Now putting the value of y in eq

$$x = 5 - \frac{6}{5} = \frac{19}{5}$$

(ii) By elimination method

$$3x + 4y = 10 \quad \text{——— (1)}$$

$$2x - 2y = 2 \quad \text{——— (2)}$$

multiplying eq. 2 with (2)

$$4x - 4y = 4 \quad \text{——— (3)}$$

adding eq. (1) and 3

$$\begin{array}{rl} 3x + 4y & = 10 \\ 4x - 4y & = 4 \\ \hline 7x & = 14 \end{array}$$

$$\Rightarrow x = 2$$

Putting the value of x in 1

$$6 + 4y = 10$$

$$\Rightarrow 4y = 4 \Rightarrow y = 1$$

So. $x = 2 \quad y = 1$

By substitution method

from eq (2) we

$x = 1 + y$ ——— (4)

Substituting eq. (4) in (1)

$3(1+y) + 4y = 10$

$7y = 7 \Rightarrow y = 1$

putting vale of y in eq (4)

$x = 1 + 1 = 2$

So $x = 2$ and $y = 1$

(ii) $3x + 5y - 4 = 0$ ——— (1)

$9x - 2y - 7 = 0$ ——— (2)

(iii) $3x - 5y - 4 = 0$ ——— (1)

$9x = 2y + 7$

$9x - 2y - 7 = 0$ ——— (2)

multiplying eq (1) with 3

$9x - 15y - 12 = 0$ ——— (3)

$9x - 2y - 7 = 0$ ——— (2)

Subtracting + + −

$13y = 5$

$y = \frac{5}{13}$

substituting value of y in eq (1)

$3x + \frac{25}{13} - 4 = 0$

$\Rightarrow 3x = \frac{27}{13}$

$\Rightarrow x = \frac{9}{13}$

$\Rightarrow x = \frac{9}{13}$ and $y = -\frac{5}{13}$

(iii) $3x + 4y = -6$ ——— (1)

(iv) $\frac{x}{2} + \frac{2y}{3} = -1$

$\frac{3x + 4y}{6} = -1$

$3x + 4y = -6$ ——— (1)

$x - \frac{y}{3} = 3$

$3x - y = 9$ ——— (2)

$3x + 4y = -6$

$3x - y = 9$

Subtracting $- \quad + \quad -$

$5y = 15$

$y = \frac{15}{5}$

$y = 3$

Substituting the value in (1)

$3x - 12 = -6$

$\Rightarrow x = \frac{6}{3} = 2$

Q2

(i) Let the fraction be $\frac{x}{y}$

given

$$\frac{x+1}{y-1} = 1$$

$$x+1 = y-1$$

$$\Rightarrow x - y = -2 \quad \text{——— (1)}$$

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

$$2x = y+1$$

$$\Rightarrow 2x - y = 1 \quad \text{——— (2)}$$

Subtracted eq. (1) from (2)

$$\begin{array}{rrrl} 2x & -y & = 1 & \text{——— (2)} \\ x & -y & = -2 & \text{——— (1)} \\ - & + & + & \\ \hline x & & = 3 & \end{array}$$

putting the value of x in eq. 1

$$3 - y = -2$$

$$\Rightarrow -y = -5 \Rightarrow y = 5$$

So fraction is $\frac{3}{5}$

(1) Let present age of Nuri is x

present age of sony is y

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

$x - 3y = -10$ ——— (1)

$x + 10 = 2(y + 10)$

$x - 2y = 10$ ——— (2)

Subtracting eq. (1) from 2

$$\begin{array}{rrr} & x - 2y & = 10 \\ & x - 3y & = -10 \\ - & + & + \\ \hline & y & = 20 \end{array}$$

Substituting value of y in eq. (1)

$x - 3 \times 20 = -10$

$\Rightarrow x = 50$

So age of Nanci $= 50$

Sonu $= 20$

(iii) Let the unit digit is x

and tens digit is y

Number $= 10y + x$

after reversing order of digit $= 10x + y$

given $x + y = 9$ ——— (1)

