

7. In Which Step Does A Mistake First Occur? $82 + (3 \times 3 - 2)$ Step 1: $82 + (3 \times 1)$ Step 2: $82 + 3$ Step 3:

Understanding the Step-by-Step Breakdown of the Mathematical Expression

7. In Which Step Does A Mistake First Occur? $82 + (3 \times 3 - 2)$ Step 1: $82 + (3 \times 1)$ Step 2: $82 + 3$ Step 3: This question highlights an important aspect of solving mathematical expressions: identifying where errors can occur during each step. By analyzing each stage carefully, students and educators can better understand common pitfalls and how to prevent them. In this article, we will explore the detailed process of evaluating the given expression, pinpoint where mistakes are most likely to happen, and provide insights into correct calculation methods.

Breaking Down the Expression: Initial Interpretation

The Original Expression

The expression in question appears as: $82 + (3 \times 3 - 2)$. To analyze this, it's important to understand the order of operations, often remembered by the acronym PEMDAS (Parentheses, Exponents, Multiplication and Division, Addition and Subtraction).

Step 1: Addressing the Parentheses

The first step involves evaluating the expression inside the parentheses: $3 \times 3 - 2$. According to PEMDAS, multiplication occurs before subtraction. Therefore, the sequence within the parentheses should be handled carefully.

Step-by-Step Evaluation of the Expression

Step 1: Evaluating the Parentheses

- Original inside parentheses: $3 \times 3 - 2$
- First, perform multiplication: $3 \times 3 = 9$
- Next, perform subtraction: $9 - 2 = 7$

Result of the parentheses: 7

Step 2: Adding to the External Number

- Original expression: $82 + (\text{result from parentheses})$
- Substitute: $82 + 7$
- Final calculation: $82 + 7 = 89$

Final Answer: 89

Analyzing the Given Steps: Where Do Errors Typically Occur?

Step 1: $82 + (3 \times 1)$

In the provided steps, the initial operation is simplified incorrectly to $82 + 3$. This suggests a misunderstanding of the original expression, which should evaluate $3 \times 3 - 2$, not 3×1 . This discrepancy indicates a common mistake – misreading or misapplying the order of operations within parentheses.

Step 2: $82 + 3$

Here, the calculation proceeds as $82 + 3 = 85$. However, since the original expression involves $3 \times 3 - 2$, the correct intermediate result after completing the multiplication and subtraction is 7, not 3. This step exemplifies a typical error where students may forget to perform the multiplication before subtraction or incorrectly simplify the expression.

Step 3: Final Calculation

Finally, adding $82 + 3$ yields 85, which is incorrect for the original problem. The correct final result should be 89, reflecting the proper order of operations. This highlights how initial miscalculations propagate through subsequent steps, emphasizing the importance of accurate foundational calculations.

Common Mistakes and How to Avoid Them

Mistake 1: Ignoring Parentheses and Order of Operations

- **Issue:** Jumping directly to addition without evaluating parentheses first.
- **Solution:** Always identify and evaluate parentheses or brackets first, following PEMDAS rules.

Mistake 2: Misreading the Expression

- **Issue:** Confusing $3 \times 3 - 2$ with 3×1 , leading to incorrect intermediate results.
- **Solution:** Carefully read and verify each part of the expression before performing calculations.

Mistake 3: Performing Operations in the Wrong Sequence

- **Issue:** Performing subtraction before multiplication or addition, violating PEMDAS.
- **Solution:** Follow the established order: Parentheses, Exponents, Multiplication/Division, Addition/Subtraction.

Strategies for Accurate Calculation

1. Break Down the Expression

Divide complex expressions into smaller parts and evaluate each step carefully. For example, explicitly compute 3×3 before subtracting 2.

2. Use Parentheses Effectively

Always prioritize calculations within parentheses, and double-check that you're working inside them before moving outward.

3. Cross-Verify Results

- Re-evaluate intermediate results to ensure correctness.
- Use reverse operations to verify answers when possible.

4. Practice with Similar Problems

Practicing varied expressions reinforces understanding and reduces the likelihood of mistakes.

Conclusion: Importance of Methodical Approach in Mathematics

The question 7. In Which Step Does A Mistake First Occur? $82 + (3 \times 3 - 2)$ Step 1: $82 + (3 \times 1)$ Step 2: $82 + 3$ Step 3: underscores the necessity of careful, methodical problem-solving in mathematics. Recognizing where errors are likely to happen allows students to develop strategies to avoid them, such as thoroughly understanding the order of operations and paying close attention to the details within expressions.

