Co-ordinate Geometry

Co-ordinate Geometry is the branch of mathematics in which algebraic methods are used to solve geometrical problems.

Cartesian Plane

1. Two perpendicular number lines intersecting at point zero are called **coordinate axes**. The horizontal number line is the ***x*-axis** (denoted by *X'OX*) and the vertical one is the ***y*-axis** (denoted by *Y'OY*). The point of intersection of *x*-axis and *y*-axis is called **origin** and denoted by '*O*'.

2. **Cartesian plane** is a plane obtained by putting the coordinate axes perpendicular to each other in the plane. It is also called coordinate plane or *xy* plane.

3. The **x-coordinate** of a point is its perpendicular distance from *y*-axis.
   The **y-coordinate** of a point is its perpendicular distance from *x*-axis.

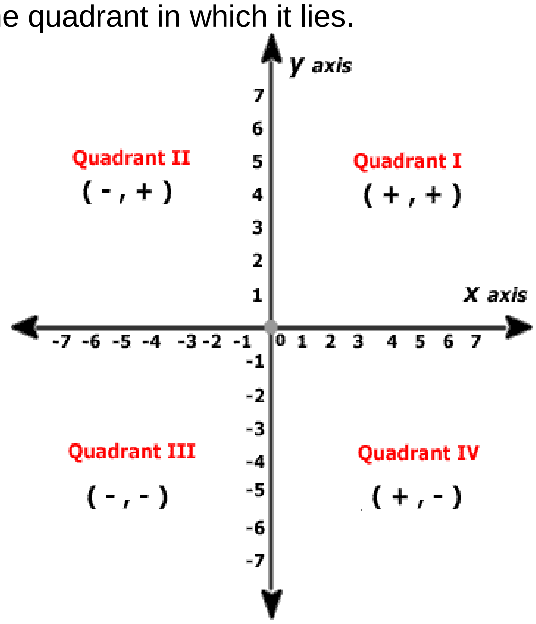
4. The point where the *x* axis and the *y* axis intersect is represented by coordinate points (0, 0) and is called the **origin**.

5. The **abscissa** of a point is the *x*-coordinate of the point. The **ordinate** of a point is the *y*-coordinate of the point.

6. If the abscissa of a point is *x* and the ordinate of the point is *y*, then (*x, y*) are called the **coordinates** of the point.

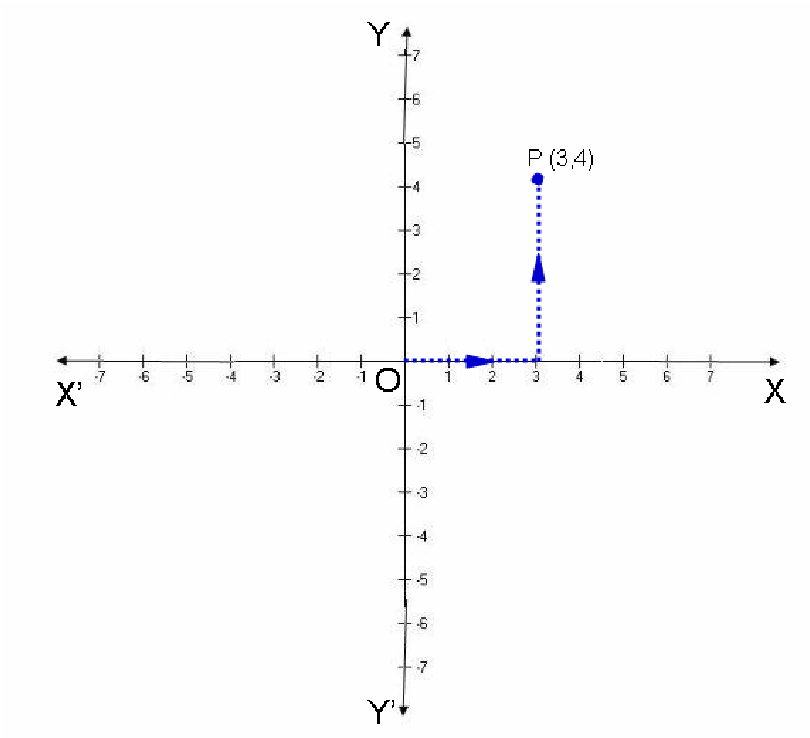
7. The axes divide the Cartesian plane into four parts called the **quadrants** (one fourth part), numbered I, II, III and IV anticlockwise from *OX*.

8. Sign of coordinates depicts the quadrant in which it lies.



9. The coordinates of a point on the *x*-axis are of the form (*x*, 0) and that of the point on *y*-axis are (0, *y*).

10. To plot a point P (3, 4) in the Cartesian plane, start from origin and count 3 units on the positive *x* axis then move 4 units towards positive *y* axis. The point at which we will arrive will be the point *P* (3, 4).



