

Exercise 6(A)

Solve the pairs of linear (simultaneous) equations by the method of elimination by substitution:

1. $8x + 5y = 9$

$3x + 2y = 4$

Solution:

Given equations,

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

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

From (1), we have

$y = (9 - 8x)/5$

Now,

Putting this value of y in (2)

$3x + 2[(9 - 8x)/5] = 4$

On simplifying, we get

$15x + 18 - 16x = 20$

$x = -2$

Substituting the value of x in (1), we get

$y = (9 - 8x)/5$

$= (9 - 8 \times -2)/5$

$= (9 + 16)/5$

$= 25/5$

$= 5$

Hence, the values of x and y are -2 and 5 respectively.

2. $2x - 3y = 7$

$5x + y = 9$

Solution:

Given equations,

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

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

From (2), we have

$y = 9 - 5x$

Putting this value of y in (1), we get

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

$2x - 27 + 15x = 7$

$17x = 34$

$x = 2$

Now, from (2) we get

$y = 9 - 5(2)$

$y = -1$

Hence, the values of x and y are 2 and -1 respectively.

3. $2x + 3y = 8$

$2x = 2 + 3y$

Solution:

Given equation,

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

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

From (2), we have

$2x = 2 + 3y$

Putting this value of $2x$ in (1), we get

$2 + 3y + 3y = 8$

$6y = 6$

$y = 1$

Now from (2), we get

$2x = 2 + 3(1)$

$x = 5/2$

$x = 2.5$

Hence, the values of x and y are 2.5 and 1 respectively.

4. $0.2x + 0.1y = 25$

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

Solution:

Given equation,

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

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

From (i), we have

$0.2x = 25 - 0.1y$

$x = [(25 - 0.1y)/0.2] \dots (iii)$

On substituting the value of x from equation (iii) in equation (ii), we get

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

$2\{[(25 - 0.1y)/0.2] - 2\} - 1.6y = 116$

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

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

$-2.6y = -130$

$y = 50$

Now, on substituting the value of y in (iii), we get

$x = (25 - 0.1y)/0.2$

$x = [25 - 0.1(50)]/0.2$

$x = (25 - 5)/0.2$

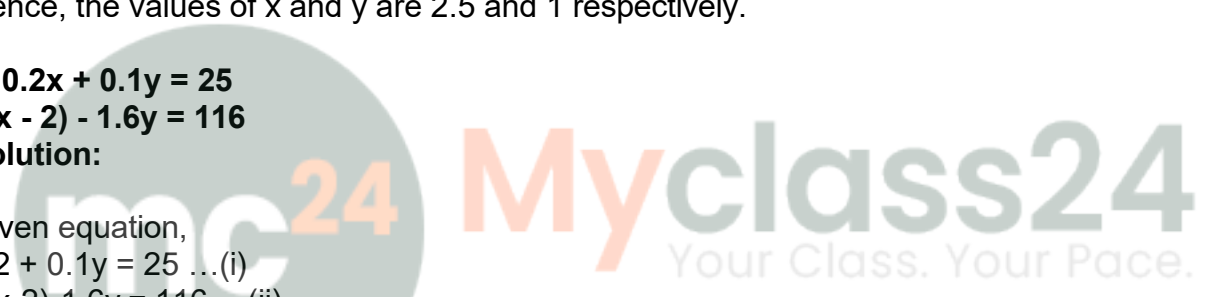
$x = 100$

Hence, the values of x and y are 100 and 50 respectively.

5. $6x = 7y + 7$

$7y - x = 8$

Solution:



Given equations,

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

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

From (2), we have

$$x = 7y - 8$$

On putting this value of x in (1), we get

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

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

$$35y = 55$$

$$y = 11/7$$

Now, on substituting the value of y in (2) we get

$$x = 7(11/7) - 8$$

$$x = 3$$

Hence, the values of x and y are 3 and 11/7 respectively.

