Chapter 7. Linear Equations

Ex 7.1

Answer 1.

(i) $5x-2=18; x=4$

We know a value is a solution of the equation if it satisfies the equation.

i.e., x_1 is a solution if $f(x_1)=0$

Here, $x_1=4$.Put in $5x-2=18$

we get LHS=RHS.

Thus, $x=4$ is a solution of the equation $5x-2=18$

(ii) $2x-5=3x; x=3$

Can be written as: $x=-5$, which is not satisfied by $x=3$.

Thus, $x=3$ is not a solution of $2x-5=3x$.

(iii) $3x+8=x-7; x=3$

Can be written as: $2x+15=0$

Putting, $x=3$, we get LHS=RHS.

Thus, Thus, $x=3$ is a solution of the equation $3x+8=x-7$

(iv) $2\frac{1}{2}x+3\frac{1}{2}x=56-2x; x=7$

Simplifying, we get:

$$\Rightarrow \frac{5}{2}x+\frac{7}{2}x=56-2x$$
$$\Rightarrow \frac{12}{2}x+2x=56$$
$$\Rightarrow 8x=56$$
$$\Rightarrow x=7$$

Put $x=7$ in above gives, LHS=RHS.

Thus, $x=7$ is a solution of the equation $2\frac{1}{2}x+3\frac{1}{2}x=56-2x; x=7$

(v) $\frac{3x-1}{4}+\frac{3}{4}=2; x=2$

Simplifying, we get:

$$\Rightarrow \frac{3x-1+3}{4}=2$$
$$\Rightarrow 3x+2=8$$
$$\Rightarrow 3x=6$$
$$\Rightarrow x=2$$

Thus, $x=2$ is a solution of the equation $\frac{3x-1}{4}+\frac{3}{4}=2; x=2$

Answer 2.

(i) $3x+8=35$

Collecting like terms, $3x=27$

$\Rightarrow x=9.$

(ii) $8x-21=3x-11$

Collecting like terms,

$8x-3x=21-11$

$\Rightarrow 5x=10$

$\Rightarrow x=2$

(iii) $2x-(3x-4)=3x-4$

Collecting like terms,

$\Rightarrow 2x-3x-3x=-8$

$\Rightarrow -4x=-8$

$\Rightarrow x=2$

(iv) $2x+\sqrt{2}=3x-4-3\sqrt{2}$

Collecting like terms,

$\Rightarrow x = 4\sqrt{2} + 4 = 4(\sqrt{2} + 1)$

(v) $15y-20=2y+6$

Collecting like terms,

$13y=26$

$\Rightarrow y=2$

(vi) $5x+10-4x+6=12x+20-3x+12$

Collecting like terms,

$\Rightarrow x+16=9x+32$

$\Rightarrow 8x=-16$

$\Rightarrow x=-2$

(vii)$(a+2)(2a+5)= 2(a+1)^2 + 13$

Collecting like terms,

$\Rightarrow a(2a+5)+2(2a+5)=2a^2+2+4a+13$

$\Rightarrow 2a^2+5a+4a+10-(2a^2+4a+15)=0$

$\Rightarrow 5a + 10 - 15 = 0$

$\Rightarrow a = 1$is the unknown.

(viii) $(6p+9)^2+(8p-7)^2=(10p+3)^2-71$

$(6p+9)^2+(8p-7)^2=(10p+3)^2-71$

$[36p^2+81+2(6p)(9)]+[64p^2+49-2(8p)(7)]=100p^2+9+2(10p)(3)-71$

$\Rightarrow 100p^2 + 130 + 2 \times 54p - 2 \times 56p = 100p^2+9-71+60p$

Collecting like terms ,

$\Rightarrow 130 + 71 - 9 = 60p + 4p$

$\Rightarrow 192 = 64p$

$\Rightarrow p = 3$

(ix) $(3x-1)^2+(4x+1)^2=(5x+1)^2+5$

Opening squares,we get:

$[9x^2+1+2(3x)(1)]+[16x^2+1+2(4x)(1)]=[25x^2+1+2(5x)(1)]+5$

$\Rightarrow 25x^2 + 2 + 8x + 6x = 25x^2 + 6 + 10x$

$\Rightarrow 4x = 4$

$\Rightarrow x = 1$

(x) $3(3x-4)-2(4x-5)=6$

Simplifying by Collecting like terms,

$9x-8x=6+12-10$

$\Rightarrow x=8$

Answer 3A.

$$\frac{4x}{27} = \frac{8}{9}$$

$$\therefore (4x)(9) = (8)(27)$$

$$\therefore x = \frac{8 \times 27}{4 \times 9}$$

$$\therefore x = \frac{2 \times 3}{1 \times 1}$$

$$\therefore x = 6$$

Answer 3B.

$$\frac{1.5y}{3} = \frac{7}{2}$$

$$\therefore (1.5y)(2) = (7)(3)$$

$$\therefore y = \frac{7 \times 3}{1.5 \times 2}$$

$$\therefore y = \frac{70 \times 3}{15 \times 2}$$

$$\therefore y = 7$$

Answer 3C.

$$-\frac{3.4m}{2.7} = \frac{10.2}{9}$$

$$\therefore (-3.4m)(9) = (10.2)(2.7)$$

$$\therefore y = -\frac{10.2 \times 2.7}{3.4 \times 9}$$

$$\therefore y = -\frac{102 \times 27}{34 \times 9 \times 10}$$

$$\therefore y = -\frac{3 \times 3}{1 \times 1 \times 10}$$

$$\therefore y = -0.9$$

Answer 3D.

$$\frac{1}{2}p + \frac{3}{4}p = p - 3$$
$$\Rightarrow \frac{1}{2}p + \frac{3}{4}p - p = -3$$
$$\Rightarrow \frac{p}{2} + \frac{3p}{4} - p = -3$$
$$\Rightarrow \frac{2p + 3p - 4p}{4} = -3$$
$$\Rightarrow \frac{p}{4} = -3$$
$$\Rightarrow p = (-3)(4)$$
$$\Rightarrow p = -12$$

Answer 3E.

$$\frac{9y}{4} - \frac{5y}{3} = \frac{1}{5}$$
$$\Rightarrow \frac{27y - 20y}{12} = \frac{1}{5}$$
$$\Rightarrow \frac{7y}{12} = \frac{1}{5}$$
$$\Rightarrow (7y)(5) = 12$$
$$\Rightarrow y = \frac{12}{7 \times 5}$$
$$\Rightarrow y = \frac{12}{35}$$

Answer 3F.

$$\frac{x}{2} + \frac{x}{4} + \frac{x}{8} = 7$$
$$\Rightarrow \frac{4x + 2x + x}{8} = 7$$
$$\Rightarrow \frac{7x}{8} = 7$$
$$\Rightarrow 7x = (7)(8)$$
$$\Rightarrow x = \frac{7 \times 8}{7}$$
$$\Rightarrow x = 8$$

Answer 3G.

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

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

$$\therefore 4m-3m=6$$

$$\therefore m=6$$

Answer 3H.

$$\frac{2(2x-1)}{9}-\frac{x-1}{2}=0$$

$$\Rightarrow \frac{4x-2}{9}-\frac{x-1}{2}=0$$

$$\Rightarrow \frac{4x-2}{9}=\frac{x-1}{2}$$

$$\Rightarrow 2(4x-2)=9(x-1)$$

$$\Rightarrow 8x-4=9x-9$$

$$\Rightarrow x=5$$

Answer 3I.

$$\frac{4}{5}x-21=\frac{3}{4}x-20$$

$$\Rightarrow \frac{4}{5}x-\frac{3}{4}x=21-20$$

$$\Rightarrow \frac{16x}{20}-\frac{15x}{20}=21-20$$

$$\Rightarrow \frac{16x-15x}{20}=1$$

$$\Rightarrow 16x-15x=20$$

$$\Rightarrow x=20$$

Answer 3J.

$$\frac{a-1}{2}-\frac{a+1}{3}=5-a$$

$$\Rightarrow \frac{a-1}{2}-\frac{a+1}{3}+a=5$$

Take the LCM of all the denominators, that is, 2 and 3 which is 6.

Multiply throughout by the LCM

$$\Rightarrow 3(a-1)-2(a+1)+6a=30$$

$$\Rightarrow 3a-3-2a-2+6a=30$$

$$\Rightarrow 7a=35$$

$$\Rightarrow a=5$$

Answer 4A.

$$\frac{5}{x}-11=\frac{2}{x}+16, x\neq 0$$

$$\Rightarrow \frac{5}{x}-\frac{2}{x}=11+16$$

$$\Rightarrow \frac{5-2}{x}=27$$

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

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

$$\Rightarrow x=\frac{1}{9}$$

Answer 4B.

$$11-\frac{3}{x}=\frac{5}{x}+3$$

$$\Rightarrow 11-3=\frac{5}{x}+\frac{3}{x}$$

$$\Rightarrow \frac{5}{x}+\frac{3}{x}=11-3$$

$$\Rightarrow \frac{5+3}{x}=8$$

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

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

$$\Rightarrow x=1$$

Answer 4C.

$$\frac{5}{3x-2}-\frac{1}{8}=0, x\neq 0, x\neq \frac{2}{3}$$

$$\Rightarrow \frac{5}{3x-2}=\frac{1}{8}$$

$$\Rightarrow 40=3x-2$$

$$\Rightarrow 3x=42$$

$$\Rightarrow x=14$$

Answer 4D.

$$\frac{1}{x-1}+\frac{4}{5}=\frac{2}{3}, x\neq 1$$

$$\Rightarrow \frac{1}{x-1}=\frac{2}{3}-\frac{4}{5}$$

$$\Rightarrow \frac{1}{x-1}=\frac{10}{15}-\frac{12}{15}$$

$$\Rightarrow \frac{1}{x-1}=\frac{-2}{15}$$

$$\Rightarrow 15=-2(x-1)$$

$$\Rightarrow 15=-2x+2$$

$$\Rightarrow 2x=-13$$

$$\Rightarrow x=\frac{-13}{2}$$

$$\Rightarrow x=-6\frac{1}{2}$$

Answer 4E.

$$\frac{7}{x-2}-\frac{5}{3}=3, x \neq 2$$
$$\Rightarrow \frac{7}{x-2}=\frac{5}{3}+3$$
$$\Rightarrow \frac{7}{x-2}=\frac{5+9}{3}$$
$$\Rightarrow \frac{7}{x-2}=\frac{14}{3}$$
$$\Rightarrow 21=14(x-2)$$
$$\Rightarrow 21=14x-28$$
$$\Rightarrow 49=14x$$
$$\Rightarrow x=\frac{49}{14}$$
$$\Rightarrow x=\frac{7}{2}$$

Answer 4F.

$$\frac{2x+3}{x+7}=\frac{5}{8}, x \neq -7$$
$$\Rightarrow 8(2x+3)=5(x+7)$$
$$\Rightarrow 16x+24=5x+35$$
$$\Rightarrow 11x=11$$
$$\Rightarrow x=1$$

Answer 4G.

$$\frac{3x-5}{7x-5}=\frac{1}{9}, x \neq \frac{5}{7}$$
$$\Rightarrow 9(3x-5)=7x-5$$
$$\Rightarrow 27x-45=7x-5$$
$$\Rightarrow 20x=40$$
$$\Rightarrow x=2$$

Answer 4H.

$$\frac{3}{x+1}-\frac{x-6}{x^2-1}=\frac{12}{x-1}$$

$$\frac{3}{x+1}-\frac{x-6}{(x-1)(x+1)}=\frac{12}{x-1}$$

LCM of all the denominators in the equation is $(x-1)(x+1)$.

