Jada Is Solving The Equation Shown Below. Negative One-half (x + 4) = 6 Which Is A Possible First Step

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Understanding how to solve algebraic equations is a fundamental skill in mathematics that forms the foundation for more advanced topics. When faced with an equation like $-\frac{1}{2}(x + 4) = 6$, students often wonder what the first step should be to isolate the variable x. This article provides a comprehensive guide to solving such equations, emphasizing the importance of choosing an effective initial move. We will analyze the problem, explore the various strategies for solving it, and highlight the best first step to take for an efficient solution process.

Understanding the Equation: $-\frac{1}{2}(x + 4) = 6$

Before diving into solving the equation, it’s crucial to understand its structure and components:

- The equation involves a linear expression multiplied by a fraction, specifically $-\frac{1}{2}$.
- The expression inside the parentheses, $(x + 4)$, contains the variable x.
- The equation is set equal to 6, a constant.

This type of equation is common in algebra and serves as a good example for practicing the process of isolating the variable.

Key Concepts in Solving Algebraic Equations

To effectively solve the equation, students should be familiar with the following algebraic principles:

- Inverse Operations: Addition and subtraction are inverse operations; multiplication and division are also inverses.

- Distributive Property: When an expression involves a coefficient outside parentheses, it can be distributed inside.
- Maintaining Equality: Whatever operation is performed on one side of the equation must be performed on the other side to keep the equation balanced.
- Simplification: Combining like terms and reducing fractions helps clarify the steps toward solving the equation.

Step-by-Step Approach to Solving $-\frac{1}{2}(x + 4) = 6$

When solving an algebraic equation, the goal is to isolate x on one side of the equation. The process involves working backwards from the current form to the form $x = \text{something}$.

Step 1: Identify the First Step

The initial move should aim to eliminate the fractional coefficient multiplying the parentheses to make the equation easier to work with.

Step 2: Choosing the Best First Step

There are several options for the initial step:

1. Distribute $-\frac{1}{2}$ across $(x + 4)$:
$$
-\frac{1}{2} \times x + -\frac{1}{2} \times 4
$$
2. Multiply both sides of the equation by the reciprocal of $-\frac{1}{2}$, which is -2:
$$
-2 \times \left(-\frac{1}{2}(x + 4)\right) = -2 \times 6
$$
3. Isolate the parentheses first by dividing both sides by $-\frac{1}{2}$.

Each method has merits, but some are more straightforward for beginners.

Why Distributing is a Good First Step

Distributing $-\frac{1}{2}$ across $(x + 4)$ simplifies the equation into a linear form:

\[

$$
-\frac{1}{2}x - 2 = 6
$$

This step makes the equation easier to manipulate because it removes the parentheses, allowing you to work directly with linear terms.

How to Distribute $-\frac{1}{2}$:

- Multiply $-\frac{1}{2}$ by x:
$$
-\frac{1}{2} \times x = -\frac{1}{2}x
$$
- Multiply $-\frac{1}{2}$ by 4:
$$
-\frac{1}{2} \times 4 = -2
$$

Resulting in:

$$
-\frac{1}{2}x - 2 = 6
$$

Performing the Distribution: Step-by-Step

1. Start with the original equation:

$$
-\frac{1}{2}(x + 4) = 6
$$

2. Apply the distributive property:

$$
-\frac{1}{2} \times x + -\frac{1}{2} \times 4 = 6
$$

3. Calculate each term:

$$
-\frac{1}{2}x - 2 = 6
$$

4. Now, the equation is simplified, and you can move forward to isolate x.

Alternative First Step: Multiplying Both Sides by -2

Another approach is to eliminate the fraction by multiplying both sides of the equation by -2.

Step-by-step:

1. Write the original equation:

$$
-\frac{1}{2}(x + 4) = 6
$$

2. Multiply both sides by -2:

$$
-2 \times \left(-\frac{1}{2}(x + 4)\right) = -2 \times 6
$$

3. Simplify the left side:

$$
\left(-2 \times -\frac{1}{2}\right)(x + 4) = -12
$$

Since $-2 \times -\frac{1}{2} = 1$, the equation simplifies to:

$$
1 \times (x + 4) = -12
$$

Which simplifies further to:

$$
x + 4 = -12
$$

Result: This method directly isolates the parentheses, making the next step straightforward.

Comparing the First Steps: Which Is Better?

Both methods effectively lead to solving for x, but their suitability depends on the context and student preference:

- Distributing first maintains the original structure but involves working with fractions, which might be less comfortable for some students.
- Multiplying both sides by -2 eliminates the fraction immediately, simplifying the equation significantly.

