

Exercise 3B

Page No: 103

Solve for x and y:

Question 1:

$$x + y = 3,$$

$$4x - 3y = 26.$$

Solution:

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

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

Isolate x from equation (1), we get

$$x = 3 - y$$

Substituting the value of x in equation (2),

$$4(3 - y) - 3y = 26$$

$$12 - 4y - 3y = 26$$

$$-7y = 14$$

$$y = -2$$

Solve for x:

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

Answer: $x = 5$ and $y = -2$

Question 2:

$$x - y = 3,$$

$$x/3 + y/2 = 6$$

Solution:

$$x - y = 3 \quad \dots\dots(1)$$

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

Find the value of x from equation and substitute in equation (2).

$$x = 3 + y$$

Now,

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

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

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

$$\Rightarrow 6 + 5y = 36 \Rightarrow 5y = 36 - 6 = 30$$

$$y = \frac{30}{5} = 6$$

$$\text{and } x = 3 + y = 3 + 6 = 9$$

The value of x is 9 and the value of y is 6.

Question 3:

$$2x + 3y = 0,$$

$$3x + 4y = 5.$$

Solution:

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

$$3x + 4y = 5 \dots\dots(2)$$

Let us use elimination method to solve the given system of equations.

Multiply (1) by 4 and (2) by 3. And subtract both the equations.

$$8x + 12y = 0$$

$$9x + 12y = 15$$

$$\underline{\quad - \quad - \quad -}$$

$$\text{Subtracting, } -x = -15 \Rightarrow x = 15$$

$$\text{From (1), } y = -10$$

Hence: x = 15 and y = -10

Question 4:

$$2x - 3y = 13,$$

$$7x - 2y = 20.$$

Solution:

$$2x - 3y = 13 \dots\dots(1)$$

$$7x - 2y = 20 \dots\dots(2)$$

Let us use elimination method to solve the given system of equations.

Multiply (1) by 2 and (2) by 3. And subtract both the equations.

$$\begin{array}{r}
 4x - 6y = 26 \\
 21x - 6y = 60 \\
 \hline
 \text{Subtracting, } -17x = -34
 \end{array}$$

$$x = \frac{-34}{-17} = +2$$

Substitute the value of x in equation (1), we have

$$y = -3$$

Hence: $x = 2$ and $y = -3$

Question 5.

$$3x - 5y - 19 = 0,$$

$$-7x + 3y + 1 = 0.$$

Solution:

$$3x - 5y - 19 = 0 \dots\dots\dots(1)$$

$$-7x + 3y + 1 = 0 \dots\dots\dots(2)$$

Let us use elimination method to solve the given system of equations.

Multiply (1) by 3 and (2) by 5. And add both the equations.

$$\begin{array}{r}
 9x - 15y = 57 \\
 -35x + 15y = -5 \\
 \hline
 \text{Adding, } -26x = 52
 \end{array}$$

$$x = \frac{52}{-26} = -2$$

Substitute the value of x in equation (1), we have

$$3 \times (-2) - 5y = 19 \Rightarrow -6 - 5y = 19$$

$$y = -5$$

Hence: $x = -2$ and $y = -5$

$\Rightarrow x = -2, y = -5$

Question 6:

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

$$3x - 7y + 10 = 0.$$

Solution:

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

$$3x - 7y + 10 = 0 \dots\dots\dots(2)$$

Let us use substitution method to solve the given system of equations. Find the value of y from equation (1) and substitute the value in (2).

From (1)

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

And,

$$3x - 7(2x + 3) = 30 \Rightarrow 3x - 14x - 21 = -10$$

$$-11x = -10 + 21 = 11 \Rightarrow x = \frac{11}{-11} = -1$$

$$\text{and } y = 2x + 3$$

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

$$y = 1$$

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

$$1 = 2x + 3$$

$$x = -1$$

Answer: $x = -1$ and $y = 1$

Question 7:

$$x/2 - y/9 = 6,$$

$$x/7 + y/3 = 5.$$

Solution:

$$x/2 - y/9 = 6$$

$$x/7 + y/3 = 5$$

Simplify both the equations:

$$\frac{x}{2} - \frac{y}{9} = 6 \Rightarrow \frac{9x - 2y = 108}{18} \text{ and}$$

$$\frac{x}{7} + \frac{y}{3} = 5 \Rightarrow \frac{3x + 7y = 105}{21}$$

$$9x - 2y = 108 \dots\dots\dots(1)$$

$$3x + 7y = 105 \dots\dots\dots(2)$$

Let us use elimination method to solve the given system of equations.