$9(10y + x) = 2(10x + y)$

$88y - 11x = 0$

$-x + 8y = 0$ ——— (2)

adding eq. (1) and (2)

$$x + y = 9 \quad \text{——} (1)$$
$$-x + 8y = 0 \quad \text{——} (2)$$
$$+ \quad + \quad +$$
$$9y = 9$$
$$\Rightarrow y = 1$$

Substituting y in eq (1)

we get $x = 8$

So number is $10y + x = 10 \times 1 + 8 = 8$

(21) Total money withdrawn = ₹ 2000

No of ₹50 notes be x

No. of ₹100 notes be y

Total no. of notes = 25

$$x + y = 25 \quad \text{——} (1)$$

$$50x + 100y = 2000$$
$$\Rightarrow 50(x + 2y) = 2000$$
$$\Rightarrow (x + 2y) = \frac{2000}{50} = 40$$
$$\Rightarrow x + 2y = 40 \quad \text{——} (2)$$

Subtracting eq. (2) from 1

$$\begin{array}{r} x + y = 25 \\ x + 2y = 40 \\ \hline -y = -15 \end{array}$$

$$\Rightarrow y = 15$$

putting the value of y in eq. 1

$$x + 15 = 25$$

$$x = 10$$

(v) Charges for three days = x

additional Charges = y

Book kept by Sarita = 7 days ₹27

Book kept by Suny = 5 days ₹21

$$3x + 4y = 27 \quad \text{---------- (1)}$$

$$3x + 2y = 21 \quad \text{---------- (2)}$$

eq1 $3x + 4y = 27$

eq2 $3x + 2y = 21$

$$2y = 6$$

$$y = 3$$

$3x + 2y = 21$

$3x + 6 = 21$

$3x = 15$

$x = \frac{15}{3}$

$x = 5$

Exercise 3.5

1. $x - 3y = 3 = 0$

(a) $3x - 9y - 2 = 0$

$\frac{a_1}{a_2} = \frac{1}{3}$ $\quad \frac{b_1}{b_2} = \frac{-3}{+9} = \frac{1}{3}$

$\frac{c_1}{c_2} = \frac{-3}{-2} = \frac{3}{2}$

$\left(\frac{a_1}{a_2}\right) = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

(No solution)

(b) $2x + y = 5$

$3x + 2y = 8$

$\frac{a_1}{a_2} = \frac{2}{3}$ $\quad \frac{b_1}{b_2} = \frac{1}{2}$

$\frac{c_1}{c_2} = \frac{+5}{+8}$

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$)

Enique solution)

(iii) $3x - 5y - 20 = 0$ $\quad A_1 = 3 \quad B_1 = -5 \quad C_1 = -20$

$6x - 10y - 40 = 0$ $\quad A_2 = 6 \quad B_2 = -10 \quad C_1 = -40$

$$\frac{1}{2} \frac{3}{6} = \frac{5}{10} \frac{1}{2} = \frac{20}{40} \frac{1}{2}$$

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

infinitely many solution

(iv) $x - 3y - 7 = 0$

$A_1 = 1 \quad B_1 = -3 \quad C_1 = -7$

$3x - 3y - 15 = 0$

$A_2 = 3 \quad B_2 = -3 \quad C_2 = -15$

$$\frac{1}{3} \neq \frac{-3}{-3} = \frac{-7}{-15}$$

unique solution

$$x = \frac{b_1 c_2 - c_1 b_2}{a_1 b_2 - a_2 b_1}$$

$$= \frac{-3(-15) - (-7)(-3)}{1(-3) - (3)(-3)}$$

$$= \frac{+45 - 21}{-3 + 9} = \frac{17}{3}$$

$$y = \frac{c_1 a_2 - c_2 a_1}{a_1 b_1 - a_2 b_1}$$

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

$$= \frac{-21 + 7}{-3 + 9}$$

$$= \frac{-14}{3}$$

3.

