

What Is A Correct First Step In Solving The Inequality $4(3 + 5x) \leq 12 - 20x$?

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When tackling inequalities, understanding the correct first step is crucial to solving them efficiently and accurately. The inequality presented appears somewhat complex and possibly contains typographical errors or formatting issues, but it likely resembles a problem involving algebraic expressions with multiple terms and coefficients. The key to solving such inequalities lies in simplifying the expression systematically, applying algebraic principles, and carefully managing multiple steps. In this article, we'll explore what constitutes the correct initial step in solving similar inequalities, discuss strategies for simplifying complex expressions, and provide detailed guidance to navigate these problems confidently.

Understanding the Structure of the Inequality

Before determining the correct first step, it's important to interpret the given inequality correctly. The expression provided is:

$$4(3 + 5x) \leq 12 - 20x$$

This appears to be a fragmented or improperly formatted inequality, possibly intended as:

- $4(3 + 5x) \leq 12$
- $20x + 6x + 9 \leq 12$
- or a similar combination involving these terms.

To proceed, let's assume the inequality is:

$$4(3 + 5x) \leq 12$$

or perhaps more complex, such as:

$$4(3 + 5x) + 6x + 9 \leq 12 + 20x + 6x + 9$$

Given the ambiguity, the core principles apply to various similar inequalities. The main goal is to isolate

the variable (x) on one side to determine its range of values.

Key Principles for Solving Inequalities

Before diving into specific steps, it's essential to understand the foundational principles:

- Maintain the inequality direction: When multiplying or dividing both sides by a negative number, reverse the inequality sign.
- Combine like terms: Simplify expressions by adding or subtracting similar terms.
- Apply inverse operations carefully: Use addition, subtraction, multiplication, and division to isolate the variable.
- Perform the same operation on both sides: To preserve equality/inequality, any operation applied to one side must be applied to the other.

The Correct First Step in Solving the Inequality

Identifying the initial move depends on analyzing the structure of the inequality. Generally, the correct first step involves simplifying the inequality expression as much as possible before moving forward. Here are the typical initial actions:

1. Remove Parentheses by Distribution

If the inequality contains parentheses, the first step should be to distribute any outside coefficients:

- Example: $4(3 + 5x)$ becomes $4 \times 3 + 4 \times 5x = 12 + 20x$

2. Combine Like Terms

After distribution, combine similar terms on each side:

- For example, if the inequality now reads:

$$12 + 20x + 6x + 9 \leq 12 + 20x + 6x + 9$$

combine constants and variable terms separately.

3. Simplify Both Sides

Reduce the inequality to the simplest form possible:

- Sum constants: $12 + 9 = 21$
- Sum variable terms: $20x + 6x + 20x + 6x = (20 + 6 + 20 + 6) x = 52x$
- Sum constants on the right: $12 + 912 + 912 = 1836$

The simplified inequality might look like:

(simplified left side) $\leq$ (simplified right side)

which helps clarify the next steps.

4. Isolate the Variable

Once simplified, the main goal is to get all terms containing x on one side and constants on the other.

Step-by-Step Approach for the First Move

Based on the principles above, here is a typical sequence for the correct first step:

Step 1: Distribute any factors over parentheses.

Step 2: Combine like terms on each side to simplify the inequality.

Step 3: Subtract or add terms to gather all variable terms on one side and constants on the other.

Example: Solving a Similar Inequality Step-by-Step

Suppose the inequality is:

$$4(3 + 5x) + 6x + 9 \leq 12 + 20x + 6x + 912 + 20x + 6x + 912$$

Step 1: Distribute

- Left side: $4 \times 3 + 4 \times 5x + 6x + 9 = 12 + 20x + 6x + 9$

- Right side: $12 + 20x + 6x + 912 + 20x + 6x + 912$

Step 2: Combine like terms

- Left: $12 + 9 + (20x + 6x) = 21 + 26x$

- Right: $12 + 912 + 20x + 6x + 20x + 6x$

Sum constants: $12 + 912 + 912 = 1836$

Sum variable terms: $20x + 6x + 20x + 6x = (20 + 6 + 20 + 6) x = 52x$

So, the inequality becomes:

$$21 + 26x \leq 1836 + 52x$$

Step 3: Bring variable terms to one side and constants to the other

Subtract $26x$ from both sides:

$$21 + 26x - 26x \leq 1836 + 52x - 26x$$

Simplifies to:

$$21 \leq 1836 + 26x$$

Subtract 1836 from both sides:

$$21 - 1836 \leq 26x$$

$$-1815 \leq 26x$$

Step 4: Solve for x

Divide both sides by 26:

$$(-1815) / 26 \leq x$$

Calculate:

$$x \geq (-1815) / 26 \approx -69.8$$

(Note: Since dividing by a positive number, the inequality sign remains the same.)