Multiply throughout by the LCM.

$3(x-1)-(x-6)=12(x+1)$

$\Rightarrow 3x-3-x+6=12x+12$

$\Rightarrow 3x-12x-x=12-6+3$

$\Rightarrow -10x=9$

$\Rightarrow x=-\frac{9}{10}$

Answer 4I.

$$\frac{x+13}{x^2-1}+\frac{5}{x+1}=\frac{7}{x+1}$$

$$\Rightarrow \frac{x+13}{(x-1)(x+1)}+\frac{5}{x+1}=\frac{7}{x+1}$$

LCM of all the denominators in the equation is $(x-1)(x+1)$.

Multiply throughout by the LCM.

$x+13+5(x-1)=7(x-1)$

$\Rightarrow x+13+5x-5=7x-7$

$\Rightarrow 13-5+7=7x-5x-x$

$\Rightarrow x=15$

Answer 4J.

$$\frac{6x+7}{3x+2}=\frac{4x+5}{2x+3}$$

$\Rightarrow (6x+7)(2x+3)=(4x+5)(3x+2)$

$\Rightarrow 6x(2x+3)+7(2x+3)=4x(3x+2)+5(3x+2)$

$\Rightarrow 12x^2+18x+14x+21=12x^2+8x+15x+10$

$\Rightarrow 18x+14x+21=8x+15x+10$

$\Rightarrow 18x-8x+14x-15x=10-21$

$\Rightarrow 9x=-11$

$\Rightarrow x=-\frac{11}{9}$

Answer 4K.

$$2\frac{1}{5}-\frac{x-2}{3}=\frac{x-1}{3}$$
$$\Rightarrow \frac{11}{5}-\frac{x-2}{3}=\frac{x-1}{3}$$
$$\Rightarrow \frac{11}{5}=\frac{x-1}{3}+\frac{x-2}{3}$$
$$\Rightarrow \frac{11}{5}=\frac{x-1+x-2}{3}$$
$$\Rightarrow \frac{11}{5}=\frac{2x-3}{3}$$
$$\Rightarrow 10x-15=33$$
$$\Rightarrow 10x=48$$
$$\Rightarrow x=4.8$$

Answer 4L.

$$\frac{1}{2}\left(y-\frac{1}{3}\right)+\frac{1}{4}\left(2y+\frac{1}{5}\right)=\frac{3}{4}\left(y-\frac{1}{12}\right)$$
$$\Rightarrow \frac{y}{2}-\frac{1}{6}+\frac{y}{2}+\frac{1}{20}=\frac{3y}{4}-\frac{1}{16}$$
$$\Rightarrow \frac{y}{2}+\frac{y}{2}-\frac{3y}{4}=-\frac{1}{16}+\frac{1}{6}-\frac{1}{20}$$
$$\Rightarrow y-\frac{3y}{4}=-\frac{1}{16}+\frac{1}{6}-\frac{1}{20}$$
$$\Rightarrow \frac{4y-3y}{4}=-\frac{-15+40-12}{240}$$
$$\Rightarrow \frac{y}{4}=\frac{13}{240}$$
$$\Rightarrow y=\frac{13}{240}\times 4$$
$$\Rightarrow y=\frac{13}{60}$$

Answer 4M.

$$2+\frac{3x-2}{3x+2}=\frac{3x+2}{x+1}$$
$$\Rightarrow 2=\frac{3x+2}{x+1}-\frac{3x-2}{3x+2}$$
$$\Rightarrow 2=\frac{(3x+2)(3x+2)-(3x-2)(x+1)}{(x+1)(3x+2)}$$
$$\Rightarrow 2(x+1)(3x+2)=(3x+2)(3x+2)-(3x-2)(x+1)$$
$$\Rightarrow 2\left[3x^2+2x+3x+2\right]=\left[9x^2+6x+6x+4\right]-\left[3x^2+3x-2x-2\right]$$
$$\Rightarrow 6x^2+4x+6x+4=9x^2+6x+6x+4-3x^2-3x+2x+2$$
$$\Rightarrow 4x=6x-3x+2x+2$$
$$\Rightarrow -x=2$$
$$\Rightarrow x=-2$$

Answer 4N.

$$\frac{7x-1}{4}-\frac{1}{3}\left(2x-\frac{1-x}{2}\right)=5\frac{1}{3}$$
$$\Rightarrow \frac{7x-1}{4}-\frac{2x}{3}+\frac{1-x}{6}=\frac{16}{3}$$

LCM of all the denominators is 12.

Multiply the equation throughout by the LCM.

$$\Rightarrow \frac{3(7x-1)}{12}-\frac{4(2x)}{12}+\frac{2(1-x)}{12}=16(4)$$
$$\Rightarrow \frac{21x-3}{12}-\frac{8x}{12}+\frac{2-2x}{12}=64$$
$$\Rightarrow 21x-3-8x+2-2x=64$$
$$\Rightarrow 11x=64+3-2$$
$$\Rightarrow 11x=65$$
$$\Rightarrow x=\frac{65}{11}$$

Answer 5A.

$$\sqrt{x-5}=3$$

Squaring both sides

$$\Rightarrow x-5=(3)^2$$
$$\Rightarrow x-5=9$$
$$\Rightarrow x=9+5$$
$$\Rightarrow x=14$$

Answer 5B.

$$7-\frac{1}{\sqrt{y}}=0$$

$$\Rightarrow 7=\frac{1}{\sqrt{y}}$$

Squaring both sides

$$\Rightarrow (7)^2=\frac{1}{y}$$

$$\Rightarrow 49=\frac{1}{y}$$

$$\Rightarrow y=\frac{1}{49}$$

Answer 5C.

$$\frac{1}{5}=\frac{3\sqrt{x}}{3}$$

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

Squaring both sides

$$\Rightarrow \left(\frac{1}{5}\right)^2=x$$

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

Answer 5D.

$$2\sqrt{\frac{x-3}{x+5}}=\frac{1}{3}$$

$$\Rightarrow \left(2\sqrt{\frac{x-3}{x+5}}\right)^2=\left(\frac{1}{3}\right)^2$$

$$\Rightarrow 4\left(\frac{x-3}{x+5}\right)=\frac{1}{9}$$

$$\Rightarrow \frac{4x-12}{x+5}=\frac{1}{9}$$

$$\Rightarrow 9(4x-12)=x+5$$

$$\Rightarrow 36x-108=x+5$$

$$\Rightarrow 35x=113$$

$$\Rightarrow x=\frac{113}{35}$$

Answer 6.

$$\frac{2}{m} \times 1\frac{1}{5} = \frac{3}{7} \text{ of } 2\frac{1}{2}$$

$$\text{means } \frac{2}{m} \times 1\frac{1}{5} = \frac{3}{7} \times 2\frac{1}{2}$$

$$\Rightarrow \frac{2}{m} \times \frac{6}{5} = \frac{3}{7} \times \frac{5}{2}$$

$$\Rightarrow \frac{12}{5m} = \frac{15}{14}$$

$$\Rightarrow (12)(14) = (15)(5m)$$

$$\Rightarrow \frac{12 \times 14}{15 \times 5} = m$$

$$\Rightarrow m = \frac{56}{25}$$

Answer 7.

(i) $a(x-2a)+b(x-2b)=4ab$

On simplyfying, we get :

$\Rightarrow xa - 2a^2 + bx - 2b^2 = 4ab$

$\Rightarrow$ On Collecting like terms, we get :

$\Rightarrow x(a+b) = 4ab + 2(a^2 + b^2)$

$$\Rightarrow x = \frac{2(a^2 + b^2 + 2ab)}{(a+b)} = \frac{2(a+b)^2}{(a+b)} = 2(a+b)$$

(ii) $a(x-b)-b(x-a)=a^2-b^2$

On simplyfying, we get :

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

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

$\Rightarrow x = (a+b)$

(iii) $a(x-b)-x(x-2b)=x+5(x-b)$

On simplyfying, we get :

$\Rightarrow ax - ab - x + 2b = x + 5x - 5b$

$\Rightarrow -ab + 2b + 5b = 6x + x - ax$

$\Rightarrow (7 - a)b = (7 - a)x$

$\Rightarrow x = b$

(iv) $8x+a(x-b)=10(ax-b)$

$\Rightarrow 8x+ax-ab-10ax+10b=0$

$\Rightarrow 8x-9ax=ab-10b$

$\Rightarrow x(8-9a)=b(a-10)$

$\Rightarrow x=\frac{b(a-10)}{(8-9a)}$

(v) $a(2x-b)-b(3x-a)+a(x+1)=b(x+5)$

On simplyfying, we get :

$2ax - ab - 3bx + ab + ax + a = bx + 5b$

$\Rightarrow 3ax - 4bx = 5b - a$

$\Rightarrow x(3a - 4b) = 5b - a$

$\Rightarrow x = \frac{5b - a}{(3a - 4b)}$

Answer 8.

$7(3-4x) = 1$

$\Rightarrow 21-28x = 1$

$\Rightarrow 20 = 28x$

$\Rightarrow x = \frac{20}{28}$

$\Rightarrow x = \frac{5}{7}$

$$2x^2 + 7x + 6 = 2\left(\frac{5}{7}\right)^2 + 7\left(\frac{5}{7}\right) + 6$$

$$= 2\left(\frac{25}{49}\right) + 7\left(\frac{5}{7}\right) + 6$$

$$= \frac{50}{49} + 5 + 6$$

$$= \frac{50}{49} + 11$$

$$= \frac{50 + 539}{49}$$

$$= \frac{589}{49}$$

Answer 9.

Given $a = \frac{2x-3}{5}$, $b = \frac{3x-2}{3}$

Consider,

$2(3a-b)+1=0$

Substituting the expressions for a and b in the equation, we get

$$2\left[3\left(\frac{2x-3}{5}\right)-\frac{3x-2}{3}\right]+1=0$$

$$\Rightarrow 2\left[\frac{6x-9}{5}-\frac{3x-2}{3}\right]+1=0$$

$$\Rightarrow 2\left[\frac{3(6x-9)-5(3x-2)}{15}\right]+1=0$$

$$\Rightarrow 2\left[\frac{18x-27-15x+10}{15}\right]+1=0$$

$$\Rightarrow 2\left[\frac{3x-7}{15}\right]+1=0$$

$$\Rightarrow 2\left[\frac{3x-7}{15}\right]=-1$$

$$\Rightarrow 3x-7=-1\left(\frac{15}{2}\right)$$

$$\Rightarrow 3x-7=-\frac{15}{2}$$

$$\Rightarrow 3x=-\frac{15}{2}+7$$

$$\Rightarrow 3x=\frac{-15+14}{2}$$

$$\Rightarrow x=-\frac{1}{6}$$

Answer 10.

