Exercise 6(B)

Solution 1:

$13 + 2y = 9x$...(1)

$3y = 7x$...(2)

Multiplying equation no. (1) by 3 and (2) by 2, we get,

$$\begin{array}{rrr} 39 + 6y = 27x & \ldots(1) \\ 6y = 14x & \ldots(2) \\ - \quad - \quad - & \\ \hline 39 = 13x & \end{array}$$

$x = 3$

From (2)

$3y = 7(3)$

$y = 7$

Solution 2:

3x - y = 23...(1)

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

4x + 3y = 48...(2)

Multiplying equation no. (1) by 3

$$9x-3y=69 \quad \ldots(3)$$

$$\begin{array}{r} 4x+3y=48 \\ \hline 13x=117 \end{array}$$

$$x=9$$

From (1)

3(9) - y = 23

y = 27 - 23

y = 4

Solution 3:

The given pair of linear equations are

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

$$\Rightarrow -\frac{x}{3}+\frac{5y}{2}=8 \ldots\ldots\ldots\ldots\ldots (i) \text{ [On simplifying]}$$

$$\frac{y}{2}+\frac{5x}{3}=12$$

$$\Rightarrow \frac{5x}{3}+\frac{y}{2}=12 \ldots\ldots\ldots\ldots\ldots (ii) \text{ [On simplifying]}$$

Multiply equation (i) by 5, we get:

$$-\frac{5x}{3}+\frac{25y}{2}=40$$

$$\begin{array}{rl} \frac{5x}{3}+\frac{y}{2}=12 & \text{[Equation } (ii)\text{]} \\ + \quad + \quad + & \text{[Adding]} \\ \hline \frac{26y}{2}=52 & \end{array}$$

$$\Rightarrow 13y = 52$$

$$\Rightarrow y = 4$$

Substituting $y = 4$ in equation (i), we get

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

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

$$\Rightarrow x = 6$$

∴ Solution is $x = 6$ and $y = 4$.

Solution 4:

$$\frac{1}{5}(x-2)=\frac{1}{4}(1-y) \Rightarrow \quad 4x+5y=13 \quad \ldots(1)$$

$$26x+3y=-4 \quad \ldots(2)$$

Multiplying equation no. (1) by 3 and(2) by 5.

$$12x+15y=39 \quad \ldots(3)$$

$$130x+15y=-20$$

$$- \quad - \quad +$$

$$-115x=59$$

$$x=-\frac{59}{118}$$

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

From (1)

$$4\left(-\frac{1}{2}\right)+5y=13$$

$$5y=13+2$$

$$y=3$$

Solution 5:

$y = 2x - 6$

$y = 0$

$$\Rightarrow 2x-y=6 \quad \ldots(1)$$

$$y=2 \quad \ldots(2)$$

$$2x=6$$

$x = 3y = 0$

Solution 6:

The given pair of linear equations are

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

$\Rightarrow 13x - y = 48$.....(*i*) [On simplifying]

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

$\Rightarrow x - y = 12$.....(*ii*) [On simplifying]

Multiply equation (*ii*)by 13, we get:

$13x - 13y = 156$

$13x - y = 48$ [Equation (*i*)]

$-\quad +\quad -$ [Subtracting]

$-12y = 108$

$\Rightarrow y = -9$

Substituting $y = -9$ in equation (i), we get

$13x - (-9) = 48$

$\Rightarrow 13x = 39$

$\Rightarrow x = 3$

∴ Solution is $x = 3$ and $y = -9$.

Solution 7:

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

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

$\Rightarrow -x - y = -6$

$\Rightarrow x + y = 6$...(1)

$2x + 5y = 4$...(2)

Multiplying equation no. (1) by 2.

