স্থানাঙ্ক :

① ⓐ $y = mx + c$

$r\sin\theta = mr\cos\theta + c$ (Ans)

ⓑ $x^2 + y^2 = a^2$

$r^2 = a^2$

$r = a$ (Ans)

②

ⓐ $r = 2\cos a\theta$

$\Rightarrow r^2 = 2ar\cos\theta$

$\Rightarrow x^2 + y^2 = 2ax$

$\Rightarrow x^2 + y^2 - 2ax = 0$ (Ans)

ⓑ $r\cos(\theta - \alpha) = k$

$\Rightarrow r\cos\theta\cos\alpha + r\sin\theta\sin\alpha = k$

$\Rightarrow x\cos\alpha + y\sin\alpha = k$ (Ans)

③

~~ক~~ ———

$a^2 = (a-7)^2 + (5-2)^2$

$a^2 = a^2 - 14a + 49 + 9$

$a = \frac{58}{14}$

$= \frac{27}{7}$ Ans

④ let, ভুজ $= x$

কোটি $= 2x$ স্থানাঙ্ক $(x, 2x)$

Now,

$\{(x-4)^2 + (2x-3)^2\}^2 = (\sqrt{10})^2$

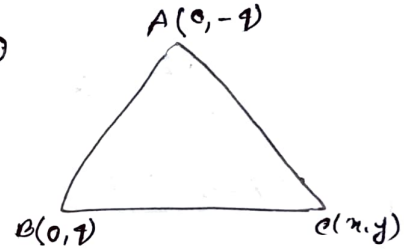
$\Rightarrow x^2 - 8x + 16 + 4x^2 - 12x + 9 = 10$

$\Rightarrow 5x^2 - 20x + 15 = 0$

$\Rightarrow x = 1, 3$

∴ বিন্দুটির স্থানাঙ্ক $(1, 2)$ এবং $(3, 6)$ Ans

⑤



$AB = \sqrt{(4-4)^2} = 8$

$BC^2 = (x-0)^2 + (y-4)^2 = 8^2$

$= x^2 + y^2 - 8y + 16 = 64$ ——— (I)

$AC^2 = (x-0)^2 + (y+4)^2 = 8^2$

$= x^2 + y^2 + 8y + 16 = 64$ ——— (II)

(I) ও (II) নং হতে,

$16y = 0$

$y = 0$

y-এর মান (I) এ বসাই,

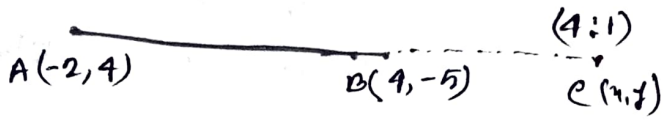
$x^2 + 16 = 64$

$x^2 = 48 = 4$

$x = 4\sqrt{3}$

∴ স্থানাঙ্ক $= (4\sqrt{3}, 0)$ Ans

(6) (7)



সূত্রমতে,

$$AB = 3BC$$

$$AB + BC = 3BC + BC$$

$$AC = 4BC$$

$$AC : BC = 4 : 1$$

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

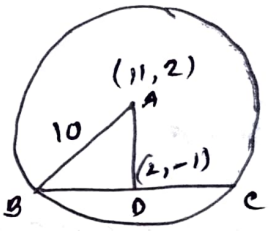
$$= \frac{16+2}{3} = 6$$

$$Y = \frac{4 \times -5 - 1 \times 4}{3}$$

$$= \frac{-24}{3} \quad 8$$

∴ প্রান্তাঙ্ক $(6, -8)$

(5)



$$AD = \sqrt{(11-2)^2 + (2+1)^2}$$

$$= \sqrt{90}$$

$$BD^2 = AB^2 - AD^2$$

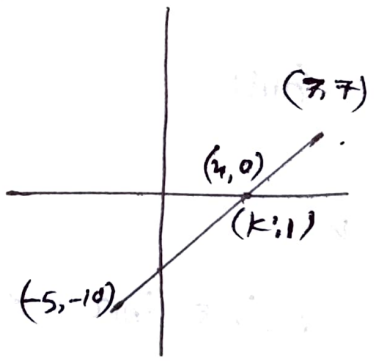
$$= 10^2 - (\sqrt{90})^2$$

$$BD = \sqrt{10}$$

$$\therefore BC = 2 \times \sqrt{10} = 2\sqrt{10}$$

[Showed]

(8)



Now,

$$0 = \frac{-10k + 7}{k+1}$$

$$k = \frac{7}{10}$$

$$\therefore k : 1 = 7 : 10$$

[Ans]

