Exercise : 7.2

(1) Let $m(2:3)$, $A(-1,7)$ and $B(4,-3)$.

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

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

$$= \frac{8 + (-3)}{5}$$

$$= \frac{5}{5} \quad \boxed{x = 1}$$

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

$$y = \frac{(2 \times -3) + (3 \times 7)}{2+3}$$

$$y = \frac{-6 + 21}{5}$$

$$y = \frac{15}{5} \quad \boxed{y = 3}$$

$\therefore (1, 3)$.

(2) Let A(4,-1) and B(-2,-3) and, P and Q be the points of trisection.

P divides AB in ratio 1:2,

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

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

$$= \frac{-2+8}{3}$$

$$= \frac{6}{3}$$

$$\boxed{x = 2}$$

$$y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

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

$$= \frac{-3-2}{3}$$

$$\boxed{y = \frac{-5}{3}}$$

Q divides AB in ratio 2:1.

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

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

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

$$= \frac{0}{3}$$

$$\boxed{x = 0}$$

$$y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

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

$$= \frac{-6 + (-1)}{3}$$

$$= \frac{-6-1}{3}$$

$$\boxed{y = \frac{-7}{3}}$$

$\therefore P\left(2, \frac{-5}{3}\right)$, $Q\left(0, \frac{-7}{3}\right)$

(or)

3) D coordinate of Niharika's point = $\frac{100}{4}$ on 2nd line $= 25$

$= (2, 25)$

coordinate of Preet's point = $\frac{100}{5}$ 20

$= (8, 20)$

Let A(2,25) and B(8,20)

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

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

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

$= \sqrt{36+25}$

$= \sqrt{61}$

∴ The distance between two flags is $\sqrt{61}$

Now,

$x = \frac{x_2m_1+x_1m_2}{m_1+m_2}$

$= \frac{8\times1+2\times1}{1+1}$

$= \frac{8+2}{2}$

$= \frac{10}{2}$

$= 5$ units

$y = \frac{y_2m_1+y_1m_2}{m_1+m_2}$

$= \frac{20\times1+25\times1}{1+1}$

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

$= \frac{45}{2}$

$= 22.5$ units.

(5, 22.5)

∴ She should post her flag on 5th row in 22.5 units.

(a) Let the ratio be $k:1$

Now,

$$\frac{m_1x_2 + m_2x_1}{m_1 + m_2} = -1$$

$$\frac{6k + (-3)}{k+1} = -1$$

$$\frac{6k - 3}{k+1} = -1$$

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

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

$$7k = 2$$

$$\boxed{k = \frac{2}{7}}$$

$$\frac{m_1y_2 + m_2y_1}{m_1 + m_2} = 6$$

$$\frac{-8k + 10}{k+1} = 6$$

$$-8k + 10 = 6k + 6$$

$$-8k - 6k = 6 - 10$$

$$-14k = -4$$

$$k = \frac{-4}{-14}$$

$$\boxed{k = \frac{2}{7}}$$

∴ The ratio is 2:7

(-1, 5)

The ratio,

$\Rightarrow \frac{5k-5}{k+1}$

$\Rightarrow 5k-5 = k+1$

$\Rightarrow 5k-k = 1+5$

$\Rightarrow 4k = 6$

(5) Let the ratio be $k:1$.

coordinates of $y = P(x, 0)$

Here, $x_1 = 1, y_1 = -5$

$x_2 = -4, y_2 = 5$

$P\left[\frac{k(-4)+1(1)}{k+1}, \frac{k(5)+1(-5)}{k+1}\right]$

$= P\left[\frac{-4k+1}{k+1}, \frac{5k-5}{k+1}\right]$.

= P lies on x-axis, so its ordinate is 0

$\therefore \frac{5k-5}{k+1} = 0$

$5k-5 = 0$

$5k = 5$

$k = \frac{5}{5}$

$k = 1$.

required ratio = 1:1.

