$, $X'OY'$ and $Y'OY'$ are known as the first, the second, the third and the fourth quadrants respectively.

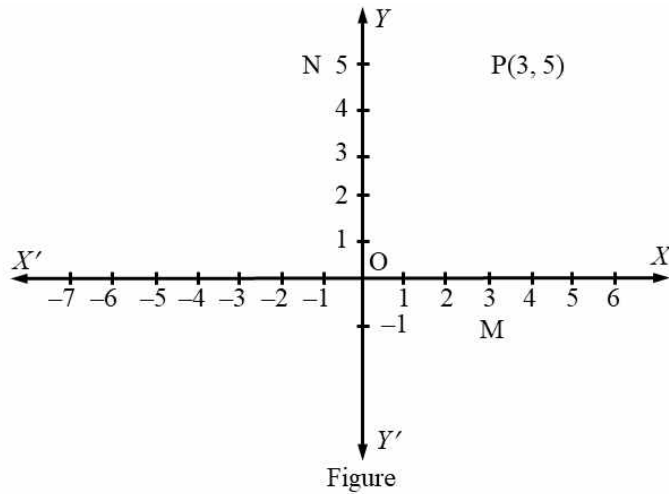
Cartesian Coordinates of A Point Let $X'OX$ and $Y'OY$ be the coordinate axes and let P be any point in the plane of the paper. Draw $PM \perp X'OX$ and $PN \perp Y'OY$.

The length of the line segment OM is called the x -coordinate or abscissa of point P and the length of the directed line segment ON is called the y -coordinate or ordinate of point P . If $OM = 3$ units and $ON = 5$ units, then the x -coordinate or abscissa of point P is 3 and the y -coordinate or ordinate of P is 5 and we say that the coordinates of P are $(3, 5)$. Note that $(3, 5)$ is an ordered pair in which the positions of 3 and 5 cannot be interchanged.



MISOSTUDY.COM

The Best Online Coaching for IIT-JEE | NEET Medical | CBSE INQUIRY +91 8929 803 804



Thus, for a given point P , the abscissa and ordinate are the distances of the point P from y -axis and x -axis respectively.

If we take a point on x -axis, then clearly the distance of this point from x -axis is 0 and therefore the ordinate of this point is 0.

Thus, the ordinate or y -coordinate of every point on x -axis is 0 and the coordinates of a point on x -axis are of the form $(x, 0)$.

Similarly, if we take a point on y -axis, then its distance from y -axis is 0 and therefore, the x -coordinate or abscissa of this point is 0.

Thus, the abscissa or x -coordinate of every point on y -axis is zero and the coordinates of a point on y -axis are of the form $(0, y)$.

The coordinate of the origin are taken as $(0, 0)$.

Convention of Signs Let $X'OX$ and $Y'OY$ be the coordinate axes. The ray OX is taken as positive x -axis, OX' as negative x -axis, OY as positive y -axis and OY' as negative y -axis. This means that any distance measure along OX will be taken as positive and the distance moved along OX' will be negative. Similarly, the distance moved along or parallel to OY will be taken as positive and the distance along OY' will be negative.

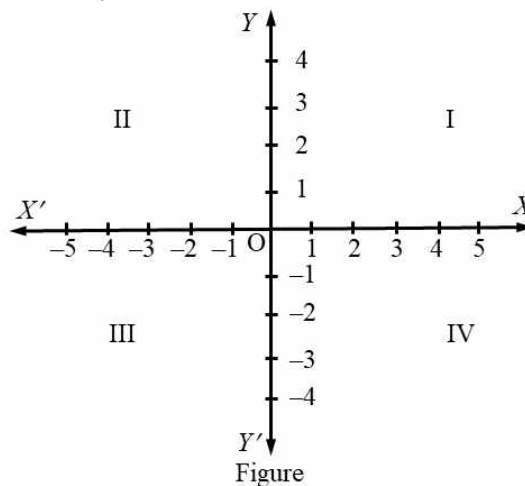
In view of the above sign convention, we find that:

In I quadrant : $x > 0, y > 0$

In II quadrant : $x < 0, y > 0$

In III quadrant : $x < 0, y < 0$

In IV quadrant : $x > 0, y < 0$.



MISOSTUDY.COM

The Best Online Coaching for IIT-JEE | NEET Medical | CBSE INQUIRY +91 8929 803 804

Example In which quadrant do the following points lie?

- (i) (4, 2) (ii) (-3, 5) (iii) (-2, -5) (iv) (4, -2).

Solution (i) In the point (4, 2) abscissa and ordinate both are positive, so it lies in the first quadrant.
 (ii) In the point (-3, 5) abscissa is negative and ordinate is positive, So, it lies in the second quadrant.
 (iii) The point (-2, -5) lies in the third quadrant.
 (iv) The point (4, -2) lies in the fourth quadrant.

02. Plotting of Points

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

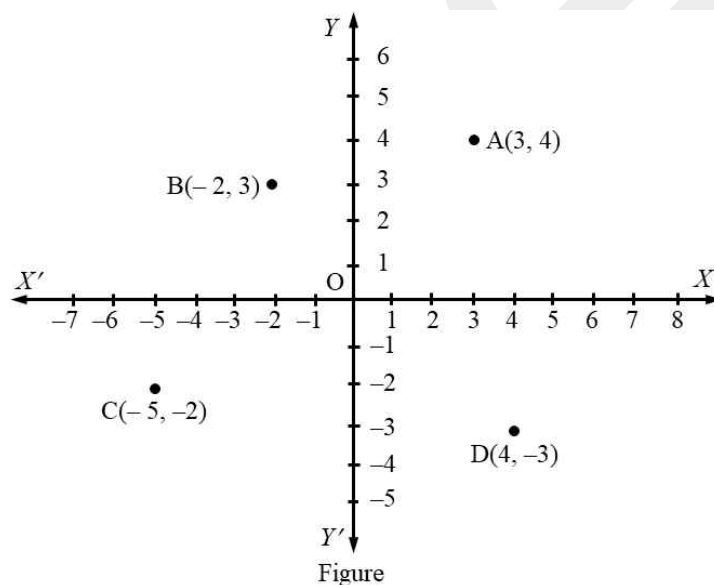
Algorithm

- 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). The horizontal line as $X'OX$ and the vertical line as $Y'OY$. The line $X'OX$ is the x -axis and the line $Y'OY$ as the y -axis.
Step III Choose a suitable scale on x -axis and y -axis and mark the points on both the axes.
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. Suppose we arrive at point M . From point M move vertically upward or downward through $|b|$ units according as b is positive or negative. The point where we arrive finally is the required point $P(a, b)$.

Example Plot the following points on a graph paper:

- (i) (3, 4) (ii) (-2, 3) (iii) (-5, -2) (iv) (4, -3).

Solution Let $X'OX$ and $Y'OY$ be the coordinate axes. Then the given four points may be plotted as given below:



MISOSTUDY.COM

The Best Online Coaching for IIT-JEE | NEET Medical | CBSE INQUIRY +91 8929 803 804