

Algebra I

Lesson 7-4

- I can solve systems of equations by using elimination with multiplication.
- I can determine the best method for solving systems of equations.

SOLVING SYSTEMS OF EQUATIONS

Method	The Best Time to Use
Graphing	When estimating a solution because it doesn't give exact solution
Substitution	if one of the variables in either equation has a coefficient of 1 or -1
Elimination Using Addition	if one of the variables has opposite coefficients in the 2 equations
Elimination Using Subtraction	if one of the variables has the same coefficient in the 2 equations
Elimination Using Multiplication	if none of the coefficients are 1 or -1 and neither of the variables can be eliminated by simply adding or subtracting

Solving a system of equations by elimination using multiplication.

Step 1: Put the equations in Standard Form.

Standard Form: $Ax + By = C$

Step 2: Determine which variable to eliminate.

Look for variables that have the same coefficient.

$$\begin{aligned} 2x + 5y &= 3 \\ 3x + 7y &= 4 \end{aligned}$$

Step 3: Multiply the equations and solve.

Solve for the variable.

$$\begin{aligned} -6x - 15y &= 9 \\ 6x + 14y &= 8 \end{aligned}$$

Step 4: Plug back in to find the other variable.

Substitute the value of the variable into the equation.

Step 5: Check your solution.

Substitute your ordered pair into BOTH equations.

Solve the system using elimination.

$$2x + 2y = 6$$

$$3x - y = 5$$

Step 1: Put the equations in Standard Form.

They already are!

Step 2: Determine which variable to eliminate.

None of the coefficients are the same!

Find the least common multiple of each variable.

$$\text{LCM} = 6x, \text{LCM} = 2y$$

Which is easier to obtain?

$$2y$$

(you only have to multiply the bottom equation by 2)

Solve the system using elimination.

$$2x + 2y = 6$$

$$3x - y = 5$$

Step 3: Multiply the equations and solve.

$$\begin{array}{r} 2(3x - y) = 5 \cdot 2 \\ 6x - 2y = 10 \\ (+) 2x + 2y = 6 \\ \hline 8x = 16 \\ \hline x = 2 \end{array}$$

Step 4: Plug back in to find the other variable.

$$\begin{array}{r} 3(2) - y = 5 \\ 6 - y = 5 \quad (2, 1) \\ -6 \quad -6 \\ \hline -y = -1 \\ y = 1 \end{array}$$

Solve the system using elimination.

$$2x + 2y = 6$$

$$3x - y = 5$$

Step 5: Check your solution.

$$\begin{array}{l} (2)(2) + 2(1) = 6 \\ 4 + 2 = 6 \\ 6 = 6 \end{array} \quad \begin{array}{l} 3(2) - 1 = 5 \\ 6 - 1 = 5 \\ 5 = 5 \end{array}$$

Solve the system using elimination.

$$3x + 4y = -25$$

$$2x - 3y = 6$$

$$2(3x + 4y) = (-25)(2) \quad -3(2x - 3y) = (6)(-3)$$

$$6x + 8y = -50 \quad -6x + 9y = -18$$

$$\begin{array}{r} 6x + 8y = -50 \\ (+) \quad -6x + 9y = -18 \\ \hline 17y = -68 \\ \quad +17 \quad +17 \\ \hline y = 4 \end{array}$$

$$\begin{array}{r} 2x + 3(-4) = 6 \\ 2x + 12 = 6 \\ \quad -12 \quad -12 \\ \hline 2x = -6 \\ \quad \quad \quad 2 \\ \hline x = -3 \end{array}$$

$(-3, 4)$

Determine the Best Method

$$4x - 3y = 12$$

$$x + 2y = 14$$

$$\begin{array}{r} x + 2y = 14 \\ \quad -2y \quad -2y \\ \hline x = -2y + 14 \end{array}$$

$$\begin{array}{r} 4(-2y + 14) - 3y = 12 \\ -8y + 56 - 3y = 12 \\ \quad -11y + 56 = 12 \\ \quad \quad -56 \quad -56 \\ \hline -11y = -44 \\ \quad \quad -11 \quad -11 \\ \hline y = 4 \end{array}$$

$$\begin{array}{r} x + 2(4) = 14 \\ x + 8 = 14 \\ \quad -8 \quad -8 \\ \hline x = 6 \end{array}$$

$(6, 4)$

Write and Solve a System of Equations

A coal barge on the Ohio River travels 24 miles upstream in 3 hours. The return trip takes the barge only 2 hours. Find the rate of the barge in still water.

Assignment

Pg. 390 #4-38 even, 48, 50