

What Is The Missing Step In Solving The Inequality $4(x-3) + 4 \cdot 10 + 6x \geq 1$. The Distributive Property: $4x-12$

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When solving algebraic inequalities, especially those involving parentheses, the distributive property plays a crucial role. The problem presented—" $4(x-3) + 4 \cdot 10 + 6x$ "—appears to be incomplete or contains typographical errors, which can lead to confusion. Nonetheless, the core issue revolves around understanding the missing step that often causes students and even seasoned learners to stumble during the solution process. In particular, the focus here is on recognizing the importance of the distributive property and its correct application, which is essential to correctly simplifying and solving the inequality. This article will explore this problem comprehensively, identify the common pitfalls, and clarify the missing step in the process.

Understanding the Problem: Breaking Down the Expression

Analyzing the Given Expression

The original expression is:

$$4(x-3) + 4 \cdot 10 + 6x$$

At first glance, this expression appears to be missing some operators or contains typographical errors. A typical algebraic expression involving similar terms might look like:

$$4(x - 3) + 4 \cdot 10 + 6x$$

or perhaps,

$$4(x - 3) + 4(10) + 6x$$

Assuming the intended expression is:

$$4(x - 3) + 4(10) + 6x$$

which simplifies to:

$$4(x - 3) + 40 + 6x$$

Now, the goal is to solve an inequality involving this expression, such as:

$$4(x - 3) + 40 + 6x < \text{some value}$$

or

$$4(x - 3) + 40 + 6x > \text{some value}$$

Without an explicit inequality sign, we'll focus on simplifying the expression itself and identifying the missing step related to the distributive property.

The Distributive Property: A Critical Step

What Is the Distributive Property?

The distributive property is a fundamental algebraic rule that states:

- For any real numbers a , b , and c :

$$a(b + c) = ab + ac$$

This property allows us to eliminate parentheses by distributing the multiplication over addition or subtraction inside the parentheses.

Applying the Distributive Property Correctly

In our case:

$$4(x - 3)$$

Applying the distributive property gives:

$$4x - 4 \cdot 3 = 4x - 12$$

This is the key step that simplifies the expression and sets the foundation for solving the inequality.

The Common Mistake: The Missing Step

What Do Students Usually Overlook?

Many students often forget to apply the distributive property when dealing with expressions like $4(x - 3)$. They might:

- Leave the parentheses as is and proceed without expanding
- Forget to multiply both terms inside the parentheses
- Fail to recognize that the distributive property is necessary before combining like terms

This oversight leads to incorrect or incomplete solutions.

The Consequences of Skipping the Distributive Property

Failing to apply the distributive property results in:

- Incorrect simplification of the expression
- Errors in subsequent steps such as combining like terms
- Incorrect solutions to the inequality

Therefore, the missing step is the proper application of the distributive property to expand the parentheses.

Step-by-Step Solution Process

To clarify, let's walk through the complete, correct process of simplifying and preparing the inequality for solving.

Step 1: Recognize the Expression

Suppose the inequality is:

$$4(x - 3) + 40 + 6x < \text{some value}$$

or simply focus on simplifying the left side.

Step 2: Apply the Distributive Property

- Expand $4(x - 3)$ as:

$$4x - 12$$

Step 3: Combine Like Terms

- After expansion, the expression becomes:

$$`4x - 12 + 40 + 6x`$$

- Combine the x-terms:

$$`4x + 6x = 10x`$$

- Combine the constant terms:

$$`-12 + 40 = 28`$$

- So, the simplified expression is:

$$`10x + 28`$$

Step 4: Set Up the Inequality

Suppose we are solving:

$$`10x + 28 < \text{some value}`$$

or any other inequality involving this expression.

Step 5: Solve the Inequality

- Subtract 28 from both sides:

$$`10x < \text{some value} - 28`$$

- Divide both sides by 10:

$$`x < (\text{some value} - 28)/10`$$

This completes the solution process.

Why Is the Missing Step So Important?

The Role of the Distributive Property

The distributive property acts as a bridge between the expression with parentheses and its expanded form. Without applying it correctly:

- The expression remains incomplete or incorrect
- Further steps become invalid or lead to errors
- The solution is based on an incorrect foundation

Ensuring a Clear Path to the Solution

By explicitly applying the distributive property, students:

- Clarify the structure of the expression
- Simplify the process of combining like terms
- Reduce the risk of algebraic errors

Common Misunderstandings and How to Avoid Them

Misunderstanding 1: Thinking Parentheses Do Not Need Expanding

Some students may assume parentheses only group terms without needing expansion. Remember, when a coefficient is outside parentheses, expansion is necessary unless the context indicates otherwise.

