Chapter 8. Simultaneous Linear Equations

Ex 8.1

Answer 1A.

The given equations are

$2x + y = 8 \quad \ldots.(i)$

$3y = 3 + 4x \quad \ldots.(ii)$

Now, consider equation $2x + y = 8$

$\Rightarrow y = 8 - 2x \quad \ldots.(iii)$

Substituting the value of y in eqn. (ii), we get

$3(8 - 2x) = 3 + 4x$

$\Rightarrow 24 - 6x = 3 + 4x$

$\Rightarrow -6x - 4x = 3 - 24$

$\Rightarrow -10x = -21$

$\Rightarrow x = \frac{21}{10}$

Putting the value of x in eqn. (iii), we get

$y = 8 - 2\left(\frac{21}{10}\right) = 8 - \frac{21}{5} = \frac{40 - 21}{5} = \frac{19}{5}$

Thus, the solution set is $\left(\frac{21}{10}, \frac{19}{5}\right)$.

Answer 1B.

The given equations are

$x + 3y = 5 \quad \ldots.(i)$

$7x - 8y = 6 \quad \ldots.(ii)$

Now, consider equation $x + 3y = 5$

$\Rightarrow x = 5 - 3y \quad \ldots.(iii)$

Substituting the value of x in eqn. (ii), we get

$7(5 - 3y) - 8y = 6$

$\Rightarrow 35 - 21y - 8y = 6$

$\Rightarrow 35 - 29y = 6$

$\Rightarrow -29y = -29$

$\Rightarrow y = 1$

Putting the value of y in eqn. (iii), we get

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

Thus, the solution set is (2, 1).

Answer 1C.

The given equations are

$5x + 4y - 23 = 0 \quad ....(i)$

$x + 9 = 6y \quad ....(ii)$

Now, consider equation $x + 9 = 6y$

$\Rightarrow x = 6y - 9 \quad ....(iii)$

Substituting the value of x in eqn. (i), we get

$5(6y - 9) + 4y - 23 = 0$

$\Rightarrow 30y - 45 + 4y - 23 = 0$

$\Rightarrow 34y - 68 = 0$

$\Rightarrow 34y = 68$

$\Rightarrow y = \frac{68}{34} = 2$

Putting the value of y in eqn. (iii), we get

$x = 6(2) - 9 = 12 - 9 = 3$

Thus, the solution set is (3, 2).

Answer 1D.

The given equations are

$2x + 3y = 31 \quad ....(i)$

$5x - 4 = 3y \quad ....(ii)$

Now, consider equation $2x + 3y = 31$

$\Rightarrow 2x = 31 - 3y$

$\Rightarrow x = \frac{31 - 3y}{2} \quad ....(iii)$

Substituting the value of x in eqn. (ii), we get

$5\left(\frac{31 - 3y}{2}\right) - 4 = 3y$

$\Rightarrow \frac{155 - 15y}{2} - 4 = 3y$

$\Rightarrow \frac{155 - 15y - 8}{2} = 3y$

$\Rightarrow 147 - 15y = 6y$

$\Rightarrow 21y = 147$

$\Rightarrow y = \frac{147}{21} = 7$

Putting the value of y in eqn. (iii), we get

$x = \frac{31 - 3(7)}{2} = \frac{31 - 21}{2} = \frac{10}{2} = 5$

Thus, the solution set is (5, 7).

Answer 1E.

The given equations are

$7x - 3y = 31 \quad ....(i)$

$9x - 5y = 41 \quad ....(ii)$

Now, consider equation $7x - 3y = 31$

$\Rightarrow 7x = 31 + 3y$

$\Rightarrow x = \frac{31 + 3y}{7} \quad ....(iii)$

Substituting the value of x in eqn. (ii), we get

$9\left(\frac{31 + 3y}{7}\right) - 5y = 41$

$\Rightarrow \frac{279 + 27y}{7} - 5y = 41$

$\Rightarrow \frac{279 + 27y - 35y}{7} = 41$

$\Rightarrow 279 - 8y = 287$

$\Rightarrow -8y = 8$

$\Rightarrow y = -1$

Putting the value of y in eqn. (iii), we get

$x = \frac{31 + 3(-1)}{7} = \frac{31 - 3}{7} = \frac{28}{7} = 4$

Thus, the solution set is $(4, -1)$.

Answer 1F.

The given equations are

$13 + 2y = 9x \quad ....(i)$

$3y = 7x \quad ....(ii)$

Now, consider equation $3y = 7x$

$\Rightarrow y = \frac{7}{3}x \quad ....(iii)$

Substituting the value of y in eqn. (i), we get

$13 + 2\left(\frac{7}{3}x\right) = 9x$

$\Rightarrow 13 + \frac{14}{3}x = 9x$

$\Rightarrow 9x - \frac{14}{3}x = 13$

$\Rightarrow \frac{27x - 14x}{3} = 13$

$\Rightarrow 13x = 39$

$\Rightarrow x = \frac{39}{13} = 3$

Putting the value of x in eqn. (iii), we get

$y = \frac{7}{3} \times 3 = 7$

Thus, the solution set is $(3, 7)$.

Answer 1G.

The given equations are

$0.5x + 0.7y = 0.74 \quad ....(i)$

$0.3x + 0.5y = 0.5 \quad ....(ii)$

Now, consider equation $0.5x + 0.7y = 0.74$

$\Rightarrow 0.5x = 0.74 - 0.7y$

$\Rightarrow x = \dfrac{0.74 - 0.7y}{0.5} \quad ....(iii)$

Substituting the value of x in eqn. (ii), we get

$0.3\left(\dfrac{0.74 - 0.7y}{0.5}\right) + 0.5y = 0.5$

$\Rightarrow \dfrac{0.222 - 0.21}{0.5} + 0.5y = 0.5$

$\Rightarrow \dfrac{0.222 - 0.21y + 0.25}{0.5} = 0.5$

$\Rightarrow 0.222 + 0.04y = 0.25$

$\Rightarrow 0.04y = 0.028$

$\Rightarrow y = \dfrac{0.028}{0.04} = \dfrac{28}{40} = \dfrac{7}{10} = 0.7$

Putting the value of y in eqn. (iii), we get

$x = \dfrac{0.74 - 0.7(0.7)}{0.5} = \dfrac{0.74 - 0.49}{0.5} = \dfrac{0.25}{0.5} = \dfrac{25}{50} = \dfrac{1}{2} = 0.5$

Thus, the solution set is (0.5, 0.7).

Answer 1H.

The given equations are

$0.4x + 0.3y = 1.7 \quad ....(i)$

$0.7x - 0.2y = 0.8 \quad ....(ii)$

Multiplying both the equations by 10, we get

$4x + 3y = 17 \quad ....(iii)$

$7x - 2y = 8 \quad ....(iv)$

Now, consider equation $4x + 3y = 17$

$\Rightarrow 4x = 17 - 3y$

$\Rightarrow x = \dfrac{17 - 3y}{4} \quad ....(v)$

Substituting the value of x in eqn. (iv), we get

$7\left(\dfrac{17 - 3y}{4}\right) - 2y = 8$

$\Rightarrow \dfrac{119 - 21y}{4} - 2y = 8$

$\Rightarrow \dfrac{119 - 21y - 8y}{4} = 8$

$\Rightarrow 119 - 29y = 32$

$\Rightarrow -29y = 32 - 119$

$\Rightarrow -29y = -87$

$\Rightarrow y = \dfrac{-87}{-29} = 3$

Putting the value of y in eqn. (v), we get

$x = \dfrac{17 - 3(3)}{4} = \dfrac{17 - 9}{4} = \dfrac{8}{4} = 2$

Thus, the solution set is (2, 3).

Answer 1I.

The given equations are

$3-(x+5)=y+2 \quad ....(i)$

$2(x+y)=10+2y \quad ....(ii)$

Consider $3-(x+5)=y+2$

$\Rightarrow 3-x-5=y+2$

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

$\Rightarrow x+y=-4$

$\Rightarrow x=-4-y \quad ....(iii)$

Now, consider equation $2(x+y)=10+2y$

$\Rightarrow 2x+2y=10+2y$

$\Rightarrow 2x=10$

$\Rightarrow x=5$

Substituting the value of x in eqn. (iii), we get

$5=-4-y$

$\Rightarrow y=-4-5=-9$

Thus, the solution set is $(5,-9)$.

Answer 1J.

The given equations are

$7(y+3)-2(x+2)=14 \quad ....(i)$

$4(y-2)+3(x-3)=2 \quad ....(ii)$

Consider $7(y+3)-2(x+2)=14$

$\Rightarrow 7y+21-2x-4=14$

$\Rightarrow -2x+7y=-3$

$\Rightarrow 2x-7y=3$

$\Rightarrow 2x=7y+3$

$\Rightarrow x=\frac{7y+3}{2} \quad ....(iii)$

Now, consider equation $4(y-2)+3(x-3)=2$

$\Rightarrow 4y-8+3x-9=2$

$\Rightarrow 3x+4y=19$

$\Rightarrow 3\left(\frac{7y+3}{2}\right)+4y=19 \quad ....[\text{From (iii)}]$

$\Rightarrow \frac{21y+9+8y}{2}=19$

$\Rightarrow 29y+9=38$

$\Rightarrow 29y=29$

$\Rightarrow y=1$

Substituting value of y in eqn. (iii), we get

$x=\frac{7(1)+3}{2}=\frac{10}{2}=5$

Thus, the solution set is $(5,1)$.

Answer 2.

(i) 6x+3y=7xy

3x+9y=11xy

Dividing both sides of each equation by xy, we get,

$$\frac{6}{y}+\frac{3}{x}=7\ \ldots\ldots\ldots(1)$$

$$\frac{3}{y}+\frac{9}{x}=11\ldots\ldots\ldots(2)$$

Multiplying (2) by 2,

$$\frac{6}{y}+\frac{18}{x}=22\ldots\ldots\ldots(3)$$

Subtracting (1) from (3), we get,

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

$$\Rightarrow x=1$$

$$\therefore \frac{3}{y}+9=11$$

$$\Rightarrow \frac{3}{y}=11-9=2$$

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

Thus, the solution set is $\left(1,\frac{3}{2}\right)$.

(ii) 8v-3u=5uv

6v-5u=-2uv

Dividing both sides of each equation by uv, we get,

$$\frac{8}{u}-\frac{3}{v}=5\ldots\ldots\ldots(1)$$

$$\frac{6}{u}-\frac{5}{v}=-2\ldots\ldots\ldots(2)$$

Multiplying (1) by 3 and (2) by 4, we get,

$$\frac{24}{u}-\frac{9}{v}=15\ldots\ldots\ldots(3)$$

$$\frac{24}{u}-\frac{20}{v}=-8\ \ldots\ldots\ldots(4)$$

Subtracting (4) from (3), we get,

$$\frac{11}{v}=23$$

$$\Rightarrow v=\frac{11}{23}$$

$$\therefore \frac{6}{u}-\frac{5}{11}\times 23=-2$$

$$\Rightarrow \frac{6}{u}-\frac{115}{11}=-2$$

$\Rightarrow \frac{6}{u} = -2 + \frac{115}{11} = \frac{-22+115}{11} = \frac{93}{11}$

$\Rightarrow u = \frac{6 \times 11}{93} = \frac{22}{31}$

Thus, the solution set is $\left(\frac{22}{11}, \frac{11}{23}\right)$.

(iii) $3(2u+v) = 7uv$

$3(u+3v) = 11uv$

Dividing by uv, we get,

$\frac{6}{v} + \frac{3}{u} = 7$ ....(1)

$3(u + 3v) = 11uv$

$3u + 9v = 11uv$

Dividing by uv, we get

$\frac{3}{v} + \frac{8}{u} = 11$.........(2)

Multiplying (1) by 3, we get,

$\frac{18}{v} + \frac{9}{u} = 21$ ....(3)

Subtracting (2) from(3), we get,

$\frac{15}{v} = 10$

$\Rightarrow v = \frac{15}{10} = \frac{3}{2}$

$\therefore \frac{3}{u} = 7 - 6 \times \frac{2}{3} = 7 - 4 = 3$

$\Rightarrow u = 1$

Thus, the solution set is $\left(1, \frac{3}{2}\right)$.

(iv) $2(3u-v) = 5uv$

$2(u+3v) = 5uv$

$2(3u-v) = 5uv$

$\Rightarrow 6u - 2v = 5uv$

$\Rightarrow \frac{6}{v} - \frac{2}{u} = 5$.........(1)

$2(u+3v) = 5uv$

$\Rightarrow 2u + 6v = 5uv$

$\Rightarrow \frac{2}{u} + \frac{6}{v} = 5$ ....(2)

Multiplying equation (1) by 3, we get,

$$\frac{18}{v} - \frac{6}{u} = 15 \text{ ....(3)}$$

Adding (2) and(3),

$$\frac{20}{v} = 20$$

$$\Rightarrow v = 1$$

$$\therefore \frac{6}{u} = 5 - \frac{2}{1} = 3$$

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

Thus, the solution set is(2, 1).

Answer 3A.

The given equations are

$13a - 11b = 70$ ....(i)

$11a - 13b = 74$ ....(ii)

Multiplying eqn. (i) by 13 and eqn. (ii) by 11, we get

$169a - 143b = 910$ ....(iii)

$121a - 143b = 814$ ....(iv)

Subtracting eqn. (iv) from eq. (iii), we get

$48a = 96$

$\Rightarrow a = 2$

Substituting the value of a in eqn. (i), we get

$13(2) - 11b = 70$

$\Rightarrow 26 - 11b = 70$

$\Rightarrow -11b = 70 - 26$

$\Rightarrow -11b = 44$

$\Rightarrow b = -4$

Thus, the solution set is (2, – 4).

Answer 3B.

The given equations are

$41x + 53y = 135$ ....(i)

$53x + 41y = 147$ ....(ii)

Multiplying eqn. (i) by 53 and eqn. (ii) by 41, we get

$2173x + 2809y = 7155$ ....(iii)

$2173x + 1681y = 6027$ ....(iv)

Subtracting eqn. (iv) from eq. (iii), we get

$1128y = 1128$

$\Rightarrow y = 1$

Substituting the value of y in eqn. (i), we get

$41x + 53(1) = 135$

$\Rightarrow 41x + 53 = 135$

$\Rightarrow 41x = 135 - 53$

$\Rightarrow 41x = 82$

$\Rightarrow x = 2$

Thus, the solution set is (2, 1).

Answer 3C.

The given equations are

$65x - 33y = 97 \quad ....(i)$

$33x - 65y = 1 \quad ....(ii)$

Multiplying eqn. (i) by 33 and eqn. (ii) by 65, we get

$2145x - 1089y = 3201 \quad ....(iii)$

$2145x - 4225y = 65 \quad ....(iv)$

Subtracting eqn. (iv) from eq. (iii), we get

$3136y = 3136$

$\Rightarrow y = 1$

Substituting the value of y in eqn. (ii), we get

$33x - 65(1) = 1$

$\Rightarrow 33x - 65 = 1$

$\Rightarrow 33x = 1 + 65$

$\Rightarrow 33x = 66$

$\Rightarrow x = 2$

Thus, the solution set is (2, 1).

Answer 3D.

The given equations are

$103a + 51b = 617 \quad ....(i)$

$97a + 49b = 583 \quad ....(ii)$

Sbtracting eqn. (ii) from (i), we get

$6a + 2b = 34$

$\Rightarrow 3a + b = 17 \quad$ [Dividing throughout by 2] $\quad ....(iii)$

$200a + 100b = 1200$

$\Rightarrow 2a + b = 12 \quad$ [Dividing throughout by 100] $\quad ....(iv)$

Subtracting eqn. (iv) from eqn. (iii), we get

$a = 5$

Substituting the value of a in eqn. (iii), we get

$3(5) + b = 17$

$\Rightarrow 15 + b = 17$

$\Rightarrow b = 2$

Thus, the solution set is (5, 2).

Answer 4A.