$$8x + 5y = 9$$
$$8x + 5y - 9 = 0$$
$$3x + 2y = 4$$
$$3x + 2y - 4 = 0$$

$A_1 = 8 \quad B_1 = 5 \quad C_1 = -9$

$A_2 = 3 \quad B_2 = 2 \quad C_2 = -4$

cross multiplication

$$x = \frac{b_1 c_2 - c_1 b_2}{a_1 b_2 - b_1 a_2}$$

$$= \frac{5(-4) - (-9)(2)}{8(2) - (5)(3)}$$

$$= \frac{-20 + 18}{16 - 15}$$

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

$$y = \frac{c_1 a_2 - a_1 c_2}{a_1 b_2 - b_1 a_2}$$

$$= \frac{(-9)(3) - (8)(-4)}{(8)(2) - (5)(3)}$$

$$= \frac{-27 + 32}{16 - 15}$$

$$= \frac{5}{1} = 5$$

Substitution

$$8x + 5y = 9$$
$$3x + 3y = 4$$
$$8x = 9 - 5y$$
$$x = \frac{9 - 5y}{8}$$

Substituting value of x in 2nd equation

$$= \frac{3(9-5y)}{8} + 2y = 4$$

$$= \frac{27 - 15y}{8} + 2y = 4$$

$$= \frac{27 - 15y + 16y}{8} = 4$$

$$\Rightarrow 27 + y = 8 \times 4$$

$$\Rightarrow y = 32 - 27$$

$$\Rightarrow y = 5$$

value of x

$$3x + 2(5) = 4$$
$$3x = 4 - 10$$
$$x = -\frac{6}{3} = -2$$

4

(i) Let x be the fixed charge and y be the charge of food.

A.T.Q

$x + 20y = 1000$ ——— (i)

$x + 26 = 1180$ ——— (ii)

Subtracting (i) from (ii) we get

$6y = 180$

$y = Rs.30$

Using this value in eq (ii)

$x = 1180 - 26 \times 30$

$x = Rs\ 400$

Therefore fixed charge is Rs 400 and charge per day is 230.

(ii) Let the fraction be $\frac{x}{y}$.

So, as per the question given,

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

$\Rightarrow 3x - y = 3$ ——— (1)

$\frac{x}{(y+8)} = \frac{1}{4}$

$\Rightarrow 4x - y = 8$ ——— (2)

Subtracting equation (1) and (2), we get

$x = 5$ ——— (3)

Using this value in equation (2), we get

$(4 \times 5) - y = 8$

$y = 12$

Therefore, the fraction $\frac{5}{12}$.

(ii) Let the number of right answers is x and number of wrong

According to the given questions

$3x - y = 40$ ——— (1)

$4x - 2y = 50$

$\Rightarrow 2x - y = 25$ ——— (2)

Subtract eq(2) from eq(1)

$x = 15$ ——— (3)

$30 - y = 25$

or $y = 5$

Therefore number of right answers = 15 and number of wrong numbers = 5

(2M) If car travels in same direction

$5x - 5y = 100$

$x - y = 20$ ——— (i)

If the car travels in the opposite direction

$xy = 100$ ——— (ii)

Solving equation (i) and (ii)

$x = 60$ km/h ——— (iii)

using eq (i)

$60 - y = 20$

$y = 40$ km/h

Speed of car from point A = 60 km/h

Speed of car from point B = 40 km/h

(4M) Let,

The length of parallelogram = x unit

A.T.Q

$(x-5)(y+3) = xy - 9$

$3x - 5y - 6 = 0$ ——— (i)

$(x+3)(y+2) = xy + 67$

$2x + 3y - 61 = 0$ ——— (ii)

using cross multiplication method we get

$$\frac{x}{(305+18)} = \frac{y}{(-12+183)} = \frac{1}{(9+10)}$$

Therefore, $x = 17$ and $y = 9$.

Hence, the length of rectangle = 17 units

and breadth of the rectangle = 9 units.

Exercise 3.6

1. Let $\frac{1}{x} = m$ and $\frac{1}{y} = n$

$$\frac{m}{2} + \frac{n}{3} = 2$$

$$\Rightarrow 3m + 2n - 12 = 0 \quad \text{---(1)}$$

$$\frac{m}{3} + \frac{n}{2} = \frac{13}{6}$$

$$\Rightarrow 2m + 3n - 13 = 0 \quad \text{---(2)}$$

Cross multiplication

$$\frac{m}{(-26 - (-36))} =$$

$$= \frac{n}{(-24 - (-39))}$$

$$= \frac{1}{(9 - 4)}$$

$$= \frac{m}{10} = \frac{n}{15} = \frac{1}{5}$$

$\frac{m}{10} = \frac{1}{5}$ and $\frac{n}{15} = \frac{1}{5}$

So $m = 2$ and $n = 3$

$\frac{1}{x} = 2$ and $\frac{1}{y} = 3$

$x = \frac{1}{2}$ and $y = \frac{1}{3}$

(2) Substituting $\frac{1}{rx}$ and $\frac{1}{ry} = x$ in the equation

$2m + 3n = 2$ ——— (i)

