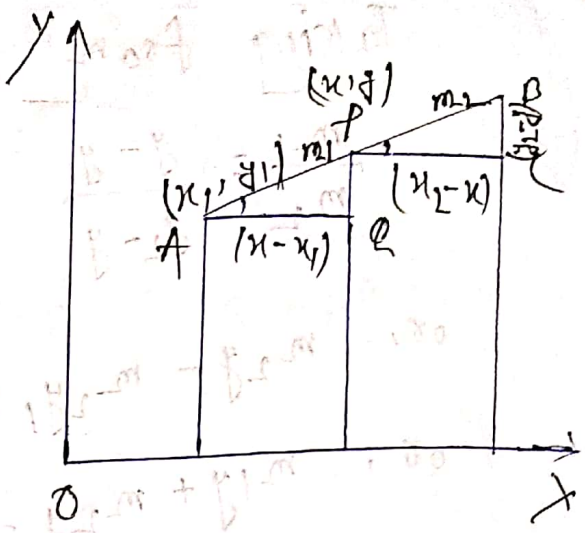
विभाजन सूत्र :⇒



$$(x,y) = \left(\frac{m_1x_2 + m_2x_1}{m_1+m_2}, \frac{m_1y_2 + m_2y_1}{m_1+m_2} \right)$$

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

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

Proof:⇒ $\Delta APQ \sim \Delta ABC$

$$\frac{AP}{AB} = \frac{AQ}{AC} = \frac{PQ}{BC}$$

or, $$\frac{m_1}{m_2} = \frac{x-x_1}{x_2-x} = \frac{y-y_1}{y_2-y}$$

Taking from 1st & 2nd two terms

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

or, $$m_2x - m_2x_1 = m_1x_2 - m_1x$$

or, $$m_1x + m_2x = m_1x_2 + m_2x_1$$

or, $$x(m_1+m_2) = \frac{m_1x_2 + m_2x_1}{m_1+m_2}$$

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Taking from 1st & last two terms,

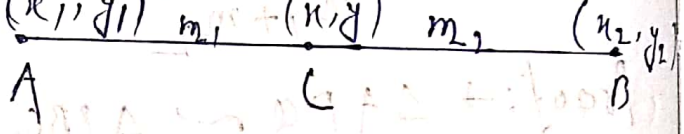
$$\frac{m_1}{m_2} = \frac{y - y_1}{y_2 - y}$$

or, $m_2 y - m_2 y_1 = m_1 y_2 - m_1 y$

or, $m_1 y + m_2 y = m_1 y_2 + m_2 y_1$

or, $y(m_1 + m_2) = m_1 y_2 + m_2 y_1$

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

* 

$$m_1 = m_2$$

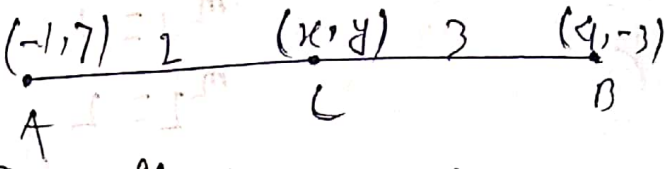
$$x = \frac{x_1 + x_2}{2}$$

$$y = \frac{y_1 + y_2}{2}$$

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Ex - 7.2

(1)



माना कि बिंदु C का बिंदुपथ (x, y) है।

$m_1 = 2$

$m_2 = 3$

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

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

$$= \frac{8-3}{5}$$

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

$$= 1$$

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

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

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

$$= \frac{15}{5}$$

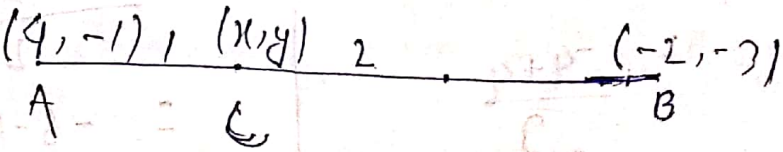
$$= 3$$

बिंदु C का बिंदुपथ $= (x, y)$

$= (1, 3)$ Ans

(2)





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माना कि C का निर्देशांक = (x, y) है।

$m_1 = 1$

$m_2 = 2$

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

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

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

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

$$= 2$$

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

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

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

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

$(4, -1)$ 2 (x, d) 1 $(-2, -1)$

A D B

माना कि D का निर्देशांक = (x, d) है।

$m_1 = 2$

$m_2 = 1$

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

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

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

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

$$= 0$$

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

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

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

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

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बिंदु C का निर्देशांक = (x, y)

$= \left(2, \frac{-5}{2}\right)$ Ans

बिंदु D का निर्देशांक = (c, d)

$= \left(0, \frac{-7}{2}\right)$ Ans

(3)

