Simultaneous Linear Equations

SIMULTANEOUS LINEAR EQUATIONS

Exercise 5.1

Soution – 18-

(i) $x+y=14$

$x-y=4$

$\therefore \quad x+y=14$

$x-y=4$

$\therefore x=y+4$

$x+y=14$

$[y+4]+y=14$

$2y+4=14$

$2y=14-4$

$2y=10$

$y=\frac{10}{2}5$

$x+y=14$

$x+5=14$

$x=14-5$

$x=9$

$\therefore x=9, y=5$

(ii) $s - t = 3$ — ①

$\frac{s}{3} + \frac{t}{2} = 6$ — ②

$2s + 3t = 6$

$t = \frac{6 - 2s}{3}$

① $\Rightarrow s - t = 3$

$s - \left(\frac{6 - 2s}{3}\right) = 3$

$3s - 6 - 2s = 3$

$s - 6 = 3$

$s = 6 + 3$

$= 9$

$s - t = 3$

$9 - t = 3$

$-t = 3 - 9$

$+t = +6$

$t = 6$

$\therefore s = 9, t = 6.$

9 Solution - 1

(iii) $2x+3y=9$ — (1)

$3x+4y=5$ — (2)

$4y = 5-3x$

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

(1) $\Rightarrow 2x+3y=9$

$2x+3\left(\frac{5-3x}{4}\right)=9$

$8x+15-9x=36$

$-x = 36-15$

$-x = 21$

$x = -21$

$\therefore 2x+3y=9$

$2(-21)+3y=9$

$-42+3y=9$

$3y = 9+42$

$3y = 51$

$y = \frac{51}{3} = 17$

$\therefore x=-21, y=17$

iv) $3x - 5y = 4$ —①

$9x - 2y = 7$ —②

② $9x - 2y = 7$

$9x = 7 + 2y$

$x = \frac{7+2y}{9}$

$3x - 5y = 4$

$3\left(\frac{7+2y}{9}\right) - 5y = 4$

$21 + 6y - 45y = 36$

$-39y = 36 - 21$

$-39y = 15$

$-y = \frac{15}{39}$

$-y = 5/13$

$y = -5/13$.

$3x - 5\left(\frac{-5}{13}\right) = 4$

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

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

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

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

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

Solution - 28-

(i) $a+3b=5$ — (1)

$7a-8b=6$ — (2)

From (1), $a = \frac{6+8b}{7}$

$a + 3b = 5$

$\frac{6+8b}{7} + 3b = 5$

$6+8b+21b = 35$

$6+29b = 35$

$29b = 35-6$

$29b = 29$

$b = \frac{29}{29}$

$b = 1$

$a+3b = 5$

$a + 3(1) = 5$

$a = 5-3$

$a = 2.$

$\therefore a = 2, \ b = 1$

(ii) $5x+4y-4=0$

$x-20=12y$.

$\therefore x-20=12y$

$y=\frac{x-20}{12}$

$5x+4y-4=0$

$5x+4\left(\frac{x-20}{12}\right)-4=0$

$60x+4x-80-48=0$

$64x-128=0$

$64x=128$

$x=128/4$

$x=2$

$5x+4y-4=0$

$5(2)+4y-4=0$

$10+4y-4=0$

$6+4y=0$

$4y=6$

$y=6/4=3/2$

$\therefore x=2,\ y=3/2$

Solution – 3

(i) $2x - \frac{3y}{4} = 3$ — ①

$5x - 2y - 7 = 0$ — ②.

$8x = 12 + 3y$

$x = \frac{12+3y}{8}$

$5\left(\frac{12+3y}{8}\right) - 2y - 7 = 0$

$60 + 15y - 16y - 56 = 0$

$-y = 56 - 60$

$+y = +4$

$y = 4$

$5x - 2y - 7 = 0$

$5x - 2(4) - 7 = 0$

$5x - 8 - 7 = 0.$

$5x - 15 = 0$

$5x = 15$

$x = 15/5$

$x = 3$

∴ $x = 3, y = 4$

(ii) $2x + 3y = 23$

$5x - 20 = 8y$.

