

Exercise 7.2

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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

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

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

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, 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.

$$x_1 = \frac{1 \times (-2) + 2 \times 4}{1+2} = \frac{-2+8}{3} = 6/3 = 2$$

$$y_1 = \frac{1 \times (-3) + 2 \times (-1)}{1+2} = \frac{-3-2}{3} = -5/3$$

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

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

$$x_2 = \frac{2 \times (-2) + 1 \times 4}{2+1} = \frac{-4+4}{3} = 0$$

$$y_2 = \frac{2 \times (-3) + 1 \times (-1)}{2+1} = \frac{-6-1}{3} = -7/3$$

The coordinates of the point Q is (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 $\frac{1}{4}$ th the distance AD on the 2nd line and posts a green flag. Preet runs $\frac{1}{5}$ th 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 flag exactly halfway between the line segment joining the two flags, where should she post her flag?

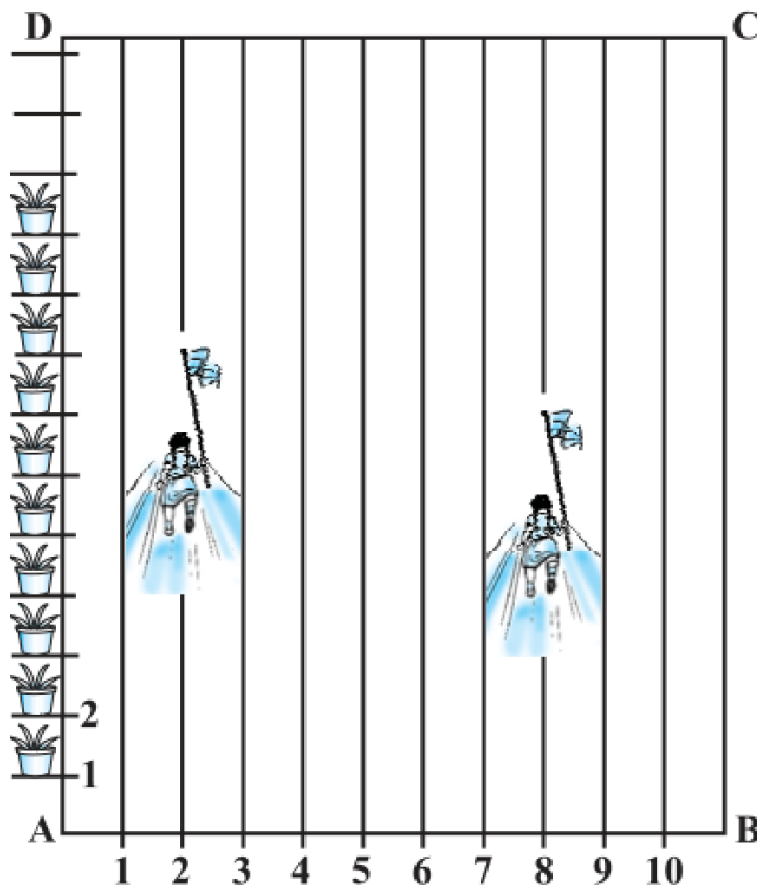


Fig. 7.12

Solution:

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

Similarly, Preet posted

red flag at $\frac{1}{5}$ of the distance AD i.e., $(\frac{1}{5} \times 100) \text{ m} = 20\text{m}$ from the starting point of 8th line. Therefore, the coordinates of this point are (8, 20).

Distance between these flags can be calculated by using 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 say this point be P(x, y).

$$x = \frac{2+8}{2} = 10/2 = 5 \text{ and}$$

$$y = \frac{20+25}{2} = \frac{45}{2}$$

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

Therefore, Rashmi should post her blue flag at $45/2 = 22.5\text{m}$ on 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, $-1 = (6k-3)/(k+1)$

$$-k - 1 = 6k - 3$$

$$7k = 2$$

$$k = 2/7$$

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.