In general, multiplying both sides by the reciprocal of the coefficient is often considered the most efficient first step because it quickly clears fractions and simplifies the equation.

Final Solution After the First Step

Let's follow through with the most efficient first step—multiplying both sides by -2:

1. Original equation:

$$
-\frac{1}{2}(x + 4) = 6
$$

2. Multiply both sides by -2:

$$
x + 4 = -12
$$

3. Subtract 4 from both sides to isolate x:

$$
x = -12 - 4
$$

$$
x = -16
$$

Answer:

$$
\boxed{x = -16}
$$

This process demonstrates the importance of choosing an initial step that simplifies the problem efficiently and reduces the chance of errors.

Summary of the Best First Step in Solving $-\frac{1}{2}(x + 4) = 6$

- Multiplying both sides by -2 is a highly effective first step because it removes the fractional coefficient immediately, transforming the equation into a simple linear equation.
- Distributing $-\frac{1}{2}$ across $(x + 4)$ is also valid but may involve handling fractions initially.
- The choice of first step depends on the solver’s comfort with fractions versus inverses, but multiplying both sides by the reciprocal is generally the most straightforward approach.

Additional Tips for Solving Similar Equations

- Always identify the coefficient of the variable and consider multiplying both sides by its reciprocal to clear fractions.
- Distribute carefully when necessary, ensuring each term is correctly multiplied.
- Maintain the balance of the equation by performing the same operation on both sides.
- Simplify at every step to avoid errors and make subsequent steps clearer.
- Check your solution by substituting the value of x back into the original equation.

Conclusion: Mastering the First Step in Algebraic Equations

Solving equations like $-\frac{1}{2}(x + 4) = 6$ hinges on choosing an effective first step that simplifies the process. Whether distributing the fraction or multiplying both sides by the reciprocal, the goal remains the same: to isolate x efficiently and accurately. By understanding these strategies, students can develop confidence in tackling a wide range of algebraic problems, laying a solid foundation for further mathematical learning.

Remember, the key to solving algebraic equations is systematic approach and strategic thinking about the most efficient initial move. Practice with similar equations will reinforce these skills, making the process second nature.

Keywords: solving algebraic equations, first step in solving equations

Frequently Asked Questions

What is the first step Jada should take to solve the equation -1/2(x + 4) = 6?

Jada should start by isolating the expression inside the parentheses by multiplying both sides of the equation by -2.

Why is multiplying both sides of the equation by -2 a good first step?

Because it cancels out the negative one-half coefficient, simplifying the equation to x + 4 = -12.

What is the next step after multiplying both sides by -2?

Subtract 4 from both sides to solve for x, resulting in x = -16.

Can Jada solve the equation without multiplying both sides by -2? Why or why not?

No, because multiplying helps eliminate the fraction, making the equation easier to solve directly.

Is multiplying both sides of the equation by the reciprocal of -1/2 a valid first step?

Yes, multiplying both sides by -2, which is the reciprocal of -1/2, is a valid first step to clear the fraction.

What common mistake might students make when solving this equation?

A common mistake is forgetting to multiply both sides by -2 or mishandling the signs when doing so.

What is the importance of understanding the first

step in solving equations like this?

Understanding the first step helps ensure the equation is simplified correctly, leading to an accurate solution.

Additional Resources

Solving Algebraic Equations: A Deep Dive into Jada's Approach to the Equation $-\frac{1}{2}(x + 4) = 6$

In the realm of algebra, equations serve as the backbone for understanding relationships between variables and constants. One of the foundational skills students must master is solving linear equations, which often involve coefficients, parentheses, and various operations.

Today, we'll analyze and evaluate Jada's approach to solving the equation:

$$
-\frac{1}{2}(x + 4) = 6
$$

This equation provides a rich context for exploring how to simplify, manipulate, and ultimately solve for x. Our goal is to understand the best first step in solving this equation, providing insights that are both educational and practical.

Understanding the Equation: What Are We Dealing With?

Before diving into solutions, it’s crucial to comprehend the structure of the equation:

$$
-\frac{1}{2}(x + 4) = 6
$$

Key Components:

- Coefficient $-\frac{1}{2}$: This indicates that the entire expression $(x + 4)$ is multiplied by $-\frac{1}{2}$.

- Parentheses $(x + 4)$: Signify that the expression inside should be treated as a single entity, especially when applying operations like distribution or inverse operations.