$y = \frac{5x-20}{8}$

$2x + 3\left(\frac{5x-20}{8}\right) = 23$

$16x + 15x - 60 = 184$

$31x = 184 + 60$

$31x = 244$

$x = \frac{244}{31} = 7\frac{27}{31}$

$2x + 3y = 23$

$2\left(\frac{244}{31}\right) + 3y = 23$

$\frac{488}{31} + 3y = 23$

$3y = 23 - \frac{488}{31}$

$3y = \frac{225}{31}$

$y = \frac{225}{31} \div 3$

$y = \frac{75}{31}$

$y = 2\frac{13}{31}$.

$\therefore x = 7\frac{27}{31} \quad y = 2\frac{13}{31}$.

Solution – 4

(i) $mx - ny = m^2 + n^2$ — (i)

$x + y = 2m$ — (ii)

Substitute (ii) in (i)

$\therefore \quad x = 2m - y$

$\Rightarrow \quad m(2m-y) - ny = m^2 + n^2$

$2m^2 - my - ny = m^2 + n^2$

$2m^2 - y(m+n) = m^2 + n^2$

$2m^2 - m^2 - n^2 = y(m+n)$

$m^2 - n^2 = y(m+n)$

$(m+n)(m-n) = y(m+n)$

$\therefore \quad y = m - n$ //.

$\therefore \quad x = 2m - y$

$= 2m - m + n$

$x = m + n$

$\therefore \quad x = m + n$

$y = m - n.$

(ii) $\frac{b}{a}x + \frac{a}{b}y = a^2+b^2$ (19)

$x + y = 2ab$

$\Rightarrow \quad x = 2ab - y$

$\therefore \quad \frac{b}{a}(2ab - y) + \frac{a}{b}y = a^2+b^2$

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

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

$2b^2 - a^2 - b^2 = y\left(\frac{b^2-a^2}{ab}\right)$

$b^2 - a^2 = y\left(\frac{b^2-a^2}{ab}\right)$

$\frac{y}{ab} = 1$

$y = ab$

$\therefore \quad x = 2ab - y$

$x = 2ab - ab$

$= ab$

(5) $2x+y=35$

$3x+4y=65$

$3x+4y=65$

$4y=65-3x$

$y=\frac{65-3x}{4}$

$2x+y=35$

$2x+\frac{65-3x}{4}=35$

$8x+65-3x=140$

$8x-3x=140-65$

$5x=75$

$x=15$

$2x+y=35$

$2(15)+y=35$

$30+y=35$

$y=35-30$

$=5$

$\therefore x=15,\ y=5$

$\therefore x/y=\frac{15}{5}=3$

(6) $3x - y = 5$

$4x - 3y = -1$

$3x = 5y + y$

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

$4\left(\frac{5+y}{3}\right) - 3y = -1$

$20 + 4y - 9y = -3$

$-5y = -3 - 20$

$-5y = -23$

$y = \frac{23}{5}$

$3x - y = 5$

$3x - \frac{23}{5} = 5$

$15x - 23 = 25$

$15x = 25 + 23$

$15x = 48$

$x = \frac{48}{15} = 16/5$

$y = px - 3$

$\frac{23}{5} = p\left(\frac{16}{5}\right) - 3$

$\frac{23}{5} = \frac{16p}{5} - 15$

$\frac{23}{5} - 15 = \frac{16p}{5}$

$p = \frac{19}{8}$

Exercise 5.2

Solution - ii-

① $3x+4y=10$ -①

$2x-2y=2$ -②

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

① $\Rightarrow 3\left(\frac{2+2y}{2}\right)+4y=10$

$\frac{6+6y}{2}+4y=10$

$6+6y+8y=20$

$6+14y=20$

$14y=20-6$

$14y=14$

$y=\underline{1}$

① $\Rightarrow 3x+4y=10$

$3x=10-4$

$3x=6$

$x=\frac{6^{2}}{3_{1}}$

$x=2$

$\therefore x=2,\ y=\underline{1}$

Sol (2)

