Use The Elimination Method To Solve The System Of Equations. Choose Thecorrect Ordered Pair.10x+2y =

Use The Elimination Method To Solve The System Of Equations. Choose The correct Ordered Pair. 10x + 2y =

Introduction to the Elimination Method

Solving systems of equations is a fundamental skill in algebra that allows us to find the values of variables that satisfy multiple equations simultaneously. Among the various techniques available, the elimination method stands out for its efficiency, especially when the equations are aligned in a way that makes elimination straightforward. This method involves adding or subtracting equations to eliminate one variable, simplifying the process of solving for the remaining variable.

In this article, we will explore how to effectively use the elimination method to solve systems of equations, with an emphasis on the example involving the equation 10x + 2y = and how to determine the correct ordered pair.

Understanding the Elimination Method

What Is the Elimination Method?

The elimination method, also known as the addition method, is a technique where you align two equations and manipulate them to cancel out one variable. Once one variable is eliminated, you can solve for the remaining variable directly, then substitute back to find the other.

When to Use the Elimination Method

This method is particularly useful when:

- The coefficients of one variable are opposites or can be made opposites through multiplication.
- The system involves two equations with two variables.
- Quick elimination of a variable simplifies the solving process.

Steps to Solve a System of Equations Using the Elimination Method

Follow these fundamental steps:

1. **Write the system in standard form:** Ax + By = C

2. **Align the equations:** Arrange both equations with variables and constants in columns.

3. **Make coefficients of one variable opposites:** Multiply one or both equations by suitable constants to align coefficients.

4. **Add or subtract the equations:** To eliminate one variable.

5. **Solve for the remaining variable:** Use basic algebra to find its value.

6. **Substitute back:** Plug the found value into one of the original equations to find the other variable.

7. **Verify the solution:** Substitute both values into the original equations to ensure correctness.

Applying the Elimination Method to the Equation 10x + 2y =

Suppose you are given the system:

\[
\begin{cases}
10x + 2y = a \quad \text{(Equation 1)} \\
\text{Another equation involving } x \text{ and } y \quad \text{(Equation 2)}
\end{cases}
\]

Since the original prompt mentions "10x + 2y =" without specifying the constant, let's consider an example system for demonstration:

$$
\begin{cases}
10x + 2y = 20 \quad \text{(Equation 1)} \\
3x - y = 7 \quad \text{(Equation 2)}
\end{cases}
$$

Our goal: use the elimination method to find the correct ordered pair (x, y).

Step-by-Step Solution

Step 1: Write the equations in standard form

Equation 1: $10x + 2y = 20$

Equation 2: $3x - y = 7$

Step 2: Make the coefficients of one variable opposites

To eliminate y, align the coefficients of y in both equations.

- Equation 2 has $- y$. To match the coefficient of $2y$ in Equation 1, multiply Equation 2 by 2:

$$
2 \times (3x - y) = 2 \times 7
$$
$$
6x - 2y = 14
$$

Now, the system becomes:

$$
\begin{cases}
10x + 2y = 20 \quad \text{(Equation 1)} \\

6x - 2y = 14 \quad \text{(Modified Equation 2)}
\end{cases}
\]

Step 3: Add the equations to eliminate \(y\)

Adding Equation 1 and the modified Equation 2:

\[
(10x + 2y) + (6x - 2y) = 20 + 14
\]
\[
(10x + 6x) + (2y - 2y) = 34
\]
\[
16x = 34
\]

Solve for \(x\):

\[
x = \frac{34}{16} = \frac{17}{8}
\]

Step 4: Substitute \(x = \frac{17}{8}\) into one of the original equations to find \(y\)

Using Equation 2: \(3x - y = 7\)

Plug in \(x = \frac{17}{8}\):

\[
3 \times \frac{17}{8} - y = 7
\]
\[
\frac{51}{8} - y = 7
\]

Express 7 as a fraction with denominator 8:

\[
\frac{51}{8} - y = \frac{56}{8}
\]

Subtract $\frac{51}{8}$ from both sides:

$$
- y = \frac{56}{8} - \frac{51}{8} = \frac{5}{8}
$$

Multiply both sides by -1:

$$
y = -\frac{5}{8}
$$

Step 5: Final answer — the ordered pair

$$
\boxed{
\left(\frac{17}{8}, \; -\frac{5}{8} \right)
}
$$

This is the unique solution satisfying both equations.

Verifying the Solution

Always verify your solution by substituting back into the original equations.

- For Equation 1:

$$
10x + 2y = 10 \times \frac{17}{8} + 2 \times \left(-\frac{5}{8}\right) = \frac{170}{8} - \frac{10}{8} = \frac{160}{8} = 20
$$

- For Equation 2:

$$
3x - y = 3 \times \frac{17}{8} - \left(-\frac{5}{8}\right) = \frac{51}{8} + \frac{5}{8} = \frac{56}{8} = 7
$$

Both equations check out, confirming the correctness of the solution.