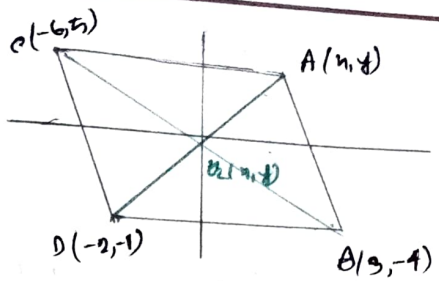
Again,

$$x = \frac{7 \times -5 + 10 \times 7}{17}$$

$$\therefore x = \frac{35}{17}$$

[Ans]

(9)



মধ্যবিন্দু,

$$x = \frac{-6+3}{2} = -\frac{3}{2}$$

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

Again,

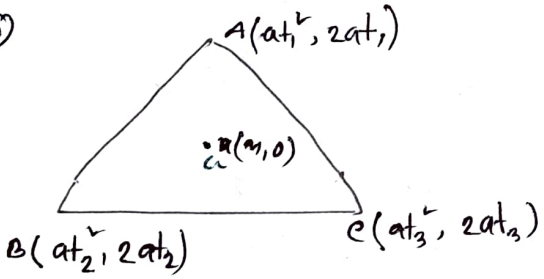
$$-\frac{3}{2} = \frac{x-2}{2} \quad \Big| \quad \frac{1}{2} = \frac{y-1}{2}$$

$$\Rightarrow x = -3+2 \quad \Big| \quad y = 1+1$$

$$= -1 \quad \Big| \quad = 2$$

$\therefore$ যুগ্মাঙ্ক $(-1, 2)$ Ans

(10)



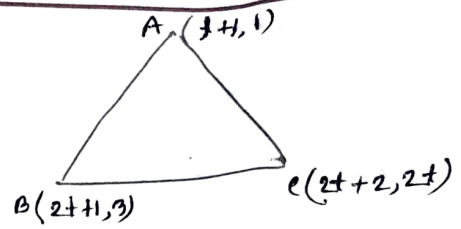
$$0 = \frac{2at_1 + 2at_2 + 2at_3}{3}$$

$$2a(t_1 + t_2 + t_3) = 0$$

$$t_1 + t_2 + t_3 = 0$$

(Showed)

(11)



$$\Delta ABC = \frac{1}{2}\begin{vmatrix} 2t+2 & 2t & 1 \\ 2t+1 & 3 & 1 \\ t+1 & 1 & 1 \end{vmatrix}$$

$$\Rightarrow \frac{1}{2}\begin{vmatrix} 1 & 2t-3 & 0 \\ t & 2 & 0 \\ t+1 & 1 & 1 \end{vmatrix}$$

$$= \frac{1}{2}\left|2 - 2t^2 + 3t\right|$$

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

প্রশ্নমতে, $\frac{1}{2}(2t^2 - 3t - 2) = 0$

$$2t^2 - 3t - 2 = 0$$

$\therefore t = -\frac{1}{2}, 2$ Proved

(12)

$$\frac{1}{2}\begin{vmatrix} a & 2-2a & 1 \\ 1-a & 2a & 1 \\ -4-a & 6-2a & 1 \end{vmatrix}$$

$$\Rightarrow \frac{1}{2}\begin{vmatrix} a-1+a & 2-2a-2a & 0 \\ 1-a-4a+4 & 2a-6+2a & 0 \\ -4-a & 6-2a & 1 \end{vmatrix}$$

$$\Rightarrow \frac{1}{2}\begin{vmatrix} 2a-1 & 2-4a \\ 5 & 4a-6 \end{vmatrix}$$

$$= \frac{1}{2}\left|8a^2 - 12a - 4a + 6 - 10 + 20a\right|$$

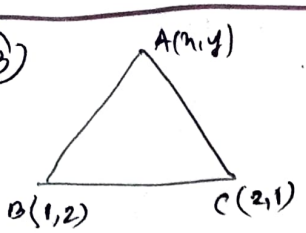
$$= \frac{1}{2}\left|8a^2 + 4a - 4\right|$$

প্রশ্নমতে, $\frac{1}{2}\left|8a^2 + 4a - 4\right| = 0$

$$8a^2 + 4a - 4 = 0$$

$$a = -1, \frac{1}{2}$$ Ans

(13)



প্রশ্নমতে,

$$\frac{1}{2}\begin{vmatrix} x & y & 1 \\ 1 & 2 & 1 \\ 2 & 1 & 1 \end{vmatrix} = 6$$

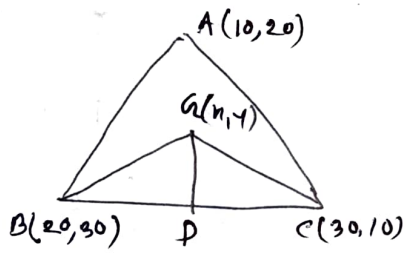
$$= \frac{1}{2}\begin{vmatrix} x-1 & y-2 & 0 \\ -1 & 1 & 0 \\ 2 & 1 & 1 \end{vmatrix} = 6$$

$$= \frac{1}{2}|x-1+y-2| = 6$$

$$= x+y-3 = 12$$

$$\therefore x+y = 15 \quad \text{(showed)}$$

(14)