(ii)

$2x = 5y + 4$

$3x - 2y + 16 = 0$

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

$3\left(\frac{5y+4}{2}\right) - 2y + 16 = 0$

$\frac{15y+12}{2} - 2y + 16 = 0$

$15y + 12 - 4y + 32 = 0$

$11y + 44 = 0$

$11y = -44$

$y = \frac{-44}{11} = -4$

$y = -4$

$2x = 5(-4) + 4$

$2x = -20 + 4$

$2x = -16$

$x = \frac{-16}{2}$

$x = -8$

$\therefore x = -8, \; y = -4$

Solution - 2

(i) $\frac{3}{4}x - \frac{2}{3}y = 1$

$\frac{3}{8}x - \frac{1}{6}y = 1$

$\Rightarrow \quad \frac{3}{8}x = 1 + \frac{1}{6}y$

$x = \left(1 + \frac{1}{6}y\right)\frac{8}{3}$

$\therefore \quad \frac{x}{4}\left(1 + \frac{1}{6}y\right)\frac{8}{3} - \frac{2}{3}y = 1$

$2 + \frac{2}{6}y - \frac{2}{3}y = 1$

$2 - 1 = \frac{2}{3}y - \frac{1}{3}y$

$1 = \frac{2-1}{3} \cdot y$

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

$\therefore y = 3$

$\therefore \quad \frac{3}{4}x - \frac{2}{x}(x) = 1$

$\frac{3}{4}x = 1 + 2$

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

$x = \frac{3 \times 4}{3}$

$x = 4$

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

$\frac{2}{3}x + 4y + \frac{1}{2} = 0$

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

$2x = 3y + 3$

$x = \frac{3y + 3}{2}$

$\therefore \quad \frac{2}{3}\left(\frac{3y+3}{2}\right) + 4y + \frac{1}{2} = 0$

$\frac{\cancel{2}}{\cancel{3}} \cdot \frac{\cancel{3}(y+1)}{\cancel{2}} + 4y + \frac{1}{2} = 0$

