

Solution to

ସରଳ ସମ୍ବନ୍ଧୀୟତା

EXERCISE - 1(b)

ePathshala

Ritesh

1. ପ୍ରତିକଳ୍ପ ପ୍ରଣାଳୀରେ ନିମ୍ନଲିଖିତ ସହସମୀକରଣ ଦ୍ଵାରା ସମାଧାନ କର ।

(i) $x + y - 8 = 0$, $2x - 3y - 1 = 0$

(ii) $3x + 2y - 5 = 0$, $x - 3y - 9 = 0$

(iii) $2x - 5y + 8 = 0$, $x - 4y + 7 = 0$

(iv) $11x + 15y + 23 = 0$, $7x - 2y - 20 = 0$

(v) $ax + by - a + b = 0$, $bx - ay - a - b = 0$

(vi) $x + y - a = 0$, $ax + by - b^2 = 0$

(i) $x + y - 8 = 0$ — (i)

$2x - 3y - 1 = 0$ — (ii)

$\Rightarrow x = 8 - y$ — (iii)

(iii) ଓ (ii) ରୁ

$2(8 - y) - 3y - 1 = 0 \Rightarrow 16 - 2y - 3y - 1 = 0 \Rightarrow 15 = 5y \Rightarrow y = 3$ — (iv)

(iv) ଓ (i) ରୁ $x + 3 - 8 = 0 \Rightarrow x = 5$
(5, 3) Ans

(ii) $3x + 2y - 5 = 0$ — (i)

$x - 3y - 9 = 0$ — (ii)

$\Rightarrow x = 3y + 9$ — (iii)

(iii) ଓ (i) ରୁ

$3(3y + 9) + 2y - 5 = 0 \Rightarrow 9y + 27 + 2y - 5 = 0$

$\Rightarrow 11y + 22 = 0 \Rightarrow 11y = -22 \Rightarrow y = -2$ — (iv)

(iv) ଓ (i) $3x + 2(-2) - 5 = 0$

$\Rightarrow 3x - 4 - 5 = 0 \Rightarrow 3x = 9 \Rightarrow x = 3$ | (3, -2) Ans

(iii) $2x - 5y + 8 = 0$ — (i)

$x - 4y + 7 = 0$ — (ii)

$\Rightarrow x = 4y - 7$ — (iii)

(iii) ଓ (i) ରୁ

$2(4y - 7) - 5y + 8 = 0 \Rightarrow 8y - 14 - 5y + 8 = 0$

$\Rightarrow 3y = 6 \Rightarrow y = 2$ — (iv)

(iv) ଓ (ii) $x - 4 \times 2 + 7 = 0 \Rightarrow x - 8 + 7 = 0 \Rightarrow x = 1$

(1, 2) Ans

1. ପ୍ରଦତ୍ତ ପ୍ରଣାଳୀରେ ନିମ୍ନଲିଖିତ ସହସମୀକରଣ ଦ୍ଵାରା ସମାଧାନ କର ।

(i) $x + y - 8 = 0, 2x - 3y - 1 = 0$

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(iv) $11x + 15y + 23 = 0, 7x - 2y - 20 = 0$

(v) $ax + by - a + b = 0, bx - ay - a - b = 0$

(vi) $x + y - a = 0, ax + by - b^2 = 0$

(iv) $11x + 15y + 23 = 0 \quad \text{---(i)}$
 $7x - 2y - 20 = 0 \Rightarrow 2y = 7x - 20$
 $\hookrightarrow \text{(ii)}$
 $\Rightarrow y = \frac{1}{2}(7x - 20) \quad \text{---(iii)}$
 from (i) & (iii)

$$11x + \frac{15}{2}(7x - 20) + 23 = 0 \Rightarrow 22x + 105x - 300 + 46 = 0$$

$$\Rightarrow 127x = 254 \Rightarrow \boxed{x = 2} \quad \text{---(iv)}$$

from (iii) & (iv) $y = \frac{1}{2}(7 \times 2 - 20)$
 $= \frac{1}{2}(14 - 20) = \frac{1}{2} \times (-6)$
 $\Rightarrow \boxed{y = -3} \quad \text{---(v)} \quad \boxed{(x, y) = (2, -3)} \quad \text{---(Ans)}$

(v) $ax + by - a + b = 0 \quad \text{---(i)}$ $bx - ay - a - b = 0 \quad \text{---(ii)}$
 $\Rightarrow x = \frac{ay + a + b}{b} \quad \text{---(iii)}$

from (iii) & (i)

$$a \left[\frac{ay + a + b}{b} \right] + by - a + b = 0 \Rightarrow a^2y + a^2 + ab + b^2y - ab + b^2 = 0$$

$$\Rightarrow y(a^2 + b^2) = -(a^2 + b^2) \Rightarrow \boxed{y = -1} \quad \text{---(iv)}$$

from (iv) & (iii)

$$x = \frac{a(-1) + a + b}{b} = 1 \Rightarrow \boxed{x = 1} \quad \text{---(v)} \quad \boxed{(x, y) = (1, -1)} \quad \text{---(Ans)}$$

