

Solving Linear Systems Using Elimination

Solving a linear system by **elimination** is also an algebraic method that gives **exact solutions**. Since a solution to a linear system is the point that satisfies **ALL** equations, the x-value and the y-value of the point must be the same for each equation. When we multiply equations by a constant, we create an equivalent equation. This is a technique that helps us to eliminate variables that make it difficult for us to solve the system.

Steps for Solving a Linear Systems using Elimination:

Example:

$\begin{array}{r} 2x + 5y = 16 \quad \textcircled{1} \\ x - y = 1 \quad \textcircled{2} \end{array}$	Label the equations.
<p>If I want to eliminate the variable 'y', I will need to multiply eq'n $\textcircled{2}$ by 5 so that the 'y' in that equation will have a coefficient of -5.</p> $\textcircled{2} \times 5: \begin{array}{r} x - y = 1 \\ 5x - 5y = 5 \end{array} \leftarrow \text{eq'n} \textcircled{2}$	Multiply one of the equations by a constant so that adding OR subtracting the equations will eliminate a variable. Label this new, equivalent , equation.
<p>I see now that I have 5y and -5y, so if I ADD these equations, I will get 0y (I will have eliminated y).</p> $\begin{array}{r} \textcircled{1} + \textcircled{3} \quad 2x + 5y = 16 \quad \leftarrow \text{eq'n} \textcircled{1} \\ \quad \quad 5x - 5y = 5 \quad \quad \leftarrow \text{eq'n} \textcircled{3} \\ \hline 7x + 0y = 21 \\ 7x = 21 \\ x = \frac{21}{7} \\ x = 3 \end{array}$	Add OR subtract the equations to eliminate the desired variable and solve for the remaining variable.
<p>Sub. $x = 3$ into eq'n $\textcircled{2}$ and solve for y:</p> $\begin{array}{r} x - y = 1 \quad \leftarrow \text{eq'n} \textcircled{2} \\ 3 - y = 1 \\ 3 - 1 = y \\ 2 = y \end{array}$ <p>\therefore The solution is (3,2)</p>	Substitute your answer from the previous step into one of the original equations to solve for the remaining variable (the one you eliminated earlier). State the solution.

Reflect: Why do you think this method is called the ELIMINATION method?

Use the steps and example provided to complete the following question:

Use Elimination to solve this linear system. CHECK YOUR ANSWER.

$$x + y = 6$$

$$2x + y = 8$$

Practice:

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