$x = p + 1$ and

$$2.5 + \frac{2p+1}{3} = 1.5(2x-1)$$

$$\Rightarrow 2.5 + \frac{2p+1}{3} = 1.5[2(p+1)-1]$$

$$\Rightarrow 2.5 + \frac{2p+1}{3} = 3(p+1) - 1.5$$

$$\Rightarrow 2.5 + \frac{2p+1}{3} = 3p + 3 - 1.5$$

$$\Rightarrow 2.5 + \frac{2p+1}{3} = 3p + 1.5$$

$$\Rightarrow \frac{2p+1}{3} - 3p = 1.5 - 2.5$$

$$\Rightarrow \frac{2p+1-9p}{3} = -1$$

$$\Rightarrow 2p + 1 - 9p = -3$$

$$\Rightarrow -7p = -3 - 1$$

$$\Rightarrow -7p = -4$$

$$\Rightarrow p = \frac{4}{7}$$

Answer 11.

We first solve $\frac{4m-3}{2} - \frac{3m-1}{5} = \frac{3}{2}$ for m :

Taking LCM,

$$\frac{5(4m-3) - 2(3m-1)}{10} = \frac{3}{2}$$

$$\Rightarrow \frac{20m - 6m - 15 + 2}{10} = \frac{3}{2}$$

$$\Rightarrow \frac{14m - 13}{10} = \frac{3}{2}$$

$\Rightarrow$ On Cross - multiplying, we get :

$$2(14m - 13) = 30$$

$$\Rightarrow 14m - 13 = 15$$

$$\Rightarrow m = 2$$

Now, given $m = x - 3$

$$\Rightarrow 2 = x - 3$$

$$\Rightarrow x = 5$$

Answer 12.

Given $x = 3$ is a solution of $ax^2 + (a-4)x + 1 = a$

$\Rightarrow x = 3$ must satisfy the equation.

$\Rightarrow 9a + (a-4)3 + 1 - a = 0$

$\Rightarrow 9a + 3a - 12 + 1 - a = 0$

$\Rightarrow 11a - 11 = 0$

$\Rightarrow a = 1$

Answer 13.

$\frac{a}{b} = \frac{3}{2}$ (Given)

$\Rightarrow$ On Cross – multiplying, we get :

$2a = 3b$ - - - (1)

Also, $a=2x-5$, $3b=3x+1$ -----(2)

From (1) and (2),

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

$\Rightarrow 4x-10-3x-1=0$

$\Rightarrow x=11$

Answer 14.

$\frac{1}{x}-\frac{2}{3b}+1=0$

Taking LCM,

$\Rightarrow \frac{3b-2x+3bx}{3bx}=0$

$\Rightarrow 3b=x(-3b+2)$

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

Solving $\frac{2x+4}{8}-\frac{3-2x}{12}=\frac{x-3}{6}$ for x :

$\Rightarrow \frac{x+2}{4}-\frac{(3-2x)}{12}-\left(\frac{x-3}{6}\right)=0$

Taking LCM,

$\frac{3(x+2)-(3-2x)-2(x-3)}{12}=0$

$\Rightarrow 3x+6-3+2x-2x+6=0$

$\Rightarrow 3x=-9$

$\Rightarrow x=-3$ -----(2)

From (1) and (2),

$\Rightarrow \frac{3b}{2-3b}=-3$

Cross multiplying,

$\Rightarrow 3b=-6+9b$

$\Rightarrow -6b=-6$

$\Rightarrow b=1$

Answer 15.

$x+\frac{6}{a}=11$

$\Rightarrow \frac{ax+6}{a}=11$

On Cross – multiplying, we get :

$ax+6=11a$

$\Rightarrow x=\frac{11a-6}{a}$ --------(1)

$4\frac{1}{3}-\frac{3x-4}{5}=\frac{x-7}{3}$

$\Rightarrow \frac{13}{3}-\frac{3x-4}{5}=\frac{x-7}{3}$

$\Rightarrow \frac{13x5-3(3x-4)}{15}=\frac{x-7}{3}$

$\Rightarrow \frac{65-9x+12}{5}=x-7$

Crossmultiplying,

$5(x-7)=77-9x$

$\Rightarrow 5x+9x=77+35$

$\Rightarrow 14x=112$

$\Rightarrow x=\frac{112}{14}=8--------(2)$

From,(1)and(2),

$\frac{11a-6}{a}=8$

$\Rightarrow 8a=11a-6$

$\Rightarrow 6=3a$ or $a=2$

Answer 16.

Given $m(x-1)=40\Rightarrow x-1=\frac{40}{m}$

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

$\frac{(x-1)}{2}=1+\frac{x-1+1+1}{3}$ ....(Adding and subtracting 1 in the RHS)

$\Rightarrow \frac{\left(\frac{40}{m}\right)}{2}=1+\frac{\left(\frac{40}{m}\right)+2}{3}$

$\Rightarrow \frac{40}{2m}=1+\frac{\frac{40+2m}{m}}{3}$

$\Rightarrow \frac{40}{2m}=1+\frac{40+2m}{3m}$

$\Rightarrow \frac{40}{2m}=\frac{3m+40+2m}{3m}$

$\Rightarrow \frac{40}{2m}=\frac{5m+40}{3m}$

$\Rightarrow 40(3m)=2m(5m+40)$

$\Rightarrow 120m=10m^2+80m$

$\Rightarrow 10m^2+80m-120m=0$

$\Rightarrow 10m^2=40m$

$\Rightarrow m=4$

Ex 7.2

Answer 1.

We are to find that value of x for which the two expressions are equal:

i.e, $\frac{x}{5}+2=\frac{x}{3}-4$

$\Rightarrow \frac{x}{5}-\frac{x}{3}=-2-4$

$\Rightarrow$ Taking LCM, $\frac{3x-5x}{15}=-6$

$\Rightarrow \frac{-2x}{15}=-6$

On Cross – multiplying, we get :

$2x = 15 \times 6$

$\Rightarrow x = 45$

Answer 2.

Given that:

$\frac{1}{3}(x+7)-\frac{1}{5}(3x-2)=3$

Taking LCM, $\frac{5(x+7)-3(3x-2)}{15}=3$

$\Rightarrow$ On simplyfying and Cross – multiplying, we get :

$5x - 9x + 35 + 6 = 15 \times 3$

$\Rightarrow -4x + 41 = 45 \Rightarrow -4x = 4$

$\Rightarrow x = -1$

Answer 3.

We have to find the value of x which makes the two expressions equal:

$10(3x+12)= 3(9x+50)$

$\Rightarrow 30x-27x=150-120$

$\Rightarrow 3x=30$

$\Rightarrow x=10$

Answer 4.

Given: $15(x+1)+10(x+2)+6(x+3) = 270$.

$\Rightarrow$ Collecting like terms, we get :

$(15x + 10x + 6x) + (15 + 20 + 18) - (270) = 0$

$\Rightarrow 31x = 217$

$\Rightarrow x = 7$

Answer 5.

We know that the sum of all angles of a triangle are 180° (By angle sum property)

Thus, we get : $(3x - 5)^\circ + (3x + 5)^\circ + 6x^\circ = 180^\circ$

$\Rightarrow$ Collecting like terms, we get :

$(12x)^\circ + (5 - 5)^\circ = 180^\circ$

$\Rightarrow x = \frac{180}{12}^\circ = 15^\circ.$

Thus, the angles of the traingle are respectively :

$(3x - 5)^\circ = (3 \times 15 - 5)^\circ = 40^\circ$

$(3x + 5)^\circ = (3 \times 15 + 5)^\circ = 50^\circ$

And $6x^\circ = 6 \times 15^\circ = 90^\circ$

Since one of the angles is 90°, the type of triangle formed is right angled.

Answer 6.

We know that the sum of all angles of a quadrilateral are 360°

(By angle sum property of a quadrilateral)

Thus,

$(2x - 4)^\circ + (5x - 10)^\circ + (4x - 8)^\circ + (7x - 14)^\circ = 360^\circ$

$\Rightarrow$ Collecting like terms, we get :

$(2x + 5x + 4x + 7x) + (-4 - 10 - 8 - 14)^\circ = 360^\circ$

$\Rightarrow 18x - 36^\circ - 360^\circ = 0$

$\Rightarrow x = \frac{396^\circ}{18} = 22^\circ$

Answer 7.

We know that the sum of all angles of a triangle are 180°

Thus, $2(x+6)^\circ + 3(x-1)^\circ + 6(x+1)^\circ = 180^\circ$

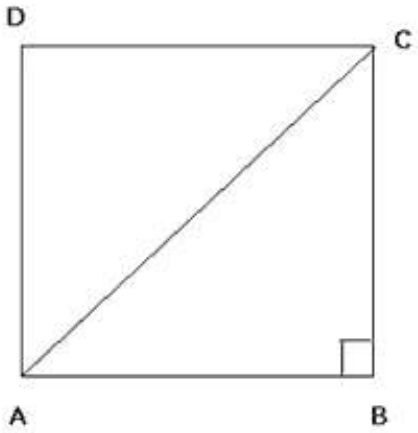
$\Rightarrow$ Collecting like terms, we get :

$(2x + 3x + 6x)^\circ + (12 + 6 - 3)^\circ = 180^\circ$

$\Rightarrow 11x^\circ = 180^\circ - 15^\circ = 165^\circ$

$\Rightarrow x = 15^\circ$

Answer 8.



By pythagoras theorem, Inrt ΔABC :

$AC^2 = AB^2 + BC^2$

$$\left[\frac{(x+1)}{2}\right]^2 + \left[\frac{(x+1)}{2}\right]^2 = \left[\frac{3-x}{\sqrt{2}}\right]^2$$

$$\Rightarrow \left[\frac{(x+1)^2}{4}\right] + \left[\frac{(x+1)^2}{4}\right] = \left[\frac{(3-x)^2}{2}\right]$$

$$\Rightarrow \left[\frac{(x+1)^2}{2}\right] = \left[\frac{(9+x^2-6x)}{2}\right]$$

$$\Rightarrow (x^2+1+2x)-(9+x^2-6x) = 0$$

$$\Rightarrow 8x - 8 = 0$$

$$\Rightarrow x = 1\text{unit.}$$

Answer 9.

Let the three consecutive natural numbers be x, x+1 and x+2.

Then, sum=x+x+1+x+2=216

$\Rightarrow 3x+3=216$

$\Rightarrow 3x=213$

$x=71$

$\Rightarrow x+1=72, x+2=73$

Thus, the 3 natural numbers are: 71, 72 and 73.

Answer 10.

Let the three consecutive odd natural numbers be $2n+1, 2n+3, 2n+5$

Then, sum $=2n+1+2n+3+2n+5=99$

$\Rightarrow 6n+9=99$

$\Rightarrow 6n=90$

$n=15$

$\Rightarrow 2n+1=31, 2n+3=33, 2n+5=35$

Thus, the 3 natural numbers are: 31, 33, 35.

Answer 11.

Let the number be x.

