

FOOT OF THE PERPENDICULAR,
IMAGE OF A POINT W.R.T. A LINE,
DISTANCE OF A POINT FROM A
LINE, ANGLE BETWEEN TWO LINES ①

Class: IX, Mathematics

(F⁺)

SOLUTIONS

TEACHING TASK

01. $A(a \cos \theta, a \sin \theta), B(a \cos \phi, a \sin \phi)$
 $x_1 \quad y_1 \quad x_2 \quad y_2$

Eqn of the line

$$y - a \sin \theta = \left(\frac{a \sin \phi - a \sin \theta}{a \cos \phi - a \cos \theta} \right) (x - a \cos \theta)$$

$$\Rightarrow y - a \sin \theta = \frac{2 \cos \left(\frac{\theta + \phi}{2} \right) \cdot \sin \left(\frac{\phi - \theta}{2} \right)}{-2 \sin \left(\frac{\phi + \theta}{2} \right) \sin \left(\frac{\phi - \theta}{2} \right)} (x - a \cos \theta)$$

$$\Rightarrow (y - a \sin \theta) \sin \left(\frac{\phi + \theta}{2} \right) = -(x - a \cos \theta) \cos \left(\frac{\theta + \phi}{2} \right)$$

$$\Rightarrow \cos \left(\frac{\theta + \phi}{2} \right) x + \sin \left(\frac{\theta + \phi}{2} \right) y - a \sin \theta \sin \left(\frac{\theta + \phi}{2} \right) - a \cos \theta \cos \left(\frac{\theta + \phi}{2} \right)$$

$$= \cos \left(\frac{\theta + \phi}{2} \right) x + \sin \left(\frac{\theta + \phi}{2} \right) y - a \left[\cos \left(\theta - \frac{\theta + \phi}{2} \right) \right] = 0$$

$$= \cos \left(\frac{\theta + \phi}{2} \right) x + \sin \left(\frac{\theta + \phi}{2} \right) y - a \cos \left(\frac{\theta - \phi}{2} \right) = 0 \rightarrow \text{①}$$

Now, let P(h, k) be the foot of the perpendicular from (0, 0) on the line ①

We have

$$\frac{h-0}{\cos(\frac{\theta+\phi}{2})} = \frac{k-0}{\sin(\frac{\theta+\phi}{2})} = \frac{-(-a\cos(\frac{\theta-\phi}{2}))}{1} \quad (2)$$

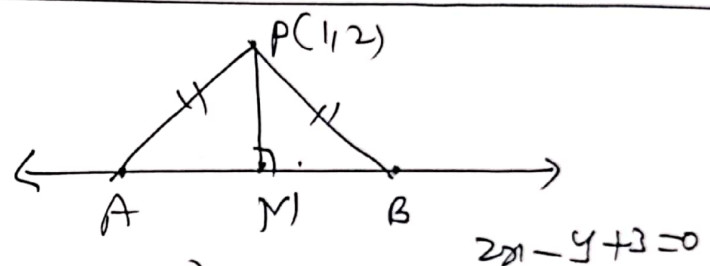
$$h = a \cos(\frac{\theta+\phi}{2}) \cos(\frac{\theta-\phi}{2}), \quad k = a \sin(\frac{\theta+\phi}{2}) \cos(\frac{\theta-\phi}{2})$$

$$h = \frac{a}{2} (\cos \theta + \cos \phi), \quad k = \frac{a}{2} (\sin \theta + \sin \phi)$$

Ans: C

02 ~~∴ (b) is~~

M is nothing but foot of the ⊥.



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

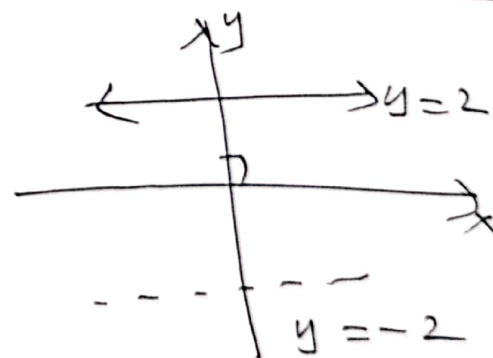
$$\therefore (h, k) = \left(-\frac{1}{5}, \frac{13}{5}\right)$$

Ans: A

03 A(7, 2), B(-3, 2)

Eqn of the line $y = 2$

Image of the line $\Rightarrow y = -2$



Ans: D

*04

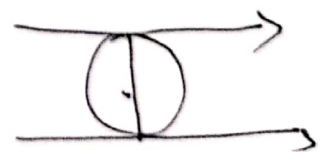
$$3x + 4y - 14 = 0 \rightarrow (1)$$

$$(1) \times 2 \Rightarrow 6x + 8y - 28 = 0$$

$$(2) \Rightarrow 6x + 8y - 7 = 0$$

$$\therefore \text{Diameter} = \frac{|-28+7|}{\sqrt{36+84}} = \frac{21}{10}$$

$$\therefore \text{radius} = \frac{21}{20}$$

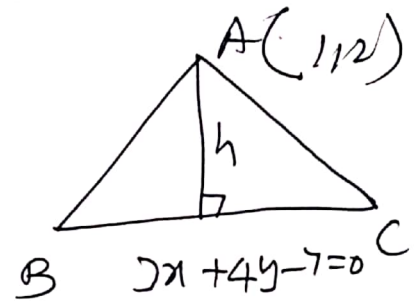


Ans: —

05.

$$h = \frac{|3 \cdot 1 + 4 \cdot 2 - 7|}{\sqrt{9 + 16}}$$

$$= \frac{4}{5}$$



(3)

$$\therefore \frac{\sqrt{3}}{2} a = \frac{4}{5} \Rightarrow a = \frac{8}{5\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{8\sqrt{3}}{15}$$