Tips for Using the Elimination Method Effectively

- **Always aim to align coefficients:** Multiplying equations to get matching or oppositely signed coefficients simplifies elimination.
- **Check for the easiest variable to eliminate:** Sometimes, choosing the variable with the smallest coefficients or simplest elimination makes the process faster.
- **Be cautious with fractions:** Simplify where possible and double-check calculations involving fractions.
- **Verify your solutions:** Plug the values back into the original equations to ensure accuracy.

Conclusion

The elimination method is a powerful algebraic tool for solving systems of equations, especially when the coefficients are conducive to elimination through multiplication. By systematically aligning coefficients, adding or subtracting equations, and solving step-by-step, you can efficiently find the correct ordered pair that solves the system.

In our example, solving the system involving $10x + 2y = 20$ and $3x - y = 7$ revealed the solution $\left(\frac{17}{8}, -\frac{5}{8}\right)$. Mastery of this method enhances your problem-solving skills and prepares you for more complex algebraic challenges.

Further Practice

To strengthen your understanding, try solving these systems using the elimination method:

1. $5x + 3y = 11$ and $10x - y = 7$
2. $2x + 4y = 8$ and $3x + y = 9$
3. $7x - 2y = 3$ and $14x + y = 20$

Remember to follow the steps outlined above, verify your solutions, and practice regularly to become proficient in solving systems of equations using the elimination method.

Frequently Asked Questions

How do you use the elimination method to solve the system 10x + 2y = 20 and 5x - y = 5?

First, align the equations: $10x + 2y = 20$ and $5x - y = 5$. Multiply the second equation by 2 to match coefficients: $10x - 2y = 10$. Then, add the two equations: $(10x + 2y) + (10x - 2y) = 20 + 10$, which simplifies to $20x = 30$. Solving for x gives $x = 3/2$. Substitute x back into one of the original equations to find y: $10(3/2) + 2y = 20 \rightarrow 15 + 2y = 20 \rightarrow 2y = 5 \rightarrow y = 5/2$. The solution is $(x, y) = (3/2, 5/2)$.

What is the key step in using the elimination method to solve 10x + 2y = 0 and 3x + 4y = 10?

The key step is to multiply one or both equations to align the coefficients of either x or y so that adding or subtracting them eliminates one variable. For example, multiply the first equation by 2 and the second by 1 to get $20x + 4y = 0$ and $3x + 4y = 10$. Subtract the second from the first: $(20x - 3x) + (4y - 4y) = 0 - 10$, simplifying to $17x = -10$, then solve for x and substitute back to find y.

How do you verify the solution obtained from the elimination method?

Substitute the found values of x and y into both original equations. If both equations are satisfied (both sides equal), then the solution is correct. If not, recheck your calculations or the elimination steps.

Can the elimination method be used when the equations have different coefficients for variables?

Yes, the elimination method can be used by multiplying equations by suitable constants to make the coefficients of one variable equal (or opposites). Once aligned, you can eliminate that variable by addition or subtraction.

Choose the correct ordered pair solution for the system: 10x + 2y = 20 and 5x - y = 5.

The solution is $(x, y) = (3/2, 5/2)$.

Additional Resources

Use The Elimination Method To Solve The System Of Equations. Choose The Correct Ordered Pair. 10x + 2y =

In the realm of algebra, systems of equations are fundamental tools used to find the values of variables that satisfy multiple conditions simultaneously. Among the various techniques available, the elimination method stands out for its efficiency and clarity, especially when dealing with linear systems. This article explores how to employ the elimination method effectively to solve systems of equations, guiding you step-by-step through the process and demonstrating how to determine the correct ordered pair that satisfies a given equation such as 10x + 2y =.

Understanding Systems of Equations

Before delving into the elimination method, it’s crucial to understand what a system of equations entails. Essentially, a system comprises two or more equations involving the same variables. The solution to the system is the set of variable values that satisfy all equations simultaneously.

Example:

Suppose you have the following system:

- Equation 1: $3x + 2y = 12$
- Equation 2: $5x – y = 7$

The goal is to find the values of x and y that satisfy both equations at once.

The Elimination Method: An Overview

The elimination method is a systematic approach that involves adding or subtracting equations to eliminate one variable, thereby simplifying the system to a single variable. Once one variable is found, substituting back into one of the original equations yields the other variable.

Key steps in the elimination method:

1. Align the equations: Write equations in a standard form, typically with variables and constants aligned vertically.
2. Equalize coefficients of one variable: Multiply equations by suitable constants if necessary, so that the coefficients of one variable are opposites or equal.
3. Add or subtract equations: Combine the equations to eliminate one variable.

4. Solve for the remaining variable: Use algebraic manipulation to find the value.
5. Back-substitute: Plug the found value into one of the original equations to find the other variable.

