

7x-7=3x-23. Can U Show The Steps

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Solving algebraic equations can sometimes feel overwhelming, especially if you're new to the subject. However, with a clear step-by-step approach, solving equations like $7x - 7 = 3x - 23$ becomes manageable and straightforward. In this comprehensive guide, we'll walk through the process of solving this equation, explaining each step in detail, so you can understand the reasoning behind each move. Whether you're a student preparing for exams or just brushing up on algebra, this article will help you master solving linear equations with confidence.

Understanding the Equation

Before diving into the solution, it's essential to understand what the equation represents. The equation:

$$7x - 7 = 3x - 23$$

is a linear equation in one variable, (x) . Our goal is to find the value of (x) that makes both sides of the equation equal.

Key concepts:

- Linear equations involve variables raised only to the first power.
- Solving involves finding the value of the variable that satisfies the equation.
- Equivalent operations such as addition, subtraction, multiplication, and division can be performed on both sides of the equation to isolate the variable.

Step-by-Step Solution Process

Let's now proceed through the steps to solve the equation:

$$7x - 7 = 3x - 23$$

Step 1: Simplify Both Sides of the Equation

In this case, the equation is already simplified since there are no like terms to combine on either side. However, always check for similar terms to combine.

Tip: Combining like terms reduces the complexity of the equation and makes solving easier.

Step 2: Get All Variable Terms on One Side

To isolate (x) , we want to gather all terms containing (x) on one side of the equation.

Method:

- Subtract $(3x)$ from both sides to move the $(3x)$ term to the left:

$$[7x - 3x - 7 = 3x - 3x - 23]$$

which simplifies to:

$$[(7x - 3x) - 7 = 0 - 23]$$

Calculations:

$$[4x - 7 = -23]$$

Result:

$$[4x - 7 = -23]$$

Step 3: Isolate the Variable Term

Next, eliminate the constant term on the side with the variable.

- Add 7 to both sides:

$$[4x - 7 + 7 = -23 + 7]$$

which simplifies to:

$$\left[4x = -16 \right]$$

Step 4: Solve for (x)

Now, divide both sides by the coefficient of (x) , which is 4:

$$\left[\frac{4x}{4} = \frac{-16}{4} \right]$$

which simplifies to:

$$\left[x = -4 \right]$$

Final Answer

The solution to the equation $7x - 7 = 3x - 23$ is:

$$\left[\boxed{x = -4} \right]$$

Verification of the Solution

Always verify your solution by substituting $(x = -4)$ back into the original equation to ensure it satisfies both sides.

Original Equation:

$$\left[7x - 7 = 3x - 23 \right]$$

Substitute $(x = -4)$:

Left side:

$$\left[7(-4) - 7 = -28 - 7 = -35 \right]$$

Right side:

$$\left[3(-4) - 23 = -12 - 23 = -35 \right]$$

Since both sides equal (-35) , the solution $(x = -4)$ is correct.

Additional Tips for Solving Linear Equations

- Always perform the same operation on both sides to maintain equality.
- Simplify as much as possible at each step.
- Check your solution by substitution.
- Be cautious with negative signs and distribute multiplication carefully.

Common Mistakes to Avoid

- Forgetting to perform the operation on both sides (e.g., subtracting only from one side).
- Mixing up signs when moving terms across the equation.
- Not simplifying expressions fully before proceeding.
- Dividing by zero (which occurs if the coefficient of x becomes zero).

Practice Problems

To reinforce your understanding, try solving these similar equations:

1. $5x + 3 = 2x + 9$
2. $4x - 2 = 10$
3. $3(x - 4) = 2x + 1$
4. $6x + 7 = 2(3x + 4)$

Conclusion

Solving the equation $7x - 7 = 3x - 23$ demonstrates fundamental algebraic techniques such as combining like terms, maintaining equality, and isolating the variable. By following the systematic steps outlined—gathering variables on one side, simplifying constants, and dividing by the coefficient—you can confidently solve similar linear equations. Remember to verify your solutions to ensure accuracy, and keep practicing with various equations to build your skills.

Mastery of solving equations is a crucial step in understanding more advanced algebra concepts, and with consistent practice, you'll become proficient at tackling these problems efficiently.

Frequently Asked Questions

How do I solve the equation $7x - 7 = 3x - 23$ step by step?

To solve $7x - 7 = 3x - 23$:

1. Subtract $3x$ from both sides: $7x - 3x - 7 = -23$.
2. Simplify: $4x - 7 = -23$.
3. Add 7 to both sides: $4x = -23 + 7$.
4. Simplify: $4x = -16$.
5. Divide both sides by 4: $x = -16 / 4$.
6. Simplify: $x = -4$.

What are the steps to isolate x in the equation $7x - 7 = 3x - 23$?

First, move all x terms to one side by subtracting $3x$ from both sides: $7x - 3x = -23 + 7$. Then, combine like terms: $4x = -16$. Finally, divide both sides by 4 to find x : $x = -4$.

Can you explain how to verify the solution $x = -4$ for the equation $7x - 7 = 3x - 23$?

