9th Math Exercise 7.2

Q.1 Find the slope and inclination of the line joining the points：

(i) $(-2,4);(5,11)$

Solution：

$(-2,4);(5,11)$

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

$= \dfrac{11-4}{5-(-2)}$

$m = \dfrac{7}{5+2} = \dfrac{7}{7} = 1$

Indication： $\tan\,\alpha = m$

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

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

$\alpha = 45°$

(ii) $(3,-2);(2,7)$

Solution：

$(3,-2),(2,7)$

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

$m = \dfrac{7-(-2)}{2-3} = \dfrac{7+2}{-1} = \dfrac{9}{-1} = -9$

Inclination: $\tan\,\alpha = \mathrm{m}$

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

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

$\alpha = -83.65$

Making angle positive:

$\alpha = 180° - 83.65°$

$\alpha = 96.34$

(iii) $(4,6);(4,8)$

Solution:

$(4,6),(4,8)$

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

$= \dfrac{8-6}{4-4} = \dfrac{2}{0} = \infty$

$x+\dfrac{\frac{39}{5}}{12}=\dfrac{\frac{y-0}{5}}{13}=r(\text{ say })$

$\mathrm{m} = \infty$ (undefined)

Inclination: $\tan\ \alpha = \mathrm{m}$

$\tan\ \alpha = \infty\ \therefore \alpha = 90^{\circ}$

Q. 2 By means of slopes, show that the following points lie on the same line:

(i) $\mathrm{A}(-1,-3); \mathrm{B}(1,5); \mathrm{C}(2,9)$

Solution:

$A(-1,-3); B(1,5); C(2,9)$

If slope of $\overline{\mathrm{AB}}$ = slope of $\overline{\mathrm{BC}}$ then points A , B and C are collinear.

Slope of $\overline{\mathrm{AB}}$:

Slope of AB :

$m_1 = \dfrac{y_2 - y_1}{x_2 - x_1}$

$m_1 = \dfrac{5-(-3)}{1-(-1)} = \dfrac{5+3}{1+1} = \dfrac{8}{2} = 4$

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

$$m_2 = \frac{9-5}{2-1} = \frac{4}{1} = 4$$

Since, slope of $\overline{\mathrm{AB}}$ = slope of $\overline{\mathrm{BC}}$, so points A, B and C are collinear.

(ii) $\mathrm{P}(4,-5), \mathrm{Q}(7,5), \mathrm{R}(10,15)$

Solution:

$\mathrm{P}(4,-5); \mathrm{Q}(7,5); \mathrm{R}(10,15)$

Slope of $\overline{\mathrm{PQ}}$:

$m_1 = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{5-(-5)}{7-4}$

$= \dfrac{5+5}{3} = \dfrac{10}{3}$

Since, slope of $\overline{\mathrm{PQ}}$ = slope of $\overline{\mathrm{QR}}$, so points PQ and R are collinear points.

