CHAPTER-7

CO-ORDINATE GEOMETRY

INTRODUCTION

We have already studied of co-ordinate geometry in earlier classes. In 9th class , we have learnt **to plot the point (x, y) on the graph.** In point (x, y), $x-$ coordinate is called the ***abscissa*** and $y-$ coordinate is called ***ordinate***.

We can divide a surface into four parts (called ***quadrants***) by drawing two perpendicular lines. Some information about the quadrants:

- Origin is $(0,0)$
- Any point on $x-$ axis is of form $(x, 0)$.
- Any point on $y-$ axis is of form $(0, y)$.
- Equation of $x-$ axis is $y = 0$.
- Equation of $y-$ axis is $x = 0$.
- Distance of any point of (x, y) from $x-$ axis is ***positive value of y*** and from $y-$ axis is ***positive value of x***.

Now In this chapter we shall learn the method of finding

- Distance Formula
- Section Formula (internally)
- Formula of Area of Polygon (Triangle)

DISTANCE FORMULA

In this section, we shall learn to find the distance between two points of length of a line segment joining two points.

Let A (x_1, y_1) and B (x_2, y_2) be two given points in the co-ordinate plane. Draw AL $\perp$ OX and BM $\perp$ OY

then $AL = MN = y_1, BM = y_2, BN = BM - MN = y_2 - y_1$

and $OL = x_1,\ OM = x_2, AN = LM = x_2 - x_1$

In right angled ΔABN

$$AB^2 = AN^2 + BN^2$$

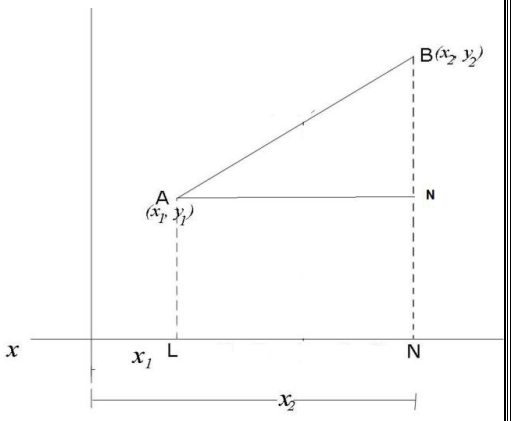
$$\Rightarrow AB^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$$

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

or This Result may be written as

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

$$= \sqrt{\left(\begin{matrix}\textbf{Difference between}\\ \boldsymbol{x}\ \textbf{co-ordinates}\end{matrix}\right)^2 + \left(\begin{matrix}\textbf{Difference between}\\ \boldsymbol{y}\ \textbf{co-ordinates}\end{matrix}\right)^2}$$



Distance of any point from Origin

The distance of the point A(x, y) from the origin O(0,0) is given by

$$\mathbf{OA} = \sqrt{(\boldsymbol{x}-\mathbf{0})^2 + (\boldsymbol{y}-\mathbf{0})^2} = \sqrt{\boldsymbol{x}^2 + \boldsymbol{y}^2}$$

Lets discuss some examples on Distance Formula:

1. **Find the distance between the following points:**

i) $(\mathbf{2}, \mathbf{3})$**and** $(\mathbf{5}, \mathbf{7})$ **ii**) $(-\mathbf{3}, \mathbf{5})$ **and** $(\mathbf{2}, -\mathbf{3})$ **iii**) $(\mathbf{5}, \mathbf{1})$ **and** $(\mathbf{2}, \mathbf{5})$

iv) $(\mathbf{2}, \mathbf{0})$**and** $(-\mathbf{1}, \mathbf{0})$ **v**) $(\mathbf{0}, -\mathbf{2})$**and** $(\mathbf{0}, -\mathbf{4})$

Sol :-

i) (2,3)and (5,7)

$\therefore$ Distance $= \sqrt{(2-5)^2 + (3-7)^2} = \sqrt{(-3)^2 + (-4)^2}$

$= \sqrt{(-3) \times (-3) + (-4) \times (-4)} = \sqrt{9+16} = \sqrt{25} = \sqrt{5 \times 5} = 5$

ii) $(-3,5)$and $(2, -3)$

$\therefore$ Distance $= \sqrt{(-3-2)^2 + (5-(-3))^2} = \sqrt{(-5)^2 + (5+3)^2}$

$= \sqrt{(-5)^2 + (8)^2} = \sqrt{(-5) \times (-5) + 8 \times 8} = \sqrt{25+64} = \sqrt{89}$

iii) (5,1)and (2,5)

$\therefore$ Distance $= \sqrt{(5-2)^2 + (1-5)^2} = \sqrt{(3)^2 + (-4)^2}$

$= \sqrt{3 \times 3 + (-4) \times (-4)} = \sqrt{9+16} = \sqrt{25} = \sqrt{5 \times 5} = 5$

iv) (2,0)and $(-1,0)$

$\therefore$ Distance $= \sqrt{(2-(-1))^2 + (0-0)^2} = \sqrt{(2+1)^2 + 0} = \sqrt{3^2} = 3$

v) $(0, -2)$and $(0, -4)$

$\therefore$ Distance $= \sqrt{(0-0)^2 + ((-2)-(-4))^2} = \sqrt{0 + (-2+4)^2} = \sqrt{(2)^2} = 2$

EXERCISE

1. **Find the distance between the following points:**

i) $(\mathbf{5}, \mathbf{2})$**and** $(\mathbf{7}, \mathbf{3})$ **ii**) $(\mathbf{0}, \mathbf{0})$ **and** $(\mathbf{3}, \mathbf{3})$ **iii**) $(\mathbf{1}, \mathbf{4})$ **and** $(-\mathbf{2}, \mathbf{0})$

iv) $(\mathbf{5}, \mathbf{0})$**and** $(-\mathbf{3}, \mathbf{0})$ **v**) $(\mathbf{0}, -\mathbf{4})$**and** $(\mathbf{0}, \mathbf{2})$