

5-3a Solving Systems by Elimination

EQ: How can you solve a system of linear equations by adding and subtracting?

Elimination Using Addition +		
Use addition when: <i>you have the same coefficients with OPPOSITE signs</i>		
	$\begin{cases} 3x - 4y = 10 \\ x + 4y = -2 \end{cases}$	$\begin{cases} y + 3x = -2 \\ -3x + 2y = 14 \end{cases}$
Step 1: Write the system in <u>standard form</u> so that like terms are aligned. <i>*Ax + By = C</i>	Already in S.F.	$\begin{cases} 3x + y = -2 \\ -3x + 2y = 14 \end{cases}$
Step 2: Eliminate one of the variables by <u>adding</u> and solve for the other variable. <i>*To ADD, just do what the sign tells you to do.</i>	$\begin{array}{r} 3x - 4y = 10 \\ +1x + 4y = -2 \\ \hline 4x = 8 \\ \frac{4x}{4} = \frac{8}{4} \\ x = 2 \end{array}$	$\begin{array}{r} 3x + y = -2 \\ -3x + 2y = 14 \\ \hline 3y = 12 \\ \frac{3y}{3} = \frac{12}{3} \\ y = 4 \end{array}$
Step 3: Substitute the value of the variable into one of the original equations and solve for the other variable.	$\begin{array}{r} x + 4y = -2 \\ 2 + 4y = -2 \\ -2 \quad -2 \\ \hline 4y = -4 \\ \frac{4y}{4} = \frac{-4}{4} \\ y = -1 \end{array}$	$\begin{array}{r} 4 + 3x = -2 \\ 4 + 3x = -2 \\ -4 \quad -4 \\ \hline 3x = -6 \\ \frac{3x}{3} = \frac{-6}{3} \\ x = -2 \end{array}$
Step 4: Write the answers from step 2 and 3 as an ordered pair (x, y). <i>*Don't forget to check!</i>	(2, -1)	(-2, 4)

Elimination Using Subtraction -		
*Use subtraction when: <i>you have the same coefficients with the same signs.</i>		
Examples	$\begin{cases} 2x + y = -5 \\ 2x - 5y = 13 \end{cases}$	$\begin{cases} 3y = -3x + 15 \\ -2x = -3y - 5 \end{cases}$
Step 1: Write the system in <u>standard form</u> so that like terms are aligned. <i>*Ax + By = C</i>	Already in S.F.	$\begin{cases} 3x + 3y = 15 \\ -2x + 3y = -5 \end{cases}$
Step 2: Eliminate one of the variables by <u>subtracting</u> and solve for the other variable. <i>*To SUBTRACT, add the opposite (change the signs of each term in the 2nd equation)</i>	$\begin{array}{r} 2x + y = -5 \\ -2x + 5y = -13 \\ \hline 6y = -18 \\ \frac{6y}{6} = \frac{-18}{6} \\ y = -3 \end{array}$	$\begin{array}{r} 3x + 3y = 15 \\ +2x - 3y = +5 \\ \hline 5x = 20 \\ \frac{5x}{5} = \frac{20}{5} \\ x = 4 \end{array}$
Step 3: Substitute the value of the variable into one of the original equations and solve for the other variable.	$\begin{array}{r} 2x + y = -5 \\ 2x + (-3) = -5 \\ 2x - 3 = -5 \\ +3 \quad +3 \\ \hline 2x = -2 \\ \frac{2x}{2} = \frac{-2}{2} \\ x = -1 \end{array}$	$\begin{array}{r} 3y = -3x + 15 \\ 3y = -3(4) + 15 \\ 3y = -12 + 15 \\ 3y = 3 \\ \frac{3y}{3} = \frac{3}{3} \\ y = 1 \end{array}$
Step 4: Write the answers from step 2 and 3 as an ordered pair (x, y). <i>*Don't forget to check!</i>	(-1, -3)	(4, 1)