11. If $x \neq y$, then $(x, y) \neq (y, x)$ and if $(x, y) = (y, x)$, then $x = y$.

Graphing a Linear Equation

1. The Cartesian plane can be used to graph different kinds of situations from everyday life.

2. A line graph which is a whole unbroken line is called a linear graph.

3. Two quantities which vary directly can be plotted as a linear graph. Independent variable is generally taken on x axis the dependent variable is taken on y axis.

4. Steps to draw a graph:
   I. Find out the relation between y and x.
   II. Calculate different values of y corresponding to the values of x.
   III. Tabulate the results.
   IV. Plot the points.
   V. Join the points to obtain the graph.

5. By looking at a linear graph, we can find out the ‘y’ coordinate (or 'x' coordinate) in relation to any point on the ‘x’ axis (or 'y' axis).

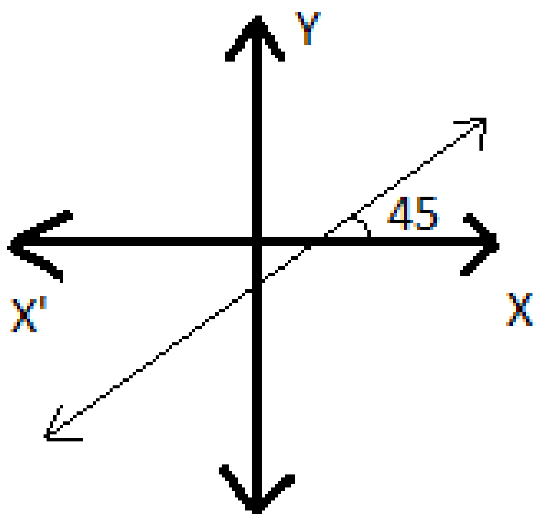
6. $x = 0$ is the equation of the y-axis and $y = 0$ is the equation of the x-axis.

Inclination and Slope

1. The angle which a straight line makes with the positive direction of the x-axis (measured in the anti-clockwise direction) is called inclination of the line.

   The inclination of the line is usually denoted by θ (theta).

   In the below figure, $\theta = 45^o$



2. If θ is the inclination of a line then slope of the line is tan θ and is usually denoted by letter m.

   Slope = m = tan θ.

   For x-axis and every line parallel to x-axis, the inclination $\theta = 0^o$.

   Hence, Slope (m) = tan θ = tan 0^o = 0

   For y-axis and every line parallel to y-axis, the inclination $\theta = 90^o$.

   Hence, Slope (m) = tan θ = tan 90^o = not defined

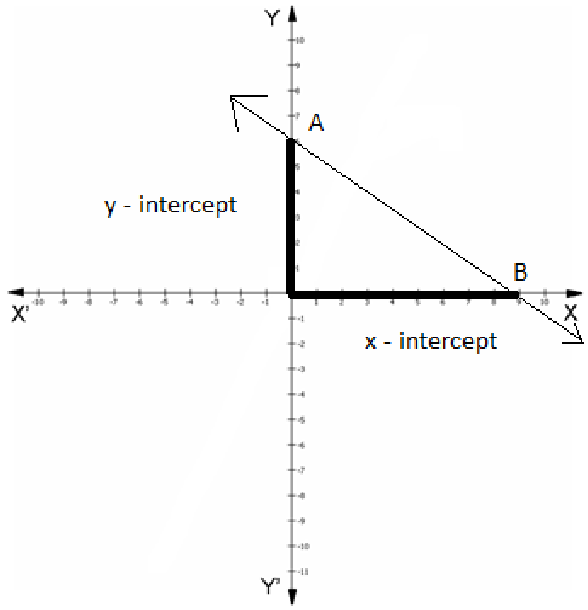
Y-Intercept

If a straight line meets y-axis at a point, the distance of this point from the origin is called y-intercept and is usually denoted by the letter c.

For x-axis, y-intercept = 0

For every, line parallel to y-axis, y-intercept = 0.

Y-intercept is positive if measure above the origin and negative if measured below the origin.



Steps to find Slope and the Y-Intercept of a given line (ax + by + c = 0):

1. Make y, the subject of the equation.

$$\Rightarrow y = \frac{-a}{b}x - \frac{c}{b}$$

2. The coefficient of x is the slope.

$$\Rightarrow \text{slope (m)} = \frac{-a}{b}$$

3. The constant term is the y-intercept of the given line.

$$\Rightarrow \text{y-intercept} = \frac{-c}{b}$$