DAY 3

1. Find the value of y for which the distance between the points $P(2,-3)$ and $Q(10,y)$ is 10 units. [Ex 7.1, Q8]

Sol :- Given $P(2,-3)$ and $Q(10,y)$ and PQ = 10 units

$\Rightarrow \sqrt{(2-10)^2+(-3-y)^2}=10$

$\Rightarrow (-8)^2+(9+y^2+6y)=10^2 \quad \Rightarrow 64+9+y^2+6y=100$

$\Rightarrow y^2+6y+73-100=0 \quad \Rightarrow y^2+6y-27=0$

$\Rightarrow y^2+9y-3y-27=0 \quad \Rightarrow y(y+9)-3(y+9)=0$

$\Rightarrow (y+9)(y-3)=0 \quad \Rightarrow y=3,-9$

2. Find a point on $x-$ axis which is equidistant from points $(3,4)$ and $(2,-3)$.

Sol:- We know any point on $x-$ axis is $P(x,0)$

Given condition Let $P(x,0)$ is equidistant from Q(3,4) and R$(2,-3)$

$\Rightarrow PQ=PR \quad \Rightarrow PQ^2=PR^2$

$\Rightarrow (x-3)^2+(0-4)^2=(x-2)^2+(0-(-3))^2$

$\Rightarrow (x^2+3^2-2\times x\times 3)+(-4)^2=(x^2+2^2-2\times x\times 2)+(3)^2$

$\Rightarrow x^2+9-6x+16=x^2+4-4x+9$

$\Rightarrow x^2-6x+25=x^2-4x+13$

$\Rightarrow -6x+4x=13-25 \quad \Rightarrow -2x=-12$

$\Rightarrow x=\frac{-12}{-2}=6$

$(6,0)$ is point which is equidistant from(3,4)and $(2,-3)$

3. Find a point on $y-$ axis which is equidistant from points $A(6,5)$ and $B(-4,3)$.

Sol:- We know any point on $y-$ axis is $P(0,y)$

Given condition Let $P(0,y)$ is equidistant from A(6,5) and B$(-4,3)$

$\Rightarrow PA=PB \quad \Rightarrow PA^2=PB^2$

$\Rightarrow (0-6)^2+(y-5)^2=(0-(-4))^2+(y-3)^2$

$\Rightarrow (-4)^2+(y^2+5^2-2\times y\times 5)=(-4)^2+(y^2+3^2-2\times y\times 3)$

$\Rightarrow 16+y^2+25-10x=16+y^2+9-6y$

$\Rightarrow y^2-10x+41=y^2-6y+25$

$\Rightarrow -10y+6y=25-41 \quad \Rightarrow -4y=-16$

$\Rightarrow y=\frac{-16}{-4}=4$

$(0,4)$ is the point which is equidistant from A(6,5)and B$(-4,3)$

4. Find the relation between x and y if the point (x,y) is equidistant from points $(7,1)$ and $(3,5)$. [Example 4]

Sol:- Let $P(x,y)$ is equidistant from points A(7,1) and B(3,5)

$\Rightarrow PA=PB \quad \Rightarrow PA^2=PB^2$

$\Rightarrow (x-7)^2+(y-1)^2=(x-3)^2+(y-5)^2$

$\Rightarrow (x^2+7^2-2\times x\times 7)+(y^2+1^2-2\times y\times 1)$

$$= (x^2 + 3^2 - 2 \times x \times 3) + (y^2 + 5^2 - 2 \times y \times 5)$$

$\Rightarrow \quad x^2 + 49 - 14x + y^2 + 1 - 2y = x^2 + 9 - 6x + y^2 + 25 - 10y$

$\Rightarrow \quad -14x + 6x - 2y + 10y + 50 - 34 = 0$

$\Rightarrow \quad -8x + 8y + 16 = 0$

Divide by -8, we get

$\Rightarrow \quad \boldsymbol{x - y - 2 = 0}$ which is the required relation.

When vertices of Quadrilateral are given:

In last section, we have discussed about distance formula of collinear points and non collinear points. Now we shall discuss when vertices of quadrilateral are given.

- **Parallelogram**: When opposite sides/distances are equal.
- **Rectangle**: When opposite sides/distances and diagonals are equal.
- **Rhombus**: When all sides/distances are equal.
- **Square**: When all sides/distances and diagonals are equal.

5. Show that $(1, 7), (4, 2), (-1, -1)$ and $(-4, 4)$ are the vertices of the square.

Sol: $-$Let A(1,7), B(4,2), C$(-1, -1)$ and D$(-4,4)$ are the vertices of the quadrilateral ABCD.

Now AB $= \sqrt{(1-4)^2 + (7-2)^2} = \sqrt{(-3)^2 + 5^2} = \sqrt{9 + 25} = \sqrt{34}$

BC $= \sqrt{(4-(-1))^2 + (2-(-1))^2} = \sqrt{5^2 + 3^2} = \sqrt{25 + 9} = \sqrt{34}$

CD $= \sqrt{(-1-(-4))^2 + (-1-4)^2} = \sqrt{3^2 + (-5)^2} = \sqrt{9 + 25} = \sqrt{34}$

AD $= \sqrt{(1-(-4))^2 + (7-4)^2} = \sqrt{5^2 + 3^2} = \sqrt{25 + 9} = \sqrt{34}$

Diagonal AC $= \sqrt{(1-(-1))^2 + (7-(-1))^2} = \sqrt{2^2 + 8^2} = \sqrt{4 + 64} = \sqrt{68}$

BD $= \sqrt{(4-(-4))^2 + (2-4)^2} = \sqrt{8^2 + (-2)^2} = \sqrt{64 + 4} = \sqrt{68}$

$\therefore$ All sides and diagonals are equal, So ABCD is a square.

EXERCISE

1. Ex 7.1, Q 6,7,9,10
2. Show that A(2,4), B$(-2,3)$, C$(-1, -1)$ and D(3,0) are the vertices of the square.
3. Find a point on y axis which is equidistant from (4,0) and (4,12).