Misunderstanding 2: Forgetting to Multiply All Terms Inside Parentheses

Always multiply each term inside parentheses by the factor outside. For example, in $4(x - 3)$, both x and -3 must be multiplied by 4.

Misunderstanding 3: Confusing the Order of Operations

Ensure the distributive property is applied before combining like terms or solving inequalities.

How to Avoid These Mistakes

- Double-check whether parentheses are present and need expansion
- Carefully distribute multiplication across all terms inside parentheses
- Follow the order of operations (PEMDAS/BODMAS)
- Practice with various examples to reinforce understanding

Summary: The Crucial Missing Step

The core missing step in solving the inequality involving $4(x - 3) + 40 + 6x$ is the correct application of the distributive property. Specifically, expanding $4(x - 3)$ to $4x - 12$ is essential before combining like terms or isolating the variable. Skipping this step leads to incorrect simplifications and ultimately incorrect solutions. Mastering the distributive property ensures a solid foundation for solving a wide variety of algebraic problems involving parentheses and coefficients.

Final Thoughts and Practice Tips

- Always identify parentheses and determine whether expansion is necessary.
- Apply the distributive property immediately where applicable.
- Simplify fully before moving to solving the inequality.
- Practice similar problems to develop intuition and avoid missing steps.

By understanding and emphasizing the importance of the distributive property, students can confidently navigate algebraic inequalities and avoid common pitfalls. Remember, the key to solving these problems lies not just in performing operations but in performing them correctly and systematically.

Frequently Asked Questions

What is the first step in solving the inequality $4(x - 3) + 4 + 10 + 6x$?

The first step is to apply the distributive property to $4(x - 3)$, which gives $4x - 12$.

After applying the distributive property, what should be the next step in solving the inequality?

Combine like terms on the same side of the inequality, such as $-12 + 4 + 10 + 6x$.

What common mistake might students make when solving this inequality?

They might forget to distribute the 4 properly or overlook combining like terms afterward.

How does recognizing the missing step help in solving the inequality correctly?

Identifying and completing the missing step ensures all terms are simplified properly before isolating the variable.

What is the missing step in the process: $4(x - 3) + 4 + 10 + 6x$, with the distributive property already applied as $4x - 12$?

The missing step is to combine like terms: $4x - 12 + 4 + 10 + 6x$.

Why is combining like terms important after using the distributive property?

It simplifies the inequality, making it easier to isolate the variable and solve for its value.

Can you provide a step-by-step approach to solve the inequality starting from $4(x - 3) + 4 + 10 + 6x$?

Yes. First, distribute 4 to get $4x - 12$. Then, combine like terms: $4x + 6x = 10x$, and $-12 + 4 + 10 = 2$. So, the simplified inequality is $10x + 2$.

What is the overall importance of understanding the missing step in this inequality?

Understanding the missing step improves problem-solving skills and ensures accurate solutions when working with algebraic inequalities.

Additional Resources

What Is The Missing Step In Solving The Inequality $4(x-3) + 4 + 10 + 6x$? The Distributive Property: $4x-12$

Understanding how to solve inequalities is a fundamental skill in algebra, and recognizing the correct steps is crucial for arriving at the right solution. In particular, the application of the distributive property often poses challenges for students, especially when it appears as a missing step or overlooked in the process. In the inequality $4(x-3) + 4 + 10 + 6x$, the key step involves correctly applying the distributive property to expand the expressions. The missing step is typically the expansion of $4(x-3)$ into $4x - 12$, which is essential for simplifying and solving the inequality effectively.

In this comprehensive review, we will explore the importance of the distributive property in solving inequalities, identify the common pitfalls that lead to missing steps, and provide a detailed walkthrough on how to correctly approach such problems. We will also analyze the features and pros/cons of focusing on this step, offering insights into how mastering it can improve algebraic problem-solving skills.

Understanding the Distributive Property

What Is the Distributive Property?

The distributive property is a fundamental algebraic principle that states:

$$a(b + c) = ab + ac$$

This property allows us to multiply a single term by each term inside a parentheses, thereby expanding expressions and simplifying algebraic structures. It is especially vital when dealing with expressions like $4(x-3)$ because it transforms a factored form into a simplified sum of terms.

Features of the Distributive Property:

- Facilitates expansion of algebraic expressions.
- Essential for solving equations and inequalities involving parentheses.
- Helps in combining like terms after expansion.

