Ex # 7.2

Remember:

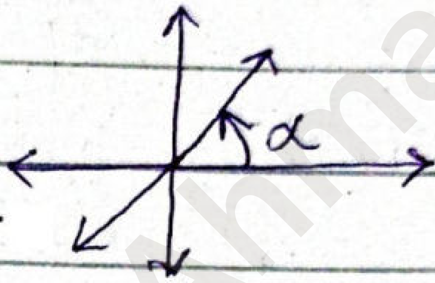
① Two Point Slope Formula:

$$\text{Slope} = m = \frac{y_2 - y_1}{x_2 - x_1}$$

② Inclination (angle):

$$m = \tan\alpha$$

∵ Inclination angle is always Positive.



Q#1 (i) $(-2, 4)$; $(5, 11)$

$x_1 \quad y_1 \qquad x_2 \quad y_2$

Slope:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{11 - 4}{5 - (-2)} = \frac{7}{5+2}$$

$$m = 7/7$$

$$\boxed{m = 1}$$

Inclination:

$$\tan\alpha = m$$

$$\Rightarrow \tan\alpha = 1$$

$$\alpha = \tan^{-1}(1)$$

$$\boxed{\alpha = 45^\circ}$$

(ii) $(3,-2)\,;\,(2,7)$
$x_1 \; y_1 \quad x_2 \; y_2$

slope:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

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

$$m = \frac{7+2}{-1}$$

$$\boxed{m = -9}$$

Inclination:

$$\tan\alpha = m$$

$$\tan\alpha = -9$$

$$\alpha = \tan^{-1}(-9)$$

$$\alpha = -83^\circ 39'$$

$$\Rightarrow \alpha = 180^\circ - 83^\circ 39'$$

$$\boxed{\alpha = 96^\circ 20'}$$

(iii) $(4,6)\,;\,(4,8)$
$x_1 \; y_1 \quad x_2 \; y_2$

slope:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{8-6}{4-4}$$

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

$$\boxed{m = \infty}$$

Inclination:

$$\tan\alpha = m$$

$$\tan\alpha = \infty$$

$$\alpha = \tan^{-1}(\infty)$$

$$\boxed{\alpha = 90^\circ}$$

Note: For three points A, B and C, if
slope of AB = slope of BC
Then, A, B and C are collinear.

Q#2 (i) $A(-1,-3)$, $B(1,5)$, $C(2,9)$

Slope of $AB = \frac{y_2 - y_1}{x_2 - x_1}$ $\left\{ \begin{matrix} A(-1,-3), & B(1,5) \\ x_1 \ y_1 & x_2 \ y_2 \end{matrix} \right.$

Slope of $AB = \frac{5-(-3)}{1-(-1)} = \frac{5+3}{1+1}$

Slope of $AB = \frac{8}{2} = 4$

Now;

Slope of $BC = \frac{y_2 - y_1}{x_2 - x_1}$ $\left\{ \begin{matrix} B(1,5), & C(2,9) \\ x_1 \ y_1 & x_2 \ y_2 \end{matrix} \right.$

Slope of $BC = \frac{9-5}{2-1} = \frac{4}{1}$

Slope of $BC = 4$

Since, slope of AB = slope of BC

So, A, B and C are collinear.

(ii) $P(4,-5)$, $Q(7,5)$, $R(10,15)$

Slope of $PQ = \frac{y_2 - y_1}{x_2 - x_1}$ $\left\{ \begin{matrix} P(4,-5), & Q(7,5) \\ x_1 \ y_1 & x_2 \ y_2 \end{matrix} \right.$

Slope of $PQ = \frac{5-(-5)}{7-4} = \frac{5+5}{3}$

Slope of $PQ = \frac{10}{3}$

Now;

Slope of $QR = \frac{y_2 - y_1}{x_2 - x_1}$ $\left\{ \begin{matrix} Q(7,5), & R(10,15) \\ x_1 \ y_1 & x_2 \ y_2 \end{matrix} \right.$

$$\text{slope of } QR = \frac{15-5}{10-7}$$

$$\text{slope of } QR = \frac{10}{3}$$

Since, slope of PQ = slope of QR
So, P, Q and R are collinear.

