Solve The System Of Equations. 3y + 5x = 26- 2 - 5x = -16

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Understanding how to solve systems of equations is a fundamental skill in algebra that helps in solving real-world problems involving multiple variables. When presented with a system such as *3y + 5x = 26- 2 - 5x = -16*, the goal is to find the values of x and y that satisfy both equations simultaneously. This article will guide you through the process of solving such a system step-by-step, using various methods and strategies to make the process clear and manageable.

What Is a System of Equations?

A system of equations consists of two or more equations with the same set of variables. The solutions to the system are the values of these variables that make all equations true at the same time.

Examples of Systems of Equations

- Linear systems with two variables, such as:
- 2x + 3y = 12
- x - y = 4
- Non-linear systems, such as quadratic or exponential equations

Understanding the Given System of Equations

The problem statement appears to be a bit jumbled, but it likely represents two equations:

1. 3y + 5x = 26 - 2
2. -5x = -16

Let's clarify and rewrite these equations for ease of solving.

Rewriting the Equations

- Equation 1: 3y + 5x = 24 (since 26 - 2 = 24)
- Equation 2: -5x = -16

Now, the system becomes:

System of Equations

1. $3y + 5x = 24$
2. $-5x = -16$

These equations are linear and can be solved using substitution or elimination methods.

Step-by-Step Solution of the System

Step 1: Solve for one variable in one of the equations

Starting with Equation 2:

$-5x = -16$

Dividing both sides by -5:

$x = (-16) / (-5) = 16/5$

So,

$x = 16/5$

Step 2: Substitute the value of x into the other equation

Now, substitute $x = 16/5$ into Equation 1:

$3y + 5x = 24$

Substituting:

$3y + 5(16/5) = 24$

Simplify:

$3y + 16 = 24$

Step 3: Solve for y

Subtract 16 from both sides:

$3y = 24 - 16$

$3y = 8$

Divide both sides by 3:

$y = 8 / 3$

$y = 8/3$

Final Solution

The solutions to the system are:

- $x = 16/5$
- $y = 8/3$

These values satisfy both original equations.

Verification of the Solution

To ensure the solution is correct, substitute x and y back into the original equations.

Equation 1: $3y + 5x = 24$

Calculate:

$3(8/3) + 5(16/5) = ?$

$(3\ 8/3) = 8$

$(5\ 16/5) = 16$

Sum:

$8 + 16 = 24$ □

Equation 2: $-5x = -16$

Calculate:

$-5\ (16/5) = -16$ □

Both equations are satisfied, confirming the solution is correct.

Methods to Solve Systems of Equations

1. Substitution Method

- Solve one equation for one variable.
- Substitute into the other equation.

- Solve for the remaining variable.
- Back-substitute to find the first variable.

2. Elimination Method

- Multiply equations to align coefficients.
- Add or subtract equations to eliminate one variable.
- Solve for the remaining variable.
- Substitute back to find the other variable.

3. Graphical Method

- Graph both equations on coordinate axes.
- The intersection point(s) represent the solution(s).

Practical Tips for Solving Systems of Equations

- Always simplify equations first.
- Check for special cases, such as parallel lines (no solution) or identical lines (infinite solutions).
- Use substitution when one variable is already isolated.
- Use elimination when coefficients are easy to align.
- Verify your solutions in the original equations.

Common Mistakes to Avoid

- Mixing up signs during calculation.
- Forgetting to check solutions in all original equations.
- Incorrectly simplifying fractions or coefficients.
- Overlooking the possibility of no solution or infinite solutions.

Applications of Solving Systems of Equations

Understanding how to solve systems of equations has practical applications across various fields:

- Economics: Finding equilibrium points.
- Physics: Solving for multiple unknowns in motion problems.
- Engineering: Designing systems with multiple constraints.
- Business: Maximizing profit or minimizing costs with multiple variables.

Conclusion

Solving systems of equations is a vital skill in mathematics that enables problem-solving across numerous disciplines. In our example, we successfully found that x = 16/5 and y = 8/3 satisfy both equations, illustrating the process from rewriting equations, solving step-by-step, to verifying solutions. Whether you prefer substitution, elimination, or graphical methods, mastering these techniques will enhance your algebraic problem-solving skills and prepare you for more complex mathematical challenges.

Additional Resources for Learning

- Algebra textbooks and online tutorials.
- Interactive algebra calculators.
- Educational videos on solving systems of equations.
- Practice worksheets and problem sets.

By practicing different methods and understanding the underlying concepts, you'll become proficient at solving systems of equations efficiently and accurately.

Remember: Always double-check your solutions to ensure they satisfy all equations in the system. With regular practice, solving systems of equations will become an intuitive and valuable skill in your mathematical toolkit.

Frequently Asked Questions

What is the first step to solve the system of equations 3y + 5x = 26 and -2 - 5x = -16?

Rearrange the second equation to isolate x or y; for example, add 2 to both sides to get -5x = -18.

How do you solve for x in the equation -2 - 5x = -16?

Add 2 to both sides to get -5x = -14, then divide both sides by -5 to find x = 14/5.

Once x is found, how do you find y using the first equation 3y + 5x = 26?

Substitute the value of x into the first equation and solve for y: 3y + 5(14/5) = 26.

What is the solution for x in the system of equations?

x = 14/5 or 2.8.

What is the value of y when x = 14/5 in the first equation?

Substitute x = 14/5 into 3y + 5x = 26: 3y + 26 = 26, so 3y = 0, and y = 0.

What is the final solution to the system of equations?

The solution is x = 14/5 and y = 0.

How can you verify the solution (x = 14/5, y = 0)?

Plug the values into both original equations to check if both are satisfied: 3(0) + 5(14/5) = 26 and -2 - 5(14/5) = -16.