$\frac{3}{5}x - \frac{2}{3}y + 1 = 0$

$\Rightarrow 9x - 10y + 15 = 0$

$\Rightarrow 9x - 10y = -15 \quad \ldots.(i)$

$\frac{1}{3}y + \frac{2}{5}x = 4$

$\Rightarrow 5y + 6x = 60$

$\Rightarrow 6x + 5y = 60 \quad \ldots.(ii)$

Multiplying eqn. (ii) by 2, we get

$12x + 10y = 120 \quad \ldots.(iii)$

Adding eqns. (i) and (iii), we get

$21x = 105$

$\Rightarrow x = 5$

Substituting the value of x in eqn. (ii), we get

$6(5) + 5y = 60$

$\Rightarrow 30 + 5y = 60$

$\Rightarrow 5y = 30$

$\Rightarrow y = 6$

Thus, the solution set is (5,6).

Answer 4B.

$\frac{x}{3} + \frac{y}{4} = 11$

$\Rightarrow 4x + 3y = 132 \quad \ldots.(i)$

$\frac{5x}{6} - \frac{y}{3} = -7$

$\Rightarrow 5x - 2y = -42 \quad \ldots.(ii)$

Multiplying eqn. (i) by 2 and eqn. (ii) by 3, we get

$8x + 6y = 264 \quad \ldots.(iii)$

$15x - 6y = -126 \quad \ldots.(iv)$

Adding eqns. (iii) and (iv), we get

$23x = 138$

$\Rightarrow x = 6$

Substituting the value of x in eqn. (i), we get

$4(6) + 3y = 132$

$\Rightarrow 24 + 3y = 132$

$\Rightarrow 3y = 108$

$\Rightarrow y = 36$

Thus, the solution set is (6,36).

Answer 4C.

The given equations are $\frac{3}{2x} + \frac{2}{3y} = 5$ and $\frac{5}{x} - \frac{3}{y} = 1$

Let $\frac{1}{x} = a$ and $\frac{1}{y} = b$

Then, we have

$\frac{3}{2}a + \frac{2}{3}b = 5$

$\Rightarrow 9a + 4b = 30 \quad ....(i)$

And, $5a - 3b = 1 \quad ....(ii)$

Multiplying eqn. (i) by 3 and eqn. (ii) by 4, we get

$27a + 12b = 90 \quad ....(iii)$

$20a - 12b = 4 \quad ....(iv)$

Adding eqns. (iii) and (iv), we get

$47a = 94$

$\Rightarrow a = 2$

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

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

Substituting the value of a (i), we get

$9(2) + 4b = 30$

$\Rightarrow 18 + 4b = 30$

$\Rightarrow 4b = 12$

$\Rightarrow b = 3$

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

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

Thus, the solution set is $\left(\frac{1}{2}, \frac{1}{3}\right)$.

Answer 4D.

The given equations are $\frac{3}{x} - \frac{1}{y} = -9$ and $\frac{2}{x} + \frac{3}{y} = 5$.

Let $\frac{1}{x} = a$ and $\frac{1}{y} = b$

Then, we have

$3a - b = -9 \quad ....(i)$

$2a + 3b = 5 \quad ....(ii)$

Multiplying eqn. (i) by 3, we get

$9a - 3b = -27 \quad ....(iii)$

Adding eqns. (ii) and (iii), we get

$11a = -22$

$\Rightarrow a = -2$

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

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

Substituting the value of a in eqn. (i), we get

$3(-2) - b = -9$

$\Rightarrow -6 - b = -9$

$\Rightarrow b = -6 + 9$

$\Rightarrow b = 3$

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

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

Thus, the solution set is $\left(-\frac{1}{2}, \frac{1}{3}\right)$.

Answer 4E.

The given equations are

$y - x = 0.8$

$-x + y = 0.8 \quad \ldots.(i)$

And, $\dfrac{13}{2(x+y)} = 1$

$\Rightarrow 13 = 2x + 2y$

$\Rightarrow 2x + 2y = 13 \quad \ldots.(ii)$

Multiplying eqn. (i) by 2, we get

$-2x + 2y = 1.6 \quad \ldots.(iv)$

Adding eqns. (ii) and (iii), we get

$4y = 14.6$

$\Rightarrow y = 3.65$

Substituting the value of y in eqn. (i), we get

$-x + 3.65 = 0.8$

$\Rightarrow -x = -2.85$

$\Rightarrow x = 2.85$

Thus, the solution set is $(2.85, 3.65)$.

Answer 4F.

The given equations are $\dfrac{2}{x} + \dfrac{3}{y} = \dfrac{9}{xy}$ and $\dfrac{4}{x} + \dfrac{9}{y} = \dfrac{21}{xy}$.

Let $\dfrac{1}{x} = a$ and $\dfrac{1}{y} = b$

Then, we have

$2a + 3b = 9ab \quad \ldots.(i)$

$4a + 9b = 21ab \quad \ldots.(ii)$

Multiplying eqn. (i) by 2, we get

$4a + 6b = 18ab \quad \ldots.(iii)$

Subtracting eqn. (iii) from eqn. (ii), we get

$3b = 3ab$

$\Rightarrow a = 1$

$\Rightarrow \dfrac{1}{x} = 1$

$\Rightarrow x = 1$

Substituting the value of a in (i), we get

$2(1) + 3b = 9(1)b$

$\Rightarrow 2 + 3b = 9b$

$\Rightarrow 6b = 2$

$\Rightarrow b = \frac{1}{3}$

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

$\Rightarrow y = 3$

Thus, the solution set is (1, 3).

Answer 4G.

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

$\Rightarrow x + y = 2xy \quad ....(i)$

$\frac{x - y}{xy} = 6$

$\Rightarrow x - y = 6xy \quad ....(ii)$

Adding eqns. (i) and (ii), we get

$2x = 8xy$

$\Rightarrow y = \frac{1}{4}$

Substituting the value of y in eqn. (i), we get

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

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

$\Rightarrow 8x + 2 = 4x$

$\Rightarrow 4x = -2$

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

Thus, the solution set is $\left(-\frac{1}{2}, \frac{1}{4}\right)$.

Answer 4H.

The given equations are $\frac{2}{x+1} - \frac{1}{y-1} = \frac{1}{2}$ and $\frac{1}{x+1} + \frac{2}{y-1} = \frac{5}{2}$.

Let $\frac{1}{x+1} = a$ and $\frac{1}{y-1} = b$

Then, we have

$2a - b = \frac{1}{2} \quad \ldots.(i)$

$a + 2b = \frac{5}{2} \quad \ldots.(ii)$

Multiplying eqn. (i) by 2, we get

$4a - 2b = 1 \quad \ldots.(iii)$

Adding eqns. (ii) and (iii), we get

$5a = \frac{7}{2}$

$\Rightarrow a = \frac{7}{10}$

$\Rightarrow \frac{1}{x+1} = \frac{7}{10}$

$\Rightarrow 10 = 7x + 7$

$\Rightarrow 7x = 3$

$\Rightarrow x = \frac{3}{7}$

Substituting the value of a in eqn. (iii), we get

$4 \times \frac{7}{10} - 2b = 1$

$\Rightarrow \frac{14}{5} - 2b = 1$

$\Rightarrow 2b = \frac{14}{5} - 1 = \frac{9}{5}$

$\Rightarrow b = \frac{9}{10}$

$\Rightarrow \frac{1}{y-1} = \frac{9}{10}$

$\Rightarrow 10 = 9y - 9$

$\Rightarrow 9y = 19$

$\Rightarrow y = \frac{19}{9}$

Thus, the solution set is $\left(\frac{9}{10}, \frac{19}{9}\right)$.

Answer 4I.

The given equations are $\frac{6}{x+y} = \frac{7}{x-y} + 3$ and $\frac{1}{2(x+y)} = \frac{1}{3(x-y)}$.

Let $\frac{1}{x+y} = a$ and $\frac{1}{x-y} = b$

Then, we have

$6a = 7b + 3$

$\Rightarrow 6a - 7b = 3 \quad \ldots.(i)$

And, $\frac{1}{2}a = \frac{1}{3}b$

$\Rightarrow 3a = 2b$

$\Rightarrow 6a = 4b \quad \ldots.(ii)$

Substituting the value of 6a in eqn. (i), we get

$4b - 7b = 3$

$\Rightarrow -3b = 3$

$\Rightarrow b = -1$

$6a = -4$

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

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

Adding both these eqns., we get

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

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

$\Rightarrow -\frac{5}{4} - y = -1$

$\Rightarrow y = -\frac{5}{4} + 1 = -\frac{1}{4}$

Thus, the solution set is $\left(-\frac{5}{4}, -\frac{1}{4}\right)$.

Answer 4K.

The given equations are $\frac{2}{3x+2y}+\frac{3}{3x-2y}=\frac{17}{5}$ and $\frac{5}{3x+2y}+\frac{1}{3x-2y}=2.$

Let $\frac{1}{3x+2y}=a$ and $\frac{1}{3x-2y}=b$

Then, we have

$2a+3b=\frac{17}{5}$ ....(i)

$5a+b=2$ ....(ii)

Multiplying eqn. (i) by 5 and eqn. (ii) by 2, we get

$10a+15b=17$ ....(iii)

$10a+2b=4$ ....(iv)

Subtracting eqn. (iv) from eqn. (iii), we get

$13b=13$

$\Rightarrow b=1$

Substituting the value of b in eqn. (ii), we get

$5a+1=2$

$\Rightarrow 5a=1$

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

$\Rightarrow 3x+2y=5$ and $3x-2y=1$

Adding these two equations, we get

$6x=6$

$\Rightarrow x=1$

$\Rightarrow 3(1)+2y=5$

$\Rightarrow 2y=2$

$\Rightarrow y=1$

Thus, the solution set is $(1, 1)$.

Answer 4L.

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

$$\Rightarrow \frac{x+y}{xy} = \frac{5}{6}$$

$$\Rightarrow \frac{1}{y} + \frac{1}{x} = \frac{5}{6} \qquad ....(i)$$

$$\frac{xy}{y-x} = 6$$

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

$$\Rightarrow \frac{1}{x} - \frac{1}{y} = \frac{1}{6} \qquad ....(ii)$$

Adding eqns. (i) and (ii), we get

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

$$\Rightarrow x = 2$$

$$\Rightarrow \frac{1}{y} + \frac{1}{2} = \frac{5}{6}$$

$$\Rightarrow \frac{1}{y} = \frac{5}{6} - \frac{1}{2} = \frac{5-3}{6} = \frac{2}{6} = \frac{1}{3}$$

$$\Rightarrow y = 3$$

Thus, the solution set is $(2, 3)$.

Answer 5.

$2x+y = 23$ ....(1)

$4x-y = 19$ ....(2)

Adding (1) and (2),

$6x = 42$

$\Rightarrow x = 7$

$\therefore y = 23 - 2x = 23 - 14 = 9$

$\therefore x - 3y = 7 - 3(9) = 7 - 27 = -20$

$5y - 2x = 5(9) - 2(7) = 45 - 14 = 31$

Answer 6.

10y = 7x-4 ....(1)

12x+18y = 1 ....(2)

Multiplying (1) by 9 and (2) by 5, we get,

63x – 90y = 36 ....(3)

60x + 90y = 5 ....(4)

Adding (3) and (4), we get,

123x = 41

$\Rightarrow x = \frac{41}{123} = \frac{1}{3}$

$\therefore 10y = \frac{7}{3} - 4 = \frac{7-12}{3} = \frac{-5}{3}$

$\Rightarrow y = \frac{-5}{3} \times \frac{1}{10} = \frac{-1}{6}$

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

$8y - x = \frac{-8}{6} - \frac{1}{3} = \frac{-8-2}{6} = \frac{-10}{6} = \frac{-5}{3}$

Answer 7.

$$4x + \frac{6}{y} = 15 \ldots\ldots\ldots(1)$$

$$6x - \frac{8}{y} = 14 \ldots\ldots\ldots(2)$$

Multiplying (1) by 4 and (2) by 3, we get,

$$16x + \frac{24}{y} = 60 \ldots\ldots\ldots(3)$$

$$18x - \frac{24}{y} = 42 \ldots\ldots\ldots(4)$$

Adding (3) and (4), we get,

$$34x = 102$$

$$\Rightarrow x = \frac{102}{34} = 3$$

$$\therefore \frac{6}{y} = 15 - 4x = 15 - 12 = 3$$

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

Thus, the solution set is (3, 2).

Now, $y = ax - 2$

$$\Rightarrow 2 = 3a - 2$$

$$\Rightarrow 3a - 4$$

$$\Rightarrow a = \frac{4}{3} = 1\frac{1}{3}.$$

Answer 8.

$$\frac{3}{x}-\frac{2}{y}=0 \_\_\_\_\_(1)$$

$$\frac{2}{x}+\frac{5}{y}=19 \_\_\_\_\_(2)$$

Multiplying (1) by 5 and (2) by 2, we get,

$$\frac{15}{x}-\frac{10}{y}=0 \_\_\_\_\_(3)$$

$$\frac{4}{x}+\frac{10}{y}=38 \_\_\_\_\_(4)$$

Adding (3) and(4), we get,

$$\frac{19}{x}=38$$

$$\Rightarrow x=\frac{19}{38}=\frac{1}{2}$$

Now, $\frac{3}{x}=\frac{2}{y}$

$$\Rightarrow \frac{2}{y}=6$$

$$\Rightarrow y=\frac{2}{6}=\frac{1}{3}$$

Thus, the solution set is $\left(\frac{1}{2},\frac{1}{3}\right)$.

Now, $y=ax+3$

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

$$\Rightarrow \frac{a}{2}=\frac{1}{3}-3=\frac{1-9}{3}=\frac{-8}{3}$$

$$\Rightarrow a=\frac{-8}{3}\times 2=\frac{-16}{3}=-5\frac{1}{3}$$

Answer 9.

The given equations are

$7y - 3x = 7 \quad ....(i)$

$5y - 11x = 87 \quad ....(ii)$

$5x + 4y = 43 \quad ....(iii)$

Multiplying eqn. (i) by 5 and eqn. (ii) by 7, we get

$35y - 15x = 35 \quad ....(iv)$

$35y - 77x = 609 \quad ....(v)$

Subtracting eqn. (iv) from eqn. (v), we get

$-62x = 574$

$\Rightarrow x = -\frac{574}{62} = -\frac{287}{31}$

$\Rightarrow 7y - 3 \times \left(-\frac{287}{31}\right) = 7$

$\Rightarrow 7y + \frac{861}{31} = 7$

$\Rightarrow 7y = 7 - \frac{861}{31} = \frac{217 - 861}{31} = -\frac{644}{31}$

$\Rightarrow y = -\frac{644}{7 \times 31} = -\frac{92}{31}$

Putting $x = -\frac{287}{31}$ and $y = -\frac{92}{31}$ in L.H.S. of eqn. (iii), we get

$L.H.S. = 5 \times \left(-\frac{287}{31}\right) + 4 \times \left(-\frac{92}{31}\right) = -\frac{1435}{31} - \frac{368}{31} = -\frac{1803}{31} \neq 43$

$\Rightarrow L.H.S. \neq R.H.S.$

Hence, the given system of equations are not consistent.

Answer 10.