(iii) $L(-4,6)$, $M(3,8)$, $N(10,10)$

$$\text{slope of } LM = \frac{y_2-y_1}{x_2-x_1} \quad \left\{ \begin{matrix} L(-4,6), & M(3,8) \\ x_1\ y_1 & x_2\ y_2 \end{matrix} \right.$$

$$\text{slope of } LM = \frac{8-6}{3-(-4)} = \frac{2}{3+4}$$

$$\text{slope of } LM = \frac{2}{7}$$

Now;

$$\text{Slope of } MN = \frac{y_2-y_1}{x_2-x_1} \quad \left\{ \begin{matrix} M(3,8), & N(10,10) \\ x_1\ y_1 & x_2\ y_2 \end{matrix} \right.$$

$$\text{slope of } MN = \frac{10-8}{10-3}$$

$$\text{slope of } MN = \frac{2}{7}$$

Since, slope of LM = slope of MN
So, L, M and N are collinear.

(iv) $X(a, 2b)$, $Y(c, a+b)$, $Z(2c-a, 2a)$

Slope of $XY = \dfrac{y_2 - y_1}{x_2 - x_1}$ $\left\{ \begin{matrix} X(a, 2b), & Y(c, a+b) \\ x_1 \;\; y_1 & x_2 \;\; y_2 \end{matrix} \right.$

Slope of $XY = \dfrac{a+b-2b}{c-a}$

Slope of $XY = \dfrac{a-b}{c-a}$

Now;

Slope of $YZ = \dfrac{y_2 - y_1}{x_2 - x_1}$ $\left\{ \begin{matrix} Y(c, a+b), & Z(2c-a, 2a) \\ x_1 \;\; y_1 & x_2 \;\; y_2 \end{matrix} \right.$

Slope of $YZ = \dfrac{2a-(a+b)}{2c-a-c}$

Slope of $YZ = \dfrac{2a-a-b}{c-a}$

Slope of $YZ = \dfrac{a-b}{c-a}$

Since, slope of XY = slope of YZ

So, X, Y and Z lie on same line.

$k = ?$

Q#3

$A(7,3)$, $B(k,-6)$ and $C(-4,5)$, $D(-6,4)$

$A(7,3)$, $B(K,-6)$
$x_1\ y_1$ $\quad x_2\ y_2$

Slope of $AB = \dfrac{y_2-y_1}{x_2-x_1}$

$= \dfrac{-6-3}{K-7}$

Slope of $AB = \dfrac{-9}{K-7}$

$\Rightarrow m_1 = \dfrac{-9}{K-7}$

$C(-4,5)$, $D(-6,4)$
$x_1\ y_1$ $\quad x_2\ y_2$

Slope of $CD = \dfrac{y_2-y_1}{x_2-x_1}$

$= \dfrac{4-5}{-6-(-4)}$

$= \dfrac{-1}{-6+4}$

$= \dfrac{-1}{-2}$

Slope of $CD = 1/2$

$\Rightarrow m_2 = 1/2$

Now;

(i)

For Parallel Lines,

$m_1 = m_2$

$\Rightarrow \dfrac{-9}{K-7} = \dfrac{1}{2}$

$\Rightarrow -9\times 2 = 1(K-7)$

$-18 = K-7$

$-18+7 = K$

$\boxed{-11 = K}$

(ii)

For Perpendicular Lines,

$m_1 m_2 = -1$

$$\left(\frac{-9}{k-7}\right)\left(\frac{1}{2}\right) = -1$$

$$\frac{-9}{2(k-7)} = -1$$

$$\Rightarrow \quad -9 = -2(k-7)$$

$$-9 = -2k + 14$$

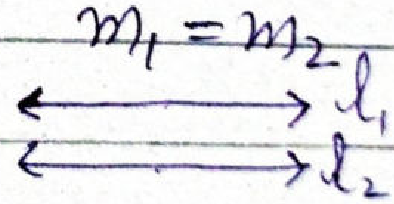
$$-9 - 14 = -2k$$

$$\cancel{-}23 = \cancel{-}2k$$

$$23 = 2k$$

$$\boxed{\frac{23}{2} = k}$$

Remember: (i) if Two Lines are Parallel, then their slopes will be equal. i.e $m_1 = m_2$



