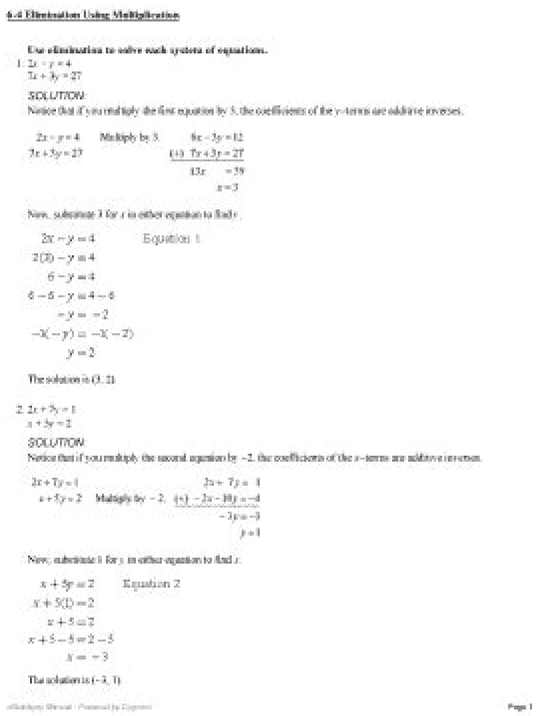
6 4 Practice Elimination Using Multiplication



6-4 Elimination Using Multiplication

Use elimination to solve each system of equations.

1. $2x - y = 4$
$7x + 3y = 27$

SOLUTION:
Notice that if you multiply the first equation by 3, the coefficients of the y-terms are additive inverses.

$2x - y = 4$ Multiply by 3. $6x - 3y = 12$
$7x + 3y = 27$ (+) $7x + 3y = 27$
$13x = 39$
$x = 3$

Now, substitute 3 for x in either equation to find y.

$2x - y = 4$ Equation 1
$2(3) - y = 4$
$6 - y = 4$
$6 - 6 - y = 4 - 6$
$-y = -2$
$-1(-y) = -1(-2)$
$y = 2$

The solution is (3, 2).

2. $2x + 7y = 1$
$x + 5y = 2$

SOLUTION:
Notice that if you multiply the second equation by −2, the coefficients of the x-terms are additive inverses.

$2x + 7y = 1$ $2x + 7y = 1$
$x + 5y = 2$ Multiply by −2. (+) $-2x - 10y = -4$
$-3y = -3$
$y = 1$

Now, substitute 1 for y in either equation to find x.

$x + 5y = 2$ Equation 2
$x + 5(1) = 2$
$x + 5 = 2$
$x + 5 - 5 = 2 - 5$
$x = -3$

The solution is (−3, 1).

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6 4 practice elimination using multiplication is a valuable technique often employed in algebra to solve systems of linear equations. This method involves manipulating equations to eliminate one of the variables, allowing for easier solutions. By using multiplication, we can align the coefficients of one variable in both equations, making it possible to add or subtract the equations to eliminate that variable. In this article, we will explore the process of elimination using multiplication, delve into its importance, and provide detailed examples to enhance understanding.

Understanding the Basics of Elimination

Before diving into the specific method of 6 4 practice elimination using multiplication, it's essential to grasp the fundamentals of the elimination method.

What is the Elimination Method?

The elimination method is a technique used to solve systems of equations by eliminating one of the variables, thus simplifying the problem. This is particularly useful when dealing with two equations containing two variables. The basic steps include:

1. Align the Equations: Write both equations in standard form (Ax + By = C).
2. Multiply if Necessary: Modify one or both equations by multiplying them with a number to align the coefficients of one variable.

3. Add or Subtract the Equations: Combine the equations to eliminate one variable.
4. Solve for the Remaining Variable: Once one variable is eliminated, solve for the remaining variable.
5. Back Substitute: Substitute back to find the value of the eliminated variable.

Why Use Elimination?

The elimination method is advantageous for several reasons:

- Simplicity: It can be easier to eliminate a variable than to isolate it as in the substitution method.
- Efficiency: In some cases, especially when dealing with larger systems or fractions, elimination can be quicker.
- Flexibility: It can be applied to systems of equations with any number of variables, though here we will focus on the two-variable case.

Applying the 6 4 Practice Elimination Using Multiplication

Let’s break down the process of 6 4 practice elimination using multiplication through detailed examples.

Example 1: Basic Application

Consider the following system of equations:

1. $2x + 3y = 12$ (Equation 1)
2. $4x - 2y = 8$ (Equation 2)

Step 1: Align the Equations

Both equations are already in standard form.