$y + 1 + 4y + \frac{1}{2} = 0$

$5y + \frac{3}{2} = 0$

$5y = -\frac{3}{2}$

$y = -\frac{3}{10}$

$\therefore \quad 2x - 3y - 3 = 0$

$2x - 3 \cdot \left(\frac{-3}{10}\right) - 3 = 0$

$2x + \frac{9}{10} - 3 = 0$

$2x = 3 - \frac{9}{10}$

$2x = \frac{30 - 9}{10}$

$x = \frac{21}{20}$ //

Solution- 3

(i) $15x - 14y = 117$

$14x - 15y = 115$

$\Rightarrow 14x = 115 + 15y$

$x = \frac{115 + 15y}{14}$

$\therefore 15\left(\frac{115+15y}{14}\right) - 14y = 117$

$1725 + 225y - 196y = 117 \times 14$

$1725 + 225y - 196y = 1638$

$29y = +1638 - 1725$

$29y = -87$

$y = \frac{-87}{29}$

$y = -3$

$\therefore 15x - 14(-3) = 117$

$15x + 42 = 117$

$15x = 117 - 42$

$15x = 75$

$x = \frac{75}{15}$

$x = 5$

(ii) $41x + 53y = 135$

$53x + 41y = 147$

$53x = 147 - 41y$

$x = \frac{147 - 41y}{53}$

$41x + 53y = 135$

$41\left(\frac{147-41y}{53}\right) + 53y = 135$

$6027 - 1681y + 2809y = 135 \times 53$

$6027 - 1681y + 2809y = 7155$

$1128y = 1128$

$y = \frac{1128}{1128}$

$y = 1$

$\therefore \quad 41x + 53y = 135$

$41x + 53(1) = 135$

$41x = 135 - 53$

$41x = 82$

$x = \frac{82}{41}$

$x = 2,$

Solution-4

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

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

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

$\therefore \quad \frac{x}{6} = \frac{3x}{4} - 1 - 6$

$\frac{x}{6} = \frac{3x}{4} - 7$

$\frac{x}{6_3} = \frac{3x - 28}{4_2}$

$\frac{x}{3} = \frac{3x - 28}{2}$

$2x = 9x - 84$

$9x - 2x = 84$

$7x = 84$

$x = \frac{84}{7}$

$x = 12$

$\therefore \quad \frac{x}{6} = y - 6$

$\frac{12}{6} = y - 6$

$y = 2 + 6$

$y = 8$

(ii) $x - \frac{2}{3}y = \frac{8}{3}$

$\frac{2x}{5} - y = \frac{7}{5}$

$y = \frac{2x}{5} - \frac{7}{5}$

$y = \frac{2x - 7}{5}$

$\therefore \quad x - \frac{2}{3}\left(\frac{2x-7}{5}\right) = \frac{8}{3}$

$x - \frac{4x - 14}{15} = \frac{8}{3}$

$\frac{15x - 4x + 14}{15_5} = \frac{8}{3}$

$15x - 4x + 14 = 8 \times 5$

$11x + 14 = 40$

$11x = 40 - 14$

$11x = 26$

$x = \frac{26}{11}.$

$\therefore \quad \frac{26}{11} - \frac{2}{3}y = \frac{8}{3}$

$\frac{2}{3}y = \frac{26}{11} - \frac{8}{3}$

$\frac{2}{3}y = \frac{78 - 88}{33}$

$y = \frac{\overset{5}{\cancel{10}}}{33_{11}} \times \frac{3}{2} = \frac{5}{11}$

Solution - 5

(i) $9-(x-4) = y+7$

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

$\Rightarrow 9-x+4 = y+7$

$13-x = y+7$

$y = 13-x-7$

$y = 6-x$

$\therefore 2(x+6-x) = 4-3(6-x)$

$2x+12-2x = 4-18+3x$

$12 = -14+3x$

$3x = 12+14$

$3x = 26$

$x = \frac{26}{3}$

$y = 6-x$

$y = 6-\frac{26}{3}$

$y = \frac{18-26}{3}$

$y = -8/3$

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

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

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

$x - y = 3.$

$x = 3 + y.$

$\therefore 2(3+y) + \frac{3+y-y}{6} = 2$

$6 + 2y + \frac{3}{6_2} = 2$

$6 + 2y + \frac{1}{2} = 2$

$2y = 2 - \frac{1}{2} - 6$

$2y = \frac{4 - 1 - 12}{2}$

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

$y = -\frac{9}{4}$

$x = 3 + y$

$x = 3 - \frac{9}{4}$

$x = \frac{12-9}{4}$

$x = \frac{3}{4}$ //.

Sdution- 6 :

(i) $4x + \frac{x-y}{8} = 17$

$\Rightarrow \frac{32x + x - y}{8} = 17$

$33x - y = 136 \quad \text{---} (i)$

and $2y + x - \frac{5y+2}{3} = 2$

$\frac{6y + 3x - 5y - 2}{3} = 2$

$y + 3x - 2 = 6$

$y + 3x = 6 + 2$

$y + 3x = 8$

$y = 8 - 3x \quad \text{---} (ii)$

Equ(ii) in equ (i)

$\therefore 33x - 8 + 3x = 136$

$36x = 136 + 8$

$36x = 144$

$x = \frac{144}{36}$

$x = 4.$

$y = 8 - 3.(4)$

$= 8 - 12$

$= -4,$

(ii) Given $x-3y = 3x-1 = 2x-y$

$\therefore \quad x-3y = 3x-1$

$3x-x = 1-3y$

$2x = 1-3y$

$2x+3y = 1 \quad \text{— (i)}$

$\therefore \quad 3x-1 = 2x-y$

$3x-2x = 1+y$

$x = 1+y \quad \rightarrow \text{(ii)}$

Eqn (ii) in eqn (i)

