

Carole Wrote $100 - 10(4 + 2f) = 100 - 40 + 20f$ Find And Correct The Error In The Students Work.

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Understanding algebraic expressions and their simplifications is fundamental in mathematics. When students work through problems involving distribution and combining like terms, errors can occur, leading to incorrect solutions. In this article, we will analyze the expression, identify the error in the student's work, and explain how to properly simplify and correct it. This detailed exploration aims to enhance learners' algebra skills, clarify common misconceptions, and improve problem-solving accuracy.

Understanding the Original Expression

The given expression is:

$$100 - 10(4 + 2f) = 100 - 40 + 20f$$

Before delving into the correction, it is essential to understand the components of this expression.

Breaking Down the Expression

- The left side involves a subtraction of a product: $100 - 10(4 + 2f)$
- The right side expresses the expanded form: $100 - 40 + 20f$

The goal is to simplify the left side correctly and verify if it matches the right side, or if there is an inconsistency that indicates an error.

Step-by-Step Simplification

Let's walk through the process of simplifying the left side:

1. Distribute the 10 across the parentheses

Using the distributive property:

$$10 \times 4 = 40$$

$$10 \times 2f = 20f$$

So, the expression becomes:

$$\backslash[100 - (40 + 20f) \backslash]$$

2. Apply the subtraction to each term inside the parentheses

Remember that subtracting a sum distributes as:

$$\backslash[100 - 40 - 20f \backslash]$$

This simplifies to:

$$\backslash[60 - 20f \backslash]$$

Comparing the Simplified Form to the Given Result

The simplified form of the left side is:

$$\backslash[60 - 20f \backslash]$$

However, the right side provided in the original expression is:

$$\backslash[100 - 40 + 20f \backslash]$$

Simplify the right side:

$$\backslash[100 - 40 + 20f = 60 + 20f \backslash]$$

Now, compare:

- Left side simplified: $60 - 20f$
- Given right side: $60 + 20f$

The expressions are not equivalent because of the sign of the $\backslash(20f \backslash)$ term. This indicates a potential error in the student's work or the original expression.

Identifying the Error

Based on the above, the core mistake appears when the student wrote:

$$\backslash[100 - 10(4 + 2f) = 100 - 40 + 20f \backslash]$$

The student seems to have:

- Correctly distributed the 10 to get $\backslash(40 + 20f \backslash)$
- Then, subtracted this from 100, resulting in:

$$\backslash[100 - 40 - 20f \backslash]$$

which simplifies to $\backslash(60 - 20f \backslash)$

But the student wrote the right side as $\backslash(100 - 40 + 20f \backslash)$, which implies they incorrectly handled the subtraction or misapplied the distributive

property, leading to the addition instead of subtraction of $(20f)$.

Key error:

The student mistakenly changed the sign of the $(20f)$ term when copying or simplifying, resulting in:

$[100 - 40 + 20f]$

instead of the correct:

$[100 - 40 - 20f]$

Conclusion:

The main mistake was in the handling of the negative sign during the distribution or subtraction process.

How To Correct The Error

To correct this error, the student must:

- Recognize that subtracting the entire expression $(10(4 + 2f))$ from 100 involves subtracting both terms inside the parentheses.
- Maintain the correct signs throughout the distribution and subtraction process.

Corrected Step-by-Step Solution:

1. Distribute the 10:

$[$
 $10 \times 4 = 40$
 $]$
 $[$
 $10 \times 2f = 20f$
 $]$

2. Express the subtraction:

$[$
 $100 - (40 + 20f)$
 $]$

3. Remove parentheses:

$[$
 $100 - 40 - 20f$
 $]$

4. Simplify:

$[$
 $60 - 20f$
 $]$

Final Correct Expression:

$$\begin{aligned} & \backslash[\\ & 100 - 10(4 + 2f) = 60 - 20f \\ & \backslash] \end{aligned}$$

This matches the simplified form of the left side and shows that the original right side $\backslash(100 - 40 + 20f \backslash)$ was incorrect relative to the distribution process.

Additional Insights and Common Mistakes

Understanding where students often go wrong helps in correcting misconceptions:

- **Misapplying the distributive property:** Students may forget to distribute the negative sign when distributing across parentheses.
- **Incorrect sign handling:** Changing signs arbitrarily or misunderstanding subtraction's role can lead to errors.
- **Copying errors:** Mistakenly copying the wrong expression or misreading the problem can cause inconsistencies.

To avoid these mistakes:

- Always distribute the negative sign along with the number outside parentheses.
- Carefully perform each step, double-checking signs.
- Use parentheses to clarify the order of operations and prevent misinterpretation.

Practice Problems for Reinforcement

To reinforce these concepts, practice solving similar expressions:

1. Simplify $\backslash(50 - 5(3 + 4f) \backslash)$
2. Simplify $\backslash(200 - 8(2 + 3f) \backslash)$
3. Simplify $\backslash(120 - 6(5 + 2f) \backslash)$

By practicing these, students develop confidence in correctly distributing and handling signs.

Summary and Conclusion

In conclusion, the error in the student's work stemmed from a misapplication of distribution and signs. The correct process involves:

- Distributing each term inside the parentheses properly.
- Applying subtraction to each term, maintaining correct signs.
- Simplifying to the correct form.

The accurate simplified form of the original expression is:

$$100 - 10(4 + 2f) = 60 - 20f$$

By understanding these fundamental algebraic principles, students can avoid common mistakes and improve their problem-solving skills, leading to better performance in mathematics assessments and real-world applications.

Remember: Always double-check your distribution, signs, and simplification steps to ensure accuracy in algebraic expressions.

Frequently Asked Questions

What is the original equation given in the problem?

