

Chapter 8. Simultaneous Linear Equations

Ex 8.1

Answer 1A.

The given equations are

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\Rightarrow 2x = 31 - 3y$$

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

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

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

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

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

$$\Rightarrow 7x = 31 + 3y$$

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

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

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

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

Now, consider equation $3y = 7x$

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

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

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

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

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

$$\Rightarrow 0.5x = 0.74 - 0.7y$$

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

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

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

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

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

$$\Rightarrow 0.222 + 0.04y = 0.25$$

$$\Rightarrow 0.04y = 0.028$$

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

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

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

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

Answer 1H.

The given equations are

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

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

Multiplying both the equations by 10, we get

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

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

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

$$\Rightarrow 4x = 17 - 3y$$

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

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

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

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

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

$$\Rightarrow 119 - 29y = 32$$

$$\Rightarrow -29y = 32 - 119$$

$$\Rightarrow -29y = -87$$

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

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

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

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

Answer 1I.

The given equations are

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\Rightarrow 3x + 4y = 19$$

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

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

$$\Rightarrow 29y + 9 = 38$$

$$\Rightarrow 29y = 29$$

$$\Rightarrow y = 1$$

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,

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

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

Multiplying (2) by 2,

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

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,

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

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

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

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

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

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 $\left(\frac{22}{31}, \frac{11}{23}\right)$.

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

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

Dividing by uv , we get,

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

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

$$3u + 9v = 11uv$$

Dividing by uv , we get

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

Multiplying (1) by 3, we get,

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

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

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

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

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

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

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

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

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

Multiplying equation (1) by 3, we get,

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

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

$$13a - 11b = 70 \quad \dots(i)$$

$$11a - 13b = 74 \quad \dots(ii)$$

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

$$169a - 143b = 910 \quad \dots(iii)$$

$$121a - 143b = 814 \quad \dots(iv)$$

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

$$41x + 53y = 135 \quad \dots(i)$$

$$53x + 41y = 147 \quad \dots(ii)$$

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

$$2173x + 2809y = 7155 \quad \dots(iii)$$

$$2173x + 1681y = 6027 \quad \dots(iv)$$

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

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

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

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

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

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

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

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

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

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

$$6a + 2b = 34$$

$$\Rightarrow 3a + b = 17 \quad [\text{Dividing throughout by 2}] \quad \dots(iii)$$

$$200a + 100b = 1200$$

$$\Rightarrow 2a + b = 12 \quad [\text{Dividing throughout by 100}] \quad \dots(iv)$$

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.

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

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

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

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

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

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

Multiplying eqn. (ii) by 2, we get

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

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.

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

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

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

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

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

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

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

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

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

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

$$\text{And, } 5a - 3b = 1 \quad \dots(ii)$$

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

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

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

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

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

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

Multiplying eqn. (i) by 3, we get

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

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

$$y - x = 0.8$$

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

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

$$\Rightarrow 13 = 2x + 2y$$

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

Multiplying eqn. (i) by 2, we get

$$-2x + 2y = 1.6 \quad \dots(iii)$$

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 $\frac{2}{x} + \frac{3}{y} = \frac{9}{xy}$ and $\frac{4}{x} + \frac{9}{y} = \frac{21}{xy}$.

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

Then, we have

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

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

Multiplying eqn. (i) by 2, we get

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

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

$$3b = 3ab$$

$$\Rightarrow a = 1$$

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

$$\Rightarrow x = 1$$

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.

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

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

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

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

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

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

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

Multiplying eqn. (i) by 2, we get

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

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 $\left(\frac{3}{7}, \frac{19}{9}\right)$.

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

$$6a = 7b + 3$$

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

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

$$\Rightarrow 3a = 2b$$

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

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

$$4b - 7b = 3$$

$$\Rightarrow -3b = 3$$

$$\Rightarrow b = -1$$

$$6a = -4$$

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

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

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

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

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

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

$$10a + 15b = 17 \quad \dots(iii)$$

$$10a + 2b = 4 \quad \dots(iv)$$

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

$$13b = 13$$

$$\Rightarrow b = 1$$

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

$$5a + 1 = 2$$

$$\Rightarrow 5a = 1$$

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

$$\Rightarrow 3x + 2y = 5 \quad \text{and} \quad 3x - 2y = 1$$

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.

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

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

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

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

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

$$\Rightarrow \frac{1}{x} - \frac{1}{y} = \frac{1}{6} \quad \dots(ii)$$

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.

$$2x+y = 23 \dots\dots(1)$$

$$4x-y = 19 \dots\dots(2)$$

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.

$$10y = 7x - 4 \dots\dots\dots(1)$$

$$12x + 18y = 1 \dots\dots\dots(2)$$

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

$$63x - 90y = 36 \dots\dots\dots(3)$$

$$60x + 90y = 5 \dots\dots\dots(4)$$

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.

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

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

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

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

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

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).

$$\text{Now, } y = ax - 2$$

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

$$\Rightarrow 3a - 4$$

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

Answer 8.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$-62x = 574$$

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

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

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

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

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

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

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

$$\Rightarrow \text{L.H.S.} \neq \text{R.H.S.}$$

Hence, the given system of equations are not consistent.

Answer 10.

The given equations are

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

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

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

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

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

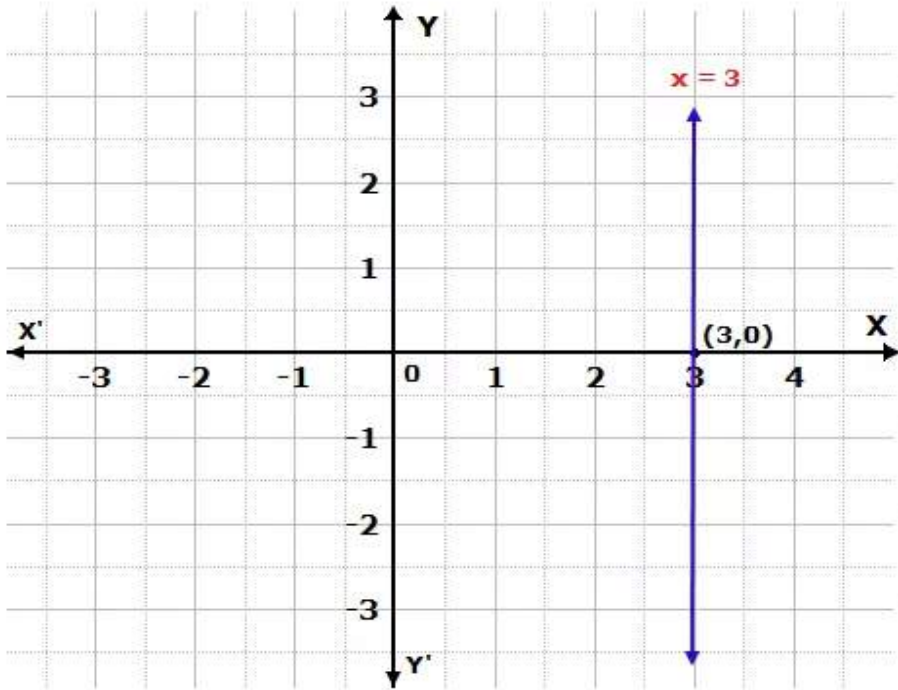
$$\Rightarrow -\frac{20}{9}m = 1 - \frac{1}{3} = \frac{2}{3}$$

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

Ex 8.2

Answer 1A.

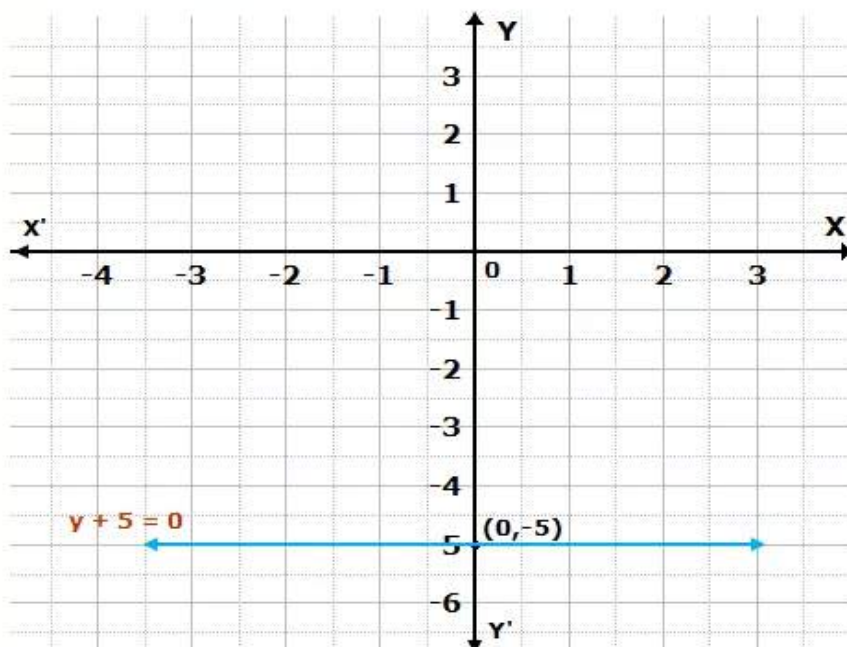
The graph of $x = 3$ is as follows:



Answer 1B.