1. ପ୍ରତିକଳ୍ପ ପ୍ରଣାଳୀରେ ନିମ୍ନଲିଖିତ ସହସମାକରଣ ଦୃଶ୍ୟ ଉପାଧାନ କର ।

(ii) $x + y - 8 = 0$, $2x - 3y - 1 = 0$

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(iv) $11x + 15y + 23 = 0$, $7x - 2y - 20 = 0$

(v) $ax + by - a + b = 0$, $bx - ay - a - b = 0$

(vi) $x + y - a = 0$, $ax + by - b^2 = 0$

$$(vi) \quad x + y - z = 0 \quad \text{--- (i)}$$

$$ax + by - b^2 = 0 \quad \text{--- (ii)}$$

$$\rightarrow n = a - y - (i \ i \ i)$$

from (ii) & (iii) $a(a-y) + by - b^2 = 0$

$$\rightarrow a^2 - ay + by - b^2 = 0 \Rightarrow y(a-b) = a^2 - b^2$$

$$\rightarrow \boxed{y = (a+b)} \quad [\because a^2 - b^2 = (a+b)(a-b)]$$

$$L \rightarrow (iv)$$

from (iii) & (iv) $x = a - a - b$

$$\Rightarrow \boxed{x = -b} \quad \text{--- (v)}$$

$$(x, y) = (-b, a+b) \quad (\text{Ans})$$

2. ଉପସରଣ ପ୍ରଣାଳୀରେ ନିମ୍ନଲିଖିତ ସହ ସମାନ୍ବରଣ ମାନଙ୍କର ସମାଧାନ କର ।

(i) $x - y - 3 = 0$, $3x - 2y - 10 = 0$

(iii) $3x - 5y - 4 = 0$, $9x - 2y - 1$

(v) $\sqrt{2}x + \sqrt{3}y = 0$, $\sqrt{5}x + \sqrt{2}y = 0$

(ii) $3x + 4y = 10$, $2x - 2y = 2$

(iv) $0.4x - 1.5y = 6.5$, $0.3x + 0.2y = 0.9$

(vi) $ax + by = 0$, $x + y - c = 0$ ($a+b \neq 0$)

(i)

$$\begin{array}{l} \text{(i)} \quad x - y - 3 = 0 \\ \text{(ii)} \quad 3x - 2y - 10 = 0 \\ \text{(i)} \times 2 \quad 2x - 2y - 6 = 0 \end{array}$$

$$(x, y) = (4, 1)$$

$$\begin{array}{l} \text{(ii)} - \text{(i)} \times 2 \quad x - 4 = 0 \\ \Rightarrow x = 4 \end{array}$$

$$\begin{array}{l} \text{put } x = 4 \text{ in (i)} \quad 4 - y - 3 = 0 \\ \Rightarrow y = 4 - 3 = 1 \end{array}$$

(ii)

$$\begin{array}{l} \text{(i)} \quad 3x + 4y = 10 \\ \text{(ii)} \quad 2x - 2y = 2 \\ \text{(ii)} \times 2 \quad 4x - 4y = 4 \end{array}$$

$$\text{put } x = 2 \text{ in (i)}$$

$$2 \times 2 - 2y = 2$$

$$\Rightarrow 2y = 2 \Rightarrow y = 1$$

$$\begin{array}{l} \text{(i)} + \text{(ii)} \times 2 \Rightarrow 7x = 14 \\ \Rightarrow x = 2 \end{array}$$

$$(x, y) = (2, 1)$$

(iii)

$$\begin{array}{l} \text{(i)} \quad 3x - 5y - 4 = 0 \\ \text{(ii)} \quad 9x = 2y - 1 \\ \Rightarrow 9x - 2y + 1 = 0 \\ 3 \times \text{(i)} \quad 9x - 15y - 12 = 0 \end{array}$$

$$\text{put } y = -1 \text{ in (ii)}$$

$$9x = 2(-1) - 1$$

$$= -3$$

$$x = \frac{-3}{9} = -\frac{1}{3}$$

$$\begin{array}{l} \text{(i)} - 3 \times \text{(ii)} \quad 13y + 13 = 0 \\ \Rightarrow y = -1 \end{array}$$

$$(x, y) = \left(-\frac{1}{3}, -1\right)$$

2. ଉପସରଣ ପ୍ରଣାଳୀରେ ନିମ୍ନଲିଖିତ ସହ ସମାନ୍ବିତ ଗୋଟିଏ ସମୀକରଣ ସମାଧାନ କର ।

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(iii) $3x - 5y - 4 = 0$, $9x - 2y = 1$