D এর স্থানাংক $\frac{20+30}{2} = 25$

$\frac{30+10}{2} = 20$

$$x = \frac{20+10+30}{3} = 20$$

$$y = \frac{30+20+10}{3} = 20$$

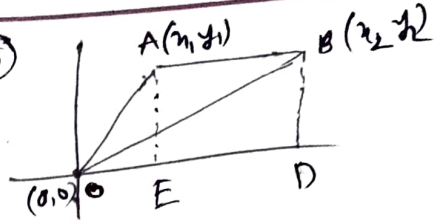
$$(x,y) = (20,20)$$

$$\therefore GD^2 = (20-25)^2 + (20-20)^2$$

$$GD = \sqrt{(5)^2}$$

$$GD = 5 \quad \boxed{\text{Ans}}$$

(15)



$\Delta AOB = \Delta AEO + \text{ট্রা: } ABDE - \Delta BOD$

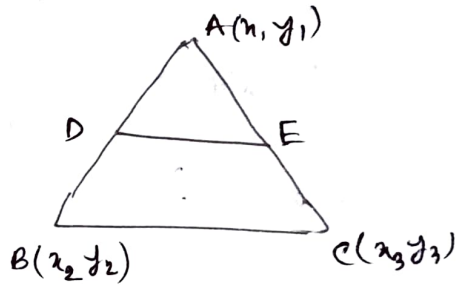
$$= \frac{1}{2}x_1y_1 + \frac{1}{2}(y_2+y_1)(x_2-x_1) - \frac{1}{2}x_2y_2$$

$$= \frac{1}{2}(x_1y_1 + x_2y_2 - y_2x_1 + x_2y_1 - x_1y_1 - x_2y_2)$$

$$= \frac{1}{2}(x_2y_1 - x_1y_2)$$

$$= \frac{1}{2}|(x_1y_2 - x_2y_1)| \quad \text{(proved)}$$

(16)



$$D = \frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}$$

$$E = \frac{x_1+x_3}{2}, \frac{y_3+y_1}{2}$$

$$DE = \sqrt{\left(\frac{x_1+x_2}{2} - \frac{x_1+x_3}{2}\right)^2 + \left(\frac{y_1+y_2}{2} - \frac{y_1+y_3}{2}\right)^2}$$

$$= \sqrt{\left(\frac{x_1+x_2-x_1+x_3}{2}\right)^2 + \left(\frac{y_1+y_2-y_1-y_3}{2}\right)^2}$$

$$= \sqrt{\frac{(x_2-x_3)^2}{4} + \frac{(y_2-y_3)^2}{4}}$$

$$= \frac{1}{2}\sqrt{(x_2-x_3)^2 + (y_2-y_3)^2}$$

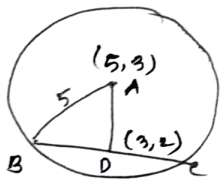
$$\sqrt{\frac{x_2 - x_3}{2} + \frac{y_2 y_3}{2}}$$

$$BC = \sqrt{(x_2 - x_3)^2 + (y_2 - y_3)^2}$$

$\therefore BC = \frac{1}{2} DE$

(proved)

(17)

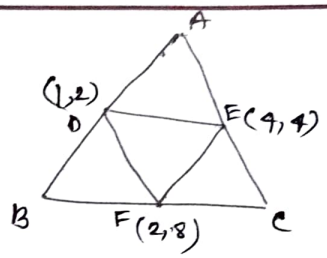


$$AD = \sqrt{(5-3)^2 + (3-2)^2}$$
$$= \sqrt{5}$$

$$BD = \sqrt{5^2 - (\sqrt{5})^2}$$
$$= \sqrt{20}$$
$$= 2\sqrt{5}$$

$\therefore BC = 2 \times 2\sqrt{5}$
$= 4\sqrt{5}$ Ans

(19)



$$\Delta DEF = \frac{1}{2} \begin{vmatrix} 1 & 2 & 1 \\ 4 & 4 & 1 \\ 2 & 8 & 1 \end{vmatrix}$$

$$= \frac{1}{2} \begin{vmatrix} -3 & -2 & 0 \\ 2 & -4 & 0 \\ 2 & 8 & 1 \end{vmatrix}$$

$$= \frac{1}{2} |+12 + 4|$$
$$= 8$$

কোনো ত্রিভুজের মধ্যমাসমূহ দিয়ে গঠিত ত্রিভুজের ক্ষেত্রফল ঐ ত্রিভুজের ক্ষেত্রফলের $\frac{1}{4}$ ভাগ

$\therefore \Delta ABC$ এর ক্ষেত্রফল $= 8 \times 4$
$= 32$ বর্গ একক

Ans