

7. Simplify The Expression. $3[(15 \div 3)^2 + 4]$

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In this article, we will work through the process of simplifying the given algebraic expression: **7. Simplify The Expression. $3[(15 \div 3)^2 + 4]$** . The primary goal is to understand each step involved in simplifying complex expressions that include operations such as multiplication, addition, and brackets. By breaking down the problem systematically, we can ensure clarity and accuracy in reaching the simplest form of the expression. This approach not only helps in solving this particular problem but also builds foundational skills applicable to a broad range of algebraic expressions.

Understanding the Expression Components

Before we delve into the simplification process, it is crucial to interpret the components of the expression properly. The expression appears to be somewhat ambiguous with the notation; however, based on common algebraic conventions, it is likely meant to be:

$$7 \times 3 \times [(15 \times 3)^2 + 4]$$

Here, the key points are:

- The presence of multiplication signs, which could be implied between numbers.
- The brackets indicating the order of operations.
- Exponents, specifically the square of an expression.
- Addition within the brackets.

Assuming the intended expression is:

$$7 \times 3 \times [(15 \times 3)^2 + 4]$$

Our task is to simplify this step-by-step according to algebraic rules.

Step 1: Clarify and Rewrite the Expression

To avoid confusion, let's write the expression explicitly:

Expression: $7 \times 3 \times [(15 \times 3)^2 + 4]$

This expression involves:

- Multiplication of 7 and 3.
- The term inside brackets: (15×3) squared plus 4.

Our goal is to evaluate this expression thoroughly.

Step 2: Simplify the Innermost Brackets

The first step involves simplifying the expression inside the parentheses:

$$(15 \times 3)$$

Calculate:

$$15 \times 3 = 45$$

Now, the expression becomes:

$$7 \times 3 \times [(45)^2 + 4]$$

Step 3: Calculate the Exponentiation

Next, evaluate (45) squared:

$$45^2 = 45 \times 45 = 2025$$

Now, the expression updates to:

$$7 \times 3 \times [2025 + 4]$$

Step 4: Simplify Inside the Brackets

Add 2025 and 4:

$$2025 + 4 = 2029$$

The expression now simplifies to:

$$7 \times 3 \times 2029$$

Step 5: Perform the Multiplications

The remaining operations are straightforward multiplications:

First, multiply 7 and 3:

$$7 \times 3 = 21$$

Next, multiply this result by 2029:

$$21 \times 2029$$

Calculate:

$$21 \times 2029$$

Break it down:

- $20 \times 2029 = 20 \times 2029 = 40,580$
- $1 \times 2029 = 2,029$

Add these:

$$40,580 + 2,029 = 42,609$$

Thus, the simplified value of the original expression is:

$$42,609$$

Summary of Simplification Process

To summarize:

1. Interpret the expression correctly with explicit multiplication signs.
2. Simplify the innermost brackets first: $(15 \times 3) = 45$.
3. Square the result: $45^2 = 2025$.
4. Add 4 inside the brackets: $2025 + 4 = 2029$.
5. Multiply the remaining factors: $7 \times 3 = 21$.
6. Multiply $21 \times 2029 = 42,609$.

Additional Tips for Simplifying Similar Expressions

When tackling similar algebraic expressions, keep these tips in mind:

- **Follow the order of operations (PEMDAS/BODMAS):** Parentheses, Exponents, Multiplication/Division, Addition/Subtraction.
- **Simplify inside brackets first:** Always handle expressions within brackets before moving outward.
- **Calculate exponents early:** Exponents often significantly impact the size of the number, so evaluate them before addition or multiplication.
- **Break down complex multiplications:** For large numbers, consider breaking the multiplication into parts for easier calculation.
- **Double-check calculations:** Small mistakes in intermediate steps can lead to incorrect final results.

Common Mistakes to Avoid

While simplifying algebraic expressions, be cautious of:

1. **Misinterpreting notation:** Ensure parentheses and exponents are correctly understood.
2. **Ignoring the order of operations:** Always evaluate brackets and exponents before multiplication or addition.
3. **Arithmetic errors:** Double-check calculations, especially with large numbers or exponents.
4. **Assuming implicit multiplication:** Always explicitly include multiplication signs when necessary to avoid ambiguity.