Ans: C

$$06. \quad 7x - y + 3 = 0 \quad | \quad x + y - 3 = 0$$

$$\Rightarrow m_1 = 7 \quad | \quad m_2 = -1$$

$$\left| \frac{m-7}{1+7m} \right| = \left| \frac{m+1}{1-m} \right|$$

~~S.O.B.S~~

$$\Rightarrow \frac{m^2 - 14m + 49}{1 + 49m^2 + 14m} = \frac{m-7}{1+7m} = \pm \frac{m+1}{1-m}$$

Case (i) $\frac{m-7}{1+7m} = \frac{m+1}{1-m}$

$$\Rightarrow (m-7)(1-m) = (m+1)(1+7m)$$

$$\Rightarrow m - m^2 - 7 + 7m = m + 7m^2 + 1 + 7m$$

$$\Rightarrow 8m^2 + 7 = 0$$

Case (ii) $\frac{m-7}{1+7m} = -\frac{m+1}{1-m}$

$$\Rightarrow (m-7)(1-m) = -(m+1)(1+7m)$$

$$\Rightarrow m - m^2 - 7 + 7m = -m - 7m^2 - 1 - 7m$$

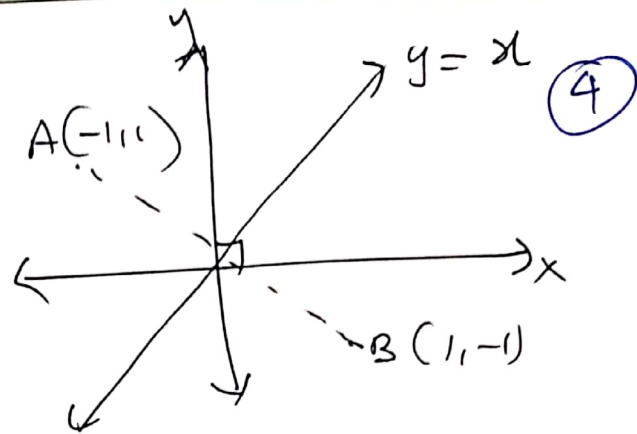
$$\Rightarrow 6m^2 + 16m - 6 = 0$$

$$\Rightarrow 3m^2 + 8m - 3 = 0$$

Ans: C

07. $A(-1, 1), B(1, -1)$

Mid-point $(0, 0)$, lies
on $y = x$

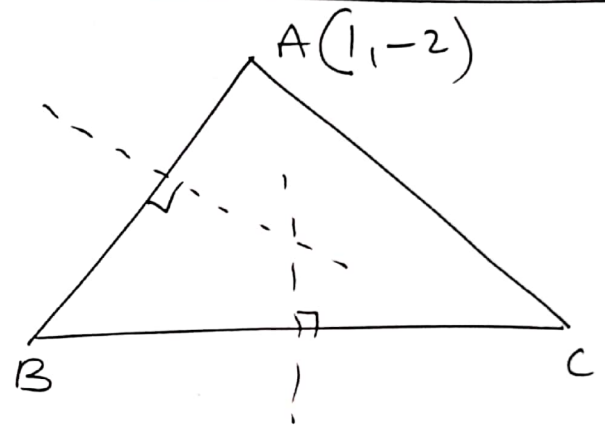


Ans: B

08. $A(1, -2)$, let $B(h, k)$

$$x - y - 5 = 0$$

$$\frac{h-1}{1} = \frac{k+2}{-1} = \frac{-2(1+2-5)}{1+1}$$



$$B(h, k) = (-3, -4)$$

let $B(-3, -4)$, let $C(h, k)$, $x + 2y = 0$

$$\frac{h-3}{1} = \frac{k+4}{2} = \frac{-2(3-8)}{1+4} = 2$$

$$\therefore (h, k) = (5, 0)$$

Ans: C

09. $x \sec \alpha - y \csc \alpha - a = p$

$$p = \frac{1-a}{\sqrt{\sec^2 \alpha + \csc^2 \alpha}} = a \sin \alpha \cos \alpha = \frac{1}{2} a \sin 2\alpha$$

$$\therefore 2p = a \cos 2\alpha \rightarrow (1)$$

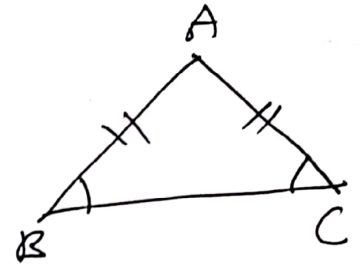
Also, $x \cos \alpha + y \sin \alpha - a \cos 2\alpha = 0$

$$q = \frac{1-a \cos 2\alpha}{\sqrt{\cos^2 \alpha + \sin^2 \alpha}} = a \cos 2\alpha \rightarrow (2)$$

$$(1)^2 + (2)^2 \Rightarrow 4p^2 + q^2 = a^2$$

Ans: A

10. $(a+b)x + (a-b)y - 2ab = 0 \rightarrow (1)$
 $(a-b)x + (a+b)y - 2ab = 0 \rightarrow (2)$
 $x+y=0 \rightarrow (3)$



Slope of (1) $\Rightarrow m_1 = -\left(\frac{a+b}{a-b}\right)$
 $= \frac{a+b}{b-a}$

Slope of (2) $\Rightarrow m_2 = -\left(\frac{a-b}{a+b}\right) = \frac{b-a}{a+b}$

$\tan A = \left| \frac{\frac{a+b}{b-a} - \frac{b-a}{a+b}}{1 + \left(\frac{a+b}{b-a}\right)\left(\frac{b-a}{a+b}\right)} \right|$

$\tan A = \left| \frac{(a+b)^2 - (b-a)^2}{2(a^2 - b^2)} \right| = \left| \frac{2ab}{a^2 - b^2} \right|$