नदी द्वारा दूसरी पंक्ति में खड़े सारे केले का निर्देशांक $= \left(2, \frac{1}{4} \times 100^{25}\right)$

$= 2, 25$

प्रीत द्वारा आठवीं पंक्ति में खड़े सारे लाल केले का निर्देशांक $= \left(8, \frac{1}{5} \times 100^{20}\right)$

$= (8, 20)$

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

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

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

$= \sqrt{36 + 25}$

$= \sqrt{61}$ m Ans

माना कि (x, y) बिंदु रहीम द्वारा नीले केले का निर्देशांक है।

$m_1 = m_2$

$x = \frac{x_1 + x_2}{2}$

$= \frac{2+8}{2} = \frac{10}{2} = 5$

$y = \frac{y_1 + y_2}{2}$

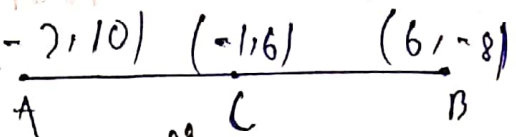
$= \frac{25 + 20}{2} = \frac{45}{2} = 22.5$

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B का निर्देशांक = (5, 22.5)

पाँचवी पंक्ति Ans

(4.)



माना कि बिंदुओं जोड़ने वाले रेखाखंड को बिंदु $C(-1, 6)$ में विभाजित करता है।

$m_1 = \lambda$

$m_2 = 1$

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

$$\text{or, } -1 = \frac{\lambda(6) + (1)(-3)}{\lambda + 1}$$

$$\text{or, } -1 = \frac{6\lambda + 3}{\lambda + 1}$$

$$\text{or, } 6\lambda - 3 = -\lambda + 3$$

$$\text{or, } 6\lambda + \lambda = -1 + 3$$

$$\text{or, } 7\lambda = 2$$

$$\therefore \lambda = \frac{2}{7}$$

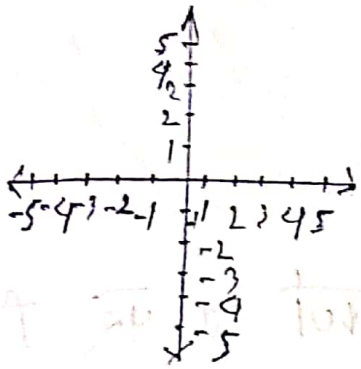
$$\frac{m_1}{m_2} = \frac{\lambda}{1}$$

$$\text{or, } \frac{m_1}{m_2} = \frac{\frac{2}{7}}{1}$$

$$\text{or, } \frac{m_1}{m_2} = \frac{2}{7} \quad \therefore m_1 : m_2 = 2 : 7 \text{ Ans}$$

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(5.) $y = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$



or, $0 = \frac{m_1(5) + m_2(-5)}{m_1 + m_2}$

or, $5m_1 - 5m_2 = 0$

or, $5m_1 - 5m_2 = 0$

or, $5m_1 = 5m_2$

or, $\frac{m_1}{m_2} = \frac{1}{1}$ $\therefore m_1 : m_2 = 1:1$ Ans

बिंदु C को निर्देशांक $= (x, 0)$

$m_1 = m_2$

$x = \frac{x_1 + x_2}{2}$

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

$= \frac{1 - 4}{2}$

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

(1,-5) (x,0) (-4,5)

A C B

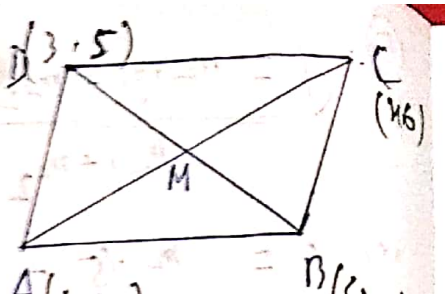
बिंदु C को निर्देशांक $= (x, 0)$

$= \left(\frac{-3}{2}, 0\right)$

Ans

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(5)



विकर्ण AC पर बिंदु M का निर्देशांक

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

$$= \left(\frac{1+x}{2}, \frac{2+6}{2} \right)$$

$$= \left(\frac{1+x}{2}, \frac{8}{2} \right)$$

$$= \left(\frac{1+x}{2}, 4 \right) \quad \text{---(1.)}$$

विकर्ण BD पर बिंदु M का निर्देशांक

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

$$= \left(\frac{7}{2}, \frac{y+5}{2} \right) \quad \text{---(2.)}$$

from eqn (1) & (2)

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

$$\therefore 1+x = 7$$

$$\therefore x = 7-1 = 6$$

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

$$\therefore y+5 = 8$$

$$y = 8-5 = 3$$

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(7.) माना दिइ बिंदु A को निर्देशांक (x_1, y_1) छ।