(iv) $0.4x - 1.5y = 6.5$, $0.3x + 0.2y = 0.9$

(v) $\sqrt{2}x + \sqrt{3}y = 0$, $\sqrt{5}x + \sqrt{2}y = 0$

(vi) $ax + by = 0$, $x + y - c = 0$ ($a+b \neq 0$)

(iv) (i) $0.4x - 1.5y = 6.5$

3(i) $1.2x - 4.5y = 19.5$

(ii) $0.3x + 0.2y = 0.9$

4(ii) $1.2x + 0.8y = 3.6$

put $y = -3$ in (ii)

3(i) - 4(ii) $-5.3y = 15.9$

$0.3x + 0.2(-3) = 0.9$

$\Rightarrow y = -3$

$\Rightarrow 0.3x - 0.6 = 0.9$

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

$\Rightarrow 0.3x = 1.5 \Rightarrow x = 5$

(v) (i) $\sqrt{2}x + \sqrt{3}y = 0$

$(x, y) = (0, 0)$

(ii) $\sqrt{5}x + \sqrt{2}y = 0$

$\left[\begin{array}{l} c_1 = c_2 = 0 \text{ \& } \\ a_1b_2 - a_2b_1 \neq 0 \end{array} \right]$

(ଏମିତି ସମୀକରଣ)

(vi) (i) $ax + by = 0$

put $y = \frac{ac}{a-b}$ in (ii)

(ii) $x + y - c = 0$

$x + \frac{ac}{a-b} - c = 0$

(ii) $\times a$ $ax + ay - ac = 0$

$\Rightarrow x = c - \frac{ac}{a-b}$

(i) - a(ii) $by - ay + ac = 0$

$= \frac{ac - bc - ac}{a-b}$

$\Rightarrow y(b-a) = -ac$

$\Rightarrow x = \frac{-bc}{a-b}$

$\Rightarrow -y(a-b) = -ac$

$\Rightarrow y = \frac{ac}{a-b}$

$(x, y) = \left(\frac{-bc}{a-b}, \frac{ac}{a-b} \right)$

3. ବହୁଗୁଣନ ପ୍ରଣାଳୀରେ ନିମ୍ନଲିଖିତ ସହସମୀକରଣମାନଙ୍କ ସମାଧାନ କର ।

(i) $x + 2y + 1 = 0, 2x - 3y - 12 = 0$

(ii) $2x + 5y = 1, 2x + 3y = 3$

(iii) $x + 6y + 1 = 0, 2x + 3y + 8 = 0$

(iv) $\frac{x}{a} + \frac{y}{b} = a + b, \frac{x}{a^2} + \frac{y}{b^2} = 2$

(v) $x + 6y + 1 = 0, 2x + 3y + 8 = 0$

(vi) $4x - 9y = 0, 3x + 2y - 35 = 0$

(i) $x + 2y + 1 = 0$ $a_1 = 1$ $b_1 = 2$ $c_1 = 1$
 $2x - 3y - 12 = 0$ $a_2 = 2$ $b_2 = -3$ $c_2 = -12$

$$x = \frac{b_1 c_2 - b_2 c_1}{a_1 b_2 - a_2 b_1} = \frac{2(-12) - (-3)1}{1(-3) - 2(2)} = \frac{-24+3}{-3-4}$$

$$= \frac{-21}{-7} = 3$$

$$y = \frac{c_1 a_2 - c_2 a_1}{a_1 b_2 - a_2 b_1} = \frac{1 \cdot 2 - (-12)1}{1(-3) - 2(2)} = \frac{2+12}{-3-4} = \frac{14}{-7}$$

$$= -2$$

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

(ii) $2x + 5y = 1 \Rightarrow 2x + 5y - 1 = 0$ $a_1 = 2$ $b_1 = 5$ $c_1 = -1$
 $2x + 3y = 3 \Rightarrow 2x + 3y - 3 = 0$ $a_2 = 2$ $b_2 = 3$ $c_2 = -3$

$$x = \frac{b_1 c_2 - b_2 c_1}{a_1 b_2 - a_2 b_1} = \frac{5(-3) - (-1)3}{2(3) - 2(5)} = \frac{-15+3}{6-10}$$

$$= \frac{-12}{-4} = 3$$

$$y = \frac{c_1 a_2 - c_2 a_1}{a_1 b_2 - a_2 b_1} = \frac{(-1)2 - (-3)2}{2(3) - 2(5)} = \frac{-2+6}{6-10}$$

