EXERCISE 7.2 PAGE NO: 167

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

Solution:

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

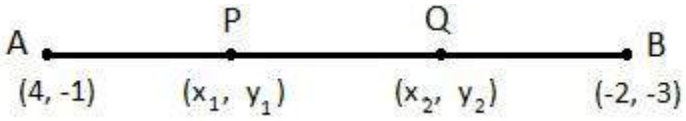
x = (2×4 + 3×(-1))/(2 + 3) = (8 – 3)/5 = 1

y = (2×-3 + 3×7)/(2 + 3) = (-6 + 21)/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).

Solution:



Let P (x_1, y_1) and Q (x_2, y2) be 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 = (1×(-2) + 2×4)/3 = (-2 + 8)/3 = 6/3 = 2

y_1 = (1×(-3) + 2×(-1))/(1 + 2) = (-3 – 2)/3 = -5/3

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

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

x_2 = (2×(-2) + 1×4)/(2 + 1) = (-4 + 4)/3 = 0

y_2 = (2×(-3) + 1×(-1))/(2 + 1) = (-6 – 1)/3 = -7/3

The coordinates of the point Q are (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 flags? If Rashmi has to post a blue flag exactly halfway between the line segment joining the two flags, where should she post her flag?

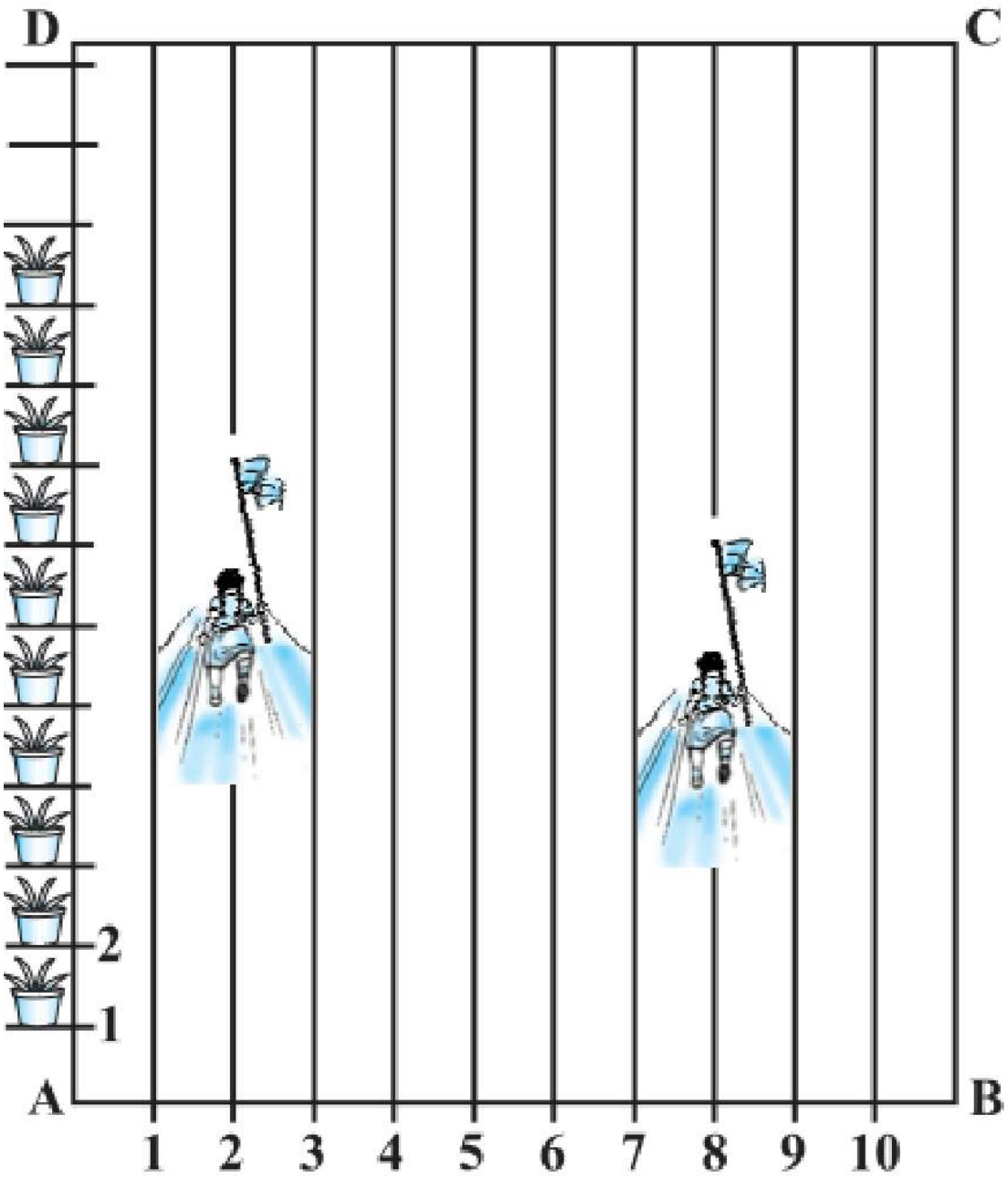


Fig. 7.12

Solution:

From the given instruction, we observed that Niharika posted the green flag at 1/4th of the distance AD, i.e. (1/4 ×100) m = 25 m from the starting point of the 2nd line. Therefore, the coordinates of this point are (2, 25).

Similarly, Preet posted a red flag at 1/5 of the distance AD, i.e. (1/5 ×100) m = 20 m from the starting point of the 8th line. Therefore, the coordinates of this point are (8, 20).