(ii)

if Two Lines are Perpendicular, then Product of their slopes will be equal to -1. i.e

$$m_1 m_2 = -1$$

or $\quad m_1 = -1/m_2$

Q#4 $A(6,1)$, $B(2,7)$, $C(-6,-7)$

we will find slope of AB, BC and AC.

$A(6,1)$, $B(2,7)$
$x_1 \; y_1$ $\quad x_2 \; y_2$

$$\text{slope of } AB = m_1 = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m_1 = \frac{7-1}{2-6} = \frac{\cancel{6}\,3}{-\cancel{4}\,2}$$

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

Now;

$B(2,7)$, $C(-6,-7)$
$x_1 \; y_1$ $\quad x_2 \; y_2$

$$\text{slope of } BC = m_2 = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m_2 = \frac{-7-7}{-6-2} = \frac{\cancel{-14}\,7}{\cancel{-8}\,4}$$

$$\boxed{m_2 = 7/4}$$

and;

$A(6,1)$, $C(-6,-7)$
$x_1 \; y_1$ $\quad x_2 \; y_2$

$$\text{slope of } AC = m_3 = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m_3 = \frac{-7-1}{-6-6} = \frac{\cancel{-8}\,2}{\cancel{-12}\,3}$$

$$\boxed{m_3 = \frac{2}{3}}$$

As,
$$m_1 m_3 = \left(-\frac{3}{2}\right)\left(\frac{2}{3}\right)$$
$$m_1 m_3 = -1$$

So, AB and AC are Perpendicular to each other. Hence, A, B and C are vertices of right triangle.

Q5. (a) Let $A(1,-2), B(2,4)$ and $C(4,1)$, $D(-8,2)$

$A(1,-2)$, $B(2,4)$
$x_1\ y_1$ $\quad x_2\ y_2$

slope of $AB = m_1 = \frac{y_2 - y_1}{x_2 - x_1}$

$$m_1 = \frac{4-(-2)}{2-1}$$
$$m_1 = \frac{4+2}{1}$$
$$m_1 = 6$$

$C(4,1)$, $D(-8,2)$
$x_1\ y_1$ $\quad x_2\ y_2$

slope of $CD = m_2 = \frac{y_2 - y_1}{x_2 - x_1}$

$$m_2 = \frac{2-1}{-8-4}$$
$$m_2 = \frac{1}{-12}.$$

Since, $m_1 \neq m_2$ and also $m_1 m_2 \neq -1$.
So, both lines are neither Parallel nor Perpendicular.

(b) Let $A(-3,4)$, $B(6,2)$ and $C(4,5)$, $D(-2,-7)$

$A(-3,4)$, $B(6,2)$
x_1 y_1 x_2 y_2

slope of $AB = m_1 = \frac{y_2 - y_1}{x_2 - x_1}$

$m_1 = \frac{2-4}{6-(-3)}$

$m_1 = \frac{-2}{6+3}$

$m_1 = -\frac{2}{9}$

$C(4,5)$, $D(-2,-7)$
x_1 y_1 x_2 y_2

slope of $CD = m_2 = \frac{y_2 - y_1}{x_2 - x_1}$

$m_2 = \frac{-7-5}{-2-4}$

$m_2 = \frac{\cancel{-12}^{\,2}}{\cancel{-6}_{\,1}}$

$m_2 = 2$

Since,

$m_1 \neq m_2$ and also $m_1 m_2 \neq -1$. So, both lines are neither parallel nor perpendicular.