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

The graph is as follows:



Answer 1C.

$$3x + 2y - 6 = 0$$

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

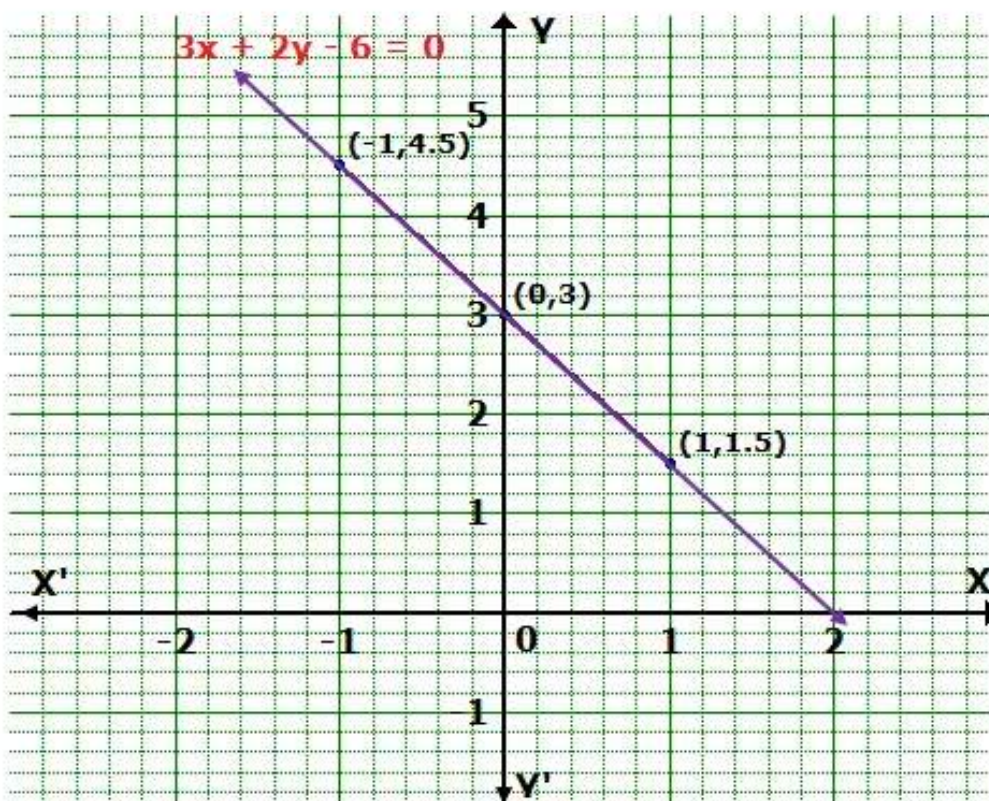
$$\Rightarrow 2y = 6 - 3x$$

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

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.

$$5x - 5y = 8$$

$$\Rightarrow 5x = 8 - 5y$$

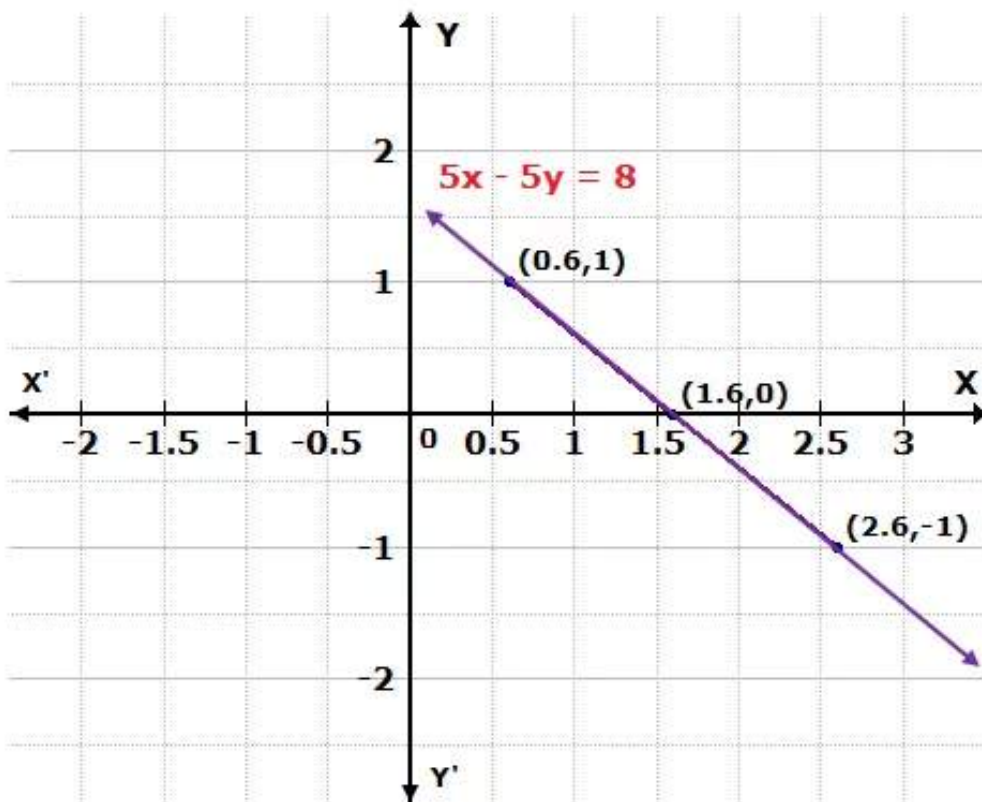
$$\Rightarrow x = \frac{8 - 5y}{5}$$

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

$\Rightarrow 3x + 2y = 6$

$\Rightarrow 2y = 6 - 3x$

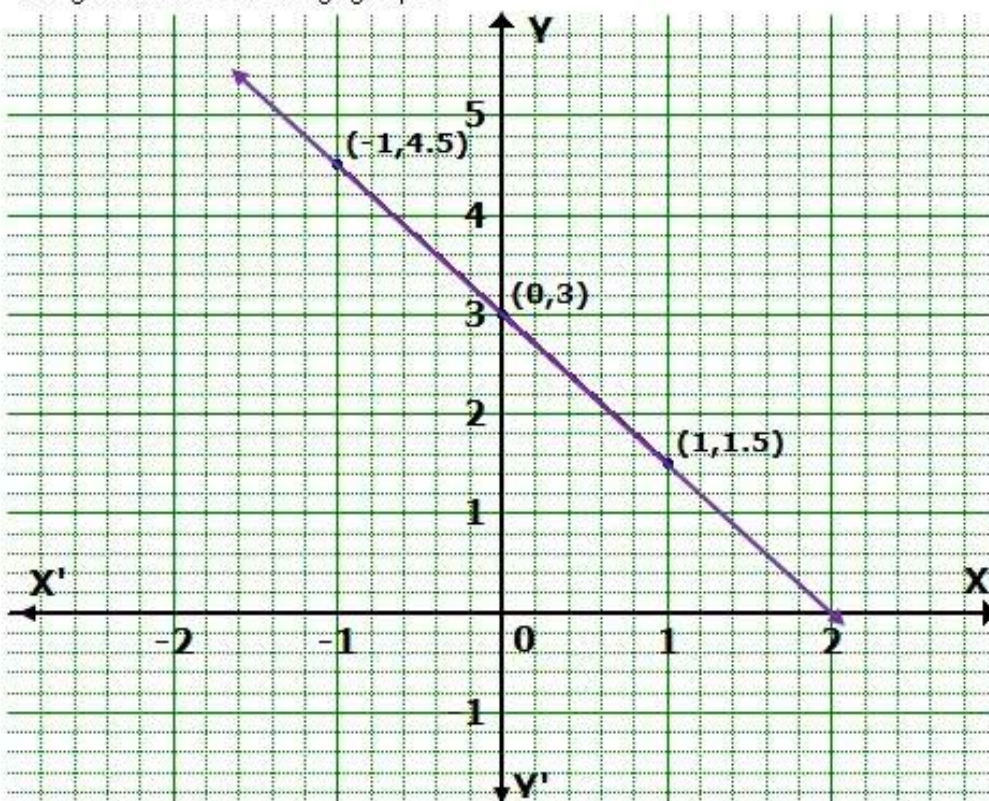
$\Rightarrow y = \frac{6 - 3x}{2}$

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.

