EXERCISE 7.2

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

$$\left(\frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2} \right)$$

$(-1, 7)$ as x_1, y_1

$(4, -3)$ as x_2, y_2

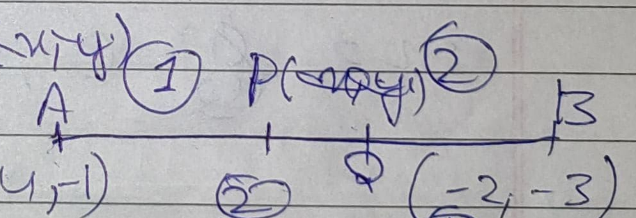
$$x = \frac{2(4) + 3(-1)}{2+3}, \quad y = \frac{2(-3) + 3(7)}{2+3}$$

$$x = \frac{8 - 3}{5}, \quad y = \frac{-6 + 21}{5}$$

$$x = \frac{5}{5} = 1; \quad y = \frac{15}{5} = 3$$

Therefore $(1, 3)$ is the required point.

(2) ~~Let the points be R(x,y)~~
Let P and Q be the
points of trisection
of AB, that is, $AP = PQ = QB$.



Therefore P divides AB internally in ratio 1:2. Therefore, the coordinates of P are, by section formula,

$$\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2}$$

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

$$x = \frac{-2+8}{3}, \quad y = \frac{-3-2}{3}$$

$$x = \frac{6}{3}\,2, \quad y = \frac{-5}{3}$$

Now, Q also divides AB internally in the ratio 2:1, So, the coordinates of Q are -

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

$$x = \frac{-4+4}{3}, \quad y = \frac{-6-1}{3}$$

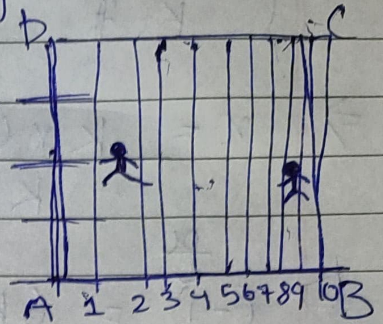
$$x = \frac{0}{3}\,0, \quad y = \frac{-7}{3}$$

Therefore, the coordinates of the trisection of the line segment joining A and B are: $\left(2, -\frac{5}{3}\right)$ & $\left(0, \frac{-7}{3}\right)$

(3) The school ground is in shape of rectangle named ABCD.

The distance between 100 flower pots = 1 m along AD

The distance travelled by niharika = $\frac{1}{4}$ th of 100 m, which is $\frac{1}{4} \times 100 = 25$ m.



The distance travelled by Preet = $\frac{1}{5}$ th of 100 m

which is, $\frac{1}{5} \times 100 = 20$ m

Rashmi has to post a blue flag exactly halfway between the line segment joining the two flags = ratio 1:1

$$x = \frac{x_1 + x_2}{2}, \quad y = \frac{y_1 + y_2}{2}$$

$$x = \frac{2+8}{2}, \quad y = \frac{25+20}{2}$$

$$x = \frac{10}{2} = 5, \quad y = \frac{45}{2} = 22\frac{1}{2}$$

Using distance formula,

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

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

$$= \sqrt{(6)^2 + (5)^2} = \sqrt{36+25}$$

$$= \sqrt{61}$$

So, the distance will be $\sqrt{61}$.

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(4) Here P divides AP is K:1.

$$\left(\frac{Kx_2+x_1}{K+1}, \frac{Ky_2+y_1}{K+1}\right)$$

A(-3,10)   K : 1   P(-1,6)   B(6,-8)

$$\Rightarrow x = \frac{K\times 6+1(-3)}{K+1}, \frac{K(-8)+1(10)}{K+1}$$

$$\Rightarrow (-1) = \frac{6K-3}{K+1}, \frac{-8K+10}{K+1}$$

$\Rightarrow 6K-3 = -K-1$

$\Rightarrow 6K+K = -1+3$

$\Rightarrow K = \frac{2}{7}$

So, the line segment joining the points (-3, 10) and (6, -8) is divided by (-1,6) is 2:7.