Note: Forming of Equation

(i) ~~tath~~ Point slope formula,

$$y - y_1 = m(x - x_1)$$

(ii) Two intercept form:

$$\frac{x}{a} + \frac{y}{b} = 1$$

where $a = x$-intercept and $b = y$-intercept

Q#6 (a) Find eq. of ~~Line~~ horizontal Line through $(7,-9)$

As, slope of horizontal Line $= m = 0$

So,

Eq. of Line Passing through $(7,-9)$ having slope 0,

$$y - y_1 = m(x - x_1)$$

$$\Rightarrow \quad y - (-9) = 0(x - 7)$$

$$\boxed{y + 9 = 0} \text{ Ans.}$$

(b) the vertical Line through $(-5,3)$

As, slope of Vertical Line $= m = \infty$

So,

Eq. of Line Passing through $(-5,3)$ having slope ∞,

$$y - y_1 = m(x - x_1)$$

$$y - 3 = \infty\,(x - (-5))$$

$$\frac{y-3}{\infty} = x + 5$$

$$\Rightarrow \quad 0 = x + 5 \quad \text{or} \quad \boxed{x + 5 = 0}$$

(c) through $A(-6,5)$ having slope 7.

Eq. of Line passing through $A(-6,5)$ having slope 7.

$$y - y_1 = m(x - x_1)$$

$$y - 5 = 7(x - (-6))$$

$$y - 5 = 7(x + 6)$$

$$y - 5 = 7x + 42$$

$$\Rightarrow \quad 0 = 7x - y + 5 + 42$$

$$\Rightarrow \quad 7x - y + 47 = 0$$

(d) through $(8,-3)$ having slope 0.

Eq. of Line Passing through $(8,-3)$ having slope 0.

$$y - y_1 = m(x - x_1)$$

$$y - (-3) = 0(x - 8)$$

$$y + 3 = 0$$

(e) through $(-8,5)$ having slope undefined

Eq. of Line Passing through $(-8,5)$ having slope ∞,

$$y - y_1 = m(x - x_1)$$

$$y - 5 = \infty(x - (-8))$$

$$\frac{y-5}{\infty} = x + 8$$

$$0 = x + 8 \quad \text{or} \quad x + 8 = 0$$

(f) through $(-5, -3)$ and $(9, -1)$

First, we will find slope,

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{-1 - (-3)}{9 - (-5)} = \frac{-1 + 3}{9 + 5}$$

$$m = \frac{\cancel{2}^{1}}{\cancel{14}_{7}}$$

$$m = 1/7$$

Now;