In summary, the most common mistake occurs at the initial evaluation of the parentheses, where misreading the expression leads to incorrect intermediate results. By adhering to PEMDAS, double-checking each step, and practicing regularly, learners can improve their accuracy and confidence in solving mathematical problems.

Frequently Asked Questions

At which step does the first mistake occur in the expression $82 + (3 \times 3 - 2)$?

The first mistake occurs in Step 1 if the expression is incorrectly simplified or if the order of operations is not followed properly. In the given steps, the mistake appears to happen at Step 2 when 3×3 is simplified as 3, which is incorrect.

What is the correct way to evaluate $82 + (3 \times 3 - 2)$?

First, evaluate inside the parentheses: $3 \times 3 = 9$, then $9 - 2 = 7$. Finally, add 82: $82 + 7 = 89$.

Why is Step 2 ' $82 + 3$ ' incorrect in the given process?

Because in Step 2, the multiplication inside the parentheses (3×3) should be evaluated as 9, not 3. The mistake is treating 3×3 as 3.

How can misplacing parentheses lead to errors in this calculation?

Misplacing parentheses can change the order of operations, leading to incorrect evaluation. Proper parentheses ensure multiplication is done before addition, preventing mistakes.

What is the importance of following the BIDMAS/BODMAS rule in this problem?

BIDMAS/BODMAS (Brackets, Orders, Division and Multiplication, Addition and Subtraction) guides the correct order of operations, ensuring accurate calculation. Ignoring it can cause errors, like treating 3×3 as 3.

Can you identify a common mistake students make with this type of problem?

A common mistake is performing addition before multiplication or misreading the parentheses, which leads to incorrect simplification steps.

What is the final correct value of the expression $82 + (3 \times 3 - 2)$?

$$+ (3 \times 3 - 2)?$$

The correct value is 89, obtained by evaluating inside the parentheses first ($3 \times 3 = 9$, then $9 - 2 = 7$), then adding to 82.

How can one prevent errors when solving similar arithmetic expressions?

By carefully following the order of operations, double-checking each step, and correctly applying parentheses to clarify the sequence of calculations.

Additional Resources

Understanding the Step-by-Step Breakdown of the Expression: “ $82 + (3 \times 3 - 2)$ ”

Mathematics is often viewed as a logical and systematic discipline, where clarity in the order of operations is paramount. The expression “ $82 + (3 \times 3 - 2)$ ” appears straightforward but can be a source of confusion, especially when students or learners attempt to evaluate it without a clear understanding of the prescribed order of operations. This detailed review aims to dissect the problem, analyze each step, and identify precisely where the first mistake can occur, providing insights into common pitfalls and best practices.

Introduction to the Expression and Its Components

The expression in question is:

$$> 82 + (3 \times 3 - 2)$$

At first glance, this appears to involve a combination of addition, multiplication, and subtraction, enclosed within parentheses. The goal is to evaluate this expression accurately, adhering to the standard order of operations, often remembered by the acronym PEMDAS (Parentheses, Exponents, Multiplication and Division, Addition and Subtraction).

Key components:

- The number 82
- The parentheses: $(3 \times 3 - 2)$
- Inside the parentheses:
- Multiplication: 3×3

- Subtraction: result of the multiplication minus 2
- Final addition: 82 plus the result of the parentheses

Understanding the Order of Operations

Before diving into the step-by-step evaluation, it is crucial to reaffirm the order of operations:

1. Parentheses: Simplify expressions inside parentheses first.
2. Exponents: Evaluate any exponents next.
3. Multiplication and Division: From left to right.
4. Addition and Subtraction: From left to right.

Applying these rules ensures consistency and correctness across all evaluations.

Step-by-Step Evaluation of the Expression

Let's analyze each step explicitly.

Step 1: Evaluate Inside the Parentheses

The expression inside the parentheses is:

$$> (3 \times 3 - 2)$$

- First, perform the multiplication:
 $3 \times 3 = 9$
- Next, perform the subtraction:
 $9 - 2 = 7$

So, the parentheses simplify to 7.

Result after Step 1:

$$> 82 + 7$$

Step 2: Final Addition

- Add 82 and 7:
- $82 + 7 = 89$

Final answer: 89

Where Does a Mistake First Occur? An In-Depth Analysis

Given that the steps are straightforward when following PEMDAS, the question arises: At which step does a mistake first occur? To answer this, we must analyze common errors made during such evaluations.

