

Multiply Out The Brackets And Then Simplify: $12(-10x+5y)$

Multiply Out The Brackets And Then Simplify: $12(-10x+5y)$ is a fundamental algebraic operation that forms the basis for many more advanced mathematical concepts. Whether you're a student learning algebra for the first time or someone brushing up on essential math skills, understanding how to properly expand and simplify expressions like this is crucial. This process not only enhances your algebraic fluency but also helps you solve complex equations more efficiently. In this comprehensive guide, we will explore step-by-step how to multiply out the brackets in the expression $12(-10x + 5y)$, simplify the resulting terms, and understand the underlying principles involved.

Understanding the Expression: $12(-10x + 5y)$

Before diving into the multiplication process, it's important to understand the components of the expression:

- The coefficient 12 is a constant multiplier.
- The terms inside the brackets are $-10x$ and $5y$, which are algebraic terms with variables and coefficients.

The goal is to distribute the 12 across both terms inside the brackets, then combine like terms where possible to simplify the expression.

Step-by-Step Guide to Multiply Out and Simplify

Step 1: Distribute the 12 across each term inside the brackets

The distributive property states that:

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

Applying this to the expression:

$$12(-10x + 5y) = 12 \times (-10x) + 12 \times 5y$$

Perform the multiplications separately:

- $12 \times -10x = -120x$
- $12 \times 5y = 60y$

Step 2: Write the expanded expression

After distribution, the expression becomes:

```
\[-120x + 60y\]
```

This is the expanded form, with all brackets removed.

Step 3: Simplify the expression

In this case, the terms $(-120x)$ and $(60y)$ are unlike terms because they involve different variables (x and y). Therefore, they cannot be combined further.

The simplified expression remains:

```
\[-120x + 60y\]
```

Key Concepts in Multiplying Out and Simplifying Algebraic Expressions

Understanding the process of multiplying out brackets and simplifying involves grasping several fundamental algebraic principles:

1. Distributive Property

- The cornerstone of expanding expressions.
- Allows multiplication of a single term across terms inside parentheses.

2. Like Terms

- Terms that have the same variables raised to the same powers.
- Can be combined through addition or subtraction.

3. Simplification

- The process of combining like terms and reducing expressions to their simplest form.

Common Mistakes to Avoid

While performing these operations, beginners often make errors. Here are some pitfalls to watch out for:

- **Forgetting to distribute the coefficient:** Always multiply the coefficient with each term inside the brackets.
- **Incorrect sign handling:** Be careful with negative signs to avoid errors in the final expression.
- **Attempting to combine unlike terms:** Remember, only like terms can be combined.
- **Overlooking variables:** Ensure all terms are accounted for during distribution.

Additional Examples of Multiplying Out and Simplifying

To reinforce the concept, here are some more examples similar to $12(-10x + 5y)$:

Example 1: $5(3a - 4b)$

- Distribute 5:

```
\[
5 \times 3a = 15a
\]
\[
5 \times -4b = -20b
\]
```

- Final simplified expression:

```
\[
15a - 20b
\]
```

Example 2: $-3(2x + 7y)$

- Distribute -3:

```
\[
-3 \times 2x = -6x
```

```
\]  
\[  
-3 \times 7y = -21y  
\]
```

- Final simplified expression:

```
\[  
-6x - 21y  
\]
```

Example 3: $2(4m - n + 3p)$

- Distribute 2:

```
\[  
2 \times 4m = 8m  
\]  
\[  
2 \times -n = -2n  
\]  
\[  
2 \times 3p = 6p  
\]
```

- Final simplified expression:

```
\[  
8m - 2n + 6p  
\]
```

Practical Applications of Multiplying Out Brackets and Simplifying

Mastering these algebraic techniques is vital across various fields:

1. Solving Equations

- Expanding expressions to isolate variables.
- Simplifying complex algebraic equations.

2. Algebraic Factoring

- Reversing the process to factor expressions.
- Simplifying factored expressions for easier calculation.

3. Mathematical Modeling

- Developing formulas in physics, engineering, and economics.
- Simplifying models for analysis and prediction.