Eq. of Line Passing through $(-5, -3)$ having slope $1/7$,

$$y - y_1 = m(x - x_1)$$

$$y - (-3) = \frac{1}{7}(x - (-5))$$

$$y + 3 = \frac{1}{7}(x + 5)$$

$$7(y + 3) = 1(x + 5)$$

$$7y + 21 = x + 5$$

$\Rightarrow \quad 0 = x - 7y - 21 + 5$

$\Rightarrow \quad x - 7y - 16 = 0$

(g) y-intercept -7 and slope -5

$(0, -7)$

So, Eq. of Line Passing through $(0,-7)$ and having slope -5,

$$y - y_1 = m(x - x_1)$$

$$y - (-7) = -5(x - 0)$$

$$y + 7 = -5x$$

$$\Rightarrow \quad 5x + y + 7 = 0$$

(h) x-intercept -3 and y-intercept 4

Two intercept form of eq. is,

$$\frac{x}{a} + \frac{y}{b} = 1$$

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

$$\Rightarrow \quad \frac{-4x + 3y}{12} = 1$$

$$-4x + 3y = 12$$

$$\Rightarrow \quad 4x - 3y + 12 = 0$$

(i) x-intercept -9 and slope -4

$\downarrow$ $(-9,0)$

So, eq. of Line Passing through $(-9,0)$ having slope -4,

$$y-y_1 = m(x-x_1)$$

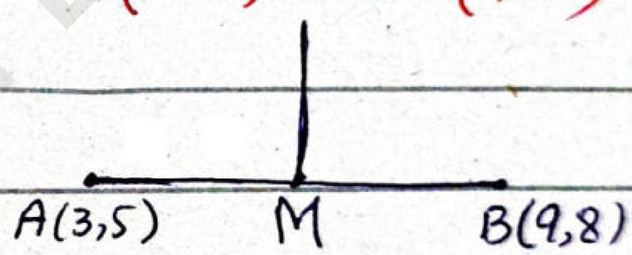
$$y-0 = -4(x-(-9))$$

$$y = -4(x+9)$$

$$y = -4x-36$$

$$\Rightarrow \quad 4x+y+36=0$$

Q#7 Given Points $A(3,5)$ and $B(9,8)$



Slope of Line Segment $AB = \dfrac{y_2-y_1}{x_2-x_1}$

$$= \frac{8-5}{9-3}$$

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

slope of $AB = \frac{1}{2}$ $\boxed{\because m_1 m_2 = -1}$

Now;

slope of $\perp r$ bisector $= \dfrac{-1}{\text{slope of } AB}$

slope of $\perp r$ bisector $= \frac{-1}{1/2}$

$\Rightarrow$ slope of $\perp r$ bisector $= -2$

Now; Let M be mid-point of AB. and M is the point through which the perpendicular bisector passes.

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

$\underset{x_1 \quad y_1}{A(3,5)}$, $\underset{x_2 \quad y_2}{B(9,8)}$

$$M(x,y) = \left(\frac{3+9}{2}, \frac{5+8}{2}\right)$$

$$= \left(\frac{\cancel{12}^{6}}{\cancel{2}}, \frac{13}{2}\right)$$

$$M(x,y) = \left(6, \frac{13}{2}\right)$$

hence,

Eq. of $\perp r$ bisector passing through $\left(6, \frac{13}{2}\right)$ having slope -2