The given equations are

$2x + 3y + 6 = 0 \quad ....(i)$

$4x - 3y - 8 = 0 \quad ....(ii)$

$x + my - 1 = 0 \quad ....(iii)$

Adding eqns. (i) and (ii), we get

$6x - 2 = 0$

$\Rightarrow 6x = 2$

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

Substituting the value of x in eqn. (i), we get

$2 \times \frac{1}{3} + 3y + 6 = 0$

$\Rightarrow 3y = -6 - \frac{2}{3} = \frac{-18-2}{3} = \frac{-20}{3}$

$\Rightarrow y = -\frac{20}{9}$

Substituting the value of x and y in eqn. (iii), we get

$\frac{1}{3} + m \times \left(-\frac{20}{9}\right) - 1 = 0$

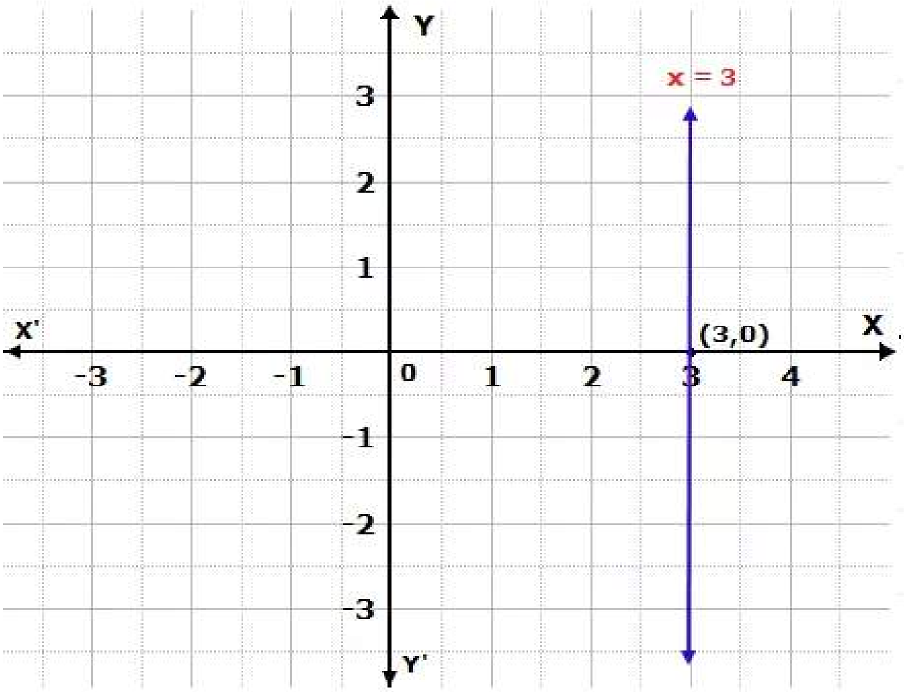
$\Rightarrow -\frac{20}{9}m = 1 - \frac{1}{3} = \frac{2}{3}$

$\Rightarrow m = -\frac{2}{3} \times \frac{9}{20} = -\frac{3}{10}$

Ex 8.2

Answer 1A.

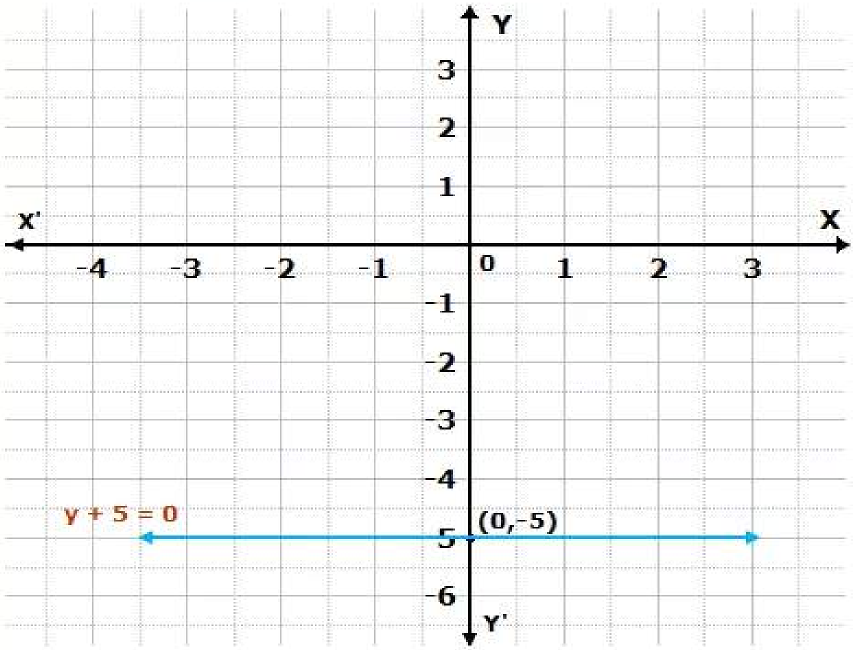
The graph of x = 3 is as follows:



Answer 1B.

Given equation, y + 5 = 0
i.e. y = -5

The graph is as follows:



Answer 1C.

$3x + 2y - 6 = 0$

$\Rightarrow 3x + 2y = 6$

$\Rightarrow 2y = 6 - 3x$

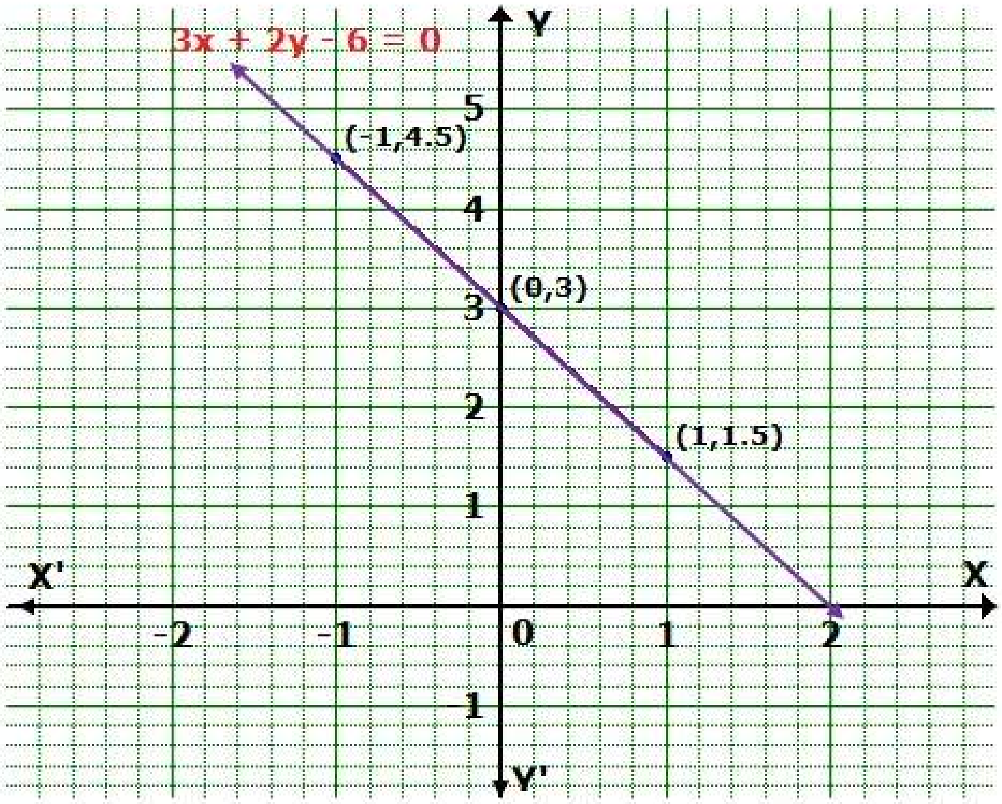
$\Rightarrow y = \frac{6 - 3x}{2}$

Corresponding values of x and y can be tabulated as follows:

x	0	1	−1
y	3	1.5	4.5

Plotting the points (0, 3), (1, 1.5) and (−1, 4.5),

we get the following graph:



Answer 1D.

$5x - 5y = 8$

$\Rightarrow 5x = 8 - 5y$

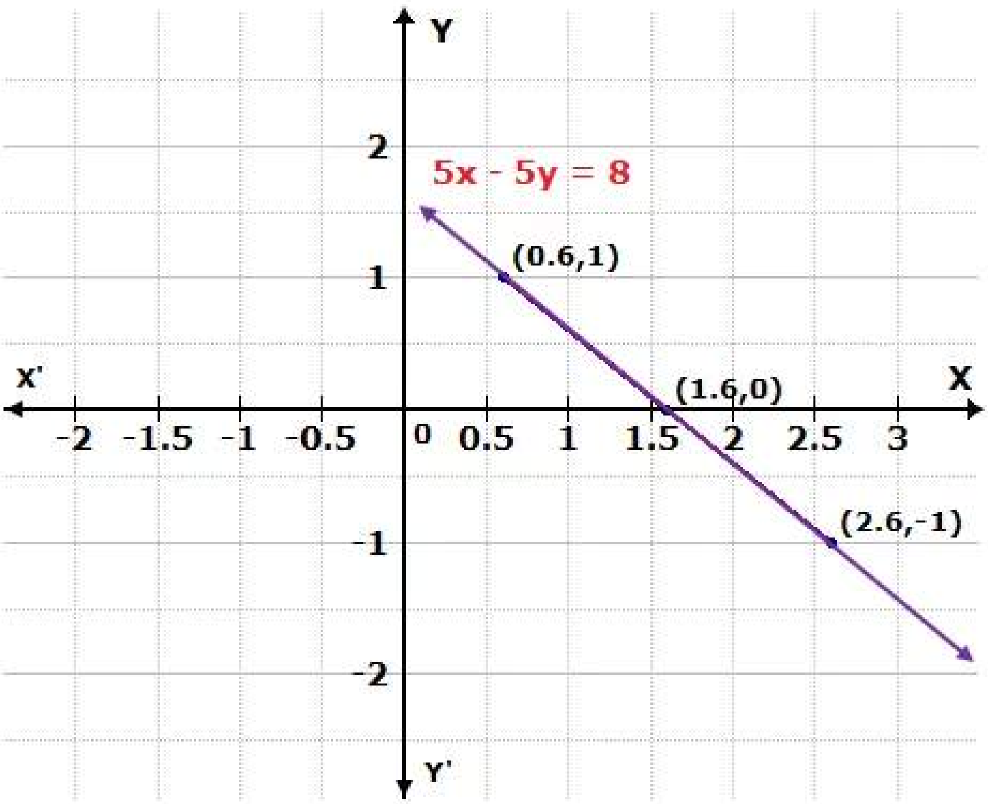
$\Rightarrow x = \dfrac{8 - 5y}{5}$

Corresponding values of x and y can be tabulated as follows:

x	1.6	0.6	2.6
y	0	1	−1

Plotting the points (1.6, 0), (0.6, 1) and (2.6, − 1),

we get the following graph:



Answer 2A.

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

$\Rightarrow 3x + 2y = 6$

$\Rightarrow 2y = 6 - 3x$

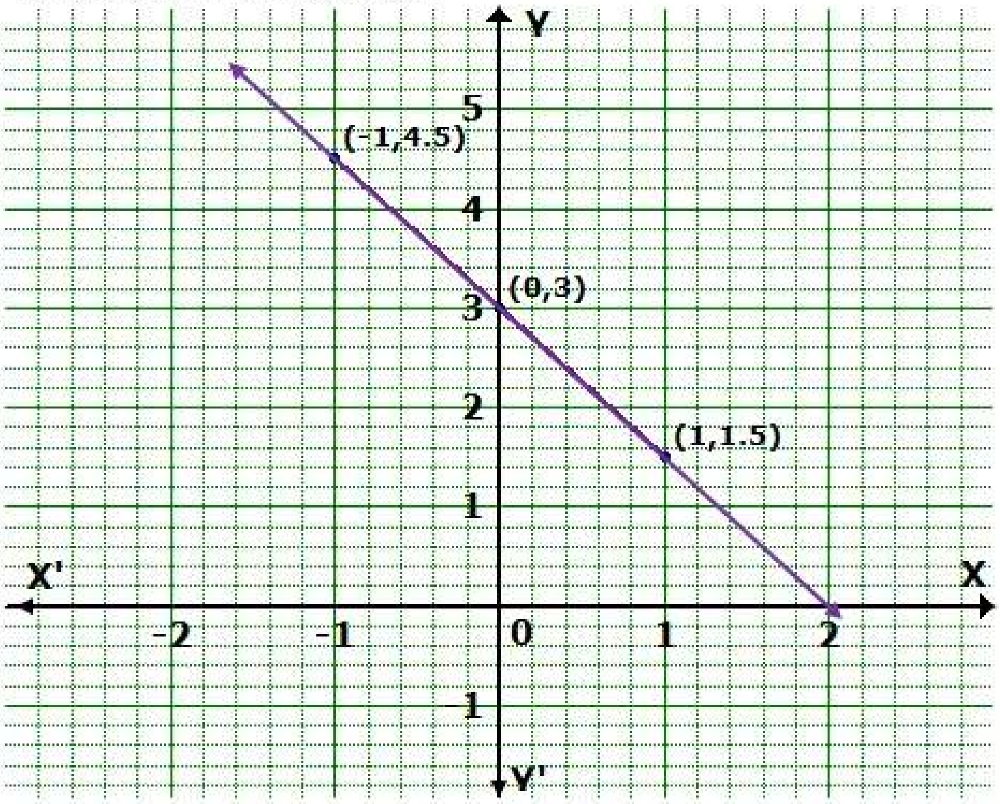
$\Rightarrow y = \frac{6 - 3x}{2}$

Corresponding values of x and y can be tabulated as follows:

x	0	1	−1
y	3	1.5	4.5

Plotting the points (0, 3), (1, 1.5) and (−1, 4.5),

we get the following graph:



Thus, the graph of the equation meets the X-axis at (2, 0) and Y-axis at (0, 3).

Answer 2B.

$$\frac{3x+14}{2} = \frac{y-10}{5}$$

$\Rightarrow 15x + 70 = 2y - 20$

$\Rightarrow 15x - 2y = -90$

$\Rightarrow 2y = 90 + 15x$

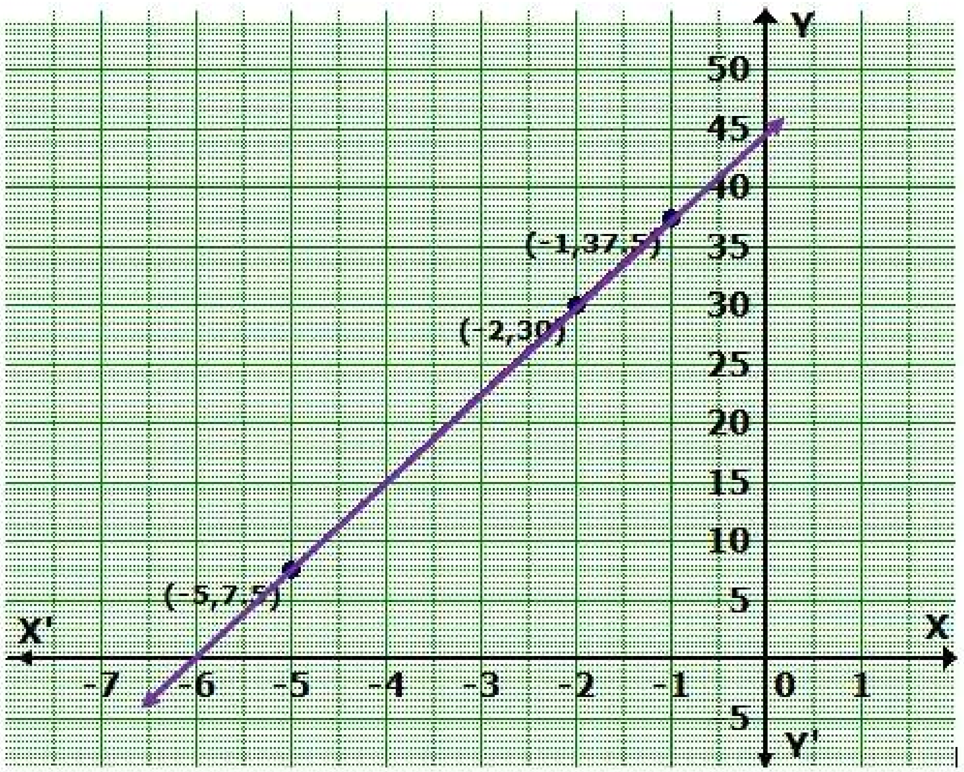
$$\Rightarrow y = \frac{90+15x}{2}$$

Corresponding values of x and y can be tabulated as follows:

x	−5	−2	−1
y	7.5	30	37.5

Plotting the points (−5, 7.5), (−2, 30) and (−1, 37.5),

we get the following graph:



Thus, the graph of the equation meets the X-axis at (-6, 0) and Y-axis at (0, 45).