$\therefore \quad 2(1+y)+3y = 1$

$2+2y+3y = 1$

$5y = 1-2$

$5y = -1$

$y = -1/5$

$\therefore \quad x = y+1$

$x = \frac{-1}{5}+1$

$x = \frac{-1+5}{5}$

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

Solution - 7

Given $\frac{3}{x} + 4y = 7$

$\frac{5}{x} + 6y = 13$

$\Rightarrow \quad \frac{5}{x} = 13 - 6y$

(or) $\quad 6y = 13 - \frac{5}{x}$

$6y = \frac{13x - 5}{x}$

$y = \frac{13x - 5}{6x}$

$\therefore \quad \frac{3}{x} + 4y = 7$

$\frac{3}{x} + 4\left(\frac{13x - 5}{6x}\right) = 7$

$\frac{3}{x} + \frac{52x - 20}{6x} = 7$

$\frac{18 + 52x - 20}{6x} = 7$

$52x - 2 = 42x$

$52x - 42x = 2$

$10x = 2$

$x = 2/10$

$x = 1/5$

$\Rightarrow \quad y = \frac{13(1/5) - 5}{6(1/5)}$

$$y = \frac{\frac{13}{5} - 5}{\frac{6}{5}}$$

$$y = \frac{\frac{13-25}{5}}{\frac{6}{5}}$$

$$y = \frac{-12}{6}$$

$$y = -2$$

(ii) $5x - 9 = \frac{1}{y}$

$$x + \frac{1}{y} = 3.$$

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

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

या $5\left(\frac{3y-1}{y}\right) - 9 = \frac{1}{y}$

$$\frac{15y-5}{y} - 9 = \frac{1}{y}$$

$$\frac{15y-5-9y}{y} = \frac{1}{y}$$

$$6y - 5 = 1$$

$$6y = 1+5$$

$$6y = 6$$

$$y = \frac{6}{6}$$

$$y = 1.$$

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

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

$$x = 2$$

Solution – 8

(i) $px + qy = p - q$

$$qx - py = p + q$$

$$qx = p + q + py$$

$$x = \frac{q + p(1+y)}{q}$$

$$\therefore \quad p\left(\frac{q + p(1+y)}{q}\right) + qy = p - q$$

$$\frac{pq + p^2(1+y)}{q} + qy = p - q$$

$$\frac{pq + p^2(1+y)}{q} + q^2y = p - q$$

$$pq + p^2(1+y) + q^2y = pq - q^2$$

$$p^2(1+y) = -q^2 - q^2y$$

$$p^2(1+y) = -q^2(1+y)$$

$$p^2 + p^2y = -q^2 - q^2y$$

$$p^2y + q^2y = -q^2 - p^2$$

$$y(p^2 + q^2) = -(p^2 + q^2)$$

$$y = -1.$$

$$\therefore \quad x = \frac{q + p(1+y)}{q}$$

$$x = \frac{q + p(1-1)}{q}$$

$$x = \frac{q + p(0)}{q}$$

$$x = \frac{q+0}{q}$$

$$x = \frac{q}{q}$$

$$x = 1$$

$$\therefore \quad x = 1$$

$$y = -1$$

(iii) $\frac{x}{a} - \frac{y}{b} = 0$

$ax + by = a^2 + b^2$

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

$x = \frac{a}{b} \cdot y$

$\Rightarrow a \cdot \frac{a}{b} \cdot y + by = a^2 + b^2$

$\frac{a^2}{b} y + by = a^2 + b^2$

$\frac{a^2 y + b^2 y}{b} = a^2 + b^2$

$(a^2 + b^2) y = (a^2 + b^2)\, b$

$y = b$

$\therefore x = \frac{a}{b} \cdot b$

$\therefore x = a$

