

How Do You Use The Distributive Property To Remove The Parentheses. From $5(10+w)$

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Mathematics often involves simplifying expressions to make calculations easier and to solve equations efficiently. One fundamental property that aids in this process is the Distributive Property. This property allows us to eliminate parentheses in an algebraic expression by distributing a number or term outside the parentheses across each term inside. For example, in the expression $5(10 + w)$, the distributive property helps us remove the parentheses and rewrite it in a simpler form: $5 \times 10 + 5 \times w$.

Understanding how to apply the distributive property is essential for students learning algebra, as it forms the foundation for more complex topics such as solving equations, simplifying expressions, and factoring. This article provides a comprehensive guide on how to use the distributive property to remove parentheses, focusing on the specific example of $5(10 + w)$, along with detailed explanations, step-by-step procedures, and practical tips.

What Is the Distributive Property?

Definition and Explanation

The distributive property is a fundamental algebraic rule that states:

$$a(b + c) = a \times b + a \times c$$

This means that when a number (or term) multiplies a sum inside parentheses, it can be distributed to each addend separately, and then the products can be summed.

In simpler terms, instead of multiplying the outside number by the entire parentheses, you multiply it by each term inside the parentheses individually and then combine the results.

Why Is the Distributive Property Important?

- Simplification: It helps break down complex expressions into simpler parts.
- Solving Equations: It is essential for isolating variables.
- Understanding Algebra: It builds a foundation for factoring and expanding expressions.
- Real-Life Applications: Many problems in finance, physics, and engineering involve distributive-like calculations.

Step-by-Step Guide to Using the Distributive Property on $5(10 + w)$

Applying the distributive property to the expression $5(10 + w)$ involves a systematic process. Here is a detailed step-by-step guide:

Step 1: Identify the Terms

- Recognize the outside coefficient: 5
- Recognize the terms inside parentheses: 10 and w

Step 2: Apply the Distributive Property

- Multiply 5 by each term inside the parentheses separately:
 - 5×10
 - $5 \times w$

Step 3: Write the Expanded Expression

- Combine the products:
 - $50 + 5w$

Step 4: Simplify if Necessary

- The expression $50 + 5w$ is already simplified. You can now proceed to solve for w if part of an equation or further manipulate it as needed.

Practical Examples of Using the Distributive Property

Using concrete examples helps reinforce the concept and demonstrates its application in different contexts.

Example 1: Basic Application

Express and simplify: $3(4 + x)$

Solution:

1. Distribute 3:
 - $3 \times 4 = 12$
 - $3 \times x = 3x$
2. Write the simplified expression:

$$- 12 + 3x$$

Example 2: Algebraic Expression with Multiple Terms

Simplify: $2(5 + 3y + z)$

Solution:

1. Distribute 2 to each term:

$$- 2 \times 5 = 10$$

$$- 2 \times 3y = 6y$$

$$- 2 \times z = 2z$$

2. Write the simplified expression:

$$- 10 + 6y + 2z$$

Example 3: Applying in Equation Solving

Solve for w: $5(10 + w) = 75$

Solution:

1. Expand the left side:

$$- 50 + 5w = 75$$

2. Subtract 50 from both sides:

$$- 5w = 25$$

3. Divide both sides by 5:

$$- w = 5$$

Common Mistakes to Avoid

While applying the distributive property is straightforward, students often make some common errors:

1. **Forgetting to distribute to all terms:** For example, writing $5(10 + w) = 50 + w$ instead of $50 + 5w$.
2. **Misapplying signs:** When dealing with negative numbers, ensure to distribute the sign correctly.
3. **Confusing addition and multiplication:** Remember that the distributive property involves multiplication outside the parentheses, not addition.

4. **Overlooking the order of operations:** After distribution, follow proper order of operations for further calculations.
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Tips for Mastering the Distributive Property

To become proficient in applying the distributive property, consider the following tips:

- **Practice regularly:** Work on various problems to build confidence.
 - **Learn the pattern:** Recognize that the property applies to sums, differences, and even with variables.
 - **Use visual aids:** Draw diagrams or use area models to understand the multiplication of terms.
 - **Check your work:** After expanding, verify by re-multiplying to ensure correctness.
 - **Understand the logic:** Visualize the distributive property as breaking a rectangle into smaller parts in geometry, which can help internalize the concept.
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Extended Applications of the Distributive Property

Beyond removing parentheses in simple expressions, the distributive property is vital in various advanced mathematical topics:

Factoring

- Reversing the process of distribution to factor common terms.
- Example: $50 + 5w$ can be factored as $5(10 + w)$.