Then As per the ques,

$$x+\frac{x}{2}=60$$

$$\Rightarrow \frac{3x}{2}=60$$

Crossmultiplying,

$$x=\frac{120}{3}=40$$

Answer 12.

Let the number be x.

Then As per the ques,

$2x-15=25$

$2x-15=25$

$\Rightarrow 2x=40$

$x=20$

Answer 13.

Let the two nos be x and y

Then, as per the question,

Their Sum $=x+y=50$

Their difference $=x-y=10$

Then, adding the two equations, $2x=60$

$x=30, y=20$

Answer 14.

Let the two nos be x and y

Then, as per the question,

$x-21=71-x$

$\Rightarrow 2x=92 \Rightarrow x=46$

Answer 15.

Let the two parts be x and y.

Then, $x+y=300$

Also, one part is less than the other by 48.

$\Rightarrow \frac{1}{2}(300-x)-x=48$

$\Rightarrow 300-3x=96$

$\Rightarrow x=\frac{204}{3}=68$

Then, $y=300-68=232$

Answer 16.

Let the two consecutive even numbers be 2n and 2n+1.

Then As per the question,

$2n+(2n+2)=38$

$\Rightarrow 4n=36$ or $n=9$

Thus, numbers are $2n=18$ and $2n+1=20$.

Answer 17.

Let the complementary angles be

$\angle 1+\angle 2=90°$

Then, as per question, Also, $\angle 1-\angle 2=14°$

Solving, the equation:

$\angle 1=52°$ and $\angle 2=38°$

Answer 18.

Let the supplementary angles be

$\angle 1+\angle 2=180°$

$\Rightarrow (7x+6)+(2x-15)=180°$

$\Rightarrow 9x=180°+15°-6°=189°$

$\Rightarrow \frac{189}{9}=21°$

Thus, the measure of the angles are: $(7x+6)_V$

and $(2x-15)°$.

$=153°$ and $27°$

Answer 19.

We know that, sum of the measure of the angles of a triangle is 180°.

$9x-5+7x+5+20x=180°$

$\Rightarrow 36x=180$

$\Rightarrow x=\frac{180}{36}$

$\Rightarrow x=5$

To show that the triangle is isosceles, we can show that at least two angles of the triangle are equal.

$9x-5=9(5)-5=40$

$7x+5=7(5)+5=40$

So, the triangle is an isosceles trianlge.

Answer 20.

Sum of angles of a quadrilateral = 360°

$\Rightarrow x°+(3x-40)°+2x°+(4x+30)°=360°$

$\Rightarrow 10x°-10°=360°$

$\Rightarrow x=37°$

Therefore, the measures of the angles are 37°,(3X37-40)°, 2X37° and (4X37+20)°

i.e 37°,71°,74° and 168°.

Answer 21.

Let the two numbers be x and y.

Then Given, $x+y=150$ and $x:y=2:3$

Then, the number $x=\frac{2}{2+3}$ of $150=\frac{2\times150}{5}=60$

And $y=\frac{3}{2+3}$ of $150=\frac{3\times150}{5}=90$

Answer 22.

Let the two numbers be x and y

Then, $x:y=11:13$

The smaller number =

$$\frac{11}{11+13}\text{ of }(x+y)=286\text{ (Given)}$$

$$\Rightarrow\frac{11}{24}\times(x+y)=286$$

$$\Rightarrow(x+y)=\frac{286\times24}{11}=624$$

The bigger number=

$$\frac{13}{11+13}\text{of }(624)$$

$$\Rightarrow\frac{13}{24}\times(624)=338$$

Answer 23.

Let the two consecutive even natural numbers be $2x$ and $2x+2$.

As per the given condition,

$(2x+2)^2-(2x)^2=68$

$\Rightarrow 4x^2+8x+4-4x^2=68$

$\Rightarrow 8x+4=68$

$\Rightarrow 8x=64$

$\Rightarrow x=\frac{64}{8}$

$\Rightarrow x=8$

$2x=2(8)=16$ and $2x+2=2(8)+2=16+2=18$

Hence, the numbers are 16 and 18.

Answer 24.

Let the two consecutive odd natural numbers be $2n+1$ and $2n+3$, where n is a natural number.

Given, $(2n+3)^2+(2n+1)^2=650$

$\Rightarrow (4n^2+9+12n)+(4n^2+1+4n)=650$

$\Rightarrow 8n^2+10+16n=650$

$\Rightarrow 8n^2+16n-640=0$

$\Rightarrow n^2+2n-80=0$

$\Rightarrow n^2+10n-8n-80=0$

$\Rightarrow n(n+10)-8(n+10)=0$

$\Rightarrow (n-8)(n+10)=0$

Thus, $n=8$ as $n=-10$ is not possible.

Thus, the two consecutive odd natural numbers are 17 and 19

Answer 25.

Let the two consecutive even natural numbers be $2x+1$ and $2x+3$.
As per the given condition,

$$(2x+3)^2-(2x+1)^2=72$$
$$\Rightarrow 4x^2+12x+9-[4x^2+4x+1]=72$$
$$\Rightarrow 4x^2+12x+9-4x^2-4x-1=72$$
$$\Rightarrow 12x+9-4x-1=72$$
$$\Rightarrow 8x=64$$
$$\Rightarrow x=\frac{64}{8}$$
$$\Rightarrow x=8$$

$2x+1=2(8)+1=16+1=17$ and $2x+3=2(8)+3=16+3=19$
Hence, the numbers are 17 and 19.

Answer 26.

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

Given, The denominator of a fraction is 18 more than the numerator.

i.e., x=y-18

or y-x=18---(1)

Also, If 1 is added to both the numerator and denominator, the value of the fraction equals the value of fraction obtained by adding 8 to the numerator and 15 to the denominator.

$$\Rightarrow \frac{x+1}{y+1}=\frac{x+8}{y+15}$$
$$\Rightarrow \frac{x+1-(y+1)}{y+1}=\frac{x+8-(y+15)}{y+15}$$
$$\Rightarrow \frac{x-y}{y+1}=\frac{x-y-7}{y+15}$$

$$\Rightarrow \frac{-18}{y+1} = \frac{-18-7}{y+15}$$

$$\Rightarrow \frac{18}{y+1} = \frac{25}{y+15}$$

$\Rightarrow 18y + 18 \times 15 = 25y + 25$
$\Rightarrow 7y = 245$
$\Rightarrow y = 35.$
Hence, $x = y - 18 = 35 - 18 = 17$

The fraction is $\frac{17}{35}$

Answer 27.

Let the units place be x and tens place be y.

Then, the two-digit number is 10y+x.

Given, the digit at the ten's place is 4 times the digit at the unit's place.

$\Rightarrow y=4x$---(1)

Also, sum of the digits and the number is 92.

$\Rightarrow x+y+(10y+x)=92$

$\Rightarrow 11y+2x=92$---(2)

Solving (1) and (2), we get:

$11X4x+2x=92$

$46x=92$

$\Rightarrow x=2$

So, $y=8$

Then, the two-digit number is $10X8+2=82$

Answer 28.

Let the units place be x and tens place be y.

Then, the two-digit number is 10y+x.

Given, x:y=3:2---(1)

If the digits are reversed,

The reversed number is 10x+y.

The original number is 10y+x.

Given the resulting number with reversed digits is 27 more than the original number.

$\Rightarrow 10x+y-27=10y+x$

$\Rightarrow 9x-9y-27=0$

$\Rightarrow x=y+3$---(2)

Using (2) in (1), gives:

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

$\Rightarrow 2y+6=3y$

$\Rightarrow y=6$

Thus, $x=y+3=9$

The number is $10y+x=10\times 6+9=69$

Ex 7.3

Answer 1.

Let the distance covered by walking = x km.

Then, the distance covered on the motorcycle = (95-x) km

Speed when walking = 5 km/hr.

Time taken = $\frac{x}{5}$ hrs

Speed on motorcycle = 40km/h

Time taken on motorcycle = $\frac{95-x}{40}$ hrs

As the total time is 3 hours.

Thus, we get:

$$\frac{x}{5}+\frac{95-x}{40}=5$$

Taking LCM, we get :

$$\Rightarrow \frac{8x+95-x}{40}=5$$

$$\Rightarrow 7x+95=200$$

$$\Rightarrow 7x=105$$

$$\Rightarrow x=15\text{km}.$$

Then, the distance covered on the motorcycle = (95-x) km

= (95-15) km = 80 km.

Answer 2.

Let the speed of Anand be x km/hr.

Then Speed of Sonu=(x+4) km/hr.

In 5 hours, Anand travels =5x km

In 5 hours, Sonu travels=5(x+4) km

Distance between two places =660km

The total distance travelled by Anand and Sonu will be same as the distance between two places

ATQ, 5x+5(x+4) =660

$\Rightarrow$10x +20=660

$\Rightarrow$ 10x =640

$\Rightarrow$ x=64 km/hr

Speed of Anand=64km/hr

Speed of Sonu= 64+4=68km/hr

Answer 3.

Let the distance of the market from his home= x km.

Speed= 4 km/h

Time taken= $\frac{x}{4}$ hrs

Also, distance of the market to home= x km.

Speed= 3 km/h

Time taken = $\frac{x}{3}$ hrs

As per the condition, he took 30 minutes more in returning from the market.

$$\frac{x}{3}-\frac{x}{4}=\frac{30}{60}$$

$$\Rightarrow \frac{4x-3x}{12}=\frac{1}{2}$$

$$\Rightarrow \frac{x}{12}=\frac{1}{2}$$

$\Rightarrow$ x = 6km.

Answer 4.

Distance =30 km.

Let the speed of A be x km/hr.

And, the speed of B be y km/hr.

Then, time taken by A= $\left(\frac{30}{x}\right)$ hrs.

Also, time taken by B= $\left(\frac{30}{y}\right)$ hrs.

As per given ques, A takes 4hours more than B in walking 30 km.

$$\Rightarrow\left(\frac{30}{x}\right)=4+\left(\frac{30}{y}\right)---(1)$$

Also, If A doubles his speed, he will take 1hr less than B.

$$\Rightarrow\left(\frac{30}{2x}\right)+1=\left(\frac{30}{y}\right)---(2)$$

Using (2) in (1), gives :

$$\left(\frac{30}{x}\right)=4+\left(\frac{30}{2x}\right)+1$$

$$\Rightarrow\left(\frac{30}{x}\right)-\left(\frac{15}{x}\right)=5$$

$$\Rightarrow\frac{15}{x}=5$$

$$\Rightarrow x=3\text{km/hr.}$$

From (1),

$$\Rightarrow\left(\frac{30}{3}\right)=4+\left(\frac{30}{y}\right)$$

$$\Rightarrow 6=\left(\frac{30}{y}\right)$$

$$\Rightarrow y=5\text{ km/hr.}$$

Thus, the speed of A is 3 km/hr.

And, the speed of B is 5 km/hr.

Answer 5.

Let the total time taken by the motorcyclist to reach his destination = x hrs

Speed =24km/h

Also, the distance of his destination from the start= Speed x time

Speed =30km/h

Given, driving at 24km/hr, a person reaches his destination 5 minutes late.