4. Calculus and Higher Mathematics

- Preparing expressions for differentiation and integration.
- Managing complex algebraic manipulations.

Tips for Efficient Practice and Mastery

To become proficient at multiplying out brackets and simplifying, consider the following strategies:

1. Practice with a variety of algebraic expressions regularly.
2. Double-check signs and coefficients during each step.
3. Use visual aids like algebra tiles or diagrams for complex expressions.
4. Solve real-world problems that require algebraic manipulation to build practical understanding.

Conclusion

Mastering the process of multiplying out brackets and simplifying algebraic expressions like $12(-10x + 5y)$ is essential for effective problem-solving in mathematics. By following systematic steps—distributing coefficients, performing multiplications, and combining like terms—you can confidently handle a wide range of algebraic operations. Remember, practice makes perfect, and understanding these fundamental principles provides a solid foundation for more advanced mathematical concepts. Whether you're tackling homework, preparing for exams, or applying math in real-world scenarios, these skills are invaluable for success in algebra and beyond.

Frequently Asked Questions

How do you multiply the expression $12(-10x + 5y)$?

You distribute 12 to both terms inside the brackets: $12 \cdot -10x = -120x$ and $12 \cdot 5y = 60y$, resulting in $-120x + 60y$.

What is the simplified form of $12(-10x + 5y)$?

The simplified form is $-120x + 60y$ after multiplying out the brackets.

Can you factor out common factors from the expression $-120x + 60y$?

Yes, both terms share a common factor of 60, so you can factor it out: $60(-2x + y)$.

What is the importance of distributing in algebraic expressions like $12(-10x + 5y)$?

Distributing allows you to eliminate parentheses and combine like terms, making the expression easier to simplify or evaluate.

If you need to evaluate $12(-10x + 5y)$ for $x=2$ and $y=3$, what is the result?

First, simplify to $-120x + 60y$. Substitute: $-120(2) + 60(3) = -240 + 180 = -60$.

What is the distributive property used in multiplying out brackets like $12(-10x + 5y)$?

The distributive property states that $a(b + c) = ab + ac$, so $12(-10x + 5y)$ becomes $12(-10x) + 12(5y)$.

Is the process of multiplying out brackets the same as expanding an algebraic expression?

Yes, multiplying out brackets is also called expanding the expression, which involves distributing and simplifying.

How can you check if your multiplication and simplification of $12(-10x + 5y)$ are correct?

You can verify by re-distributing the simplified expression to see if you get the original expression, or substitute specific values for x and y to confirm the results match.

Additional Resources

Multiply Out The Brackets And Then Simplify: $12(-10x + 5y)$

When approaching algebraic expressions, especially those involving brackets, the fundamental skill of distributing a number across terms inside parentheses is essential. The process of "multiply out the brackets" and then simplifying is often the first step in solving equations, factoring, or manipulating algebraic expressions. This guide provides a comprehensive, step-by-step overview of how to multiply out brackets, with a specific example: $12(-10x + 5y)$. We will explore the underlying principles, detailed procedures, common pitfalls, and tips to master this foundational skill.

Understanding the Concept of Distributive Property

Before diving into the specific example, it's crucial to understand the core principle underlying multiplying out brackets: the distributive property of multiplication over addition (or subtraction).

What is the Distributive Property?

- The distributive property states that for any numbers or expressions a , b , and c :

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

- Similarly, for subtraction:

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

This property allows us to "distribute" the multiplication of a number outside the parentheses to each term inside the parentheses individually.

Why is this important?

- It transforms an expression with brackets into a simpler form without brackets.
- It lays the groundwork for solving algebraic equations, expanding expressions, and simplifying complex formulas.

Step-by-Step Process for Multiplying Out the Brackets

Let's now focus on the specific expression:

$$12(-10x + 5y)$$

This expression involves a single coefficient, 12, multiplying a binomial $(-10x + 5y)$.

Step 1: Write Down the Expression Clearly

- The expression is:

$$12 \times (-10x + 5y)$$

- Recognize that the entire binomial is being multiplied by 12.

Step 2: Apply the Distributive Property

- Multiply 12 by each term inside the parentheses separately:

$$12 \times (-10x) \text{ and } 12 \times 5y$$

- This results in two new terms, which are then combined.