Ans: B

11. Eqn. of AC $\Rightarrow 8x - 15y = 0$
 let B(1, 2).

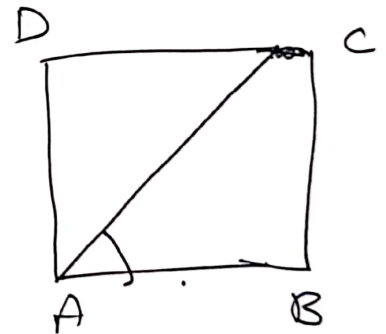
Slope of AC $= m_1 = \frac{8}{15}$

Slope of AB $= m$

$\tan 45^\circ = \left| \frac{m - \frac{8}{15}}{1 + \frac{8m}{15}} \right|$

$\left| 1 + \frac{8m}{15} \right| = \left| m - \frac{8}{15} \right|$

$1 + \frac{8m}{15} = \pm \left(m - \frac{8}{15} \right)$



Case (i) $1 + \frac{8m}{15} = m - \frac{8}{15}$

$\Rightarrow m - \frac{8m}{15} = 1 + \frac{8}{15}$

$\Rightarrow 7m = 23$

$\Rightarrow m = \frac{23}{7}$

Case (ii) $m = -\frac{7}{23}$

Ans: A, B

12.

$$4x + 3y + 2 = 0$$

$$4x + 3y + c = 0$$

$$4x + 3y + 2 = 0$$

$$4 = \frac{|2 - c|}{\sqrt{16 + 9}}$$

$$\Rightarrow |2 - c| = 20$$

$$\Rightarrow 2 - c = \pm 20$$

$$2 - c = 20$$

$$c = -18$$

$$2 - c = -20$$

$$c = 22$$

$\therefore$ Required eqⁿ are

$$4x + 3y - 18 = 0 \text{ and}$$

$$4x + 3y + 22 = 0$$

Ans: A, C

13 Statement I:

$$x \cos \alpha + y \sin \alpha - p = 0$$

$$\text{Let } x \cos \alpha + y \sin \alpha + k = 0$$

$$\text{Now, distance } p' - p = \frac{|k + p|}{\sqrt{\cos^2 \alpha + \sin^2 \alpha}}$$

$$\Rightarrow |k + p| = p' - p$$

$$\Rightarrow k + p = \pm (p' - p)$$

$$\Rightarrow k + p = p' - p \quad (\text{or}) \quad k + p = p - p'$$

$$\Rightarrow k = p' - 2p \quad (\text{or}) \quad k = -p'$$

$\therefore$ Required equation are

$$x \cos \alpha + y \sin \alpha + p' - 2p = 0 \quad (\text{True})$$

Statement II: Conceptual (True)

Ans: A

14. Statement I: $2x + 3y + 4 = 0$
 $\lambda x + \mu y + 2 = 0$
 $\frac{2}{\lambda} = \frac{3}{\mu} = \frac{4}{2} = 2$

$\therefore \lambda = 1 \quad \mu = \frac{3}{2}$

$\therefore 3\lambda - 2\mu = 3(1) - 2(\frac{3}{2}) = 0$ (True)

Statement II: Conceptual (True)

Ans: A

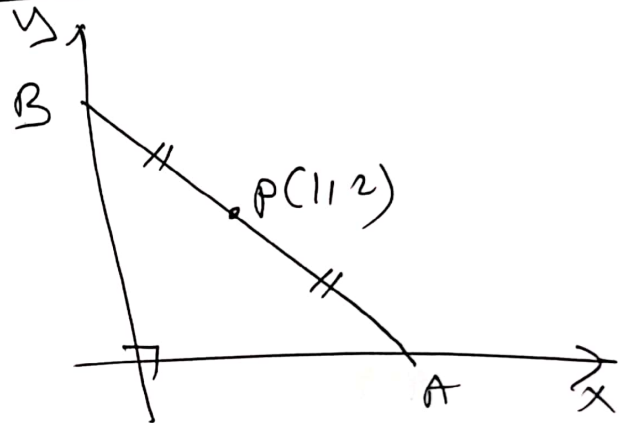
15. $A(a, 0), B(0, b)$
 $(\frac{a}{2}, \frac{b}{2}) = (1, 2)$

$a = 2, b = 4$

$\therefore \frac{x}{2} + \frac{y}{4} = 1$

$\Rightarrow 2x + y - 4 = 0$

$\therefore$ distance from the origin $= \frac{|-4|}{\sqrt{4+1}} = \frac{4}{\sqrt{5}}$
 Ans: C



16. $(\frac{a}{2}, \frac{b}{2}) = (h, k)$

$a = 2h, b = 2k$

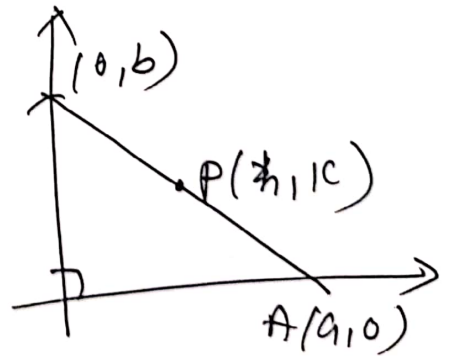
$\therefore \frac{x}{2h} + \frac{y}{2k} = 1$

$\Rightarrow kx + hy - 2hk = 0$

$p = \frac{2hk}{\sqrt{k^2 + h^2}}$

$p^2 = \frac{4h^2k^2}{h^2 + k^2}$

$\therefore \frac{1}{x^2} + \frac{1}{y^2} = \frac{4}{p^2}$ Ans: C



17.