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

$$(x, y) = (3, -1)$$

3. ବଳୁତ୍ତ୍ୱଶୀଳ ପ୍ରଣାଳୀରେ ନିମ୍ନଲିଖିତ ସହସମୀକରଣମାନଙ୍କ ସମାଧାନ କର ।

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(iv) $\frac{x}{a} + \frac{y}{b} = a + b$, $\frac{x}{a^2} + \frac{y}{b^2} = 2$

(v) $x + 6y + 1 = 0$, $2x + 3y + 8 = 0$

(vi) $4x - 9y = 0$, $3x + 2y - 35 = 0$

(iii) $x + 6y + 1 = 0$ $a_1 = 1$ $b_1 = 6$ $c_1 = 1$
 $2x + 3y + 8 = 0$ $a_2 = 2$ $b_2 = 3$ $c_2 = 8$

$$x = \frac{b_1 c_2 - b_2 c_1}{a_1 b_2 - a_2 b_1} = \frac{6 \cdot 8 - 3 \cdot 1}{1 \cdot 3 - 2 \cdot 6} = \frac{48 - 3}{3 - 12}$$

$$= \frac{45}{-9} = -5$$

$$y = \frac{c_1 a_2 - c_2 a_1}{a_1 b_2 - a_2 b_1} = \frac{1(2) - 8(1)}{1(3) - 2(6)} = \frac{2 - 8}{3 - 12}$$

$$= \frac{-6}{-9} = 2/3$$

$x, y = (-5, 2/3)$

(iv) $\frac{x}{a} + \frac{y}{b} = a + b \Rightarrow \frac{x}{a} + \frac{y}{b} - (a + b) = 0$ $a_1 = \frac{1}{a}$ $b_1 = \frac{1}{b}$ $c_1 = -(a + b)$
 $\frac{x}{a^2} + \frac{y}{b^2} = 2 \Rightarrow \frac{x}{a^2} + \frac{y}{b^2} - 2 = 0$ $a_2 = \frac{1}{a^2}$ $b_2 = \frac{1}{b^2}$ $c_2 = -2$

$$x = \frac{b_1 c_2 - b_2 c_1}{a_1 b_2 - a_2 b_1} = \frac{\frac{1}{b}(-2) - \frac{1}{b^2}-(a+b)}{\frac{1}{a} \frac{1}{b^2} - \frac{1}{b} \frac{1}{a^2}} = \frac{-\frac{2}{b} + \frac{(a+b)}{b^2}}{\frac{1}{ab^2} - \frac{1}{a^2 b}}$$

$$= \frac{-2b + a + b}{b^2} \cdot \frac{a^2 b^2}{a - b} = \frac{a - b}{b^2} \times \frac{a^2 b^2}{a - b}$$

$$= a^2$$

$$\frac{x}{a} + \frac{y}{b} = a+b \Rightarrow \frac{x}{a} + \frac{y}{b} - (a+b) = 0 \quad a_1 = \frac{1}{a} \quad b_1 = \frac{1}{b} \quad c_1 = -(a+b)$$

$$\frac{x}{a^2} + \frac{y}{b^2} = 2 \Rightarrow \frac{x}{a^2} + \frac{y}{b^2} - 2 = 0 \quad a_2 = \frac{1}{a^2} \quad b_2 = \frac{1}{b^2} \quad c_2 = -2$$

$$y = \frac{c_1 a_2 - c_2 a_1}{a_1 b_2 - a_2 b_1} = \frac{\frac{-(a+b)}{a^2} - \frac{(-2)}{a}}{\frac{\frac{1}{a}}{b^2} - \frac{\frac{1}{b}}{a^2}}$$

$$= \frac{-\frac{(a+b)}{a^2} + \frac{2a}{a^2}}{\frac{a-b}{a^2 b^2}} = \frac{a-b}{a^2} \times \frac{a^2 b^2}{a-b} = b^2$$

$$(x, y) = (a^2, b^2)$$

3. ବହୁରୂପୀୟ ପ୍ରଣାଳୀରେ ନିମ୍ନଲିଖିତ ସହସମୀକରଣମାନଙ୍କ ସମାଧାନ କର ।

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(iii) $x + 6y + 1 = 0$, $2x + 3y + 8 = 0$

(iv) $\frac{x}{a} + \frac{y}{b} = a + b$, $\frac{x}{a^2} + \frac{y}{b^2} = 2$

(v) $x + 6y + 1 = 0$, $2x + 3y + 8 = 0$

(vi) $4x - 9y = 0$, $3x + 2y - 35 = 0$

(v) Same as question no (iii)