Yes. Substitute $x = -4$ into the original equation:

Left side: $7(-4) - 7 = -28 - 7 = -35$.

Right side: $3(-4) - 23 = -12 - 23 = -35$.

Since both sides equal -35 , $x = -4$ is the correct solution.

What is the importance of balancing equations like $7x - 7 = 3x - 23$?

Balancing equations ensures that whatever operation you perform on one side is also performed on the other side, preserving equality. This allows you to isolate the variable and find its true value accurately.

Are there any common mistakes to avoid when solving $7x - 7 = 3x - 23$?

Yes, common mistakes include forgetting to perform the same operation on both sides, mixing up signs when adding or subtracting, and not simplifying expressions properly. Always double-check each step to ensure accuracy.

Additional Resources

7x - 7 = 3x - 23: An In-Depth Investigation into Solving Linear Equations

Introduction

In the realm of algebra, linear equations serve as foundational building blocks for understanding relationships between variables. Among these, the equation $7x - 7 = 3x - 23$ presents a straightforward yet instructive example of how to approach, analyze, and solve for an unknown variable. This article aims to methodically dissect and elucidate the steps involved in solving such an equation, offering clarity and insight into the process. By exploring each phase in detail, readers will gain a comprehensive understanding of linear equations and develop strategies applicable in broader mathematical contexts.

Understanding the Equation: Context and Components

Before delving into the solution process, it's essential to interpret the structure of the equation:

$$7x - 7 = 3x - 23$$

- Linear nature: The equation involves variables raised to the power of one, with coefficients and constants.
- Variables and constants: The variable x appears on both sides, each with its coefficient (7 and 3 respectively).
- Constants: The numbers -7 and -23 are constants, affecting the equation's balance.

The goal is to isolate x and find its value that satisfies the equation. To do so, we will follow a systematic approach grounded in algebraic principles.

Step-by-Step Solution Process

Step 1: Write Down the Equation Clearly

Start with the original:

$$7x - 7 = 3x - 23$$

This provides a baseline for the manipulations to come.

Step 2: Eliminate Variable Terms on One Side

To simplify, it's customary to gather all terms containing x on one side. For

instance, subtract $3x$ from both sides:

$$7x - 3x - 7 = 3x - 3x - 23$$

Simplifies to:

$$(7x - 3x) - 7 = -23$$

which reduces further to:

$$4x - 7 = -23$$

Rationale: Subtracting the same quantity from both sides maintains the equation's equality, a fundamental property of algebra.

Step 3: Isolate the Constant Term

Next, aim to move the constant term -7 to the other side. Add 7 to both sides:

$$4x - 7 + 7 = -23 + 7$$

Simplifies to:

$$4x = -16$$

Rationale: Adding or subtracting the same term from both sides preserves equality and simplifies the coefficient of x .

Step 4: Solve for the Variable

Now, divide both sides by the coefficient of x , which is 4 :

$$(4x) / 4 = (-16) / 4$$

Simplifies to:

$$x = -4$$

Rationale: Dividing both sides by the coefficient of x isolates the variable, revealing its value.

Verification of the Solution

It's prudent to verify the solution by substituting $x = -4$ back into the original equation:

$$7(-4) - 7 = 3(-4) - 23$$

Calculate each side:

Left side:

$$-28 - 7 = -35$$

Right side:

$$-12 - 23 = -35$$

Since both sides equal -35, the solution $x = -4$ satisfies the original equation.

Deeper Insights and Variations

Handling More Complex Linear Equations

The process employed here can be generalized to more intricate linear equations involving multiple variables or coefficients. Key strategies include:

- Combining like terms
- Using inverse operations (addition/subtraction, multiplication/division)
- Maintaining equality by performing identical operations on both sides

Common Pitfalls and How to Avoid Them

- Sign errors: Carefully track positive and negative signs during each step.
- Incorrect operations: Ensure that inverse operations are applied correctly; for example, adding instead of subtracting.
- Forgetting to verify: Always substitute solutions back into the original to confirm correctness.

Broader Applications and Significance

Understanding how to solve $7x - 7 = 3x - 23$ exemplifies fundamental algebraic skills useful in various disciplines, including:

- Physics: Solving for unknown quantities in equations of motion.
- Economics: Determining equilibrium points.
- Engineering: Analyzing system responses.

These skills also underpin more advanced mathematical concepts, such as solving systems of equations, inequalities, and modeling real-world scenarios.

Conclusion

The equation $7x - 7 = 3x - 23$ offers a clear illustration of linear equation solving principles. By systematically applying algebraic operations—combining like terms, isolating variables, and verifying solutions—one can confidently find the value of x that satisfies the equation. The solution, $x = -4$, exemplifies the power of structured problem-solving and reinforces core algebraic techniques fundamental to mathematics education and practical application.

In mastering these steps, learners develop not only the ability to manipulate equations but also critical thinking skills valuable across scientific and analytical disciplines. As with all mathematical endeavors, patience, precision, and verification are key to ensuring correctness and building deeper understanding.

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