

CBSE Class-10 Mathematics
NCERT solution
Chapter - 7
Coordinate Geometry - Exercise 7.1

1. Find the distance between the following pairs of points:

(i) (2, 3), (4,1)

(ii) (-5, 7), (-1, 3)

(iii) (a, b), (-a, -b)

Ans. (i) Applying Distance Formula to find distance between points (2, 3) and (4,1), we get

$$d = \sqrt{(4-2)^2 + (1-3)^2} = \sqrt{(2)^2 + (-2)^2} = \sqrt{4+4} = \sqrt{8} = 2\sqrt{2} \text{ units}$$

(ii) Applying Distance Formula to find distance between points (-5, 7) and (-1, 3), we get

$$d = \sqrt{[-1-(-5)]^2 + (3-7)^2} = \sqrt{(4)^2 + (-4)^2} = \sqrt{16+16} = \sqrt{32} = 4\sqrt{2} \text{ units}$$

(iii) Applying Distance Formula to find distance between points (a, b) and (-a, -b), we get

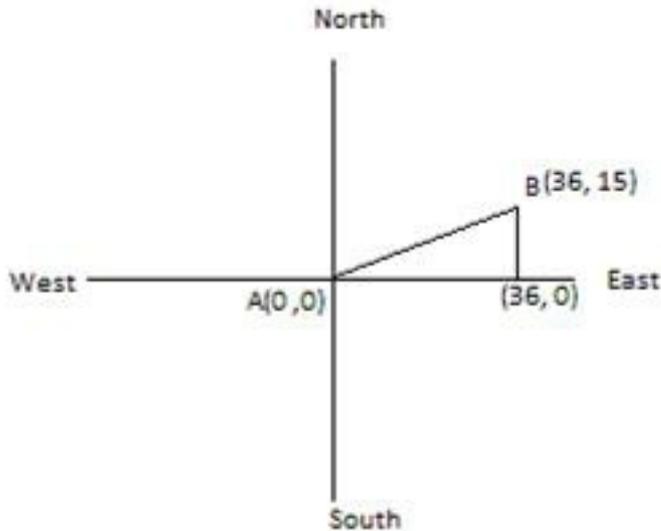
$$d = \sqrt{(-a-a)^2 + (-b-b)^2} = \sqrt{(-2a)^2 + (-2b)^2} = \sqrt{4a^2 + 4b^2} = \sqrt{4(a^2 + b^2)} = 2\sqrt{a^2 + b^2}$$

2. Find the distance between the points (0, 0) and (36, 15). Also, find the distance between towns A and B if town B is located at 36 km east and 15 km north of town A.

Ans. Applying Distance Formula to find distance between points (0, 0) and (36, 15), we get

$$d = \sqrt{(36-0)^2 + (15-0)^2} = \sqrt{(36)^2 + (15)^2} = \sqrt{1296+225} = \sqrt{1521} = 39 \text{ units}$$

Town B is located at 36 km east and 15 km north of town A. So, the location of town A and B can be shown as:



Clearly, the coordinates of point A are (0, 0) and coordinates of point B are (36, 15).

To find the distance between them, we use Distance formula:

$$d = \sqrt{[36-0]^2 + (15-0)^2} = \sqrt{(36)^2 + (15)^2} = \sqrt{1296 + 225} = \sqrt{1521} = 39 \text{ Km}$$

3. Determine if the points (1, 5), (2, 3) and (-2, -11) are collinear.

Ans. Let A = (1, 5), B = (2, 3) and C = (-2, -11)

Using Distance Formula to find distance AB, BC and CA.

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

$$BC = \sqrt{[-2-2]^2 + (-11-3)^2} = \sqrt{(-4)^2 + (-14)^2} = \sqrt{16+196} = \sqrt{212} = 2\sqrt{53}$$

$$CA = \sqrt{[-2-1]^2 + (-11-5)^2} = \sqrt{(-3)^2 + (-16)^2} = \sqrt{9+256} = \sqrt{265}$$

Since $AB + AC \neq BC$, $BC + AC \neq AB$ and $AC \neq BC$.

Therefore, the points A, B and C are not collinear.

4. Check whether (5, -2), (6, 4) and (7, -2) are the vertices of an isosceles triangle.

Ans. Let $A = (5, -2)$, $B = (6, 4)$ and $C = (7, -2)$

Using Distance Formula to find distances AB, BC and CA.

$$AB = \sqrt{[6 - 5]^2 + [4 - (-2)]^2} = \sqrt{(1)^2 + (6)^2} = \sqrt{1 + 36} = \sqrt{37}$$