Multiply (2) by 3. And subtract both the equations.

$$\begin{array}{r} 9x - 2y = 108 \\ 9x + 21y = 315 \\ \hline \text{Subtracting,} \quad -23y = -207 \\ y = \frac{-207}{-23} = +9 \end{array}$$

From (1); $9x - 2(9) = 108$

$$x = 14$$

Answer: $x = 14$ and $y = 9$

Question 8:
 $x/3 + y/4 = 11,$
 $5x/6 - y/3 = -7.$

Solution:
 $x/3 + y/4 = 11$
 $5x/6 - y/3 = -7$
 Simplify both the equations:

$$\frac{x}{3} + \frac{y}{4} = 11 \Rightarrow \frac{4x + 3y = 132}{12} \text{ and}$$

$$\frac{5x}{6} - \frac{y}{3} = -7 \Rightarrow \frac{5x - 2y = -42}{6}$$

We have,

$$4x + 3y = 132 \dots\dots\dots(1)$$

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

Let us use elimination method to solve the given system of equations.

Multiply (1) by 2 and (2) by 3. And add both the equations.

$$\begin{array}{r} 8x + 6y = 264 \\ 15x - 6y = -126 \\ \hline \text{Adding, } 23x = 138 \end{array}$$

$$x = \frac{138}{23} = 6$$

From (1): $4(6) + 3y = 132$

$$y = 108/3 = 36$$

Answer: $x = 6$ and $y = 36$

Question 9:

$$4x - 3y = 8,$$

$$6x - y = 29 / 3$$

Solution:

$$4x - 3y = 8 \dots\dots\dots(1)$$

$$6x - y = 29 / 3 \dots\dots\dots(2)$$

Let us use elimination method to solve the given system of equations.

Multiply (2) by 3. And subtract both the equations.

$$\begin{array}{r} 4x - 3y = 8 \\ 18x - 3y = 29 \\ \hline - \quad + \quad - \end{array}$$

Subtracting, $-14x = -21$

Or $x = 3/2$

From (1);

$$4(3/2) - 3y = 8$$

Or $y = -2/3$

Answer: $x = 3/2$ and $y = -2/3$

Question 10:

$$2x - 3y / 4 = 3,$$

$$5x = 2y + 7.$$

Solution:

$$2x - 3y/4 = 3 \text{ or } 8x - 3y = 12$$

$$5x = 2y + 7$$

Given set of equations can be written as:

$$8x - 3y = 12 \quad \dots\dots(1)$$

$$5x - 2y = 7 \quad \dots\dots(2)$$

Let us use elimination method to solve the given system of equations.

Multiply (1) by 2 and (2) by 3. And subtract both the equations.

$$\begin{array}{r} 16x - 6y = 24 \\ 15x - 6y = 21 \\ \hline - \quad + \quad - \end{array}$$

Subtracting, $x = 3$

From (1); $8(3) - 3y = 12$

$$y = 4$$

Answer: $x = 3$ and $y = 4$

Question 11:

$$2x + 5y = 8 / 3,$$

$$3x - 2y = 5 / 6 .$$

Solution:

$$2x + 5y = 8 / 3 \quad \dots\dots(1)$$

$$3x - 2y = 5 / 6 \quad \dots\dots(2)$$

Let us use elimination method to solve the given system of equations.