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

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

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

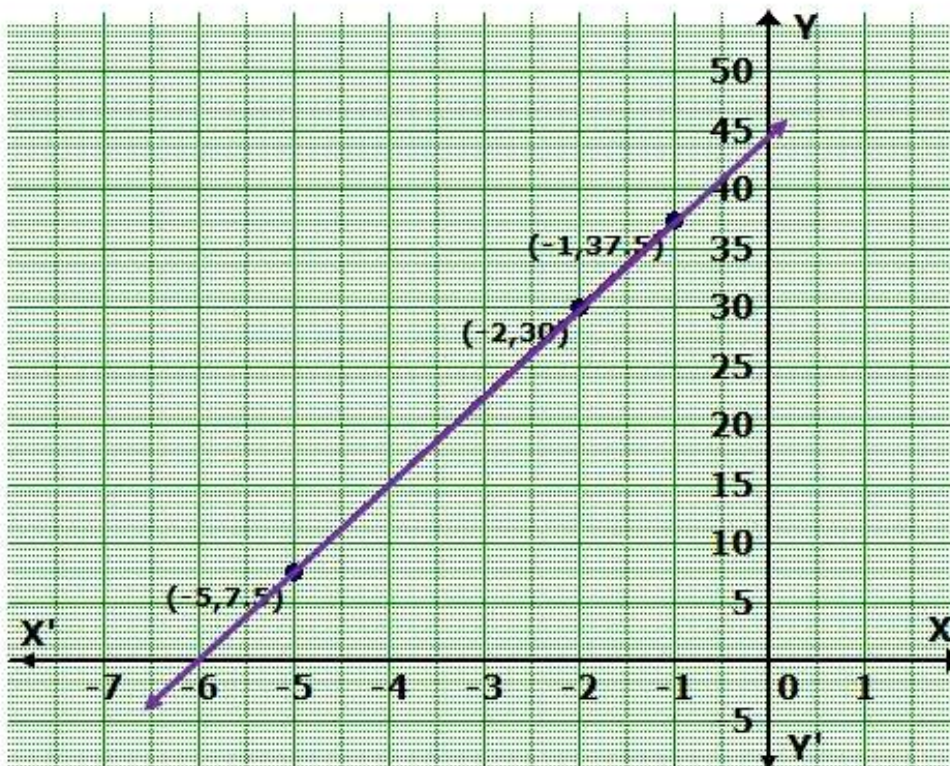
$$\Rightarrow 2y = 90 + 15x$$

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

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.

$$4x - 3y + 12 = 0$$

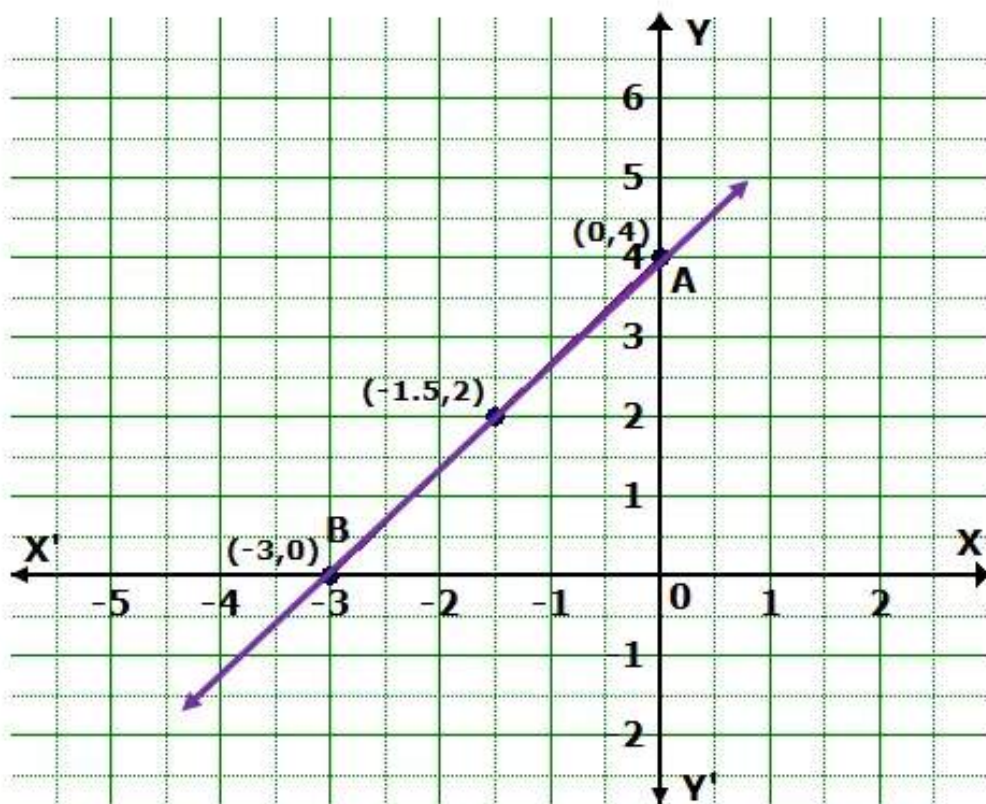
$$\Rightarrow 4x = 3y - 12$$

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

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:



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

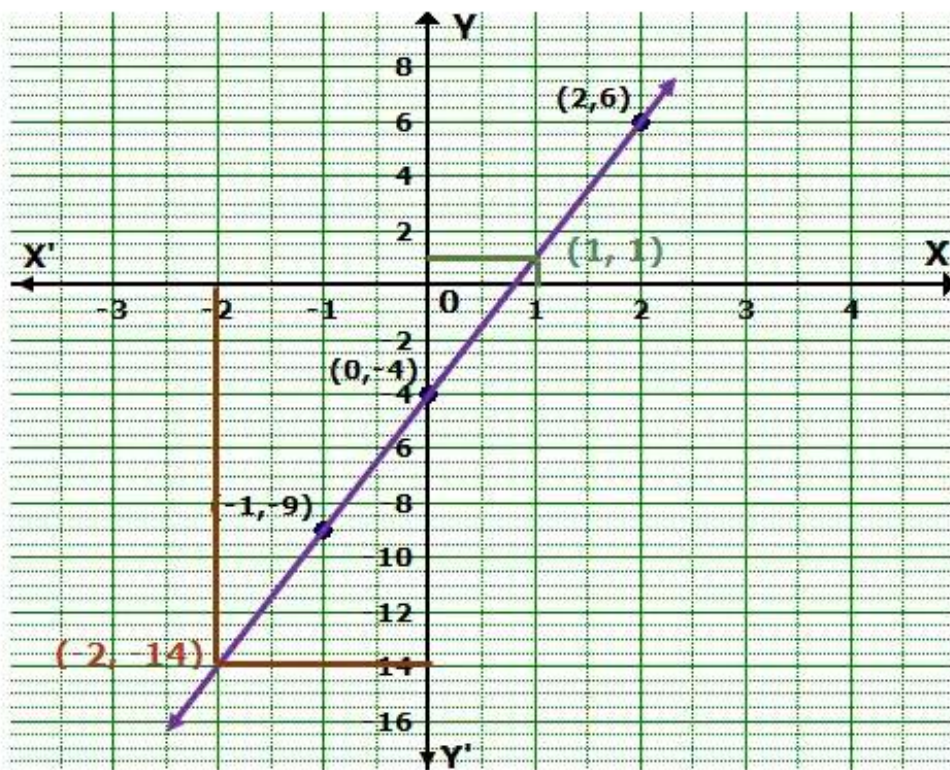
Answer 4.

$$y = 5x - 4$$

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:

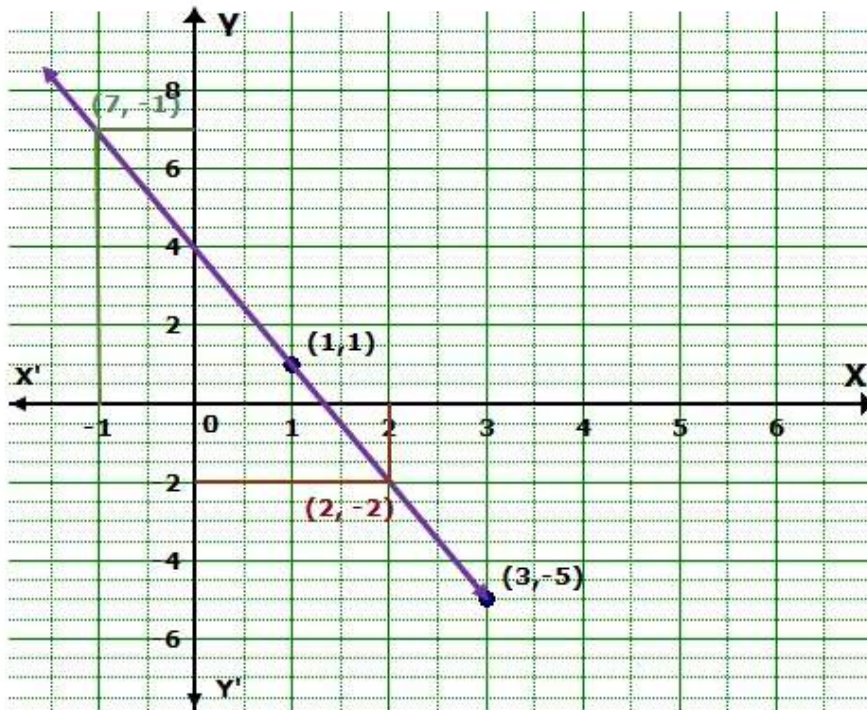


From the graph, we find that

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

Answer 5.