$$(q-r)x + (r-p)y + (p-q) = 0$$

$$(q^3-r^3)x + (r^3-p^3)y + (p^3-q^3) = 0$$

represents same line

$$\frac{q^3-r^3}{q-r} = \frac{r^3-p^3}{r-p} = \frac{p^3-q^3}{p-q}$$

$$\Rightarrow q^2 + qr + r^2 = r^2 + rp + p^2$$

$$\Rightarrow q^2 - p^2 = rp - rq$$

$$\Rightarrow (q+p)(q-p) = r(p-q)$$

$$\Rightarrow (q+p)(q-p) + r(q-p) = 0$$

$$\Rightarrow (p+q+r)(q-p) = 0$$

$$\Rightarrow p+q+r = 0$$

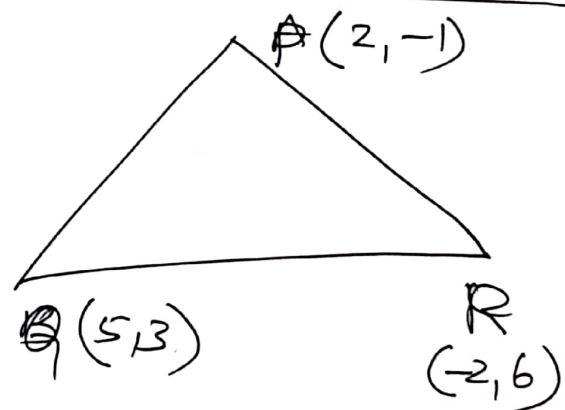
Ans: A

18 slope of PQ = $\frac{3+1}{5-2} = \frac{4}{3}$

slope of QR = $\frac{6-3}{-2-5}$
 $= -\frac{3}{7}$

$$\therefore \tan \theta = \left| \frac{\frac{4}{3} + \frac{3}{7}}{1 - \frac{4}{3} \cdot \frac{3}{7}} \right| = \left| \frac{\frac{37}{21}}{\frac{13}{21}} \right| = \left| \frac{37}{13} \right|$$

Ans: D —



(9)

19. $\sqrt{3}x + y = 0$

slope $= -\sqrt{3} \rightarrow m_1$

Let slope of AB $= m_2$

$$\tan 60^\circ = \left| \frac{m + \sqrt{3}}{1 - \sqrt{3}m} \right|$$

$$\sqrt{3} = \left| \frac{m + \sqrt{3}}{1 - \sqrt{3}m} \right|$$

$$\Rightarrow \pm \sqrt{3} = \frac{m + \sqrt{3}}{1 - \sqrt{3}m}$$

Case (i) $\sqrt{3} = \frac{m + \sqrt{3}}{1 - \sqrt{3}m}$

$$\Rightarrow \sqrt{3} - 3m = m + \sqrt{3}$$

$$\Rightarrow m = 0.$$

$\therefore$ Eqⁿ of the line (2, 2), $m = 0$

$$y - 2 = 0$$

$$\Rightarrow y = 2 \Rightarrow y = k$$

Ans: 2

20.

$$4x - 3y - 8 = 0$$

$$m_1 = \frac{4}{3}$$

$$2x + 5y - 4 = 0$$

$$m_2 = -\frac{2}{5}$$

$$\tan \theta = \left| \frac{\frac{4}{3} + \frac{2}{5}}{1 - \frac{4}{3} \cdot \frac{2}{5}} \right| = \left| \frac{\frac{26}{15}}{\frac{7}{15}} \right| = 3.7$$

Integral value = 3

Ans: 3

21

(i) $2x - 3y + 7 = 0$

$$m_1 = \frac{2}{3}$$

$$7x + 4y - 9 = 0$$

$$m_2 = -\frac{7}{4}$$



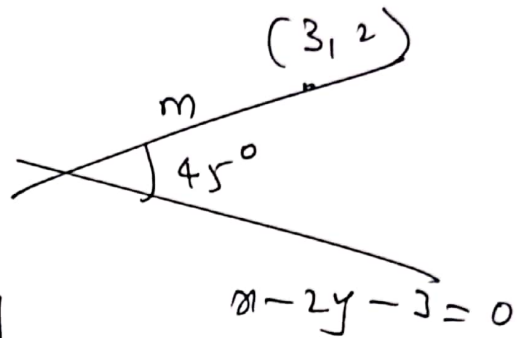
$$\tan \theta = \left| \frac{\frac{2}{3} + \frac{1}{4}}{1 - \frac{2}{3} \cdot \frac{1}{4}} \right| = \left| \frac{29}{-2} \right|$$

(10)

