5x - Y = 6x + 6y = 4To Solve The System By Elimination, What Integer Would You Multiply The FIRST Equation

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When dealing with systems of equations, especially those involving multiple variables, the elimination method is a powerful technique to find solutions efficiently. The question often arises: "What integer should I multiply the first equation by to eliminate one variable?" In this article, we'll delve into this specific problem involving the system:

$$
5x - y = 6x + 6y = 4
$$

and explore how to determine the appropriate integer to multiply the first equation to facilitate elimination. We will walk through the steps, clarify the reasoning, and provide tips for solving similar systems.

Understanding the System of Equations

Before jumping into the solution, it's essential to interpret the given system correctly. The expression:

$$
5x - y = 6x + 6y = 4
$$

can be confusing if read as a single statement. Typically, in systems of equations, each equation is separated by an equality sign. The notation here suggests that the entire expression might be a typo or a misinterpretation.

Possible interpretations:

1. Two separate equations:

$$
\begin{cases}
5x - y = 4 \\
6x + 6y = 4
\end{cases}
$$

2. A combined statement with a typo: Maybe it was meant as:

$$
5x - y = 6x + 6y = 4
$$

which doesn't make sense because a chain of equalities like that isn't valid unless it signifies multiple equalities.

Most likely, the intended system is:

$$
\begin{cases}
5x - y = 4 \quad (Equation\,1) \\
6x + 6y = 4 \quad (Equation\,2)
\end{cases}
$$

We will proceed under this assumption, as it aligns with common systems of two equations with two variables.

Setting Up the Equations for Elimination

Given the two equations:

$$
\begin{cases}
5x - y = 4 \quad (Equation\,1) \\
6x + 6y = 4 \quad (Equation\,2)
\end{cases}
$$

The goal of elimination is to eliminate one variable by making the coefficients of that variable opposites in both equations.

Step 1: Identify the coefficients of the variable to eliminate.

- For y: coefficients are -1 in Equation 1 and 6 in Equation 2.
- For x: coefficients are 5 in Equation 1 and 6 in Equation 2.

Suppose we choose to eliminate y.

Step 2: Find the least common multiple (LCM) of the coefficients of y:

$$
\text{LCM of } 1 \text{ and } 6 = 6
$$

Step 3: Determine multipliers to make the coefficients of y opposites.

- Multiply Equation 1 by 6:

$$
6 \times (5x - y) = 6 \times 4 \Rightarrow 30x - 6y = 24
$$

- Multiply Equation 2 by 1:

$$
1 \times (6x + 6y) = 4 \Rightarrow 6x + 6y = 4
$$

Now, the coefficients of y are -6 and 6, which are opposites, allowing elimination by addition.

Determining the Integer to Multiply the First Equation

In our previous step, we multiplied Equation 1 by 6 to match the coefficient of y:

$$
6 \times \text{Equation 1}
$$

This multiplication ensures the coefficients of y are -6 and 6, enabling the elimination process.

Answer: The integer you multiply the first equation by is 6.

This is the minimal positive integer that facilitates eliminating y from the system.

Performing the Elimination Method

Let's proceed with the elimination step-by-step.

Step 1: Write the modified equations:

$$
\begin{cases}
30x - 6y = 24 \quad (Equation\,1\,multiplied) \\
6x + 6y = 4 \quad (Equation\,2\,unchanged)
\end{cases}
$$

Step 2: Add the equations to eliminate y:

$$
(30x - 6y) + (6x + 6y) = 24 + 4
$$

$$
(30x + 6x) + (-6y + 6y) = 28
$$

$$
36x = 28
$$

Step 3: Solve for x:

$$
x = \frac{28}{36} = \frac{7}{9}
$$

Step 4: Substitute \(x = \frac{7}{9} \) back into one of the original equations to find \(y \). Using Equation 1:

\[
5x - y = 4
\]

\[
5 \times \frac{7}{9} - y = 4
\]

\[
\frac{35}{9} - y = 4
\]

\[
-y = 4 - \frac{35}{9}
\]

Express 4 as \(\frac{36}{9}\):

\[
-y = \frac{36}{9} - \frac{35}{9} = \frac{1}{9}
\]

\[
y = -\frac{1}{9}
\]

Final Solution to the System

The solution to the system, considering our calculations, is:

\[
\boxed{
x = \frac{7}{9}, \quad y = -\frac{1}{9}
}
\]

This pair $\left(\frac{7}{9}, -\frac{1}{9}\right)$ satisfies both original equations.