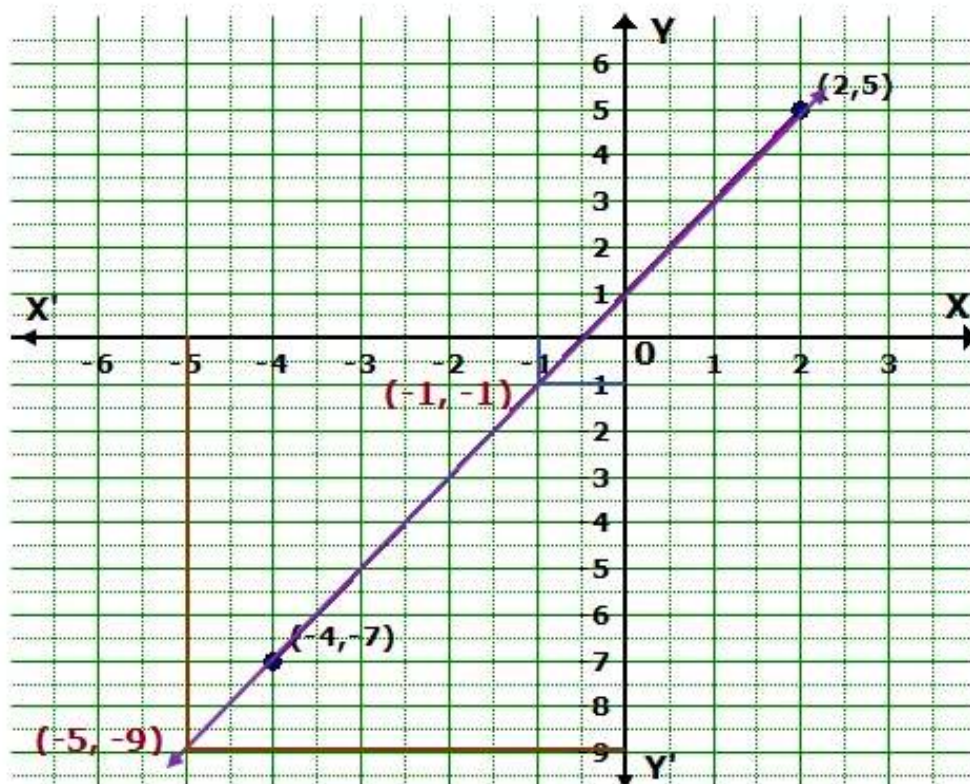
The graph is as follows:



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) $x+3y=8$

$$3x=2+2y$$

$$x+3y=8 \text{ _____(1)}$$

$$3x=2+2y \text{ _____(2)}$$

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_1 , which is the graph of equation (1).

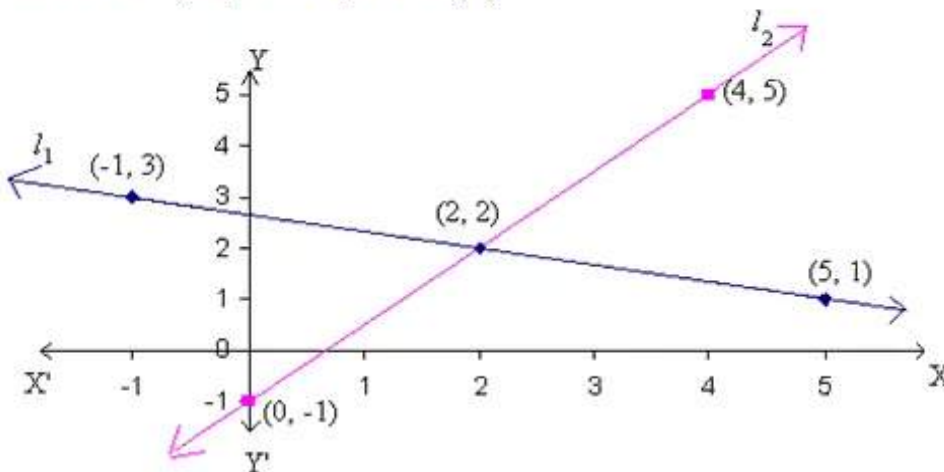
Again, $3x=2+2y$

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

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) $2x+4y=7$

$$3x+8y=10$$

$$2x+4y=7 \text{ _____(1)}$$

$$3x+8y=10 \text{ _____(2)}$$

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).

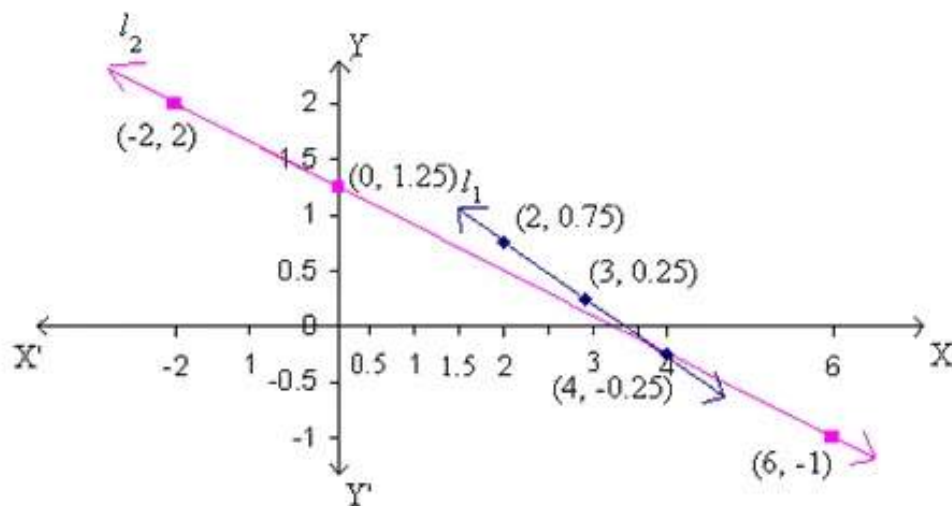
Again, $3x+8y=10$

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

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) $2x-y=9$

$$5x+2y=27$$

$$2x-y=9 \quad \text{---(1)}$$

$$5x+2y=27 \quad \text{---(2)}$$

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_1 , which is the graph of equation (1).

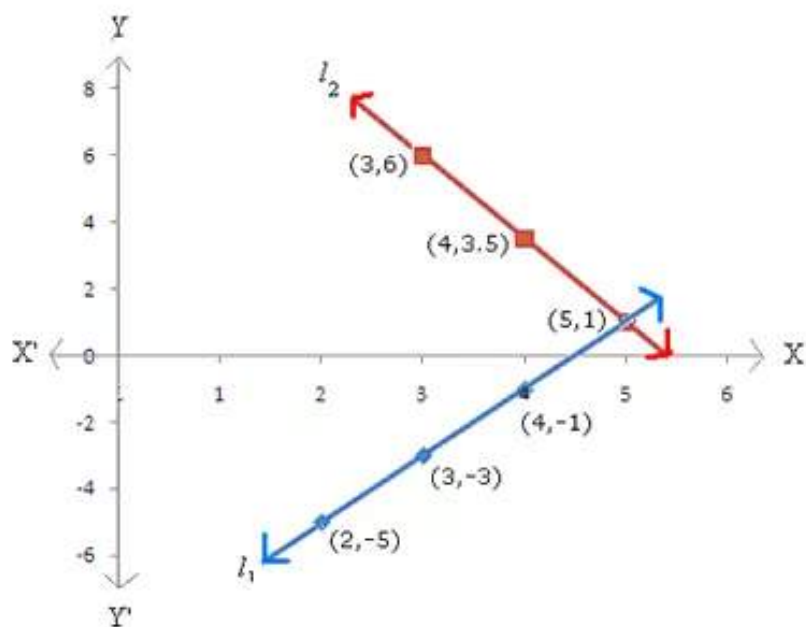
Again, $5x + 2y = 27$

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

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) $x + 4y + 9 = 0$

$$3y = 5x - 1$$

$$x + 4y = -9 \quad \text{_____ (1)}$$

$$3y = 5x - 1 \quad \text{_____ (2)}$$

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

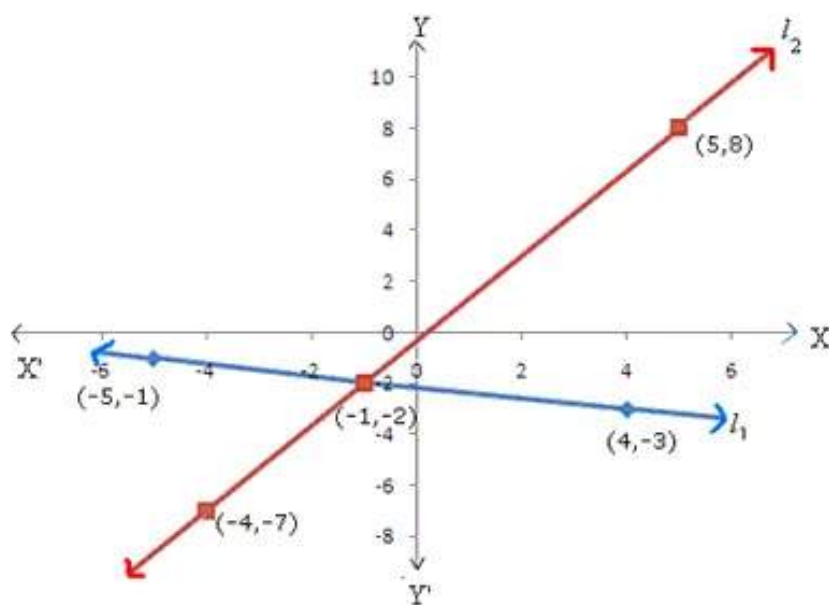
Plotting points $(4, -3)$, $(-1, -2)$ and $(-5, -1)$ and joining them, we get a line l_1 which is the graph of equation (1).

