

What Is The Second Step To Solving This Equation? $9x - 23 = 49$

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When approaching algebraic equations like $9x - 23 = 49$, understanding each step is crucial to finding the solution accurately. The question often arises: after identifying the goal of isolating the variable, what exactly is the second step? In this case, the second step involves eliminating the constant term from the side of the equation with the variable. This article will guide you through the process of solving the equation step-by-step, emphasizing the importance of the second step, and providing helpful tips along the way.

Understanding the Equation: $9x - 23 = 49$

Before diving into the steps, it's essential to understand what the equation represents. The equation $9x - 23 = 49$ involves a variable (x), a coefficient (9), and constants (-23 and 49). Your goal is to find the value of x that makes the equation true. To do this, you need to perform inverse operations to isolate x on one side of the equation.

First Step Recap: Adding 23 to Both Sides

Most students recognize that the initial step involves undoing the subtraction of 23. To do this:

1. Identify the constant term being subtracted from the term with the variable: -23.
2. Add 23 to both sides of the equation to maintain equality:

Equation after the first step:

$$9x - 23 + 23 = 49 + 23$$

Simplifies to:

$$9x = 72$$

At this point, the equation is simplified, but the variable x is still multiplied by 9. The next step is to undo this multiplication.

What Is The Second Step To Solving This Equation?

The second step involves isolating x by removing the coefficient 9. Since x is multiplied by 9, the inverse operation is division. Therefore:

Dividing Both Sides by 9

- The goal: To divide both sides of the equation by 9 to solve for x .
- Why division? Because division is the inverse of multiplication, and it cancels out the coefficient attached to x .

Applying this step:

$$(9x) \div 9 = 72 \div 9$$

Simplifies to:

$$x = 8$$

This completes the process of solving the equation, with x now isolated and equal to 8.

Step-by-Step Breakdown of the Solution Process

To fully understand how to solve equations like $9x - 23 = 49$, it's helpful to review each step systematically:

Step 1: Identify the goal

- The goal is to solve for x , which involves isolating x on one side of the equation.

Step 2: Eliminate the constant term

- Add 23 to both sides to cancel out the -23:

$$9x - 23 + 23 = 49 + 23$$

- Simplify:

$$9x = 72$$

Step 3: Remove the coefficient from the variable

- Divide both sides by 9:

$$(9x) \div 9 = 72 \div 9$$

- Simplify:

$$x = 8$$

Step 4: Verify the solution

- Substitute $x = 8$ back into the original equation to ensure correctness:

$$9(8) - 23 = 49$$

$$72 - 23 = 49$$

$$49 = 49 \text{ (True)}$$

Thus, $x = 8$ is the solution.

Why Is The Second Step Important?

Understanding the significance of the second step—dividing both sides by the coefficient—is vital for several reasons:

- **Completes the isolation of the variable:** After removing the constant, dividing by the coefficient fully isolates x .
- **Ensures the equation remains balanced:** Performing the same operation on both sides maintains equality.
- **Builds foundation for solving more complex equations:** Mastery of this step is essential for tackling equations with larger coefficients or variables in more complex expressions.

Remember: Always perform inverse operations in the correct order—first eliminate constants, then coefficients.

Common Mistakes to Avoid During the Second Step

While dividing both sides by the coefficient is straightforward, students often make mistakes such as:

- **Dividing only one side:** Always divide both sides to maintain equality.
- **Incorrect division:** Forgetting to divide both sides or dividing only parts of the equation.
- **Misinterpreting coefficients:** Confusing the coefficient (9) with the variable or vice versa.

By carefully following the steps and double-checking each operation, you can avoid these common errors.

Practice Problems for Mastery

Practicing similar equations can help reinforce the second step of dividing by the coefficient:

- $2x + 5 = 15$ - What is the second step?
- $7x - 4 = 24$ - What is the second step?
- $3x + 9 = 0$ - What is the second step?

For each, the second step involves dividing both sides by the coefficient of x after the constant term has been eliminated.

Conclusion

In solving algebraic equations like $9x - 23 = 49$, understanding each step's purpose ensures accuracy and builds confidence. The second step—dividing both sides by the coefficient of x —is crucial because it completes the process of isolating the variable. Remember, always perform inverse operations systematically: first, eliminate constants by addition/subtraction, and then remove coefficients by division/multiplication. Mastery of this process not only solves simple equations but also lays the groundwork for tackling more complex algebraic problems with confidence.

By following these guidelines, you'll be well on your way to solving algebraic equations efficiently and correctly!

Frequently Asked Questions

What is the first step to solving the equation $9x - 23 = 49$?

The first step is to add 23 to both sides of the equation to isolate the term with x .

How do I isolate the term with x in the equation $9x - 23 = 49$?

Add 23 to both sides of the equation: $9x - 23 + 23 = 49 + 23$, simplifying to $9x = 72$.

What operation should I perform after adding 23 to both sides?

Next, divide both sides by 9 to solve for x .

How do I find the value of x after performing the second step?

Divide 72 by 9: $x = 72 \div 9$, which simplifies to $x = 8$.

What is the importance of performing the same operation on both sides?

It maintains the equality of the equation and ensures the solution is valid.

Can I verify my solution by substituting $x = 8$ back into the original equation?

Yes, substituting $x = 8$ into $9x - 23$ should give you 49, confirming your solution is correct.

What is the final answer to the equation $9x - 23 = 49$?

The value of x is 8.

Additional Resources

What Is The Second Step To Solving This Equation? $9x - 23 = 49$

When faced with algebraic equations, students and mathematicians alike often find themselves at a crossroads—determining the sequence of steps necessary to isolate the variable and find its value. In particular, the equation $9x - 23 = 49$ exemplifies a typical linear equation that requires systematic approach and understanding of fundamental algebraic principles. The question, "What is the second step to solving this equation?" invites a detailed exploration of the logical process involved, emphasizing the importance of each move in reaching the solution.