- Equality to 6: The goal is to find the value of x that makes the left side equal to 6.

Step 1: Why Is Choosing the Correct First Step Important?

In solving equations, the initial step sets the stage for subsequent operations. An effective first step simplifies the equation efficiently, minimizes potential errors, and leads to a straightforward path to the solution.

For the equation in question, possible first steps could include:

- Eliminating the fraction by multiplying both sides by a common denominator.

- Isolating the parentheses by dividing both sides by $-\frac{1}{2}$.

- Distributing the coefficient across the parentheses (though in this context, distribution isn't necessary unless we plan to expand).

Jada's approach to the first step will influence the ease and clarity of the solution process. Let's evaluate the options.

Potential First Steps Explored

Option 1: Multiply Both Sides by -2 to Clear the Fraction

Rationale: Multiplying both sides by -2 (the reciprocal of $-\frac{1}{2}$) can eliminate the fraction directly, simplifying the equation to a more manageable form.

Process:

$$
-\frac{1}{2}(x + 4) = 6
$$

Multiply both sides by -2:

$$
(-2) \times \left(-\frac{1}{2}(x + 4)\right) = 6 \times (-2)
$$

Simplify:

$$
(x + 4) = -12
$$

Advantages:

- Simplifies the equation immediately.

- Avoids dealing with fractions in subsequent steps.

- Leads directly to solving for x.

Potential Considerations:

- Must be cautious with signs; multiplying by -2 flips the sign.

Option 2: Divide Both Sides by $-\frac{1}{2}$

Rationale: Isolating $(x + 4)$ by dividing both sides by $-\frac{1}{2}$.

Process:

$$
x + 4 = \frac{6}{-\frac{1}{2}} = 6 \times \left(-2\right) = -12
$$

Advantages:

- Directly isolates the parentheses expression.

Considerations:

- Dividing by a fraction involves multiplying by its reciprocal, which can be error-prone if not handled carefully.

Option 3: Distribute $-\frac{1}{2}$ across $(x +

4)\)

Rationale: To expand the equation, but in this case, distribution isn’t necessary because the equation is already simplified.

Process:

$$
-\frac{1}{2}x - \frac{1}{2} \times 4 = 6
$$

$$
-\frac{1}{2}x - 2 = 6
$$

But this complicates the process slightly, as it introduces an additional step to solve for x.

Conclusion: This is less optimal as a first step because it adds an unnecessary step.

Jada’s Selected First Step: Multiplying Both Sides by -2

Based on the options, the most efficient and straightforward first step is:

"Multiply both sides of the equation by -2."

Why?

- Eliminates fractions immediately.

- Simplifies the equation to a basic linear form.

- Maintains the equality without introducing errors.

Step-by-step process:

1. Original Equation:

$$
-\frac{1}{2}(x + 4) = 6
$$

2. Multiply both sides by -2:

$$
-2 \times \left(-\frac{1}{2}(x + 4)\right) = 6 \times (-2)
$$

3. Simplify the left side:

$$
(-2) \times \left(-\frac{1}{2}\right) = 1
$$

Thus,

$$
1 \times (x + 4) = -12
$$

which simplifies to:

$$
x + 4 = -12
$$

4. Solve for x:

$$
x = -12 - 4 = -16
$$

Implications and Educational Significance

Jada’s method demonstrates a key algebraic principle: eliminating fractions by multiplying both sides by the least common denominator (LCD) or its reciprocal is often the most efficient initial step.

Educational Takeaways:

- Always consider the coefficients: Recognize fractions and decide on the best way to clear them.

- Maintain balance: Whatever operation is performed on one side must be performed on the other to preserve equality.

- Sign management: Be alert to the signs involved, especially when multiplying by negative numbers.

- Simplify early: Reducing the equation early on prevents errors and simplifies subsequent steps.

Conclusion: Why This First Step Sets the Stage for Success

Jada’s choice to multiply both sides of the equation by \(-2\) exemplifies strategic problem-solving in algebra. It’s an efficient, straightforward approach that reduces the equation to a simple linear form, paving the way for quick resolution.

Key takeaways:

- Multiplying both sides by \(-2\) removes the fraction \(-\frac{1}{2}\), making the problem easier to solve.

- It emphasizes understanding the structure of the equation and identifying the most effective initial operation.

- This approach fosters confidence in handling similar algebraic equations, reinforcing foundational skills.

Final note: Mastering initial steps like this enhances problem-solving fluency, encourages logical thinking, and builds a solid foundation for tackling more complex algebraic challenges in the future.

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