6. $y = 4x - 7$

$16x - 5y = 25$

Solution:

Given equations,

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

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

From (1), we have

$$y = 4x - 7$$

On putting this value of y in (2)

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

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

$$-4x = -10$$

$$x = 5/2$$

Now, on substituting the value of x in (1), we get

$$y = 4(5/2) - 7$$

$$y = 10 - 7$$

$$y = 3$$

Hence, the values of x and y are 5/2 and 3 respectively.

7. $2x + 7y = 39$

$3x + 5y = 31$

Solution:

Given equations,

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

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

From (1), we have

$$x = (39 - 7y)/2$$

On putting the value of x in (2), get

$$3[(39 - 7y)/2] + 5y = 31$$

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

$$-11y = -55$$

$$y = 5$$

Now, on substituting the value of y in (1), we get

$$x = [39 - 7(5)]/2$$

$$x = 4/2$$

$$x = 2$$

Hence, the values of x and y are 2 and 5 respectively.

8. $1.5x + 0.1y = 6.2$

$3x - 0.4y = 11.2$

Solution:

Given equations,

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

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

From (i), we have

$$1.5x + 0.1y = 6.2$$

$$1.5x = 6.2 - 0.1y$$

$$x = (6.2 - 0.1y)/1.5 \dots (iii)$$

On substituting the value of x in (ii), we get

$$3x - 0.4y = 11.2$$

$$3\left\{\frac{6.2 - 0.1y}{1.5} - 2\right\} - 0.4y = 11.2$$

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

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

$$-0.6y = -1.2$$

$$y = 2$$

Now, on substituting the value of y in (iii), we get

$$x = (6.2 - 0.1y)/1.5$$

$$x = [6.2 - 0.1(2)]/1.5$$

$$x = (6.2 - 0.2)/1.5$$

$$x = 4$$

Hence, the values of x and y are 4 and 2 respectively.

9. $2(x - 3) + 3(y - 5) = 0$

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

Solution:

Given equations,

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

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

From (1), we have

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

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

$$2x = 21 - 3y$$

$$x = (21 - 3y)/2 \dots (3)$$

And from (2), we have

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

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

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

On substituting x from (3) in (4), we get

$$5[(21 - 3y)/2] + 4y - 21 = 0$$

$$(105 - 15y)/2 + 4y - 21 = 0$$

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

$$-7y + 63 = 0$$

$$7y = 63$$

$$y = 9$$

Now, substituting y = 9 in (3), we get

$$x = [21 - 3(9)]/2$$

$$= (21 - 27)/2$$

$$= (-6/2)$$

$$= -3$$

Hence, the values of x and y are -3 and 9 respectively.

10. $(2x + 1)/7 + (5y - 3)/3 = 12$

$(3x + 2)/2 - (4y + 3)/9 = 13$

Solution:

Given equations,

$$2x+1/7 + (5y - 3)/3 = 12 \dots (1)$$

$$(3x + 2)/2 - (4y + 3)/9 = 13 \dots (2)$$

From (1), we have

$$(2x + 1)/7 + (5y - 3)/3 = 12$$

$$[3(2x + 1) + 7(5y - 3)]/21 = 12$$

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

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

$$6x + 35y = 270$$

$$6x = 270 - 35y$$

$$x = (270 - 35y)/6 \dots (3)$$

And from (2), we have

$$(3x + 2)/2 - (4y + 3)/9 = 13$$

$$[9(3x + 2) - 2(4y + 3)]/18 = 13$$

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

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

$$27x - 8y = 222 \dots (4)$$

On substituting x from (3) in (4), we get

$$27[(270 - 35y)/6] - 8y = 222$$

$$7290 - 945y - 8y = 1332$$

$$-993y = -5958$$

$$y = 6$$

Now, on substituting value of y in (3), we get

$$\begin{aligned}x &= (270 - 35 \times 6)/6 \\ &= (270 - 210)/6 \\ &= 60/6 \\ &= 10\end{aligned}$$

Hence, the values of x and y are 10 and 6 respectively.