(vi) $4x - 9y = 0$ $a_1 = 4$ $b_1 = -9$ $c_1 = 0$
 $3x + 2y - 35 = 0$ $a_2 = 3$ $b_2 = 2$ $c_2 = -35$

$$x = \frac{b_1 c_2 - b_2 c_1}{a_1 b_2 - a_2 b_1} = \frac{(-9)(-35) - 2 \cdot 0}{4 \cdot 2 - 3(-9)} = \frac{315 - 0}{8 + 27} = \frac{315}{35} = 9$$

$$y = \frac{c_1 a_2 - c_2 a_1}{a_1 b_2 - a_2 b_1} = \frac{0 \cdot 3 - (-35) \cdot 4}{4 \cdot 2 - 3(-9)} = \frac{35 \times 4}{35} = 4$$

$(x, y) = (9, 4)$ (Ans)

4. ନିମ୍ନଲିଖିତ ସହସମୀକରଣମାନଙ୍କ ସମାଧାନ କର ।

$$(i) \quad \frac{2}{x} + \frac{3}{y} = 17, \quad \frac{1}{x} + \frac{1}{y} = 7$$

$$(x \neq 0, y \neq 0)$$

$$(i) \quad \frac{2}{x} + \frac{3}{y} = 17 \quad \text{--- (i)} \quad \frac{1}{x} + \frac{1}{y} = 7 \quad \text{--- (ii)}$$

$$2(ii) \quad \frac{2}{x} + \frac{2}{y} = 14$$

$$(i) - 2(ii) : \quad \frac{3}{y} - \frac{2}{y} = 17 - 14 \Rightarrow \frac{1}{y} = 3 \Rightarrow y = \frac{1}{3}$$

putting $y = \frac{1}{3}$ in eqⁿ (i)

$$\frac{1}{x} + 3 = 7 \Rightarrow \frac{1}{x} = 7 - 3 \Rightarrow \frac{1}{x} = 4 \Rightarrow x = \frac{1}{4}$$

$$(x, y) = \left(\frac{1}{4}, \frac{1}{3}\right) \quad (\text{Ans})$$

$$(ii) \quad \frac{5}{x} + 6y = 13, \quad \frac{3}{x} + 20y = 35$$

$$(x \neq 0)$$

$$\frac{5}{x} + 6y = 13 \quad \text{--- (i)}$$

$$\frac{3}{x} + 20y = 35 \quad \text{--- (ii)}$$

$$(i) \times 3 \quad \frac{15}{x} + 18y = 39$$

$$5(ii) \quad \frac{15}{x} + 100y = 175$$

$$5(ii) - 3(i) : \quad 100y - 18y = 175 - 39 \Rightarrow 82y = 136$$

$$\Rightarrow y = \frac{136}{82} = \frac{68}{41}$$

putting $y = \frac{68}{41}$ in eqⁿ (i)

$$\frac{5}{x} + 6 \times \frac{68}{41} = 13 \Rightarrow \frac{5}{x} = 13 - \frac{408}{41} = \frac{533 - 408}{41} = \frac{125}{41}$$

$$(x, y) = \left(\frac{125}{41}, \frac{68}{41}\right)$$

$$(iii) \quad 2x - \frac{3}{y} = 9, \quad 3x + \frac{7}{y} = 2$$

$$(y \neq 0)$$

$$(i) \quad 2x - \frac{3}{y} = 9 \quad 3(i) \quad 6x - \frac{9}{y} = 27$$

$$(ii) \quad 3x + \frac{7}{y} = 2 \quad 2(ii) \quad 6x + \frac{14}{y} = 4$$

$$3(i) - 2(ii) \quad \frac{-9-14}{y} = 23 \Rightarrow \frac{-23}{y} = 23$$

$$\Rightarrow \boxed{y = -1}$$

putting $y = -1$ in eq (i)

$$2x - \frac{3}{(-1)} = 9 \Rightarrow 2x + 3 = 9 \Rightarrow 2x = 6 \Rightarrow \boxed{x = 3}$$

$$(x, y) = (3, -1)$$

$$(iv) \quad 4x + 6y = 3xy, \quad 8x + 9y = 5xy$$

$$(x \neq 0, y \neq 0)$$

$$(i) \quad 4x + 6y = 3xy$$

$$(ii) \quad 8x + 9y = 5xy$$

$$2(i) \quad 8x + 12y = 6xy$$

$$(ii) \quad 8x + 9y = 5xy$$

$$2(i) - (ii) \quad 12y - 9y = xy \Rightarrow 3y = xy \Rightarrow \boxed{x = 3}$$

putting $x = 3$ in eq (i)

$$4(3) + 6y = 3(3)y \Rightarrow 12 + 6y = 9y \Rightarrow 3y = 12$$

$$\Rightarrow \boxed{y = 4}$$

$$\boxed{(x, y) = (3, 4)}$$

$$(v) \quad (a-b)x + (a+b)y = a^2 - 2ab - b^2$$

$$(a+b)x + (a+b)y = a^2 + b^2$$

$$(i) \quad (a-b)x + (a+b)y = a^2 - 2ab - b^2$$

$$(ii) \quad (a+b)x + (a+b)y = a^2 + b^2$$

$$(i) - (ii) \quad [(a-b) - (a+b)]x = a^2 - 2ab - b^2 - (a^2 + b^2)$$

$$\Rightarrow (a-b-a-b)x = a^2 - 2ab - b^2 - a^2 - b^2$$

$$\Rightarrow -2bx = -2b^2 - 2ab \Rightarrow -2bx = -2b(b+a)$$

$$\Rightarrow \boxed{x = a+b}$$

putting $x = a+b$ in eqⁿ (i)