(iii) $\mathrm{L}(-4,6); \mathrm{M}(3,8); \mathrm{N}(10,10)$

Solution:
$\mathrm{H}-4{,}6);\mathrm{M}(3{,}8);\mathrm{N}(10{,}10)$
Slope of $\overline{\mathrm{LM}}=m_1\frac{y_2-y_1}{x_2-x_1}$
$$m_1=\frac{8-6}{3-(-4)}=\frac{8-6}{3+4}=\frac{2}{7}$$
Slope of $\overline{\mathrm{MN}}=\mathrm{m}_2=\frac{\mathrm{y}_2-\mathrm{y}_1}{x_2-x_1}$
$$m_2=\frac{10-8}{10-3}=\frac{2}{7}$$
Since, slope of $\overline{\mathrm{LM}}=$ slope of $\overline{\mathrm{MN}}$, so points L,M and N are collinear points.
(iv) $\mathrm{X}(\mathrm{a},2\ \mathrm{b});\mathrm{Y}(\mathrm{c},a+\mathrm{b});\mathrm{Z}(2\mathrm{c}-a,2a)$
Solution:
$X(a,2b);\mathrm{Y}(\mathrm{c},a+\mathrm{b});\mathrm{Z}(2\mathrm{c}-a,2a)$
Slope of $\overline{XY}=m_1=\frac{y_2-y_1}{x_2-x_1}$
$$\mathrm{m}_1=\frac{(a+\mathrm{b})-(2\ \mathrm{b})}{\mathrm{c}-a}$$
$$\mathrm{m}_1=\frac{a+\mathrm{b}-2\ \mathrm{b}}{\mathrm{c}-a}$$
$$=\frac{a-\mathrm{b}}{\mathrm{c}-a}$$
Slope of $\overline{\mathrm{YZ}}=\mathrm{m}_2=\frac{\mathrm{y}_2-\mathrm{y}_1}{x_2-x_1}$
$$\mathrm{m}_2=\frac{2a-(a+\mathrm{b})}{(2\mathrm{c}-a)-(\mathrm{c})}$$
$$\mathrm{m}_2=\frac{2a-a-\mathrm{b}}{2\mathrm{c}-a-\mathrm{c}}$$
$$\mathrm{m}_2=\frac{a-b}{\mathrm{c}-a}$$
Since, slope of $\overline{\mathrm{YZ}}=$ slope of $\overline{\mathrm{YZ}}$, so points X,Y and Z are collinear points.
Q. 3 Find k so that the line joining $A(7{,}3);B(k,-6)$ and the line joining $C(-4{,}5);D(-6{,}4)$ are:
(i) parallel
(ii) perpendicular
Solution:
Slope of $\overline{AB}=m_1=\frac{y_2-y_1}{x_2-x_1}$

$m_1 = \frac{-6-3}{k-7} = \frac{-9}{k-7}$

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

$m_2 = \frac{4-5}{-6(-4)} = \frac{-1}{-6+4} = \frac{-1}{-2} = \frac{1}{2}$

(i) When line segments are parallel.

solution:

Slopes of parallel lines are equal.

If $\overline{AB} \| \overline{CD}$, then

$$m_1 = m_2$$

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

$$-18 = k - 7$$

$$-18 + 7 = k$$

(ii) When line segments are perpendicular.

Solution

If $\overline{AB} \perp \overline{CD}$, then

$$m_1 \times m_2 = -1$$

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

$$\frac{-9}{2k-14} = 1$$

$$9 = 2k - 14$$

$$9 + 14 = 2k$$

$$23 = 2k$$

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

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

Q. 4 Using slopes, show that the triangle with its vertices $A(6,1), B(2,7)$ and $C(-6,-7)$ is a right triangle.

Solution:

$A(6,1), B(2,7)$ and $C(-6,-7)$

First we find the slopes of sides of $\triangle ABC$.

Slope of side $\overline{AB}$.

$$m_1 = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{7-1}{2-6} = \frac{6}{-4} = -\frac{3}{2}$$
Slope of side $\overline{\mathrm{BC}}$:
$$m_2 = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-7-7}{-6-2} = \frac{-14}{-8} = \frac{7}{4}$$
Slope of side $\overline{\mathrm{AC}}$:
$$m_3 = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-7-1}{-6-6} = \frac{-8}{-12} = \frac{2}{3}$$
We observe that
$$m_1 \times m_3 = \frac{-3}{2} \times \frac{2}{3}$$
$$m_1 \times m_3 = -1$$
This shows that side $\overline{\mathrm{AB}} \perp$ side $\overline{\mathrm{AC}}$ Hence, $\triangle ABC$ is a right angled triangle with 90° at vertex A .

Q. 5 Two pairs of points are given. Find whether the two lines determined by these points are:

(1) parallel

(ii)perpendicular

(iii) none

(a) $(1,-2),(2,4)$ and $(4,1)(-8,2)$

Solution:

Let $\mathrm{A}(1,-2), \mathrm{B}(2,4)$ and $\mathrm{C}(4,1), \mathrm{D}(-8,2)$ Slope of AB
$$m_1 = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4-(-2)}{2-1} = \frac{4+2}{1} = \frac{6}{1} = 6$$
Slope of $\overline{\mathrm{CD}}$:
$$\mathrm{m}_2 = \frac{\mathrm{y}_2 - \mathrm{y}_1}{x_2 - x_1} = \frac{2-1}{-8-4} = \frac{1}{-12}$$

Multiplying these slopes:
$$m_1 \times m_2 = 6 \times \frac{1}{-12} = -\frac{1}{2}$$
These slopes are neither equal nor their product is -1 , so the lines determined by given points are neither parallel nor perpendicular to each other

