

What Is The First Step In Solving The Inequality

$M - \frac{2}{6} < -1$ Multiply Both Sides By 6.0 Add 2 To

Understanding the Inequality: $M - \frac{2}{6} < -1$

When approaching the inequality $M - \frac{2}{6} < -1$, the primary goal is to isolate the variable M to determine the range of values that satisfy the inequality. Before diving into algebraic manipulations, it's crucial to understand the structure of the inequality, the role of each term, and the principles that govern inequality operations. The initial step often involves eliminating fractions to simplify the expression, making subsequent steps clearer and more straightforward.

Why Multiply Both Sides By 6?

The Purpose of Multiplying Both Sides

The term $\frac{2}{6}$ is a fraction, which can complicate calculations. Multiplying both sides of the inequality by the denominator (6) removes the fraction, simplifying the inequality and making it easier to work with. This process relies on the property that multiplying both sides of an inequality by a positive number preserves the inequality's direction.

Ensuring Valid Operations

- Multiplying or dividing both sides of an inequality by a positive number does not change the inequality's sense.
- If multiplying or dividing by a negative number, the inequality's direction must be reversed.

Step-by-Step Process to Solve the Inequality

Step 1: Rewrite the inequality

Start with the original inequality:

$$M - \frac{2}{6} < -1$$

Recognize that $\frac{2}{6}$ can be simplified to $\frac{1}{3}$ for ease of understanding, although multiplying directly by 6 is the primary goal.

Step 2: Multiply both sides by 6

This step clears the fraction:

$$6 \left(M - \frac{1}{3} \right) < 6 \left(-1 \right)$$

Applying the distributive property:

$$6M - 6 \left(\frac{1}{3} \right) < -6$$

Calculating:

$$6M - 2 < -6$$

Step 3: Isolate the variable term

Add 2 to both sides to move constant terms away from the variable:

$$6M - 2 + 2 < -6 + 2$$

Simplifies to:

$$6M < -4$$

Step 4: Solve for M

Divide both sides by 6:

$$M < -4/6$$

Simplify the fraction:

$$M < -2/3$$

Final Solution and Interpretation

The inequality indicates that M must be less than $-2/3$. This means that any number less than $-2/3$ satisfies the original inequality.

- Solution in interval notation: $(-\infty, -2/3)$
- Graphically: A number line with a shaded region extending leftward from $-2/3$, not including $-2/3$ itself (since it's a strict inequality).

Common Mistakes to Avoid

- **Forgetting to multiply both sides:** Always ensure both sides are multiplied by the same number.
- **Neglecting to simplify fractions:** Simplify fractions to make calculations cleaner.
- **Not reversing the inequality when multiplying by a negative:** Remember, multiplying both sides by a negative number reverses the inequality sign, which is not applicable in this case since 6 is positive.
- **Omitting the addition step:** When moving constants, always perform the inverse operation to isolate the variable term.

Additional Considerations

Why is the Inequality Solvable?

Because the inequality involves linear expressions, it's straightforward to solve by applying basic algebraic principles. The key is to maintain the inequality's direction when performing operations and to simplify as much as possible before concluding the solution.

Implications of the Solution

The solution set tells us about the possible values of M that satisfy the given inequality. Understanding these solutions can be useful in various contexts, such as constraints in optimization problems, thresholds in scientific measurements, or bounds in real-world applications.

Summary of the Solution Process

1. Identify the fraction and recognize the need to clear it.
2. Multiply both sides by 6 to eliminate the denominator, ensuring the operation preserves the inequality's direction.
3. Add 2 to both sides to isolate the term with the variable.
4. Simplify the resulting inequality.
5. Divide both sides by 6 to solve for M .
6. Interpret the solution in context, noting the inequality's direction and the set of all M values satisfying the inequality.

