. **Exercise 7.1 Page: 105**

**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)

**Answer:**

(i) Distance between the points is given by

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

Therefore the distance between (2,3) and (4,1) is given by

l = $\sqrt{(2-4)^2 + (3-1)^2}$

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

= √4+4 = √8 = 2√2

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

l =$\sqrt{(-5-(-1))^2 + (7-3)^2}$

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

= √16+16 = √32 = 4√2

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

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

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

$$= \sqrt{4a^2 + 4b^2} = 2\sqrt{a^2 + b^2}$$

**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 and15 km north of town A.**

**Answer:**

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

$$= \sqrt{(36-0)^2 + (15-0)^2} = \sqrt{36^2 + 15^2}$$

= √1296 + 225 = √1521 = 39

Yes, we can find the distance between the given towns A and B.

Assume town A at origin point (0, 0).

Therefore, town B will be at point (36, 15) with respect to town A.

And hence, as calculated above, the distance between town A and B will be 39km.

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

**Answer:**

Let A = (1, 5), B = (2, 3) and C = (–2, –11)

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

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

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

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

Since AB+BC ≠ CA

Therefore, the points (1, 5), (2, 3), and (−2, −11) are not collinear.

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

**Answer:**

Let A = (5, –2), B = (6, 4) and C = (7, –2)

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

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

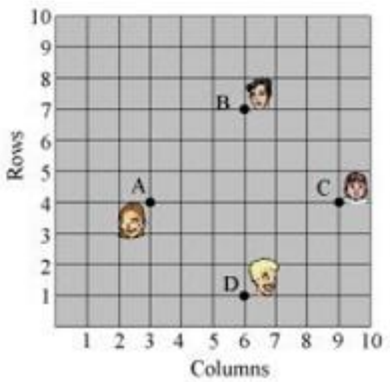
BC = $\sqrt{(6-7)^2 + (4-(-2))^2} = \sqrt{(-1)^2 + (6)^2} = \sqrt{1 + 36} = \sqrt{37}$

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

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.**




**Answer:**

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

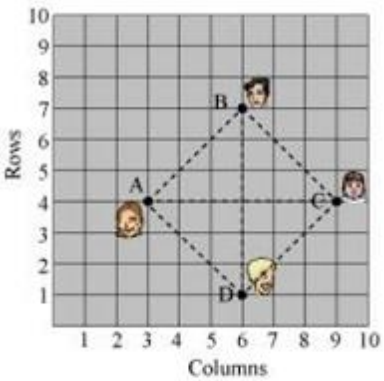
BC = $\sqrt{(6-9)^2+(7-4)^2} = \sqrt{(-3)^2+(3)^2} = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2}$

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

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

Therefore, All the sides of ABCD are equal here

Now, we will check the length of its diagonals.




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

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

So, Diagonals of ABCD are also equal.

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)

**Answer:**

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

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

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

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

Therefore, all four sides of quadrilateral are equal.

Now, we will check the length of diagonals.

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

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

Therefore, diagonals of quadrilateral ABCD are also equal.

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

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

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

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

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

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

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

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

Here opposite sides of quadrilateral ABCD are equal.

We can now find out the lengths of diagonals.

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

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

Here diagonals of ABCD are not equal.

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).**

**Answer:**

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:

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

$$\Rightarrow\sqrt{(x-(-2))^2+(0-(-9))^2}=\sqrt{(x+2)^2+(9)^2}$$

Squaring both sides, we get

$$\Rightarrow\sqrt{(x-2)^2+(5)^2}=\sqrt{(x+2)^2+(9)^2}$$

$(x-2)^2 + 25 = (x+2)^2 + 81$

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

$8x = - 25 - 81$

$8x = -56$

$x = - 7$

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.**

**Answer:**

Using Distance formula, we have

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

$\Rightarrow \sqrt{(-8)^2 + (3+y)^2} = 10$

$\Rightarrow 64 + (y+3)^2 = 100$

$\Rightarrow (y+3)^2 = 100-64 = 36$

$\Rightarrow y+3 = \pm 6$

$\Rightarrow y+3=6$ or $y+3 = -6$

Therefore $y = 3$ or $-9$

**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.**

**Answer:**

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

PQ = RQ

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

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

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

$\Rightarrow 41 = x^2 + 25$

$16 = x^2$

$x = \pm 4$

Thus, R is (4, 6) or (–4, 6).