$4m - 9n = -1$ ——— (ii)

Multiplying equation (i) by 3, we get

$6m + 9n = 6$ ——— (iii)

Adding eq (ii) and (iii) we get

$10m = 5$

$m = \frac{1}{2}$ ——— (iv)

Putting the value of m in eq (i)

$\frac{2 \times 1}{2} + 3n = 2$

$3n = 1$

$n = \frac{1}{3}$

$m = \frac{1}{\sqrt{n}}$

$\frac{1}{2} = \frac{1}{\sqrt{n}}$

$n = 4$

$n = \frac{1}{\sqrt{y}}$

$\frac{1}{3} = \frac{1}{\sqrt{y}}$

$y = 9$

Hence $n = 4$ and $y = 9$

(iii) Putting the eq

$4m + 3y = 14 \Rightarrow 4m + 3y - 14 = 0$ ——— (i)

$3m + 4y = 23 \Rightarrow 3m - 4y - 23 = 0$ ——— (ii)

By cross multiplication

$$\frac{m}{(-69 - 56)} = \frac{y}{(-42 - (-92))} = \frac{1}{(-16 - 9)}$$

$$-\frac{m}{125}$$

$$= \frac{y}{50}$$

$$= \frac{1}{25}$$

$\frac{-m}{125} = \frac{-1}{25}$ and $\frac{y}{50}$

$= \frac{-1}{25}$

$m = 5$ and $b = -2$

$m = \frac{1}{n} = 5$

So $n = \frac{1}{5}$

$y = -2$

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

$\frac{6}{(x-1)} = \frac{3}{(y-2)} = 1$

Substituting $\frac{1}{x-1} = m$ and $\frac{1}{(y-2)} = n$

$5m + n = 2$ ——— (i)

$6m - 3n = 1$ ——— (ii)

Multiplying equation (i) by 3, we get

$15m + 3n = 6$ ——— (iii)

Adding (ii) and (iii)

$21m = 7$

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

Putting the value in eq (1)

$$\frac{5 \times 1}{3} + n = 2$$

$$n = \frac{2-5}{3} = \frac{1}{3}$$

$$n = \frac{1}{(n-1)}$$

$$\Rightarrow \frac{1}{3} = \frac{1}{(n-1)}$$

$$\Rightarrow n = 4$$

$$n = \frac{1}{(y-2)}$$

$$\Rightarrow \frac{1}{3} = \frac{1}{(y-2)}$$

$$\Rightarrow y = 5$$

So $n = 4$ and $y = 5$

(iv) $$\frac{(7n - 2y)}{ny} = 5$$

$$\frac{\frac{7}{y-2}}{x} = 15 \quad \text{---------- (i)}$$

$$\frac{8}{y} + \frac{7}{n} = 15 \quad \text{---------- (ii)}$$

Substitution $\frac{1}{x} = m$ in the eq

$-2m + 7n = 5 \Rightarrow -2 + 7n - 5 = 0$ (iii)

$7m + 8n = 15$ $7m + 8n - 15 = 0$ (iv)

By cross multiplication method, we get,

$$\frac{m}{(-105-(-40))} = \frac{n}{(-35-30)} = \frac{1}{(-16-49)}$$

$$\frac{m}{(-65)} = \frac{n}{(-65)} = \frac{1}{(-65)}$$

$$\frac{m}{-65} = \frac{1}{-65}$$

$$m = 1$$

$$\frac{n}{(-65)} = \frac{1}{(-65)}$$

$$n = 1$$

$m = 1$ and $n = 1$

$m = \frac{1}{x} = 1$ $\quad n = \frac{1}{y} = 1$

Therefore $x = 1$ and $y = 1$

(iv) $6x + 3y = 6xy$

$$\frac{6}{y} + \frac{3}{x} = 6$$

Let $\frac{1}{x} = m$ and $\frac{1}{y} = n$

$\Rightarrow 6n + 3m = 6$

$\Rightarrow 3m + 6n - 6 = 0$ ——— (i)