Conclusion

The first and most crucial step in solving the inequality $M - \frac{2}{6} < -1$ is to eliminate the fraction by multiplying both sides by 6. This step simplifies the inequality, making it easier to manipulate and solve. Always remember to perform operations carefully, maintain the inequality's direction when multiplying or dividing by positive numbers, and simplify expressions for clarity. Mastering these foundational steps ensures a systematic approach to solving linear inequalities and enhances overall problem-solving skills in algebra.

Frequently Asked Questions

What is the first step in solving the inequality $M - \frac{2}{6} < -1$?

The first step is to multiply both sides of the inequality by 6 to eliminate the denominator.

Why do we multiply both sides by 6 when solving $M - \frac{2}{6} < -1$?

Multiplying both sides by 6 clears the fraction, simplifying the inequality for easier solving.

After multiplying both sides by 6, what is the next step in solving the inequality?

The next step is to simplify both sides and then isolate the variable M.

Is it necessary to add 2 after multiplying by 6 in solving the inequality?

Adding 2 comes after isolating the variable; it is part of the subsequent steps, not the initial step.

What operation should be performed after multiplying both sides by 6 in the inequality?

After multiplying, you should simplify and then add 2 to both sides if needed to isolate M.

Can you explain why we add 2 after the initial steps in solving $M - \frac{2}{6} < -1$?

Adding 2 is done to move constants to the other side, helping to isolate the variable M.

What is the complete first step to solve the inequality $M - \frac{2}{6} < -1$?

Multiply both sides by 6 to eliminate the fraction, then proceed to simplify and solve for M.

Additional Resources

What Is The First Step In Solving The Inequality $M - \frac{2}{6} < -1$? O Multiply Both Sides By 6. O Add 2 To

Understanding how to solve inequalities is fundamental in algebra, and identifying the initial step is crucial for arriving at the correct solution efficiently. When presented with an inequality such as $(M - 2)/6 < -1$, the question naturally arises: What is the first step to isolate the variable M and solve the inequality? The phrase suggests two potential operations—multiplying both sides by 6 or adding 2—which indicates an exploration into the logical sequence of algebraic manipulations. This article aims to analyze this problem comprehensively, explaining why certain steps are taken first, the principles behind them, and how to methodically approach such inequalities to reach a solution.

Understanding the Inequality: Context and Components

Before diving into the solution process, it's essential to understand the structure and components of the given inequality.

Analyzing the Expression

The inequality in question is:

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$$\frac{M - 2}{6} < -1$$

\]

Here, M is the variable we need to solve for, and the expression involves a rational function (a numerator divided by a denominator). The inequality states that this rational expression is less than -1 .

Key components:

- Numerator: $(M - 2)$
- Denominator: 6
- Inequality Sign: Less than ($<$)
- Constant on the right side: -1

Goals:

- Isolate M to find the range of values satisfying the inequality.
- Understand the correct algebraic steps to do so while maintaining the inequality's integrity.

Why Is It Important to Recognize the Structure?

Recognizing the structure helps determine the appropriate operations—particularly whether multiplying both sides by a positive or negative number affects the inequality's direction, which is a common source of errors.

The First Step in Solving the Inequality: Key Principles

Identifying the correct initial operation hinges on understanding several algebraic principles:

1. Eliminate the Denominator to Simplify

Since the inequality involves a fraction, the natural first step is to eliminate the denominator. This simplifies the inequality, making it more straightforward to solve.

How?

Multiply both sides of the inequality by the denominator (which is 6).

Important Note:

When multiplying both sides by a positive number (here, 6), the direction of the inequality remains unchanged.

If the denominator were negative, multiplying by it would reverse the inequality sign.

2. The Role of Multiplication in Inequalities

Multiplying both sides of an inequality by a positive number preserves the inequality's direction; multiplying by a negative number reverses the direction.

In this case:

- Since 6 is positive, multiplying both sides by 6 is safe and straightforward.

3. The Common Misconception: Adding or Subtracting First

Adding 2 to both sides is an alternative operation, but it is not the first step in this particular problem. Instead, adding 2 is typically used after the variable term is isolated or to further simplify the inequality once the denominator is eliminated.

