

# for the following problem which operation should be done first

**for the following problem which operation should be done first** is a fundamental question in mathematics and arithmetic that ensures accurate computation and problem-solving. Understanding the correct sequence of operations is crucial for students, educators, and professionals alike, as it prevents errors and confusion when evaluating expressions. This article explores the rules and reasoning behind operation precedence, commonly known as the order of operations. By examining the hierarchy of operations such as addition, subtraction, multiplication, division, exponents, and parentheses, the reader will gain clarity on which operation to perform first in any given problem. The article also covers mnemonic devices, common pitfalls, and practical examples to reinforce the concept. A clear comprehension of this topic enhances mathematical fluency and problem-solving efficiency. The following sections will guide through these essential aspects in detail.

- Understanding the Order of Operations
- Role of Parentheses and Grouping Symbols
- Priority of Exponents and Roots
- Multiplication and Division Precedence
- Addition and Subtraction Placement
- Common Mistakes and How to Avoid Them
- Practical Examples Demonstrating Which Operation to Do First

## Understanding the Order of Operations

The question of **for the following problem which operation should be done first** is directly answered by understanding the order of operations, a universally accepted sequence for evaluating mathematical expressions. This order ensures consistency and correctness in calculations. The standard hierarchy is often remembered by the acronym PEMDAS, which stands for Parentheses, Exponents, Multiplication, Division, Addition, and Subtraction. This sequence dictates that operations enclosed in parentheses are performed first, followed by exponents, then multiplication and division (from left to right), and finally addition and subtraction (also from left to right).

Without following this order, different people might interpret the same expression differently, leading to inconsistent results. For example, the expression  $6 + 3 \times 4$  could yield 36 if addition were done first, or 18 if multiplication is done first. The order of operations resolves such ambiguities.

## Significance of the Order

The order of operations provides a clear guideline that helps in solving complex problems systematically. It eliminates guesswork and ensures mathematical expressions are universally interpreted the same way. This is especially important in advanced mathematics, programming, and scientific calculations where precision is critical.

## Role of Parentheses and Grouping Symbols

One of the first steps in determining **for the following problem which operation should be done first** involves identifying parentheses or other grouping symbols. Parentheses ( ), brackets [ ], and braces { } indicate operations that must be performed prior to anything outside these symbols. This grouping mechanism overrides the typical order of operations by prioritizing the operations contained within.

Parentheses not only clarify the intended computations but also allow for modification of the natural precedence when necessary. Operations inside nested parentheses are resolved from the innermost to the outermost.

## Types of Grouping Symbols

- **Parentheses ( )**: Most common, indicate highest priority grouping.
- **Brackets [ ]**: Usually used for nested groups within parentheses.
- **Braces { }**: Used for further nesting or sets in advanced mathematics.

## Priority of Exponents and Roots

After resolving any operations within parentheses, the next step in determining **for the following problem which operation should be done first** involves evaluating exponents and roots. Exponents represent repeated multiplication and have higher precedence than multiplication or division. This includes square roots and other radical expressions, which are often treated similarly.

For example, in the expression  $3 + 2^3 \times 4$ , the exponent  $2^3$  is calculated first, resulting in 8, before multiplication and addition take place. This step is essential because exponents can significantly change the value of the expression if not correctly prioritized.

## Handling Roots and Fractional Exponents

Roots such as square roots ( $\sqrt{\phantom{x}}$ ) are often seen as fractional exponents (e.g.,  $\sqrt{x}$  equals  $x^{(1/2)}$ ) and thus take the same precedence as exponents. When both roots and exponents appear, they should be evaluated prior to multiplication, division, addition, or subtraction.

# Multiplication and Division Precedence

Once parentheses and exponents are resolved, attention turns to multiplication and division, which share the same level of priority. For **for the following problem which operation should be done first**, multiplication and division must be performed from left to right as they appear in the expression. They are evaluated before addition and subtraction but after parentheses and exponents.