$2x + 2y = 12$

$2x + 5y = 4$

$- \quad - \quad -$

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

From (1)

$x - \frac{8}{3} = 6 \qquad \Rightarrow x = \frac{26}{3}$

Solution 8:

$2x - 3y - 3 = 0$

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

$\Rightarrow 2x - 3y = 3 \ldots (1)$

$\Rightarrow 4x + 24y = -3 \ldots (2)$

Multiplying equation no. (1) by 8.

$$16x - 24y = 24 \quad \ldots (3)$$

$$4x + 24y = -3$$

$$20x = 21 \quad \Rightarrow x = \frac{21}{20}$$

From (1)

$$2\left(\frac{21}{20}\right) - 3y = 3$$

$$-3y = 3 - \frac{21}{10} \Rightarrow y = \frac{-3}{10}$$

Solution 9:

$13x + 11y = 70 \ldots (1)$

$11x + 13y = 74 \ldots (2)$

Adding (1) and (2)

$24x + 24y = 144$

$x + y = 6 \ldots (3)$

subtracting (2) from (1)

$2x - 2y = -4$

$x - y = -2 \ldots (4)$

$x + y = 6 \ldots (3)$

$$2x = 4 \quad \Rightarrow x = 2$$

From (3)

$2 + y = 6 \Rightarrow y = 4$

Solution 10:

41x + 53y = 135...(1)
53x + 41y = 147...(2)
Adding (1) and (2)
94x + 94y = 282
x + y = 3...(3)

Subtracting (2) from (1)

$$\begin{array}{rrr} -12x + 12y = -12 & & \\ -x + y = -1 & \ldots(4) & \\ \hline x + y = 3 & & \\ \hline 2y = 2 & \Rightarrow y = 1 & \end{array}$$

From (3)
x + 1 = 3 ⇒ x = 2

Solution 11:

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

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

Adding equation (1) and (2) we get,
2x + y = 23
4x - y = 19

$$\begin{array}{rr} 6x = 42 & \Rightarrow x = 7 \end{array}$$

From (1)
2(7) + y = 23
y = 23 - 14
⇒ y = 9
∴ x - 3y = 7 - 3(9) = -20

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

Solution 12:

$10y = 7x - 4$

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

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

Multiplying equation no. (1) by 12 and (2) by 7.

$$-84x + 120y = -48 \quad \ldots(3)$$
$$84x + 126y = 7$$
$$246y = -41 \quad \Rightarrow y = \frac{-1}{6}$$

From (1)

$$-7x + 10\left(\frac{-1}{6}\right) = -4$$

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

$$\therefore 4\left(\frac{1}{3}\right) + 6\left(\frac{-1}{6}\right) = \frac{1}{3} \text{ and } 8y - x = 8\left(\frac{-1}{6}\right) - \frac{1}{3} = \frac{-5}{3}$$

Solution 13:

(i)

The given pair of linear equations are

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

$\Rightarrow 55x + 6y = 128 \ldots\ldots\ldots\ldots\ldots\ldots(i)$ [On simplifying]

$$\frac{7 - 5x}{2} + \frac{3 - 4y}{6} = 5y - 18$$

$\Rightarrow 15x + 34y = 132 \ldots\ldots\ldots\ldots\ldots\ldots(ii)$ [On simplifying]

Multiply equation (i) by 3 and equation (ii) by 11, we get:

$165x + 18y = 384$

$165x + 374y = 1452$

$- \quad - \quad -$ [Subtracting]

$-356y = -1068$

$\Rightarrow y = 3$

Substituting $y = 3$ in equation (i), we get

$55x + 6(3) = 128$

$\Rightarrow 55x = 110$

$\Rightarrow x = 2$

$\therefore$ Solution is $x = 2$ and $y = 3$.

(ii)

The given pair of linear equations are

$4x = 17 - \frac{x - y}{8}$

$\Rightarrow 33x - y = 136$.....(*i*) [On simplifying]

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

$\Rightarrow 3x + y = 8$.....(*ii*) [On simplifying]

Multiply equation (*ii*)by 11, we get:

$33x + 11y = 88$

$33x - y = 136$ [Equation (i)]

$- \quad + \quad -$ [Subtracting]

$12y = -48$

$\Rightarrow y = -4$

Substituting $y = -4$ in equation (i), we get:

$33x - (-4) = 136$

$\Rightarrow 33x = 132$

$\Rightarrow x = 4$

∴ Solution is $x = 4$ and $y = -4$.

Solution 14:

Let x = 2 and y = 1 be a solution of the equation

$2x + 3y = m$.