Now,

$P\left[\frac{-4k+1}{k+1}, \frac{5k-5}{k+1}\right]$

$P\left[\frac{-4(1)+1}{1+1}, \frac{5-5}{2}\right]$

$P = \left[\frac{-3}{2}, 0\right]$

$P\left[\frac{-3}{2}, 0\right]$.

(6) We know that diagonals of a ||gm intersect each other.

coordinates of AC = coordinate of BD.

Finding midpoint of AC,

$\Rightarrow \frac{x_1+x_2}{m_1+m_2} = \frac{y_1+y_2}{m_1+m_2}$

$\Rightarrow \frac{1+x}{2} = \frac{2+6}{2}$

$\Rightarrow \frac{1+x}{2} = \frac{8}{2}$

$\Rightarrow \frac{1+x}{2} = \frac{8}{2}$ ... (i)

Finding midpoint of BD,

$\Rightarrow \frac{x_1+x_2}{m_1+m_2} = \frac{y_1+y_2}{m_1+m_2}$

$\Rightarrow \frac{4+3}{2} = \frac{y+5}{2}$

$\Rightarrow \frac{7}{2} = \frac{y+5}{2}$ ... (ii)

Comparing coordinates of x and y.

$\frac{1+x}{2} = \frac{8}{2} \Rightarrow \frac{1+x}{2} = \frac{7}{2}$

$1+x = 8 \Rightarrow 1+x = 7$

$x = 7 \Rightarrow x = 7-1$

$\Rightarrow \boxed{x = 6}$

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

$\Rightarrow y+5 = 8$

$\Rightarrow y = 8-5$

$\Rightarrow \boxed{y = 3}$

$\therefore x = 6$ and $y = 3$.

Let the centre be P(2,-3), B(1,4) and the ratio will be $k:1$.

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

$$2 = \frac{x_1 + 1}{2}$$

$$x_1 + 1 = 4$$

$$\boxed{x_1 = 3}$$

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

$$-3 = \frac{y_1 + 4}{2}$$

$$y_1 + 4 = -6$$

$$\boxed{y_1 = -10}$$

$\therefore A(3, -10)$

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

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

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

$$\frac{AP + PB}{AP} = \frac{3+4}{3}$$

$$\frac{AP}{AP} + \frac{PB}{AP} = \frac{3}{3} + \frac{4}{3}$$

$$1 + \frac{PB}{AP} = \frac{4}{3} + 1$$

$$\frac{PB}{AP} = \frac{4}{3}$$

$$PB : AP = 4:3.$$

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

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

$$= \frac{6 - 8}{7}$$

$$\boxed{x = \frac{-2}{7}}$$

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

$$= \frac{-12 + (-8)}{7}$$

$$= \frac{-12 - 8}{7}$$

$$\boxed{y = \frac{-20}{7}}$$

(10)

$$AC = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$
$$= \sqrt{(-1-3)^2+(4-0)^2}$$
$$= \sqrt{(-4)^2+(4)^2}$$
$$= \sqrt{16+16}$$
$$= \sqrt{32}$$

$$BD = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$
$$= \sqrt{(2-4)^2+(-1-5)^2}$$
$$= \sqrt{(-6)^2+(-6)^2}$$
$$= \sqrt{36+36}$$
$$= \sqrt{72}$$

Area of rhombus $= \frac{1}{2} \times \sqrt{32} \times \sqrt{72}$
$= \frac{1}{2} \times 4\sqrt{2} \times 6\sqrt{2}$
$= \frac{1}{2} \times 48$
$= 24$

(9) A(-2, 2) and B(2, 8), let the point which divides the line segment be P:

$x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}$
$= \frac{2 + (-2)}{2}$
$= \frac{2-2}{2}$
$= \frac{0}{2}$
$x = 0$

$y = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$
$= \frac{8+2}{2}$
$= \frac{10}{2}$
$y = 5$

$\therefore (0, 5)$.