Simplifying Polynomial Expressions

- Expanding and combining like terms.

Solving Equations

- Distributing to eliminate parentheses before isolating variables.

Real-Life Use Cases

- Calculating total costs when multiple items are purchased at different prices.
- Distributing work or resources evenly across groups.

Summary

Applying the distributive property to remove parentheses like in $5(10 + w)$ is a fundamental skill in algebra that simplifies expressions and prepares them for solving equations. The key steps involve identifying the outside coefficient, distributing it to each term inside the parentheses, and then combining the results to obtain a simplified expression. Mastery of this property not only streamlines calculations but also builds a strong foundation for tackling more complex algebraic tasks.

By practicing the step-by-step process, avoiding common mistakes, and understanding the underlying concept, students can confidently use the distributive property to simplify expressions like $5(10 + w)$ and beyond. Whether in academic settings or real-world problems, this property remains an essential tool in the mathematician's toolkit.

Remember: The distributive property is not just a rule — it's a way of thinking about how numbers and variables interact in algebraic expressions. Practice applying it regularly to become more comfortable and efficient in your math skills!

Frequently Asked Questions

What is the distributive property in algebra?

The distributive property states that multiplying a number by a sum inside parentheses is the same as multiplying each addend individually and then adding the results. In symbols, $a(b + c) = ab + ac$.

How do you apply the distributive property to the expression $5(10 + w)$?

You multiply 5 by each term inside the parentheses: 5×10 and $5 \times w$, resulting in $50 + 5w$.

Why is the distributive property useful for removing parentheses?

It allows you to eliminate parentheses by distributing the multiplication over addition, simplifying the expression and making it easier to solve or evaluate.

Can the distributive property be used with subtraction inside parentheses?

Yes, the distributive property applies to subtraction as well. For example, $a(b - c) = ab - ac$.

What are the steps to use the distributive property on $5(10 + w)$?

First, multiply 5 by 10 to get 50, then multiply 5 by w to get $5w$, and finally combine the results: $50 + 5w$.

Is it necessary to distribute in all algebraic expressions with parentheses?

Not always, but when an expression involves multiplication outside parentheses, distributing helps to simplify or solve the expression more easily.

How does understanding the distributive property help in solving equations?

It helps by opening up parentheses, so you can combine like terms and isolate variables more straightforwardly.

What is an example of using the distributive property with $5(10 + w)$ in an equation?

For example, if you have $5(10 + w) = 70$, applying the distributive property gives $50 + 5w = 70$, which can then be solved for w .

Additional Resources

How Do You Use The Distributive Property To Remove The Parentheses From $5(10 + w)$

Understanding how to use the distributive property to remove parentheses in algebra is a fundamental skill that lays the groundwork for more complex mathematical concepts. In this detailed guide, we will explore the concept step-by-step, focusing on the expression $5(10 + w)$. We will discuss what the distributive property is, how it applies to this specific expression, and provide practical examples and strategies to master this technique.

Introduction to the Distributive Property

What Is The Distributive Property?

The distributive property is a fundamental algebraic rule that allows us to multiply a single term across terms inside parentheses. It helps in simplifying expressions and solving equations by removing parentheses effectively.

Formal Definition:

For any numbers or variables a , b , and c :

$$a(b + c) = a \times b + a \times c$$

This property states that multiplying a number outside parentheses by the sum of two numbers inside the parentheses is equivalent to multiplying the outside number by each inside term separately and then adding the products.

Visual Explanation:

Imagine you have a group of items, each consisting of a certain number of objects, and you want to find the total. The distributive property allows you to distribute the multiplication across each group and then sum the results.

Applying the Distributive Property to $5(10 + w)$

Step-by-Step Breakdown

Let's analyze the expression:

$$5(10 + w)$$

The goal is to remove the parentheses, transforming this into a simple algebraic expression without parentheses, making it easier to evaluate or manipulate.

Step 1: Recognize the structure

- The number outside, 5, is multiplied by the sum inside the parentheses: $(10 + w)$.
- The parentheses indicate that the addition should be performed after multiplying 5 with each term, following the distributive property.

Step 2: Apply the distributive rule

- Distribute 5 to each term inside the parentheses:

$$5 \times 10 + 5 \times w$$

- This simplifies to:

$$50 + 5w$$

Step 3: Final expression

- The expression without parentheses is:

$$50 + 5w$$

This is the simplest form after applying the distributive property.

