Solve The Following System Of Equations Using Any Method You Want.10y+24=-3x3x-9=y

Solve The Following System Of Equations Using Any Method You Want. 10y + 24 = -3x, 3x - 9 = y

When faced with a system of equations like 10y + 24 = -3x and 3x - 9 = y, students and mathematicians alike seek effective strategies to find the solution set that satisfies both equations simultaneously. Solving such systems is a foundational skill in algebra, essential for understanding relationships between variables and modeling real-world problems. In this comprehensive guide, we will explore various methods to solve the given system, including substitution, elimination, and graphing, while providing step-by-step instructions, tips, and insights to enhance your problem-solving skills.

Understanding the System of Equations

Before diving into solution methods, it’s crucial to understand the structure of the given system:

1. Equation 1: 10y + 24 = -3x
2. Equation 2: 3x - 9 = y

These equations involve two variables, x and y, and are linear, meaning their graphs are straight lines. The solutions to the system are the points (x, y) where these lines intersect.

Methods for Solving the System of Equations

There are several effective methods to solve systems of linear equations, including:

1. Substitution Method

2. Elimination Method

3. Graphical Method

4. Matrix Method (Using Inverse Matrices or Cramer's Rule)

In this article, we will primarily focus on substitution and elimination, as they are most straightforward for the given system.

Method 1: Solving the System Using Substitution

The substitution method involves solving one of the equations for one variable and substituting that expression into the other equation.

Step-by-Step Process

1. Express y from Equation 2:

Since Equation 2 is y = 3x - 9, we can directly solve for y:

$$
y = 3x - 9
$$

2. Substitute y into Equation 1:

Equation 1: 10y + 24 = -3x

Substitute y:

$$
10(3x - 9) + 24 = -3x
$$

3. Simplify and solve for x:

Expand:

$$
30x - 90 + 24 = -3x
$$

Combine like terms:

$$
30x - 66 = -3x
$$

Add 3x to both sides:

$$
33x - 66 = 0
$$

Add 66 to both sides:

$$
33x = 66
$$

Divide both sides by 33:

$$
x = 2
$$

4. Find y using the value of x:

Recall $y = 3x - 9$:

$$
y = 3(2) - 9 = 6 - 9 = -3
$$

Solution: The point of intersection is $(x, y) = (2, -3)$.

Method 2: Solving the System Using Elimination

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

Step-by-Step Process

1. Rewrite the equations in standard form:

Equation 1: $10y + 3x = -24$

Equation 2: $y = 3x - 9$ (already in slope-intercept form)

2. Express both equations with similar terms:

To eliminate y, rewrite Equation 2 as:

$$
y - 3x = -9
$$

3. Align the equations:

Equation 1: $3x + 10y = -24$

Equation 2: $-3x + y = -9$

4. Add the two equations to eliminate x:

$$
(3x + 10y) + (-3x + y) = -24 + (-9)
$$

Simplify:

$$
3x - 3x + 10y + y = -33
$$

$$
0 + 11y = -33
$$

Solve for y:

$$
y = \frac{-33}{11} = -3
$$

5. Substitute y back into one of the original equations to find x:

Using Equation 2: $y = 3x - 9$

$$
-3 = 3x - 9
$$

Add 9 to both sides:

$$
6 = 3x
$$

Divide both sides by 3:

\[
x = 2
\]

Solution: Again, the intersection point is (2, -3).

Method 3: Graphical Solution

Graphing the two equations provides a visual representation of the solution. The point where the lines cross is the solution.

Steps to Graph the System

1. Rewrite equations in slope-intercept form:

- Equation 1: 10y + 24 = -3x

Solve for y:

\[
10y = -3x - 24
\]

\[
y = \frac{-3x - 24}{10}
\]

- Equation 2: y = 3x - 9

2. Plot the lines:

- For Equation 1, pick values for x, compute y, and plot points.
- For Equation 2, do the same.

3. Identify the intersection point:

The crossing point of the two lines is at (2, -3), confirming our algebraic solutions.

Additional Tips for Solving Systems of Equations

- Always check your solutions by substituting back into the original equations.
- Be aware of special cases, such as:
- No solution (parallel lines, inconsistent equations)
- Infinite solutions (coincident lines)
- Practice different methods to become proficient and recognize which method is most efficient for a given system.
- Use graphing tools or software for visual verification, especially with complex systems.

Conclusion

Solving systems of equations like $10y + 24 = -3x$ and $3x - 9 = y$ can be approached through various methods, each offering unique advantages. The substitution method is straightforward when one equation is easily solved for a variable, while elimination can be more efficient when the coefficients align conveniently. Graphical solutions provide visual confirmation but may lack precision without proper tools.