Step-by-Step Analytical Approach to the Inequality

Let's analyze the logical sequence to solve $\frac{M - 2}{6} < -1$.

Step 1: Multiply Both Sides by 6

- Reasoning:

To eliminate the denominator, multiply both sides by 6.

$$\begin{aligned} & 6 \times \left(\frac{M - 2}{6} \right) < 6 \times (-1) \\ & \end{aligned}$$

- Result:

$$\begin{aligned} & M - 2 < -6 \\ & \end{aligned}$$

- Rationale:

This operation is valid because 6 is positive; thus, the inequality's direction remains the same.

Step 2: Isolate M by Adding 2

- Reasoning:

Now, add 2 to both sides to solve for M.

$$\begin{aligned} & M - 2 + 2 < -6 + 2 \\ & \end{aligned}$$

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$M < -4$

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- Result:

The solution to the inequality is all real values of M less than -4 .

Summary of the Sequence of Operations:

1. Multiply both sides by 6 to clear the denominator.
2. Add 2 to both sides to isolate M .

This sequence ensures that the inequality is manipulated correctly, respecting algebraic rules.

Addressing the Question: What Is The First Step?

Given the initial options—Multiply Both Sides By 6 or Add 2 To—the

correct first step is:

Multiply Both Sides By 6

Explanation:

Multiplying both sides by 6 is the starting point because it directly removes the fraction, simplifying the inequality into a linear form.

Without clearing the denominator first, subsequent steps become more cumbersome and prone to error.

Adding 2 to both sides is a subsequent step used to solve for M after the fraction is eliminated. It is not the initial step because performing operations out of sequence can lead to incorrect solutions or misinterpretation of the inequality.

Why Is Multiplying Both Sides By 6 the Correct First Step?

1. Eliminates the Fraction

Removing the denominator simplifies the inequality, making it easier to manipulate algebraically.

2. Preserves the Inequality Sign

Since 6 is positive, multiplying both sides by 6 maintains the inequality's direction, preventing the need for reversal or concern about the sign change.

3. Sets the Stage for Final Solution

Once the fraction is eliminated, the inequality reduces to a linear form, enabling straightforward addition or subtraction to isolate M .

4. Avoids Premature Operations

Adding 2 before clearing the denominator would not simplify the expression and could complicate the process.

Additional Considerations and Common Pitfalls

When solving inequalities involving fractions, several pitfalls can occur if operations are not performed carefully.

1. Reversing the Inequality Sign

- When multiplying or dividing both sides by a negative number, the inequality sign must be reversed.

- In this problem, since the multiplier (6) is positive, no reversal is necessary.

2. Misordering Operations

- Doing addition or subtraction before clearing fractions can lead to errors.
- Always aim to eliminate fractions first to avoid confusion.

3. Handling Absolute Values or Variable Restrictions

- In some inequalities, especially those involving absolute values or restrictions on variables, additional steps are necessary.
- Here, since the denominator is a positive constant, no such restrictions are involved.

Conclusion: The Correct First Step and Its Rationale

In solving the inequality $\left(\frac{M - 2}{6} < -1\right)$, the first and most logical step is multiplying both sides by 6. This operation clears the fraction, simplifying the inequality to a linear form that can be easily manipulated to solve for M.

Following this step, adding 2 to both sides completes the algebraic process, leading to the solution:

$$\begin{aligned} & \backslash[\\ & M < -4 \\ & \backslash] \end{aligned}$$

This systematic approach underscores the importance of understanding the properties of inequalities and the rules of algebra. Recognizing the initial step not only streamlines the solution process but also minimizes errors, ensuring a correct and efficient resolution.

In essence, the first step in solving the inequality $\frac{M - 2}{6} < -1$ is to multiply both sides by 6, as it directly addresses the fraction and paves the way for straightforward algebraic manipulation.

[What Is The First Step In Solving The Inequality \$M - 2 \leq 10\$ Multiply Both Sides By 6 0 Add 2 To](#)

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