$$\therefore \theta = \tan^{-1} \left(\pm \frac{29}{2} \right)$$

(ii) $x - 2y - 3 = 0$

slope $= m = \frac{1}{2}$



$$\tan 45^\circ = \left| \frac{m - \frac{1}{2}}{1 + \frac{m}{2}} \right|$$

$$1 = \left| \frac{2m - 1}{2 + m} \right|$$

$$\frac{2m - 1}{2 + m} = \pm 1$$

$$\Rightarrow \frac{2m - 1}{2 + m} = 1$$

$$\Rightarrow 2m - 1 = 2 + m$$

$$\Rightarrow m = 3$$

$\therefore$ eqn $(3, 2), m = 3$

$$y - 2 = 3(x - 3)$$

$$\Rightarrow y - 2 = 3x - 9$$

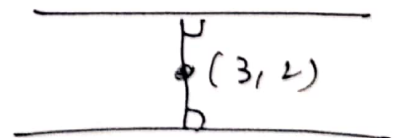
$$\Rightarrow 3x - y - 7 = 0$$

(iii) $x + 2y - 5 = 0$

$$x + 2y + c = 0$$

$$\frac{|3 + 2(2) - 5|}{\sqrt{1 + 4}} = \frac{|3 + 2(2) + c|}{\sqrt{1 + 4}}$$

$$|2| = |7 + c|$$



$$\pm 2 = 7 + c$$

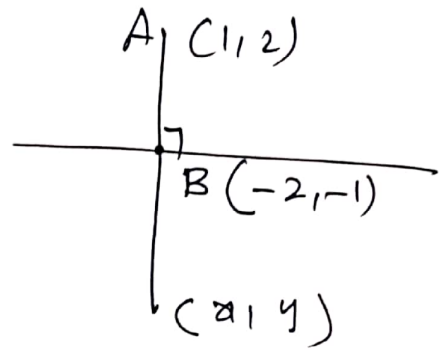
$$c = -5 \text{ or } -9$$

$$x + 2y - 9 = 0$$

Q

$$(iv) \left(\frac{x+1}{2}, \frac{y+2}{2} \right) = (-2, -1)$$

$$(x, y) = (-5, -4)$$



(11)

Ans. x, y, z, γ

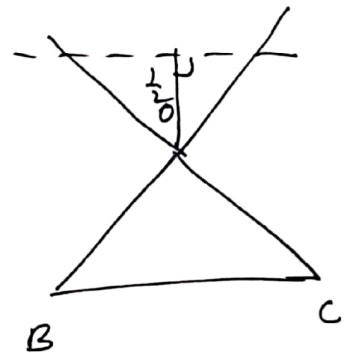
22

(i)

$$\begin{aligned} (-2, -7) &\rightarrow (x-2y, -3x+y) \\ &\rightarrow (-2-2(-7), -3(-2)-7) \\ &\rightarrow (12, -1) \end{aligned}$$

$$(ii) B(-3, -1), C(-1, -3)$$

$$\begin{aligned} \text{slope of BC} = m &= \frac{-3+1}{-1+3} \\ &= \frac{-2}{2} = -1 \end{aligned}$$



$$\text{Eqn of BC} \rightarrow y+1 = -1(x+3)$$

$$\Rightarrow x+3+y+1=0$$

$$\Rightarrow x+y+4=0$$

$$\text{Eqn of Required line } x+y+k=0$$

$$\frac{1}{2} = \frac{|k|}{\sqrt{1+1}} \Rightarrow k = \pm \frac{\sqrt{2}}{2} \Rightarrow k = \frac{1}{\sqrt{2}}$$

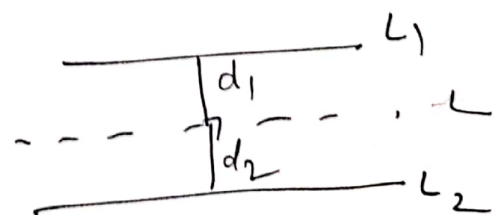
$$\text{Required line is } x+y+\frac{1}{\sqrt{2}}=0$$

$$\Rightarrow \sqrt{2}x + \sqrt{2}y + 1 = 0$$

$$(iii) L_0 = 3x+4y+2=0$$

$$L_1 = 3x+4y+5=0$$

$$L_2 = 3x+4y-5=0$$



$$d_1 = \frac{|2-5|}{\sqrt{3^2+4^2}} = \frac{3}{5}$$

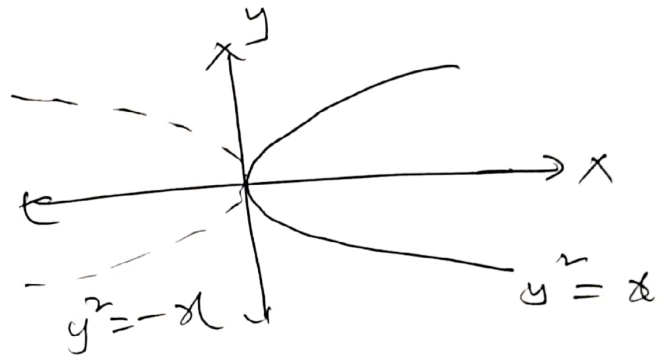
$$d_2 = \frac{|2+5|}{\sqrt{3^2+4^2}} = \frac{7}{5}$$

$$\therefore d_1 : d_2 = 3 : 7$$

$$(iv) y = \sqrt{x}$$

$$\Rightarrow y^2 = x$$

$$\therefore y = \sqrt{-x}$$



Ans: x, —, p, t

STUDENTS TASK

CUQ'S

01. Conceptual

Ans: B

02. Conceptual

Ans: C

03. Conceptual

Ans: A

04. Conceptual

Ans: C

05. Conceptual

Ans: D

06. Conceptual

Ans: D

07. Conceptual

Ans: C

08. Conceptual

Ans: B

09. Conceptual

Ans: A

10. Conceptual

Ans: C

JEE MAINS LEVEL

(13)

01. Image of $(2, 3)$ w.r.t y -axis = $(-2, 3)$

$A(-2, 3), B(-1, -1), C(-4, \lambda)$

Collinear $\Rightarrow$ slope of AB = slope of BC

$$\Rightarrow \frac{-1-3}{-1+2} = \frac{\lambda+3}{-4+1}$$

$$\Rightarrow \lambda = 11$$

Ans: C

02

$$d = \frac{|-1|}{\sqrt{p^2 \sec^2 \alpha + p^2 \csc^2 \alpha}}$$
$$= \frac{|p|}{\sqrt{\cos^2 \alpha + \sin^2 \alpha}} = |p|$$