By mastering these techniques, students and professionals can confidently tackle a wide range of algebraic problems involving linear systems. Remember, practice is key—try solving similar systems to strengthen your understanding and develop intuition for different solution strategies.

Key Takeaways:

- The solution to the system is $(x, y) = (2, -3)$.
- Multiple methods can arrive at the same result.
- Understanding the structure of equations aids in choosing the most effective solving method.
- Visual tools complement algebraic strategies for comprehensive problem-solving.

Meta Description:
Learn how to solve the system of equations $10y + 24 = -3x$ and $3x - 9 = y$ using substitution, elimination, and graphing methods. Step-by-step solutions and tips included.

Keywords:
solve system of equations, algebra, substitution method, elimination method,

linear equations, intersection point, algebraic solutions, graphing equations, math problems

Frequently Asked Questions

What is the first step to solve the system of equations $10y + 24 = -3x$ and $3x - 9 = y$?

A good first step is to express one variable in terms of the other, for example, from the second equation $y = 3x - 9$, which can then be substituted into the first equation.

How do you substitute $y = 3x - 9$ into the equation $10y + 24 = -3x$?

Replace y in the first equation with $3x - 9$, resulting in $10(3x - 9) + 24 = -3x$.

What is the simplified form of the equation after substitution?

Simplifying, we get $30x - 90 + 24 = -3x$, which simplifies further to $30x - 66 = -3x$.

How do you solve for x after simplifying the equation $30x - 66 = -3x$?

Add 3x to both sides to get $33x - 66 = 0$, then add 66 to both sides to get $33x = 66$, and divide both sides by 33 to find $x = 2$.

What is the value of y when $x = 2$?

Substitute $x = 2$ into $y = 3x - 9$, resulting in $y = 3(2) - 9 = 6 - 9 = -3$.

What is the solution to the system of equations?

The solution is $x = 2$, $y = -3$.

Can you verify the solution by plugging $x = 2$ and $y = -3$ back into the original equations?

Yes. For the first equation: $10(-3) + 24 = -3(2) \rightarrow -30 + 24 = -6$, which simplifies to $-6 = -6$. For the second equation: $3(2) - 9 = y \rightarrow 6 - 9 = -3$, which matches y. Both are true, confirming the solution.

What method did you use to solve this system of equations?

I used substitution, substituting y = 3x - 9 into the first equation and solving for x.

Are there alternative methods to solve this system, and what are they?

Yes, alternative methods include the elimination method or graphing. In this case, substitution was straightforward due to the form of the equations.

What is the importance of verifying the solution in solving systems of equations?

Verifying ensures that the found solution satisfies all original equations, confirming its correctness and avoiding errors from algebraic manipulations.

Additional Resources

Solving Systems of Equations: An Expert Guide to Unraveling the Mystery of 10y + 24 = -3x and 3x - 9 = y

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When tackling algebraic problems involving multiple equations, one of the most fundamental yet powerful skills is solving systems of equations. These systems can be presented in various forms—linear, nonlinear, with two variables, or more—and require a strategic approach to find the values that satisfy all equations simultaneously.

Today, we will explore a particular system of equations:

$$
\begin{cases}
10y + 24 = -3x \\
3x - 9 = y
\end{cases}
$$

Our goal? To determine the values of x and y that satisfy both equations at once. As we navigate through this problem, you'll see the strengths and nuances of different methods—substitution, elimination, and graphical analysis—demonstrating how each approach can be applied effectively. Whether you're a student sharpening your algebraic skills or an educator seeking insightful explanations, this comprehensive review will deepen your understanding.

Understanding the System of Equations

Before jumping into solutions, let's analyze the structure of the given system.

The Equations at a Glance:

1. $10y + 24 = -3x$
2. $3x - 9 = y$

At first glance, both equations are linear in form, involving two variables x and y. The first equation can be rearranged into a form that explicitly expresses y in terms of x, or vice versa. The second already gives y explicitly in terms of x.

Understanding these forms allows us to choose the most straightforward method: substitution, since the second equation is already solved for y.

Method 1: Substitution Method

The substitution method involves solving one of the equations for one variable and then substituting this expression into the other equation. Given the second equation:

$$
y = 3x - 9
$$

we can substitute this into the first equation to find x.

Step-by-step Solution:

Step 1: Express y from the second equation

$$
y = 3x - 9
$$

Step 2: Substitute y into the first equation

\[
10(3x - 9) + 24 = -3x
\]

Expanding the left side:

\[
30x - 90 + 24 = -3x
\]

Simplify:

\[
30x - 66 = -3x
\]

Step 3: Solve for \(x \)

Bring all \(x \) terms to one side:

\[
30x + 3x = 66
\]

\[
33x = 66
\]

Divide both sides by 33:

\[
x = \frac{66}{33} = 2
\]

Step 4: Find \(y \) using the expression from the second equation

\[
y = 3(2) - 9 = 6 - 9 = -3
\]

Result:

\[
\boxed{
x = 2, \quad y = -3
}
\]

Verification:

Always verify your solution by plugging the values into the original equations.