$2x + 4y = 5xy$

$$\frac{2}{y} + \frac{4}{x} = 5$$

$2n + 4m = 5$

$4m + 2n - 5 = 0$ ——— (ii)

$3m + 6n - 6 = 0$

$4m + 2n - 5 = 0$

By cross multiplication

$$\frac{m}{(-30 - (-12))} = \frac{n}{(-24 - (-13))} = \frac{1}{(6 - 24)}$$

$$\frac{m}{-18} = \frac{n}{-9} = \frac{1}{(-18)}$$

$\frac{m}{-18} = \frac{1}{-18}$

$m = 1$

$\frac{n}{-9} = \frac{1}{-18}$

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

$m = 1$ and $n = \frac{1}{2}$

$m = \frac{1}{x} = 1$ and $n = \frac{1}{y} = \frac{1}{2}$

$x = 1$ and $y = 2$

$x = 1$ and $y = 2$

(vii) Substituting $\frac{1}{x+y} = m$

$\frac{1}{x-y} = n$

$10m + 2n = 4 \rightarrow 10m + 2n - 4 = 0$ ... (i)

$15m - 5n = -2 \rightarrow 15m - 5n + 2 = 0$ ... (ii)

$\frac{m}{(4-20)} = \frac{n}{(60-(-30))} = \frac{1}{(-50-30)}$

$\frac{m}{-16} = \frac{n}{-80} = \frac{1}{-80}$

$\frac{m}{-16} = \frac{1}{-80}$ and $\frac{n}{-80} = \frac{1}{-80}$

$m = \frac{1}{5}$ and $n = 1$

$m = \frac{1}{n+y} = \frac{1}{5}$

$n + y = 5$ ——— (i)

$n = \frac{1}{n-y} = 1$

$n - y = 1$ ——— (ii)

Adding eq (i) and (ii)

$2n = 6 \Rightarrow n = 3$ (v)

Putting value of $n = 3$ in eq (3)

$y = 2$

$n = 3$ and $y = 2$

2.

(a) Let us take

Speed of Ritu in still water = n km/h

Speed of stream = y km/h

Speed her dirty
Downstream : x+y km/h
Upstream : x-y km/h

A T. Q
$2(x+y) = 20$
$x+y = 10$ ——— (i)

and $2(x-y) = 4$

$x-y = 2$ ——— (ii)

Adding both the eq i and ii we get.

$2x = 12$

$x = 6$

Putting the value of x in eq i
$y = 4$

So
Speed of Ritu in still water = 6 km/hr
Speed of stream = 4 km/hr

No of days taken by women to finish work = x

No of days taken by men to finish the work = y
Work done by women in one day = $\frac{1}{x}$
Work done by women in x days = $\frac{1}{6}$

$4\left(\frac{2}{x}+\frac{5}{y}\right)=1$

$\left(\frac{8}{x}+\frac{5}{y}\right)=\frac{1}{4}$

and $3\left(\frac{3m}{x}+\frac{6}{y}\right)=1$

$\left(\frac{3}{x}+\frac{6}{y}\right)=\frac{1}{3}$

Put $\frac{1}{x}=m$ and $\frac{1}{y}=n$

$2m+5n=\frac{1}{4} \Rightarrow 8m+20n=1$ ——— (1)

$3m+6n=\frac{1}{3} \Rightarrow 9m+18n=1$ ——— (2)

Now, by cross multiplication method

$$\frac{m}{(20-18)}=\frac{n}{(9-8)}=\frac{1}{(180-144)}$$

$$\frac{m}{2}=\frac{n}{1}=\frac{1}{36}$$

$$\frac{m}{2}=\frac{1}{36}$$

$$m=\frac{1}{18}$$

$$m=\frac{1}{x}=\frac{1}{18}$$

$\therefore x=18$

$$n=\frac{1}{y}=\frac{1}{36}$$