In this article, we will analyze the structure of the equation, interpret the initial and subsequent steps, and provide a comprehensive guide for solving similar equations efficiently. By dissecting the problem

methodically, readers will develop a clearer understanding of how to approach linear equations and the reasoning behind each operation.

Understanding the Equation: Structure and Components

Before diving into the steps, it's essential to understand the structure of the equation:

$$9x - 23 = 49$$

This is a linear equation in one variable, x . The left side contains two terms:

- The term $9x$, which indicates that x is multiplied by 9.
- The constant term -23 , which is subtracted from $9x$.

The right side is a constant: 49.

The goal in solving this equation is to determine the value of x that makes the equation true. To do so, we need to manipulate the equation so that x is isolated on one side, preferably on the left, with all other terms moved to the right.

Initial Step: Understanding the Purpose of the First Operation

Typically, in solving linear equations, the first step involves undoing the addition or subtraction that is directly attached to the variable. In this case, the term -23 is subtracted from $9x$.

Question: What is the first step in solving the equation?

Answer: The first step is to eliminate the constant term -23 from the left side to begin isolating the term involving x .

Why Remove the Constant Term First?

Removing or "undoing" the constant term is crucial because it simplifies the equation, bringing us closer to isolating the variable. Since the constant -23 is added to $9x$ (which is effectively subtracting 23), the inverse operation is to add 23 to both sides of the equation.

Adding 23 to both sides maintains the balance of the equation due to the properties of equality. This operation simplifies to:

$$(9x - 23) + 23 = 49 + 23$$

which reduces to:

$$9x = 72$$

This step is fundamental because it simplifies the equation to a form where x is multiplied by a coefficient only, making the next step straightforward.

What Is The Second Step? A Step-by-Step Breakdown

After removing the constant term, the next move involves isolating x by eliminating its coefficient, which is 9. The process involves division, the inverse operation of multiplication.

The second step in solving the equation $9x = 72$ is:

Dividing both sides by 9

This step is crucial because:

- It cancels out the coefficient of x (which is 9).
- It leaves x alone on the left side.
- It maintains the equality because of the properties of equality—dividing both sides by the same non-zero number does not change the equation's truth value.

Mathematically, this is:

$$(9x) \div 9 = 72 \div 9$$

which simplifies to:

$$x = 8$$

This is the solution to the original equation, but more importantly, understanding that dividing both sides by 9 is the second step in the process emphasizes mastering the order and logic of algebraic manipulations.

Why Is Division the Second Step? Analyzing the Logical

Sequence

The logical sequence in solving linear equations is guided by the goal of isolating the variable. The steps follow the inverse operations:

1. Undo addition/subtraction: Remove constant terms attached to the variable.
2. Undo multiplication/division: Eliminate the coefficient of the variable.

In the given equation, after removing the constant, the next logical operation is division because:

- The coefficient of x is 9.
- To isolate x , we must divide both sides by 9.

This systematic approach ensures clarity and reduces errors, especially for learners mastering algebra.

Comprehensive Step-by-Step Solution

To fully understand the process, let's walk through each step explicitly:

Step 1: Add 23 to both sides

Equation:

$$9x - 23 = 49$$

Operation:

$$9x - 23 + 23 = 49 + 23$$

Result:

$$9x = 72$$

Step 2: Divide both sides by 9

Equation:

$$9x = 72$$

Operation:

$$(9x) \div 9 = 72 \div 9$$

Result:

$$x = 8$$

This completes the solution process, demonstrating that $x = 8$.

Alternative Approaches and Common Mistakes

While the steps outlined are standard, students sometimes make errors or overlook alternatives that might simplify the process.

Alternative Approach: Using Substitution

Instead of directly adding or dividing, one might consider substitution methods if the equation is part of a system. However, in this simple linear case, the straightforward algebraic manipulation is most efficient.

Common Mistakes to Avoid

- Ignoring the inverse operations: For example, attempting to divide before adding or subtracting constants can lead to incorrect solutions.
- Applying operations to only one side: Remember that to maintain equality, operations must be performed on both sides.
- Dividing by zero: Always confirm the coefficient is non-zero before dividing, which is naturally true in this case.

Understanding the Underlying Principles: Algebraic Properties at Play

Each step in solving the equation is grounded in fundamental algebraic properties:

- Addition and Subtraction Properties of Equality: Adding or subtracting the same quantity from both sides maintains the equality. (e.g., adding 23 to both sides)
- Multiplication and Division Properties of Equality: Multiplying or dividing both sides by the same non-zero number preserves equality. (e.g., dividing both sides by 9)

Recognizing these properties enables a systematic approach and enhances problem-solving skills.

Implications for Learning and Teaching Algebra

Understanding what constitutes the second step in solving an equation is vital for students developing algebraic fluency. Emphasizing the logical sequence:

1. Identify the operation to undo first (often addition or subtraction).
2. Perform that operation on both sides.
3. Proceed to eliminate coefficients with division or multiplication.

By breaking down the process and explaining the rationale behind each step, educators can reinforce conceptual understanding over rote memorization.

Conclusion: The Significance of the Second Step

In the context of the equation $9x - 23 = 49$, the second step—dividing both sides by 9—is not just a mechanical move; it embodies a fundamental principle of algebra: undoing multiplication to isolate the variable. Recognizing this step helps learners grasp the logical flow of equation solving and prepares them for more complex algebraic problems.

Mastering each step, especially understanding why and when to perform division, builds a robust foundation for algebraic reasoning. As equations become more complicated, these core principles serve as guiding beacons, ensuring that students can approach any linear equation with confidence and clarity.

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