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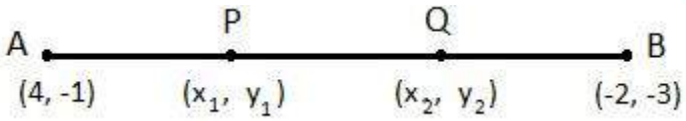
1. Find the coordinates of the point which divides the join of (- 1, 7) and (4, - 3) in the ratio 2:3.
Solution:

Let P(x, y) be the required point. Using the section formula, we get
x = (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, 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 = (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 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 1/4 th 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 flag exactly halfway between the line segment joining the two flags, where should she post her flag?

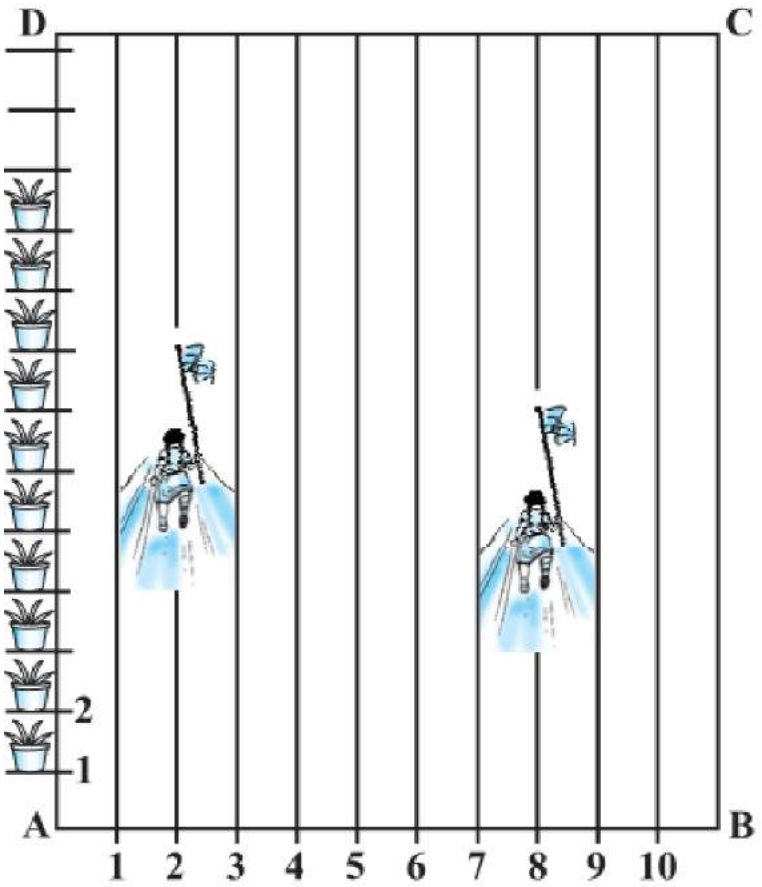


Fig. 7.12

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 = 25m from the starting point of 2nd line. Therefore, the coordinates of this point are (2, 25).

Similarly, Preet posted red flag at 1/5 of the distance AD i.e., (1/5 ×100) m = 20m 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,

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

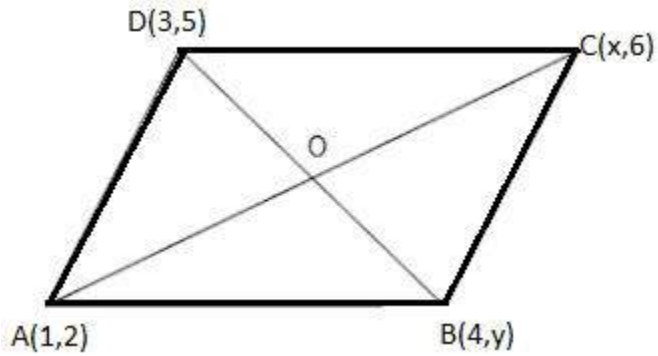
5. Find the ratio in which the line segment joining A (1, - 5) and B (- 4, 5) is divided by the x-axis. Also find the coordinates of the point of division.

Solution:
Let the ratio in which the line segment joining A (1, - 5) and B (- 4, 5) is divided by 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)).
Or $P(x, y) = \frac{-4k+1}{k+1}, \frac{5k-5}{k+1}$

We know that y-coordinate of any point on x-axis is 0.
Therefore, (5k-5)/(k+1) = 0
5k = 5
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) = ((-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 same.
To find the value of x and y, solve for 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)

Midpoint of AC and BD are same, this implies
(1+x)/2 = 7/2 and 4 = (5+y)/2

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

$x = 6$ and $y = 3$. 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) =((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). Answer!

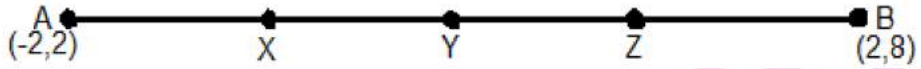
8. If A and B are (-2, -2) and (2, -4), respectively, find the coordinates of P such that AP = 3/7 AB and P lies on the line segment AB.

Solution:

The coordinates of
point 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 = $(\frac{3(2)+4(-2)}{3+4}, \frac{3(-4)+4(-2)}{3+4}) = (\frac{6-8}{7}, \frac{-12-8}{7}) = \left(-\frac{2}{7}, -\frac{20}{7}\right)$ 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.

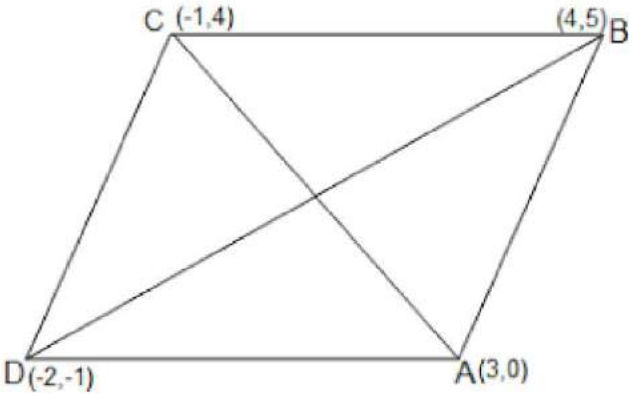
Coordinates of X = $(\frac{1(2)+3(-2)}{1+3}, \frac{1(8)+3(2)}{1+3}) = (-1, 7/2)$

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

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

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)

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