Conclusion

Simplifying complex algebraic expressions requires careful attention to the order of operations and systematic calculation. In our case, by methodically evaluating each component of the expression, we arrived at the final simplified value of 42,609. Mastery of these steps enhances problem-solving skills and prepares you to handle more advanced algebraic challenges confidently. Remember, breaking down the problem into manageable parts and verifying each step ensures accuracy and builds a solid foundation in algebra.

Frequently Asked Questions

How do I simplify the expression $3[(15 - 3)^2 + 4]$ step by step?

First, evaluate inside the parentheses: $(15 - 3) = 12$. Then multiply by 2: $12 \times 2 = 24$. Next, add 4: $24 + 4 = 28$. Finally, multiply by 3: $3 \times 28 = 84$. So, the simplified result is 84.

What is the order of operations to simplify $3[(15 - 3)^2 + 4]$?

Use the order PEMDAS: Parentheses first, then exponents (if any), followed by multiplication and division from left to right, then addition and subtraction. Here, evaluate $(15 - 3)$ first, then multiply by 2, add 4, and finally multiply the whole expression by 3.

Can I simplify the expression $3[(15 - 3)^2 + 4]$ without detailed steps?

Yes. First, compute $(15 - 3) = 12$, then multiply by 2 to get 24, add 4 to get 28, and finally multiply by 3 to obtain the answer, which is 84.

What common mistakes should I avoid when simplifying $3[(15 - 3)^2 + 4]$?

Avoid skipping steps, especially forgetting to evaluate inside parentheses first, or confusing multiplication order. Also, ensure you multiply 12 by 2 before adding 4, and multiply the entire sum by 3 at the end.

How can I verify my answer when simplifying $3[(15 - 3)^2 + 4]$?

Recheck each step: confirm $(15 - 3) = 12$, then $12 \times 2 = 24$, add 4 to get 28, and multiply 28 by 3 to get 84. Confirming these steps ensures your final answer is correct.

Additional Resources

Simplify The Expression $3[(15 - 3)^2 + 4]$ – A Comprehensive Guide to Mastering Algebraic Simplification

Introduction to Simplifying Algebraic Expressions

Mathematics is often described as the language of the universe, and algebra serves as its foundational dialect. Among the core skills in algebra is the ability to simplify expressions, which involves transforming complex formulas into their most manageable and understandable forms. Simplification not only makes calculations easier but also enhances comprehension of the relationships between variables and constants.

The expression "Simplify The Expression.3[(15 3)2 + 4" presents a typical scenario where multiple algebraic operations—such as multiplication, addition, and possibly exponents—must be carefully unraveled. Before diving into the specific steps, let's understand the importance of simplification:

- It reduces computational complexity.
- It makes the expression easier to interpret.
- It prepares the expression for solving equations or evaluating specific values.
- It helps identify equivalent forms, revealing insights into the structure of the problem.

In this detailed review, we'll dissect this expression methodically, explore similar examples, and provide strategies to approach and master such algebraic tasks.

Deciphering the Expression: Clarifying the Components

The provided expression appears to be:

"Simplify The Expression.3[(15 3)2 + 4"

However, the notation is somewhat ambiguous and may contain typographical errors or unconventional formatting. Based on standard mathematical conventions, it's reasonable to interpret it as:

$3 [(15 - 3) 2 + 4]$

or perhaps:

$3 [(15 \div 3) 2 + 4]$

Alternatively, the expression could involve exponents or other operations,

but since they are not explicitly stated, the most logical assumption is that it's:

$$3 [(15 - 3) 2 + 4]$$

Note: If the original expression intended different operations, adjustments in the steps would be necessary. Always clarify the notation before proceeding.

Step-by-Step Breakdown of the Simplification Process

Let's proceed with the assumption that the expression to simplify is:

$$3 [(15 - 3) 2 + 4]$$

1. Understand the Order of Operations

In algebra, the order of operations (also known as PEMDAS/BODMAS) determines the sequence in which operations should be performed:

- Parentheses/Brackets
- Exponents/Orders
- Multiplication and Division (from left to right)
- Addition and Subtraction (from left to right)

Applying these rules ensures consistency and correctness.

2. Simplify Inside the Brackets

Start with the innermost parentheses:

- Calculate $(15 - 3)$:

$$15 - 3 = 12$$

- Multiply by 2:

$$12 \cdot 2 = 24$$

- Add 4:

$$24 + 4 = 28$$

Now, the expression simplifies to:

3 28

3. Final Multiplication

Multiply 3 by 28:

$$3 \times 28 = 84$$

Result: The simplified form of the expression is 84.

