53 solving systems of linear equations by elimination answer key

53 Solving Systems of Linear Equations by Elimination Answer Key is an essential topic in algebra that provides students with the tools to find the values of variables in linear equations. The elimination method is a powerful technique that allows for the systematic solving of systems of equations by eliminating one variable at a time. This article will delve into the elimination method, provide detailed examples, and present an answer key for practice problems.

Understanding Systems of Linear Equations

A system of linear equations consists of two or more linear equations involving the same set of variables. For example, the following two equations form a system:

1. $2x + 3y = 6$
2. $4x - y = 5$

The goal of solving a system of equations is to find the values of the variables that satisfy all equations simultaneously. There are several methods for solving such systems, including graphing, substitution, and elimination. In this article, we will focus specifically on the elimination method.

The Elimination Method

The elimination method involves combining the equations in such a way that one of the variables is eliminated, allowing for a simpler equation to be solved. This method can be particularly effective for systems of linear equations.

Steps to Solve by Elimination

1. Write the equations in standard form: Ensure that both equations are in the form $Ax + By = C$.

2. Align the equations: Write the equations one above the other.

3. Multiply if necessary: If the coefficients of one of the variables are not opposites, multiply one or both equations by a number that will make them

opposites.

4. Add or subtract the equations: Combine the equations to eliminate one variable.

5. Solve for the remaining variable: Once one variable is eliminated, solve for the other variable.

6. Substitute back: Use the value found to substitute back into one of the original equations to find the second variable.

7. Check your solution: Always substitute both values back into the original equations to verify they satisfy both equations.

Examples of Solving Systems of Equations by Elimination

Let’s go through a couple of examples step-by-step to illustrate the elimination method:

Example 1

Solve the following system:

1. $3x + 2y = 16$
2. $4x - 2y = 8$

Step 1: Align the equations
The equations are already aligned.

Step 2: Add the equations
We can add the two equations together because the coefficients of y are opposites:

$$
(3x + 2y) + (4x - 2y) = 16 + 8
$$

This simplifies to:

$$
7x = 24
$$

Step 3: Solve for x
Dividing both sides by 7:

$$
x = \frac{24}{7}
$$

Step 4: Substitute back to find y
Use the value of x in one of the original equations. We will use the first equation:

$$
3\left(\frac{24}{7}\right) + 2y = 16
$$

This simplifies to:

$$
\frac{72}{7} + 2y = 16
$$

Subtract $\frac{72}{7}$ from both sides:

$$
2y = 16 - \frac{72}{7} = \frac{112}{7} - \frac{72}{7} = \frac{40}{7}
$$

Dividing by 2 gives:

$$
y = \frac{20}{7}
$$

Final Solution:
The solution to the system is $x = \frac{24}{7}$, $y = \frac{20}{7}$.

Example 2

Solve the following system:

1. $5x + 3y = 9$
2. $2x + 3y = 7$

Step 1: Align the equations
The equations are already aligned.

Step 2: Eliminate one variable
We can eliminate $3y$ by subtracting the second equation from the first:

$$
(5x + 3y) - (2x + 3y) = 9 - 7
$$

This gives:

$$
3x = 2
$$

Step 3: Solve for x
Dividing both sides by 3 gives:

$$
x = \frac{2}{3}
$$

Step 4: Substitute back to find y
Use the value of x in one of the original equations:

$$
5\left(\frac{2}{3}\right) + 3y = 9
$$

This simplifies to:

$$
\frac{10}{3} + 3y = 9
$$

Subtract $\frac{10}{3}$ from both sides:

$$
3y = 9 - \frac{10}{3} = \frac{27}{3} - \frac{10}{3} = \frac{17}{3}
$$

Dividing by 3 gives:

$$
y = \frac{17}{9}
$$

Final Solution:
The solution to the system is $x = \frac{2}{3}$, $y = \frac{17}{9}$.

Practice Problems

Now that we have explored the elimination method with examples, it’s time for some practice. Solve the following systems of equations and check your answers with the provided answer key.

1. $2x + 5y = 10$
$3x - 2y = 4$

2. $x - y = 1$
$2x + 3y = 12$

3. $4x + y = 11$
$2x - 3y = -1$

4. $6x + 2y = 18$
$3x - 4y = -10$

Answer Key for Practice Problems

1. Problem 1:
$x = 2$, $y = 1$

2. Problem 2:
$x = 3$, $y = 2$

3. Problem 3:
$x = 2$, $y = 3$

4. Problem 4:
$x = 2$, $y = 3$

Conclusion

53 Solving Systems of Linear Equations by Elimination Answer Key is a crucial resource for students learning algebra. Understanding how to effectively utilize the elimination method empowers students to tackle a wide range of mathematical problems confidently. By practicing this method through various examples and problems, learners can solidify their skills in solving systems of linear equations. Keep practicing, and soon, solving systems of equations will become second nature!

Frequently Asked Questions

What is the elimination method in solving systems of linear equations?

The elimination method involves adding or subtracting equations to eliminate one variable, making it easier to solve for the other variable.

How can you tell if a system of equations has no solution using the elimination method?

If, after eliminating a variable, you end up with a contradictory statement (like 0 = 5), the system has no solution and is considered inconsistent.

What are the steps to solve a system of equations using elimination?

1. Align the equations in standard form. 2. Multiply equations if necessary to align coefficients. 3. Add or subtract equations to eliminate one variable. 4. Solve for the remaining variable. 5. Substitute back to find the other variable.

What does it mean if a system of equations has infinitely many solutions?

It means that the two equations represent the same line, and there are an infinite number of points that satisfy both equations.

Can the elimination method be used for three-variable systems?

Yes, the elimination method can be extended to solve systems with three variables by eliminating one variable at a time until you solve for the remaining variables.

What should you do if the coefficients of the variables are fractions in the elimination method?

You can multiply the entire equation by the least common denominator to eliminate the fractions before proceeding with elimination.

Is it always necessary to multiply the equations when using elimination?

No, it is not always necessary to multiply the equations; you can sometimes directly add or subtract them if the coefficients are already suitable for elimination.

What is the importance of keeping equations in standard form when using elimination?

Keeping equations in standard form (Ax + By = C) makes it easier to visualize and manage the elimination process.

What happens if you make a mistake during the elimination process?

If you make a mistake, it will likely lead to an incorrect solution or a contradiction; it's important to check each step carefully.

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

You can verify the solution by substituting the values back into the original equations to ensure both equations are satisfied.

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