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

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) $x = 4$

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

$$x = 4 \quad \text{--- (1)}$$

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

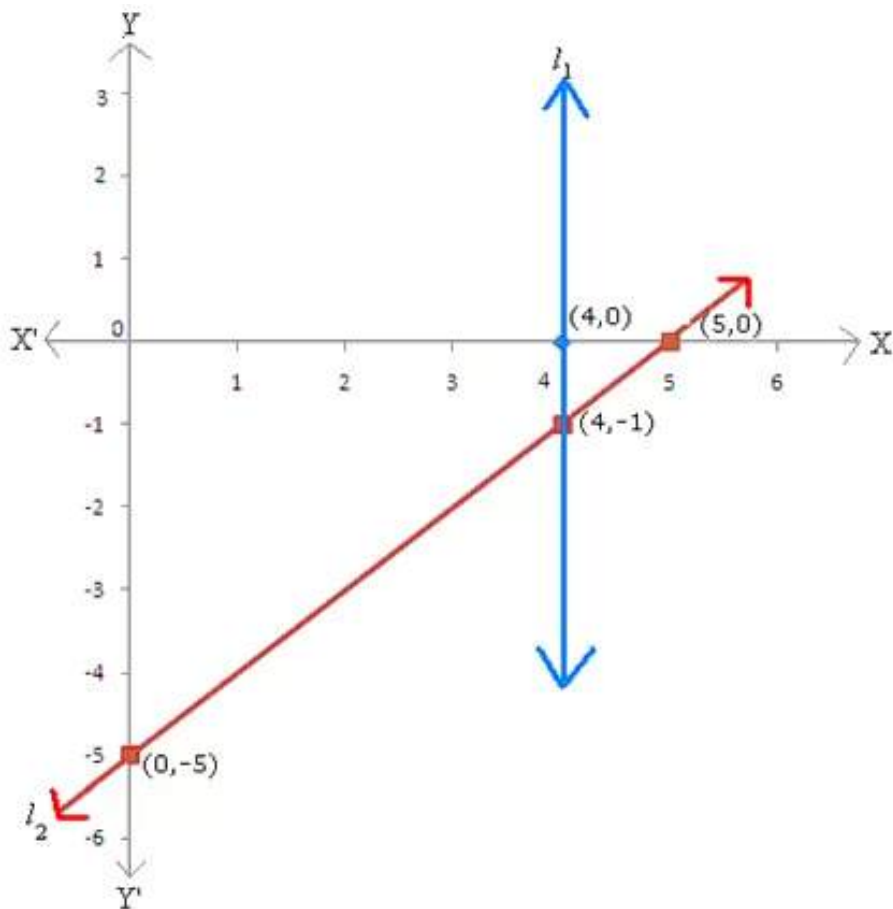
The graph of equation (1) will be the line l_1 which is at a distance of 4 Units from the y-axis. $(4, 0)$

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) $3y=5-x$

$$2x=y+3$$

$$3y=5-x \quad \text{_____ (1)}$$

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

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

Corresponding values of x and y can be tabulated as:

x	2	-1	-4
y	1	2	3

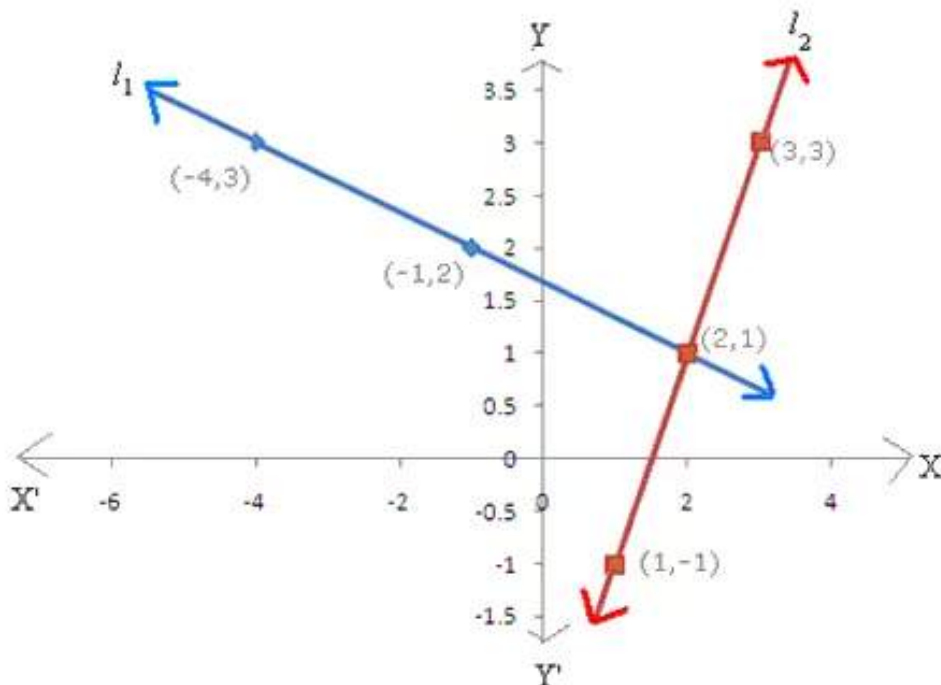
Plotting points $(2, 1)$, $(-1, 2)$, $(-4, 3)$ and joining them, we get a line l_1 which is the graph of equation (1).

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

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) $x-2y=2$

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

$$x-2y=2 \text{ _____(1)}$$

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

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

Corresponding values of x and y can be tabulated as:

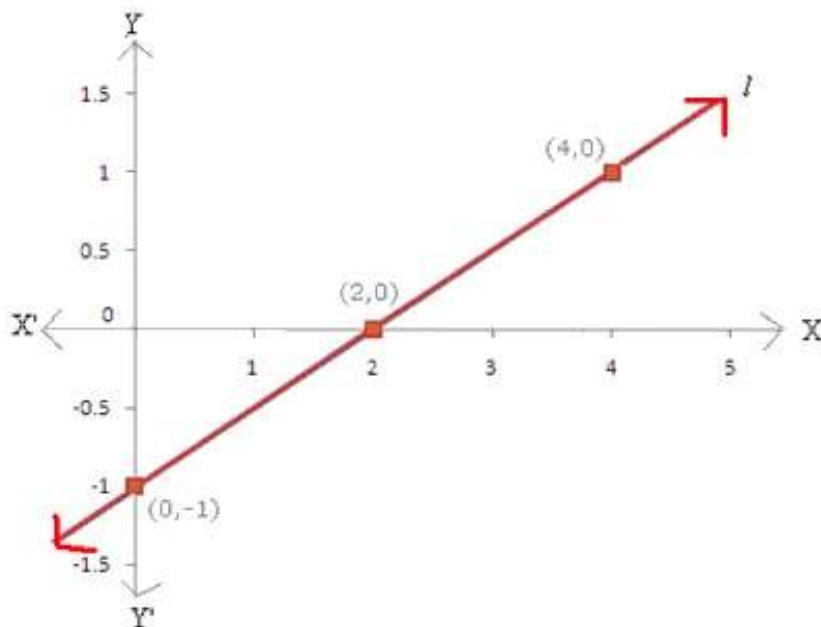
x	2	0	4
y	0	-1	1

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

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) $2x-6y+10=0$

$$3x-9y+25=0$$

$$2x-6y+10 = 0 \text{ _____(1)}$$

$$3x-9y+25=0 \text{ _____(2)}$$

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

Corresponding values of x and y can be tabulated as:

x	-5	-2	1
y	0	1	2

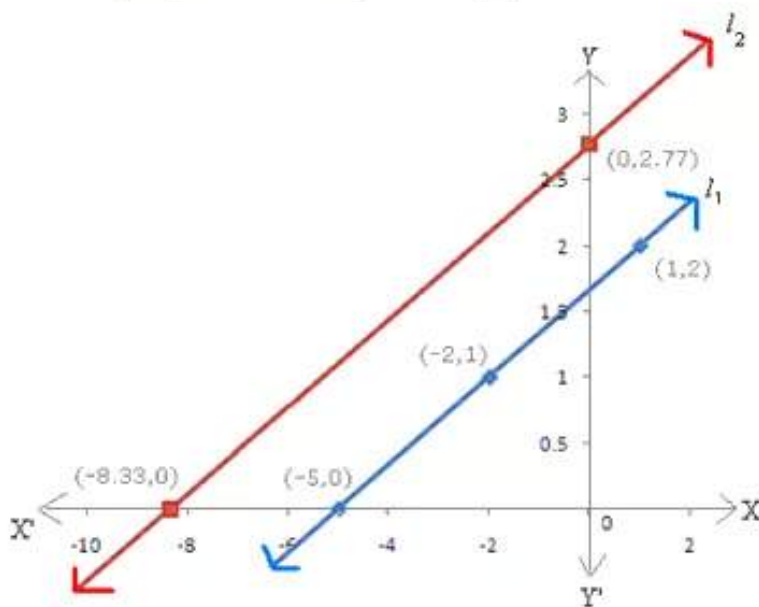
Plotting points $(-5, 0)$, $(-2, 1)$, $(1, 2)$ and joining them, we get a line l_1 which is the graph of the equation (1).

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

Corresponding values of x and y can be tabulated as:

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

Plotting points $\left(0, \frac{25}{9}\right)$, $\left(\frac{-25}{3}, 0\right)$ 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.