Multiply (1) by 4 and (2) by 5. And add both the equations.

$$24x + 60y = 32$$

$$90x - 60y = 25$$

$$\text{Adding, we get } 114x = 57$$

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

Substitute the value of x in equation (1), we have

$$2(1/2) + 5y = 8 / 3$$

$$y = 1/3$$

Answer: $x = \frac{1}{2}$ and $y = \frac{1}{3}$

Question 12:

$$2x + 3y + 1 = 0,$$

$$(7 - 4x) / 3 = y$$

Solution:

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

$$(7 - 4x) / 3 = y \quad \dots\dots(2)$$

Put value of y in (1), we get

$$2x + 3((7 - 4x) / 3) + 1 = 0$$

$$2x + 7 - 4x + 1 = 0$$

$$x = 4$$

from (2):

$$(7 - 4(4)) / 3 = y$$

$$y = -3$$

Answer: $x = 4$ and $y = -3$

Question 13:

$$0.4x + 0.3y = 1.7,$$

$$0.7x - 0.2y = 0.8.$$

Solution:

$$0.4x + 0.3y = 1.7$$

$$0.7x - 0.2y = 0.8$$

Multiply both the equations by 10, we get

$$4x + 3y = 17 \quad \dots\dots\dots(1)$$

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

Multiply (1) by 2 and (2) by 3,

$$8x + 6y = 34$$

$$21x - 6y = 24$$

Adding both the equations

$$29x = 58$$

$$x = 2$$

$$\text{From (1); } 4 \times 2 + 3y = 17$$

$$\Rightarrow 8 + 3y = 17$$

$$\Rightarrow 3y = 17 - 8 = 9$$

$$y = 3$$

Answer: $x = 2, y = 3$

Question 14:

$$0.3x + 0.5y = 0.5,$$

$$0.5x + 0.7y = 0.74.$$

Solution:

$$0.3x + 0.5y = 0.5,$$

$$0.5x + 0.7y = 0.74.$$

Multiply both the equations by 10, we get

$$3x + 5y = 5 \quad \dots\dots(1)$$

$$5x + 7y = 7.4 \quad \dots\dots(2)$$

Multiply (1) by 7 and (2) by 5. And subtract both the equations.

$$21x + 35y = 35$$

$$25x + 35y = 37$$

$$\text{Subtracting, } -4x = \quad -2$$

$$x = \frac{-2}{-4} = \frac{1}{2} = 0.5$$

Substitute the value of x in equation (1), we have

$$3(0.5) + 5y = 5$$

$$y = 0.7$$

Answer: $x = 0.5$ and $y = 0.7$

Question 15:

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

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

Solution:

Simplify given equations

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

$$\text{or } 7y - 2x = -3$$

$$\text{and } 4(y - 2) + 3(x - 3) = 2$$

$$\text{or } 4y + 3x = 19$$

new set of equations is:

$$7y - 2x = -3 \quad \dots\dots(1)$$

$$4y + 3x = 19 \quad \dots\dots(2)$$

Let us use elimination method to solve the given system of equations.

Multiply (1) by 3 and (2) by 2. And add both the equations.

$$\begin{aligned} 21y - 6x &= -9 \\ 8y + 6x &= 38 \end{aligned}$$

Adding, $29y = 29 \Rightarrow y = \frac{29}{29} = 1$

Substitute the value of x in equation (1), we have

$$7(1) - 2x = -3$$

$$x = 5$$

Answer: $x = 5$ and $y = 1$

Question 16:

$$6x + 5y = 7x + 3y + 1 = 2(x + 6y - 1)$$

Solution:

$$6x + 5y = 7x + 3y + 1 = 2(x + 6y - 1)$$

$$6x + 5y = 7x + 3y + 1$$

$$\Rightarrow 6x + 5y - 7x - 3y = 1$$

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

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

Again, $7x + 3y + 1 = 2(x + 6y - 1)$

$$7x + 3y + 1 = 2x + 12y - 2$$

$$\Rightarrow 7x + 3y - 2x - 12y = -2 - 1$$

$$\Rightarrow 5x - 9y = -3$$

New set of equations is:

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

$$5x - 9y = -3 \quad \dots\dots\dots(2)$$

Using substitution method;