(b) $(-3,4),(6,2)$ and $(4,5),(-2,-7)$

Solution
$A(-3,4), B(A,2)$ and $C(4,5), D(-2,-7)$
slope of AB
$$m_1 = \frac{y_2 - y_1}{x_2 - x_1} - \frac{2-4}{6-(-3)} = \frac{-2}{6+3} = \frac{-2}{9}$$
Slope of $\overline{\mathrm{CD}}$
$$m_2 = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-7-5}{-2-4} = \frac{-12}{-6} = 2$$
Multiplying these slopes,
$$m_1 \times m_2 = \frac{-2}{9} \times 2$$
$$m_1 \times m_2 = \frac{-4}{9}$$
We observe that the slopes are neither equal nor their product is -1 , so the lines determined by these points are neither parallel nor perpendicular to each other.

Q. 6 Find an equation of:
(a) the horizontal line through $(7,-9)$
Solution:
The point slope form of equation is:
$y - y_1 = m(x - x_1)$
The slope of horizontal line: $\mathrm{m} = 0$
Given point $(x_1, y_1) = (7,9)$
Put $x_1 = 7$ and $y_1 = -9$ in eq. (1)
$$y - (-9y) = 0(x - 7)$$
$$y + 9 = 0$$
(b) the vertical line through $(-5,3)$
Solution:
Equation of vertical line through $(-5,3)$
Equation of line in point sloe form is
$y - y_1 = m(x - x_1)$

Slope of vertical line $= m = \infty = \frac{1}{0}$
Given point $(x_1, y_1) = (-5,3)$ putting the value in eq. (i)

$$y-3=\frac{1}{0}[x-(-5)]$$

$\Rightarrow 0(y-3)=1(x+5)$

$0=x+5$

$\Rightarrow x+5=0$

(c) through $A(-6,5)$ having slope 7 0930ves Solution:

A(6,5), slope $=m=7$

The equation of line in point slope form is:

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

Put x_1 6. $\mathrm{y}_1=5$ and $\mathrm{m}=7\mathrm{ineq}$. (i)

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

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

$y-5=7x+42$

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

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

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

Solution:

Point $P(8,-3)$ and slope $=m=0$

The equation of line in point slope form is

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

Put $x_1=8, y_1=-3$ and $m=0$ in eq. (i)

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

$y+3=0$

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

Solution:

point $p(8,5)$, slope $=m=\infty=\frac{1}{0}$(undefined)

The equation of line in point slope form is

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

Prot $x_1=8, y_1=5$ and $m=\frac{1}{0}$

$$y-5=\frac{1}{0}[r-(-8)]$$

$0(y-5)=1(x+8)$

$0=x+8$

$\Rightarrow x+8=0$

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

Solution:
Points $\mathrm{A}(-5,3), \mathrm{B}(9,-1)$
The slope of line passing through given points is
$$m=\frac{y_2-y_1}{x_2-x_1}=\frac{-1-(-3)}{9-(-5)}=\frac{-1+3}{9+5}=\frac{2}{14}=\frac{1}{7}$$
The equation of line in point slope form is:
$y-y_1=m(x-x_1)$
Let $(\mathrm{x}_1, \mathrm{y}_1)=(-5,-3)$ [Take any one of two points)
Putting the values in eq. (1)
$$y-(-3)=\frac{1}{7}[x-(-5)]$$
$$y+3=\frac{1}{7}(x+5)$$
$$7(y+3)=x+5$$
$$7y+21=x+5$$
$$0=x+5-7y-21$$
$\Rightarrow x-7y-16=0$
(g) y-intercept: -7 and slope: -5
Solution:
y intereept $\rightarrow \mathrm{c} \rightarrow$?
slope $-5 \Rightarrow \mathrm{m}=-5$
The equation of line in slope-intercept form is
$$y=mx+c$$
$$y=-5x+(-7) \text{ (putting values)}$$
$$y=-5x-7$$
(h) x-intercept: -3 and y-intercept:
Solution:
x - intercept be $a=-3$
y - intercept be $\mathrm{b}=4$
The equation of lien two-intercept form is:
$$\frac{x}{a}+\frac{y}{b}=1$$
$$\frac{x}{-3}+\frac{y}{4}=1$$
$$\frac{-4x+(3)y}{12}=1$$
$\Rightarrow -4x+3y=12$
$$0=4x-3y=12$$
$$4x-3y+12=0$$