When point R is (4,6)

PR = $\sqrt{(5-4)^2+(-3-6)^2} = \sqrt{\left(1^2+(-9)^2\right)} = \sqrt{1+81} = \sqrt{82}$

QR = $\sqrt{(0-4)^2+(1-6)^2} = \sqrt{(-4)^2+(-5)^2} = \sqrt{16+25} = \sqrt{41}$

When point R is (- 4,6)

PR = $\sqrt{(5-(-4))^2+(-3-6)^2} = \sqrt{(9)^2+(-9)^2} = \sqrt{81+81} = 9\sqrt{2}$

QR = $\sqrt{(0-(-4))^2+(1-6)^2} = \sqrt{(4)^2+(-5)^2} = \sqrt{16+25} = \sqrt{41}$

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

**Answer:**

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

Using Distance formula, we can write

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

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

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

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

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

$\Rightarrow 20 = 12x + 4y$

$\Rightarrow 3x + y = 5$

$\Rightarrow 3x + y - 5 = 0$

. **Exercise 7.2 Page: 111**

Solve the followings Questions.

**1. Find the coordinates of the point which divides the join of (- 1, 7) and (4, - 3) in the ratio 2:3.**

**Answer:**

Let P(x, y) be the required point. Using the section formula

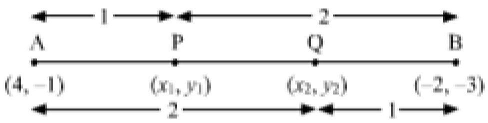
$$x=\frac{2\times 4+3\times(-1)}{2+3}=\frac{8-3}{5}=\frac{5}{5}=1$$

$$y=\frac{2\times(-3)+3\times 7}{2+3}=\frac{-6+21}{5}=\frac{15}{5}=3$$

Therefore the point is (1,3).

**2. Find the coordinates of the points of trisection of the line segment joining (4, -1) and (-2, -3).**

**Answer:**




Let P $(x_1,y_1)$ and Q $(x_2,y_2)$ are the points of trisection of the line segment joining the given points i.e., AP = PQ = QB

Therefore, point P divides AB internally in the ratio 1:2.

$$x_1=\frac{1\times(-2)+2\times 4}{1+2},\ y_1=\frac{1\times(-3)+2\times(-1)}{1+2}$$

$$x_1=\frac{-2+8}{3}=\frac{6}{3}=2,\ y_1=\frac{-3-2}{3}=\frac{-5}{3}$$

Therefore $P(x_1,y_1)$ = (2, -5/3)

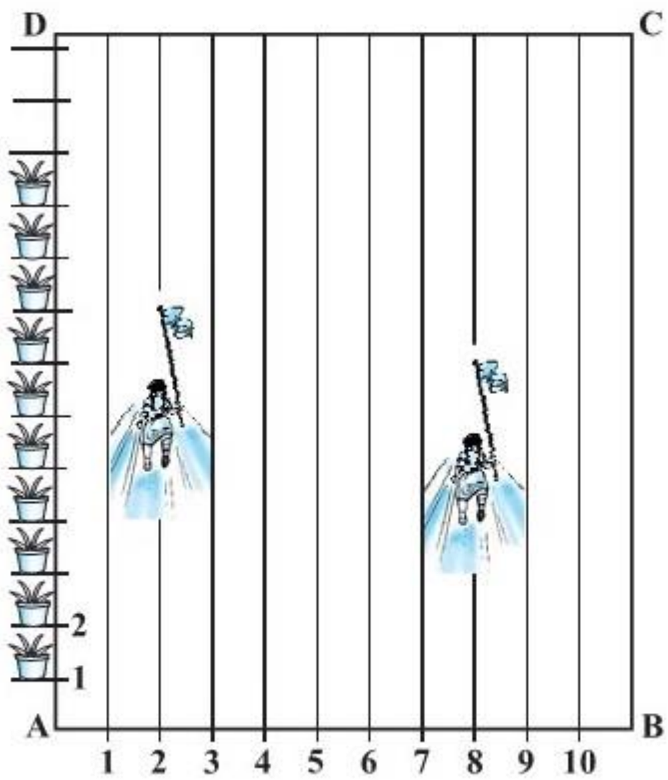
Point Q divides AB internally in the ratio 2:1.

