

Lesson 11: Solving Systems of Equations by Addition/Elimination

CC attribute: *Beginning and Intermediate Algebra* by T. Wallace.



Objective: Solve linear systems by addition and elimination.

Students will be able to:

- Solve linear systems by addition and elimination of one variable.
- Write system solutions as ordered pairs in the form (x, y) .
- Verify the accuracy of a solution by plugging it into each equation in the system.

Prerequisite Knowledge:

- Solving a linear equation.
- Applying the distributive property.
- Combining like terms.

Lesson:

I - Motivating Example(s):

We present the steps for solving a system of linear equations by addition/elimination alongside an example.

Steps for Addition/Elmination	System: $\begin{cases} 2x - 5y = -13 \\ -3y + 4 = -5x \end{cases}$
1. Line up the variables and constants.	Rearrange the second equation $2x - 5y = -13$ $5x - 3y = -4$
2. Multiply to get opposites (use LCM).	First Equation: multiply by -5 $-5 \cdot (2x - 5y) = (-13) \cdot (-5)$ $-10x + 25y = 65$ Second Equation: multiply by 2 $2 \cdot (5x - 3y) = (-4) \cdot 2$ $10x - 6y = -8$
3. Add equations to eliminate a variable.	$\begin{array}{r} -10x + 25y = 65 \\ 10x - 6y = -8 \\ \hline 19y = 57 \end{array}$

4. Solve for the remaining variable.	$\frac{19y}{19} = \frac{57}{19}$ $y = 3$
5. Plug back into either of the given equations and solve.	$2x - 5(3) = -13$ $2x - 15 = -13$ $\frac{+15}{2} \quad \frac{+15}{2}$ $\frac{2x}{2} = \frac{2}{2}$ $x = 1$
Our solution, as a coordinate pair.	$(x, y) = (1, 3)$

II - Demo/Discussion Problems:

Solve each of the following systems of linear equations by addition/elimination.

$$1. \begin{cases} 3x + 6y = -9 \\ 2x + 9y = -26 \end{cases} \quad 2. \begin{cases} 2x - 5y = 3 \\ -6x + 15y = -9 \end{cases} \quad 3. \begin{cases} 4x - 6y = 8 \\ 6x - 9y = 15 \end{cases}$$

III - Practice Problems:

Solve each of the following systems of linear equations by addition/elimination.

$$\begin{array}{lll}
1. \begin{cases} 4x + 2y = 0 \\ -4x - 9y = -28 \end{cases} & 9. \begin{cases} 0 = 9x + 5y \\ y = \frac{2}{7}x \end{cases} & 17. \begin{cases} -7x + 10y = 13 \\ 4x + 9y = 22 \end{cases} \\
2. \begin{cases} -6x + 9y = 3 \\ 6x - 9y = -9 \end{cases} & 10. \begin{cases} -7x + y = -10 \\ -9x - y = -22 \end{cases} & 18. \begin{cases} -6 - 42y = -12x \\ x - \frac{7}{2}y = \frac{1}{2} \end{cases} \\
3. \begin{cases} -x - 5y = 28 \\ -x + 4y = -17 \end{cases} & 11. \begin{cases} 5x - 5y = -15 \\ 5x - 5y = -15 \end{cases} & 19. \begin{cases} -9x + 5y = -22 \\ 9x - 5y = 13 \end{cases} \\
4. \begin{cases} 10x + 6y = 24 \\ -6x + y = 4 \end{cases} & 12. \begin{cases} -10x - 5y = 0 \\ 10x + 10y = 30 \end{cases} & 20. \begin{cases} 4x - 6y = -10 \\ 4x - 6y = -14 \end{cases} \\
5. \begin{cases} -7x + 4y = -4 \\ 10x - 8y = -8 \end{cases} & 13. \begin{cases} x + 3y = -1 \\ 10x + 6y = -10 \end{cases} & 21. \begin{cases} 2x - y = 5 \\ 5x + 2y = -28 \end{cases} \\
6. \begin{cases} -7x - 3y = 12 \\ -6x - 5y = 20 \end{cases} & 14. \begin{cases} -6x + 4y = 4 \\ -3x - y = 26 \end{cases} & 22. \begin{cases} 2x + 4y = 24 \\ 4x - 12y = 8 \end{cases} \\
7. \begin{cases} 9x + 6y = -21 \\ -10x - 9y = 28 \end{cases} & 15. \begin{cases} -5x + 4y = 4 \\ -7x - 10y = -10 \end{cases} & 23. \begin{cases} 5x + 10y = 20 \\ -6x - 5y = -3 \end{cases} \\
8. \begin{cases} -8x - 8y = -8 \\ 10x + 9y = 1 \end{cases} & 16. \begin{cases} -4x - 5y = 12 \\ -10x + 6y = 30 \end{cases} & 24. \begin{cases} 9x - 2y = -18 \\ 5x - 7y = -10 \end{cases}
\end{array}$$

$$25. \begin{cases} -7x + 5y = -8 \\ -3x - 3y = 12 \end{cases}$$

$$26. \begin{cases} 9y = 7 - x \\ -18y + 4x = -26 \end{cases}$$

$$27. \begin{cases} -x - 2y = -7 \\ x + 2y = 7 \end{cases}$$

$$28. \begin{cases} -3x + 3y = -12 \\ -3x + 9y = -24 \end{cases}$$

$$29. \begin{cases} -5x + 6y = -17 \\ x - 2y = 5 \end{cases}$$

$$30. \begin{cases} -6x + 4y = 12 \\ 12x + 6y = 18 \end{cases}$$

$$31. \begin{cases} -9x - 5y = -19 \\ 3x - 7y = -11 \end{cases}$$

$$32. \begin{cases} 3x + 7y = -8 \\ 4x + 6y = -4 \end{cases}$$

$$33. \begin{cases} 8x + 7y = -24 \\ 6x + 3y = -18 \end{cases}$$

$$34. \begin{cases} 21 = -9x + 12y \\ \frac{4}{3}y + \frac{7}{3}x = -1 \end{cases}$$