(i) x-intercept: -9 and slope: -4
Solution:
x-intercept $= -9$
Slope $= m = -4$
If x-intercept is -9 , then line passes through point $(-9,0)$
The equation of line in point slope form is:
$y - y_1 = m(x - x_1)$
Putting the values

$$y - 0 = -4[x - (-9)]$$
$$y - 0 = -4(x + 9)$$
$$y = -4x - 36$$
$$4x + y + 36 = 0$$

Q. 7 Find an equation of the perpendicular bisector of the segment joining the points
$A(3,5)$ and $B(9,8)$
Solution:
$\mathrm{A}(3,5), \mathrm{B}(9,8)$.
Perpendicular bisector passes through midpoint of a line segment perpendicularly.

Let midpoint of A and B be $M(x_m, y_m)$

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_2 + y_1}{2}\right)$$
$$M\left(\frac{3 + 9}{2}, \frac{5 + 8}{2}\right)$$
$$= M\left(\frac{12}{2}, \frac{13}{2}\right)$$
$$= M(6,6.5)$$

Slope of $\overline{AB}$: $m_1 = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - 5}{9 - 3} = \frac{3}{6} = \frac{1}{2}$

Let m_2 be the slope of line $\perp \overline{AB}$ We know that for perpondicular lines

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

The point slope form of equation is:
$y - y_1 = m(x - x_1)$
Since line passes through midpoint. So put

$$x_1 = 6, y_1 = \frac{13}{2}$$
$$y - \frac{13}{2} = -2(x - 6)$$
$$\frac{2y - 13}{2} = -2x + 12$$
$$2y - 13 = -4x + 24$$
$$2y - 13 + 4x - 24 = 0$$
$$4x + 2y - 37 = 0$$

Q. 8 Find an equation of the line through $(-4, -6)$ and perpendicular to a line having slope $\frac{-3}{2}$.

Solution:

Slope of line $= m_1 = \frac{-3}{2}$

Let slope of perpendicular line $= \mathrm{m}_2$

We know that

$$m_1 \times m_2 = -1$$
$$\frac{-3}{2} \times m_2 = -1$$
$$\Rightarrow m_2 = \frac{-1 \times 2}{3}$$
$$m_2 = \frac{2}{3}$$

Since line passes through $(-4, -6)$, so we take $(x_1, y_1) = (-4, -6)$

The point slope form of equation is.

$$y - y_1 = m(x - x_1)$$
$$y - (-6) = \frac{2}{3}[x - (-4)]$$
$$y + 6 = \frac{2}{3}(x + 4)$$
$$\Rightarrow 3(y + 6) = 2(x + 4)$$
$$3y + 18 = 2x + 8$$
$$\Rightarrow 0 = 2x + 8 - 3y - 18$$
$$\Rightarrow 2x - 3y - 10 = 0$$

Q. 9 Find an equation of the line through ($11, -5$) and parallel to a line with slope- 24.

Solution:

Given point $\mathrm{p}(11, -5)$

Let slope of line $\overline{\mathrm{AB}} = \mathrm{m}_1 = -24$
Let slope of line parallel to $\mathrm{AB} = \mathrm{m}_2$
Since slopes of parallel lines are equal

$$\mathrm{m}_2 = \mathrm{m}_1$$
$$\mathrm{m}_2 = -24$$

The point = slope form of an equation is:

$$y - y_1 = m_2(x - x_1)$$

put $x_1 = 11, y = -5$

$$y - (-5) = -24(x - 11)$$
$$y + 5 = -24x + 264$$
$$y + 5 + 24x - 264 = 0$$
$$24x + y - 259 = 0$$

Q. 10 Convert each of the following equations into slope intercept form, two intercept form and normal form:
Solution
(a) $2x - 4y + 11 = 0$

$$2x - 4y + 11 = 0$$

(i) Slope intercept form
from eq. (i)
$2x - 4y + 11 = 0 \quad 2x + 11 - 4y = 0$

$$\Rightarrow y = \frac{2x + 11}{4}$$
$$y = \frac{2x}{4} + \frac{11}{4}$$
$$y = \frac{1}{2}x + \frac{11}{4} \ (\because y = mx + c)$$