$$x_2 = \frac{2\times(-2)+1\times4}{2+1}, y_2 = \frac{2\times(-3)+1\times(-1)}{2+1}$$

$$x_2 = \frac{-4+4}{3} = 0, y_2 = \frac{-6-1}{3} = \frac{-7}{3}$$

Q ($x_2$ ,$y_2$) = (0, -7/3)

**3. To conduct Sports Day activities, in your rectangular shaped school ground ABCD, lines have been drawn with chalk powder at a distance of 1 m each. 100 flower pots have been placed at a distance of 1 m from each other along AD, as shown in the following figure. Niharika runs 1/4th the distance AD on the 2nd line and posts a green flag. Preet runs 1/5th the distance AD on the eighth line and posts a red flag. What is the distance between both the flags? If Rashmi has to post a blue flagexactly halfway between the line segment joining the two flags, where should she post her flag?**




**Answer:**

From the figure, taking A as (0, 0), x- axis along AB and y- axis along AD, we will obtain the coordinates of the green flag and the red flag.

The green flag is at $\frac{1}{4}$th of the total distance

$$= \frac{1}{4} \times 100 = 25 \text{ m in 2nd line.}$$

∴ The coordinates of green flag are (2, 25).

Similarly, coordinates of red flag are (8, 20).

Distance between two flags,

$$D = \sqrt{(8-2)^2 + (20-25)^2}$$

$$= \sqrt{(6)^2 + (-5)^2} = \sqrt{36+25} = \sqrt{\mathbf{61}} \text{ } \mathbf{m}.$$

Now, blue flag is posted at the midpoint of the distance between two flags

$$\therefore \text{ Coordinates of blue flag } = \left(\frac{2+8}{2}, \frac{25+20}{2}\right)$$

$$= (5, 22.5)$$

Hence, the blue flag will be posted in 5th line at a distance of **22.5 m**.

**4. Find the ratio in which the line segment joining the points (-3, 10) and (6, - 8) is divided by (-1, 6).**

**Answer:**

Let the ratio in which the line segment joining ( -3, 10) and (6, -8) is divided by point ( -1, 6) be k:1.

Therefore, -1 = 6k-3/k+1

-k - 1 = 6k -3

7k = 2

k = 2/7

Therefore, the required ratio is 2:7.

**5. Find the ratio in which the line segment joining A (1, - 5) and B (- 4, 5) is divided by the x-axis. Also find the coordinates of the point of division.**

**Answer:**

Let the ratio in which the line segment joining A (1, - 5) and B ( - 4, 5) is divided by x-axis be k:1.

Therefore, the coordinates of the point of division is (-4k+1/k+1, 5k-5/k+1).

We know that y-coordinate of any point on x-axis is 0.

∴ 5k-5/k+1 = 0

Therefore, x-axis divides it in the ratio 1:1.

To find the coordinates let's substitute the value of k in equation(1)

Required point = [(- 4(1) + 1) / (1 + 1), (5(1) - 5) / (1 + 1)]

= [(- 4 + 1) / 2, (5 - 5) / 2]

= [- 3/2, 0]

**6. If (1, 2), (4, y), (x, 6) and (3, 5) are the vertices of a parallelogram taken in order, find x and y.**

**Answer:**

Let A,B,C and D be the points (1,2) (4,y), (x,6) and (3,5) respectively.