Solution – 9 :-

Given $2x + y = 23$

$4x - y = 19$

$\Rightarrow \quad y = 23 - 2x$

$\therefore \quad 4x - 23 + 2x = 19$

$6x = 19 + 23$

$6x = 42$

$x = \frac{42}{6}$

$x = 7$

$\therefore \quad y = 23 - 2x$

$y = 23 - 2(7)$

$y = 23 - 14$

$y = 9.$

$\therefore \quad x - 3y \Rightarrow 7 - 3(9) = 7 - 27$

$= -20$

$\therefore x - 3y = -20$

$\therefore \quad 5y - 2x \Rightarrow 5(9) - 2(7)$

$\Rightarrow \quad 45 - 14$

$\Rightarrow \quad 31$

$\therefore \quad 5y - 2x = 31.$

Solution – 10 :

Given expression $ax + by$

(i) $ax + by = 7$

when $x = 2 ; y = 1$

$\therefore \quad 2a + b = 7$ ——— (i)

(ii) $ax + by = 1$

when $x = -1 , y = 1$

$-a + b = 1$ ——— (ii)

$\therefore \quad b = 1 + a$

$\therefore \quad 2a + 1 + a = 7$

$3a + 1 = 7$

$3a = 7 - 1$

$3a = 6$

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

$a = 2$

$b = 1 + a$

$b = 1 + 2$

$= 3$.

16)

Let the number be $xy\ [10x+y]$

Reverse of that number $yx\ [10y+x]$

And Given that $\frac{xy\,[10x+y]}{yx\,[10y+x]} = 1\frac{3}{4}$

$$\Rightarrow \frac{10x+y}{10y+x} = \frac{7}{4}$$

$$\Rightarrow 40x+4y = 70y+7x$$

$$\Rightarrow 33x-66y = 0$$

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

And also given that $x+y = 12$ — (2)

on solving eq(1) and eq.(2)

$$(2)-(1) \Rightarrow x+y-x+2y = 12$$

$$3y = 12$$

$$\boxed{y = 4}$$

Put $y=4$ in (1)

$$\Rightarrow x-8 = 0$$

$$\Rightarrow \boxed{x = 8}$$

The required number is 84

17)

Let the number be $xy\ [10x+y]$ and reverse of number is $yx\ [10y+x]$

Given $\frac{10x+y}{10y+x} = \frac{5}{6}$

$$\Rightarrow 60x+6y = 50y+5x$$

$$\Rightarrow 55x-44y = 0$$

$$\Rightarrow 5x-4y = 0 \quad \text{—} \ (1)$$

And also given that $x-y = 1$ — (2)

Put $x = y+1$ in eq.(1)

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

$$y = -5$$

Put $y=-5$ in eq.(2)

$$\Rightarrow x = -4$$

$\therefore$ The required number is 45

(8) Let the number be xyz $[100x+10y+z]$

Given that $x = 4z$ — ①

$x+y+z = 14$ — ②

And reverse of the number is zyx $[100z+10y+x]$

and given that $(100x+10y+z)-(100z+10y+x) = 594$

$\Rightarrow 99x-99z = 594$

$\Rightarrow 99[x-z] = 594$

$\Rightarrow x-z = 6$ — ③

on solving eq. ① & ③

$4z - z = 6$

$3z = 6$

$\Rightarrow z = 2$

Put $z=2$ in eq. ③ $\Rightarrow x-z=6$

$\Rightarrow x = 8$

Put $x=8$ and $z=2$ in eq. ② $\Rightarrow 8+y+2=14$

$\Rightarrow y = 4$.

