

Name:

IN THIS LESSON, YOU WILL:

- Solve systems of linear equations by elimination
- Compare solution methods for systems of linear equations
- Make cost-benefit decisions
- Plan and budget for near-term savings goals



INTRO

QUESTION OF THE DAY: Which savings strategy is most effective?

Write your answer to the question below. Then, compare your answer to the answer on the second slide. Finally, follow your teacher's directions on how to answer the follow-up questions below. You may assume there are 30 days in a month for this saving example.

- 1. Which savings strategy is most effective:**
 - a. Saving \$5 per day?
 - b. Saving \$35 per week?
 - c. Saving \$150 per month?
- 2. Why do you think the winning strategy is more effective than the others?**
- 3. How can you compare these three savings strategies that all have different time frames?**
- 4. What do you notice about the amount saved per month for each of the three saving strategies?**
- 5. What strategy saves the most in a year? How much does it save?**
- 6. What do you think the results of this study say about how much saving has to do with math and how much saving has to do with your mindset?**



LEARN IT

Solving Systems by Elimination

So far, you have learned how to solve systems of equations by graphing and by using substitution. We will look at a third method here.

Like substitution, the **elimination method** is an algebraic method that allows you to find a numerical answer to a system of equations.

1. Review the completed example below to solve the system of equations using elimination.

$$4x + 4y = 24$$

$$4x - y = 9$$

1 Rearrange:
Rearrange both equations into standard form. Line up the x and y terms in each equation.

$$4x + 4y = 24$$

$$4x - y = 9$$

2 Multiply:
Multiply one (or both) equations by a constant to get "opposites". You want one variable with equal but opposite coefficients in each equation.

$$4x + 4y = 24$$

$$-1(4x - y = 9)$$

3 Add:
Add the equations together to eliminate one variable.

$$4x + 4y = 24$$

$$-4x + y = -9$$

4 Solve:
Solve for the variable that remains.

$$5y = 15$$

$$y = 3$$

5 Substitute:
Substitute your solved variable back into either equation to solve for the other variable OR repeat steps 1-4 to find the other variable.

$$4x - (3) = 9$$

$$4x = 12$$

$$x = 3$$

6 Answer:

$$(3, 3)$$

Additional Practice

Follow your teacher's directions to complete the examples below.

2. Solve the system of equations using elimination.

$$4x + 4y = 24$$

$$4x = 9 - y$$

1 Rearrange:

2 Multiply:

3 Add:

4 Solve:

5 Substitute:

6 Answer:

3. Solve the system of equations using elimination.

$$x - 3y = 2$$

$$2x - 13 = -3y$$

4. Solve the system of equations using elimination.

$$3x = 2 + 2y$$

$$3y - 4 = -2x$$

5. Fill in the missing parts to solve the system of equations.

$$2x = 8 + 2y$$

$$0 = 4 - 3x - y$$

1 Rearrange:

$$2x - \underline{\hspace{1cm}} = 8$$

$$\underline{\hspace{1cm}} = 4$$

2 Multiply:

$$(2x - 2y = 8)$$

$$\underline{\hspace{1cm}}(3x + y = 4)$$

3 Add:

$$2x - 2y = 8$$

$$\underline{\hspace{1cm}} + 2y = \underline{\hspace{1cm}}$$

4 Solve:

$$8x = \underline{\hspace{1cm}}$$

$$x = \underline{\hspace{1cm}}$$

5 Substitute:

$$2(\underline{\hspace{1cm}}) - 2y = 8$$

$$-2y = \underline{\hspace{1cm}}$$

$$y = \underline{\hspace{1cm}}$$

6 Answer:

$$(\underline{\hspace{1cm}}, \underline{\hspace{1cm}})$$



PRACTICE IT

5-Point Practice: Solve Systems by Elimination

Complete any number of problems that add up to 5 points. For each system, use the elimination method to find the solution.

**1 point
each**

$$\begin{aligned}2y + 2x &= 10 \\ 2y + x &= 7\end{aligned}$$

$$\begin{aligned}x + y &= 4 \\ -3x - y &= 0\end{aligned}$$

$$\begin{aligned}y - 3x &= 10 \\ 2y - x &= -5\end{aligned}$$

**2 points
each**

$$\begin{aligned}3x - 2y &= 2 \\ 5x - 5y &= 10\end{aligned}$$

$$\begin{aligned}5x + 4y &= -14 \\ 3x + 6y &= 6\end{aligned}$$

**3 points
each**

$$\begin{aligned}2y &= x + 1 \\ -2x - y &= 7\end{aligned}$$

$$\begin{aligned}3y &= 2x \\ 2y + x &= 7\end{aligned}$$



Choosing a Solution Method

We've now discussed three different methods for solving systems of equations. Each method has advantages and disadvantages, and each method may be simpler to use for a given system of equations. Review this chart and then practice selecting what method to use to solve a system of equations.

Method	Advantages	Disadvantages	When to Use
Graphing	• Solution is easy to see • Recognizable when first learning	• Cannot find an exact answer for non-integer solutions • Can take more time	• When graph is already drawn for at least one • When the equations are in slope-intercept form
Substitution	• Most straightforward	• Can be more difficult with fractions	• When one variable is already isolated • When one variable has a coefficient of one.
Elimination	• Don't have to combine like terms • Works naturally with standard form equations	• Finding the correct multipliers can be tricky	• When the equation starts in standard form • When the coefficients of one variable are the same or opposite • When the numbers are fractions or inconvenient for substitution

For the following problems, choose the solving method that you think is most appropriate and state the reasons why you made that choice. There may be more than one method that works. You do NOT need to solve the problem.

1. $y = 2x + 1$
 $y = 6 - 3x$

2. $x + 3y = 7$
 $2x + 3y = 11$

3. $3x - 2y = -7$
 $2x + 5y = 8$

4. $y = 3x - 1$
 $2x + 4y = 25$



EXPLORE IT

ACTIVITY: Card Sort: Linear Systems

Follow your teacher's instructions to complete this Desmos activity.



APPLY IT

Follow your teacher's directions to complete the Application Problems.

Teachers, you can find the Application problems linked in the Lesson Guide.