Mid-point of AC = Mid-point of BD

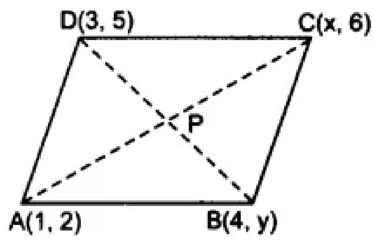
$$\Rightarrow \quad \frac{x+1}{2}, \frac{6+2}{2} = \frac{4+3}{2}, \frac{y+5}{2}$$

$$\Rightarrow \quad \frac{x+1}{2} = \frac{7}{2} \text{ and } \frac{6+2}{2} = \frac{y+5}{2}$$

$$\Rightarrow \quad x + 1 = 7 \text{ and } 8 = y + 5$$

$$\Rightarrow \quad x = 7 - 1 \text{ and } y = 8 - 5 = 3$$

$$\Rightarrow \quad x = 6 \quad \text{and } y = 3$$




**7. Find the coordinates of a point A, where AB is the diameter of circle whose centre is (2, - 3) and B is (1, 4).**

**Answer:**

Let (x,y) be the coordinate of A.

Since AB is the diameter of the circle, the centre will be the mid-point of AB.

now, as centre is the mid-point of AB.

x-coordinate of centre = (2x+1)/2

y-coordinate of centre = (2y+4)/2

But given that centre of circle is (2,−3).

Therefore,

$(2x+1)/2=2 \Rightarrow x=3$

$(2y+4)/2=-3 \Rightarrow y=-10$

Thus the coordinate of A is (3,−10).

**8. If A and B are (–2, –2) and (2, –4), respectively, find the coordinates of P such that AP = 3/7 AB and P lies on the line segment AB.**

**Answer:**

As given the coordinates of A(−2,−2) and B(2,−4) and P is a point lies on AB.

And AP = 3/7 AB

∴BP = 4/7

Then, ratio of AP and PB = $m_1:m_2 = 3:4$

Let the coordinates of P be (x,y).

$\therefore x = (m_1x_2 + m_2x_1) / (m_1 + m_2)$

$\Rightarrow x = (3 \times 2 + 4 \times (-2)) / (3 + 4) = (6 - 8) / 7 = -2 / 7$

And $y = (m_1y_2 + m_2y_1) / (m_1 + m_2)$

$\Rightarrow y = ((3 \times (-4) + 4 \times (-2)) / (3 + 4) = (-12-8) / 7 = -20 / 7$

∴ Coordinates of P = −2 / 7, −20 / 7

**9. Find the coordinates of the points which divide the line segment joining A (-2, 2) and B (2, 8) into four equal parts.**

**Answer:**

From the figure, it can be observed that points X,Y,Z are dividing the line segment in a ratio 1:3,1:1,3:1 respectively.

Using Sectional Formula, we get,

Coordinates of X = ((1 × 2 + 3 × (−2)) / (1 + 3), (1 × 8 + 3 × 2) / (1 + 3))

= (−1, 7/2)

Coordinates of Y = (2 − 2) / 2, (2 + 8) / 2 = (0,5)

Coordinates of Z = ((3 × 2 + 1 × (−2)) / (1 + 3), (3 × 8 + 1 × 2) / (1 + 3)

=(1, 13/2)

**10. Find the area of a rhombus if its vertices are (3, 0), (4, 5), (-1, 4) and (-2,-1) taken in order. [Hint: Area of a rhombus = 1/2(product of its diagonals)]**

**Answer:**
Let (3, 0), (4, 5), ( - 1, 4) and ( - 2, - 1) are the vertices A, B, C, D of a rhombus ABCD.

Length of the diagonal AC=

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

Length of the diagonal BD=

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

Area of rhombus ABCD = 1/2 X 4√2 X 6√2= 24 square units.
Therefore, the area of a rhombus if its vertices are (3, 0), (4, 5), (-1, 4) and (-2,-1) taken in order, is 24 square units.