From (1), $x = 2y - 1$

Substituting the value of x in (2),

$$5(2y - 1) - 9y = -3$$

$$\Rightarrow 10y - 5 - 9y = -3$$

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

$$\Rightarrow y = 2$$

And, $x = 2y - 1 = 2(2) - 1 = 3$

Answer: $x = 3, y = 2$

Question 17:

$$\frac{x+y-8}{2} = \frac{x+2y-14}{3} = \frac{3x+y-12}{11}$$

Solution:

Simply equations:

$$\frac{x+y-8}{2} = \frac{x+2y-14}{3}$$

$$3x + 3y - 24 = 2x + 4y - 28$$

$$3x + 3y - 2x - 4y = -28 + 24$$

$$x - y = -4$$

And

$$\frac{x+2y-14}{3} = \frac{3x+y-12}{11}$$

$$11x + 22y - 154 = 9x + 3y - 36$$

$$11x + 22y - 9x - 3y = -36 + 154$$

$$2x + 19y = 118$$

New set of equations is:

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

$$2x + 19y = 118 \quad \dots\dots\dots(2)$$

Using substitution method:

From (1): $x = y - 4$

Put x in (2)

$$2(y - 4) + 19y = 118$$

$$2y - 8 + 19y = 118$$

$$21y = 118 + 8 = 126$$

$$y = \frac{126}{21} = 6$$

Again, $x = y - 4 = 6 - 4 = 2$

Answer: $x = 2, y = 6$

Question 18:

$$5/x + 6y = 13,$$

$$3/x + 4y = 7 \quad (x \neq 0)$$

Solution:

$$5/x + 6y = 13 \quad \dots\dots(1)$$

$$3/x + 4y = 7 \quad \dots\dots(2)$$

Let us use elimination method to solve the given system of equations.

Multiply (1) by 2 and (2) by 3. And subtract both the equations.

$$\frac{10}{x} + 12y = 26$$

$$\frac{9}{x} + 12y = 21$$

$$\hline$$

Subtracting, $\frac{1}{x} = 5 \Rightarrow x = \frac{1}{5}$

Substitute the value of x in equation (1), we have

$$5/(1/5) + 6y = 13$$

$$y = -2$$

Answer: $x = 1/5$ and $y = -2$

Question 19:

$$\begin{aligned}x + 6/y &= 6, \\3x - 8/y &= 5 \quad (y \neq 0)\end{aligned}$$

Solution:

$$\begin{aligned}x + 6/y &= 6 \quad \dots\dots(1) \\3x - 8/y &= 5 \quad \dots\dots(2)\end{aligned}$$

Using elimination method to solve the given system of equations.

Multiply (1) by 3. And subtract both the equations.

$$\begin{array}{r}3x + \frac{18}{y} = 18 \\3x - \frac{8}{y} = 5 \\ \hline - \quad + \quad -\end{array}$$

Subtracting, $\frac{26}{y} = 13 \Rightarrow y = \frac{26}{13} = 2$

Substitute the value of y in equation (1), we have

$$x + 6/(2) = 6$$

$$x = 3$$

Answer: $x = 3$ and $y = 2$

Question 20:

$$\begin{aligned}2x - 3/y &= 9, \\3x + 7/y &= 2 \quad (y \neq 0)\end{aligned}$$

Solution:

$$\begin{aligned}2x - 3/y &= 9 \quad \dots\dots(1) \\3x + 7/y &= 2 \quad \dots\dots(2)\end{aligned}$$

Using elimination method to solve the given system of equations.

Multiply (1) by 3 and (2) by 2. And subtract both the equations.

$$6x - \frac{9}{y} = 27$$

$$6x + \frac{14}{y} = 4$$

$$\begin{array}{r} - - - - \\ \hline \text{Subtracting, } \frac{-23}{y} = 23 \end{array}$$

$$y = -1$$

Substitute the value of y in equation (1), we have

$$2x - 3/(1) = 9$$

$$x = 3$$

Answer: $x = 3, y = -1$