Answer 3.

$4x - 3y + 12 = 0$

$\Rightarrow 4x = 3y - 12$

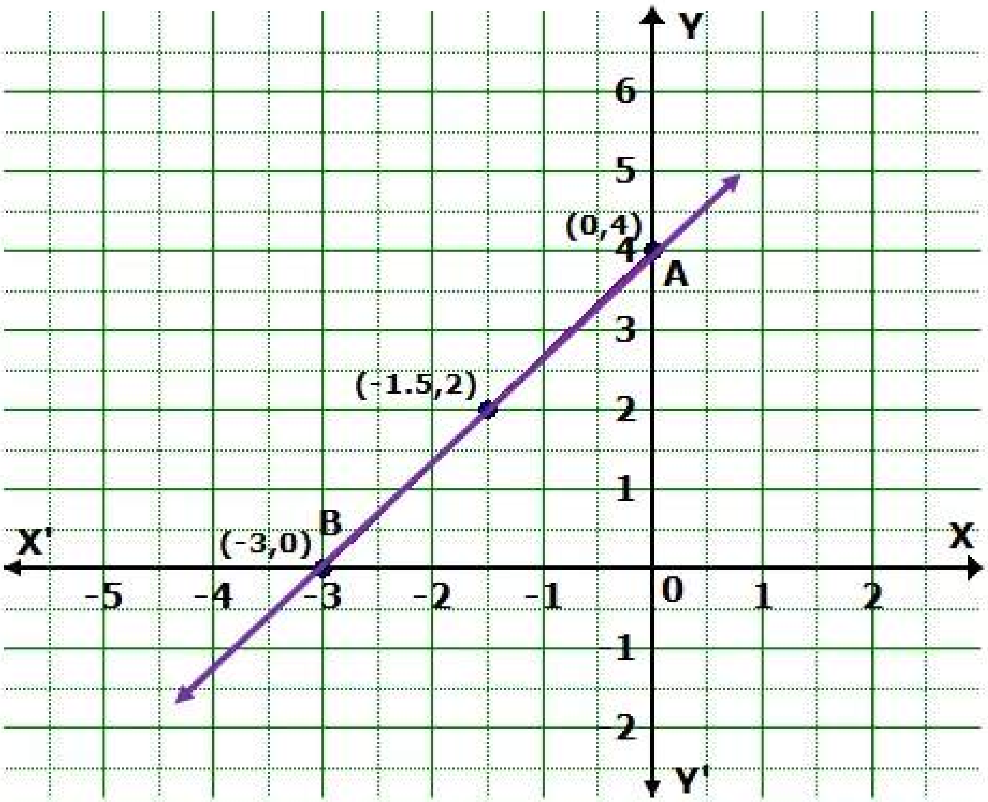
$\Rightarrow x = \dfrac{3y - 12}{4}$

Corresponding values of x and y can be tabulated as follows:

x	−3	−1.5	0
y	0	2	4

Plotting the points (−3, 0), (−1.5, 2) and (0, 4),

we get the following graph:



Area of $\Delta OAB = \frac{1}{2} \times OB \times OA = \frac{1}{2} \times 3 \times 4 = 6$ sq. units

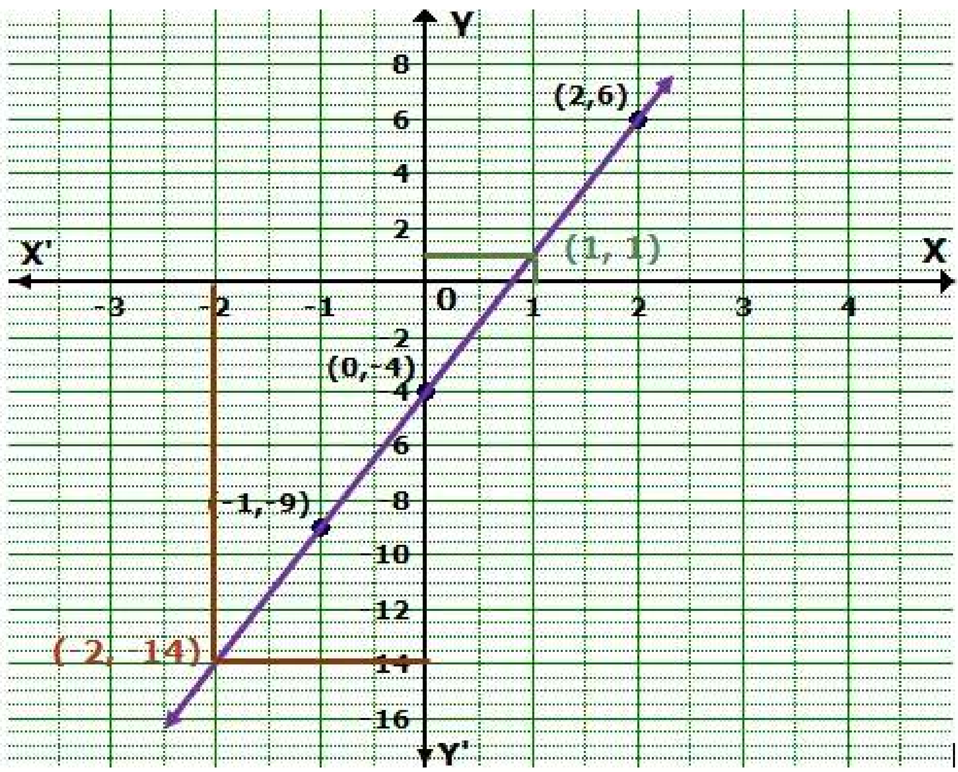
Answer 4.

$y = 5x - 4$

Corresponding values of x and y can be tabulated as follows:

x	0	2	−1
y	−4	6	−9

Plotting the points (0, − 4), (2, 6) and (−1,−9),
we get the following graph:

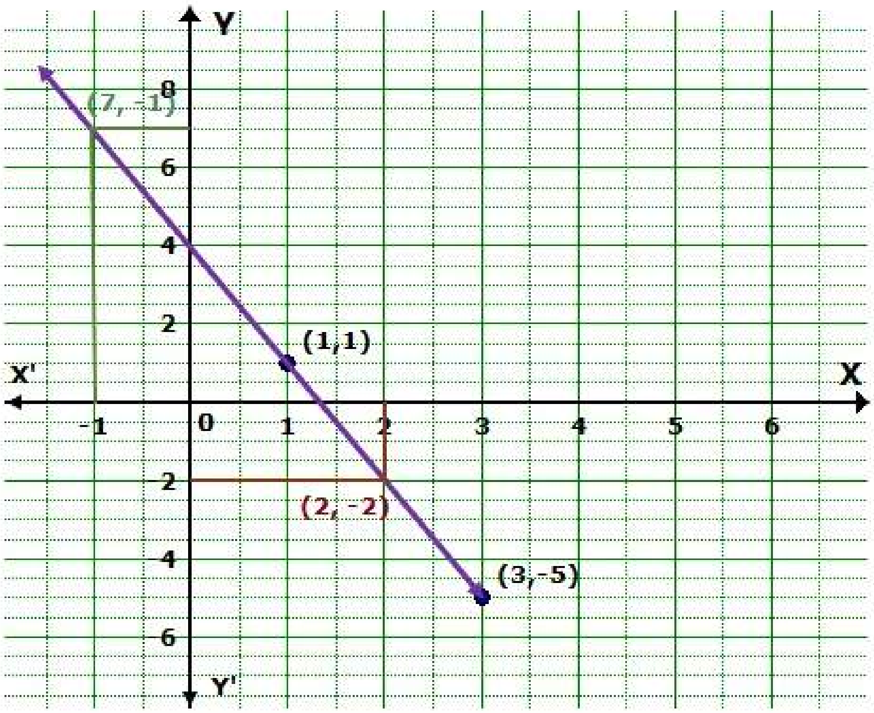


From the graph, we find that

a. When y = 1, x = 1.
b. When x = -2, y = -14

Answer 5.

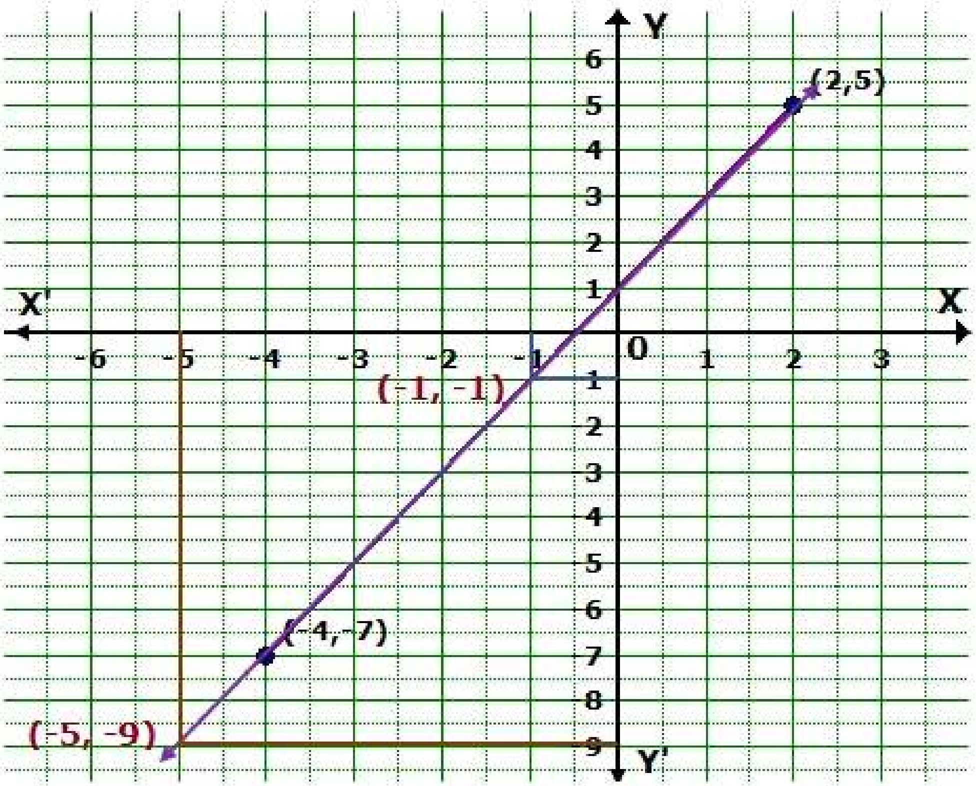
The graph is as follows:



From the graph, we find that p = -1 and q = -2.

Answer 6.

The graph is as follows:



From the graph, we find that a = -1 and b = -9.

Answer 7.

(i) $x+3y=8$

$3x=2+2y$

$x+3y=8$ ______(1)

$3x=2+2y$ _____(2)

Now, $x+3y=8$

$$\Rightarrow y=\frac{8-x}{3}$$

Corresponding values of x and y can be tabulated as:

x	-1	2	5
y	3	2	1

Plotting points (-1, 3), (2, 2), (5, 1) and joining them, we get a line l, which is the graph of equation (1).

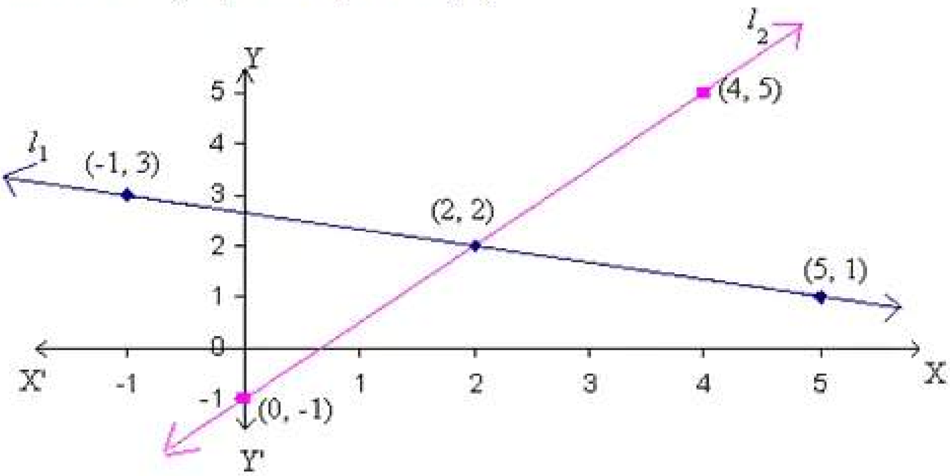
Again, $3x=2+2y$

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

Corresponding values of x and y can be tabulated as :

x	2	4	0
y	2	5	-1

Plotting points (2, 2), (4, 5), (0,-1) and joining them, we get a line l_2 which is the graph of equation (2).



The two lines l_1 and l_2 intersect at the point (2, 2). Hence, x=2, y=2 is the unique solution of the given equation.

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

$3x+8y=10$

$2x+4y=7$ ______(1)

$3x+8y=10$ _____(2)

Now, $2x+4y=7$

$$\Rightarrow 4y=7-2x$$

$\Rightarrow y = \frac{7-2x}{4}$

Corresponding values of x and y can be tabulated as:

x	2	3	4
y	0.75	0.25	-0.25

Plotting points (2, 0.75), (3, 0.25), (4, -0.25) and joining them, we get a line l_1 which is the graph of equation (1).

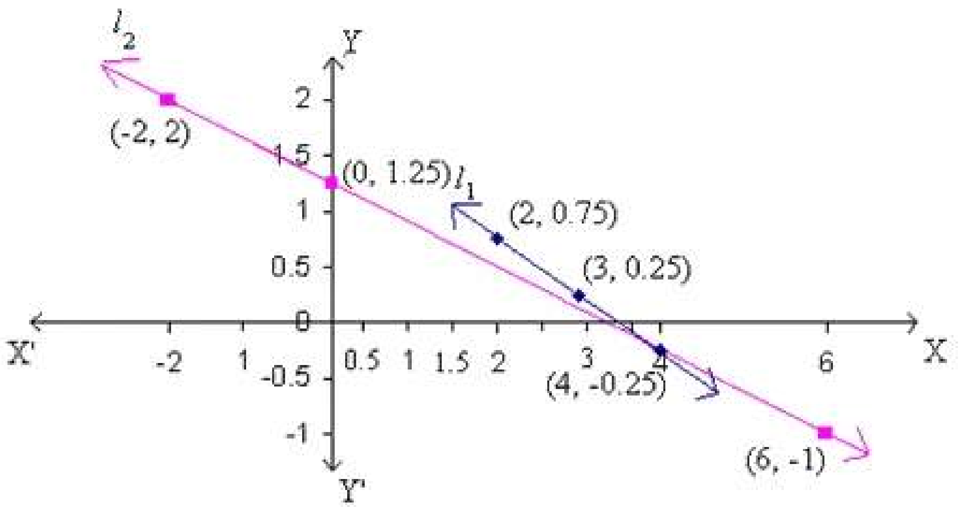
Again, 3x+8y=10

$\Rightarrow x = \frac{10-8y}{3}$

Corresponding values of x and y can be tabulated as:

x	6	-2	0
y	-1	2	1.25

Plotting points (6, 1), (2, 2), (0, 1.25) and joining them, we get a line l_2 which is the graph of equation (2).



The two lines l_1 and l_2 intersect at the point (4, -0.25), ie, $\left(4, \frac{-1}{4}\right)$.

Hence x=4 and y=$\frac{-1}{4}$ is the unique solution of the given equations.

(iii) 2x-y=9

5x+2y=27

2x-y=9 _____(1)

5x+2y=27 _____(2)

Now, 2x-y=9

$\Rightarrow y = 2x - 9$

Corresponding values of x and y can be tabulated as:

x	2	3	4
y	-5	-3	-1

Plotting points (2,-5), (3,-3), (4,-1) and joining them, we get a line l, which is the graph of equation (1).