Ans: D

03

$$-L_{11} : L_{22} = 4 : 9$$

$$-(3 \cdot 1 + 4 \cdot 2 - 7) : (3 \cdot k + 4 \cdot 1 - 7) = 4 : 9$$

$$k = -2$$

Ans: B

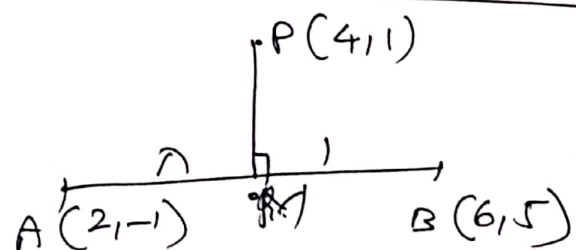
04

let ratio be $\lambda : 1$

$$M = \left(\frac{6\lambda + 2}{\lambda + 1}, \frac{5\lambda - 1}{\lambda + 1} \right)$$

$$S_{PM} \times S_{AB} = -1$$

$$\frac{\frac{5\lambda - 1}{\lambda + 1} - 1}{\frac{6\lambda + 2}{\lambda + 1} - 4} \times \frac{5 + 1}{6 - 2} = -1$$



upon solving

$$\lambda = \frac{5}{8}$$

$$\therefore \lambda : 1 = 5 : 8$$

Ans: B

05

$$x \cos \alpha + y \sin \alpha = p_1 \rightarrow (1)$$

$$x \cos \beta + y \sin \beta = p_2 \rightarrow (2)$$

$$\text{slope of (1)} \Rightarrow m_1 = \frac{-\cos \alpha}{\sin \alpha}$$

$$\text{slope of (2)} \Rightarrow m_2 = \frac{-\cos \beta}{\sin \beta}$$

$$\therefore \tan \theta = \left| \frac{\frac{-\cos \alpha}{\sin \alpha} + \frac{\cos \beta}{\sin \beta}}{1 + \frac{\cos \alpha \cos \beta}{\sin \alpha \sin \beta}} \right|$$

$$= \left| \frac{\sin \alpha \cos \beta - \cos \alpha \sin \beta}{\cos \alpha \cos \beta + \sin \alpha \sin \beta} \right|$$

$$= \left| \frac{\sin(\alpha - \beta)}{\cos(\alpha - \beta)} \right| = \tan(\alpha - \beta)$$

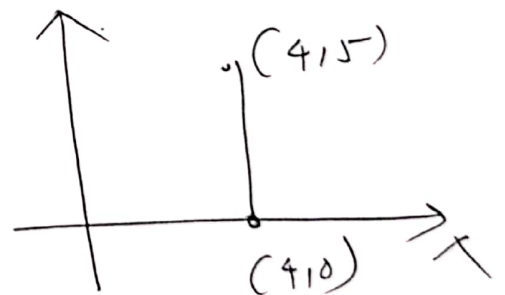
$$\therefore \theta = \alpha - \beta$$

Ans: B

06

Foot of the $\perp$ from
(4, 5) on x-axis = (4, 0).

Image of (4, 5) w.r.t
y-axis = (-4, 5)



$$\text{Required Eqn } (4, 0), (-4, 5) \rightarrow 5x + 8y - 20 = 0$$

Ans: B

67.

$$\left(-\frac{7}{5}, -\frac{6}{5}\right), (1, 2)$$

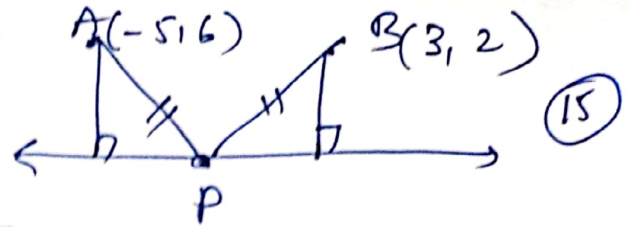
$$\text{mid-point} = \left(\frac{-\frac{7}{5} + 1}{2}, \frac{-\frac{6}{5} + 2}{2}\right) = \left(-\frac{1}{5}, \frac{2}{5}\right)$$

$3x + 4y = 1$ satisfies above pt

Ans: B

08

let $P(h, k)$ be the required point.



$P(h, k)$ lies on $4x - y - 2 = 0$

$$4h - k - 2 = 0 \rightarrow (1)$$

Given $PA = PB$

$$\Rightarrow PA^2 = PB^2$$

$$\Rightarrow (h+5)^2 + (k-6)^2 = (h-3)^2 + (k-2)^2$$

$$\Rightarrow h^2 + 10h + 25 + k^2 - 12k + 36 = h^2 - 6h + 9 + k^2 - 4k + 4$$

$$\Rightarrow 16h - 8k + 48 = 0$$

$$\Rightarrow 2h - k + 6 = 0 \rightarrow (2)$$

Solving (1) & (2) $(h, k) = (4, 14)$

Ans: B

09. option Verification method. Opt: C

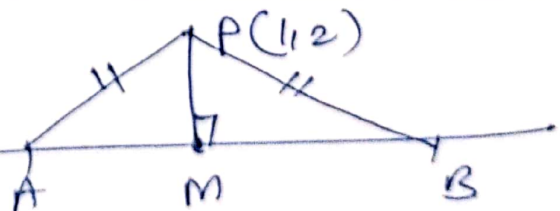
$$d = \frac{|2(-2) - 1 + 5|}{\sqrt{4+1}} = 0.$$

$\therefore C(-2, 1)$ lies on the line.

Hence it is nearest point

Ans: C

10. m is foot of the $\perp$ from $P(1, 2)$ upon the line $2x - y + 3 = 0$.