∴ The required number is 842

(9) Let the age of mavina and her daughter be 'm' and 'D'

Given that $m-4 = 3(D-4)$ ①

$m+6 = 2(D+6)$ ②

eq. ① $\Rightarrow m-4 = 3D-12$

$\Rightarrow m = 3D-8$ — ③

eq. ② $\Rightarrow m+6 = 2D+12$

$\Rightarrow m = 2D+6$ — ④

from ③ & ④ $3D-8 = 2D+6$

$D = 14$

Put $D=14$ in eq. ④

$m = 28+6 = 34$

$m = 34$.

∴ The present age of mavina and her daughter is 34 and 14.

eq.① $\times 12 \Rightarrow 144x + 120y = 1560000$

eq.② $\times 10 \Rightarrow 100x + 120y = 1340000$

$44x = 220000$

$x = 5000$

Put $x = 5000$ in eq.②①

$60000 + 10y = 130000$

$10y = 70000$

$y = 7000$

Thus the money invested at 12% is 5000/-

10% is 7000/-

22) let the cost price of table be 'x' and list price of chair be 'y'

Case-(i)

Table is sold at a profit of 8%.

$\therefore$ S.P of table $= x + \frac{8x}{100} = \frac{108x}{100}$

Chair is sold at a discount of 10%.

$\therefore$ S.P of chair $= y - \frac{10y}{100} = \frac{90y}{100}$

and given that $\frac{108x}{100} + \frac{90y}{100} = \frac{5608}{100}$

$\Rightarrow 6x + 5y = 5600 - ①$

Case-(ii)

Table is sold at a profit of 10%.

$\therefore$ SP of table $= x + \frac{10x}{100} = \frac{110x}{100}$

Chair is sold at a discount of 8%

$\therefore$ SP of Chair $= y - \frac{8y}{100} = \frac{92y}{100}$

Given that $\frac{110x}{100} + \frac{92y}{100} = 1028$

$\Rightarrow 110x + 92y = 102800 - ②$

on solving eq① & eq.② $x = 600$, $y = 400$

$\therefore$ Cost Price of table is 600/- and list Price of Chair is 400/-

eq. ① - eq. ② $y = 5$

Put $y = 5$ in ①

$\Rightarrow x - 10 = 2$

$\Rightarrow x = 12$.

∴ No. of students in the class is $12 \times 5 = 60$.

25)

Let 'x' grams of 18 carat gold is added, then the amount of 12 carat gold added is $(120 - x)$ grams

Given Purity of gold is 24 carat

$$\therefore x \cdot \frac{18}{24} + (120 - x) \cdot \frac{12}{24} = 120 \times \frac{16}{24}$$

$$\Rightarrow 18x + 12(120 - x) = 120 \times 16$$

$$\Rightarrow 18x + 12 \times 120 - 12x = 120 \times 16$$

$$\Rightarrow 6x = 120(16 - 12)$$

$$\Rightarrow x = \frac{120 \times 4}{6} = 80$$

∴ 80 grams of 18 carat gold added with $120 - 80 = 40$gms of 12 carat gold.

26)

Given A and B both can do work in 15 days.

(A+B) one day's work $= 1/15$

$$\frac{\text{A's 1 day's work}}{\text{B's 1 day's work}} = \frac{\frac{3}{2}}{1} = \frac{3}{2}$$

Let A's 1 day's work be $3x$ and B's 1 day work is $2x$

Then $3x + 2x = \frac{1}{15}$

$5x = 1/15$

$\Rightarrow x = 1/75$

A's 1 day work $= 3x \frac{1}{75} = \frac{1}{25}$

B's 1 day work $= 2x \frac{1}{75} = \frac{1}{37.5}$

∴ A and B can do that work in 25 and 37.5 days respectively ...4

27) Let a man's rate be 'm';
women's rate be 'w'

Given $2m + 5w = 1/4$

$m + w = 1/12$

$\Rightarrow 8m + 20w = 1 \quad -①$

$\Rightarrow 12m + 12w = 1 \quad -②$

eq. ① $\times 3 \Rightarrow 24m + 60w = 3$

eq. ② $\times 2 \Rightarrow 24m + 24w = 2$

$36w = 1$

$w = 1/36$

$w = 1/36$ in ②

$m = 1/18$

1 man would take 18 days to complete the work.