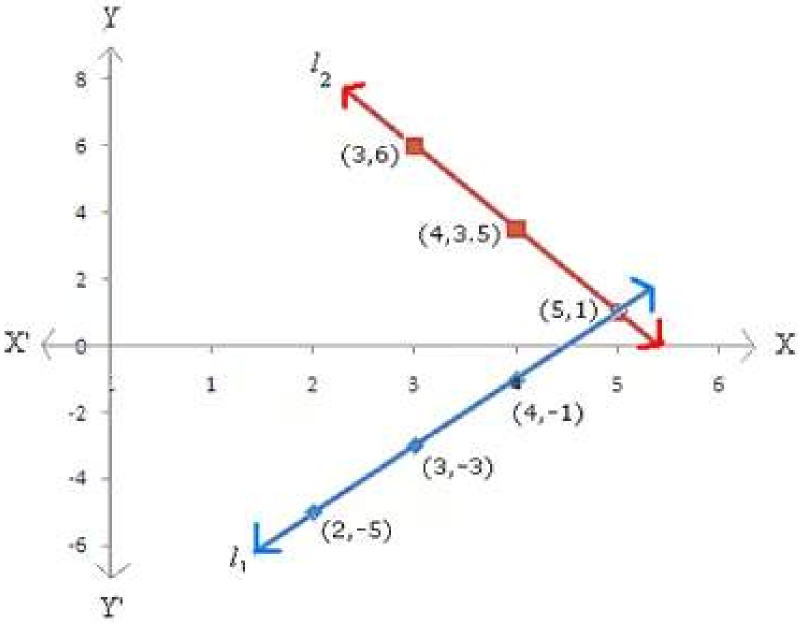
Again, 5x+2y=27

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

Corresponding values of x and y can be tabulated as:

x	5	4	3
y	1	3.5	6

Plotting points (5, 1), (4, 3.5), (3, 6) and joining them, we get a line l_2 which is the graph of equation (2).



The two lines l_1 and l_2 intersect at a unique point (5, 1).

Thus, x=5 and y=1 is the unique solution of the given equations.

(iv) x+4y+9=0

3y=5x-1

x+4y=-9 ______(1)

3y=5x-1 ______(2)

Now, x+4y=-9 $\Rightarrow x = -9 - 4y$

Corresponding values of x and y can be tabulated as:

x	4	-1	-5
y	-3	-2	-1

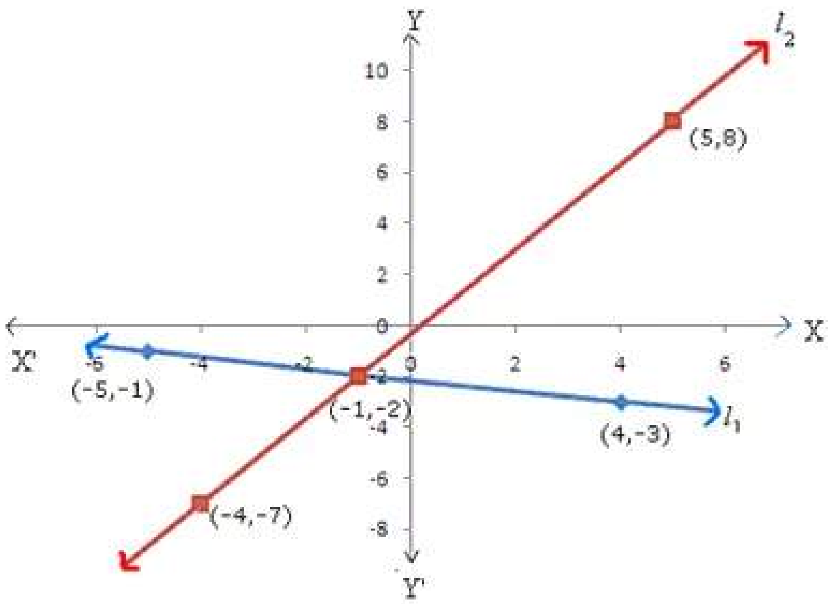
Plotting points (4,-3), (-1,-2) and (-5,-1) and joining them, we get a line l_1 which is the graph of equation (!).

Again, $3y=5x-1 \Rightarrow y=\frac{5x-1}{3}$

Corresponding values of x and y can be tabulated as:

x	-4	-1	5
y	-7	-2	8

Plotting points (-4,-7), (-1-2), (5, 8) and joining them we get a line l_2 which is the graph of equation (2).



The two lines l_1 and l_2 intersect at a unique point (-1,-2). Thus, x=-1 and y=-2 is the unique solution of the given equations.

(v) x=4

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

x=4 _____(1)

$\frac{3x}{3}-y=5$ ______(2)

The graph of equation (1) will be the line l_1 which is at a distance of 4

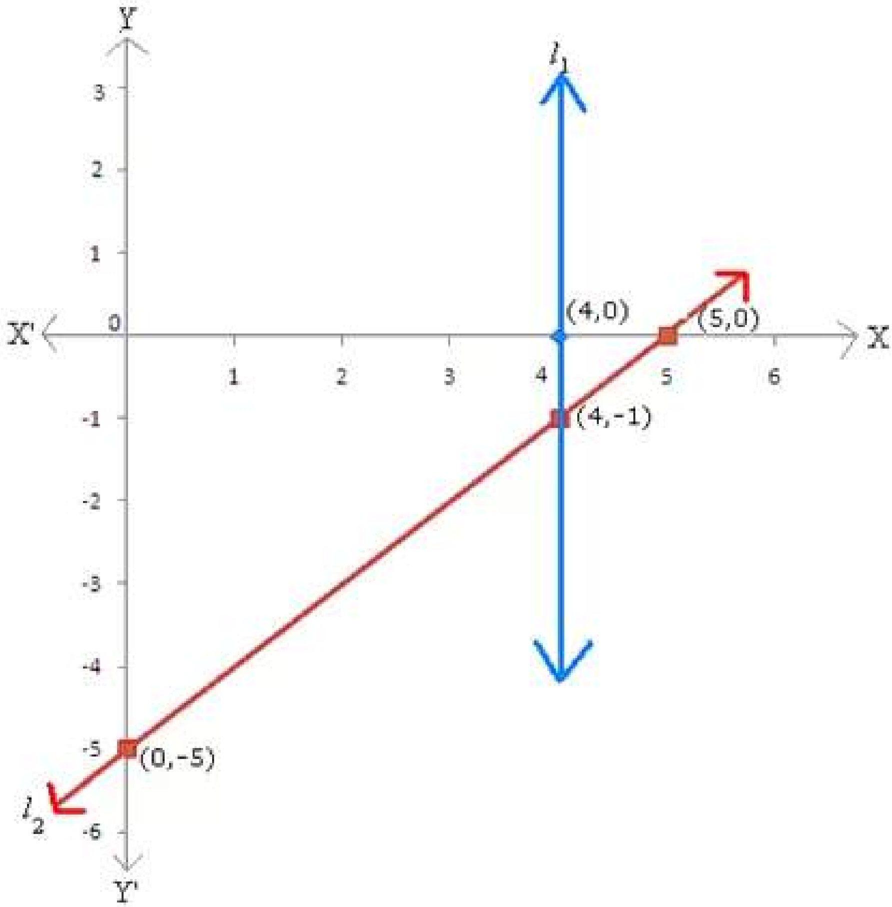
Units from the y-axis. (4, 0)

From (2), x-y=5

Corresponding values of x and y can be tabulated as:

x	4	0	5
y	-1	-5	0

Plotting points (4,-1), (0,-5), (5, 0) and joining them, we get a line l_2 which is the graph of equation (2).



The two lines l_1 and l_2 intersect at a unique point (4,-1). Thus, x=4 and y=-1 is the unique solution of the given equations.

(vi) $3y=5-x$

$2x=y+3$

$3y= 5-x$ ________(1)

$2x = y+3$ _______(2)

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

Corresponding values of x and y can be tabulated as:

x	2	-1	-4
y	1	2	3

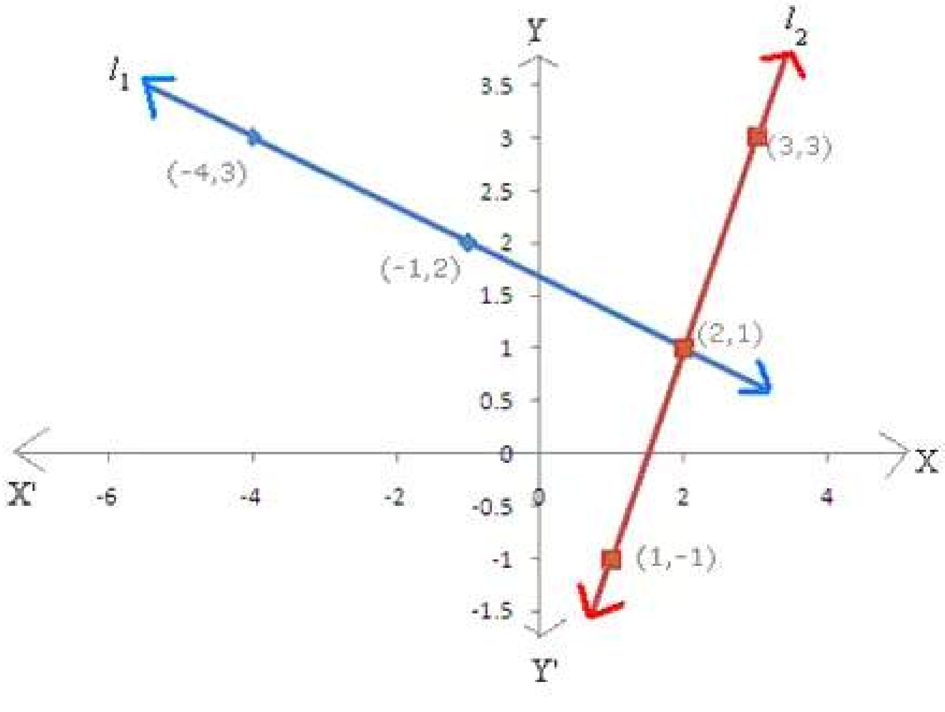
Plotting points (2, 1), (-1, 2), (-4, 3) and joining them, we get a line l_1 which is the graph of equation (1).

Again, $2x = y+3 \Rightarrow x = \frac{y+3}{2}$

Corresponding values of x and y can be tabulated as:

x	2	1	3
y	1	-1	3

Plotting points (2, 1), (-1, 1), (3, 3) and joining them, we get a line l_2 which is the graph of equation (2).



The two lines l_1 and l_2 intersect at a unique point (2, 1).

Thus, $x=2$ and $y=1$ is the unique solution of the given equations.

(vii) x-2y=2

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

x-2y=2 ______(1)

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

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

Corresponding values of x and y can be tabulated as:

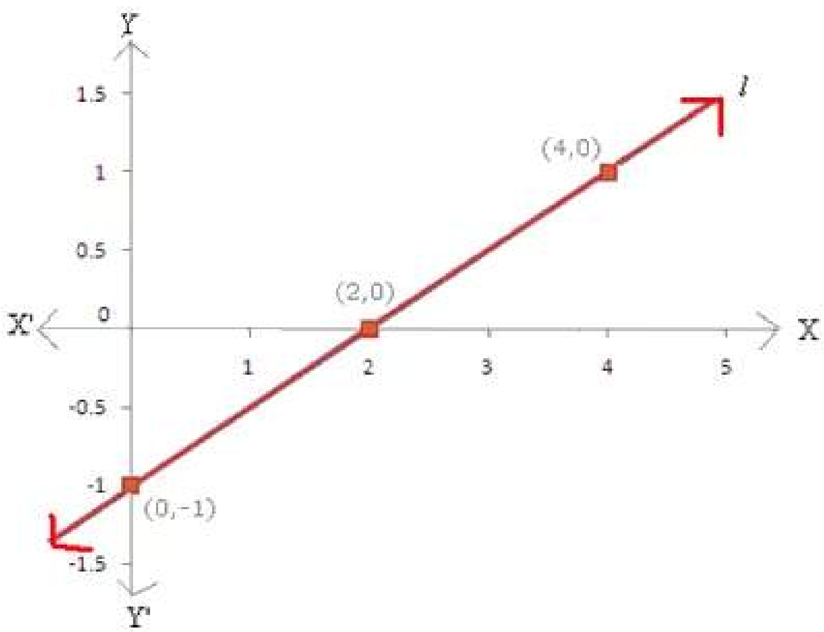
x	2	0	4
y	0	-1	1

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

Corresponding values of x and y can be tabulated as:

x	0	2	4
y	-1	0	1

Plotting points (0,-1), (2, 0), (4, 1) and joining them, we get a line l, which is the graph for both the equations (1) and (2).



Hence, the given system of equations has infinitely many solutions.

(viii) 2x-6y+10=0

3x-9y+25=0

2x-6y+10 = 0______(1)

3x-9y+25=0 ______(2)

$2x\text{-}6y+10=0 \Rightarrow x=\dfrac{6y-10}{2}=3y-5$

Corresponding values of x and y can be tabulated as:

x	-5	-2	1
y	0	1	2

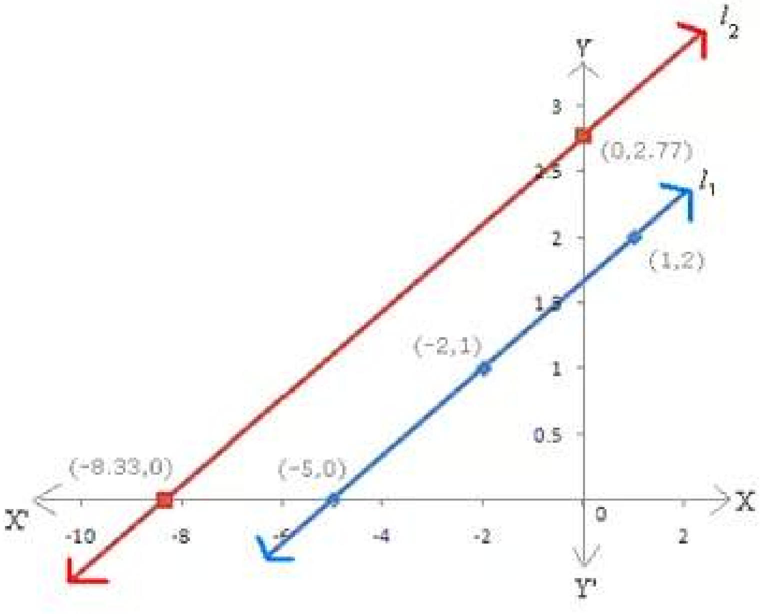
Plotting points (-5, 0), (-2, 1), (1, 2) and joining them, we get a line l_1 which is the graph of the equation (1).

Again, $3x\text{-}9y+25=0 \Rightarrow x=\dfrac{9y-25}{3}$

Corresponding values of x and y can be tabulated as:

x	0	$\dfrac{-25}{3}$=-8.33
y	$\dfrac{25}{9}$=2.77	0

Plotting points $\left(0,\dfrac{25}{9}\right),\left(\dfrac{-25}{3},0\right)$ and joining them, we get a line l_2 which is the graph of the equation (2).



The lines l_1 and l_2 do not intersect each other.

Thus, the given equations do not have any solution.