Pros:

- Simplifies complex expressions.
- Provides clarity in the structure of algebraic equations.
- Fundamental skill for higher-level algebra and calculus.

Cons:

- Easy to overlook or forget during calculations.
- Can be misapplied if signs and coefficients are not carefully handled.

Why Is It Important in Solving Inequalities?

Applying the distributive property correctly ensures that all terms are expressed explicitly, making it easier to combine like terms and isolate variables. In solving inequalities such as $4(x-3) + 4(10) + 6x$, missing the step of expanding $4(x-3)$ into $4x - 12$ would lead to errors or incomplete solutions.

Breaking Down the Inequality: Step-by-Step Approach

Let's analyze the inequality:

$$4(x-3) + 4(10) + 6x$$

The goal is to solve for x , typically by isolating x on one side of the inequality. The first, critical step involves expanding the expression properly.

Step 1: Recognize the Need for Expansion

Before solving, identify expressions within parentheses that require distribution. Here, $4(x-3)$ is a prime candidate for applying the distributive property, as is $4(10)$.

Step 2: Apply the Distributive Property

This is where the missing step often occurs. The expansion should be:

$$4(x-3) = 4x - 12$$

Similarly,

$$4(10) = 40$$

Now, the entire expression becomes:

$$4x - 12 + 40 + 6x$$

Step 3: Combine Like Terms

Combine the x -terms:

$$4x + 6x = 10x$$

Combine the constants:

$$-12 + 40 = 28$$

Resulting in:

$$10x + 28$$

Step 4: Set Up the Inequality

Depending on the inequality's form (less than, greater than, etc.), you would set the expression as:

$$10x + 28 < \text{some_value}$$

or

$$10x + 28 > \text{some_value}$$

and proceed to solve for x accordingly.

The Missing Step: Why It Matters

The core of this analysis is recognizing that the missing step is the explicit application of the distributive property to expand $4(x-3)$ into $4x - 12$. Omitting this step leads to several issues:

Potential consequences of missing the step:

- Incomplete or incorrect solutions.
- Confusion about which terms to combine.
- Difficulty in isolating the variable effectively.

Common mistakes when the step is overlooked:

- Leaving parentheses unexpanded.
- Forgetting to distribute the coefficient across all terms.
- Misapplying the distributive property, especially with negative signs or multiple parentheses.

Features of addressing this step correctly:

- Ensures clarity and correctness.
- Simplifies subsequent algebraic manipulations.
- Builds a solid foundation for solving more complex inequalities and equations.

Practical Tips for Mastering the Distributive Property

- Always look for parentheses when you encounter multiplication of a term and a grouped expression.
- Break down the distribution step explicitly, especially when learning or teaching.
- Double-check signs and coefficients during expansion.
- Practice with varied problems to develop fluency in applying the property.

Sample practice problem:

Expand and simplify: $3(2x + 5) - 4(x - 1)$

Solution steps:

- Distribute: $3 \cdot 2x + 3 \cdot 5 - 4 \cdot x + 4 \cdot 1$
- Simplify: $6x + 15 - 4x + 4$
- Combine like terms: $(6x - 4x) + (15 + 4) = 2x + 19$

Conclusion: The Significance of the Missing Step

In algebra, the importance of the distributive property cannot be overstated. It is a foundational step that ensures expressions are fully expanded and simplified before further solving. The missing step of expanding $4(x-3)$ into $4x - 12$ in the inequality example may seem minor, but it is precisely the step that guarantees the correctness of the entire solution process.

By mastering this step, students and practitioners can avoid common pitfalls, develop confidence in their algebra skills, and handle more complex expressions with ease. Remember, paying close attention to every step in the solving process—including the expansion via the distributive property—ultimately leads to more accurate and efficient problem-solving.

Features of focusing on this step:

- Enhances understanding of algebraic structures.
- Prevents errors in subsequent steps.
- Builds good problem-solving habits.

Pros and Cons Recap:

- Pros:
 - Ensures expression is fully expanded.
 - Clarifies the algebraic structure.
 - Simplifies the process of combining like terms.
- Cons:
 - Can be overlooked under time pressure.
 - May cause confusion if signs and coefficients are mishandled.

In summary, the missing step in solving inequalities like $4(x-3) + 4(10) + 6x$ is the explicit application of the distributive property. Recognizing and correctly executing this step is essential for accurate algebraic solutions and for developing a strong mathematical foundation.

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