Understanding the Components of the Distributive Process

Why Multiply Each Term Separately?

Multiplying each term separately ensures that the entire expression maintains its value while removing the parentheses. It aligns with the fundamental algebraic principle that multiplication distributes over addition.

Key points:

- Each term inside the parentheses is independent of the others.
- The outside coefficient (5) interacts with each term individually.
- The process preserves the equality of the original expression.

Common Mistakes to Avoid

- Forgetting to distribute to all terms: For example, incorrectly writing $5(10 + w) = 5 \times 10 + w$ (missing the multiplication with 5 for w).
- Sign errors: When parentheses involve negative numbers or subtraction, be cautious with signs.
- Assuming multiplication is commutative without distributing: Remember, parentheses indicate a grouping, and the distributive property is necessary to expand the expression fully.

Practical Examples of Using the Distributive Property

Example 1: Basic Application

Express: $3(a + 4)$

Solution:

- Distribute 3:

$$3 \times a + 3 \times 4 = 3a + 12$$

Example 2: Including Variables and Constants

Express: $7(2w - 3)$

Solution:

- Distribute 7:

$$7 \times 2w - 7 \times 3 = 14w - 21$$

Example 3: Handling Negative Signs

Express: $-2(5 - x)$

Solution:

- Distribute -2:

$$-2 \times 5 + (-2) \times (-x) = -10 + 2x$$

Note: Negative times negative results in a positive.

Example 4: Complex Expression

Express: $4(3y + 2) - 5(y - 1)$

Solution:

- Distribute both terms:

$$\begin{aligned} & (4 \times 3y + 4 \times 2 - 5 \times y + 5 \times 1) \\ & (12y + 8 - 5y + 5) \end{aligned}$$

- Combine like terms:

$$(12y - 5y) + (8 + 5) = 7y + 13$$

Strategies and Tips for Mastering the Distributive Property

1. Recognize Patterns

- Look for expressions involving multiplication outside parentheses and addition/subtraction inside.
- Common patterns include expressions like $a(b + c)$, $a(b - c)$, $-a(b + c)$, etc.

2. Break Down Step-by-Step

- Always write down the multiplication explicitly.
- Distribute term-by-term rather than trying to do everything in one step.

3. Be Careful with Signs and Coefficients

- Pay attention to negative signs.
- When distributing a negative coefficient, remember to change the signs inside the parentheses accordingly.

4. Practice with Varied Examples

- Use both numeric and algebraic expressions.
- Practice with parentheses involving subtraction and negative coefficients.

5. Use Visual Aids

- Draw diagrams or use algebra tiles (physical or virtual) to visualize the distributive process.
- This can help in understanding how each term is multiplied separately.

Extended Applications of the Distributive Property

1. Simplifying Expressions

Applying the distributive property is often the first step in simplifying complex algebraic expressions, enabling you to combine like terms easily.

2. Solving Equations

To solve equations involving parentheses, you often need to distribute first:

- Example: Solve $2(3x + 4) = 14$

- Distribute:

$$6x + 8 = 14$$

- Then proceed to isolate x .

3. Factoring

Understanding the distributive property is essential for factoring expressions:

- Recognize common factors in the expanded form.
- Rewrite the factored form as a product of the common factor and a binomial.

Summary and Key Takeaways

- The distributive property states that $a(b + c) = a \times b + a \times c$.
- To remove parentheses from an expression like $5(10 + w)$, distribute the outside number to each term inside.
- Always multiply each term inside the parentheses by the outside coefficient separately.
- Be mindful of signs, especially with negative coefficients or parentheses involving subtraction.
- Practice different examples to build fluency and confidence.
- Mastering this property is crucial for simplifying expressions, solving equations, and understanding algebraic concepts at a deeper level.

Final Thoughts

The ability to use the distributive property effectively is a cornerstone of algebra. It simplifies complex expressions and paves the way for solving equations and understanding more advanced topics like polynomials, factoring, and algebraic functions. The key is to develop a systematic approach: recognize the pattern, distribute each term carefully, and always check your work. With consistent practice, applying the distributive property will become second nature, greatly enhancing your algebraic problem-solving skills and mathematical confidence.

Remember: The distributive property is not just a rule; it's a powerful tool that enables you to manipulate and understand algebraic expressions more deeply. Use it wisely, and you'll find many algebraic challenges become much more approachable.

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