(5)

A(1,-5)   P(K,1)   B(-4,5)

Here 'P' divides AB is K:1.

$$\left(\frac{Kx_2+x_1}{K+1}, \frac{Ky_2+y_1}{K+1}\right)$$

$$\frac{m_1x_2+m_2x_1}{m_1+m_2}$$

A(x_1, y_1) = A(1, -5)

B(x_2, y_2) = B(-4, 5)

$$\Rightarrow x = \frac{K(-4)+1(1)}{K+1}, y = \frac{K(5)+1(-5)}{K+1}$$

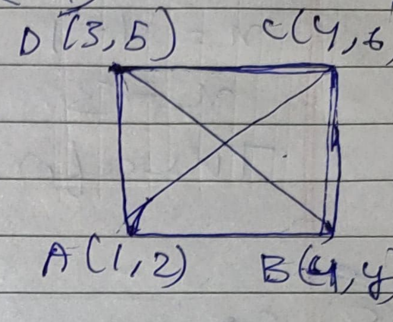
$x = \frac{-4+1}{2}$; $y = \frac{5}{1} = 1$

$x = \frac{-3}{2}$; $K = 1$

So the coordinates of the point of division are - (1, 1) & $\left(\frac{-3}{2}, 0\right)$

(6) Let (1,2), (4,y), (x, 6) & (3,5)

Mid-points $\Rightarrow \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$



$O = \frac{1+x}{2}, \frac{2+6}{2}$

$\left(\frac{1+x}{2}, 4\right)$ — (1)

Coordinates of $O = \left(\frac{4+3}{2}, \frac{5+y}{2}\right)$

$= \left(\frac{7}{2}, \frac{5+y}{2}\right)$ — (2)

For 'O' $\frac{1+x}{2} = \frac{7}{2}$

$x = 7-1$
$x = 6$

$\frac{5+y}{2} = 4$

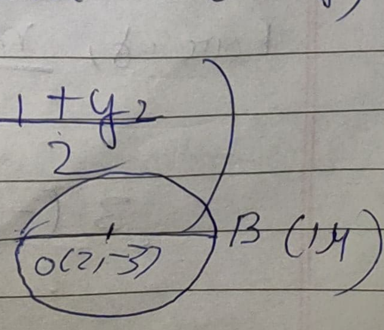
$\Rightarrow 5 + y = 8$
$\Rightarrow y = 8-5 = 3$

So, the coordinates of (x, y) are (6, 3)

(7) Here,
At coordinates A(x, y) will be (x, y)

Mid-points $= \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

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



$\frac{x+1}{2} = 2$

$x+1 = 2$

$x+1 = 2\times 2$

$x = 4-1$

$x = 3$

$\frac{y+4}{2} = (-3)$

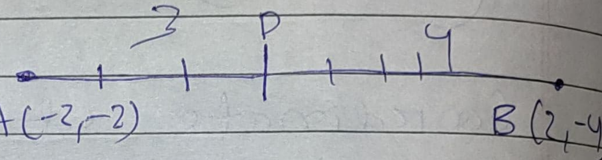
$y+4 = (-3)\times 2$

$y = (-6)(-4)$

$y = (-10)$

Therefore, the coordinates of $A(x, y)$ is $(3, -10)$

(8) Given -



$AP = \frac{3}{7} AB$

$\frac{AP}{AB} = \frac{3}{7}$, $\frac{m_1}{m_2} = \frac{3}{4}$

$AB = \frac{7}{7} = 1$, $AB - AP$

$= \frac{7}{7} - \frac{3}{7} = \frac{4}{7}$

So, $\frac{PB}{AB} = \frac{4}{7}$.

So, $\boxed{PB = 4}$ & $\boxed{AB = 7}$

Coordinate of 'P' $= \frac{m_1x_2 + m_2x_1}{m_1 + m_2}$

$\frac{3(2) + 4(-2)}{3+4} = \frac{6 + (-8)}{7}$

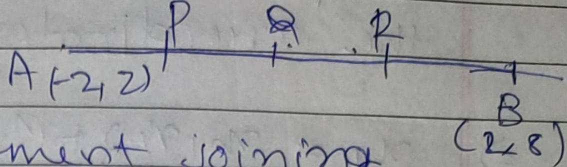
$= \frac{(-2)}{7}$

For y, $\frac{m_1y_2 + m_2y_1}{m_1 + m_2}$

$= \frac{3(-4) + 4(-2)}{3+4} = \frac{(-12) + (-8)}{7} = \frac{-20}{7}$

So the coordinates of P are –
$(x, y), \left(\frac{-2}{7}, \frac{-20}{7}\right)$

(9)