$$y - y_1 = m(x - x_1)$$

$$\Rightarrow \quad y - \frac{13}{2} = -2(x-6)$$

$$\frac{2y-13}{2} = -2(x-6)$$

$$2y - 13 = 2 \times -2(x-6)$$

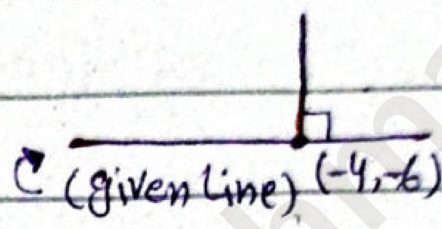
$$2y-13=-4(x-6)$$

$$2y-13=-4x+24$$

$$\Rightarrow \quad 4x+2y-13-24=0$$

$$4x+2y-37=0$$

Q#8



slope of given line $= -\dfrac{3}{2}$

slope of required $\perp r$ line $= \dfrac{-1}{-3/2}$

$\Rightarrow$ " " $= \dfrac{2}{3}$ $\quad \boxed{\because m_1 m_2 = -1}$

So,

Eq. of Line Passing through $(-4,-6)$ having slope $\dfrac{2}{3}$,

$$y-y_1 = m(x-x_1)$$

$$y-(-6) = \frac{2}{3}\left(x-(-4)\right)$$

$$y+6 = \frac{2}{3}(x+4)$$

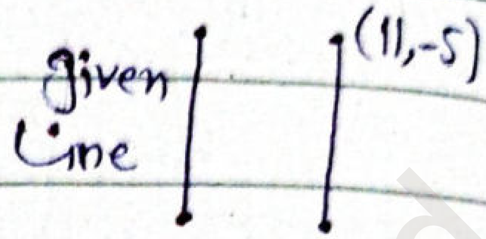
$$3(y+6) = 2(x+4)$$

$$3y+18 = 2x+8$$

$$\Rightarrow \quad 0 = 2x-3y-18+8$$

$$\Rightarrow 2x-3y-10=0$$

Q#9



slope of given Line $= -24$

slope of required Parallel Line $= -24$ $\boxed{\because m_1 = m_2}$

So,

Eq. of Line Passing through $(11,-5)$ having slope -24,

$$y - y_1 = m(x - x_1)$$

$$y-(-5) = -24(x-11)$$

$$y+5 = -24x+264$$

$$\Rightarrow 24x+y+5-264=0$$

$$\Rightarrow 24x+y-259=0$$

Remember: Forms of Equation

(1) Slope-intercept form,

$$y = mx + c$$

where $m =$ slope and $c = y$-intercept

(2) Two intercept form,

$$\frac{x}{a} + \frac{y}{b} = 1$$

(3) Normal form,

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

Where, if $Ax + By + C = 0$, Then

$$p = \frac{|c|}{\sqrt{A^2+B^2}} \quad \text{and} \quad \cos\alpha = \frac{A}{\sqrt{A^2+B^2}}$$

Q#10 (a) $2x - 4y + 11 = 0$

Slope intercept form:

$$\Rightarrow \quad 2x + 11 = 4y$$

divide by '4' on b/s,

$$\frac{\cancel{2}^{1}}{\cancel{4}_{2}}x + \frac{11}{4} = \frac{4y}{4}$$

$$\Rightarrow \quad \frac{1}{2}x + \frac{11}{4} = y$$

or

$$y = \frac{1}{2}x + 11/4$$

which is slope-intercept form

Two intercept form: $2x-4y+11=0$

$\Rightarrow \quad 2x-4y=-11$

divide by -11 on b/s

$$\frac{2x}{-11}-\frac{4y}{-11}=\frac{-11}{-11}$$

$$\Rightarrow \quad \frac{x}{-11/2}+\frac{y}{11/4}=1$$

which is two intercept form,

Normal form: $2x-4y+11=0$

Compare with, $Ax+By+C=0$

$\Rightarrow \quad A=2, \; B=-4, \; C=11$

So,

$$P=\frac{|C|}{\sqrt{A^2+B^2}}=\frac{11}{\sqrt{(2)^2+(-4)^2}}$$

$$P=\frac{11}{\sqrt{4+16}}=\frac{11}{\sqrt{20}}$$

$$P=\frac{11}{\sqrt{4\times5}}$$

$$P=\frac{11}{2\sqrt{5}}$$

Now;

as, $\cos\alpha=\dfrac{A}{\sqrt{A^2+B^2}}=\dfrac{2}{\sqrt{(2)^2+(-4)^2}}$

$$\cos\alpha = \frac{2}{\sqrt{4+16}} = \frac{2}{\sqrt{20}}$$

$$\cos\alpha = \frac{2}{\sqrt{4\times5}} = \frac{\cancel{2}}{\cancel{2}\sqrt{5}}$$

$$\cos\alpha = 1/\sqrt{5} = \frac{1}{2.2360}$$

$$\cos\alpha = 0.44722$$

$$\alpha = \cos^{-1}(0.44722)$$

$$\alpha = 63.45^\circ$$

$\{\alpha$ lies in 2nd Quad.$\}$

But $\alpha = 180^\circ - 63.45^\circ$

$$\alpha = 116.55^\circ$$

hence, required Normal form is,

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

$$\Rightarrow x\cos(116.55^\circ) + y\sin(116.55^\circ) = \frac{11}{2\sqrt{5}}$$

(b) $4x+7y-2=0$

Slope-intercept form:

$$7y = -4x + 2$$

divide by '7' on b/s,

$$\frac{\cancel{7}y}{\cancel{7}} = -\frac{4}{7}x + \frac{2}{7}$$

$$y = -\frac{4}{7}x + \frac{2}{7}$$

which is slope-intercept form.

Two intercept form: $4x+7y-2=0$

$\Rightarrow \quad 4x+7y=2$

divide by '2' on b/s,

$$\frac{\cancel{4}^{2}x}{\cancel{2}}+\frac{7y}{2}=\frac{\cancel{2}}{\cancel{2}}$$

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

$$\Rightarrow \quad \frac{x}{1/2}+\frac{y}{2/7}=1$$

which is two intercept form.