(ix) $2+\dfrac{3y}{x}=\dfrac{6}{x}$

$\dfrac{6x}{y}-5=\dfrac{4}{y}$

$2+\dfrac{3y}{x}=\dfrac{6}{x} \Rightarrow 2x+3y=6$ ______(1)

$$\frac{6x}{y} - 5 = \frac{4}{y} \Rightarrow 6x - 5y = 4 \text{ \_\_\_\_\_(2)}$$

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

Corresponding values of x and y can be tabulated as:

x	3	-3	0
y	0	4	2

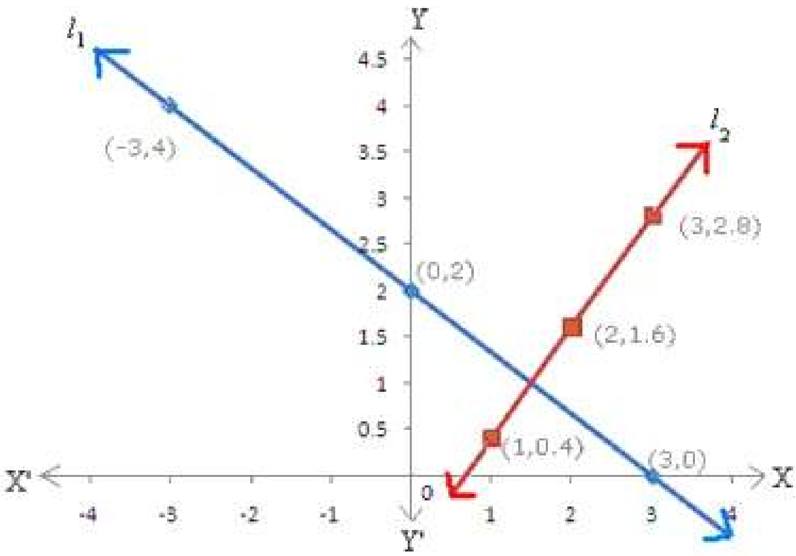
Plotting points (3, 0), (-3, 4), (0, 2) and joining them, we get a line l_1 which is the graph of equation (1).

$$6x\text{-}5y=4 \Rightarrow y = \frac{6x-4}{5}$$

Corresponding values of x and y can be tabulated as:

x	1	2	3
y	0.4	1.6	2.8

Plotting points (1, 0.4), (2, 1.6), (3, 2.8) and joining them we get a line l_2 which is the graph of equation (2).



The lines l_1 and l_2 intersect at a unique point $(\frac{3}{2}, 1)$.

(x) x+2y-7=0........(1)

2x-y-4=0.........(2)

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

Corresponding values of x and y can be tabulated as:

x	7	3	1
y	0	2	3

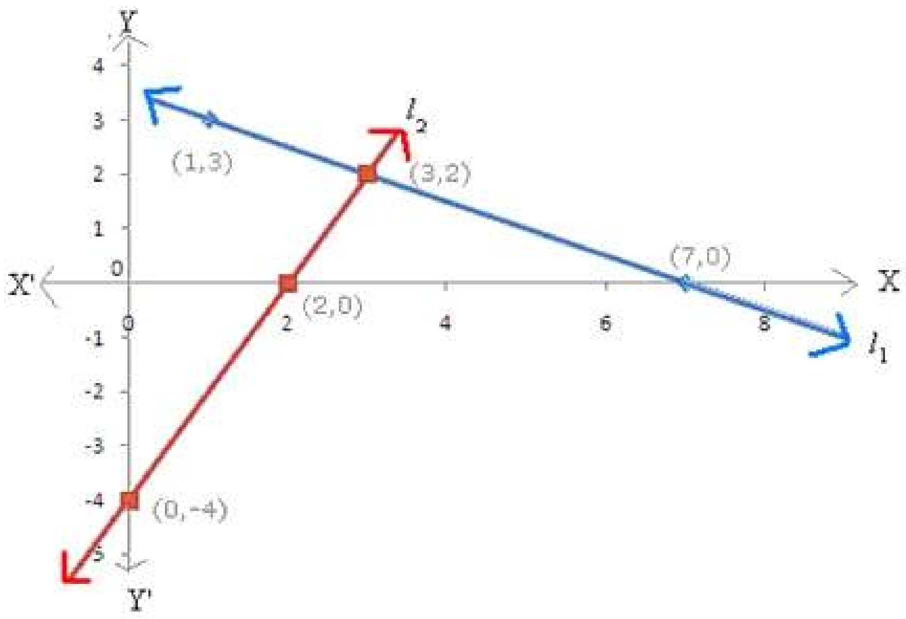
Plotting points (7, 0), (3, 2), (1, 3) and joining them, we get a line l_1 which is the graph of equation (1).

$2x-y-4=0 \Rightarrow y=2x-4$

Corresponding values of x and y can be tabulated as:

x	0	3	2
y	-4	2	0

Plotting points (0,-4), (3, 2), (2, 0) and joining them, we get a line l_2 which is the graph of equation (2).



The lines l_1 and l_2 intersect at a unique point (3, 2).

Answer 8.

(i) The given equation are:

$2y - x = 8$ ...(1)

$5y - x = 14$ ...(2)

$y = 2x + 1$ ...(3)

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

Corresponding values of x and y can be tabulated as:

x	-4	-2	0
y	2	3	4

Plotting points (-4, 2), (-2, 3), (0, 4) and joining them we get a line l_1 which is the graph of equation (1).

Again, $5y - x = 14 \Rightarrow x = 5y - 14$

Corresponding values of x and y can be tabulated as:

x	-4	1	6
y	2	3	4

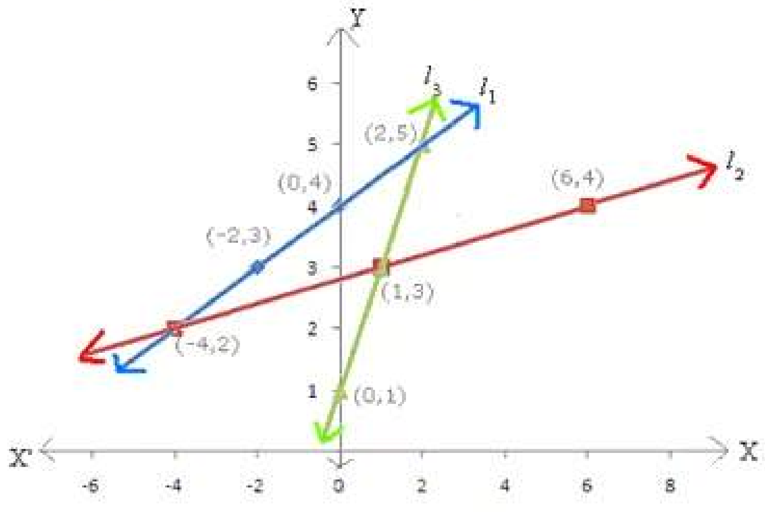
Plotting points (-4, 2), (1, 3), (6, 4) and joining them we get a line l_2 which is the graph of equation (2).

Again, $y = 2x + 1$

Corresponding values of x and y can be tabulated as:

x	0	1	2
y	1	3	5

Plotting points (0, 1), (1, 3), (2, 5) and joining them we get a line l_3 which is the graph of equation (3).



It can be seen that the lines l_1, l_2, and l_3 intersect each other form a triangle.

The vertices of Δ ABC are A(-4, 2), B(1, 3) and C (2, 5).

(ii) The given equation are:

$3y = x + 18$ ...(1)

$x + 7y = 22$ ...(2)

$y + 3x = 26$ ...(3)

$3y = x + 18 \Rightarrow x = 3y - 18$

Corresponding values of x and y can be tabulated as:

x	0	-3	-6
y	6	5	4

Plotting points (0, 6), (-3, 5) and (-6, 4) and joining them, we get a line l_1 which is the graph of equation (1).

Again, $x + 7y = 22 \Rightarrow x = 22 - 7y$

Corresponding values of x and y can be tabulated as:

x	1	8	-6
y	3	2	4

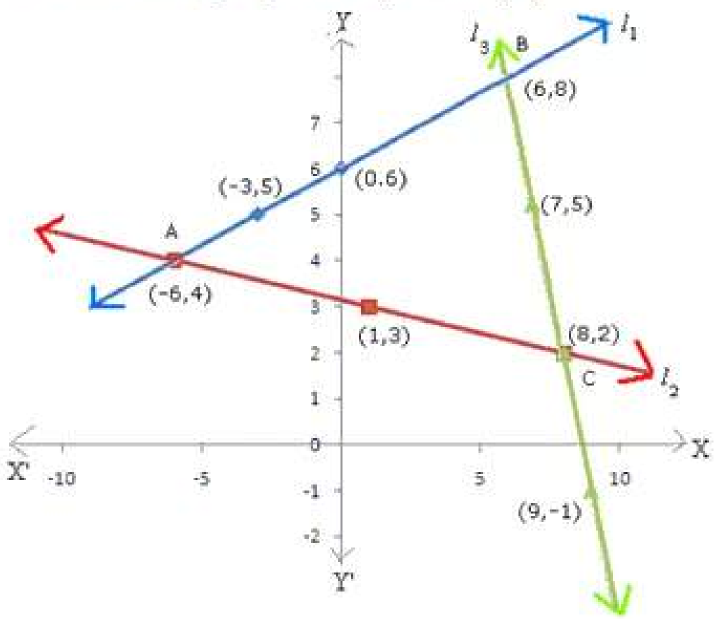
Plotting points (1, 3), (8, 2), (-6, 4) and joining them, we get a line l_2 which is the graph of equation (2).

Also, $y+3x = 26 \Rightarrow y = 26-3x$

Corresponding values of x and y can be tabulated as:

x	7	8	9
y	5	2	-1

Plotting points (7, 5), (8, 2), (9,-1) and joining them, we get a line l_3 which is the graph of equation (3).



It can be seen that the lines l_1, l_2 and l_3 intersect each other to from triangle ABC

The vertices of Δ ABC are A(-6, 4), B(6, 8) and C(8, 2).

Answer 9.

$4x - 5y - 20 = 0 \quad ...(1)$

$3x + 3y - 15 = 0 \quad ...(2)$

$4x - 5y - 20 = 0 \Rightarrow 4x = 5y + 20$

Corresponding values of x and y can be tabulated as:

x	0	-5	5
y	-4	-8	0

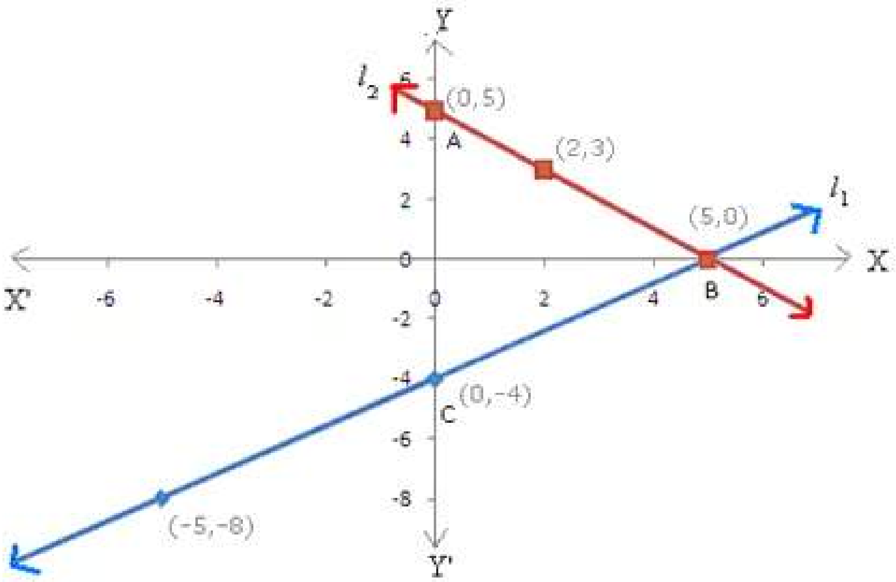
Plotting points (0,-4), (-5,-8), (5, 0) and joining them, we get a line l_1 which is the graph of equation (1).

Again, $3x + 3y - 15 = 0 \Rightarrow x + y - 5 = 0 \Rightarrow x + y = 5$

Corresponding values of x and y can be tabulated as:

x	0	5	2
y	5	0	3

Plotting points (0, 5), (5, 0), (2, 3) and joining them, we get a line l_2 which is the graph of equation (2).



The lines l_1 and l_2 intersect at (5, 0). Thus, the solution of equations (1) and (2) is x = 5 and y = 0.

Now, it can be seen that Δ ABC is formed by the two lines l_1 and l_2 and the y-axis.

The vertices of Δ ABC is A(0, 5), B(5, 0) and C(0,-4).

Answer 10.

$x - y + 1 = 0$ ...(1)

$4x + 3y = 24$ ...(2)

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

Corresponding values of x and y can be tabulated as:

x	0	3	-1
y	1	4	0

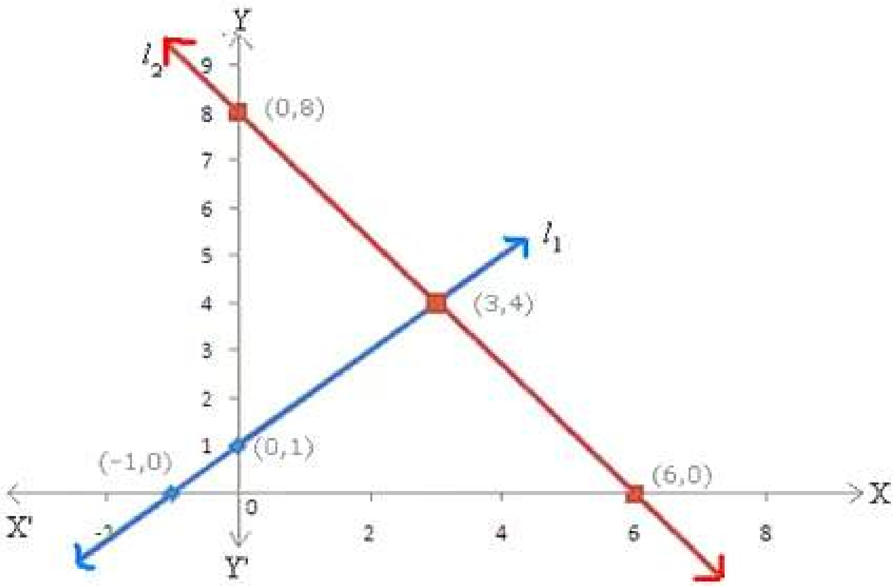
Plotting points (0, 1), (1, 2), (-1, 0) and joining them, we get a line l_1 which is the graph of equation (1).

$$4x+3y=24 \Rightarrow x = \frac{24-3y}{4}$$

Corresponding values of x and y can be tabulated as:

x	6	3	0
y	0	4	8

Plotting points (6, 0), (3, 4), (0, 8) and joining them, we get a line l_2 which is the graph of equation (2).



The lines l_1 and l_2 intersect at (3, 4). Thus, x = 3 and y = 4 is the unique solution of equation (1) and (2).

Now, from the graph, it can be seen that the lines l_1 and l_2

Intersect the x-axis at points (-1, 0) and (6, 0)

Answer 11.

$3x + 2y + 6 = 0$ ...(1)

$3x + 8y - 12 = 0$ ...(2)

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

Corresponding values of x and y can be tabulated as:

x	-2	0	-2.66
y	0	-3	1

Plotting points (-2, 0), (0, 3), (-2.66, 1) and joining them, we get a line l_1 which is the graph of equation (1).