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

$$\therefore (h, k) = \left(-\frac{1}{5}, \frac{13}{5}\right)$$

Ans: A

11. $4x - y - 7 = 0$ $\left| \begin{array}{l} kx - 5y - 9 = 0 \\ m_1 = 4 \end{array} \right. \quad m_2 = \frac{k}{5}$

(16)

$$\tan 45^\circ = \left| \frac{4 - \frac{k}{5}}{1 + \frac{4k}{5}} \right|$$

$$1 = \left| \frac{20 - k}{5 + 4k} \right|$$

$$\therefore \frac{20 - k}{5 + 4k} = \pm 5 \Rightarrow k = \frac{-25}{3}, 3$$

Ans: A, B

12. $B(\alpha, \beta)$ is the image of $(1, \frac{1}{3})$

w.r.t. $2x + 3y - 5 = 0$.

$$\frac{\alpha - 1}{2} = \frac{\beta - \frac{1}{3}}{3} = \frac{-2(2 \cdot 1 + 3(\frac{1}{3}) - 5)}{2^2 + 3^2}$$

$$= \frac{4}{13}$$

$$\therefore \alpha = \frac{8}{13} + 1, \quad \beta = \frac{12}{13} + \frac{1}{3}$$

$\frac{36}{13}$

$$\therefore \alpha = \frac{21}{13}, \quad \beta = \frac{49}{39}$$

Ans: A, B

13. Statement I: $y - 3kx + 4 = 0$

$$3kx - y - 4 = 0$$

$$\text{slope} = m_1 = 3k$$

$$(2k-1)x - (2k-1)y - 6 = 0$$

$$\text{slope} = m_2 = \frac{2k-1}{k-2k-1}$$

$$\therefore \Rightarrow m_1 \times m_2 = -1$$

$$(3k) \times \left(\frac{2k-1}{k-2k-1} \right) = -1$$

$$\Rightarrow k = \frac{1}{6}$$

(True)



Statement II: Conceptual (True)

Ans: A

14. Statement I:

$$7 = \frac{|3 \cdot 1 + 4 \cdot 1 + c|}{\sqrt{9+16}}$$

$$\Rightarrow |7+c| = 35$$

$$\Rightarrow 7+c = \pm 35$$

$$c = 28 \text{ or } -42 \quad (17)$$

(True)

Statement II: Conceptual (True)

Ans: B

15.
$$\frac{h-4}{5} = \frac{k+13}{1} = \frac{-2(5 \cdot 4 - 13 + 6)}{25+1}$$

$$\therefore (h, k) = (-11, -14)$$

Ans: A

16.
$$\frac{h-3}{1} = \frac{k-5}{-1} = \frac{-2(3-5+1)}{1+1} = 1$$

$$\frac{h-3}{1} = 1 \quad \left| \quad \frac{k-5}{-1} = 1 \right.$$

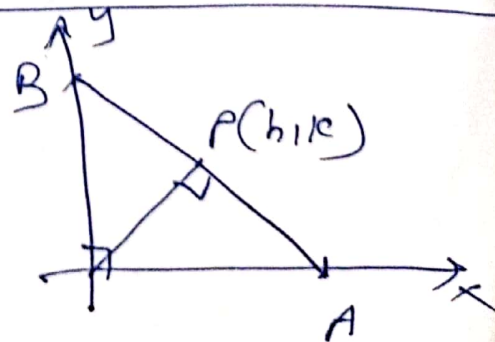
$$\Rightarrow h = 4 \quad k = 4$$

$$\therefore (h, k) = (4, 4)$$

$\therefore \text{opt B: } (x-2)^2 + (y-4)^2 = 4$. Satisfies Ans: B

17. $3x + y - \lambda = 0 \quad @ (0,0)$

$$\frac{h-0}{3} = \frac{k-0}{1} = \frac{-(3 \cdot 0 + 0 - \lambda)}{9+1}$$
$$= \frac{\lambda}{10}$$



$$(h, k) = \left(\frac{3n}{10}, \frac{n}{10} \right)$$

(1c)

This pt lies on ~~$3x + y - n = 0$~~
 ~~$3\left(\frac{3n}{10}\right) + \left(\frac{n}{10}\right)$~~

$$\text{Now } 3x + y - n = 0$$

$$\Rightarrow 3x + y = n$$

$$\Rightarrow \frac{x}{\left(\frac{n}{3}\right)} + \frac{y}{n} = 1$$

$$\therefore A\left(\frac{n}{3}, 0\right), B(0, n)$$

Required ratio: $x_1 - x : x - x_2$

$$AP:PB = \frac{n}{3} - \frac{3n}{10} : \frac{3n}{10} - 0$$

$$\Rightarrow \frac{1}{3} - \frac{3}{10} : \frac{3}{10}$$

$$\Rightarrow \frac{1}{30} : \frac{3}{10}$$

$$\Rightarrow 1:9$$

$$\therefore BP:PA = 9:1$$

Ans: A

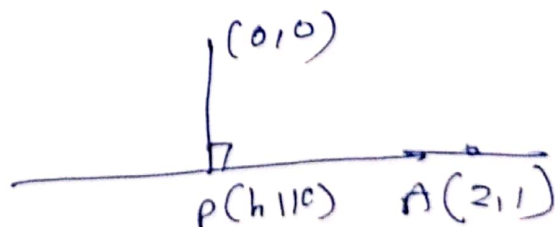
18.

$$\text{slope of } OP = m_1 = \frac{k}{h}$$

$$\text{slope of } AB = m_2 = \frac{k-1}{h-2}$$

$$\therefore m_1 \times m_2 = -1$$

$$\frac{k}{h} \times \frac{k-1}{h-2} = -1$$



$$k^2 - k = -h^2 + 2h$$

$$h^2 + k^2 - 2h - k = 0$$

$$\text{Locus} \rightarrow x^2 + y^2 - 2x - y = 0$$

Ans: B



19.