11. $3x + 2y = 11$

$2x - 3y + 10 = 0$

Solution:

Given equations,

$$3x + 2y = 11$$

$$2x - 3y + 10 = 0$$

From (i), we have

$$3x + 2y = 11$$

$$3x = 11 - 2y$$

$$x = (11 - 2y)/3 \dots \text{(iii)}$$

On substituting x from (iii) in (ii), we get

$$2[(11 - 2y)/3] - 3y + 10 = 0$$

$$[(22 - 4y)/3] - 3y = -10$$

$$(22 - 4y - 9y)/3 = -10$$

$$22 - 13y = -30$$

$$13y = 52$$

$$y = 4$$

On substituting the value of y in (iii), we get

$$x = [11 - 2(4)]/3$$

$$= (11 - 8)/3$$

$$= 3/3$$

$$= 1$$

Hence, the values of x and y are 1 and 4 respectively.

12. $2x - 3y + 6 = 0$

$2x + 3y - 18 = 0$

Solution:

Given equations,

$$2x - 3y + 6 = 0 \dots \text{(i)}$$

$$2x + 3y - 18 = 0 \dots \text{(ii)}$$

From (i), we have

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

$$2x = 3y - 6$$

$$x = (3y - 6)/2 \dots \text{(iii)}$$

On substituting x from (iii) in (ii), we get

$$2[(3x - 6)/2] + 3y = 18$$

$$3y - 6 + 3y = 18$$

$$6y = 24$$

$$y = 4$$

On substituting the value of y in (iii), we get

$$x = (3 \times 4 - 6)/2$$

$$= (12 - 6)/2$$

$$= 6/2$$

$$= 3$$

Hence, the values of x and y are 3 and 4 respectively.

$$13. (3x/2) - (5y/3) + 2 = 0$$

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

Solution:

Given equations,

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

$$x/3 + y/2 = 2\frac{1}{6} \dots (ii)$$

From (ii), we have

$$(x/3) + (y/2) = (13/6)$$

$$(2x + 3y)/6 = (13/6)$$

$$2x + 3y = 13$$

$$2x = 13 - 3y$$

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

On substituting x from (iii) in (i), we get

$$(3/2)[(13 - 3y)/2] - (5y/3) = -2$$

$$[(39 - 9y)/4] - (5y/3) = -2$$

$$(117 - 27y - 20y)/12 = -2$$

$$(117 - 47y) / 12 = -2$$

$$117 - 47y = -24$$

$$47y = 141$$

$$y = 3$$

On substituting the value of y in (iii), we have

$$x = [(13 - 3 \times 3)/2]$$

$$= (13 - 9)/2$$

$$= 4/2$$

$$= 2$$

Hence, the values of x and y are 2 and 3 respectively.

$$14. x/6 + y/15 = 4$$

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

Solution:

Given equations,

$$x/6 + y/15 = 4 \dots (i)$$

$$x/3 - y/12 = 4\frac{3}{4} \dots (ii)$$

From (i), we have

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$$x/6 + y/15 = 4$$

$$(5x+2y)/30 = 4$$

$$5x + 2y = 120$$

$$5x + 120 - 2y$$

$$x = (120 - 2y)/5 \dots(iii)$$

On substituting x from (iii) in (ii), we get

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

$$1/3(x - y/4) = 19/4$$

$$1/3\{[(120 - 2y)/5] - (y/4)\} = 19/4$$

$$(480 - 8y - 5y)/20 = 57/4$$

$$(480 - 13y)/20 = 57/4$$

$$480 - 13y = 285$$

$$13y = 195$$

$$y = 15$$

Now, on substituting the value of y in (iii), we get

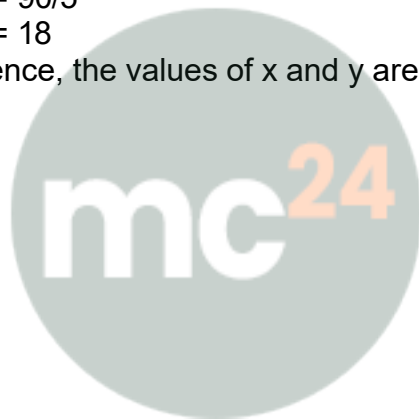
$$x = (120 - 2 \times 15)/5$$

$$= (120 - 30)/5$$

$$= 90/5$$

$$= 18$$

Hence, the values of x and y are 18 and 15 respectively.



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