Therefore, time taken by him in reaching the destination $=\left(x+\frac{5}{60}\right)$hr

And driving at 30km/hr , he will reach 4 minutes early to the destination.

Therefore, time taken by him in reaching the destination $=\left(x-\frac{4}{60}\right)$hr

We, know that distance between the start and destination will remain the same

$$\therefore 24\left(x+\frac{5}{60}\right)=30\left(x-\frac{4}{60}\right)$$
$$\Rightarrow 24(60x+5)=30(60x-4)$$
$$\Rightarrow 1440x+120=1800x-120$$
$$\Rightarrow 360x=240$$
$$\Rightarrow x=\frac{240}{360}=\frac{2}{3}$$

Therefore, the distance of his destination $= 30\left(\frac{2}{3}-\frac{4}{60}\right)\text{km}=30\left(\frac{40-4}{60}\right)=18\text{km}$

Answer 6.

Let the total time taken by the boy from home to his school be = x hrs

Speed =4km/h

Also, the distance of his office to home= Speed x time

Speed =3km/h

Given, Walking at 4km/hr, a boy reaches his school 10 minutes early.

Therefore, time taken by him in reaching the school $=\left(x-\frac{10}{60}\right)$hr

And walking at 3km/hr, he will reach 10 minutes late to the school.

Therefore, time taken by him in reaching the school $=\left(x+\frac{6}{60}\right)$hr

We, know that distance between the home and school will remain the same

$$\therefore 4\left(x-\frac{10}{60}\right)=3\left(x+\frac{10}{60}\right)$$
$$\Rightarrow 4(60x-10)=3(60x+10)$$
$$\Rightarrow 240x-40=180x+30$$
$$\Rightarrow 60x=70$$
$$\Rightarrow x=\frac{70}{60}=\frac{7}{6}\text{hr}$$

Therefore, the distance between house and school=

$$4\left(\frac{7}{6}+\frac{10}{60}\right)\text{km}=4\left(\frac{7}{6}+\frac{1}{6}\right)\text{km}=4\text{km}$$

Answer 7.

Let the average speed of the air plane =x km/hr.

Then, the average speed of the other air plane = (x+40) km/hr

As the planes are moving in opposite directions we will add the average speed of the plane to get the total speed=x+x+40= (2x+40) km/hr

Distance between the airplanes=3400 km.

After 5 hours they are 3400 km apart

$$\therefore 5 = \frac{3400}{2x+40}$$
$$\Rightarrow 10x + 200 = 3400$$
$$\Rightarrow 10x = 3200$$
$$\Rightarrow x = 320 km/hr$$

Therefore, the average speed of the plane=320km/hr

And average speed of the other plane= (320+40) = 360 km/hr

Answer 8.

Let the distance between the two ports= x km.

Given, the speed of the stream is 2 km/h

Let the speed of man in still water= y km/h.

Relative speed upstream=(y-2) km/h

Relative speed downstream=(y+2) km/h

Then, time taken to go upstream= $\frac{x}{y-2}$ hrs

Then, time taken to go downstream= $\frac{x}{y+2}$ hrs

Also, given steamer goes in down stream from one port to another in 4hours.

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

$\Rightarrow x = 4y + 8$ --(1)

Also, It covers the same distance in upstream in 5 hours

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

$\Rightarrow x = 5y - 10$ - - - (2)

Solving, (1) and (2), we get:

$4y+8=5y-10$

$\Rightarrow y = 18$ km/hr.

$x = (4 \times 18+8)$ km $= (72+8)$ km $= 80$ km

Answer 9.

Distance travelled downstream = 20 km.

Distance travelled upstream = 12 km.

Given, The speed of a boat in still water is 8km/h.

Let the speed of the stream = x km/hr.

Relative speed upstream = (8-x) km/hr

Relative speed downstream = (8+x) km/hr

Time taken to go upstream = $\frac{12}{8-x}$ hrs

Time taken to go downstream = $\frac{20}{8+x}$ hrs

As per given condition, boat takes the same time in going 20km in downstream as it takes in going 12 km upstream.

$\Rightarrow \frac{12}{8-x} = \frac{20}{8+x}$

$12(8+x)=20(8-x)$

$\Rightarrow 12 \times 8+12x=20 \times 8-20x$

$\Rightarrow 8(20-12) = 32x$

$\Rightarrow 64 = 32x$

$\Rightarrow x=2$km/hr

Thus, the speed of the stream = 2 km/hr.

Answer 10.

The average speed of speeding car is 80 km/h.

The average speed of police car is 100 km/h.

As the police car and the speeding car is moving in the same direction so

Therefore there average speed would be subtracted to get the total speed=

100km/hr – 80 km/hr=20 km/hr

Therefore the car will travel 20km in 1hour i.e 20km in 60 minutes

So, the time taken by car to travel 1km $= \frac{60}{20} = 3\,\text{minutes}$

So, time taken by car to cover a distance of 5 km as the speeding car is 5 km ahead $= \frac{60}{20} \times 5 = 15\,\text{minutes}$

Answer 11.

Let Jayeeta's age be x years and Shweta's age be 6x years.
15 years hence, means after 15 years.
As per the given condition,
$6x + 15 = 3(x + 15)$
$\Rightarrow 6x + 15 = 3x + 45$
$\Rightarrow 3x = 30$
$\Rightarrow x = 10$

Jayeeta's age = x years = 10 years
Shweta's age = 6x = 6(10) = 60 years
Hence, Jayeeta's age is 10 years and Shweta's age is 60 years.

Answer 12.

Let the common multiple be x.

So, P's age be 7x years and Q's age be 5x years.

10 years hence, means after 10 years.

As per the given condition,

$$\frac{7x+10}{5x+10}=\frac{9}{7}$$

$$\Rightarrow 7(7x+10)=9(5x+10)$$

$$\Rightarrow 49x+70=45x+90$$

$$\Rightarrow 49x-45x=90-70$$

$$\Rightarrow 4x=20$$

$$\Rightarrow x=5$$

P's age $=7x$ years $=7(5)=35$ years

Q's age $=5x=5(5)=25$ years

Hence, P's age is 35 years and Q's age is 25 years.

Answer 13.

Let the son's age be x years, so the man's age is 2x years.

As per the given condition,

$$\frac{2x+8}{x+8}=\frac{7}{4}$$

$$\Rightarrow 4(2x+8)=7(x+8)$$

$$\Rightarrow 8x+32=7x+56$$

$$\Rightarrow 8x-7x=56-32$$

$$\Rightarrow x=24$$

Son's age $=x$ years $=24$ years

Man's age $=2x$ years $=2(24)=48$ years

Hence, son's age is 24 years and man's age is 48 years.

Ex 7.4

Answer 1.

Let the breadth of the rectangle be x cm.

So, the length of the rectangle = $(30 + x)$ cm

As per the given condition,

Perimeter of the rectangle = 180

$\Rightarrow 2(l + b) = 180$

$\Rightarrow 2(30 + x + x) = 180$

$\Rightarrow 2(30 + 2x) = 180$

$\Rightarrow 60 + 4x = 180$

$\Rightarrow 4x = 180 - 60$

$\Rightarrow 4x = 120$

$\Rightarrow x = 30$

breadth = x cm = 30 cm

length = $(30 + x)$ cm = $(30 + 30)$ cm = 60 cm

Hence, the breadth is 30 cm and the length is 60 cm.

Answer 2.

Let the breadth of the rectangle be x cm.

Perimeter of the rectangle = 80

$\Rightarrow 2(l + x) = 80$

$\Rightarrow l + x = 40$

$\Rightarrow l = 40 - x$

So, the area = $lb = x(40 - x) = 40x - x^2$

breadth = $(x + 2)$ m

length = $(40 - x - 2)$ m = $(38 - x)$ m

So, area = $(38 - x)(x + 2) = 38x + 76 - x^2 - 2x = -x^2 + 36x + 76$

As per the given condition,

$-x^2 + 36x + 76 - (40x - x^2) = 36$

$\Rightarrow -x^2 + 36x + 76 - 40x + x^2 = 36$

$\Rightarrow 36x + 76 - 40x = 36$

$\Rightarrow -4x = -40$

$\Rightarrow x = 10$

So, breadth = 10 m and length = $40 - x = 30$ m

Hence, the breadth is 10 m and the length is 30 m.

Answer 3.

Let the base of the triangle be x cm.
So, each of its equal sides $= (x + 4)$ cm
As per the given condition,
perimeter of the triangle = 29 cm
$\Rightarrow x + x + 4 + x + 4 = 29$
$\Rightarrow 3x = 21$
$\Rightarrow x = 7$ cm
So, $x + 4 = 7 + 4 = 11$ cm
Hence, the sides are 7 cm, 11 cm and 11 cm.

Answer 4.

Let the breadth of the rectangle be x cm.
Perimeter of the rectangle = 100
$\Rightarrow 2(l + x) = 100$
$\Rightarrow l + x = 50$
$\Rightarrow l = 50 - x$

So, the area $= lb = x(50 - x) = 50x - x^2$
breadth $= (x + 3)$ m
length $= (50 - x - 2)$ m $= (48 - x)$ m
So, area $= (48 - x)(x + 3) = 48x + 144 - x^2 - 3x = -x^2 + 45x + 144$

As per the given condition,
$-x^2 + 45x + 144 - (50x - x^2) = 44$
$\Rightarrow -x^2 + 45x + 144 - 50x + x^2 = 44$
$\Rightarrow -5x = -100$
$\Rightarrow x = 20$

So, breadth = 20 m and length $= 50 - x = 30$ m
Hence, the breadth is 20 m and the length is 30 m.

Answer 5.

Let the number of days in which B alone can do the work be x days.

So, B can do $\frac{1}{x}$ part of the work in a day.

Given that the number of days in which A alone can do the work is 10 days.

So, A can do $\frac{1}{10}$ part of the work in a day.

Together they can complete the work in 6 days.

So, together they can do $\frac{1}{10}$ part of the work in a day.

As per the given condition,

$$\frac{1}{x}+\frac{1}{10}=\frac{1}{6}$$

$$\Rightarrow \frac{10+x}{10x}=\frac{1}{6}$$

$$\Rightarrow 6(10+x)=10x$$

$$\Rightarrow 60+6x=10x$$

$$\Rightarrow 4x=60$$

$$\Rightarrow x=15$$

Hence, B can complete the work in 15 days.

Answer 6.

Let the number of days in which B alone can do the work be x days.

So, B can do $\frac{1}{x}$ part of the work in a day.

Given that the number of days in which A alone can do the work is 10 days.

So, A can do $\frac{1}{12}$ part of the work in a day.

Together they can complete the work in 6 days.

So, together they can do $\frac{1}{4}$ part of the work in a day.

As per the given condition,

$$\frac{1}{x}+\frac{1}{12}=\frac{1}{4}$$

$$\Rightarrow \frac{12+x}{12x}=\frac{1}{4}$$

$$\Rightarrow 4(12+x)=12x$$

$$\Rightarrow 48+4x=12x$$

$$\Rightarrow 8x=48$$

$$\Rightarrow x=6$$

Hence, B can complete the work in 6 days.

Answer 7.