Summary: What Integer to Multiply the First Equation?

Key Takeaways:

- To eliminate a variable, multiply the equations so that the coefficients of that variable are opposites.
- In our example, multiplying the first equation by 6 achieved this goal for y.
- The choice of multiplier depends on the coefficients of the variable to eliminate; find the least common multiple (LCM) to keep calculations straightforward.
- Always verify your solution by substituting back into the original equations.

Additional Tips for Solving Systems by Elimination

- Identify the variable to eliminate: Choose the variable with coefficients that are easiest to manipulate.
- Find the least common multiple (LCM): Use it to determine the multipliers for each equation.
- Multiply each equation appropriately: Ensure the coefficients of the chosen variable are negatives of each other.
- Add or subtract equations: This will eliminate the chosen variable.
- Solve for the remaining variable: Once one variable is eliminated, solve the resulting equation.
- Back-substitute: Substitute the found value into one of the original equations to find the other variable.
- Check your solution: Always verify by plugging your solutions into the original equations.

Conclusion

In solving systems of equations via the elimination method, choosing the correct integer multiplier for the first equation is crucial for simplifying the process. As demonstrated, multiplying the first equation by 6 allowed us to eliminate y efficiently and solve for x and y. The key is analyzing the coefficients, finding the LCM, and applying the multipliers accordingly. With practice, identifying these multipliers becomes intuitive, making the elimination method a reliable tool for solving various systems of equations.

Remember: The goal is to manipulate equations to create matching (or opposite) coefficients for one variable, enabling straightforward elimination and solution derivation. Mastering this technique will enhance your algebra skills and prepare you for more complex mathematical problems.

Frequently Asked Questions

In the system 5x - y = 6x + 6y, what integer should you multiply the first equation by to eliminate one variable?

You should multiply the first equation by -6 to align the coefficients for elimination.

When solving the system 5x - y = 6x + 6y by elimination, what is the purpose of multiplying the first equation by a specific integer?

Multiplying the first equation by an integer helps create matching coefficients for a variable so that adding or subtracting the equations eliminates that variable.

What is the correct multiplication factor for the first equation in the system 5x - y = 6x + 6y to facilitate elimination?

The first equation should be multiplied by -6.

How do you determine the integer to multiply the first equation by when solving a system by elimination?

You determine the integer by looking at the coefficients of the variable you want to eliminate and choosing a factor that makes those coefficients opposites.

For the system 5x - y = 6x + 6y, what is the step to eliminate a variable using multiplication?

Multiply the first equation by -6 to make the coefficients of x match in magnitude but opposite in sign, enabling elimination when you add the equations.

Additional Resources

5x - Y = 6x + 6y = 4To Solve The System By Elimination, What Integer Would You Multiply The FIRST Equation

Understanding how to solve systems of equations is a fundamental skill in algebra, essential for students and professionals alike. When faced with complex equations, the elimination method often provides a streamlined approach to find solutions efficiently. In this article, we explore a particular system of equations: $5x - Y = 6x + 6y = 4$. Our goal is to determine, step-by-step, what integer you would multiply the first equation by to facilitate elimination and solve for the variables systematically.

Deciphering the Given System: Clarifying the Equation

Before diving into the solution process, it's crucial to interpret the given statement correctly. The equation presented is:

$5x - Y = 6x + 6y = 4$

At first glance, this appears to be a chain of equalities, which can be confusing. Typically, in systems of equations, each individual equation is separated by a line or a semicolon, like:

- Equation 1: $5x - y$ = some value
- Equation 2: $6x + 6y$ = some value

Given the structure, it's likely that the intended system is:

1. $5x - y = 4$
2. $6x + 6y = 4$

This interpretation makes sense because the chain "$5x - y = 6x + 6y = 4$" suggests two equations set equal to the same value, which is a common way to present systems. Alternatively, perhaps the original problem intended to present two separate equations:

- Equation A: $5x - y$ = some constant
- Equation B: $6x + 6y = 4$

For clarity and to proceed with the solution, we'll assume the system is:

Equation 1: $5x - y = k$ (unknown constant; but for the purpose of solving, let's consider the right side as 4)

Equation 2: $6x + 6y = 4$

If the exact constants differ, the process remains similar. We will focus on the system:

- $5x - y = 4$
- $6x + 6y = 4$

The Objective: Using Elimination to Solve the System

The elimination method aims to eliminate one variable by manipulating the equations such that adding or subtracting them cancels out a variable, allowing for straightforward solving of the remaining variable.