$$(a-b)(a+b) + (a+b)y = a^2 - 2ab - b^2$$

$$\Rightarrow a^2 - b^2 + (a+b)y = a^2 - 2ab - b^2$$

$$\Rightarrow (a+b)y = -2ab \Rightarrow \boxed{y = \frac{-2ab}{a+b}}$$

$$(x, y) = \left[a+b, \frac{-2ab}{a+b} \right]$$

$$(vi) \quad \frac{x}{a} + \frac{y}{b} = 2, \quad ax - by = a^2 - b^2$$

$$(i) \quad \frac{x}{a} + \frac{y}{b} = 2$$

$$(ii) \quad ax - by = a^2 - b^2$$

$$a^2(i) \quad ax + \frac{a^2}{b}y = 2a^2$$

$$(ii) \quad ax - \frac{b}{b}y = a^2 - b^2$$

$$a^2(i) - (ii) \quad \frac{a^2}{b}y + by = 2a^2 - a^2 + b^2$$

$$\Rightarrow y \left(\frac{a^2}{b} + b \right) = a^2 + b^2$$

$$\Rightarrow y \left(\frac{a^2 + b^2}{b} \right) = a^2 + b^2 \Rightarrow \boxed{y = b}$$

putting $y = b$ in eqⁿ (i) $\frac{x}{a} + \frac{y}{b} = 2 \Rightarrow \frac{x}{a} + 1 = 2 \Rightarrow \frac{x}{a} = 1$

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

$$\boxed{(x, y) = (a, b)} \quad (\text{Ans})$$

$$(vii) \frac{5}{x+y} - \frac{2}{x-y} + 1 = 0 \quad \frac{15}{x+y} + \frac{7}{x-y} - 10 = 0$$

$$(i) \frac{5}{x+y} - \frac{2}{x-y} + 1 = 0$$

$$3(i) \frac{15}{x+y} - \frac{6}{x-y} + 3 = 0$$

$$(ii) \frac{15}{x+y} + \frac{7}{x-y} - 10 = 0$$

$$(ii) \frac{15}{x+y} + \frac{7}{x-y} - 10 = 0$$

$$3(ii) - (ii) \quad -\frac{6}{x-y} - \frac{7}{x-y} + 3 + 10 = 0$$

$$\Rightarrow \frac{6+7}{x-y} = 13 \Rightarrow \frac{13}{x-y} = 13 \Rightarrow \boxed{x-y=1}$$

putting $x-y=1$ in eqⁿ (i)

$$\frac{5}{x+y} - \frac{2}{1} + 1 = 0 \Rightarrow \frac{5}{x+y} - 2 + 1 = 0$$

$$\Rightarrow \frac{5}{x+y} - 1 = 0 \Rightarrow \frac{5}{x+y} = 1 \Rightarrow \boxed{x+y=5}$$

Solving for x, y in $x-y=1$ & $x+y=5$

$$2x = 6 \Rightarrow x = 3$$

$$3-y=1 \Rightarrow y=3-1=2$$

$$\boxed{x, y = 3, 2}$$

$$\text{(viii)} \quad \frac{xy}{x+y} = \frac{6}{5}, \quad \frac{xy}{y-x} = 6$$

$$(x+y \neq 0, x-y \neq 0)$$

$$\text{(i)} \quad \frac{xy}{x+y} = \frac{6}{5} \Rightarrow 5xy = 6x + 6y$$

$$\text{(ii)} \quad \frac{xy}{y-x} = 6 \Rightarrow xy = 6y - 6x$$

$$\text{(i)} + \text{(ii)} \Rightarrow 6x + 6y - 6y + 6x = 5xy + xy$$

$$\Rightarrow 12x = 6xy \Rightarrow 12 = 6y \Rightarrow \boxed{y=2}$$

put $y=2$ on eq (i)

$$5x(2) = 6x + 6(2) \Rightarrow 10x = 6x + 12 \Rightarrow 4x = 12$$

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

$$\boxed{(x, y) \quad (3, 2)} \quad (\text{Ans})$$

$$\text{(ix)} \quad 6x + 5y = 7x + 3y + 1 = 2(x + 6y - 1)$$

$$\text{Solving: } 6x + 5y = 7x + 3y + 1 \Rightarrow x - 2y + 1 = 0 \quad \text{--- (i)}$$

