Exercise 7.1

Therefore, all four sides of quadrilateral are equal. ... (1)

Now, we will check the length of diagonals.

AC =

$$\sqrt{[-1-(-1)]^2+[2-(-2)]^2}=\sqrt{(0)^2+(4)^2}=\sqrt{0+16}=\sqrt{16}=4$$

BD =

$$\sqrt{[-3-1]^2+[0-0]^2}=\sqrt{(-4)^2+(0)^2}=\sqrt{16+0}=\sqrt{16}=4$$

Therefore, diagonals of quadrilateral ABCD are also equal. ... (2)

From (1) and (2), we can say that ABCD is a square.

(ii) Let A = (−3, 5), B= (3, 1), C= (0, 3) and D= (−1, −4)

Using Distance Formula to find distances AB, BC, CD and DA, we get

AB =

$$\sqrt{[3-(-3)]^2+[1-5]^2}=\sqrt{(6)^2+(-4)^2}=\sqrt{36+16}=\sqrt{52}=2\sqrt{13}$$

BC =

$$\sqrt{[0-3]^2+[3-1]^2}=\sqrt{(-3)^2+(2)^2}=\sqrt{9+4}=\sqrt{13}$$

CD =

$$\sqrt{[-1-0]^2+[-4-3]^2}=\sqrt{(-1)^2+(-7)^2}=\sqrt{1+49}=\sqrt{50}=5\sqrt{2}$$

DA =

$$\sqrt{[-1-(-3)]^2+[-4-5]^2}=\sqrt{(2)^2+(-9)^2}=\sqrt{4+81}=\sqrt{85}$$

We cannot find any relation between the lengths of different sides.

Therefore, we cannot give any name to the quadrilateral ABCD.

(iii) Let A = (4, 5), B= (7, 6), C= (4, 3) and D= (1, 2)

Using Distance Formula to find distances AB, BC, CD and DA, we get

AB =

$$\sqrt{[7-4]^2+[6-5]^2}=\sqrt{(3)^2+(1)^2}=\sqrt{9+1}=\sqrt{10}$$

BC =

$$\sqrt{[4-7]^2+[3-6]^2}=\sqrt{(-3)^2+(-3)^2}=\sqrt{9+9}=\sqrt{18}=3\sqrt{2}$$

CD =
$$\sqrt{[1-4]^2+[2-3]^2}=\sqrt{(-3)^2+(-1)^2}=\sqrt{9+1}=\sqrt{10}$$

DA =
$$\sqrt{[1-4]^2+[2-5]^2}=\sqrt{(-3)^2+(-3)^2}=\sqrt{9+9}=\sqrt{18}=3\sqrt{2}$$

Here opposite sides of quadrilateral ABCD are equal. ... (1)

We can now find out the lengths of diagonals.

AC =
$$\sqrt{[4-4]^2+[3-5]^2}=\sqrt{(0)^2+(-2)^2}=\sqrt{0+4}=\sqrt{4}=2$$

BD =
$$\sqrt{[1-7]^2+[2-6]^2}=\sqrt{(-6)^2+(-4)^2}=\sqrt{36+16}=\sqrt{52}=2\sqrt{13}$$

Here diagonals of ABCD are not equal. ... (2)

From (1) and (2), we can say that ABCD is not a rectangle therefore it is a parallelogram.

7. Find the point on the x–axis which is equidistant from (2, −5) and (−2, 9).

Ans. Let the point be (x, 0) on x–axis which is equidistant from (2, −5) and (−2, 9).

Using Distance Formula and according to given conditions we have:

$$\sqrt{[x-2]^2+[0-(-5)]^2}=\sqrt{[x-(-2)]^2+[(0-9)]^2}$$

$$\Rightarrow \sqrt{x^2+4-4x+25}=\sqrt{x^2+4+4x+81}$$

Squaring both sides, we get

$$\Rightarrow x^2+4-4x+25=x^2+4+4x+81$$

$\Rightarrow -4x + 29 = 4x + 85$

$\Rightarrow 8x = -56$

$\Rightarrow x = -7$

Therefore, point on the x–axis which is equidistant from (2, −5) and (−2, 9) is (−7, 0)

8. Find the values of y for which the distance between the points P (2, −3) and Q (10, y) is 10 units.

Ans. Using Distance formula, we have

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

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

$\Rightarrow 10 = \sqrt{(-8)^2 + 9 + y^2 + 6y}$

$\Rightarrow 10 = \sqrt{64 + 9 + y^2 + 6y}$

Squaring both sides, we get

$100 = 73 + y^2 + 6y$

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

Solving this Quadratic equation by factorization, we can write

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

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

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

$\Rightarrow y = 3, -9$

9. If, Q (0, 1) is equidistant from P (5, −3) and R (x, 6), find the values of x. Also, find the distances QR and PR.

Ans. It is given that Q is equidistant from P and R. Using Distance Formula, we get

PQ = RQ

$\Rightarrow PQ^2 = RQ^2$

$\Rightarrow \sqrt{(0-5)^2 + [1-(-3)^2]} = \sqrt{(0-x)^2 + (1-6)^2}$

$\Rightarrow \sqrt{(-5)^2 + [4^2]} = \sqrt{(x)^2 + (-5)^2}$

$\Rightarrow \sqrt{25 + 16} = \sqrt{x^2 + 25}$

Squaring both sides, we get

$\Rightarrow 25 + 16 = x^2 + 25$

$\Rightarrow x^2 = 16$

$\Rightarrow x = 4, -4$

Thus, Q is (4, 6) or (−4, 6).

Using Distance Formula to find QR, we get

Using value of x = 4 QR = $\sqrt{(4-0)^2 + [6-1^2]} = \sqrt{16 + 25} = \sqrt{41}$

Using value of x = −4 QR = $\sqrt{(-4-0)^2 + [6-1^2]} = \sqrt{16 + 25} = \sqrt{41}$

Therefore, QR = $\sqrt{41}$

Using Distance Formula to find PR, we get

Using value of x = 4 PR =

$$\sqrt{(4-5)^2+\left[6-(-3)^2\right]}=\sqrt{1+81}=\sqrt{82}$$

Using value of x =−4 PR =

$$\sqrt{(-4-5)^2+\left[6-(-3)^2\right]}=\sqrt{81+81}=\sqrt{162}=9\sqrt{2}$$

Therefore, x = 4, −4

QR = $\sqrt{41}$, PR = $\sqrt{82}, 9\sqrt{2}$

10. Find a relation between x and y such that the point (x, y) is equidistant from the point (3, 6) and (−3, 4).

Ans. It is given that (x, y) is equidistant from (3, 6) and (−3, 4).

Using Distance formula, we can write

$$\sqrt{(x-3)^2+(y-6)^2}=\sqrt{[x-(-3)]^2+(y-4)^2}$$

⇒

$$\sqrt{x^2+9-6x+y^2+36-12y}=\sqrt{x^2+9+6x+y^2+16-8y}$$

Squaring both sides, we get

⇒ $x^2+9-6x+y^2+36-12y$

= $x^2+9+6x+y^2+16-8y$

⇒ −6x − 12y + 45

= 6x − 8y + 25

⇒ 12x + 4y = 20

⇒ 3x + y = 5

*********** END **********