Applying the Elimination Method: Step-by-Step Example

Let’s illustrate the process with an example system:

- Equation 1: $4x + 3y = 18$
- Equation 2: $2x – y = 4$

Step 1: Write in standard form

Equation 1: $4x + 3y = 18$

Equation 2: $2x – y = 4$

Step 2: Make coefficients of one variable opposites

Notice that the coefficients of x are 4 and 2. To eliminate x, we can multiply Equation 2 by 2:

Equation 2 multiplied by 2:

$(2x – y) \times 2 \rightarrow 4x – 2y = 8$

Now, the system becomes:

- $4x + 3y = 18$
- $4x – 2y = 8$

Step 3: Subtract equations to eliminate x

Subtract Equation 2 from Equation 1:

$(4x + 3y) – (4x – 2y) = 18 – 8$

Simplifying:

$4x + 3y – 4x + 2y = 10$

This reduces to:

$(3y + 2y) = 10$

$5y = 10$

Step 4: Solve for y

Divide both sides by 5:

y = 10 / 5 = 2

Step 5: Back-substitute to find x

Use Equation 2:

2x – y = 4

Plug in y = 2:

2x – 2 = 4

Add 2 to both sides:

2x = 6

Divide both sides by 2:

x = 3

Solution:

The solution to the system is the ordered pair:

(x, y) = (3, 2)

This pair satisfies both equations, and thus, it is the solution to the system.

Connecting to the Equation 10x + 2y =

In the context of the problem statement, you’re tasked with solving a system that ultimately simplifies to an equation like 10x + 2y = some constant, and then identifying the correct ordered pair.

Suppose you have additional equations that align with this form, such as:

- Equation A: 5x + y = k

- Equation B: 2x + y = m

The goal is to find the values of x and y that satisfy the original system, leading to the specific form 10x + 2y =.

Why is this form significant?

Because 10x + 2y is a multiple of the original equations’ coefficients, and solving for this sum provides a quick way to verify potential solutions or to identify the correct ordered pair among options.

Choosing the Correct Ordered Pair

Once you have solutions from the elimination method, you might be presented with multiple options. To select the correct ordered pair:

1. Test each candidate: Substitute the pair into the original equations to verify if it satisfies all conditions.
2. Check the derived expression: Confirm whether the pair satisfies the equation $10x + 2y$ = the given constant.
3. Verify consistency: Ensure that the pair makes all equations true simultaneously, not just one.

Example:

Suppose the candidate pairs are:

- $(x, y) = (2, 4)$
- $(x, y) = (3, 2)$
- $(x, y) = (1, 5)$

Test each:

- For (2, 4):

$10(2) + 2(4) = 20 + 8 = 28$

- For (3, 2):

$10(3) + 2(2) = 30 + 4 = 34$

- For (1, 5):

$10(1) + 2(5) = 10 + 10 = 20$

If the problem states that $10x + 2y$ should equal 28, then the first pair (2, 4) is correct.

Practical Applications of the Elimination Method

The elimination method isn't just a theoretical exercise; it has numerous practical applications, including:

- Engineering: Calculating forces in statics problems where multiple conditions intersect.

- Economics: Solving supply and demand equations to find equilibrium points.
- Computer Science: Optimizing resource allocation by solving systems of linear equations.
- Physics: Analyzing motion where multiple equations describe different aspects of the system.

Its utility lies in its straightforward approach to solving linear systems efficiently, especially when dealing with more than two variables or complex coefficients.

Limitations and Alternatives

While elimination is powerful, it has limitations:

- Requires compatible coefficients: Sometimes, multiplying equations to match coefficients can be cumbersome.
- Can be algebraically intensive: For larger systems, substitution or matrix methods might be more practical.
- Not suitable for nonlinear systems: Elimination works well for linear equations but not for nonlinear ones like quadratics.

Alternatives include:

- Substitution Method: Solving one equation for one variable and substituting into the other.
- Graphical Method: Plotting the equations to visually find the intersection point.
- Matrix methods: Using determinants and Cramer's rule for systems with more variables.

Final Thoughts

Mastering the elimination method equips students and professionals with a reliable tool for solving systems of equations efficiently. Whether working through academic problems or practical scenarios, understanding how to manipulate equations to eliminate variables and solve for unknowns is invaluable.

In the specific context of the equation $10x + 2y =$, the elimination method can help quickly verify solutions and identify the correct ordered pair among multiple options. By systematically aligning equations, eliminating variables, and verifying candidate solutions, you can confidently solve complex systems and interpret their results accurately.

Remember, the key to success with the elimination method is careful algebraic manipulation, attention to detail, and thorough verification. With practice, this technique becomes an intuitive part of your problem-solving toolkit, allowing you to tackle a wide range of linear systems with confidence.

Use The Elimination Method To Solve The System Of Equations Choose Thecorrect Ordered Pair 10x 2y

Use The Elimination Method To Solve The System Of Equations Choose Thecorrect Ordered Pair 10x 2y

Related Articles

- Use The Multiplication Law For Logarithm To Expand The Following Expression:[tex]log_{8}(21)[/tex]-
- What Features Of Meiosis Allow For Independent Assortment Of Chromosomes? Multiple Choice Separation
- The Following Formula Can Be Used To Convert Fahrenheit Temperatures X To Celsius Temperatures T(x):

Back to Home