Common Mistakes and Their Origins

1. Misinterpretation of Parentheses

- Error: Attempting to perform addition or subtraction inside parentheses before multiplication.
- Incorrect approach:
 - Treating the expression inside parentheses as 3, then multiplying, then subtracting, without following the order.
 - For example, mistakenly doing $3 - 2$ first, then multiplying by 3.
- Why this is wrong:
 - According to PEMDAS, multiplication inside parentheses should be performed before subtraction.
- Impact:
 - Leads to an incorrect intermediate result, which propagates to the final answer.

2. Ignoring the Order of Operations Within Parentheses

- Error: Performing subtraction before multiplication.
- Incorrect approach:
 - Evaluating $(3 \times 3 - 2)$ as $(3 - 2) \times 3$ or similar.

- Why this is wrong:
- The multiplication operator has higher precedence than subtraction inside parentheses.
- Impact:
- Results in an entirely different value, e.g., $(3 - 2) \times 3 = 1 \times 3 = 3$, which is incorrect.

3. Misreading the Expression or Misplacing Parentheses

- Error: Confusing the expression structure, leading to incorrect grouping.
- For example, interpreting as $82 + 3 \times (3 - 2)$ or $82 + (3 \times (3 - 2))$
- Why this is problematic:
- The order of operations depends heavily on parentheses placement.
- Misreading can cause evaluation of parts out of order.
- Impact:
- Significantly alters the computational path and result.

Pinpointing the First Mistake

The first mistake typically occurs in the initial steps involving parentheses.

- If a learner fails to evaluate inside parentheses correctly, the error propagates throughout.
- Most common mistake: Performing subtraction before multiplication inside parentheses without recognizing the precedence, or neglecting parentheses altogether.

For example:

Suppose someone tries to evaluate:

> $82 + (3 \times 3 - 2)$

but mistakenly:

- First, subtract 2 from 3: $3 - 2 = 1$
- Then multiply: $1 \times 3 = 3$

This is incorrect because it treats the expression as if the parentheses are just around "3" and "-2", ignoring the multiplication priority.

Alternatively, they might:

- Perform the subtraction first (incorrectly), then multiply:

$$> (3 - 2) \times 3 = 1 \times 3 = 3$$

which is not the correct interpretation of the original expression.

This demonstrates that the mistake first occurs in interpreting the parentheses—specifically, in the handling of the multiplication versus subtraction.

Why Is This Mistake Critical?

Understanding where and how errors occur is essential for mastering mathematical operations:

- Misinterpretation of parentheses can lead to fundamentally wrong evaluations.
- Incorrect application of order of operations results in the wrong intermediate value, skewing the final result.
- Recognizing the correct sequence ensures accuracy and consistency.

Educational Implications and Learning Strategies

1. Emphasize the Importance of Parentheses

- Reinforce that parentheses dictate the first step, and all operations inside must follow the order of operations.
- Use visual aids or colored brackets to highlight the scope of operations.

2. Practice with Variations

- Provide exercises where parentheses are placed differently to challenge understanding.
- Encourage learners to verbalize the steps to reinforce comprehension.

3. Highlight Common Errors

- Discuss typical mistakes openly.
- Use error analysis to teach students to identify and correct misconceptions.

4. Use Step-by-Step Problem Solving

- Encourage writing each step explicitly.
- Check intermediate results before proceeding.

Summary of the Key Points

- The expression " $82 + (3 \times 3 - 2)$ " should be evaluated by first solving inside parentheses.
- Inside parentheses:
 - Multiply $3 \times 3 = 9$
 - Subtract 2 from $9 = 7$
- Final addition:
 - $82 + 7 = 89$

The first mistake occurs if someone misinterprets the order within the parentheses, such as:

- Performing subtraction before multiplication when it should come after.
- Ignoring parentheses altogether and evaluating operations out of order.
- Misreading the expression structure leading to incorrect grouping.

Therefore, the critical point of error lies in correctly applying the order of operations within parentheses, especially in the step where multiplication and subtraction coexist.

Conclusion

Understanding exactly where a mistake first occurs in evaluating " $82 + (3 \times 3 - 2)$ " reveals the importance of attentiveness to the rules governing the order of operations. While the steps themselves are simple, misapplication or misreading can lead to errors from the very beginning, typically at the parentheses. Recognizing and correcting these common pitfalls enhances mathematical competence and confidence. By practicing explicit, step-by-step evaluations and emphasizing the hierarchy of operations, learners can avoid these errors and arrive at the correct answer of 89 with consistency.

Remember: Always evaluate expressions inside parentheses first, respecting the order of multiplication and subtraction, to ensure accurate calculations.

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