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Understanding how to accurately solve mathematical expressions is a fundamental skill in mathematics. Proper application of the order of operations ensures that calculations are consistent and correct. In this article, we will explore how to solve the expression $(18 + 3) \times (8 + 4) + 3^2$ step by step, emphasizing the importance of following the correct order of operations.

What Is the Order of Operations?

The order of operations is a set of rules that dictate the sequence in which mathematical operations should be performed to obtain a correct result. The most common mnemonic to remember these rules is PEMDAS:

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

Following PEMDAS ensures that everyone interprets and solves mathematical expressions consistently.

Breaking Down the Expression

Let's take a closer look at the expression:

$$(18 + 3) \times (8 + 4) + 3^2$$

The expression contains parentheses, exponents, multiplication, and addition, which aligns perfectly with the PEMDAS order.

Step 1: Simplify Inside Parentheses

According to PEMDAS, we start with operations inside parentheses:

- First parentheses: $(18 + 3)$
- Second parentheses: $(8 + 4)$

Calculating these:

- $(18 + 3) = 21$
- $(8 + 4) = 12$

Now, the expression simplifies to:

$$21 \times 12 + 3^2$$

Step 2: Calculate Exponents

Next, handle exponents:

- $3^2 = 3 \times 3 = 9$

The expression now becomes:

$$21 \times 12 + 9$$

Step 3: Perform Multiplication and Division

Proceed to multiplication:

- $21 \times 12 = 252$

The expression simplifies to:

$$252 + 9$$

Step 4: Perform Addition and Subtraction

Finally, perform addition:

- $252 + 9 = 261$

Result: 261

Summary of the Step-by-Step Solution

Step	Operation	Result
1	Simplify parentheses: $(18 + 3)$ and $(8 + 4)$	21 and 12
2	Calculate exponents: 3^2	9
3	Multiply: 21×12	252
4	Add: $252 + 9$	261

Importance of Following the Correct Order of Operations

Misinterpreting the sequence of operations can lead to incorrect answers. For example, performing addition before multiplication changes the outcome:

Incorrect approach:
If someone adds $18 + 3 = 21$, then multiplies by $(8 + 4)$ without considering parentheses first, or skips the order of operations, they might get a different result.

Correct approach:
Always follow PEMDAS to ensure consistency and accuracy.

Practical Tips for Solving Expressions

- Always perform calculations inside parentheses first.
- Handle exponents immediately after parentheses.
- Perform multiplication and division from left to right.
- Finally, perform addition and subtraction from left to right.
- Double-check each step to avoid common mistakes.

Common Mistakes to Avoid

- Ignoring parentheses: Sometimes, students perform operations in the wrong order, leading to incorrect results.
- Skipping exponents: Forgetting to evaluate exponents before multiplying or adding can cause errors.
- Performing operations out of order: Multiplication should be done before addition unless parentheses dictate otherwise.
- Misreading the expression: Always carefully interpret the expression to identify all parts accurately.

Practice Problems for Mastery

To reinforce understanding, try solving the following expressions using the correct order of operations:

1. $(5 + 2) \times (10 - 4) + 4^2$

2. $3 + 4 \times (6 - 2)^2$

3. $(20 \div 5) + 2^3 - 3$

4. $8 + (3^2 + 4) \times 2$

Work through each step carefully, applying PEMDAS rules for each.

Conclusion

Properly solving mathematical expressions like $(18 + 3) \times (8 + 4) + 3^2$ hinges on understanding and applying the correct order of operations. By systematically following PEMDAS, you ensure that your calculations are accurate and consistent. Mastery of this fundamental principle not only improves your mathematical skills but also lays the groundwork for more advanced problem-solving in algebra, calculus, and beyond. Practice regularly, double-check your work, and you'll become confident in handling even the most complex expressions with ease.

Frequently Asked Questions

What is the correct order of operations to solve $(18+3) \times (8+4) + 3$ squared?

First, evaluate parentheses: $(18+3) = 21$ and $(8+4) = 12$. Then, calculate exponents: $3 \text{ squared} = 9$. Next, multiply: $21 \times 12 = 252$. Finally, add: $252 + 9 = 261$.

Why is it important to follow the order of operations in the expression $(18+3) \times (8+4) + 3$ squared?

Following the order of operations ensures that calculations are performed consistently and accurately, preventing errors and obtaining the correct result. It dictates parentheses first, exponents second, multiplication/division third, and addition/subtraction last.

What is the step-by-step solution to $(18+3) \times (8+4) + 3$ squared?

Step 1: Calculate parentheses: $18+3=21$ and $8+4=12$. Step 2: Calculate the exponent: $3 \text{ squared} = 9$. Step 3: Multiply: $21 \times 12 = 252$. Step 4: Add: $252 + 9 = 261$. The final answer is 261.

Can you explain how to simplify the expression $(18+3) \times (8+4) + 3$ squared using PEMDAS?

Yes. Applying PEMDAS: Parentheses first: $(18+3)=21$ and $(8+4)=12$. Exponents: $3 \text{ squared}=9$. Multiplication: $21 \times 12=252$. Addition: $252 + 9=261$. So, the simplified result is 261.