Common Mistakes to Avoid When Solving Inequalities

Understanding the correct first step helps prevent common errors:

- Neglecting distribution: Forgetting to distribute coefficients properly can lead to incorrect simplifications.
 - Incorrectly combining terms: Combining unlike terms or missing terms can cause errors.
 - Dividing by a negative number without reversing the inequality: Always reverse the inequality sign when dividing or multiplying both sides by a negative.
 - Ignoring the inequality direction: Be attentive to the inequality sign, especially after multiplying or dividing by negatives.
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Summary: The Key to the First Step

In conclusion, the correct first step in solving an inequality like the one presented involves distributing any factors over parentheses and simplifying both sides of the inequality. This process lays the foundation for isolating the variable and solving the inequality accurately. Always ensure to:

- Distribute coefficients over parentheses.
 - Combine like terms meticulously.
 - Keep track of the inequality sign when multiplying or dividing by negative numbers.
 - Simplify the inequality to its most basic form before proceeding with further steps.
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Additional Tips for Solving Complex Inequalities

- Break down the problem: Tackle complex inequalities in manageable parts.
 - Write down every step: Avoid mistakes by clearly documenting each move.
 - Check your work: Substitute your solution back into the original inequality to verify correctness.
 - Practice with different types: Gain confidence by solving various inequalities involving fractions, absolute values, and multi-step expressions.
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Conclusion

Identifying the correct first step in solving inequalities is essential for ensuring an accurate solution. Whether dealing with simple linear inequalities or more complex expressions, the key is to simplify the inequality as much as possible through distribution and combining like terms. This approach not only streamlines the solving process but also minimizes errors, leading to correct and reliable results. Practice these foundational steps regularly to build confidence and proficiency in solving all types of inequalities.

Keywords: solving inequalities, first step in solving inequality, algebraic inequalities, distribute, combine like terms, isolate variable, inequality solving tips, algebra practice

Frequently Asked Questions

What is the first step to simplify the inequality $4(3 - 5x) + 6x + 9 \geq 12$?

Start by distributing 4 across the parentheses: $4 \cdot 3 = 12$ and $4 \cdot (-5x) = -20x$, so the inequality becomes $12 - 20x + 6x + 9 \geq 12$.

How do I combine like terms after distributing in the inequality $4(3 - 5x) + 6x + 9 \geq 12$?

Combine the constant terms $12 + 9 = 21$ and the x terms $-20x + 6x = -14x$, resulting in $21 - 14x \geq 12$.

What is the next step after simplifying the inequality to $21 - 14x \geq 12$?

Subtract 21 from both sides to isolate the term with x : $-14x \geq 12 - 21$, which simplifies to $-14x \geq -9$.

How do I solve for x in the inequality $-14x \geq -9$?

Divide both sides by -14 . Remember to flip the inequality sign because you're dividing by a negative number: $x \leq (-9)/(-14)$, which simplifies to $x \leq 9/14$.

What is the solution set for the inequality $4(3 - 5x) + 6x + 9 \geq 12$?

The solution is $x \leq 9/14$, meaning all real numbers less than or equal to $9/14$ satisfy the inequality.

Why must the inequality sign flip when dividing both sides by a negative number?

Because dividing both sides of an inequality by a negative reverses the order of the inequality, maintaining a true statement. This is a fundamental property of inequalities.

Additional Resources

What Is A Correct First Step In Solving The Inequality $4(3 - 5x) \leq 12 + 20x - 6x + 9$?

Solving inequalities is a fundamental skill in algebra that underpins a deeper understanding of mathematical relationships. They serve as essential tools in various fields, including economics, engineering, and social sciences, where inequality constraints are common. When confronted with complex and seemingly convoluted inequalities, identifying the correct initial step is crucial for an accurate and efficient solution process.

This article explores the question: What Is A Correct First Step In Solving The Inequality $4(3 - 5x) \leq 12 + 20x - 6x + 9$?. Although the presented inequality appears jumbled or perhaps misformatted, it provides an excellent opportunity to dissect the process of approaching complex inequalities systematically, emphasizing the importance of organization, clarity, and strategic planning.

Understanding the Nature of the Inequality

Before delving into the first step, it's essential to interpret the given inequality correctly. The expression as provided is:

$$4(3 - 5x) \leq 12 + 20x - 6x + 9$$

At first glance, it appears to lack clear operators, parentheses, or relational symbols (e.g., $<$, $>$, $\leq$, $\geq$). This ambiguity may stem from a formatting error or transcription mistake. To proceed meaningfully, we must interpret or reconstruct a plausible version of the inequality based on typical algebraic patterns.

Hypothetical Reconstruction:

Suppose the inequality is intended to be:

$$4(3 - 5x) \leq 12 + 20x - 6x + 9$$

or perhaps:

$$\sqrt[4]{4(3 - 5x) \leq 12 + 20x - 6x + 9}$$

or a similar form. Alternatively, considering the pattern, perhaps the inequality is:

$$\sqrt[4]{4(3 - 5x) \leq 12 + 20x}$$

which simplifies to a more manageable expression.