28) Let the due speed of train be 'x' kmph and scheduled time by 'y' hrs

Therefore length of the journey = xy km.

Given (i) $(x+30)(y-2) = xy$

$\Rightarrow xy - 2x + 30y - 60 = xy$

$\Rightarrow 2x - 30y + 60 = 0 \quad -①$

(ii) $(x-15)(y+2) = xy$

$xy + 2x - 15y - 30 = xy$

$2x - 15y - 30 = 0 \quad -②$

eq. ② - eq ① $\Rightarrow 15y - 90 = 0$

$\Rightarrow 15y = 90$

$\Rightarrow y = 6$ hrs

Put $y = 6$ in ① $\Rightarrow 2x - 180 + 60 = 0$

$2x = 120$

$x = 60$ kmph

∴ The length of the journey is $60 \times 6 = 360$ kms.

29) Let speed of boat in still water be 'x' kmph

" current be 'y' kmph

Time to go with the current is 2 hrs

$\Rightarrow \frac{40}{x+y} = 2$

$\Rightarrow x+y = 20 \quad -(1)$

Time = Distance / speed

Time to go against the current is 4 hrs

$\Rightarrow \frac{40}{x-y} = 4$

$\Rightarrow x-y = 10 \quad -(2)$

eq (1) + (2) $\Rightarrow 2x = 30$

$x = 15$

Put $x = 15$ in (1) $\Rightarrow 15+y = 20$

$\Rightarrow y = 5$

∴ Speed of boat in still water and speed of current is 15 kmph & 5 kmph

30) let the speed of boat in still water be 'x' kmph

" current be 'y' kmph

Time to go with the current is 4 hrs

$\Rightarrow \frac{44}{x+y} = 4$

$\Rightarrow x+y = 11 \quad -(1)$

Time to go against the current is 4 hr. 48 mins

= 288 mins $\left[\frac{288}{60} \text{ hrs}\right]$

$= \frac{24}{5}$ hrs

$\Rightarrow \frac{44}{x-y} = \frac{24}{5}$

$\Rightarrow 6x - 6y = 55 \quad -(2)$

eq. (2) + eq (1) × 6 $\Rightarrow 12x = 121$

$\Rightarrow x = \frac{121}{12}$ kmph. — speed of boat in still water

Put $x = \frac{121}{12}$ in (1) $\Rightarrow y = 11 - \frac{121}{12}$

$y = \frac{11}{12}$ kmph. — speed of current

31)

Let the plane air speed be 'x' kmph and wind speed be 'y' kmph

And given that with a head wind it took 3.5 hrs

$$\Rightarrow \frac{1680}{x-y} = 3.5 = \frac{7}{2}$$

$$\Rightarrow x - y = 480 \quad -(1)$$

On return it took 3hrs

$$\Rightarrow \frac{1680}{x+y} = 3$$

$$\Rightarrow x + y = 560 \quad -(2)$$

$(1)+(2) \Rightarrow 2x = 1040$

$x = 520$

Put $x = 520$ in (2) $\Rightarrow 520 + y = 560$

$\Rightarrow y = 40$

∴ plane air speed is 520 kmph and wind speed 40kmph.

32)

Let the fixed charges be 'x' and cost of food per day be 'y'

Given that Bhawana paid 2600 for 20 days

$$\Rightarrow x + 20y = 2600 \quad -(1)$$

and Divya paid 3020 for 26 days

$$\Rightarrow x + 26y = 3020 \quad -(2)$$

eq.(2) − eq.(1) $\Rightarrow 6y = 420$

$y = 70$

Put $y = 70$ in (1)

$\Rightarrow x + 1400 = 2600$

$\Rightarrow x = 1200$

∴ fixed charges − 1200/-

cost of food per day − 70/-