

## Chapter 6. Simultaneous (Linear) Equations (Including Problems)

### Exercise 6(A)

#### Solution 1:

$$8x + 5y = 9 \dots (1)$$

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

$$(2) \Rightarrow y = \frac{9 - 8x}{5}$$

Putting this value of y in (2)

$$3x + 2 \left( \frac{9 - 8x}{5} \right) = 4$$

$$15x + 18 - 16x = 20$$

$$x = -2$$

$$\text{From (1) } y = \left( \frac{9 - 8x}{5} \right) = \frac{9 - 8(-2)}{5} = \frac{25}{5} = 5$$

$$y = 5$$

#### Solution 2:

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

$$5x + y = 9 \dots (2)$$

$$(2) \Rightarrow y = 9 - 5x$$

Putting this value of y in (1)

$$2x - 3(9 - 5x) = 7$$

$$2x - 27 + 15x = 7$$

$$17x = 34$$

$$x = 2$$

From (2)

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

$$y = -1$$

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**Solution 3:**

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

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

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

Putting this value of 2x in (1)

$$2 + 3y + 3y = 8$$

$$6y = 6$$

$$y = 1$$

$$\text{From (2) } 2x = 2 + 3(1)$$

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

$$x = 2.5$$

**Solution 4:**

The given pair of linear equations are

$$0.2x + 0.1y = 25 \dots (i)$$

$$2(x - 2) - 1.6y = 116 \dots (ii)$$

Consider equation (i)

$$0.2x + 0.1y = 25$$

$$\Rightarrow 0.2x = 25 - 0.1y$$

$$\Rightarrow x = \frac{(25 - 0.1y)}{0.2} \dots (iii)$$

Substitute the value of x from equation (iii) in equation (ii).

$$2(x - 2) - 1.6y = 116$$

$$\Rightarrow 2\left(\frac{(25 - 0.1y)}{0.2} - 2\right) - 1.6y = 116$$

$$\Rightarrow 10(25 - 0.1y) - 4 - 1.6y = 116$$

$$\Rightarrow 250 - y - 4 - 1.6y = 116$$

$$\Rightarrow -2.6y = -130$$

$$\Rightarrow y = 50 \dots (iv)$$

Substitute the value of y from equation (iv) in equation (iii).

$$x = \frac{(25 - 0.1y)}{0.2}$$

$$\Rightarrow x = \frac{(25 - 0.1(50))}{0.2}$$

$$\Rightarrow x = \frac{(25 - 5)}{0.2}$$

$$\Rightarrow x = 100$$

\(\therefore\) Solution is  $x = 100$  and  $y = 50$ .

**Solution 5:**

$$6x = 7y + 7 \dots (1)$$

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

$$(2) \Rightarrow x = 7y - 8$$

Putting this value of x in (1)

$$6(7y - 8) = 7y + 7$$

$$42y - 48 = 7y + 7$$

$$35y = 55$$

$$y = \frac{11}{7}$$

$$\text{From (2) } x = 7\left(\frac{11}{7}\right) - 8$$

$$x = 3$$

**Solution 6:**

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

$$16x - 5y = 25 \dots (2)$$

$$(1) \Rightarrow y = 4x - 7$$

Putting this value of y in (2)

$$16x - 5(4x - 7) = 25$$

$$16x - 20x + 35 = 25$$

$$-4x = -10$$

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

From (1)

$$y = 4\left(\frac{5}{2}\right) - 7$$

$$\Rightarrow y = 10 - 7$$

$$\Rightarrow y = 3$$

$$y = 10 - 7 = 3$$

Solution is  $x = \frac{5}{2}$  and  $y = 3$ .

**Solution 7:**

$$2x + 7y = 39 \dots (1)$$

$$3x + 5y = 31 \dots (2)$$

$$(1) \Rightarrow x = \frac{39 - 7y}{2}$$

Putting this value of x in (2)

$$3\left(\frac{39 - 7y}{2}\right) + 5y = 31$$

$$117 - 21y + 10y = 62$$

$$-11y = -55$$

$$y = 5$$

$$\text{From (1) } x = \frac{39 - 7(5)}{2}$$

$$x = \frac{4}{2}$$

$$x = 2$$

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### Solution 8:

The given pair of linear equations are

$$1.5x + 0.1y = 6.2 \dots\dots\dots(i)$$

$$3x - 0.4y = 11.2 \dots\dots\dots(ii)$$

Consider equation (i)

$$1.5x + 0.1y = 6.2$$

$$\Rightarrow 1.5x = 6.2 - 0.1y$$

$$\Rightarrow x = \frac{(6.2 - 0.1y)}{1.5} \dots\dots\dots(iii)$$

Substitute the value of x from equation (iii) in equation (ii).

$$3x - 0.4y = 11.2$$

$$\Rightarrow 3\left(\frac{(6.2 - 0.1y)}{1.5}\right) - 0.4y = 11.2$$

$$\Rightarrow 2(6.2 - 0.1y) - 0.4y = 11.2$$

$$\Rightarrow 12.4 - 0.2y - 0.4y = 11.2$$

$$\Rightarrow -0.6y = -1.2$$

$$\Rightarrow y = 2 \dots\dots\dots(iv)$$

Substitute the value of y from equation (iv) in equation (iii).

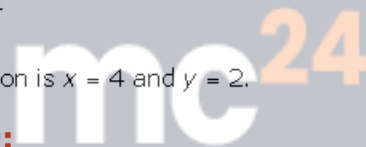
$$x = \frac{(6.2 - 0.1y)}{1.5}$$

$$\Rightarrow x = \frac{(6.2 - 0.1(2))}{1.5}$$

$$\Rightarrow x = \frac{(6.2 - 0.2)}{1.5}$$

$$\Rightarrow x = 4$$

$\therefore$  Solution is  $x = 4$  and  $y = 2$ .



### Solution 9:

Given equations are

$$2(x - 3) + 3(y - 5) = 0 \dots\dots(1)$$

$$5(x - 1) + 4(y - 4) = 0 \dots\dots(2)$$

From (1), we get

$$2x - 6 + 3y - 15 = 0$$

$$\Rightarrow 2x - 21 + 3y = 0$$

$$\Rightarrow 2x = 21 - 3y$$

$$\Rightarrow x = \frac{21 - 3y}{2}$$

From (2), we get

$$5(x - 1) + 4(y - 4) = 0$$

$$\Rightarrow 5x - 5 + 4y - 16 = 0$$

$$\Rightarrow 5x + 4y - 21 = 0 \dots\dots(3)$$

Substituting  $x = \frac{21 - 3y}{2}$  in (3), we get

$$5\left(\frac{21 - 3y}{2}\right) + 4y - 21 = 0$$

$$\Rightarrow \frac{105 - 15y}{2} + 4y - 21 = 0$$

$$\Rightarrow 105 - 15y + 8y - 42 = 0$$

$$\Rightarrow -7y + 63 = 0$$

$$\Rightarrow 7y = 63$$

$$\Rightarrow y = 9$$

Substituting  $y = 9$  in  $x = \frac{21 - 3y}{2}$ , we get

$$x = \frac{21 - 3(9)}{2} = \frac{21 - 27}{2} = \frac{-6}{2} = -3$$

$\therefore$  Solution is  $x = -3$  and  $y = 9$

**Solution 10:**

$$\frac{2x+1}{7} + \frac{5y-3}{3} = 12 \quad (\text{given})$$

$$\Rightarrow \frac{3(2x+1)+7(5y-3)}{21} = 12$$

$$\Rightarrow 6x + 3 + 35y - 21 = 252$$

$$\Rightarrow 6x + 35y - 18 = 252$$

$$\Rightarrow 6x + 35y = 270$$

$$\Rightarrow 6x = 270 - 35y$$

$$\Rightarrow x = \frac{270 - 35y}{6}$$

$$\frac{3x+2}{2} - \frac{4y+3}{9} = 13 \quad (\text{given})$$

$$\Rightarrow \frac{9(3x+2) - 2(4y+3)}{18} = 13$$

$$\Rightarrow 27x + 18 - 8y - 6 = 234$$

$$\Rightarrow 27x - 8y + 12 = 234$$

$$\Rightarrow 27x - 8y = 222 \quad \dots(1)$$

Substituting  $x = \frac{270 - 35y}{6}$  in (1), we get

$$27\left(\frac{270 - 35y}{6}\right) - 8y = 222$$

$$\Rightarrow 7290 - 945y - 48y = 1332$$

$$\Rightarrow -993y = -5958$$

$$\Rightarrow y = 6$$

Substituting  $y = 6$  in  $x = \frac{270 - 35y}{6}$ , we get

$$x = \frac{270 - 35 \times 6}{6} = \frac{270 - 210}{6} = \frac{60}{6} = 10$$

$\therefore$  Solution is  $x = 10$  and  $y = 6$