Distance between these flags can be calculated by using the distance formula,

$$\text{Distance between two flags} = \sqrt{(8-2)^2 + (20-25)^2} = \sqrt{36+25} = \sqrt{61}\ \text{m}$$

The point at which Rashmi should post her blue flag is the mid-point of the line joining these points. Let's say this point is P(x, y).

x = (2 + 8)/2 = 10/2 = 5 and y = (20 + 25)/2 = 45/2

Hence, P(*x*, *y*) = (5, 45/2)

Therefore, Rashmi should post her blue flag at 45/2 = 22.5m on the 5th line.

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

Solution:

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

Therefore, -1 = (6*k*-3)/(*k*+1)

–*k* – 1 = 6*k* -3

7*k* = 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.

Solution:

Let the ratio in which the line segment joining A (1, – 5) and B (- 4, 5) is divided by the x-axis be k:1. Therefore, the coordinates of the point of division, say P(x, y) is ((-4*k*+1)/(*k*+1), (5*k*-5)/(*k*+1)).

$$\text{Or P(x, y)} = \frac{-4k+1}{k+1}, \frac{5k-5}{k+1}$$

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

Therefore, (5k – 5)/(k + 1) = 0

5k = 5

or k = 1

So, the *x*-axis divides the line segment in the ratio 1:1.

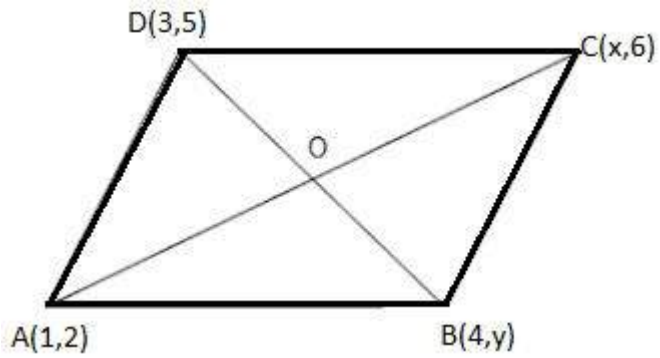
Now, find the coordinates of the point of division:

P (x, y) = ((-4(1)+1)/(1+1) , (5(1)-5)/(1+1)) = (-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*.

