Instruction

Prerequisite Skills

This lesson requires the use of the following skills:

- graphing equations of lines (A–CED.2★)
- using properties of equality to solve equations (8.EE.7b)

Introduction

Two or more equations that are solved together are called **systems of equations**. The solution to a system of equations is the point or points that make both equations true. Systems of equations can have one solution, no solutions, or an infinite number of solutions. Finding the solution to a system of equations is important to many real-world applications.

Key Concepts

- There are various methods to solving a system of equations. Two methods include the substitution method and the elimination method.

Solving Systems of Linear Equations by Substitution

- The **substitution method** involves solving one of the equations for one of the variables and substituting that into the other equation.

Substitution Method
1. Solve one of the equations for one of the variables in terms of the other variable. 2. Substitute, or replace the resulting expression into the other equation. 3. Solve the equation for the second variable. 4. Substitute the found value into either of the original equations to find the value of the other variable.

- A solution to a system of equations is written as an ordered pair, (x, y). This is the point where the lines would intersect if graphed.
- If the resulting solution is a true statement, such as $9 = 9$, then the system has an infinite number of solutions. The lines would coincide if graphed.

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- If the result is an untrue statement, such as 4 = 9, then the system has no solutions. The lines would never intersect, so they would be parallel if graphed.
- Check your answer by substituting the *x* and *y* values back into the original equations. If the answer is correct, the equations will result in true statements.

Solving Systems of Linear Equations by Elimination Using Addition or Subtraction

- The **elimination method** involves adding or subtracting the equations in the system, using properties of equality, so that one of the variables is eliminated.

Elimination Method Using Addition or Subtraction
1. Add the two equations if the coefficients of one of the variables are opposites of each other. 2. Subtract the two equations if the coefficients of one of the variables are the same. 3. Solve the resulting equation for the remaining variable. 4. Substitute the found value into either of the original equations to find the value of the other variable.

Solving Systems of Linear Equations by Elimination Using Multiplication

- Use this method when the coefficients of one of the variables are neither opposites nor the same. The multiplication property of equality can be used with one or both equations in order to make one pair of coefficients match.

Elimination Method Using Multiplication
1. Multiply each term of one equation by the same number. It may be necessary to multiply the second equation by a different number in order to have coefficients on one of the variables that are opposites or the same. 2. Add or subtract the two equations to eliminate one of the variables. 3. Solve the resulting equation for the remaining variable. 4. Substitute the found value into either of the original equations to find the value of the other variable.

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Common Errors/Misconceptions

- finding the value for only one of the variables of the system
- forgetting to distribute negative signs when substituting expressions for variables
- forgetting to multiply each term by the same number when solving by elimination using multiplication