- Equation 1:

$$
10(-3) + 24 = -3(2) \Rightarrow -30 + 24 = -6 \Rightarrow -6 = -6 \quad \checkmark
$$

- Equation 2:

$$
3(2) - 9 = -3 \Rightarrow 6 - 9 = -3 \quad \checkmark
$$

Both equations are satisfied, confirming our solution's correctness.

Method 2: Graphical Interpretation

While algebraic methods are precise, visualizing the system offers valuable intuition. Plotting the equations as lines on the Cartesian plane:

- Equation 1 (rewritten):

$$
10y + 24 = -3x \Rightarrow y = -\frac{3}{10}x - \frac{24}{10} = -0.3x - 2.4
$$

- Equation 2:

$$
y = 3x - 9
$$

Graphical Analysis:

- The first line has a slope of -0.3 and a y-intercept at -2.4.
- The second line has a slope of 3 and a y-intercept at -9.

Plotting these lines, they intersect at the point $(2, -3)$, consistent with our algebraic solution. This visual confirmation reinforces the correctness and helps in understanding the nature of the solutions.

Method 3: Elimination Method

Although substitution is straightforward here, the elimination method offers an alternative approach, especially useful when equations are not already solved for a variable.

Step 1: Rewrite equations in standard form

Equation 1:

$$
10y + 3x + 24 = 0
$$

Equation 2:

$$
3x - y - 9 = 0
$$

Step 2: Align coefficients to eliminate one variable

Multiply equation 2 by 10 to match the coefficient of y in equation 1:

$$
10(3x - y - 9) = 0 \Rightarrow 30x - 10y - 90 = 0
$$

Now, the system:

$$
\begin{cases}
10y + 3x + 24 = 0 \\
30x - 10y - 90 = 0
\end{cases}
$$

Step 3: Add the equations to eliminate y

Adding:

$$
(10y + 3x + 24) + (30x - 10y - 90) = 0 + 0
$$

Simplifies to:

$$
0 + 33x - 66 = 0
$$

$$
33x = 66
$$

$$
x = 2
$$

Step 4: Substitute $x = 2$ into one of the original equations to find y

Using the second original equation:

$$
3(2) - y = -9 \Rightarrow 6 - y = -9
$$

$$
-y = -15 \Rightarrow y = 15
$$

But wait—this conflicts with our previous solution $y = -3$. What's happening?

Identifying the discrepancy:

Notice that the previous substitution approach yielded $y = -3$, while the elimination method suggests $y = 15$. This inconsistency indicates an error in the process.

Troubleshooting:

The mistake arises because in the elimination step, the equations were combined without maintaining the same form or correctly aligning coefficients for elimination. Let's re-express the original equations carefully:

Original equations:

$$
\begin{cases}
10y + 24 = -3x \quad (1) \\
3x - 9 = y \quad (2)
\end{cases}
$$

Rewrite (1):

$$
10y + 3x + 24 = 0
$$

Rewrite (2):

$$
y - 3x + 9 = 0
$$

Now, multiply (2) by 10:

$$
10y - 30x + 90 = 0
$$

Now, the system:

$$
\begin{cases}
10y + 3x + 24 = 0 \\
10y - 30x + 90 = 0
\end{cases}
$$

Subtract the first from the second:

$$
(10y - 30x + 90) - (10y + 3x + 24) = 0 - 0
$$

Simplify:

$$
-33x + 66 = 0
$$

$$
-33x = -66
$$

$$
x = 2
$$

Now, substitute into the second original equation:

$$
3(2) - y = -9
$$

$$
6 - y = -9
$$

$$
-y = -15
$$

$$
y = 15
$$

But earlier, substitution into the first equation gave $y = -3$. Which one is correct?

Let's verify both solutions in the original equations:

- For $x=2, y=-3$:

Equation 1:

$$
10(-3) + 24 = -3(2) \Rightarrow -30 + 24 = -6 \quad \checkmark
$$

Equation 2:

$$
3(2) - 9 = -3 \Rightarrow 6 - 9 = -3 \quad \checkmark
$$

- For $x=2, y=15$:

Equation 1:

$$
10(15) + 24 = -3(2) \Rightarrow 150 + 24 = -6 \Rightarrow 174 = -6 \quad \text{False}
$$

Equation 2:

$$
3(2) - 9 = 15 \Rightarrow 6 - 9 = 15 \Rightarrow -3 = 15 \quad \text
$$

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