COORDINATE GEOMETRY

BASIC CONCEPT OF COORDINATE GEOMETRY

INTRODUCTION

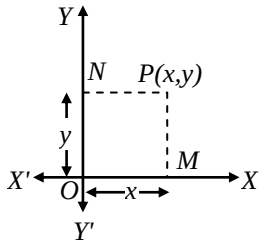
Coordinate geometry is that branch of geometry in which two numbers, called coordinates, are used to calculate the position of a point in a plane.

In this chapter we shall define the coordinates of a point in a plane with reference to two mutually perpendicular lines in the same plane. We shall study rectangular coordinate system and also how a straight line or a curve in a plane can be represented by an algebraic equation. Rene desecrates is known as the father of analytical or coordinate geometry.

CARTESIAN COORDINATES

Representation of points in the plane by ordered pairs of real numbers are called Cartesian coordinates of that point.

In Cartesian co-ordinates the position of a point P is determined by knowing the distances from two perpendicular lines passing through the fixed point. Let O be the fixed point called the origin and XOX′ and YOY′, the two perpendicular lines through O, called Cartesian or Rectangular co-ordinates axes.



Draw PM and PN perpendiculars on OX and OY respectively. OM (or MP) is called the y co-ordinate or the ordinate of the point P.

Axes of Co-ordinates

In the figure OX and OY are called as x-axis and y-axis respectively and both together are known as axes of co-ordinates.

Origin: It is point O of intersection of the axes of co-ordinates.

Co-ordinates of the Origin

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

Abscissa

The distance of the point P from y-axis is called its abscissa. In the figure, OM is the Abscissa.

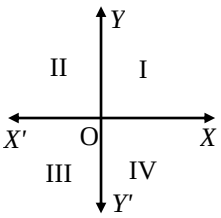
Ordinate

The distance of the point P from x-axis is called its ordinate. ON is the ordinate in the figure.

Quadrant

The axes divide the plane into four parts. These four parts are called quadrants. So, the plane consists of axes and quadrants. The plane is called the cartesian plane or the coordinate plane or the xy-plane. These axes are called the co-ordinate axes.

A quadrant is $\frac{1}{4}$ part of a plane divided by co-ordinate axes.



(i) XOY is called the first quadrant

(ii) YOX′ the second.

(iii) X′OY′ the third.

(iv) Y′OX the fourth

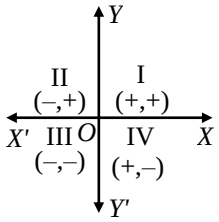
as marked in the figure.

(i) In the first quadrant, both co-ordiantes i.e., abscissa and ordinate of a point are positive.

(ii) In the second quadrant, for a point, abscissa is negative and ordinate is positive.

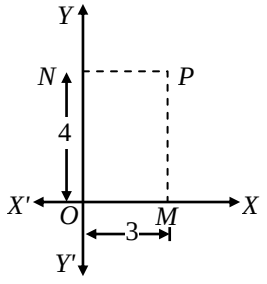
(iii) In the third quadrant, for a point, both abscissa and ordinate are negative.

(iv) In the fourth quadrant, for a point, the abscissa is positive and the ordinate is negative.



Quadrant	x-co-ordinate	y-co-ordinate	Point
First quadrant	+	+	(+,+)
Second quadrant	–	+	(–,+)
Third quadrant	–	–	(–,–)
Fourth quadrant	+	–	(+,–)

Ex.1 From the adjoining figure find



(i) Abscissa

(ii) Ordinate

(iii) Co-ordinates of a point P

Sol. (i) Abscissa = PN = OM = 3 units

(ii) Ordinate = PM = ON = 4 units

(iii) Co-ordinates of the point

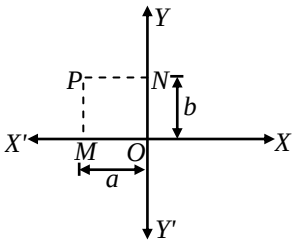
P = (Abscissa, ordinate) = (3, 4)

Ex.2 Determine

(i) Abscissa

(ii) ordinate

(iii) Co-ordinates of point P given in the following figure.



Sol. (i) Abscissa of the point P = – NP = – OM = – a

(ii) Ordinate of the point P = MP = ON = b

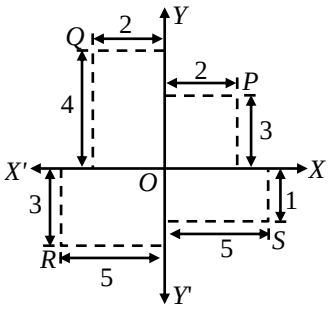
(iii) Co-ordinates of point P = (abscissa, ordinate) = (–a, b)

Ex.3 Write down the

(i) abscissa

(ii) ordinate

(iii) Co-ordinates of P, Q, R and S as given in the figure.



Sol. **Point P**

Abscissa of P = 2; Ordinate of P = 3

Co-ordinates of P = (2, 3)

Point Q

Abscissa of Q = – 2; Ordinate of Q = 4

Co-ordinate of Q = (–2, 4)

Point R

Abscissa of R = – 5; Ordinate of R = – 3

Co-ordinates of R = (–5, –3)

Point S

Abscissa of S = 5; Ordinate of S = – 1

Co-ordinates of S = (5, – 1)

Ex.4 Draw a triangle ABC where vertices A, B and C are (0, 2), (2, – 2), and (–2, 2) respectively.

Sol. Plot the point A by taking its abscissa O and ordinate = 2.

Similarly, plot points B and C taking abscissa 2 and –2 and ordinates – 2 and 2 respectively. Join A, B and C. This is the required triangle.