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

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

$$2 + \frac{3y}{x} = \frac{6}{x} \Rightarrow 2x + 3y = 6 \quad \text{_____ (1)}$$

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

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

Corresponding values of x and y can be tabulated as:

x	3	-3	0
y	0	4	2

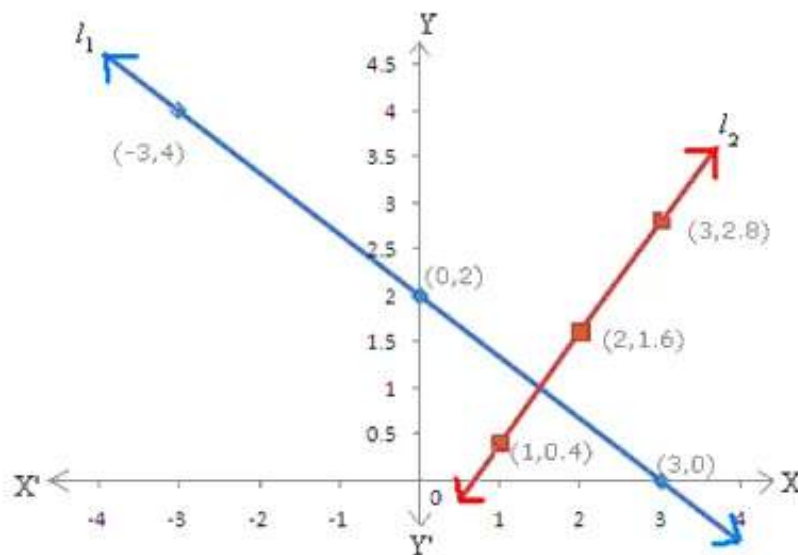
Plotting points (3, 0), (-3, 4), (0, 2) and joining them, we get a line l_1 which is the graph of equation (1).

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

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

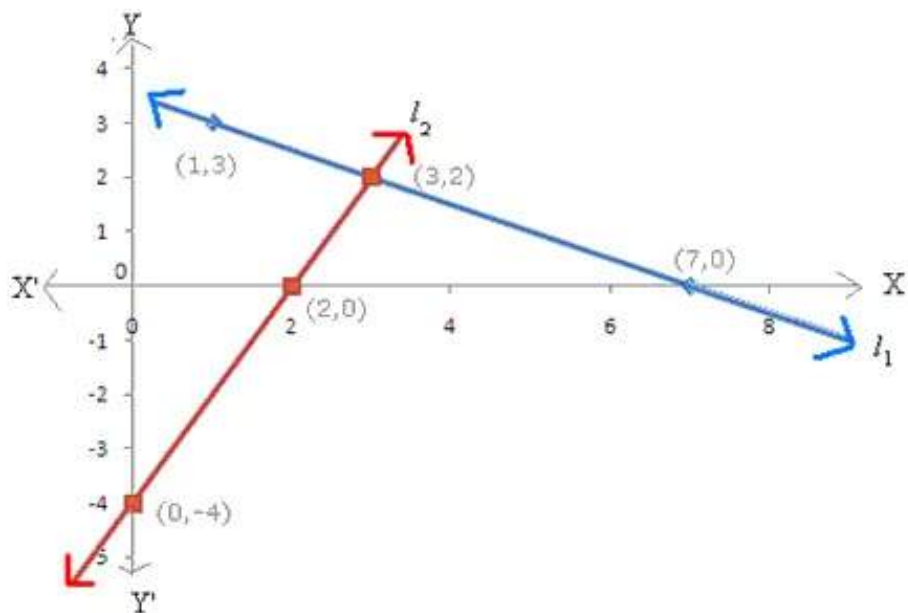
Plotting points $(7, 0)$, $(3, 2)$, $(1, 3)$ and joining them, we get a line l_1 which is the graph of equation (1).

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

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:

$$2y - x = 8 \quad \dots(1)$$

$$5y - x = 14 \quad \dots(2)$$

$$y = 2x + 1 \quad \dots(3)$$

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

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

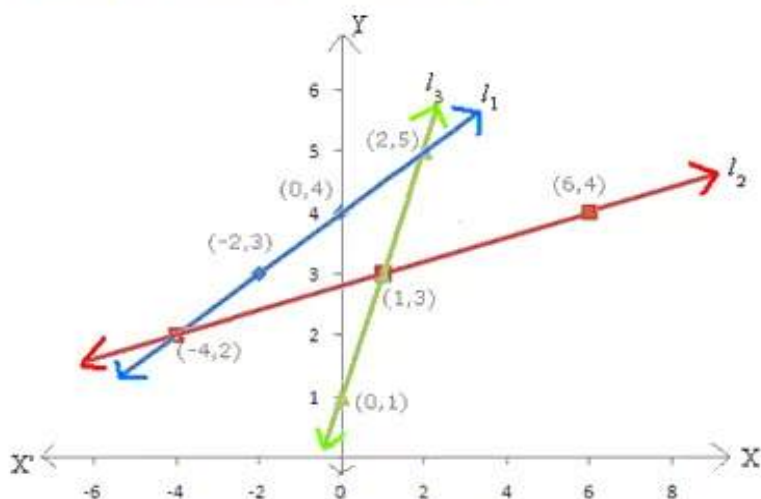
Plotting points $(-4, 2)$, $(1, 3)$, $(6, 4)$ and joining them we get a line l_2 which is the graph of equation (2).

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 ΔABC are $A(-4, 2)$, $B(1, 3)$ and $C(2, 5)$.

(ii) The given equations are:

$$3y = x + 18 \dots(1)$$

$$x + 7y = 22 \dots(2)$$

$$y + 3x = 26 \dots(3)$$

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

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).

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

Corresponding values of x and y can be tabulated as:

x	1	8	-6
y	3	2	4

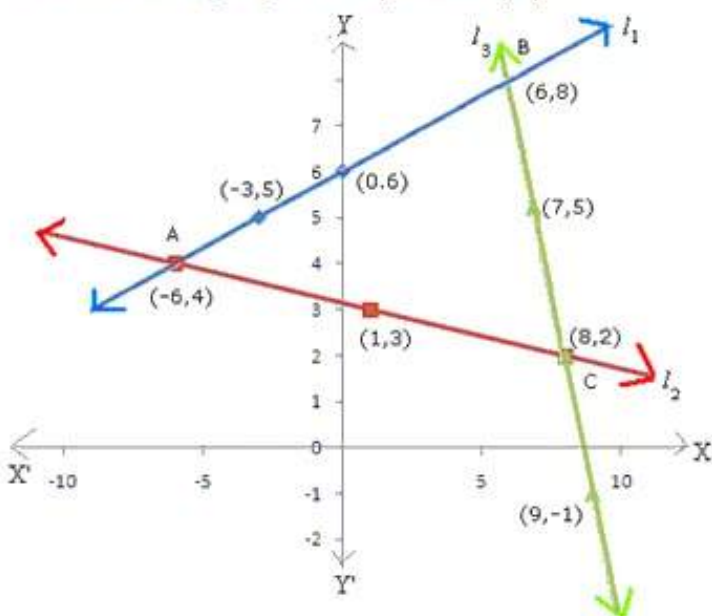
Plotting points $(1, 3)$, $(8, 2)$, $(-6, 4)$ and joining them, we get a line l_2 which is the graph of equation (2).

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

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 form triangle ABC

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

Answer 9.

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

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

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

Corresponding values of x and y can be tabulated as:

x	0	-5	5
y	-4	-8	0

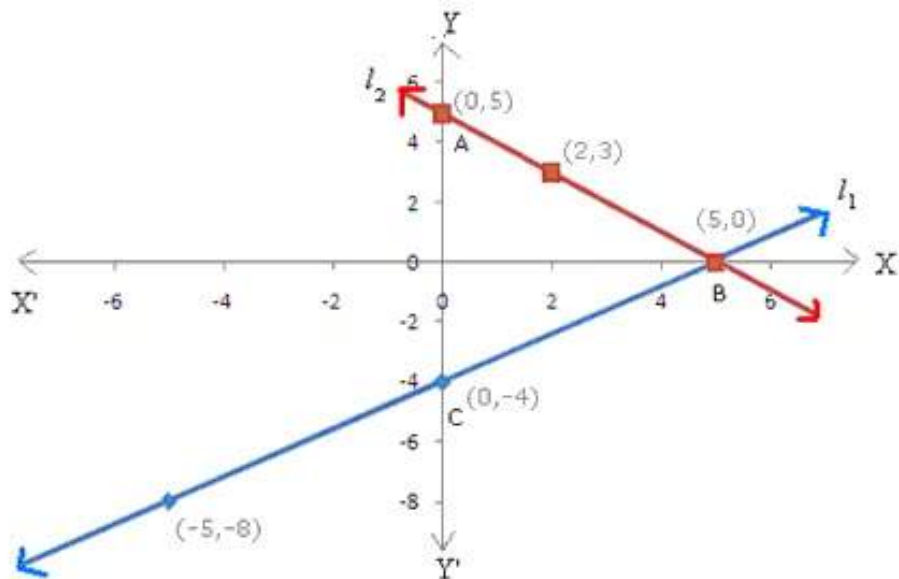
Plotting points $(0, -4)$, $(-5, -8)$, $(5, 0)$ and joining them, we get a line l_1 which is the graph of equation (1).

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

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 ΔABC is formed by the two lines l_1 and l_2 and the y -axis.