(ii) Two intercept form
From (i)

$$2x - 4y + 11 = 0$$
$$2x - 4y = -11$$

Dividing both side by -11 , we get

$$\frac{2x}{-11} - \frac{4y}{-11} = \frac{-11}{-11}$$
$$\Rightarrow \frac{x}{-11} - \frac{y}{11} = 1 \left(\because \frac{x}{2} + \frac{y}{b} = 1\right)$$

(iii) Normal form
From (1)

$2x-4y+11=0$
$2x-4y=-11$
$\because \mp\sqrt{(2)^2+(-4)^2}$
$=\mp\sqrt{4+16}=\pm\sqrt{20}=\pm\sqrt{4\times 5}=\pm 2\sqrt{5}$
Since R.H.S is to be positive, we have to take negative sign.
Dividing both side by $-2\sqrt{5}$
$$\frac{2x}{-2\sqrt{5}}-\frac{4y}{-2\sqrt{5}}=\frac{-11}{-2\sqrt{5}}$$
$$=\frac{11}{2\sqrt{5}}$$
Comparing it with
$x\cos\ \alpha+y\sin\ \alpha=p$
$x\cos\ \alpha=\dfrac{-2}{2\sqrt{5}}<0$ and $\sin\ \alpha=\dfrac{4}{2\sqrt{5}}>0$
$\Rightarrow$ Angle α lies in 2^{nd} quadrant and $\alpha=116.57^\circ$
So, $x\cos\ 116.57^\circ+y\sin\ 116.57^\circ=\frac{11}{2\sqrt{5}}$
(b) $4x+7y-2=0$
(i) slope-intercept form
$4x+7y-2=0$
$7y=-4x+2$
$y=\dfrac{4x+2}{7}$ (Dividing B S by 7)
$y=\dfrac{-4}{7}x+\dfrac{2}{7}$ $(\because y=mx+c)$
(ii) Two intercept form
$4x+7y-2=0$
$4x+7y=2$
Dividing both side by " 2 "
$$\frac{4x}{2}+\frac{7y}{2}=\frac{2}{2}$$
$$\frac{2x}{1}+\frac{7y}{2}=1\ \left(\because \frac{x}{a}+\frac{y}{b}=1\right)$$
$$\frac{x}{\frac{1}{2}}+\frac{y}{\frac{2}{7}}=1$$
(iii) Normal form

$$4x + 7y - 2 = 0$$
$$4x + 7y = 2$$
$$\because \sqrt{4^2 + 7^2} = \sqrt{16 + 49} = \sqrt{65}$$
Dividing both side by $\sqrt{65}$
$$\frac{4x}{\sqrt{65}} + \frac{7y}{\sqrt{65}} = \frac{2}{\sqrt{65}}$$
Comparing with $x\cos\ \alpha + y\sin\ \alpha = p$
$$\cos\ \alpha = \frac{4}{\sqrt{65}} > 0, \sin\ \alpha = \frac{7}{\sqrt{65}} > 0$$
⇒ Angle lies in 1^{st} quadrant and $\alpha = 60.26°$

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

(i) Slope-intercept form
$$15y - 8x + 3 = 0$$
$$15y = 8x - 3$$
$$y = \frac{8x - 3}{15}$$
$$y = \frac{8x}{15} - \frac{3}{15}$$
$\because y = mx + c$

(ii) Two intercept form
$$15y - 8x + 3 = 0$$
$$-8x + 15y = -3$$
Dividing by " -3 "
$$\frac{-8x}{-3} + \frac{15y}{-3} = 3$$
$$\frac{8x}{3} + \frac{15y}{-3} = 1$$
$$\Rightarrow \frac{8x}{3} + \frac{15y}{-1} = 1$$
$$\Rightarrow \frac{x}{3} + \frac{y}{-1} = 1$$
8 5

(iii) Normal form
$$15y - 8x + 3 = 0$$
$$-8x + 15y = -3$$
$$\left(\because \sqrt{(-8)^2 + (15)^2} = \pm\sqrt{64 + 225} = \pm\sqrt{289} = \pm 17\right)$$