Slope of $x - y + 1 = 0$

$$m = \frac{-1}{-1} = 1$$

$$\therefore \tan \alpha = 1$$

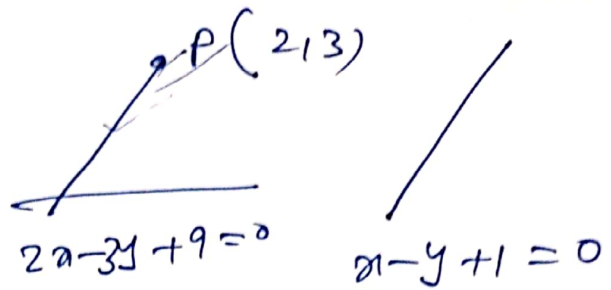
$$\alpha = 45^\circ$$

$$d = \frac{|ax_1 + by_1 + c|}{|a \cos \alpha + b \sin \alpha|} = \left| \frac{2 \cdot 2 - 3 \cdot 3 + 9}{2 \cdot \frac{1}{\sqrt{2}} - \frac{3}{\sqrt{2}}} \right|$$

$$= \sqrt{2} \times 4$$

$$\therefore d^2 = 32$$

Ans: 32



$$\frac{7}{13}$$

20.

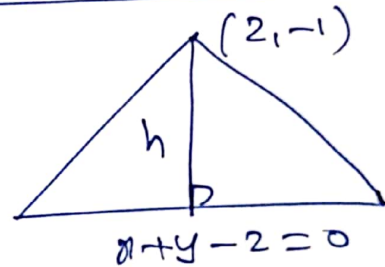
$$h = \frac{|2 - 1 - 2|}{\sqrt{1+1}} = \frac{1}{\sqrt{2}}$$

$$\therefore \frac{\sqrt{3}}{2} d = \frac{1}{\sqrt{2}}$$

$$\Rightarrow d = \frac{2}{\sqrt{6}}$$

$$\Rightarrow d^2 = \frac{4}{6} = 0.6$$

Integral value = 0



Ans: 0

21 (i) Reflection of $x = 3$ in y -axis is $x = -3$

$$(ii) 3x + 4y + 3 = 0 \rightarrow (1)$$

$$(2) \Rightarrow 6x + 8y + 6 = 0$$

$$6x + 8y + 11 = 0$$

$$d = \frac{|11 - 6|}{\sqrt{36 + 64}} = \frac{5}{10} = \frac{1}{2}$$



$$(iii) \begin{aligned} 3x + y - 4 &= 0 \\ 6x + 2y + 9 &= 0 \end{aligned}$$

Lines are parallel

$$\Rightarrow -\frac{b}{2} = -\frac{3}{1} \Rightarrow \boxed{b=6}$$

$$x - ay + 10 = 0$$

$$3x + y - 4 = 0$$

Lines are parallel

$$\Rightarrow \frac{1}{a}x - 3 = -1$$

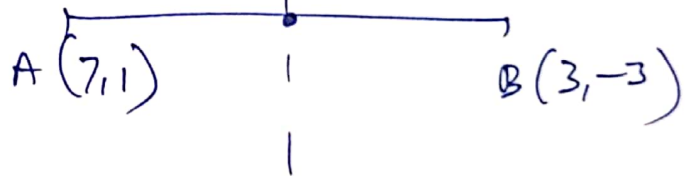
$$\Rightarrow \boxed{a=3}$$

$$\therefore ab = 18$$

(iv) mid-point

$$= \left(\frac{7+3}{2}, \frac{1-3}{2} \right)$$

$$= (5, -1)$$



Ans: 5, -1, 2, 8

$$22 (i) \tan 45^\circ = \left| \frac{m-1}{1+m} \right|$$

$$1 = \left| \frac{m-1}{1+m} \right|$$

$$\frac{m-1}{1+m} = \pm 1$$

$$\Rightarrow \frac{m-1}{1+m} = 1 \quad \text{or}$$

$$\Rightarrow m-1 = 1+m$$

X

$$\frac{m-1}{1+m} = -1$$

$$m-1 = -1-m$$



22) (i) point $(3, 2)$ Given line $x - 2y = 3$

(21)

$$\text{slope} = m_1 = \frac{1}{2}$$

$$\therefore \tan 45^\circ = \left| \frac{m - \frac{1}{2}}{1 + \frac{m}{2}} \right|$$

$$\Rightarrow 1 = \left| \frac{2m - 1}{2 + m} \right|$$

$$\frac{2m - 1}{2 + m} = \pm 1$$

$$\Rightarrow 2m - 1 = 2 + m$$

$$\Rightarrow m = 3$$

$$\frac{2m - 1}{2 + m} = -1$$

$$2m - 1 = -2 - m$$

$$3m = -1$$

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

(ii) $y = 2x + 1$

$$\text{slope} = m = 2$$

$$\tan 45^\circ = \left| \frac{m - 2}{1 + 2m} \right|$$

$$\frac{m - 2}{1 + 2m} = \pm 1$$

$$m - 2 = 1 + 2m$$

$$\Rightarrow m = -3$$

eqn of the line $(1, 2)$, $m = -3$

$$3x + y = 5$$

(iii) $(1, 1)$, $(x + y + 5 = 0)$

$$\frac{h - 1}{1} = \frac{k - 1}{1} = -2 \frac{(1 + 1 + 5)}{1 + 1}$$

$$\therefore (h, k) = (-6, -6)$$

$$\begin{aligned} \text{Dist} &= \sqrt{36 + 36} \\ &= 6\sqrt{2} \end{aligned}$$



(iv)

$(2, 3)$ $(-4, a)$
 d_1 d_2
 $3x + 4y - 8 = 0$

$$d_1 = d_2$$

$$\frac{|-12 + 4a - 8|}{\sqrt{9 + 16}} = \frac{|6 + 12 - 8|}{\sqrt{9 + 16}}$$

$$\Rightarrow |4a - 20| = |10|$$

$$\Rightarrow 4a - 20 = \pm 10$$

$$\Rightarrow a = \frac{32}{4} = 8$$

Ans: p, r, s, v

$\Rightarrow$ THE END $\Leftarrow$

(22)