$$\text{Solving } 6x + 5y = 2x + 12y - 2 \Rightarrow 4x - 7y + 2 = 0 \quad \text{--- (ii)}$$

$$4 \text{ (i)} \quad 4x - 8y + 4 = 0$$

$$\text{(ii)} \quad 4x - 7y + 2 = 0$$

$$\xrightarrow{\quad} -y + 2 = 0 \Rightarrow \boxed{y=2}$$

putting $y=2$ in eqn (i)

$$x - 2 \times 2 + 1 = 0 \Rightarrow x - 4 + 1 = 0 \Rightarrow \boxed{x=3}$$

$$\boxed{(x, y) = (3, 2)}$$

$$(x) \quad \frac{x+y-8}{2} = \frac{x+2y-14}{3} = \frac{3x+y-12}{11}$$

$$\text{Solving } \frac{x+y-8}{2} = \frac{x+2y-14}{3} \Rightarrow \begin{array}{l} 3x+3y-24 = \\ 2x+4y-28 \end{array}$$

$$\Rightarrow x - y + 4 = 0 \quad \text{--- (i)}$$

$$\text{Solving } \frac{x+y-8}{2} = \frac{3x+y-12}{11} \Rightarrow \begin{array}{l} 11x+11y-88 \\ = 6x+2y-24 \end{array}$$

$$\Rightarrow 5x + 9y - 64 = 0 \quad \text{--- (ii)}$$

$$5 \text{ (i)} \quad 5x - 5y + 20 = 0$$

$$(ii) \quad 5x + 9y - 64 = 0$$

$$\begin{array}{r} \hline -14y + 84 = 0 \Rightarrow 14y = 84 \Rightarrow \boxed{y = 6} \end{array}$$

putting $y = 6$ in eqⁿ (i)

$$x - 6 + 4 = 0 \Rightarrow \boxed{x = 2}$$

$$(x, y) = (2, 6) \quad (\text{Ans})$$

$$(xi) \frac{x+y}{2} - \frac{x-y}{3} = 8, \quad \frac{x+y}{3} + \frac{x-y}{4} = 11$$

let's assume $x+y = u$ & $x-y = v$

$$(i) \frac{u}{2} - \frac{v}{3} = 8$$

$$(ii) \frac{u}{3} + \frac{v}{4} = 11$$

$$2(i) \quad u - \frac{2v}{3} = 16$$

$$3(ii) \quad u + \frac{3v}{4} = 33$$

$$2(i) - 3(ii) \quad -\frac{2v}{3} - \frac{3v}{4} = 16 - 33$$

$$\Rightarrow \frac{-8v - 9v}{12} = -17 \Rightarrow -17v = -12 \times 17$$

$$\Rightarrow v = 12$$

$$\text{putting } v=12 \text{ on eq. (i)} \quad \frac{u}{2} - \frac{12}{3} = 8$$

$$\Rightarrow \frac{u}{2} = 8 + 4 \Rightarrow \frac{u}{2} = 12 \Rightarrow u = 24$$

$$x+y = 24 \quad \& \quad x-y = 12$$

$$\text{solving for } x \text{ \& } y: \quad 2x = 36 \Rightarrow \boxed{x = 18}$$

$$18 + y = 24 \Rightarrow \boxed{y = 6} \quad (\text{Ans})$$

$$(xii) \frac{x}{a} = \frac{y}{b}, ax + by = a^2 + b^2$$

$$(i) \frac{x}{a} = \frac{y}{b} \Rightarrow bx - ay = 0$$

$$(ii) ax + by = a^2 + b^2$$

$$a(i) \quad abx - a^2y = 0$$

$$b(ii) \quad abx + b^2y = a^2b + b^3$$

$$a(i) - b(ii) \quad -a^2y - b^2y = -a^2b - b^3$$

$$\Rightarrow y(a^2 + b^2) = b(a^2 + b^2) \Rightarrow \boxed{y = b}$$

putting $y = b$ in eqⁿ (i)

$$\frac{x}{a} = \frac{b}{b} \Rightarrow \boxed{x = a}$$

$$\boxed{(x, y) (a, b)}$$

5. ନିମ୍ନଲିଖିତ ଦ୍ଵିପଦମିଶ୍ରଣର ମୂଲ୍ୟ ନିର୍ଣ୍ଣୟ କର :

$$(i) \begin{vmatrix} 2 & 5 \\ 6 & 0 \end{vmatrix} \quad (ii) \begin{vmatrix} 2 & -1 \\ 3 & 2 \end{vmatrix} \quad (iii) \begin{vmatrix} 0 & 4 \\ 5 & -1 \end{vmatrix} \quad (iv) \begin{vmatrix} \frac{1}{2} & 1 \\ 3/4 & 1/5 \end{vmatrix}$$