Solution:

Let A, B, C and D be the points of a parallelogram: A(1, 2), B(4, *y*), C(*x*, 6) and D(3, 5).



Since the diagonals of a parallelogram bisect each other, the midpoint is the same.

To find the value of x and y, solve for the midpoint first.

Midpoint of AC = ((1+x)/2 , (2+6)/2) = ((1+x)/2 , 4)

Midpoint of BD = ((4+3)/2 , (5+y)/2) = (7/2 , (5+y)/2)

The midpoint of AC and BD are the same, this implies

(1+x)/2 = 7/2 and 4 = (5+y)/2

$x + 1 = 7$ and $5 + y = 8$

$x = 6$ and $y = 3$

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

Solution:

Let the coordinates of point A be (x, y).

Mid-point of AB is (2, – 3), which is the centre of the circle.

Coordinate of B = (1, 4)

(2, -3) =((x+1)/2 , (y+4)/2)

(x+1)/2 = 2 and (y+4)/2 = -3

x + 1 = 4 and y + 4 = -6

x = 3 and y = -10

The coordinates of A(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.

Solution:

The coordinates of points A and B are (-2,-2) and (2,-4), respectively.

Since AP = 3/7 AB

Therefore, AP:PB = 3:4

Point P divides the line segment AB in the ratio 3:4.

Coordinate of P = $\left(\frac{3(2)+4(-2)}{3+4}, \frac{3(-4)+4(-2)}{3+4}\right) = \left(\frac{6-8}{7}, \frac{-12-8}{7}\right) = \left(-\frac{2}{7}, -\frac{20}{7}\right)$ which is required answer.

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

Solution:

Draw a figure, line dividing by 4 points.

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

Coordinates of X = $\left(\frac{1(2)+3(-2)}{1+3}, \frac{1(8)+3(2)}{1+3}\right) = (-1, 7/2)$

Coordinates of Y = $\left(\frac{2(1)-2(1)}{1+1}, \frac{2(1)+8(1)}{1+1}\right) = (0, 5)$

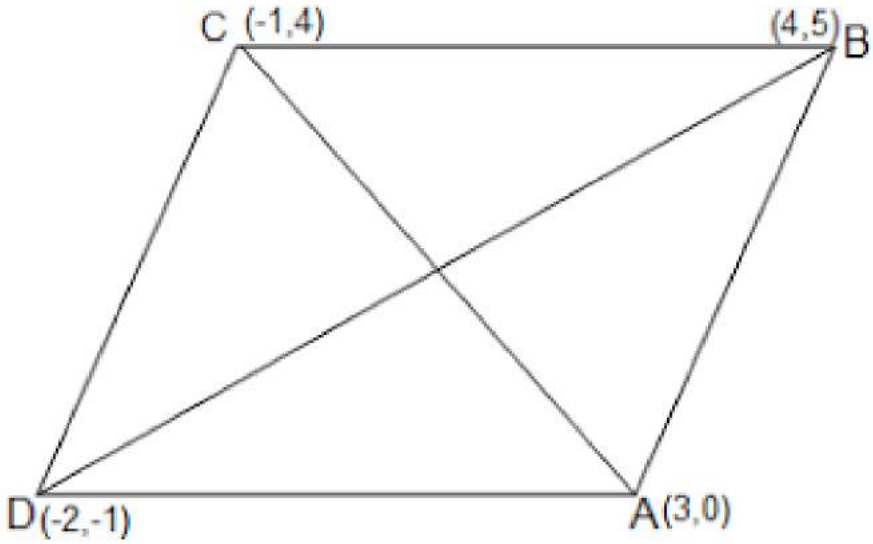
Coordinates of Z = $\left(\frac{3(2)+1(-2)}{1+3}, \frac{3(8)+1(2)}{1+3}\right) = (1, 13/2)$

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)

Solution:

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



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

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

Therefore, area of rhombus ABCD $=\frac{1}{2}\times 4\sqrt{2}\times 6\sqrt{2}=24$ square units