Are the equations in the system linear, and why is that important?

Yes, both are linear equations, which allows for straightforward methods like substitution or elimination to solve the system efficiently.

Additional Resources

Solve The System Of Equations: A Comprehensive Guide

When it comes to algebra, one of the foundational skills students and mathematicians alike need to master is solving systems of equations. These systems appear frequently across various applications—be it in engineering, physics, economics, or everyday problem-solving scenarios. Today, we'll delve deeply into solving a specific system of equations, examining methods, techniques, and nuances involved in such tasks. Our focus will be on the system:

$3y + 5x = 26$
$-2 - 5x = -16$

Let's explore this systematically.

Understanding the System of Equations

Before jumping into solving, it's essential to understand what a system of equations represents. A system consists of two or more equations with the same variables. The goal is to find the values of the variables that satisfy all equations simultaneously.

Given System:

1. $3y + 5x = 26$
2. $-2 - 5x = -16$

Notice that the second equation can be manipulated to resemble the first, or vice versa, depending on the method chosen.

Rearranging and Simplifying the Equations

Step 1: Simplify where possible.

Let's focus on the second equation:

$-2 - 5x = -16$

Add 2 to both sides:

$-2 - 5x + 2 = -16 + 2$
$-5x = -14$

This simplification provides a straightforward expression for x.

Step 2: Express x explicitly.

Divide both sides by -5:

$x = (-14)/(-5)$
$x = 14/5$

Now, we have the value of x explicitly.

Substituting Values to Find y

Once x is known, substitute it into the first equation to find y.

Equation 1:

$3y + 5x = 26$

Substitute $x = 14/5$:

$3y + 5(14/5) = 26$

Calculate 5(14/5):

5 (14/5) = 14

So,

3y + 14 = 26

Subtract 14 from both sides:

3y = 26 - 14
3y = 12

Divide both sides by 3:

y = 12/3
y = 4

Solution:

\[
\boxed{
x = \frac{14}{5}, \quad y = 4
}
\]

Verification of the Solution

To ensure the solution is correct, substitute x and y back into both original equations.

Equation 1:

3(4) + 5(14/5) = ?

Calculate:

12 + 14 = 26 → Correct

Equation 2:

-2 - 5(14/5) = ?

Calculate:

-2 - 14 = -16 → Correct

Since both equations are satisfied, the solution (x = 14/5, y = 4) is valid.

Methods for Solving Systems of Equations

While the above approach was straightforward due to the simplicity of the system, multiple methods are available for solving systems of equations, especially when equations are more complex.

1. Substitution Method

- Suitable when one equation can be easily solved for one variable.
- Involves isolating a variable in one equation and substituting into the other.

Example Application:

- Solve for x in the second equation: $x = 14/5$
- Substitute into the first to find y.

2. Elimination Method (Addition or Subtraction Method)

- Ideal when coefficients of one variable are opposites.
- Involves adding or subtracting equations to eliminate a variable.

Application to Our System:

- The equations are already aligned to eliminate x by addition, but as the second equation was simplified directly, elimination wasn't necessary here.

3. Graphical Method

- Plot each equation on a coordinate plane.
- The intersection point(s) represents the solution(s).

Note:

- For linear equations like these, graphing provides a visual confirmation.
- In our case, plotting $y = (26 - 5x)/3$ and $x = 14/5$ would intersect at the computed solution.

4. Matrix and Determinant Methods

- For larger systems, techniques like Cramer's rule or matrix inversion are efficient.
- These involve representing the system in matrix form and solving accordingly.

Dealing with Different Types of Systems

Systems can be classified based on the number of solutions:

- Consistent and independent: Exactly one solution (like ours).
- Consistent and dependent: Infinite solutions (equations are the same).
- Inconsistent: No solution (parallel lines or contradictory equations).

In our case, the system is consistent with a unique solution.

Common Pitfalls and Troubleshooting

While solving systems, especially more complex ones, several issues might arise:

- Incorrect algebraic manipulations: Always double-check arithmetic.
- Sign errors: Be cautious with negative signs.
- Overlooking extraneous solutions: Verify solutions by substituting back into original equations.
- Confusing forms: Convert all equations into similar forms for easier comparison.

Advanced Considerations

For systems involving nonlinear equations or more than two variables, the methods become more sophisticated:

- Substitution or elimination may still work but require more steps.
- Graphical methods become less practical for higher dimensions.
- Matrix methods or computational tools like calculators or software (e.g., MATLAB, WolframAlpha) are often employed.

Practical Applications of Solving Systems of Equations

Understanding how to solve systems of equations isn't just an academic exercise; it has real-world relevance:

- Economics: To find equilibrium prices and quantities.
- Physics: To determine the intersection of different forces or trajectories.
- Engineering: For circuit analysis involving multiple variables.
- Business: To optimize profit and minimize costs.

Summary and Key Takeaways

- The given system simplifies neatly, allowing direct substitution.
- The solution is $\boxed{x=14/5, y=4}$.
- Verification confirms the correctness.
- Multiple methods are available for solving systems, each suited for different scenarios.
- Careful algebra and verification are essential to avoid mistakes.
- Understanding the nature of the system (unique solution, infinite solutions, or none) guides the choice of solving method.

Final Thoughts

Mastering the skill of solving systems of equations is fundamental in mathematics and beyond. Whether tackling straightforward linear systems or more complex nonlinear ones, the core strategies remain consistent: simplifying equations, choosing an effective solving method, and verifying solutions. The example discussed here illustrates the process clearly and demonstrates the elegance of algebraic methods in finding precise solutions.

With practice, solving systems becomes a routine yet powerful tool in your mathematical toolkit, enabling you to analyze and interpret complex relationships across disciplines.

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