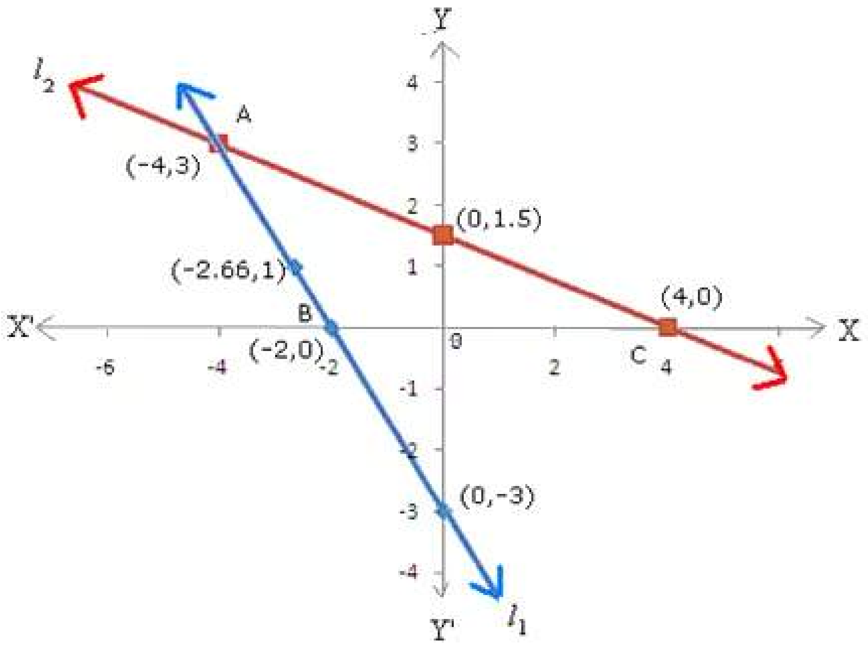
$3x+8y-12=0 \Rightarrow 3x = 12- 8y$

Corresponding values of x and y can be tabulated as:

x	4	-4	0
y	0	3	1.5

Plotting points (4, 0), (-4, 3), (0, 1.5) and joining them, we get a line l_2 which is the graph of equation (2).

It can be seen that the two lines l_1 and l_2 and the x-axis from a triangle ABC.



The coordinates of the vertices of ΔABC are A(-4, 3), B(-2, 0) and C(4, 0).

Answer 12A.

The given system of equations are $2x = 23 - 3y$ and $5x = 20 + 8y$.

Now, $2x = 23 - 3y$ ....(i)

$\Rightarrow x = \frac{23 - 3y}{2}$

Corresponding values of x and y can be tabulated as follows:

x	10	7	4
y	1	3	5

Plotting the points (10, 1), (7, 3) and (4, 5) and joining them, we get the line l_1 which is the graph of equation (i).

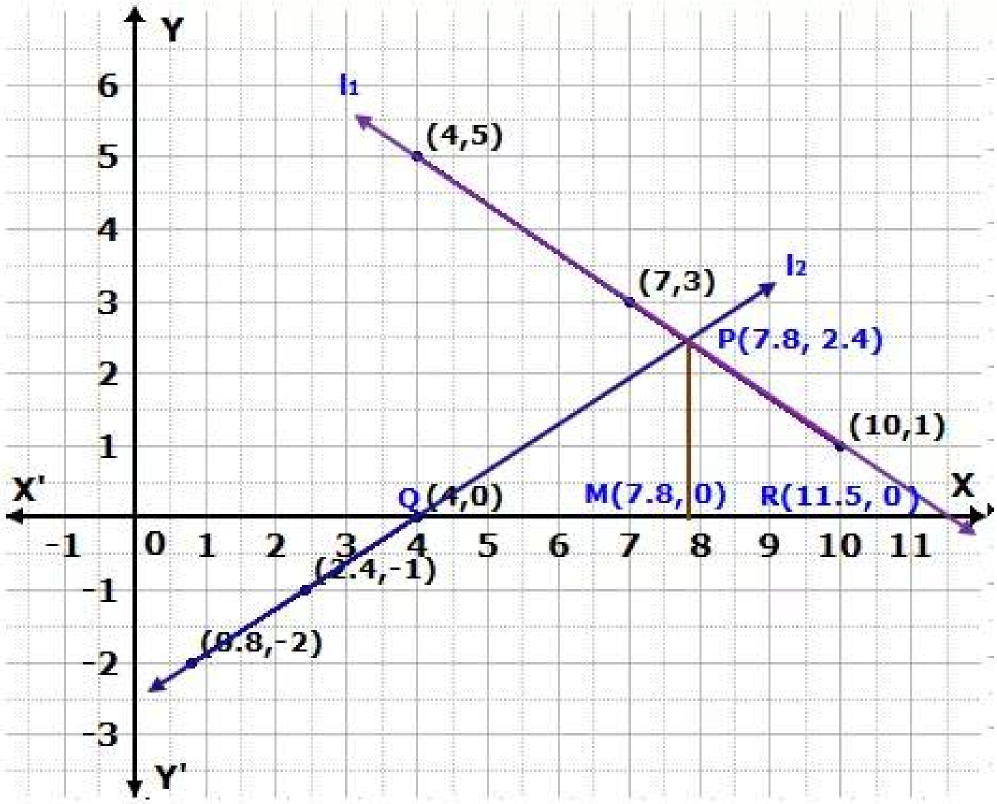
Again, $5x = 20 + 8y$ ....(ii)

$\Rightarrow x = \frac{20 + 8y}{5}$

Corresponding values of x and y can be tabulated as follows:

x	4	2.4	0.8
y	0	−1	−2

Plotting the points (4, 0), (2.4, −1) and (0.8, −2) and joining them, we get the line l_2 which is the graph of equation (ii).



The two lines l_1 and l_2 intersect at a point P(7.8, 2.4).
∴ x = 7.8, y = 2.4 is the solution of the given system of equations.

Draw PM perpendicular from P to X-axis.
Now, PM = y-coordinate of P(7.8, 2.4)
⇒ PM = 2.4 units
QR = 11.5 − 4 = 7.5 units
∴ Area of $\Delta PQR = \frac{1}{2} \times QR \times PM = \frac{1}{2} \times 7.5 \times 2.4 = 9$ sq. units

Answer 12B.

The given system of equations are
6x − 3y + 2 = 7x + 1 and 5x + 1 = 4x − y + 2.

Now, 6x − 3y + 2 = 7x + 1 ....(i)
⇒ x = 1 − 3y
Corresponding values of x and y can be tabulated as follows:

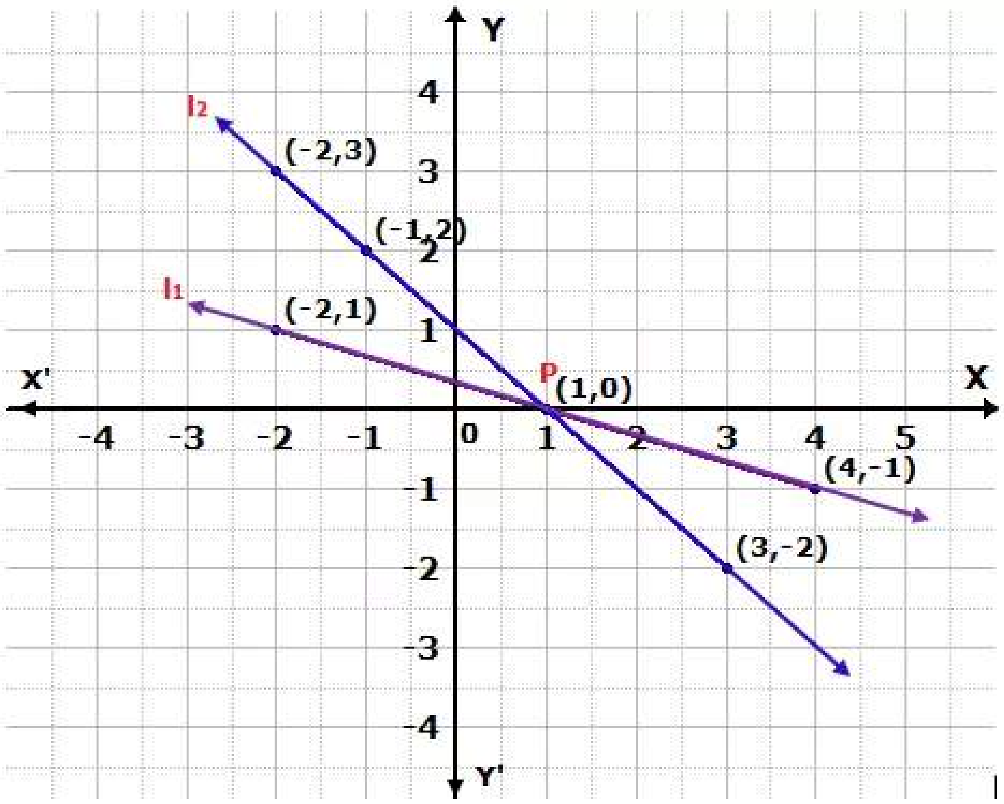
x	1	−2	4
y	0	1	−1

Plotting the points (1, 0), (−2, 1) and (4, −1) and joining them, we get the line l_1 which is the graph of equation (i).

Again, 5x + 1 = 4x − y + 2 ....(ii)
⇒ x = 1 − y
Corresponding values of x and y can be tabulated as follows:

x	−1	3	−2
y	2	−2	3

Plotting the points (−1, 2), (3, − 2) and (−2, 3) and joining them, we get the line l_2 which is the graph of equation (ii).



The two lines l_1 and l_2 intersect at a point P(1, 0).
∴ $x = 1, y = 0$ is the solution of the given system of equations.

Since both the lines l_1 and l_2 are intersecting each other at X-axis, no triangle is formed by these lines with X-axis.

Ex 8.3

Answer 1.

Let the length and breadth of a rectangle be x units and y units respectively.

According to given information, we have

$x = 2y$

$\Rightarrow x - 2y = 0 \quad ....(i)$

Also, perimeter of a rectangle = 30 units

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

$\Rightarrow x + y = 15 \quad ....(ii)$

Subtracting eqn. (ii) from eqn. (i), we get

$-3y = -15$

$\Rightarrow y = 5$

Substituting the value of y in eqn. (1), we get

$x - 2(5) = 0$

$\Rightarrow x - 10 = 0$

$\Rightarrow x = 10$

Thus, the length and breadth of a rectangle are 10 units and 5 units respectively.

Answer 2.

Let the larger number be x and the smaller number be y.

According to given information, we have

$x - y = 3$

$\Rightarrow x = 3 + y \quad ....(i)$

Also, $3x + 2y = 19$

$\Rightarrow 3(3 + y) + 2y = 19 \quad ....[\text{From (i)}]$

$\Rightarrow 9 + 3y + 2y = 19$

$\Rightarrow 5y = 10$

$\Rightarrow y = 2$

$\Rightarrow x = 3 + 2 = 5$

Thus, the required numbers are 5 and 2 respectively.

Answer 3.

Let the two numbers be x and y respectively.

Then, we have

$x = 3y \quad ....(i)$

And, $x + y = 68$

$\Rightarrow 3y + y = 68$

$\Rightarrow 4y = 68$

$\Rightarrow y = 17$

$\Rightarrow x = 3 \times 17 = 51$

Thus, the two numbers are 51 and 17 respectively.

Answer 4.

Let the two numbers be x and y respectively.

Then, we have

$4x + 3y = 15 \quad ....(i)$

$3x - 2y = 7 \quad ....(ii)$

Multiplying eqn. (i) by 2 and eqn. (ii) by 3, we get

$8x + 6y = 30 \quad ....(iii)$

$9x - 6y = 21 \quad ....(iv)$

Adding eqns. (iii) and (iv), we get

$17x = 51$

$\Rightarrow x = 3$

$\Rightarrow 4(3) + 3y = 15$

$\Rightarrow 12 + 3y = 15$

$\Rightarrow 3y = 3$

$\Rightarrow y = 1$

Thus, the two numbers are 3 and 1 respectively.

Answer 5.

Let x be the digit at ten's place and y be the digit at unit's place.
Then, the number is $10x + y$.
Number obtained by reversing the digits = $10y + x$

According to given information, we have

$x + y = 7 \quad ....(i)$

And, $(10y + x) - (10x + y) = 9$

$\Rightarrow 10y + x - 10x - y = 9$

$\Rightarrow 9y - 9x = 9$

$\Rightarrow 9(y - x) = 9$

$\Rightarrow y - x = 1 \quad ....(ii)$

Adding eqns. (i) and (ii), we get

$2y = 8$

$\Rightarrow y = 4$

$\Rightarrow x + 4 = 7$

$\Rightarrow x = 3$

$\therefore$ Required number = $10x + y = 10 \times 3 + 4 = 30 + 4 = 34$

Answer 6.

Let x be the digit at ten's place and y be the digit at unit's place.
Then, the number is $10x + y$.
Number obtained by reversing the digits = $10y + x$

According to given information, we have

$(10x + y) + (10y + x) = 110$

$\Rightarrow 11x + 11y = 110$

$\Rightarrow 11(x + y) = 9$

$\Rightarrow x + y = 10 \quad ....(i)$

Also, $x - y = 2 \quad ....(ii)$

Adding eqns. (i) and (ii), we get

$2x = 12$

$\Rightarrow x = 6$

$\Rightarrow 6 + y = 10$

$\Rightarrow y = 4$

$\therefore$ Required number = $10x + y = 10 \times 6 + 4 = 60 + 4 = 64$

Answer 7.

Let x be the digit at ten's place and y be the digit at unit's place.
Then, the number is 10x + y.
Number obtained by reversing the digits = 10y + x

According to given information, we have

$(10x + y) + 7 = (10y + x) - 2$

$\Rightarrow 10x + y + 7 = 10y + x - 2$

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

$\Rightarrow 9(x - y) = -9$

$\Rightarrow x - y = -1 \quad ....(i)$

Also, $x + y = 5 \quad ....(ii)$

Adding eqns. (i) and (ii), we get

$2x = 4$

$\Rightarrow x = 2$

$\Rightarrow 2 + y = 5$

$\Rightarrow y = 3$

$\therefore$ Required number $= 10x + y = 10 \times 2 + 3 = 20 + 3 = 23$

Answer 8.

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

According to given information, we have

$\frac{x+2}{y+2} = \frac{9}{10}$ and $\frac{x-3}{y-3} = \frac{4}{5}$

$\Rightarrow 10x + 20 = 9y + 18$ and $5x - 15 = 4y - 12$

$\Rightarrow 10x - 9y = -2 \quad ....(i)$ and $5x - 4y = 3 \quad ....(ii)$

Multiplying eqn. (ii) by 2, we get

$10x - 8y = 6 \quad ....(iii)$

Subtracting eqn. (iii) from eqn. (i), we get

$-y = -8$

$\Rightarrow y = 8$

$\Rightarrow 10x - 8(8) = 6$

$\Rightarrow 10x - 64 = 6$

$\Rightarrow 10x = 70$

$\Rightarrow x = 7$

$\therefore$ Required fraction $= \frac{7}{8}$

Answer 9.

Let the two numbers be x and y.

According to given information, we have

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

$\Rightarrow 5x = 2y$

$\Rightarrow 5x - 2y = 0 \qquad ....(i)$

And, $\frac{x+4}{y-32} = \frac{5}{2}$

$\Rightarrow 2x + 8 = 5y - 160$

$\Rightarrow 2x - 5y = -168 \qquad ....(ii)$

Multiplying eqn. (i) by 5 and eqn. (ii) by 2, we get

$25x - 10y = 0 \qquad ....(iii)$

$4x - 10y = -336 \qquad ....(iv)$

Subtracting eqn. (iv) from eqn. (iii), we get

$21x = 336$

$\Rightarrow x = 16$

$\Rightarrow 5(16) - 2y = 0$

$\Rightarrow 80 - 2y = 0$

$\Rightarrow 2y = 80$

$\Rightarrow y = 40$

Thus, the numbers are 16 and 40.

Answer 10.

Let the numerator and denominator of a fraction be x and y respectively.

$\therefore$ Fraction = $\frac{x}{y}$

According to given information, we have

$x + y = 12 \quad ....(i)$

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

$\Rightarrow 2x = y + 3$

$\Rightarrow 2x - y = 3 \quad ....(ii)$

Adding eqns. (i) and (ii), we get

$3x = 15$

$\Rightarrow x = 5$

$\Rightarrow 5 + y = 12$

$\Rightarrow y = 7$

$\therefore$ Required fraction = $\frac{5}{7}$

Answer 11.

Let the numerator and denominator of a fraction be x and y respectively.

$\therefore$ Fraction = $\frac{x}{y}$

According to given information, we have

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

$\Rightarrow 2x = y + 1$

$\Rightarrow 2x - y = 1 \quad ....(i)$

Also, $\frac{x+1}{y} = 1$

$\Rightarrow x + 1 = y$

$\Rightarrow x - y = -1 \quad ....(ii)$

Subtracting eqn. (ii) from (i), we get

$x = 2$

$\Rightarrow 2 - y = -1$

$\Rightarrow y = 3$

$\therefore$ Required fraction = $\frac{2}{3}$

Answer 12.