Step 3: Perform the Multiplications

- Calculate each term carefully:

$$- 12 \times (-10x) = (12 \times -10) x = -120x$$

$$- 12 \times 5y = (12 \times 5) y = 60y$$

Step 4: Write the Resulting Expression

- After multiplying, the expanded form becomes:

$$-120x + 60y$$

Simplification of the Expression

In this case, the expression is already simplified, but understanding the process is important, especially when dealing with more complex algebraic expressions.

What does simplification involve?

- Combining like terms: terms with the same variables raised to the same power.
- Reducing coefficients when possible.
- Ensuring the expression is in its most concise form.

In our example:

- The terms $-120x$ and $60y$ are like terms only if they have identical variables, which they do not (one involves x , the other y).
- Therefore, no further combination of terms is possible or necessary.

Common Mistakes and How to Avoid Them

While the process appears straightforward, several common errors can occur:

1. Forgetting to Distribute to All Terms

- Error: Multiplying only one term or missing a term inside the brackets.
- Solution: Always distribute to each term inside the parentheses.

2. Sign Errors

- Error: Incorrectly handling positive and negative signs, especially with negative coefficients.
- Solution: Carefully carry the signs through multiplication, and double-check the signs after each step.

3. Arithmetic Mistakes

- Error: Simple multiplication errors, such as 12×10 being 120 or 12×5 being 65.
- Solution: Use a calculator or double-check calculations.

4. Overlooking Simplification Opportunities

- Error: Failing to recognize like terms or common factors that could simplify the expression further.
- Solution: Review the resulting expression for potential factoring or combining.

Extension: Factoring the Resulting Expression

Once the expression is expanded and simplified, it sometimes becomes advantageous to factor it back, especially in solving equations or simplifying expressions further.

Factoring the expression $-120x + 60y$

- Find the greatest common factor (GCF) of the coefficients:

GCF of 120 and 60 is 60.

- Factor out 60:

$$-120x + 60y = 60(-2x + y)$$

Factoring can be useful for solving equations or rewriting expressions in a more manageable form.

Applying the Process to More Complex Expressions

While our example involves a straightforward binomial, similar principles apply to more complex algebraic expressions involving:

- Multiple brackets
- Polynomials of higher degree
- Negative coefficients
- Nested brackets

Example:

Expand and simplify:

$$(3x - 4)(2x + 5)$$

Solution:

- Use distributive property (FOIL method):

$$3x \times 2x = 6x^2$$

$$3x \times 5 = 15x$$

$$-4 \times 2x = -8x$$

$$-4 \times 5 = -20$$

- Combine like terms:

$$6x^2 + (15x - 8x) - 20 = 6x^2 + 7x - 20$$

This demonstrates how multiplying out brackets can lead to quadratic expressions, which are foundational in algebra.

Practical Tips for Mastering Multiply Out And Simplify

- Practice regularly: The more you practice expanding and simplifying, the more intuitive it becomes.
- Use algebra tiles or diagrams: Visual aids can help understand the distribution process.
- Double-check signs: Always verify the signs after each multiplication.
- Break down complex problems: If an expression involves multiple steps, work systematically.
- Use tools wisely: Calculators or algebra software can help verify your manual work, but understanding the process is essential.

Summary and Final Thoughts

Multiplying out brackets and simplifying is a cornerstone skill in algebra that enables students and practitioners to manipulate expressions confidently. In the specific example of $12(-10x + 5y)$, applying the distributive property leads to an expanded form:

$$-120x + 60y$$

This process involves understanding the distributive property, carefully performing each multiplication, respecting signs, and then simplifying if possible. While the example is straightforward, the same principles underpin much more complex algebraic manipulations. Developing a solid grasp of these foundational techniques will pave the way for success in solving equations, factoring, expanding polynomials, and tackling higher-level mathematical concepts.

Remember:

- Always distribute to every term inside brackets.
- Keep track of signs and coefficients.
- Simplify systematically.
- Practice diverse problems to build confidence and proficiency.

By mastering these steps, you'll be well-equipped to handle a wide range of algebraic challenges with clarity and precision.

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