$\Rightarrow 2(2) + 3(1) = m$

$\Rightarrow 4 + 3 = m$

$\Rightarrow m = 7$

∴ If x = 2 and y = 1 is the solution of the equation

$2x + 3y = m$ then the value of m is 7.

Solution 15:

10% of x + 20% of y = 24

$\Rightarrow 0.1x + 0.2y = 24$.....(*i*) [On simplyfying]

$3x - y = 20$.....(*ii*)

Multiply equation (*ii*)by 0.2, we get:

$0.6x - 0.2y = 4$

$0.1x + 0.2y = 24$ [Equation (i)]

$+ \quad + \quad +$ [Adding]

$0.7x = 28$

$\Rightarrow x = 40$

Substituting $x = 40$ in equation (i), we get

$0.1(40) + 0.2y = 24$

$\Rightarrow 0.2y = 20$

$\Rightarrow y = 100$

∴ Solution is $x = 40$ and $y = 100$.

Solution 16:

The value of expression mx - ny is 3 when x = 5 and y = 6.

$\Rightarrow 5m - 6n = 3$.....(*i*)

The value of expression mx - ny is 8 when x = 6 and y = 5.

$\Rightarrow 6m - 5n = 8$.....(*ii*)

Multiply equation (*i*)by 6 and equation (*ii*)by 5, we get:

$30m - 36n = 18$ [Equation (i)]

$30m - 25n = 40$ [Equation (ii)]

$- \quad + \quad -$ [Subtracting]

$-11n = -22$

$\Rightarrow n = 2$

Substituting $n = 2$ in equation (i), we get

$5m - 6(2) = 3$

$\Rightarrow 5m = 15$

$\Rightarrow m = 3$

∴ Solution is $m = 3$ and $n = 2$.

Solution 17:

$11(x-5)+10(y-2)+54=0$ (given)

$\Rightarrow 11x-55+10y-20+54=0$

$\Rightarrow 11x+10y-21=0$

$\Rightarrow 11x+10y=21$ ....(1)

$7(2x-1)+9(3y-1)=25$ (given)

$\Rightarrow 14x-7+27y-9=25$

$\Rightarrow 14x+27y-16=25$

$\Rightarrow 14x+27y=41$ ....(2)

Multiplying equation (1) by 27 and equation (2) by 10, we get

$297x+270y=567$ ....(3)

$140x+270y=410$ ....(4)

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

$157x=157$

$\Rightarrow x=1$

Substituting $x=1$ in equation (1), we get

$11\times 1+10y=21$

$\Rightarrow 10y=10$

$\Rightarrow y=1$

$\therefore$ Solution set is $x=1$ and $y=1$.

Solution 18:

$\frac{7+x}{5}-\frac{2x-y}{4}=3y-5$ (given)

$\Rightarrow 4(7+x)-5(2x-y)=20(3y-5)$

$\Rightarrow 28+4x-10x+5y=60y-100$

$\Rightarrow -6x-55y=-128$ ....(1)

$\frac{5y-7}{2}+\frac{4x-3}{6}=18-5x$ (given)

$\Rightarrow 3(5y-7)+4x-3=6(18-5x)$

$\Rightarrow 15y-21+4x-3=108-30x$

$\Rightarrow 34x+15y=132$ ....(2)

Multiplying equation (1) by 34 and equation (2) by 6, we get

$-204x-1870y=-4352$ ....(3)

$204x+90y=792$ ....(4)

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

$-1780y=-3560$

$\Rightarrow y=2$

Substituting $y=2$ in equation (1), we get

$-6x-55\times 2=-128$

$\Rightarrow -6x-110=-128$

$\Rightarrow -6x=-18$

$\Rightarrow x=3$

$\therefore$ Solution is $x=3$ and $y=2$

Solution 19:

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

$\Rightarrow 32x + x - y = 136$

$\Rightarrow 33x - y = 136$ ....(1)

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

$\Rightarrow 6y + 3x - 5y - 2 = 6$

$\Rightarrow 3x + y = 8$ ....(2)

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

$36x = 144$

$\Rightarrow x = 4$

Substituting $x = 4$ in equation (2), we get

$3 \times 4 + y = 8$

$\Rightarrow 12 + y = 8$

$\Rightarrow y = -4$

$\therefore$ Solution is $x = 4$ and $y = -4$