Let the time taken by the second tap be x hours.

So, the second tap can fill $\frac{1}{x}$ part of the tank in an hour.

Given that the time taken by the first tap to fill the tank is 12 hours.

So, the first tap can fill $\frac{1}{12}$ part of the tank in an hour.

Together they can fill the tank in 6 hours 40 minutes

$= \left(6 + \frac{40}{60}\right)$ hours

$= \left(6 + \frac{2}{3}\right)$ hours $= \frac{20}{3}$ hours

So, together they can fill $\frac{3}{20}$ part of the tank in an hour.

As per the given condition,

$\frac{1}{x} + \frac{1}{12} = \frac{3}{20}$

$\Rightarrow \frac{12+x}{12x} = \frac{3}{20}$

$\Rightarrow 20(12+x) = 36x$

$\Rightarrow 240 + 20x = 36x$

$\Rightarrow 16x = 240$

$\Rightarrow x = 15$

Hence, the time taken by the second tap is 15 hours.

Answer 8.

Let the number be x.

As per the given condition,

$x + 15\%$ of $x = 2921$

$\Rightarrow x + \frac{15}{100} \times x = 2921$

$\Rightarrow x + \frac{15x}{100} = 2921$

$\Rightarrow \frac{115x}{100} = 2921$

$\Rightarrow 115x = 292100$

$\Rightarrow x = 2540$

Hence, the number is 2540.

Answer 9.

Let the number be x.

As per the given condition,

$x - 12\%$ of $x = 1584$

$\Rightarrow x - \frac{12}{100} \times x = 1584$

$\Rightarrow x - \frac{12x}{100} = 1584$

$\Rightarrow \frac{88x}{100} = 1584$

$\Rightarrow 88x = 158400$

$\Rightarrow x = 1800$

Hence, the number is 1800.

Answer 10.

Let the one number be x.

So, the other number is $99 - x$

As per the given condition,

$99 - x = 20\%$ of $x + x$

$\Rightarrow 99 - x = \frac{20}{100} \times x + x$

$\Rightarrow 99 = \frac{20x}{100} + 2x$

$\Rightarrow 99 = \frac{220x}{100}$

$\Rightarrow x = \frac{99 \times 100}{220}$

$\Rightarrow x = 45$

and $99 - x = 99 - 45 = 54$

Hence, the numbers are 45 and 54.

Answer 11.

Let the number of normal hours of work be x hours.
So, in a week the number of overtime work hours $= (56 - x)$ hours
So, for x hours of normal work, the worker is paid Rs. $20x$
and for $(56 - x)$ hours of overtime work the worker gets
paid Rs. $40(56 - x) =$ Rs. $(2240 - 40x)$

As per the given condition,
$2240 - 40x + 20x = 1440$
$\Rightarrow 2240 - 20x = 1440$
$\Rightarrow -20x = -800$
$\Rightarrow x = \frac{800}{20}$
$\Rightarrow x = 40$

Hence, the number of hours of normal work is 40 hours.

Answer 12.

Let the number of games that he won be x.
So, the number of games that he lost is $100 - x$.
As per the given condition,
$50x - 20(100 - x) = 800$
$\Rightarrow 50x - 2000 + 20x = 800$
$\Rightarrow 50x + 20x = 2800$
$\Rightarrow 70x = 2800$
$\Rightarrow x = \frac{2800}{70}$
$\Rightarrow x = 40$

Hence, he won 40 games.

Answer 13.

Let the number of times he hit the mark be x.
So, the number of times he misses it be $100 - x$.
As per the given condition,
$50x - 20(100 - x) = 100$
$\Rightarrow 50x - 2000 + 20x = 100$
$\Rightarrow 50x + 20x = 2100$
$\Rightarrow 70x = 2100$
$\Rightarrow x = \frac{2100}{70}$
$\Rightarrow x = 30$

Hence, he hit the mark 30 times.

Answer 14.

Let the number of benches in the class = x

Number of students sitting in one bench = 4
Number of benches left = 3
Total number of students = $4(x - 3)$

Number of students sitting in one bench = 3
Number of students left = 3
Total number of students = $3x + 3$

Since the total number of students is the same,
so $4(x - 3) = 3x + 3$
$\Rightarrow 4x - 12 = 3x + 3$
$\Rightarrow x = 15$
Therefore, the number of benches = 15
Number of students = $4(x - 3) = 4(15 - 3) = 4(12) = 48$

Answer 15.

Let the CP be Rs. x and the profit is 6%.

$\therefore$ SP $= \left(1+\frac{6}{100}\right)$ of Rs. x $=$ Rs. $\frac{53x}{50}$

If he buys the artide ar 4% less, then

CP $= \left(1-\frac{4}{100}\right)$ of Rs. x $=$ Rs. $\frac{24x}{50}$

New profit $= 12\%$

$\therefore$ New SP $= \left(1+\frac{6}{100}\right)$ of Rs. $\frac{24x}{50}$

$= \text{Rs.}\left(\frac{28}{25}\times\frac{24x}{50}\right)$

As per the given condition,

$\text{Rs.}\left(\frac{28}{25}\times\frac{24x}{50}\right) = \text{Rs.}\frac{53x}{50} + \text{Rs. } 7.60$

$\Rightarrow \frac{672}{625}x = \frac{53x}{50} + \frac{76}{10}$

$\Rightarrow \frac{672}{625}x - \frac{53x}{50} = \frac{76}{10}$

$\Rightarrow (2\times 672 - 25\times 53)x = 125\times 76$

$\Rightarrow 19x = 125\times 76$

$\Rightarrow x = 500$

Hence, the CP of the article is Rs. 500.

Answer 16.

Let the amount he invested at 12% interest be Rs. x and the amount he invested at 14% interest be Rs. (35000 – x).

As per the given condition,

$\frac{12x}{100} + \frac{14(35000-x)}{100} = 4460 \quad \ldots\ldots\left[\text{Using SI} = \frac{PNR}{100}\right]$

$\Rightarrow \frac{12x}{100} + \frac{490000-14x}{100} = 4460$

$\Rightarrow \frac{12x+490000-14x}{100} = 4460$

$\Rightarrow 490000 - 2x = 446000$

$\Rightarrow -2x = -44000$

$\Rightarrow x = 22000$

and $35000 - x = 35000 - 22000 = \text{Rs. } 13000$

Hence, the amount he invested at 12% is Rs. 22000 and the amount he invested at 14% is Rs. 13000.

Answer 17.

Let the quantity of cashew kernels be x kg in 700 g $\left(\text{that is, } \frac{700}{1000}\text{kg}\right)$

and the quantity of dry grapes by $\left(\frac{700}{1000} - x\right)$ kg $= (0.7 - x)$ kg

Since the cashew kernels cost Rs. 96 per kg,

so x kg of cashew kernels cost Rs. $96x$

Since the dry grapes cost Rs. 112 per kg,

so $(0.7 - x)$ kg cost Rs. $112(0.7 - x)$

As per the given condition,

$112(0.7 - x) + 96x = 72$

$\Rightarrow 78.4 - 112x + 96x = 72$

$\Rightarrow -16x = -6.4$

$\Rightarrow x = 0.4$

$0.7 - x = 0.7 - 0.4 = 0.3$ kg

So, the quantity of cashew kernels is 0.4 kg = 400 g

and the quantity of dry grapes is 300 g.

Answer 18.

Let the amount of water be x litres.

$$\text{Volume of acid in the solution} = 33\frac{1}{3}\% \text{ of 12 litres}$$

$$= \frac{100}{3}\% \times 12$$

$$= \frac{100}{300} \times 12$$

$$= 4 \text{ litres}$$

Concentration of acid in $(12 + x)$ litres of solution = 20%

$$\Rightarrow \frac{4}{12 + x} = \frac{20}{100}$$

$$\Rightarrow \frac{4}{12 + x} = \frac{1}{5}$$

$\Rightarrow 12 + x = 20$

$\Rightarrow x = 8$ litres

Hence, 8 litres of water should be added.

Answer 19.

Let the amount of property be x.

Daughter's share $= x - \frac{1}{2}x - \frac{1}{3}x$

As per the given condition,

$$x - \frac{1}{2}x - \frac{1}{3}x = 15000$$

$$\Rightarrow \frac{6x - 3x - 2x}{6} = 15000$$

$$\Rightarrow \frac{x}{6} = 15000$$

$$\Rightarrow x = 90000$$

$$\frac{1}{2}x = \frac{90000}{2} = 45000$$

Hence, the amount of property he left was Rs. 90000 and the amount his wife got was Rs. 45000.

Ex 7.5

Answer 1.

Let the Age of B be x years.

Then, the age of A becomes 6x years.

After 15 years,

Age of A after 15 years =6x+15

Age of B after 15 years=x+15

Given, 15 years hence A will be three times as old as B.

$\Rightarrow 6x + 15 = 3(x + 15)$
$\Rightarrow 6x + 15 = 3x + 45$
$\Rightarrow 3x = 30$
$\Rightarrow x = 10$ years.

Thus, the Age of B be 10 years.

Then, the age of A becomes 60 years.

Answer 2.

Given, the present ages of A and B are in the ratio 7:5.

$\therefore$ Their present ages are $7x : 5x$.
After 10 years, their ages will be :
$(7x + 10)$ and $(5x + 10)$ respectively.
New ratio of their ages = 9 : 7
Asper given conditions,

$$\frac{(7x + 10)}{(5x + 10)} = \frac{9}{7}$$

$\Rightarrow 7(7x + 10) = 9(5x + 10)$
$\Rightarrow 49x + 70 = 45x + 90$
$\Rightarrow 4x = 20$
$\Rightarrow x = 5$ years.

Thus, the present ages of A and B are 35 and 25 respectively.

Answer 3.

Let the present age of the son be x years.

Then, the father's age=2x years.

After 8 years, their ages will be (x+8) years and (2x+8) years resp.

Given, After 8 years, the ratio of their ages will be 7:4.

Asper given conditions,

$$\frac{(x+8)}{(2x+8)} = \frac{4}{7}$$

$$\Rightarrow 7x + 56 = 8x + 32$$

$$\Rightarrow x = 24 \text{ years.}$$

Thus, the present age of the son is 24 years.

Then, the father's age=48 years.

Answer 4.

Let the age of the son be x years.

Then, the man's age= 3x years.

After 10 years, their ages becomes

(x+10) and (3x+10) respectively.

Asper given conditions,

$$\frac{(x+10)}{(3x+10)} = \frac{1}{2}$$

$$\Rightarrow 2x + 20 = 3x + 10$$

$$\Rightarrow x = 10 \text{ years}$$

Thus, the present age of the son is 10 years.

Then, the man's age=30years.

Answer 5.

Given, The difference between the ages of two brothers is 10 years

So, let their ages be x and (x-10) years respectively.

Their ages 15 years ago are,

(x-15) and (x-25) respectively.

Also, given 15 years ago their ages were in the ratio 2:1.

Asper given conditions,

$$\frac{(x-15)}{(x-25)} = \frac{2}{1}$$

$$\Rightarrow x - 15 = 2x - 50$$

$$\Rightarrow x = 50 - 15 = 35 \text{ years.}$$

Thus, their present ages are x=35years and 20 years respectively.