$m_1 = m_2$

$x = \frac{x_1 + x_2}{2}$

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

or, $x_1 + 1 = 4$

or, $x_1 = 4 - 1$

$\therefore x_1 = 3$

$y = \frac{y_1 + y_2}{2}$

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

or, $y_1 + 4 = -6$

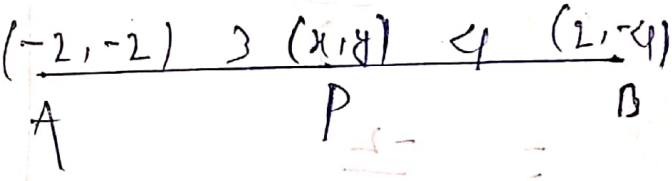
$\therefore y = -6 - 4$

$= -10$

बिंदु A को निर्देशांक $= (x_1, y_1)$

$= (3, -10)$

(8.)



माना दिइ बिंदु P को निर्देशांक $= (x, y)$

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

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

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

or, $\frac{AB}{AP} - 1 = \frac{7}{3} - 1$

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or,
$$\frac{AB - AP}{AP} = \frac{-3}{3}$$

or,
$$\frac{BP}{AP} = \frac{4}{3}$$

or,
$$\frac{AP}{BP} = \frac{3}{4}$$

$m_1 = 3$

$m_2 = 4$

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

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

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

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

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

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

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

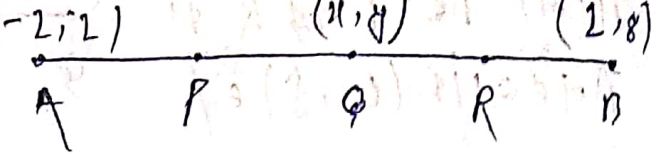
$$= \frac{-20}{7}$$

Hd: $(x, y) = \left(\frac{-2}{7}, \frac{-20}{7}\right)$ Ans

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(9.)

माना कि बिंदु Q का निर्देशांक (x, y) है।



$m_1 = m_2$

$$x = \frac{x_1 + x_2}{2}$$

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

$$= \frac{0}{2}$$

$$= 0$$

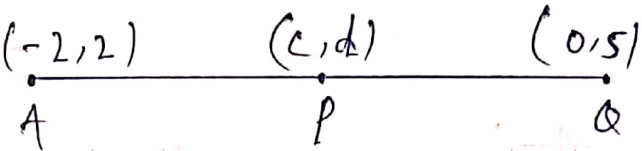
$$y = \frac{y_1 + y_2}{2}$$

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

$$= \frac{+10}{2}$$

$$= 5$$

माना कि बिंदु P का निर्देशांक (c, d) है।



$m_1 = m_2$

$$c = \frac{x_1 + x_2}{2}$$

$$= \frac{-2 + 0}{2}$$

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

$$= -1$$

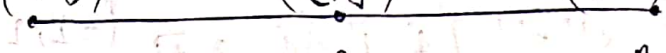
$$d = \frac{y_1 + y_2}{2}$$

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

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

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माना कि बिंदु R का निर्देशांक (e, f) है।



$m_1 = m_2$

$$x = \frac{x_1 + x_2}{2}$$

$$e = \frac{0+2}{2} = \frac{2}{2} = 1$$

$$y = \frac{y_1 + y_2}{2} = \frac{5+8}{2} = \frac{13}{2}$$

बिंदु P का निर्देशांक $= (c, d)$

$$= \left(-1, \frac{7}{2}\right) \text{ Ans}$$

बिंदु Q का निर्देशांक $= (x, y)$

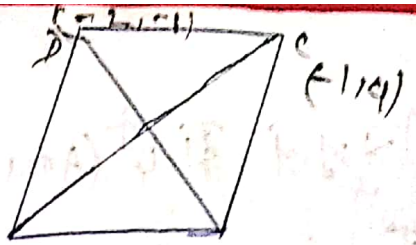
$= (0, 5)$ Ans

बिंदु R का निर्देशांक $= (e, f)$

$$= \left(1, \frac{13}{2}\right) \text{ Ans}$$

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(10.)



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

$$d_1 = \sqrt{(-1-3)^2+(4-0)^2}$$

$$= \sqrt{(-4)^2+(4)^2}$$

$$= \sqrt{16+16}$$

$$= \sqrt{32}$$

$$= 4\sqrt{2}$$

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

$$d_2 = \sqrt{(-2-4)^2+(-1-5)^2}$$

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

$$= \sqrt{36+36}$$

$$= \sqrt{72}$$

$$= 6\sqrt{2}$$

समचतुर्भुज का क्षेत्रफल $= \frac{1}{2} \times d_1 \times d_2$

$$= \frac{1}{2} \times 4\sqrt{2} \times 6\sqrt{2}$$

$$= 12 \times 2$$

$$= 24 \text{ वर्ग इकाई}$$

Ans

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