Solution:

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, say P(x, y) is $((-4k+1)/(k+1), (5k-5)/(k+1))$.

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

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

$$\text{Therefore, } \frac{5k-5}{k+1} = 0$$

$$5k = 5$$

$$\text{or } k = 1$$

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

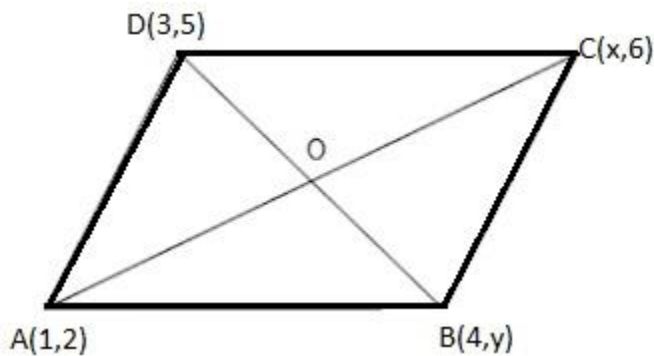
Now, find the coordinates of the point of division:

$$P(x, y) = \left(\frac{-4(1)+1}{1+1}, \frac{5(1)-5}{1+1} \right) = (-3/2, 0)$$

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 same.

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

$$\text{Midpoint of AC} = \left(\frac{1+x}{2}, \frac{2+6}{2} \right) = \left(\frac{1+x}{2}, 4 \right)$$

$$\text{Midpoint of BD} = \left(\frac{4+3}{2}, \frac{5+y}{2} \right) = \left(\frac{7}{2}, \frac{5+y}{2} \right)$$

Midpoint of AC and BD are same, this implies

$$\frac{1+x}{2} = \frac{7}{2} \text{ and } 4 = \frac{5+y}{2}$$

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

$$x = 6 \text{ and } y = 3. \text{ Answer!}$$

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).

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)

$$(2, -3) = \left(\frac{x+1}{2}, \frac{y+4}{2} \right)$$

$$\frac{x+1}{2} = 2 \text{ and } \frac{y+4}{2} = -3$$

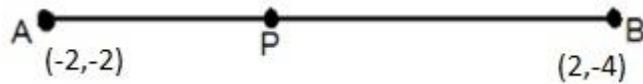
$$x+1 = 4 \text{ and } y+4 = -6$$

$$x = 3 \text{ and } y = -10$$

The coordinates of A(3,-10). Answer!

8. If A and B are (-2, -2) and (2, -4), respectively, find the coordinates of P such that $AP = \frac{3}{7} AB$ and P lies on the line segment AB.

Solution:



The coordinates of point A and B are (-2,-2) and (2,-4) respectively. Since $AP = \frac{3}{7} AB$

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, Z are dividing the line segment in a ratio 1:3, 1:1, 3:1 respectively.

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

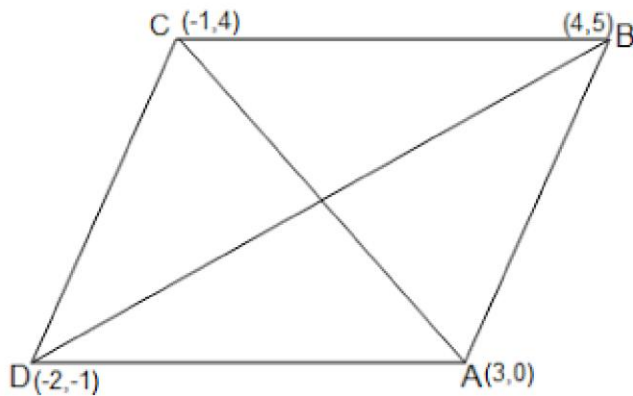
$$\text{Coordinates of Y} = \left(\frac{2(1)-2(1)}{1+1}, \frac{2(1)+8(1)}{1+1}\right) = (0, 0.5)$$

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

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 = $\frac{1}{2}$ (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.



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

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

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