The original equation is $100 - 10(4 + 2f) = 100 - 40 + 20f$.

What is the common mistake students make when expanding the expression $10(4 + 2f)$?

A common mistake is to incorrectly distribute or forget to multiply both terms inside the parentheses by 10, leading to errors in the expanded form.

How should the term $10(4 + 2f)$ be correctly expanded?

It should be expanded as $10 \cdot 4 + 10 \cdot 2f$, which equals $40 + 20f$.

What is the correct simplified form of the left side of the equation?

The left side simplifies to $100 - (40 + 20f)$ which is $100 - 40 - 20f$.

What is the corrected form of the equation after proper expansion?

The corrected equation is $100 - 40 - 20f = 100 - 40 + 20f$.

How can we identify the error in the student's work?

The error can be identified by checking whether the student correctly expanded and simplified $10(4 + 2f)$. If they missed multiplying both terms by 10, that is the mistake.

What is the significance of correctly expanding expressions in algebraic equations?

Correct expansion ensures accurate simplification and solving of the equation, preventing errors in the final solution.

What is the corrected value of the expanded expression that the student should have obtained?

The student should have obtained $40 + 20f$ after expanding $10(4 + 2f)$.

How does correcting this expansion impact solving the original equation?

Correct expansion leads to proper simplification, which is essential for accurately solving for the variable and avoiding further errors.

Additional Resources

Carole Wrote $100 - 10(4 + 2f) = 100 - 40 + 20f$ Find And Correct The Error In The Students Work is a common type of algebraic problem that often appears in assessments and practice exercises. Such problems test students' understanding of algebraic manipulation, distribution, and combining like terms. When students make errors, it provides an excellent opportunity for educators and learners alike to analyze their work, identify misconceptions, and reinforce correct methods. In this guide, we will dissect the problem step-by-step, analyze the student's work, identify where the mistake occurred, and provide a clear, corrected solution.

Understanding the Problem

The original expression given by Carole is:

$$100 - 10(4 + 2f) = 100 - 40 + 20f$$

The task is to find and correct the error in the student's work. To do this thoroughly, we first need to understand the algebraic process involved in simplifying and manipulating such an expression.

Step 1: Break Down the Expression

The left-hand side (LHS):

$$100 - 10(4 + 2f)$$

Requires distribution of the -10 across the sum inside the parentheses.

The right-hand side (RHS):

$$100 - 40 + 20f$$

Is what the student has written after their work.

Goal: Verify if the RHS correctly represents the simplified form of the LHS, and if not, find the mistake.

Step 2: Correctly Simplify the Left-Hand Side

Let's explicitly perform the distribution:

$$100 - 10(4 + 2f) = 100 - (10 \cdot 4 + 10 \cdot 2f) = 100 - (40 + 20f)$$

This simplifies to:

$$100 - 40 - 20f$$

which is:

$$(100 - 40) - 20f = 60 - 20f$$

So, the fully simplified form of the LHS is $60 - 20f$.

Step 3: Compare the Correct Simplification with the Student's RHS

The student's RHS is:

$$100 - 40 + 20f$$

which simplifies to:

$$(100 - 40) + 20f = 60 + 20f$$

This is not equal to the simplified LHS, which is $60 - 20f$.

Key Observation: The student's RHS has a plus sign before the $20f$, whereas the correct simplified form of the LHS has a minus sign: $-20f$.

Step 4: Identify the Error

The core mistake lies in the sign associated with the $20f$ term. The student appears to have:

- Correctly distributed the -10 over the parentheses, but
- Made an error when combining or writing the resulting expression.

Specifically, the student's expression $100 - 40 + 20f$ suggests that they treated the distribution as:

- 100 minus 40 , then add $20f$

which is incorrect because:

- The distribution involved -10 multiplied by $2f$, which results in $-20f$, not $+20f$.

Therefore, the error is:

> The student incorrectly assigned a positive sign to the $20f$ term after distribution, when it should have been negative.

Step 5: Correcting the Student's Work

To correct the student's work, we need to:

1. Recognize that during distribution, the negative sign applies to both terms inside the parentheses.
2. Ensure that the signs are correctly carried over after distribution.
3. Simplify the expression properly.

Correct steps:

- Distribute -10 across $(4 + 2f)$:

$$-10 \cdot 4 = -40$$

$$-10 \cdot 2f = -20f$$

- Rewrite the expression:

$$100 - 40 - 20f$$

- Simplify:

$$(100 - 40) - 20f = 60 - 20f$$

Step 6: Final Correct Expression

The fully simplified form of the original expression is:

$$60 - 20f$$

which is not equal to the student's original RHS of $100 - 40 + 20f$.

Step 7: Summary of the Key Error

The primary mistake made by the student was:

- Incorrect sign assignment after distribution, leading to an expression with a plus sign where a minus sign was appropriate.

This error often stems from misunderstanding the distribution of a negative coefficient over a sum or difference within parentheses.

Additional Tips for Students and Educators

- Always double-check the distribution: When distributing a negative number across parentheses, remember to change the signs of each term inside.
- Be cautious with signs: Signs are crucial in algebra; a single sign mistake can alter the entire expression.
- Use visual aids or number lines: For learners, visualizing positive and negative numbers can help clarify how signs change during distribution.
- Practice with similar problems: Reinforce understanding by working through problems involving negative coefficients and parentheses.

Concluding Remarks

In algebra, precision with signs and distribution is essential. The error identified in Carole's work illustrates a common pitfall that many students encounter. By carefully analyzing each step, understanding the properties of algebraic manipulation, and practicing consistent methods, learners can improve their accuracy and confidence. Correcting such errors not only enhances problem-solving skills but also deepens conceptual understanding of algebraic principles.

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