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

Answer 10.

$$x - y + 1 = 0 \quad \dots(1)$$

$$4x + 3y = 24 \quad \dots(2)$$

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

Corresponding values of x and y can be tabulated as:

x	0	3	-1
y	1	4	0

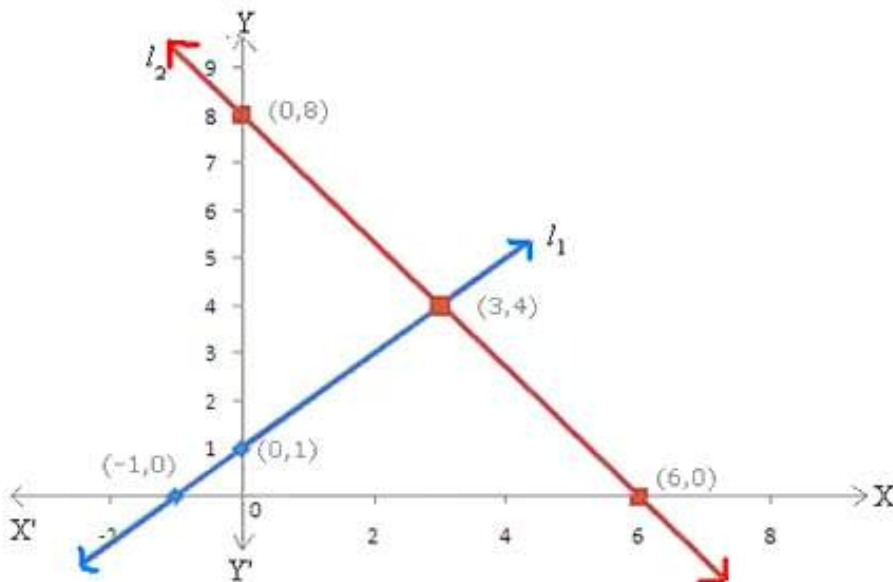
Plotting points (0, 1), (1, 2), (-1, 0) and joining them, we get a line l_1 which is the graph of equation (1).

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

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.

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

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

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

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).

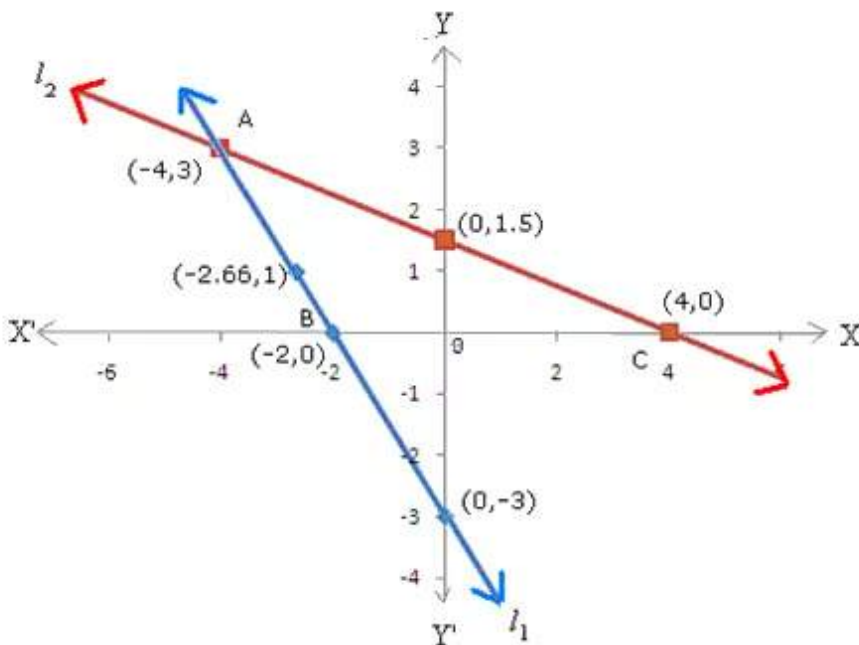
$$3x + 8y - 12 = 0 \Rightarrow 3x = 12 - 8y$$

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 form 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).

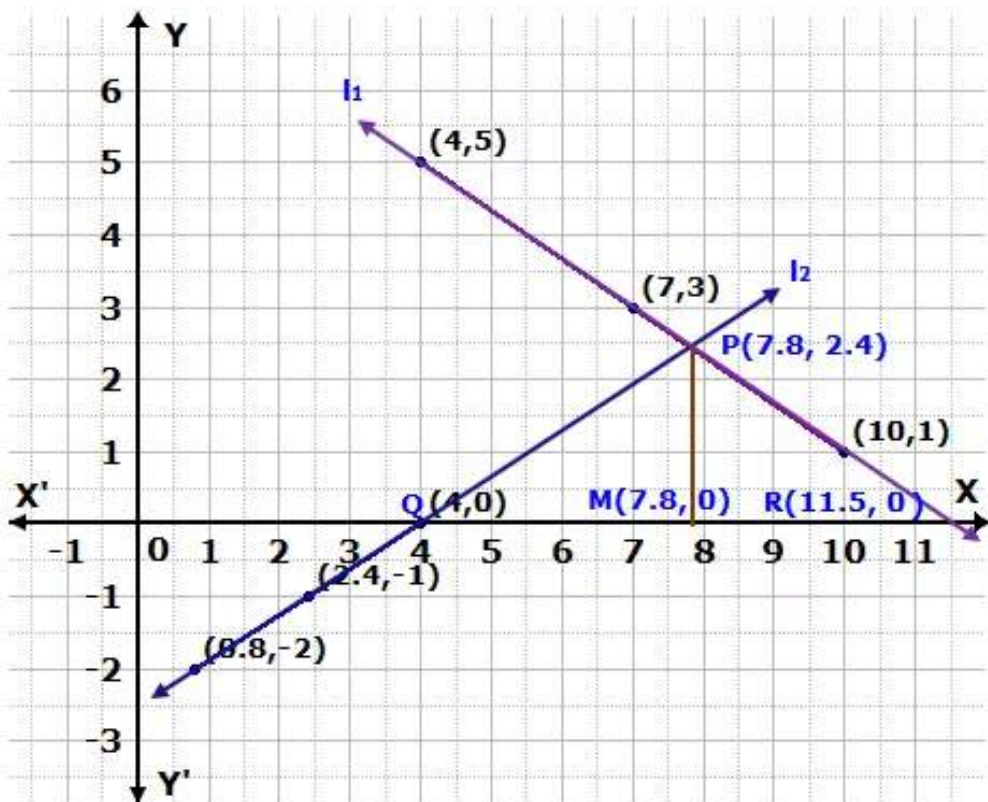
Again, $5x = 20 + 8y$ (ii)

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

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 $P(7.8, 2.4)$.

$\therefore x = 7.8, y = 2.4$ is the solution of the given system of equations.

Draw PM perpendicular from P to X -axis.

Now, $PM = y$ -coordinate of $P(7.8, 2.4)$

$\Rightarrow PM = 2.4$ units

$QR = 11.5 - 4 = 7.5$ units

\therefore 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)

$\Rightarrow x = 1 - 3y$

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).

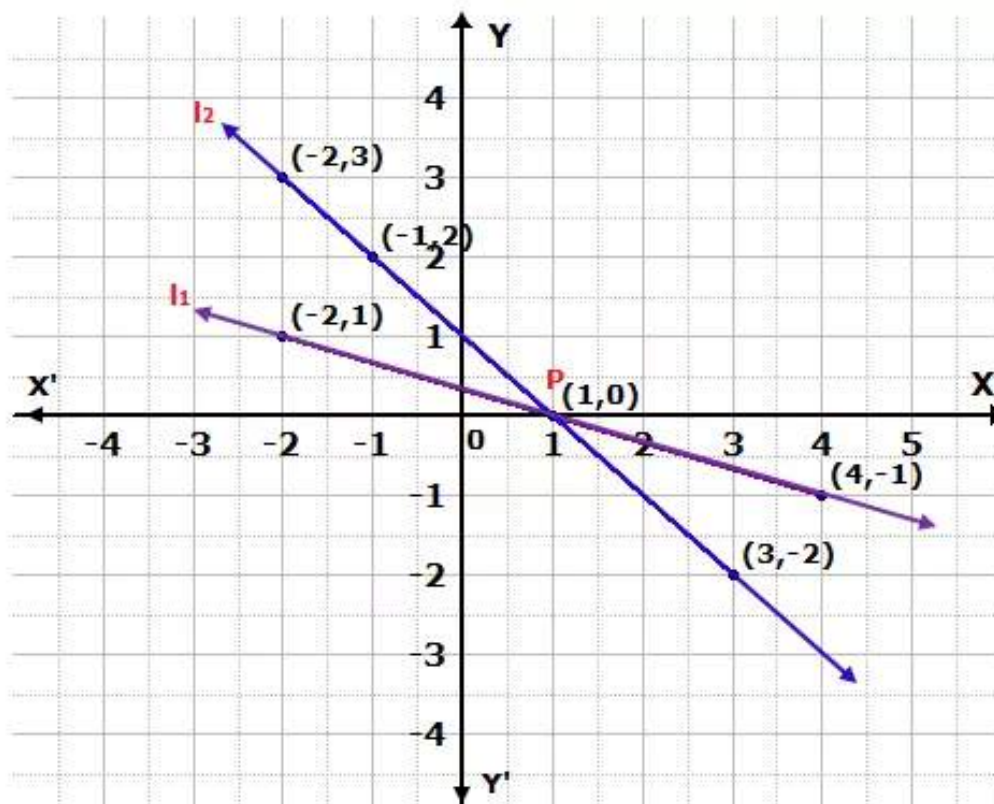
Again, $5x + 1 = 4x - y + 2$ (ii)

$\Rightarrow x = 1 - y$

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 $P(1, 0)$.