Alternative Interpretations and Their Simplifications

Since the original expression's notation could be ambiguous, let's consider alternate interpretations and how to handle them.

Interpretation A: Using Exponents

Suppose the expression was:

$$3 [(15 \div 3)^2 + 4]$$

- Calculate $(15 \div 3)$:

$$15 \div 3 = 5$$

- Square the result:

$$5^2 = 25$$

- Add 4:

$$25 + 4 = 29$$

- Multiply by 3:

$$3 \times 29 = 87$$

Result: 87

Interpretation B: Including Exponents or Parentheses Differently

Suppose the expression was:

$$3 [(15 - 3)^2 + 4]$$

- Compute $(15 - 3)$:

12

- Square it:

$12^2 = 144$

- Add 4:

$144 + 4 = 148$

- Multiply by 3:

$3 \times 148 = 444$

Result: 444

Key Strategies for Simplifying Complex Expressions

To efficiently approach similar problems, consider these strategies:

1. Clarify the Expression

- Confirm the notation and operations involved.
- Rewrite ambiguous expressions in clearer forms.
- Use parentheses explicitly to denote operation precedence.

2. Follow the Order of Operations Rigorously

- Always start with innermost parentheses.
- Handle exponents before multiplication/division.
- Complete multiplication/division before addition/subtraction.

3. Break Down the Expression into Smaller Parts

- Tackle each component separately.
- Simplify innermost parts first, then build outward.
- Use substitution if necessary to keep track of intermediate results.

4. Use Variables for Complex Parts

- Assign parts of the expression to variables for clarity.
- Reuse simplified parts in larger calculations.

5. Double-Check Calculations

- Verify each step.
- Re-apply order of operations.
- Ensure no accidental errors in arithmetic.

Common Mistakes to Avoid

When simplifying algebraic expressions, be mindful of frequent errors:

- Ignoring parentheses: Always resolve parentheses first.
- Misapplying order of operations: Remember multiplication/division and addition/subtraction have equal precedence, processed left to right.
- Incorrect exponent handling: Square, cube, or other powers must be calculated carefully.
- Sign errors: Watch for negative signs, especially in subtraction or negative numbers.
- Not simplifying fully: Always check if the expression can be reduced further.

Extending the Learning: Practice Problems

To solidify understanding, practice with similar expressions:

1. Simplify $4 [(12 \div 4) + 6]$
2. Simplify $2 [(20 - 5)^2 + 3]$
3. Simplify $5 [(18 \div 3) 2 + 7]$
4. Simplify $(8 + 4) (6 - 2)$
5. Simplify $3^2 + 4 (5 - 3)$

Solution Approach:

- Follow the same step-by-step process.
- Always start from the innermost parentheses.
- Be systematic to avoid errors.

Real-World Applications of Simplifying

Expressions

Understanding how to simplify expressions isn't just an academic exercise; it has practical applications:

- Engineering: Calculating stresses, forces, or electrical currents often involves simplifying complex formulas.
- Finance: Simplifying compound interest formulas or loan calculations for clearer insights.
- Computer Science: Optimizing algorithms by reducing computational complexity.
- Physics: Simplifying equations of motion or energy calculations.
- Statistics: Simplifying probability expressions or statistical formulas.

Mastering these skills enhances problem-solving efficiency across disciplines.

Tips for Mastery and Further Learning

- Practice Regularly: The more problems you solve, the better you become.
- Use Algebraic Software: Tools like WolframAlpha or symbolic calculators can verify your steps.
- Study Patterns: Recognize common algebraic patterns like difference of squares, factoring, or binomial expansions.
- Learn from Mistakes: Review errors to understand misconceptions.
- Seek Clarification: When in doubt about notation or operations, consult textbooks or instructors.

Conclusion: The Path to Proficiency in Simplification

Simplifying algebraic expressions is a fundamental skill that empowers students and professionals to handle complex problems with confidence. The specific expression "Simplify The Expression.3[(15 3)2 + 4" serves as an excellent example of how careful interpretation and systematic application of the order of operations lead to straightforward solutions.

By adopting methodical approaches, practicing regularly, and understanding the underlying principles, anyone can master the art of simplification. Remember, every complex problem is just a series of small, manageable steps waiting to be uncovered.

Final Tip: Always double-check your work and strive for clarity. Clear, simplified expressions not only make calculations easier but also deepen your understanding of the mathematical concepts involved.

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