Here,
Q divides the line segment joining A & B in 1:3 ratio

Therefore,
$m_1 = 1$ & $m_2 = 3$.
Putting the section formula the coordinates of P are –

$$x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}$$

$$\Rightarrow x = \frac{1(2) + 3(-2)}{1+3} \Rightarrow x = \frac{2 + (-6)}{4}$$

$$\Rightarrow x = \frac{-4}{4} = (-1)$$

For y, $= \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$

$$\Rightarrow y = \frac{1(8) + 3(+2)}{1+3}$$

$$\Rightarrow y = \frac{8 + (6)}{4} = \frac{14}{4} = \frac{7}{2}$$

Therefore, P is $\left(-1, \frac{7}{2}\right)$

(ii) Here, Q divides the line segment joining A & B in 2:2 into

Therefore, $m_1 = 2$ & $m_2 = 2$

~~Therefo~~ By putting the section formula the coordinates of Q is -

$$\Rightarrow x_1 = \frac{m_1 x_2 + m_2 + x_1}{m_1 + m_2}$$

$$\Rightarrow x = \frac{2(2) + 2(-2)}{1+3} \Rightarrow x = \frac{4+(-4)}{4} \Rightarrow x = 0$$

For y, $\frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$

$$\Rightarrow y = \frac{2(8) + 2(2)}{2+2}$$

$$\Rightarrow y = \frac{16 + (4)}{4} = \frac{20}{4} = 5$$

Therefore, the coordinates of Q is (0,5)

(iii) Here, R divides the line segment joining A & B in 3:1 ratio.

Therefore, $m_1 = 3$, & $m_2 = 1$

~~Putting~~ By putting the section formula the coordinates of Q is

$$x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}$$

$$\Rightarrow x = \frac{3(2) + 1(-2)}{3+1} \Rightarrow x = \frac{4}{4} = 1$$

For y, $\dfrac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$

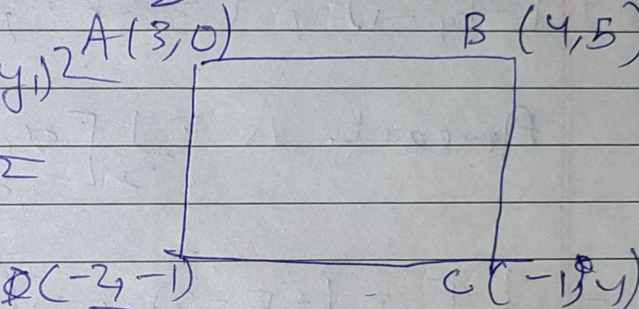
$\Rightarrow y = \dfrac{3(8) + 1(-2)}{1+3} \Rightarrow y = \dfrac{24+(-2)}{4} = \dfrac{\cancel{22}^{\,13}}{\cancel{4}_{\,2}} = \dfrac{13}{2}$

Therefore, the coordinates of R are- $\left(1, \dfrac{13}{2}\right)$

(10) Area of Rhombus $= \dfrac{1}{2} \times AC \times BD$

$\dfrac{1}{2} \times \left[\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}\right.$

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



$\Rightarrow \dfrac{1}{2} \times \left[\sqrt{(-1-3)^2 + (4-0)^2}\right] \times \left[\sqrt{(-2-4)^2 + (-1-5)^2}\right.$

$\Rightarrow \dfrac{1}{2} \times \left(\sqrt{(-4)^2 + (4)^2}\right) \times \left(\sqrt{(-6)^2 + (-6)^2}\right.$

$\Rightarrow \dfrac{1}{2} \times \sqrt{32} \times \sqrt{72}$

$= \dfrac{1}{\cancel{2}} \times \cancel{4}^{\,2}\sqrt{2} \times 6\sqrt{2}$

$= 2 \times 6 \times 2 = 24$ sq. unit

Therefore, the area of the rhombus ABCD is 24 sq. units.