Step 2: Multiply if Necessary

To eliminate y, we will manipulate the equations. We can multiply Equation 1 by 2 to make the coefficients of y equal:

- $2(2x + 3y) = 2(12)$
- This results in: $4x + 6y = 24$ (Modified Equation 1)

Now we have:

1. $4x + 6y = 24$ (Modified Equation 1)

2. $4x - 2y = 8$ (Equation 2)

Step 3: Subtract the Equations

Now subtract Equation 2 from Modified Equation 1:

$$
(4x + 6y) - (4x - 2y) = 24 - 8
$$
This simplifies to:

$$
8y = 16
$$

Step 4: Solve for y

Dividing both sides by 8 gives:

$$
y = 2
$$

Step 5: Back Substitute to Find x

Now substitute $y = 2$ back into either original equation. Using Equation 1:

$$
2x + 3(2) = 12
$$
$$
2x + 6 = 12
$$
$$
2x = 6 \implies x = 3
$$

Thus, the solution to the system is $x = 3$ and $y = 2$.

Example 2: More Complex System

Let’s consider a slightly more complex set of equations:

1. $3x + 5y = 15$ (Equation 1)
2. $5x - 4y = 1$ (Equation 2)

Step 1: Align the Equations

Again, both equations are in standard form.

Step 2: Multiply if Necessary

To eliminate y, we will multiply Equation 1 by 4 and Equation 2 by 5:

- $4(3x + 5y) = 4(15)$ → $12x + 20y = 60$ (Modified Equation 1)
- $5(5x - 4y) = 5(1)$ → $25x - 20y = 5$ (Modified Equation 2)

Now our system looks like this:

1. $12x + 20y = 60$ (Modified Equation 1)
2. $25x - 20y = 5$ (Modified Equation 2)

Step 3: Add the Equations

Now, we can add the two equations to eliminate y:

$$
(12x + 20y) + (25x - 20y) = 60 + 5
$$

This simplifies to:

$$
37x = 65
$$

Step 4: Solve for x

Dividing both sides by 37 gives:

$$
x = \frac{65}{37}
$$

Step 5: Back Substitute to Find y

Now substitute $x = \frac{65}{37}$ back into Equation 1:

$$
3\left(\frac{65}{37}\right) + 5y = 15
$$
$$
\frac{195}{37} + 5y = 15
$$

To solve for y, first convert 15 to a fraction with a denominator of 37:

$$
\frac{195}{37} + 5y = \frac{555}{37}
$$

Subtract $\frac{195}{37}$ from both sides:

$$
5y = \frac{555}{37} - \frac{195}{37} = \frac{360}{37}
$$

Now, divide by 5:

$$
y = \frac{360}{37 \cdot 5} = \frac{360}{185} = \frac{72}{37}
$$

Thus, the solution is $x = \frac{65}{37}$ and $y = \frac{72}{37}$.

Conclusion

In this article, we have explored the concept of 6 4 practice elimination using multiplication, outlining its significance and demonstrating its application through detailed examples. The elimination method is a powerful tool in solving systems of equations, providing an efficient and straightforward approach to finding solutions. By mastering this technique, students and practitioners can enhance their algebraic problem-solving skills, making it easier to tackle complex equations in various fields of study.

As you practice the elimination method, remember the key steps: align your equations, multiply when necessary, and carefully add or subtract to eliminate a variable. With practice, this method will become a fundamental tool in your mathematical toolkit.

Frequently Asked Questions

What is the main goal of using elimination in the context of solving equations?

The main goal of using elimination is to eliminate one variable by manipulating the equations, allowing for easier solving of the remaining variable.

How do you set up a problem for elimination using multiplication?

To set up a problem for elimination, you can multiply one or both equations by a number that will allow the coefficients of one variable to match, making it possible to eliminate that variable.

Can you provide an example of a system of equations

suitable for elimination using multiplication?

Sure! For example, the system: 2x + 3y = 6 and 4x + 6y = 12 can be solved using elimination after multiplying the first equation by 2 to match the coefficients of x.

What is the first step after eliminating a variable in a system of equations?

After eliminating a variable, the first step is to solve for the remaining variable by substituting back into one of the original equations.

What should you do if the coefficients of both variables are already the same in a system of equations?

If the coefficients are already the same, you can directly add or subtract the equations to eliminate one variable without needing to multiply.

Why might students struggle with elimination using multiplication?

Students might struggle because they often overlook the need to correctly multiply both sides of the equation and may not properly align the equations for elimination, leading to errors.

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