Also, their ages 15 years hence are,

(x+15) and x+5 respectively= 50 and 40 years.

Thus, the ratio of their ages 15 years hence

$$\frac{(x+15)}{(x)} = \frac{50}{40} = \frac{5}{4}$$

Answer 6.

Given, present age of boy is one-third as that of his father.

So, let the present age of the son be x years.

Then, present age of father is 3x years.

Twelve years hence, their ages becomes, (x+12) and (3x+12) respectively.

Asper given conditions,

$$\frac{(x+12)}{(3x+12)} = \frac{1}{2}$$

$$\Rightarrow 2x + 24 = 3x + 12$$

$$\Rightarrow x = 12 \text{ years}$$

Thus, the present age of the son is 12 years.

Then, present age of father is 36 years.

Answer 7.

Let the present age of the son be x years.

Then, the man's present age= y years.

5 years ago, their ages were

(x-5) and (y-5) respectively.

Asper given conditions,

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

$\Rightarrow 7x - 35 = y - 5$

$\Rightarrow 7x - y = 30 - - - -(1)$

Also, 5 years hence, their ages are

$(x + 5)$ and $(y + 5)$ resp.

Given, The age of the man will be 3 times the age of his son in 5 years from now.

$\Rightarrow (y + 5) = 3(x + 5)$

$\Rightarrow y - 3x = 10 - - - -(2)$

Adding (1) and (2), we get :

$4x = 40$

$\Rightarrow x = 10$ years.

$\Rightarrow y = 3x + 10 = 30 + 10$

$= 40$ years.

Thus, the present age of the son is 10 years.

Then, the man's age=40years.

Answer 8.

Let the present age of the son be x years.

Then, the man's age=2x years.

20 years ago, their ages will be (x-20) years and (2x-20) years resp.

Given, Twenty years ago, son was six times his son's age.

Asper given conditions,

$$\frac{(x-20)}{(2x-20)} = \frac{1}{6}$$

$\Rightarrow 6x - 120 = 2x - 20$

$\Rightarrow 4x = 100$

$\Rightarrow x = 25$ years.

$\Rightarrow y = 50$ years.

Thus, the present age of the son is 25 years.

Then, the man's age=50 years.

Answer 3.

Let the breadth of the rectangle be x cm.

Then, length is (x+30) cm.

Given, The perimeter of the rectangle is 180 cm.

$\Rightarrow 2(\text{length} \times \text{breadth}) = 180$ cm

$\Rightarrow 2(x + x + 30)\text{cm} = 180$ cm

$\Rightarrow 2x + 30 = 90$ cm

$\Rightarrow 2x = 60$ cm

$\Rightarrow x = 30$ cm

Thus, the breadth of the rectangle is 30 cm.

Then, length is 60cm.

Answer 10.

Let the length of the rectangular field be x m and breadth be y m.

Given, the perimeter of a rectangular field is 80m.

$\Rightarrow 2(x+y)=80$ m

$\Rightarrow x+y=40$ m -----(1)

Original area $=xy$ m^2

New increased length $=(x+2)$ m

New decreased breadth $=(y-2)$m

Then, new area $=(x+2)(y-2)$ m^2

Also, given the breadth is increased by 2 m and the length is decreased by 2 m, the area of the field increases by 36m^2

$\Rightarrow (x+2)(y-2)$ m^2 $= (xy+36)$ m^2

$\Rightarrow (Xy+2y-2x-4)$m$^2 = (xy+36)$ m^2

$\Rightarrow 2(y-x) =40$ m^2

$\Rightarrow (y-x)=20$ ----(2)

Solving (1) and (2), we get:

$y = 30$ m and $x = 10$ m.

Thus, the length of the rectangular field is 10 m and breadth is 30m.

Answer 11.

Let the length of the rectangle be $(x+3)$ cm and breadth be x cm.

Given, the perimeter of a rectangular field is 18m.

$\Rightarrow 2(x+x+3) =18$ m

$\Rightarrow 2(2x+3) =18$ m

$\Rightarrow 2x+3=9$

$\Rightarrow 2x=6$

$\Rightarrow x=3$ cm

Thus, the length of the rectangle is 6 cm and breadth is 3cm.

Answer 12.

Let the length of the rectangular field be x m and breadth be y m.

Given, the perimeter of a rectangular field is 140m.

$\Rightarrow 2(x+y)=140\,m$

$\Rightarrow x+y=70\,m$ ----- (1)

Original area $=xy\,m^2$

New increased length $=(x+2)\,m$

New decreased breadth $=(y-3)\,m$

Then, new area $=(x+2)(y-3)\,m^2$

Also, given the length of the field is increased by 2 m and the breadth decreased by 3m, the area is decreased by 66 m^2

$\Rightarrow (x+2)(y-3)\,m^2 = (xy-66)\,m^2$

$\Rightarrow (xy+2y-3x-6)\,m^2 = (xy-66)\,m^2$

$\Rightarrow 2y-3x) = -60$

$\Rightarrow (2y-3x)=-60$ ---- (2)

Solving (1) and (2), we get:

x = 40 m and y = 30 m.

Thus, the length of the rectangular field is 40 m and breadth is 30 m.

Answer 13.

Let the base of the isosceles triangle be x cm long.

Then, the equal sides are (x+4) cm.

Given, the perimeter of the triangle is 29cm

$\Rightarrow 2(x+4)+x=29$ cm

$3x+8=29$ cm

$\Rightarrow 3x=21$

$\Rightarrow x=7$ cm

Thus, the base of the isosceles triangle is 7 cm long.

Then, the equal sides are 11cm.

Answer 14.

Let the length of the rectangle be x

$breadth = x-2$

$perimeter = 2(length + breadth)$

$\therefore 2(x+x-2)=14$

$\Rightarrow 2x-2=7$

$\Rightarrow x=4.5$

$\therefore breadth = 4.5-2=2.5$

Answer 15.

Let the length of the rectangular field be x m and breadth be y m.

Given, the perimeter of a rectangular field is 80m.

$\Rightarrow 2(x+y) = 100$ m

$\Rightarrow x+y = 50$ m ----- (1)

Original area $= xy$ m^2

New increased length $= (x-2)$ m

New decreased breadth $= (y+3)$ m

Then, new area $= (x-2)(y+3)$ m^2

Also, its length is decreased by 2m and breadth increased by 3 m, the area of the field is increased by 44m^2

$\Rightarrow (x-2)(y+3)$ m^2 $= (xy+44)$ m^2

$\Rightarrow (xy-2y+3x-6)$ m^2 $= (xy+44)$ m^2

$\Rightarrow 3x-2y = 50$ ---- (2)

Solving (1) and (2), we get:

$y = 20$ m and $x = 30$ m.

Thus, the length of the rectangular field is 30 m and breadth is 20m.

Answer 16.

Let the breadth of the rectangle be x m.

Then, the length = (x+3) m.

Then, Area of the room = $x(x+3)$ m^2

If both the length and breadth, are increased by 1m, then:

Increased length = (x+4) m.

Increased Breadth = (x+1) m.

Given, If both the length and breadth, are increased by 1m, then the area of the room is increased by 18 cm^2

$\Rightarrow (x+1)(x+4) = x(x+3) + 18$

$\Rightarrow (x^2+x+4x+4) = x^2+3x+18$

$\Rightarrow 5x-3x = 18-4 = 14$

$\Rightarrow 2x = 14$

$\Rightarrow x = 7$ cm

Thus, the breadth of the rectangle is 7 m.

Then, the length = 10 m.

Answer 17.

Number of days A takes alone to complete the work=10 Days.

$\therefore$ Amount of work done by A in 1 day= $\frac{1}{10}$

Let the number of Days B working alone = x

$\therefore$ Amount of work done by B in 1 day= $\frac{1}{x}$

No of Days they take working together=6 Days

$\therefore$ Amount of work done by both in 1 day= $\frac{1}{6}$

$\Rightarrow \frac{1}{10}+\frac{1}{x}=\frac{1}{6}$

$\Rightarrow \frac{1}{x}=\frac{1}{6}-\frac{1}{10}$

$=\frac{5-3}{30}=\frac{2}{30}=\frac{1}{15}$

$\Rightarrow x = 15$ days

Thus, the number of Days B working alone = 15 days

Answer 18.

Number of days A takes alone to complete the work=12 Days.

$\therefore$ Amount of work done by A in 1 day= $\frac{1}{12}$

Let the number of Days B working alone = x

$\therefore$ Amount of work done by B in 1 day= $\frac{1}{x}$

No of Days they take working together=4 Days

$\therefore$ Amount of work done by both in 1 day= $\frac{1}{4}$

$\Rightarrow \frac{1}{12}+\frac{1}{x}=\frac{1}{4}$

$\Rightarrow \frac{1}{x}=\frac{1}{4}-\frac{1}{12}$

$=\frac{3-1}{12}=\frac{2}{12}=\frac{1}{6}$

$\Rightarrow x = 6$ days

Thus, the number of Days B working alone = 6 days

Answer 19.

Number of hours A takes alone to fill the tank =12 hrs.

$\therefore$ Amount of water filled by tap A in 1 hr = $\frac{1}{12}$

Number of hours tap B takes alone to fill the tank = x

$\therefore$ Amount of water filled by tap B in 1 hr= $\frac{1}{x}$

No of hours Tap A and B take together to fill the tank=6 hrs and 40 minutes

$=6hr+\frac{40}{60}$ hrs

=6hr+2/3 hrs

$\therefore$ Amount of work done by both Tap A and B in 1 hr= $\frac{1}{4}$

$$\Rightarrow \frac{1}{12}+\frac{1}{x}=\frac{1}{4}$$

$$\Rightarrow \frac{1}{x}=\frac{1}{4}-\frac{1}{12}$$

$$=\frac{3-1}{12}=\frac{2}{12}=\frac{1}{6}$$

$\Rightarrow x = 6$ days

Thus, the number of Days B working alone = 6 days

Answer 20.

Time taken by Tap A to empty the tank =6hours

Amount of work done by tap A in 1 hour $=\frac{1}{6}$

Let B takes x hour to empty the tank alone.

Amount of work done by tap B in 1 hour $=\frac{1}{x}$

$\therefore$ Amount of work done by (A+B) in 1 hour $=\frac{1}{x}+\frac{1}{6}$

Tap A along with Tap B together can empty the tank in $3\frac{3}{7}$ hours $=\frac{24}{7}$ hours

$\therefore$ In 1 hour amount of work done by A and B $=\frac{1}{\frac{24}{7}}=\frac{7}{24}$

Now, according to the question

$$\frac{1}{x}+\frac{1}{6}=\frac{7}{24}$$

$$\Rightarrow \frac{1}{x}=\frac{7}{24}-\frac{1}{6}=\frac{7-4}{24}=\frac{3}{24}=\frac{1}{8}$$

$\Rightarrow x = 8$hrs

Ex 7.6

Answer 1.

Let the number be x.