$$(i) \begin{vmatrix} 2 & 5 \\ 6 & 0 \end{vmatrix} = 2 \times 0 - 6 \times 5 = -30$$

$$(ii) \begin{vmatrix} 2 & -1 \\ 3 & 2 \end{vmatrix} = 2 \times 2 - (-1) \times 3 = 4 + 3 = 7$$

$$(iii) \begin{vmatrix} 1/2 & 1 \\ 3/4 & 1/5 \end{vmatrix} = \frac{1}{2} \times \frac{1}{5} - 1 \times \frac{3}{4} = \frac{1}{10} - \frac{3}{4} = \frac{2-15}{20} = -\frac{13}{20}$$

6. Cramer ના નિયમ વૃદ્ધિ કરી નીચે આપેલા સમીકરણોના અભિલેખન કરો :

(i) $2x + 3y = 5, 3x + y = 4$

(ii) $x + y = 3, 2x + 3y = 8$

(iii) $x - y = 0, 2x + y = 3$

(iv) $2x - y = 3, x - 3y = -1$

$$a_1x + b_1y = c_1$$

$$a_2x + b_2y = c_2$$

સુધારો

(i) $2x + 3y = 5$
 $3x + y = 4$

$$\Delta = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = \begin{vmatrix} 2 & 3 \\ 3 & 1 \end{vmatrix} \quad \Delta x = \begin{vmatrix} c_1 & b_1 \\ c_2 & b_2 \end{vmatrix} = \begin{vmatrix} 5 & 3 \\ 4 & 1 \end{vmatrix} \quad \Delta y = \begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix} = \begin{vmatrix} 2 & 5 \\ 3 & 4 \end{vmatrix}$$

$$\Delta = \begin{vmatrix} 2 & 3 \\ 3 & 1 \end{vmatrix} = 2 - 9 = -7$$

$$x = \frac{\Delta x}{\Delta} = \frac{-7}{-7} = 1$$

$$\Delta x = \begin{vmatrix} 5 & 3 \\ 4 & 1 \end{vmatrix} = 5 - 12 = -7$$

$$y = \frac{\Delta y}{\Delta} = \frac{-7}{-7} = 1$$

$$\Delta y = \begin{vmatrix} 2 & 5 \\ 3 & 4 \end{vmatrix} = 8 - 15 = -7$$

$$(x, y) = (1, 1)$$

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

$$\Delta = \begin{vmatrix} 1 & 1 \\ 2 & 3 \end{vmatrix} \quad \Delta x = \begin{vmatrix} 3 & 1 \\ 8 & 3 \end{vmatrix} \quad \Delta y = \begin{vmatrix} 1 & 3 \\ 2 & 8 \end{vmatrix}$$

$$= 3 - 2 = 1$$

$$= 9 - 8 = 1$$

$$= 8 - 6 = 2$$

$$x = \frac{\Delta x}{\Delta} = \frac{1}{1} = 1 \quad y = \frac{\Delta y}{\Delta} = \frac{2}{1} = 2$$

$$(x, y) = (1, 2)$$

(iii) $x - y = 0$
 $2x + y = 3$

$$\Delta = \begin{vmatrix} 1 & -1 \\ 2 & 1 \end{vmatrix} \quad \Delta x = \begin{vmatrix} 0 & -1 \\ 3 & 1 \end{vmatrix} \quad \Delta y = \begin{vmatrix} 1 & 0 \\ 2 & 3 \end{vmatrix}$$

$$= 1 - (-1) \cdot 2 = 1 + 2 = 3$$

$$= 0 - (-1) \cdot 3 = 0 + 3 = 3$$

$$= 3 - 0 = 3$$

$$x = \frac{\Delta x}{\Delta} = \frac{3}{3} = 1 \quad y = \frac{\Delta y}{\Delta} = \frac{3}{3} = 1$$

(iv) $2x - y = 3$
 $x - 3y = -1$

$$\Delta = \begin{vmatrix} 2 & -1 \\ 1 & -3 \end{vmatrix} \quad \Delta x = \begin{vmatrix} 3 & -1 \\ -1 & -3 \end{vmatrix} \quad \Delta y = \begin{vmatrix} 2 & 3 \\ 1 & -1 \end{vmatrix}$$

$$= 2(-3) - (-1) \cdot 1 = -6 + 1 = -5$$

$$= 3(-3) - (-1)(-1) = -9 - 1 = -10$$

$$= 2(-1) - 3(1) = -2 - 3 = -5$$

$$x = \frac{\Delta x}{\Delta} = \frac{-10}{-5} = 2 \quad y = \frac{\Delta y}{\Delta} = \frac{-5}{-5} = 1 \quad (x, y) = (2, 1) \quad (\text{Ans})$$