To make R.H.S positive
Dividing both side by " -17 "

$$\frac{-8x}{-17}+\frac{15y}{-17}=\frac{-3}{-17}$$

$$\frac{8x}{17}+\frac{15y}{-17}=\frac{3}{17}$$

Comparing it with $x\cos\ \alpha + y\sin\ \alpha = P$

$\Rightarrow \cos\ \alpha - \frac{8}{17} = 0$ and $\sin\ \alpha - \frac{-15}{17} < 0$

$\Rightarrow$ Angle α lies in 4^{th} quadrant and α -298.070

$$\Rightarrow x\cos 298.07^\circ + y\sin\ 298.07^\circ = \frac{3}{17}$$

Q. 11 In each of the following check whether the two lines are:
(i) Parallel
(iii) Perpendicular
(iii) Neither parallel nor perpendicular
(a) $2x + y - 3 = 0, 4x + 2y + 5 = 0$
Solution

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

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

Slope of line (i), $\mathrm{m}_1 = \frac{\text{-coeff of } x}{\text{coeff. of y}} = \frac{-2}{1} = -2$

Slope of line (ii),

$$\mathrm{m}_2 = \frac{-\text{ coeff of } x}{\text{coeff of } y} = -\frac{4}{2} = -2$$

We observe that $\mathrm{m}_1 = \mathrm{m}_2$
So given pair of lines are parallel. To each other.
(b) $3y = 2x + 5, 3x + 2y - 8 = 0$

$2x - 3y + 5 = 0$ (i)

$3x + 2y - 8 = 0$ (ii)

Slope of line (i):

$$\mathrm{m}_1 = \frac{-\text{ coeff. of } x}{\text{coeff. of } y} = \frac{-2}{-3} = \frac{2}{3}$$

Slope of line (ii)

$$m_2 = \frac{-\text{ coeff. of } x}{\text{coeff. of } y} = -\frac{3}{2}$$

We observe that

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

$m_1 \times m_2 = -1$

Hence the pair of lines are perpendicular to each other.
each other.

(c) $4y + 2x - 1 = 0, x - 2y - 7 = 0$

Solution

$2x + 4y - 1 = 0$

$+2y - 7 = 0$

Slope of line (i),

$\mathrm{m}_{1.} = \frac{-\text{coeff of } x}{\text{coeff of } y} = -\frac{2}{4} = -\frac{1}{2}$

Slope of line (ii)

$m_2 = \frac{\text{coeff of } x}{\text{coeff of } y} = -\frac{1}{-2} = \frac{1}{2}$

Multiplying $m1$ & m2

$$m_1 \times m_2 = \frac{-1}{2} \times \frac{1}{2} = \frac{-1}{4}$$

Hence the lines are neither parallel not perpendicular to each other.

Q. 12 Find an equation of the line $(-4,7)$ and parallel to the line $2x - 7y + 4 =$

Solution:

$2x - 7y + 4 = 0$

slope of line

$m_1 = \frac{-\text{coeff of } x}{\text{coeff of } y} = \frac{-2}{-7} = \frac{2}{7}$

Since, slope of parallel line are equal so. Slope of new line is $\mathrm{m} = \frac{2}{7}$.

As line passes through point $(-4,7)$, so we can take $(x_1, y_1) = (-4,7)$

Using point slope from of equation.

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

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

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

$7y - 49 = 2x + 8$

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

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

Q. 13 Find an equation of the line through $(-5,8)$ and perpendicular to the join of $\mathrm{A}(-15,-8), \mathrm{B}(10,7)$.

Solution:

$\mathrm{A}(-15,-8), \mathrm{B}(10,7)$

Slope of

$$\overline{\mathrm{AB}} = \frac{x_2 - x_1}{y_2 - y_1} = \frac{7-(-8)}{10(-15)}$$

$$= \frac{7+8}{10+15} = \frac{15}{25} = \frac{3}{5}$$

The Slope of line perpendicular to $AB = m_2$ we know that for perpendicular lines,

$$m_1 \times m_2 = -1$$

$$\frac{3}{5} \times m_2 = -1$$

$$m_2 = \frac{-5}{3}$$

Since line passes through point $(5,-8)$, so we can take $(x_1, y_1) = (5,-8)$

The point - slope of equation is:

$$y - y_1 = m_2(x - x)$$

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

$$3(y + 8) = -5(x - 5)$$

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

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

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