Therefore,

$$x + \frac{8}{100} \times x = 1620$$

$$\Rightarrow \frac{100x + 8x}{100} = 1620$$

$$\Rightarrow 108x = 1620 \times 100$$

$$\Rightarrow x = \frac{1620 \times 100}{108}$$

$$\Rightarrow x = 1500$$

Hence, 1500 is the number.

Answer 2.

Let the number be x.

Therefore,

$$x + \frac{15}{100} \times x = 2921$$

$$\Rightarrow \frac{100x + 15x}{100} = 2921$$

$$\Rightarrow 115x = 2921 \times 100$$

$$\Rightarrow x = \frac{2921 \times 100}{115}$$

$$\Rightarrow x = 2540$$

Hence, 2540 is the number.

Answer 3.

Let the number be x.

Therefore,

$$x - \frac{12}{100} \times x = 1584$$

$$\Rightarrow \frac{100x - 12x}{100} = 1584$$

$$\Rightarrow 88x = 1584 \times 100$$

$$\Rightarrow x = \frac{1584 \times 100}{88}$$

$$\Rightarrow x = 1800$$

Hence, 1800 is the number.

Answer 4.

Let the number be x.

Therefore,

$$x - \frac{18}{100} \times x = 1599$$

$$\Rightarrow \frac{100x - 18x}{100} = 1599$$

$$\Rightarrow 82x = 1599 \times 100$$

$$\Rightarrow x = \frac{1599 \times 100}{82}$$

$$\Rightarrow x = 1950$$

Hence, 1950 is the number.

Answer 5.

Let normal working hours be x and overtime working hours be y.

$x + y = 56$
$y = 56 - x$.....(i)

Also given, total amount received=Rs 1440

$20x + 40y = 1440$
$\Rightarrow x + 2y = 72$.....(ii)

Substituting (i) in (ii)

$x + 2(56 - x) - 72$
$\Rightarrow x + 112 - 2x = 72$
$\Rightarrow x - 2x = 72 - 112$
$\Rightarrow x = 40$

Normal working hours = 40 hrs

Answer 6.

Let working days be x and non-working days be y.

$x + y = 30$
$y = 30 - x$.....(i)

Also given, amount paid to him = Rs 1000

$60x - 20y = 1000$
$\Rightarrow 3x - y = 50$.....(ii)

Substituting (i) in (ii)

$3x - (30 - x) = 50$
$\Rightarrow 3x - 30 + x = 50$
$\Rightarrow 4x = 80$
$\Rightarrow x = 20$

Working days = 20

Answer 7.

Let number of games won be x and number of games lost be y.

$x + y = 100$

$y = 100 - x$.....(i)

Also given, Rs gained = Rs 800

$50x - 20y = 800$

$\Rightarrow 5x - 2y = 80$.....(ii)

Substituting (i) in (ii)

$5x - 2(100 - x) = 80$

$\Rightarrow 5x - 200 + 2x = 80$

$\Rightarrow 7x = 280$

$\Rightarrow x = 40$

Number of games won = 40

Answer 8.

Let the wife work for x hrs.

Since the husband works twice as much as his wife,

Therefore husband works for 2x hrs.

Total numbers of hours worked = 60

$\Rightarrow x + 2x = 60$

$\Rightarrow 3x = 60$

$\Rightarrow x = 20$

$\Rightarrow 2x = 40$

Therefore, wife works for 20 hrs and husband works for 40 hrs

Answer 9.

Let the marksman hit x times and miss y times

Therefore, $x - y = 100 \Rightarrow y = x - 100$..... (i)

Also given, Amount earned = Rs 29 = (29 x 100) paise = 2900 paise

Therefore,

$50x - 20y = 2900$

$5x - 2y = 290$ ..... (ii)

Substituting (i) in (ii)

$5x - 2(x - 100) = 290$

$5x - 2x + 200 = 290$

$3x = 90$

$x = 30$

Therefore, marksman hits 30 times and misses 70 times.

Answer 10.

Let the number of students be x and number of benches be y.

(i) When 4 students sit on one bench:

Number of benches occupied = y-3

$\Rightarrow x = 4(y-3)$ ..... (i)

(ii) When 3 students sit on one bench:

3 students are left standing

$\Rightarrow x-3 = 3y \Rightarrow x = 3y + 3$ ..... (ii)

From (i) and (ii)

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

$4y - 12 = 3y + 3$

$y = 15$

But $x = 4(y-3)$ (from (i))

$\Rightarrow x = 4(15-3)$

$\Rightarrow x = 48$

Therefore, Number of students in the class = 48

Answer 11.

Let the number of students be x and number of seats be y.

(i) When 2 students sit on one seat:

Number of seats occupied = y-7

$\Rightarrow \quad x = 2(y-7) \quad .....(i)$

(ii) When 1 student sit on one seat:

9 students are left standing

$\Rightarrow x - 9 = y \quad \Rightarrow \quad x = y + 9 \quad ..... \ (ii)$

From (i) and (ii)

$2(y-7) = y+9$

$2y - 14 = y + 9$

$y = 23$

Therefore, Number of seats in the class = 23

Answer 12.

Let s be the selling price and c be the cost price.

$$\frac{s-c}{c} = 6\%$$

$\Rightarrow s - c = 0.06c$

$\Rightarrow s = 1.06c.....(i)$

If he bought at 4% less cost price = $c - 4\%c = 0.96c$

and sold at Rs 7.60 higher $\Rightarrow$ selling price = $s + 7.60$

Therefore,

$$\frac{s+7.60-0.96c}{0.96c} = 12\%$$

$$\Rightarrow \frac{s+7.60-0.96c}{0.96c} = 0.12.....(ii)$$

Substituting (i) in (ii)

$$\Rightarrow \frac{(1.06c) + 7.60 - 0.96c}{0.96c} = 0.12$$

$$\Rightarrow \frac{0.1c + 7.60}{0.96c} = 0.12$$

$$\Rightarrow 0.1c + 7.60 = 0.12 \times 0.96c$$

$$\Rightarrow 0.1c + 7.60 = 0.1152c$$

$$\Rightarrow 0.0152c = 7.60$$

$$\Rightarrow c = 500$$

Therefore, his cost price is Rs 500.

Answer 13.

Let x and y be the cost price of first and second article respectively and z be the selling price of both.

Therefore, $x + y = 410$ ..... (i)

For first article: profit = 15%

$$\frac{z - x}{x} = 0.15$$

$$\Rightarrow z - x = 0.15x$$

$$\Rightarrow z = 1.15x \ldots\ldots\ldots (ii)$$

For second article: loss = 10%

$$\frac{y - z}{y} = 0.10$$

$$\Rightarrow y - z = 0.10y$$

$$\Rightarrow z = 0.9y \ldots\ldots\ldots (iii)$$

Selling prices of both are equal, therefore

$0.9y = 1.15x$

$$y = \frac{1.15x}{0.9} \ldots\ldots (iv)$$

Substituting (iv) in (i)

$$x + \frac{1.15x}{0.9} = 410$$

$\Rightarrow 0.9x + 1.15x = 410 \times 0.9$

$\Rightarrow 2.05x = 369$

$\Rightarrow x = 180$

Substituting value of x in (i)

$180 + y = 410$

$\Rightarrow y = 410 - 180 = 230$

Therefore, cost price of two articles = Rs 180 and Rs 230

Answer 14.

Let investment at 12% be x and at 14% be y.

Then, $x + y = 35000 \quad \Rightarrow y = 35000 - x$ ..... (i)

And $0.12x + 0.14y = 4460$ .....(ii)

Substituting (i) in (ii)

$0.12x + 0.14(35000 - x) = 4460$

$\Rightarrow 0.12x + 4900 - 0.14x = 4460$

$\Rightarrow 0.02x = 440$

$\Rightarrow x = 22000$

Substituting value of x in (i)

$\Rightarrow y = 35000 - 22000$

$\Rightarrow y = 13000$

Therefore, he invested Rs 22000 at 12% and Rs 13000 at 14%

Answer 15.

Let quantities of cashew kernels and dry grapes be x and y respectively.

Therefore, $x + y = 700g \quad \Rightarrow y = 700 - x \quad .....(i)$

Cost of cashew kernels = Rs 96/kg $\Rightarrow$ 0.096/g

Cost of dry grapes = Rs 112/kg $\Rightarrow$ 0.112/g

Cost of dry fruit pack = Rs 72

Therefore,

$0.096x + 0.112y = 72.....(ii)$

Substituting (i) in (ii)

$0.096x + 0.112(700 - x) = 72$
$\Rightarrow 0.096x + 78.4 - 0.112x = 72$
$\Rightarrow 0.016x = 6.4$
$\Rightarrow x = 400$

Substituting value of x in (i)

$400 + y = 700 \Rightarrow y = 300$

Therefore, cashew kernels = 400g and dry grapes = 300g

Answer 16.

Total number of votes polled = 9791

Number of invalid votes = 116

Number of valid votes = 9791 – 116 = 9675

Number of votes received by successful candidate $= \frac{5}{9} \times 9675 = 5375....(i)$

Number of votes received by opponent candidate $= \frac{4}{9} \times 9675 = 4300....(ii)$

Subtracting (ii) from (i)

5375 – 4300 = 1075

Therefore, the successful candidate won by 1075 votes.

Answer 17.

Let x be the water added

Then,

$12(33.33\%) = 20\%(x + 12)$
$\Rightarrow 12 \times 0.3333 = 0.2(x + 12)$
$\Rightarrow 3.999 = 0.2x + 2.4$
$\Rightarrow 0.2x = 1.596$
$\Rightarrow x = 7.95lt = 8lt$

Approximately, 8 litres of water must be added.

Answer 18.

Quantity of solution = 90 kg

$$\text{Quantity of salt} = 90kg \times \frac{10}{100} = 9kg$$

Let x kg of water be evaporated.

Therefore,

$$\frac{9}{90 - x} = \frac{20}{100}$$
$\Rightarrow 900 = 1800 - 20x$
$\Rightarrow 20x = 900$
$\Rightarrow x = 45$

Therefore, 45 kg of water must be evaporated.

Answer 19.

Let x Kg of Rs. 50 per kg tea should be added with 35 kg of tea costing Rs.60/ kg.

Total weight of tea after mixing = (x + 35) Kg

Selling price of (x + 35) Kg= (x + 35) 57 Rs.

But here SP = CP

C.P. of the tea = Rs (50x + 35 x 60)

$\Rightarrow$ (x+35) 57 = 50x + 2100

$\Rightarrow$ 57x + 1995 = 50x + 2100

$\Rightarrow$ 7x = 105

$\Rightarrow$ x= 15 kg

Therefore, 15 Kg of Rs. 50 per kg should be added.

Answer 20.

Let x be the total money left by the man.

Share of wife = $\frac{1}{2}x$

Share of son = $\frac{1}{3}x$

Share of daughter = $x - \frac{1}{2}x - \frac{1}{3}x = 0.166667x$

But daughter's share = Rs 15000

$\Rightarrow 0.166667x = Rs15000$

$\Rightarrow x = Rs90000$

Share of wife = $\frac{1}{2}x = \frac{1}{2} \times Rs90000 = Rs45000$

Therefore, Man left Rs 90000 and wife's share is Rs 45000