Let the present age of father = x years and that of son = y years

After 10 years,

father's age = (x + 10) years

son's age = (y + 10) years

According to given information, we have

$x = 7y$ ....(i)

And, $(x + 10) = 3(y + 10)$

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

$\Rightarrow x - 3y = 20$

$\Rightarrow 7y - 3y = 20$ ....[From (i)]

$\Rightarrow 4y = 20$

$\Rightarrow y = 5$

$\Rightarrow x = 7 \times 5 = 35$

Thus, the present age of son is 5 years and that of father is 35 years.

Answer 13.

Let the present age of Kapil = x years and that of Karuna = y years

After 6 years,

Kapil's age = (x + 6) years

Karuna's age = (y + 6) years

According to given information, we have

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

$\Rightarrow 3x = 2y$

$\Rightarrow 3x - 2y = 0$ ....(i)

And, $\frac{x+6}{y+6} = \frac{5}{7}$

$\Rightarrow 7x + 42 = 5y + 30$

$\Rightarrow 7x - 5y = -12$ ....(ii)

Multiplying eqn. (i) by 5 and eqn. (ii) by 2, we get

$15x - 10y = 0$ ....(iii)

$14x - 10y = -24$ ....(iv)

Subtracting eqn. (iv) from eqn. (iii), we get

$x = 24$

$\Rightarrow 3(24) - 2y = 0$

$\Rightarrow 72 - 2y = 0$

$\Rightarrow 2y = 72$

$\Rightarrow y = 36$

Thus, the present age of Kapil is 24 years and that of Karuna is 36 years.

Answer 14.

Let the present age of father = x years and that of his child = y years

After 12 years,

father's age = $(x + 12)$ years

child's age = $(y + 12)$ years

According to given information, we have

$x = 3y \quad \ldots.(i)$

Now, after 12 years

$2(x + 12) = 3(y + 12) + 36$

$\Rightarrow 2x + 24 = 3y + 36 + 36$

$\Rightarrow 2x - 3y = 48 \quad \ldots.(ii)$

$\Rightarrow 2(3y) - 3y = 48$

$\Rightarrow 3y = 48$

$\Rightarrow y = 16$

$\Rightarrow x = 3 \times 16 = 48$

Thus, the present age of father is 48 years.

* Question modified

Answer 15.

Let the two angles of a triangle be x and y respectively.
Then, the 3^{rd} angle will be $180° - (x + y)$.

According to given information, we have
$x + y = 180° - (x + y)$
$\Rightarrow 2(x + y) = 180°$
$\Rightarrow x + y = 90°$ ....(i)

And, $x - y = 20°$ ....(ii)

Adding eqns. (i) and (ii), we have
$2x = 110°$
$\Rightarrow x = 55°$
$\Rightarrow 55° + y = 90°$
$\Rightarrow y = 35°$
$\Rightarrow 3^{rd}$ angle $= 180° - (55° + 35°) = 180° - 90° = 90°$

Hence, the three angles of a triangle are 55°, 35° and 90°.

Answer 16.

In ΔABC,
$\angle A = x°$, $\angle B = (2x - 30)°$, $\angle C = y°$

Now, sum of the angles of a triangle is 180°.
$\Rightarrow \angle A + \angle B + \angle C = 180°$
$\Rightarrow x° + (2x - 30)° + y° = 180°$
$\Rightarrow 3x° + y° = 210°$ ....(i)

Also, it is given that $\angle A + \angle B = 90°$
$\Rightarrow x° + (2x - 30)° = 90°$
$\Rightarrow 3x° = 120°$
$\Rightarrow x° = 40° = \angle A$
$\Rightarrow \angle B = 2(40°) - 30° = 80° - 30° = 50°$

Substituting the value of x° in eqn. (i), we get
$\Rightarrow 3(40°) + y° = 210°$
$\Rightarrow 120° + y° = 210°$
$\Rightarrow y° = 90° = \angle C$

Thus, the three angles of a triangle are as follows:
$\angle A = 40°$, $\angle B = 50°$ and $\angle C = 90°$
It is a right-angled triangle right angle at C.

Answer 17.

Let x be the digit at ten's place and y be the digit at unit's place.
Then, the number is $10x + y$.
Number obtained by reversing the digits = $10y + x$

According to given information, we have

$x = 3y + 3 \quad ....(i)$

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

$\Rightarrow 10y + x = 2x + 2y + 2$

$\Rightarrow 8y - x = 2$

$\Rightarrow 8y - (3y + 3) = 2 \quad ....[From (i)]$

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

$\Rightarrow 5y = 5$

$\Rightarrow y = 1$

$\Rightarrow x = 3(1) + 3 = 3 + 3 = 6$

$\therefore$ Required number $= 10x + y = 10 \times 6 + 1 = 60 + 1 = 61$

Answer 18.

Let Anil's income = Rs. x and Sunita's income = Rs. y

According to given information, we have

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

$\Rightarrow 5x = 3y$

$\Rightarrow 5x - 3y = 0 \quad ....(i)$

And, $\dfrac{x - 5000}{y - 5000} = \dfrac{1}{3} \quad ....[Expense = Income - Savings]$

$\Rightarrow 3x - 15000 = y - 5000$

$\Rightarrow 3x - y = 10000 \quad ....(ii)$

Multiplying eqn. (ii) by 3, we get

$9x - 3y = 30000 \quad ....(iii)$

Subtracting eqn. (i) from eqn. (iii), we get

$4x = 30000$

$\Rightarrow x = 7500$

$\Rightarrow 5(7500) - 3y = 0$

$\Rightarrow 37500 - 3y = 0$

$\Rightarrow 3y = 37500$

$\Rightarrow y = 12500$

Hence, Anil's income is Rs. 7500 and Sunita's income is Rs. 12,500.

Answer 19.

Let the number of passed students be x and the number of failed students be y.

According to the question,

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

$\Rightarrow x = 3y \quad \ldots.(i)$

Now, if 30 less appeared and 10 less failed, then we have

Number of students appeared = $x + y - 30$

number of failed students = $y - 10$

$\therefore$ number of passed students = $x - 20$

$\Rightarrow \frac{x - 20}{y - 10} = \frac{13}{4}$

$\Rightarrow 4x - 80 = 13y - 130$

$\Rightarrow 4x - 13y = -50$

$\Rightarrow 4(3y) - 13y = -50 \quad \ldots.[\text{From (i)}]$

$\Rightarrow 12y - 13y = -50$

$\Rightarrow -y = -50$

$\Rightarrow y = 50$

$\Rightarrow x = 3 \times 50 = 150$

$\Rightarrow x + y = 150 + 50 = 200$

Hence, 200 students appeared for the examination.

Answer 20.

Cost of an eraser = Rs. x
Cost of a sharpener = Rs. y

According to given information, we have

$x = y - 1.50$

$\Rightarrow x - y = -1.50 \quad ....(i)$

And, $4x + 3y = 29 \quad ....(ii)$

Multiplying eqn. (i) by 3, we get

$3x - 3y = -4.50 \quad ....(iii)$

Adding eqns. (ii) and (iii), we get

$7x = 24.50$

$\Rightarrow x = 3.50$

$\Rightarrow 3.50 - y = -1.50$

$\Rightarrow y = 3.50 + 1.50 = 5$

Thus, the cost of an eraser is Rs. 3.50 and that of a sharpener is Rs. 5.

Answer 21.

Let the speed of the person in still water be x km/hr
and the speed of the stream be y km/hr.
Speed of the person downstream = $(x + y)$km / hr
Speed of the person upstream = $(x - y)$km / hr

Time required to go 8 km downstream = 40 minutes = $\frac{40}{60}$ hours = $\frac{2}{3}$ hours

$\Rightarrow \frac{8}{x+y} = \frac{2}{3}$

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

$\Rightarrow 12 = x + y$

$\Rightarrow x + y = 12 \quad ....(i)$

Time required to go 8 km upstream = 1 hour

$\Rightarrow \frac{8}{x-y} = 1$

$\Rightarrow 8 = x - y$

$\Rightarrow x - y = 8 \quad ....(ii)$

Adding eqns. (i) and (ii), we get

$2x = 20$

$\Rightarrow x = 10$

$\Rightarrow 10 - y = 8$

$\Rightarrow y = 2$

Thus, the speed of the person in still water is 10 km/hr and the speed of the stream is 2 km/hr.

Answer 22.

Let the speed of the boat in still water be x km/hr and the speed of the stream be y km/hr.

Speed of the boat upstream = $(x - y)$km / hr

Speed of the boat downstream = $(x + y)$km / hr

Time required to go 18 km upstream = 3 hours

$$\Rightarrow \frac{18}{x - y} = 3$$

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

$$\Rightarrow x - y = 6 \quad ....(i)$$

Time required to go 24 km downstream = 2 hours

$$\Rightarrow \frac{24}{x + y} = 2$$

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

$$\Rightarrow x + y = 12 \quad ....(ii)$$

Adding eqns. (i) and (ii), we get

$2x = 18$

$\Rightarrow x = 9$

$\Rightarrow 9 - y = 6$

$\Rightarrow y = 3$

Thus, the speed of the boat in still water is 9 km/hr and the speed of the stream is 3 km/hr.

Answer 23.

Let the speed of Salman = x km / hr
and the speed of Kirti = y km / hr
Total distance = 28 km

When they walk in the same direction,
$28x - 28y = 28$
$\Rightarrow x - y = 1 \quad ....(i)$

When they walk in the opposite direction,
$4x + 4y = 28$
$\Rightarrow x + y = 7 \quad ....(ii)$

Adding eqns. (i) and (ii), we get
$2x = 8$
$\Rightarrow x = 4$
$\Rightarrow 4 + y = 7$
$\Rightarrow y = 3$

Thus, the speed of Salman is 4 km/hr and that of Kirti is 3 km/hr.

Answer 24.

Let x gallons of 12% alcohol and y gallons of 4% alcohol be mixed.

Then, we have
$x + y = 20 \quad ....(i)$

And, 12% of x + 4% of y = 9% of 20
$\Rightarrow \frac{12}{100}x + \frac{4}{100}y = \frac{9}{100} \times 20$
$\Rightarrow 12x + 4y = 180$
$\Rightarrow 3x + y = 45 \quad ....(ii)$

Subtracting eqn. (i) from eqn. (ii), we get
$2x = 25$
$\Rightarrow x = 12.5$
$\Rightarrow 12.5 + y = 20$
$\Rightarrow y = 7.5$

Hence, 12.5 gallons of 12% alcohol
and 7.5 gallons of 4% alcohol should be used.

Answer 25.

Let the unit price for each pen = Rs. x
and the unit price for each pencil = Rs. y

According to given information, we have

$9x + 5y = 32 \quad ....(i)$

$7x + 8y = 29 \quad ....(ii)$

Multiplying eqn. (i) by 8 and eqn. (ii) by 5, we get

$72x + 40y = 256 \quad ....(iii)$

$35x + 40y = 145 \quad ....(iv)$

Subtracting eqn. (iv) from eqn. (iii), we get

$37x = 111$

$\Rightarrow x = 3$

$\Rightarrow 9(3) + 5y = 32$

$\Rightarrow 27 + 5y = 32$

$\Rightarrow 5y = 5$

$\Rightarrow y = 1$

Thus, the unit price for each pen is Rs. 3 and that for each pencil is Rs. 1.

Answer 26.

Let Sunil has x number of oranges
and Kafeel has y number of oranges.

In 1^{st} case (if Sunil gives 2 oranges to Kafeel):

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

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

$\Rightarrow 3x - y = 8 \quad ....(i)$

In 2^{nd} case (if Kafeel gives 2 oranges to Sunil):

$x + 2 = y - 2$

$\Rightarrow x - y = -4 \quad ....(ii)$

Subtracting eqn. (ii) from eqn. (i), we get

$2x = 12$

$\Rightarrow x = 6$

$\Rightarrow 6 - y = -4$

$\Rightarrow y = 10$

Thus, Sunil has 6 oranges and Kafeel has 10 oranges.

Answer 27.

Pocket money of Samidha = Rs. x
Pocket money of Shreya = Rs. y

According to given information, we have

$x - 500 = y \quad \ldots(i)$

$\Rightarrow x - y = 500$

And, $y - 500 = \frac{3}{5}x$

$\Rightarrow 5y - 2500 = 3x$

$\Rightarrow 5(x - 500) - 2500 = 3x$

$\Rightarrow 5x - 2500 - 2500 = 3x$

$\Rightarrow 2x = 5000$

$\Rightarrow x = 2500$

$\Rightarrow y = 2500 - 500 = 2000$

Thus, pocket money of Samidha is Rs. 2500 and that of Shreya is Rs. 2000.

Answer 28.

Let the C.P. of S1 mobile = Rs. x
and the C.P. of S2 mobile = Rs. y

In 1^{st} case :

S.P. of S1 mobile = Rs. x + 4% of Rs. x = Rs. $\left(x + \frac{4}{100}x\right)$ = Rs. $\frac{104}{100}x$ = Rs. $\frac{26x}{25}$

S.P. of S2 mobile = Rs. y + 6% of Rs. y = Rs. $\left(y + \frac{6}{100}y\right)$ = Rs. $\frac{106}{100}y$ = Rs. $\frac{53y}{50}$

$\therefore \frac{26x}{25} + \frac{53y}{50} = 10490$

$\Rightarrow 52x + 53y = 524500 \quad \ldots(i)$

In 2^{nd} case :

S.P. of S1 mobile = Rs. x + 6% of Rs. x = Rs. $\left(x + \frac{6}{100}x\right)$ = Rs. $\frac{106}{100}x$ = Rs. $\frac{53x}{50}$

S.P. of S2 mobile = Rs. y + 4% of Rs. y = Rs. $\left(y + \frac{4}{100}y\right)$ = Rs. $\frac{104}{100}y$ = Rs. $\frac{26y}{25}$

$\therefore \frac{53x}{50} + \frac{26y}{25} = 10510$

$\Rightarrow 53x + 52y = 525500 \quad \ldots(ii)$

Adding eqns. (i) and (ii), we get

$105x + 105y = 1050000$

$\Rightarrow x + y = 10000 \quad ....(iii)$

Subtracting eqn. (i) from eqn. (ii), we get

$x - y = 1000 \quad ....(iv)$

Adding eqns. (iii) and (iv), we get

$2x = 11000 \Rightarrow x = 5500$

$\Rightarrow 5500 - y = 1000 \Rightarrow y = 4500$

Thus, the cost price of S1 mobile is Rs. 5500 and that of S2 mobile is Rs. 4500.

Answer 29.

Let A alone will do the work in x days

and B alone will do the same work in y days.

Then, A's 1 day work = $\frac{1}{x}$ and B's 1 day work = $\frac{1}{y}$

According to given information, we have

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

$$\Rightarrow \frac{1}{x} + \frac{1}{y} = \frac{3}{20} \quad ....(i)$$

And, $\frac{1}{x} = 1\frac{1}{4} \times \frac{1}{y}$

$$\Rightarrow \frac{1}{x} = \frac{5}{4y}$$

$$\Rightarrow \frac{1}{x} - \frac{5}{4y} = 0 \quad ....(ii)$$

Subtracting eqn. (ii) from eqn. (i), we get

$$\frac{1}{y} + \frac{5}{4y} = \frac{3}{20}$$

$$\Rightarrow \frac{9}{4y} = \frac{3}{20}$$

$$\Rightarrow 4y = \frac{9 \times 20}{3} = 60$$

$$\Rightarrow y = 15$$

$$\Rightarrow \frac{1}{x} - \frac{5}{4(15)} = 0 \Rightarrow \frac{1}{x} = \frac{1}{12} \Rightarrow x = 12$$

Thus, A alone will do the work in 12 days and

B alone will do the same work in 15 days.