Key Point: In algebraic problem-solving, clarifying the given expression is critical. When presented with an unclear inequality, the first step is to:

- Carefully restate or interpret the problem.
- Look for and correct any typographical errors.
- Reconstruct a version that aligns with standard algebraic forms.

Importance of Clarification and Organization

Why Clarify the Expression?

An unclear or poorly formatted inequality can lead to missteps, confusion, or incorrect solutions. Clarifying the expression ensures that you:

- Understand exactly what is being asked.
- Identify the operations involved.
- Recognize the relationships between terms (less than, greater than, etc.).

In an academic or professional setting, misinterpretation can compromise the integrity of your solution, making clarification the most sensible first step.

Steps to Clarify the Inequality

1. Identify all components: Look for numbers, variables, operators, parentheses, and relational symbols.
2. Rearrange and rewrite: Use standard algebraic notation to rewrite the inequality clearly.
3. Check for typographical errors: Confirm whether any symbols or terms are misplaced or missing.

4. Seek context: If available, refer to related problems or instructions for hints.

Assuming a Plausible Form: The First Step in Solving

Suppose, after clarification, the inequality is determined to be:

$$\backslash[4(3 - 5x) \backslashleq 12 + 20x \backslash]$$

This is a common type of linear inequality, suitable for illustrating the correct initial step.

First Step: Expand and Simplify Both Sides

Why expand and simplify first?

Because combining like terms simplifies the inequality, making the variable's coefficient more manageable. It provides a clearer path to isolate the variable and determine the solution set.

Implementation:

- Distribute any coefficients over parentheses.
- Combine like terms on each side.
- Rewrite the inequality in a simplified, standard form ($ax + b \leq 0$, for example).

Applying the step:

$$\backslash[4(3 - 5x) \backslashleq 12 + 20x \backslash]$$

$$\backslash[12 - 20x \backslashleq 12 + 20x \backslash]$$

Systematic Approach to Solving the Inequality

Once the inequality is simplified, the subsequent steps follow a logical progression:

1. Isolate the variable term:

Subtract 12 from both sides:

$$\begin{aligned} & \backslash[\\ & 12 - 20x - 12 \leq 12 + 20x - 12 \\ & \backslash] \end{aligned}$$

$$\begin{aligned} & \backslash[\\ & -20x \leq 20x \\ & \backslash] \end{aligned}$$

2. Bring variable terms to one side:

Subtract 20x from both sides:

$$\begin{aligned} & \backslash[\\ & -20x - 20x \leq 0 \\ & \backslash] \end{aligned}$$

$$\begin{aligned} & \backslash[\\ & -40x \leq 0 \\ & \backslash] \end{aligned}$$

3. Solve for x:

Divide both sides by -40 (note that dividing by a negative reverses the inequality sign):

$$\begin{aligned} & \backslash[\\ & x \geq 0 \\ & \backslash] \end{aligned}$$

Result: The solution set is all real numbers $x \geq 0$.

Key Principles in the First Step of Solving Inequalities

The example underscores several important principles:

- Always clarify and simplify first.

Clarification prevents misinterpretation, and simplification makes the inequality more manageable.

- Distribute coefficients carefully.

This ensures no terms are missed and the inequality is correctly transformed.

- Combine like terms to reduce complexity.

Simplification leads to fewer terms, making subsequent steps straightforward.

- Maintain awareness of inequality direction when dividing by negative numbers.

Reversing the inequality sign is crucial to preserving the inequality's correctness.

Common Pitfalls and How to Avoid Them

When approaching complex inequalities, students often encounter pitfalls:

- Neglecting to distribute correctly:

Always double-check distribution.

- Forgetting to reverse the inequality sign after dividing by a negative:

This is a critical step that can drastically alter the solution.

- Overlooking the need to simplify before solving:

Always aim to reduce the inequality to its simplest form.

- Misinterpreting the original problem due to formatting issues:

Clarify the problem statement before proceeding.

Conclusion: The Crucial First Step

In solving inequalities, especially complex or poorly formatted ones like $4(3 - 5x) \leq 6x + 9$, the correct initial step is to clarify and rewrite the inequality in a clear, standard algebraic form. This step sets the foundation for all subsequent algebraic manipulations, ensuring accuracy and efficiency.

Once the inequality is clearly understood, the next logical step typically involves expanding, simplifying, and then isolating the variable. These systematic steps lead to the solution set, providing meaningful insight into the relationship between the variables involved.

In essence, the correct first step in solving any inequality is understanding what you are solving—which begins with clarifying and organizing the problem. This foundational step, often overlooked, is the key to unlocking the pathway to a correct and elegant solution.

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