Normal form: $4x+7y-2=0$

Compare with $Ax+By+C=0$

$\Rightarrow \quad A=4, \quad B=7, \quad C=-2$

as,

$$p=\frac{|C|}{\sqrt{A^2+B^2}}=\frac{|-2|}{\sqrt{(4)^2+(7)^2}}$$

$$p=\frac{2}{\sqrt{16+49}}=\frac{2}{\sqrt{65}}$$

Now,

as $$\cos\alpha=\frac{A}{\sqrt{A^2+B^2}}=\frac{4}{\sqrt{(4)^2+(7)^2}}$$

$$\cos\alpha=\frac{4}{\sqrt{16+49}}=\frac{4}{\sqrt{65}}$$

$$\cos\alpha = \frac{4}{8.0622}$$

$$\cos\alpha = 0.49614$$

$$\Rightarrow \quad \alpha = \cos^{-1}(0.49614)$$

$$\alpha = 60.26^\circ$$

hence, required Normal form is,

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

$$\Rightarrow x\cos(60.26^\circ) + y\sin(60.26^\circ) = \frac{2}{\sqrt{65}}$$

(C) $-8x + 15y + 3 = 0$

Slope-intercept form:

$$15y = 8x - 3$$

divide by '15' on b/s,

$$\frac{\cancel{15}y}{\cancel{15}} = \frac{8}{15}x - \frac{\cancel{3}^{1}}{\cancel{15}_{5}}$$

$$y = \frac{8}{15}x - \frac{1}{5}$$

which is slope intercept form.

Two intercept form: $-8x + 15y + 3 = 0$

$$\Rightarrow \quad -8x + 15y = -3$$

divide by '-3' on b/s,

$$\frac{-8x}{-3} + \frac{15y}{-3} = \frac{-3}{-3}$$

$$\frac{8x}{3} + \frac{5y}{-1} = 1$$

$$\Rightarrow \frac{x}{3/8} + \frac{y}{-1/5} = 1$$

which is two intercept form.

Normal form: $-8x+15y+3=0$

Compare with $Ax+By+C=0$

$$\Rightarrow A=-8, \quad B=15, \quad C=3$$

So,

$$P = \frac{|C|}{\sqrt{A^2+B^2}} = \frac{|3|}{\sqrt{(-8)^2+(15)^2}}$$

$$P = \frac{3}{\sqrt{64+225}} = \frac{3}{\sqrt{289}}$$

$$P = \frac{3}{17}$$

Now,

as,

$$\cos\alpha = \frac{A}{\sqrt{A^2+B^2}} = \frac{-8}{\sqrt{(-8)^2+(15)^2}}$$

$$\cos\alpha = \frac{-8}{\sqrt{64+225}} = \frac{-8}{\sqrt{289}}$$

$$\cos\alpha = \frac{-8}{17}$$

$$\cos\alpha = -0.470588$$

$$\alpha = \cos^{-1}(-0.470588)$$

$$\alpha = 61.96^\circ$$

{α Lies in 4th Quad.}

But

$$\alpha = 360^\circ - 61.96^\circ$$

$$\alpha = 298.04^\circ$$

hence, required Normal form is,

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

$$x\cos(298.04^\circ) + y\sin(298.04^\circ) = \frac{3}{17}$$

Remember: if $ax+by+c=0$,
Then, slope of Line is given as,

$$m = -\frac{a}{b}$$

Q#11
(a) $2x+y-3=0$; $4x+2y+5=0$

Let

$l_1: 2x+y-3=0$

$$\text{slope}(m_1) = \frac{-a}{b}$$

$$m_1 = \frac{-2}{1}$$

$l_2: 4x+2y+5=0$

$$\text{slope}(m_2) = \frac{-a}{b}$$

$$m_2 = -\frac{\cancel{4}\,2}{\cancel{2}}$$

$m_1 = -2$ | $m_2 = -2$

Since, $m_1 = m_2$, So, given Lines l_1 and l_2 are parallel.