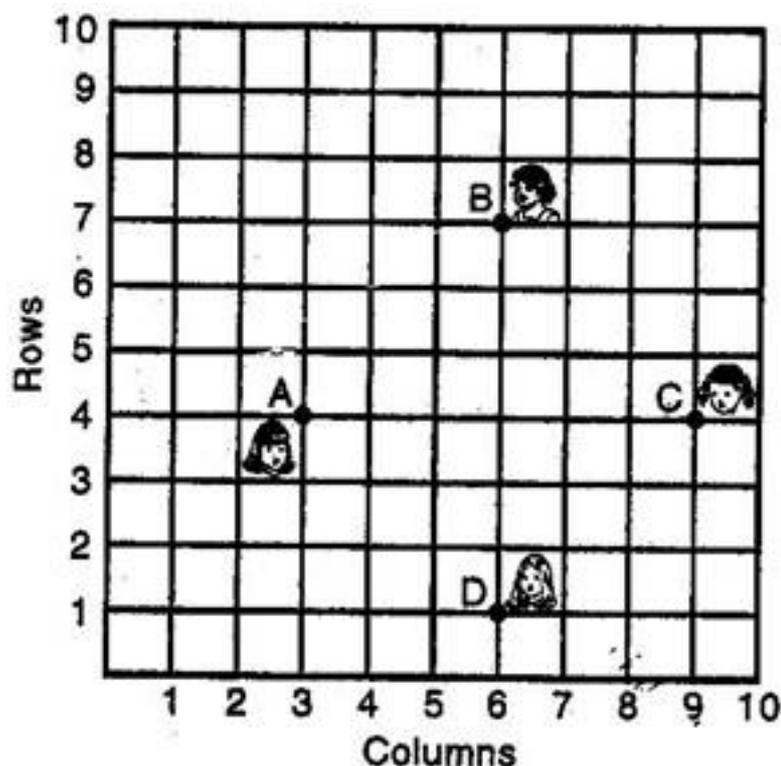
$$BC = \sqrt{[7 - 6]^2 + (-2 - 4)^2} = \sqrt{(1)^2 + (-6)^2} = \sqrt{1 + 36} = \sqrt{37}$$

$$CA = \sqrt{[7 - 5]^2 + [-2 - (-2)]^2} = \sqrt{(2)^2 + (0)^2} = \sqrt{4 + 0} = \sqrt{4} = 2$$

Since $AB = BC$.

Therefore, A, B and C are vertices of an isosceles triangle.

5. In a classroom, 4 friends are seated at the points A (3, 4), B (6, 7), C (9, 4) and D (6, 1). Champa and Chameli walk into the class and after observing for a few minutes Champa asks Chameli. "Don't you think ABCD is a square?" Chameli disagrees. Using distance formula, find which of them is correct.



Ans. We have $A = (3, 4)$, $B = (6, 7)$, $C = (9, 4)$ and $D = (6, 1)$

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

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

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

$$CD = \sqrt{[6-9]^2 + [1-4]^2} = \sqrt{(-3)^2 + (-3)^2} = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2}$$

$$DA = \sqrt{[6-3]^2 + [1-4]^2} = \sqrt{(3)^2 + (-3)^2} = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2}$$

Therefore, All the sides of ABCD are equal here. ... (1)

Now, we will check the length of its diagonals.

$$AC = \sqrt{[9-3]^2 + [4-4]^2} = \sqrt{(6)^2 + (0)^2} = \sqrt{36+0} = 6$$

$$BD = \sqrt{[6-6]^2 + [1-7]^2} = \sqrt{(0)^2 + (-6)^2} = \sqrt{0+36} = \sqrt{36} = 6$$

So, Diagonals of ABCD are also equal. ... (2)

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

Therefore, Champa is correct.

6. Name the type of quadrilateral formed, if any, by the following points, and give reasons for your answer.

(i) $(-1, -2), (1, 0), (-1, 2), (-3, 0)$

(ii) $(-3, 5), (3, 1), (0, 3), (-1, -4)$

(iii) $(4, 5), (7, 6), (4, 3), (1, 2)$

Ans. (i) Let A = $(-1, -2)$, B = $(1, 0)$, C = $(-1, 2)$ and D = $(-3, 0)$

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

$$AB = \sqrt{[1 - (-1)]^2 + [0 - (-2)]^2} = \sqrt{(2)^2 + (2)^2} = \sqrt{4 + 4} = \sqrt{8} = 2\sqrt{2}$$

$$BC = \sqrt{[-1 - 1]^2 + [2 - 0]^2} = \sqrt{(-2)^2 + (2)^2} = \sqrt{4 + 4} = \sqrt{8} = 2\sqrt{2}$$

$$CD = \sqrt{[-3 - (-1)]^2 + [0 - 2]^2} = \sqrt{(-2)^2 + (-2)^2} = \sqrt{4 + 4} = \sqrt{8} = 2\sqrt{2}$$

$$DA = \sqrt{[-3 - (-1)]^2 + [0 - (-2)]^2} = \sqrt{(-2)^2 + (2)^2} = \sqrt{4 + 4} = \sqrt{8} = 2\sqrt{2}$$

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

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

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

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

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

$$PQ = RQ$$

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

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

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

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

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

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

$$\text{Therefore, QR} = \sqrt{41}$$

Using Distance Formula to find PR, we get

$$\text{Using value of } x = 4 \text{ PR} = \sqrt{(4-5)^2 + [6-(-3)]^2} = \sqrt{1+81} = \sqrt{82}$$

$$\text{Using value of } x = -4 \text{ PR} = \sqrt{(-4-5)^2 + [6-(-3)]^2} = \sqrt{81+81} = \sqrt{162} = 9\sqrt{2}$$

Therefore, $x = 4, -4$

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

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

$$\begin{aligned}\sqrt{(x-3)^2 + (y-6)^2} &= \sqrt{[x-(-3)]^2 + (y-4)^2} \\ \Rightarrow \sqrt{x^2 + 9 - 6x + y^2 + 36 - 12y} &= \sqrt{x^2 + 9 + 6x + y^2 + 16 - 8y}\end{aligned}$$

Squaring both sides, we get

$$\Rightarrow x^2 + 9 - 6x + y^2 + 36 - 12y = x^2 + 9 + 6x + y^2 + 16 - 8y$$

$$\Rightarrow -6x - 12y + 45 = 6x - 8y + 25$$

$$\Rightarrow 12x + 4y = 20$$

$$\Rightarrow 3x + y = 5$$