What common mistakes should be avoided when solving $(18+3) \times (8+4) + 3$ squared?

Common mistakes include performing operations out of order, such as adding before multiplying or neglecting to evaluate parentheses first. Always follow the order: parentheses, exponents, multiplication/division, then addition/subtraction.

Additional Resources

Solve Using The Correct Order Of Operation $(18+3) \times (8+4) + 3$ squared: A Comprehensive Guide to Mastering Mathematical Order of Operations

Mathematics is often seen as a universal language, but it comes with its own set of rules that dictate how problems should be approached and solved. One of the most fundamental principles in mathematics is following the correct order of operation. Whether you're tackling simple arithmetic or complex algebra, understanding this sequence ensures your

solutions are accurate and consistent. Today, we'll explore the expression $(18+3) \times (8+4) + 3^2$ —a prime example that demonstrates the importance of applying the proper order of operations step-by-step for a correct and reliable answer.

Why the Correct Order of Operation Matters

In any mathematical expression, multiple operations—addition, subtraction, multiplication, division, exponents—are involved. Without a standard rule, different people might interpret the same problem differently, leading to inconsistent answers. The order of operations provides a clear set of guidelines to determine which operation to perform first, second, and so on.

The widely accepted convention in mathematics is often summarized by the acronym PEMDAS (Parentheses, Exponents, Multiplication and Division, Addition and Subtraction). This rule ensures everyone interprets and solves expressions uniformly.

Breaking Down the Expression

Let's examine the expression:

$$(18 + 3) \times (8 + 4) + 3^2$$

To solve this correctly, we need to follow the order of operations precisely. Here's a step-by-step approach.

Step 1: Parentheses (P)

The first priority according to PEMDAS is to evaluate expressions inside parentheses. We have two parentheses:

- $(18 + 3)$
- $(8 + 4)$

Calculating each:

- $(18 + 3) = 21$
- $(8 + 4) = 12$

Now, the expression simplifies to:

$$21 \times 12 + 3^2$$

Step 2: Exponents (E)

Next, evaluate exponents. The only exponent present is 3^2 :

$$- 3^2 = 9$$

Now, the expression becomes:

$$21 \times 12 + 9$$

Step 3: Multiplication and Division (MD)

After parentheses and exponents, perform multiplication and division from left to right.

$$- 21 \times 12 = 252$$

Our expression now simplifies to:

$$252 + 9$$

Step 4: Addition and Subtraction (AS)

Finally, perform addition or subtraction from left to right.

$$- 252 + 9 = 261$$

Final Answer: 261

Deep Dive into the Order of Operations: Why It Matters

Understanding each step in detail helps reinforce why the order of operations is essential, especially in more complex expressions.

The Role of Parentheses

Parentheses are used to indicate which operations should be performed first, overriding the default order. In our example, they dictated that $18 + 3$ and $8 + 4$ be calculated prior to any other operations. Neglecting parentheses can lead to incorrect results.

Handling Exponents

Exponents have higher precedence than multiplication, division, addition, or subtraction. Recognizing this ensures that powers are evaluated before combining with other operations.

The Significance of Multiplication and Division

These operations share the same level of precedence. When both appear in an expression, evaluate from left to right. This is crucial in more complex expressions to prevent miscalculations.

Addition and Subtraction Last

Finally, addition and subtraction are performed after all other operations unless parentheses specify otherwise. This sequencing preserves the integrity of the original expression.

Common Mistakes to Avoid

Even with a clear understanding of PEMDAS, mistakes happen. Here are common pitfalls and how to avoid them:

1. Ignoring parentheses: Always evaluate expressions inside parentheses first.
2. Misplacing exponents: Remember that exponents come before multiplication and addition.
3. Performing operations out of order: Stick to left-to-right evaluation for multiplication/division and addition/subtraction.
4. Skipping steps: Break down complex expressions into smaller parts to reduce errors.

Practice Problems for Mastery

To solidify your understanding, try solving these expressions using the correct order of operation:

1. $(12 + 6) \times (4 + 2) + 5^2$
2. $(20 - 4) \div (2 + 2) + 7^2$
3. $(9 + 3) \times 2^2 - 8$
4. $(15 - 5) + 3^3 \times 2$

Remember to follow PEMDAS carefully, evaluate parentheses first, handle exponents next, then multiplication/division, and finally addition/subtraction.

Final Thoughts

Mastering the correct order of operation is fundamental to solving mathematical expressions accurately. Whether you're working through simple calculations or complex algebraic formulas, applying PEMDAS ensures consistency and correctness. The example $(18+3) \times (8+4) + 3$ squared illustrates how breaking down an expression step-by-step guarantees an accurate result—in this case, 261. By practicing these principles regularly, you'll develop confidence and precision in your mathematical problem-solving skills,

making complex calculations second nature.

Remember: always prioritize parentheses, exponents, multiplication/division, and addition/subtraction, and you'll navigate any mathematical problem with ease!

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