$\therefore x = 1, y = 0$ 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

$$\begin{aligned}x &= 2y \\ \Rightarrow x - 2y &= 0 \quad \dots(i)\end{aligned}$$

Also, perimeter of a rectangle = 30 units

$$\begin{aligned}\Rightarrow 2(x + y) &= 30 \\ \Rightarrow x + y &= 15 \quad \dots(ii)\end{aligned}$$

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

$$\begin{aligned}-3y &= -15 \\ \Rightarrow y &= 5\end{aligned}$$

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

$$\begin{aligned}x - 2(5) &= 0 \\ \Rightarrow x - 10 &= 0 \\ \Rightarrow x &= 10\end{aligned}$$

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

$$\begin{aligned}x - y &= 3 \\ \Rightarrow x &= 3 + y \quad \dots(i)\end{aligned}$$

Also, $3x + 2y = 19$

$$\begin{aligned}\Rightarrow 3(3 + y) + 2y &= 19 \quad \dots[\text{From (i)}] \\ \Rightarrow 9 + 3y + 2y &= 19 \\ \Rightarrow 5y &= 10 \\ \Rightarrow y &= 2 \\ \Rightarrow x &= 3 + 2 = 5\end{aligned}$$

Thus, the required numbers are 5 and 2 respectively.

Answer 3.

Let the two numbers be x and y respectively.

Then, we have

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

$$\text{And, } x + y = 68$$

$$\Rightarrow 3y + y = 68$$

$$\Rightarrow 4y = 68$$

$$\Rightarrow y = 17$$

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

Thus, the two numbers are 51 and 17 respectively.

Answer 4.

Let the two numbers be x and y respectively.

Then, we have

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

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

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

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

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

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

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

$$\text{And, } (10y + x) - (10x + y) = 9$$

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

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

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

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

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

$$2y = 8$$

$$\Rightarrow y = 4$$

$$\Rightarrow x + 4 = 7$$

$$\Rightarrow x = 3$$

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

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

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

$$\Rightarrow 11x + 11y = 110$$

$$\Rightarrow 11(x + y) = 110$$

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

$$\text{Also, } x - y = 2 \quad \dots(ii)$$

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

$$2x = 12$$

$$\Rightarrow x = 6$$

$$\Rightarrow 6 + y = 10$$

$$\Rightarrow y = 4$$

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

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

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

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

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

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

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

$$\text{Also, } x + y = 5 \quad \dots(ii)$$

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

$$2x = 4$$

$$\Rightarrow x = 2$$

$$\Rightarrow 2 + y = 5$$

$$\Rightarrow y = 3$$

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

Answer 8.

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

According to given information, we have

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

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

$$\Rightarrow 10x - 9y = -2 \quad \dots(i) \quad \text{and} \quad 5x - 4y = 3 \quad \dots(ii)$$

Multiplying eqn. (ii) by 2, we get

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

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

$$-y = -8$$

$$\Rightarrow y = 8$$

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

$$\Rightarrow 10x - 64 = 6$$

$$\Rightarrow 10x = 70$$

$$\Rightarrow x = 7$$

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

Answer 9.

Let the two numbers be x and y .

According to given information, we have

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

$$\Rightarrow 5x = 2y$$

$$\Rightarrow 5x - 2y = 0 \quad \dots(i)$$

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

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

$$\Rightarrow 2x - 5y = -168 \quad \dots(ii)$$

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

$$25x - 10y = 0 \quad \dots(iii)$$

$$4x - 10y = -336 \quad \dots(iv)$$

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.

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

According to given information, we have

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

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

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

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

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

$$3x = 15$$

$$\Rightarrow x = 5$$

$$\Rightarrow 5 + y = 12$$

$$\Rightarrow y = 7$$

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

Answer 11.

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

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

According to given information, we have

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

$$\Rightarrow 2x = y + 1$$

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

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

$$\Rightarrow x + 1 = y$$

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

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

$$x = 2$$

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

$$\Rightarrow y = 3$$

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

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

$$x = 7y \quad \dots(i)$$

$$\text{And, } (x + 10) = 3(y + 10)$$

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

$$\Rightarrow x - 3y = 20$$

$$\Rightarrow 7y - 3y = 20 \quad \dots [\text{From (i)}]$$

$$\Rightarrow 4y = 20$$

$$\Rightarrow y = 5$$

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

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

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

$$\Rightarrow 3x = 2y$$

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

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

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

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

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

$$15x - 10y = 0 \quad \dots(iii)$$

$$14x - 10y = -24 \quad \dots(iv)$$

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

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

Now, after 12 years

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

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

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

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

$$\Rightarrow 3y = 48$$

$$\Rightarrow y = 16$$

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

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 3rd angle will be $180^\circ - (x + y)$.

According to given information, we have

$$\begin{aligned}x + y &= 180^\circ - (x + y) \\ \Rightarrow 2(x + y) &= 180^\circ \\ \Rightarrow x + y &= 90^\circ \quad \dots(i)\end{aligned}$$

$$\text{And, } x - y = 20^\circ \quad \dots(ii)$$

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

$$\begin{aligned}2x &= 110^\circ \\ \Rightarrow x &= 55^\circ \\ \Rightarrow 55^\circ + y &= 90^\circ \\ \Rightarrow y &= 35^\circ \\ \Rightarrow 3^{\text{rd}} \text{ angle} &= 180^\circ - (55^\circ + 35^\circ) = 180^\circ - 90^\circ = 90^\circ\end{aligned}$$

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

Answer 16.

In $\triangle ABC$,

$$\angle A = x^\circ, \angle B = (2x - 30)^\circ, \angle C = y^\circ$$

Now, sum of the angles of a triangle is 180° .

$$\begin{aligned}\Rightarrow \angle A + \angle B + \angle C &= 180^\circ \\ \Rightarrow x^\circ + (2x - 30)^\circ + y^\circ &= 180^\circ \\ \Rightarrow 3x^\circ + y^\circ &= 210^\circ \quad \dots(i)\end{aligned}$$

Also, it is given that $\angle A + \angle B = 90^\circ$

$$\begin{aligned}\Rightarrow x^\circ + (2x - 30)^\circ &= 90^\circ \\ \Rightarrow 3x^\circ &= 120^\circ \\ \Rightarrow x^\circ &= 40^\circ = \angle A \\ \Rightarrow \angle B &= 2(40^\circ) - 30^\circ = 80^\circ - 30^\circ = 50^\circ\end{aligned}$$

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

$$\begin{aligned}\Rightarrow 3(40^\circ) + y^\circ &= 210^\circ \\ \Rightarrow 120^\circ + y^\circ &= 210^\circ \\ \Rightarrow y^\circ &= 90^\circ = \angle C\end{aligned}$$

Thus, the three angles of a triangle are as follows:

$$\angle A = 40^\circ, \angle B = 50^\circ \text{ and } \angle C = 90^\circ$$

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

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

$$\text{And, } 10y + x = 2(x + y) + 2$$

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

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

$$\Rightarrow 8y - (3y + 3) = 2 \quad \dots[\text{From (i)}]$$

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

$$\Rightarrow 5y = 5$$

$$\Rightarrow y = 1$$

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

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

Answer 18.

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

According to given information, we have

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

$$\Rightarrow 5x = 3y$$

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

$$\text{And, } \frac{x - 5000}{y - 5000} = \frac{1}{3} \quad \dots[\text{Expense} = \text{Income} - \text{Savings}]$$

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

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

Multiplying eqn. (ii) by 3, we get

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

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,

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

$$\Rightarrow x = 3y \quad \dots(i)$$

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 = $x - 20$

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

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

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

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

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

$$\Rightarrow -y = -50$$

$$\Rightarrow y = 50$$

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

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

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

$$x = y - 1.50$$

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

$$\text{And, } 4x + 3y = 29 \quad \dots(ii)$$

Multiplying eqn. (i) by 3, we get

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

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

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

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

$$\Rightarrow 12 = x + y$$

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

Time required to go 8 km upstream = 1 hour

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

$$\Rightarrow 8 = x - y$$

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

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

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

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

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

Time required to go 24 km downstream = 2 hours

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

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

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

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,
 $28x - 28y = 28$
 $\Rightarrow x - y = 1$ (i)

When they walk in the opposite direction,
 $4x + 4y = 28$
 $\Rightarrow x + y = 7$ (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
 $x + y = 20$ (i)

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

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

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

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

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

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

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 1st case (if Sunil gives 2 oranges to Kafeel):

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

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

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

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

$$x + 2 = y - 2$$

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

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

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

$$\Rightarrow x - y = 500$$

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

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

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

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

$$\Rightarrow 2x = 5000$$

$$\Rightarrow x = 2500$$

$$\Rightarrow y = 2500 - 500 = 2000$$

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 1st case :

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

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

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

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

In 2nd case :

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

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

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

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

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

$$105x + 105y = 1050000$$

$$\Rightarrow x + y = 10000 \quad \dots(\text{iii})$$

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

$$x - y = 1000 \quad \dots(\text{iv})$$

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

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

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

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

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

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

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.