

What you will learn about:
Solving Systems of Linear Equations by Elimination

Solving Systems of equations
by Elimination

Add or Subtract
equations to
Eliminate a variable

How to solve a system of equations by elimination.

Step 1. Write both equations in standard form. If any coefficients are fractions, clear them.

Step 2. Make the coefficients of one variable opposites.

- Decide which variable you will eliminate.
- Multiply one or both equations so that the coefficients of that variable are opposites.

Step 3. Add the equations resulting from Step 2 to eliminate one variable.

Step 4. Solve for the remaining variable.

Step 5. Substitute the solution from Step 4 into one of the original equations. Then solve for the other variable.

Step 6. Write the solution as an ordered pair.

Step 7. Check that the ordered pair is a solution to **both** original equations.

Solve the system by elimination $\begin{cases} x + y = 10 \\ x - y = 12 \end{cases}$
Elem y

$$\begin{aligned} 11 + y &= 10 \\ y &= -1 \end{aligned}$$

$$\begin{aligned} x + y &= 10 \\ (+) \quad x - y &= 12 \\ \hline 2x &= 22 \\ x &= 11 \end{aligned}$$

$$(11, -1)$$

$$\begin{aligned} \text{Elem } x \\ x + y &= 10 \\ (-) \quad x - y &= 12 \\ \hline 2y &= -2 \\ y &= -1 \end{aligned}$$

$$\begin{aligned} x + (-1) &= 10 \\ x &= 11 \end{aligned}$$

$$\begin{aligned} 2y &= -2 \\ y &= -1 \end{aligned} \quad (11, -1)$$

Solve the system by elimination $\begin{cases} 3x - 2y = -2 \\ 5x - 6y = 10 \end{cases}$

$$\begin{aligned} -9x + 6y &= 6 \\ (+) \quad 5x - 6y &= 10 \\ \hline -4x &= 16 \\ \frac{-4x}{-4} &= \frac{16}{-4} \\ x &= -4 \end{aligned}$$

$$(-4, -5)$$

$$3x - 2y = -2$$

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

$$-12 - 2y = -2$$

$$-2y = 10$$

$$y = -5$$

Elim x Elim y
 top · 7 top · 2
 Bot · 4 Bot · 3

Solve the system by elimination $\begin{cases} (4x - 3y = 1) \cdot 3 \\ (5x - 9y = -4) \end{cases}$

$$\begin{array}{r} -12x + 9y = -3 \\ (+) \quad 5x - 9y = -4 \\ \hline -7x = -7 \\ x = 1 \end{array} \quad \begin{array}{r} 4(1) - 3y = 1 \\ 4 - 3y = 1 \\ -3y = -3 \\ y = 1 \end{array}$$

(1, 1)

Solve the system by elimination $\begin{cases} (4x - 3y = 9) \cdot 2 \\ (7x + 2y = -6) \cdot 3 \end{cases}$

$$\begin{array}{r} 8x - 6y = 18 \\ (+) \quad 21x + 6y = -18 \\ \hline 29x = 0 \\ x = 0 \end{array} \quad \begin{array}{r} 7(0) + 2y = -6 \\ 2y = -6 \\ y = -3 \end{array}$$

(0, -3)

Solve the system by elimination $\begin{cases} (3x - 4y = -9) \cdot 3 \\ (5x + 3y = 14) \cdot 4 \end{cases}$

$$\begin{array}{r} 9x - 12y = -27 \\ (+) \quad 20x + 12y = 56 \\ \hline 29x = 29 \\ x = 1 \end{array} \quad \begin{array}{r} 3(1) - 4y = -9 \\ 3 - 4y = -9 \\ -4y = -12 \\ y = 3 \end{array}$$

(1, 3)

Get rid of Fractions
 1st

Solve the system by elimination $\begin{cases} (x + \frac{1}{2}y = 6) \cdot 2 \\ (\frac{3}{2}x + \frac{2}{3}y = \frac{17}{2}) \cdot 6 \end{cases}$

$$\begin{array}{r} (2x + y = 12) \cdot 4 \\ 9x + 4y = 51 \\ (+) \quad -8x - 4y = -48 \\ \hline x = 3 \end{array} \quad \begin{array}{r} 2(3) + y = 12 \\ 6 + y = 12 \\ y = 6 \end{array}$$

(3, 6)

$$\begin{array}{r} 4 \\ 8 \\ -27 \\ \hline 29 \end{array}$$

$$\begin{array}{r} 2 \\ 17 \\ \hline 3 \\ 1 \end{array}$$

Solve the system by elimination $\begin{cases} \frac{1}{3}x - \frac{1}{2}y = 1 \\ \frac{3}{4}x - y = \frac{5}{2} \end{cases}$

$$\begin{aligned} (2x - 3y = 6) \cdot 3 \\ (3x - 4y = 10) \cdot 2 \\ -6x + 9y = -18 \\ (+) \quad 6x - 8y = 20 \\ \hline y = 2 \end{aligned}$$

(6, 2) $\begin{aligned} 2x - 3(2) &= 6 \\ 2x - 6 &= 6 \\ 2x &= 12 \\ x &= 6 \end{aligned}$

Solve the system by elimination $\begin{cases} 3x + 4y = 12 \\ y = 3 - \frac{3}{4}x \end{cases}$

$$\begin{aligned} 3x + 4\left(3 - \frac{3}{4}x\right) &= 12 \\ 3x + 12 - 3x &= 12 \\ 12 &= 12 \end{aligned}$$

Infinitely many solutions

Solve the system by elimination $\begin{cases} -6x + 15y = 10 \\ 2x - 5y = -5 \end{cases}$

$$\begin{aligned} -6x + 15y &= 10 \\ (+) \quad 6x - 15y &= -15 \\ \hline 0 &= -5 \end{aligned}$$

No Solution

Parallel.

Solve the system by elimination $\begin{cases} 7x - 3y = -2 \\ -14x + 6y = 8 \end{cases}$

$$\begin{aligned} 14x - 6y &= -6 \\ -14x + 6y &= 8 \\ \hline 0 &= -2 \end{aligned}$$

No Solution