Key steps include:

- Adjust the equations with suitable multipliers
- Add or subtract the equations to eliminate a variable
- Solve for the remaining variable
- Substitute back to find the other variable

To execute elimination effectively, the coefficients of one of the variables in both equations should be opposites or equal, so that adding the equations cancels out that variable.

Step 1: Identify the Coefficients and Target Variable

Let's examine the coefficients:

- In Equation 1: $5x - y = 4$ (coefficients: 5 for x, -1 for y)
- In Equation 2: $6x + 6y = 4$ (coefficients: 6 for x, 6 for y)

Our goal is to eliminate one variable, either x or y.

Eliminating y:
- Coefficients of y are -1 and 6.
- To cancel y, multiply Equation 1 by a number that makes its y coefficient equal to 6 in magnitude, so that when added, y terms cancel.

Eliminating x:
- Coefficients of x are 5 and 6.
- To cancel x, multiply one equation so that their x coefficients are equal or opposites.

Step 2: Decide Which Variable to Eliminate

Both options are valid, but eliminating y might be more straightforward because the coefficients are -1 and 6.

Multiplying Equation 1 by 6:
- Equation 1: $5x - y = 4$
- Multiplied by 6: $30x - 6y = 24$

Now, when added to Equation 2 ($6x + 6y = 4$):

- $(30x - 6y) + (6x + 6y) = 24 + 4$

Simplifies to:

- $36x = 28$

This allows us to solve for x directly:

- $x = 28 / 36 = 7 / 9$

Alternatively, if we want to eliminate x:

Multiply Equation 1 by 6 and Equation 2 by 5:

- Equation 1 x6: $30x - 6y = 24$
- Equation 2 x5: $30x + 30y = 20$

Subtract the second from the first:

- $(30x - 6y) - (30x + 30y) = 24 - 20$

Simplifies to:

- $-36y = 4$

which yields:

- $y = -4 / 36 = -1 / 9$

Step 3: Determine the Multiplication Factor for the First Equation

Given the above, the key question is: "What integer would you multiply the first equation by to facilitate elimination?"

From our calculations, to eliminate y, we multiplied the first equation by 6 (an integer). This was chosen because the y coefficient in the first equation (-1) and in the second (6) could be aligned for cancellation.

Thus, the answer is:
Multiply the first equation by 6.

This integer ensures the y terms have coefficients of -6 and 6, which sum to zero when the equations are added, eliminating y.

Why Multiply by 6?

Multiplying an equation by an integer is a strategic step to align coefficients for elimination. The choice of 6 was based on:

- The coefficient of y in the first equation: -1
- The coefficient of y in the second equation: 6

To make the y coefficients opposites, multiply the first equation by 6:

- $-1 \times 6 = -6$

Now, the equations' y coefficients are -6 and 6, which sum to zero when added, eliminating y.

Summary of the Elimination Process

1. Identify the coefficients of the variable to eliminate.
- For y: coefficients are -1 (from first equation) and 6 (from second).

2. Determine the least common multiple (LCM) or suitable multiplier.
- LCM of 1 and 6 is 6.

3. Multiply the entire first equation by 6:
- $6(5x - y) = 64$
- Result: $30x - 6y = 24$

4. Add the second equation to this result:

- (30x - 6y) + (6x + 6y) = 24 + 4

5. Simplify:
- 36x = 28
- x = 28 / 36 = 7 / 9

6. Substitute back to find y:
- Use one of the original equations with x = 7/9.

Practical Implications

This process underscores the importance of selecting the correct integer multiplier to facilitate elimination. The choice hinges on the coefficients of the variable you aim to eliminate. In this case, multiplying the first equation by 6 was the optimal choice to cancel y, leading to a straightforward solution.

Final Thoughts: The Power of Strategic Multiplication

Solving systems of equations via elimination is a powerful algebraic tool, but its efficiency depends on strategic choices. Recognizing which variable to eliminate and selecting the appropriate integer multiplier simplifies calculations and minimizes errors.

In our example, multiplying the first equation by 6 was the key step to eliminate y, allowing us to solve for x neatly. Understanding this process enhances problem-solving skills, applicable in various fields such as engineering, economics, and computer science, where systems of equations are prevalent.

Whether working with real-world data or abstract problems, mastering elimination techniques with strategic multiplication empowers you to tackle complex systems with confidence and precision.

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