(b) $3y = 2x + 5$; $3x + 2y - 8 = 0$

Let $l_1: 2x - 3y + 5 = 0$ | $l_2: 3x + 2y - 8 = 0$

slope$(m_1) = -\frac{a}{b}$ | slope$(m_2) = -\frac{a}{b}$

$m_1 = \frac{-2}{-3}$ | $m_2 = -\frac{3}{2}$

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

Since, $m_1 m_2 = \left(\frac{2}{3}\right)\left(-\frac{3}{2}\right)$

$m_1 m_2 = -1$, So, given Lines l_1 and l_2 are perpendicular.

(C) $4y + 2x - 1 = 0$; $x - 2y - 7 = 0$

Let $l_1: 2x + 4y - 1 = 0$ | $l_2: x - 2y - 7 = 0$

slope$(m_1) = -\frac{a}{b}$ | slope$(m_2) = -\frac{a}{b}$

$m_1 = -\frac{\cancel{2}^1}{\cancel{4}_2}$ | $m_2 = -\frac{1}{-2}$

$m_1 = -\frac{1}{2}$ | $m_2 = \frac{1}{2}$

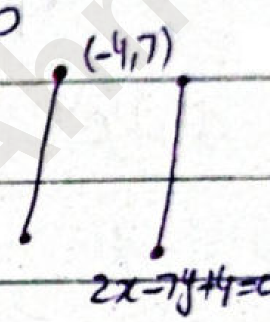
Since, $m_1 \neq m_2$ and also $m_1 m_2 \neq -1$
So, given lines l_1 and l_2 are neither parallel nor perpendicular.

Q#12 Given line; $2x-7y+4=0$

Slope of given line $= -\dfrac{a}{b}$

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

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



Now;

slope of required parallel line $= \dfrac{2}{7}$

So, Eq. of line passing through $(-4,7)$ having slope $\dfrac{2}{7}$

$$y - y_1 = m(x - x_1)$$

$$y - 7 = \frac{2}{7}(x-(-4))$$

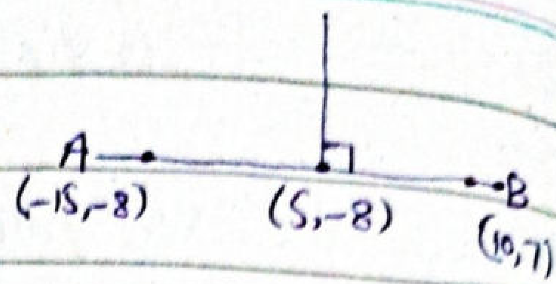
$$7(y-7) = 2(x+4)$$

$$7y - 49 = 2x + 8$$

$$\Rightarrow \quad 0 = 2x - 7y + 49 + 8$$

$$\Rightarrow \quad 2x - 7y + 57 = 0$$

Q#13



slope of Line segment AB $= \dfrac{y_2 - y_1}{x_2 - x_1}$

$A(-15, -8)$, $B(10, 7)$
$\quad x_1 \quad y_1 \qquad x_2 \quad y_2$

$$\Rightarrow \quad = \frac{7-(-8)}{10-(-15)} = \frac{7+8}{10+15}$$

$$= \frac{\cancel{15}\,3}{\cancel{25}\,5}$$

slope of AB $= 3/5$

Now,

$\because m_1 m_2 = -1$
$m_1 = \dfrac{-1}{m_2}$

Slope of required $\perp$r Line $= \dfrac{-1}{\text{slope of AB}}$

$$= \frac{-1}{3/5}$$

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

hence,
Eq. of Line Passing through $(5, -8)$ having slope $\dfrac{-5}{3}$,
$$y - y_1 = m(x - x_1)$$

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

$$\Rightarrow \quad 3(y+8) = -5(x-5)$$

$$3y+24 = -5x+25$$

$$\Rightarrow \quad 5x+3y+24-25=0$$

$$5x+3y-1=0$$

{The End}