This left-to-right rule is critical because multiplication and division are of equal precedence; the first operation encountered when reading from left to right should be performed first.

## Example of Left-to-Right Evaluation

Consider the expression  $20 \div 4 \times 5$ . According to the order of operations, division and multiplication are performed in order from left to right. Therefore,  $20 \div 4$  is evaluated first, resulting in 5, followed by  $5 \times 5$ , which equals 25.

# Addition and Subtraction Placement

The lowest priority operations in the order of operations are addition and subtraction. Similar to multiplication and division, these two operations share the same precedence and are performed from left to right. Determining **for the following problem which operation should be done first** means recognizing that addition or subtraction come last after all other higher-priority operations have been completed.

Failure to follow this sequence can lead to incorrect answers, especially in expressions that combine multiple arithmetic operations.

## Left-to-Right Rule for Addition and Subtraction

In the expression  $10 - 3 + 2$ , subtraction is performed first because it appears first from the left, resulting in 7, then addition of 2 gives a final result of 9. This left-to-right approach must always be applied to ensure accuracy.

## Common Mistakes and How to Avoid Them

Many errors in mathematical calculations stem from misunderstanding **for the following problem which operation should be done first**. One common mistake is performing operations strictly in the order they appear without regard to precedence. Another is ignoring parentheses or incorrectly handling nested grouping symbols.

Students often confuse the order between multiplication and division or addition and subtraction, forgetting the left-to-right rule. Additionally, neglecting to evaluate exponents before multiplication or division leads to inaccuracies.

## Strategies to Prevent Errors

- Always identify and solve operations inside parentheses first.
- Use mnemonic devices such as PEMDAS or BODMAS to remember the order of operations.
- Perform multiplication and division sequentially from left to right, not prioritizing one over the other.
- Apply the same left-to-right rule for addition and subtraction.
- Double-check expressions with multiple nested parentheses or exponents.

## Practical Examples Demonstrating Which Operation to Do First

To fully grasp **for the following problem which operation should be done first**, it is beneficial to review practical examples that illustrate the order of operations in action. These examples highlight how the rules are applied in various contexts.

### Example 1: Simple Expression

Evaluate  $8 + 2 \times 5$ .

Step 1: According to the order of operations, multiplication is done before addition.

Step 2: Multiply  $2 \times 5 = 10$ .

Step 3: Add  $8 + 10 = 18$ .

### Example 2: Expression with Parentheses and Exponents

Evaluate  $(3 + 5)^2 \div 4$ .

Step 1: Calculate inside the parentheses:  $3 + 5 = 8$ .

Step 2: Evaluate the exponent:  $8^2 = 64$ .

Step 3: Divide:  $64 \div 4 = 16$ .

### Example 3: Complex Expression

Evaluate  $10 - 2 \times (6 \div 3)^2 + 4$ .

Step 1: Inside parentheses, divide  $6 \div 3 = 2$ .

Step 2: Exponentiate:  $2^2 = 4$ .

Step 3: Multiply:  $2 \times 4 = 8$ .

Step 4: Perform subtraction and addition from left to right:  $10 - 8 + 4$ .

Step 5:  $10 - 8 = 2$ , then  $2 + 4 = 6$ .

These examples demonstrate how following the correct order of operations ensures precise and consistent results in solving mathematical problems.

## Frequently Asked Questions

**For the following problem  $3 + 5 \times 2$ , which operation should be done first?**

Multiplication should be done first according to the order of operations, so calculate  $5 \times 2$  before adding 3.

**In the expression  $(4 + 6) \div 2$ , which operation should be performed first?**

The operation inside the parentheses,  $4 + 6$ , should be done first.

**For the problem  $8 - 3 \times 4 + 2$ , which operation should be done first?**

Multiplication should be done first, so calculate  $3 \times 4$  before performing addition and subtraction.

**In the expression  $12 \div 3 + 5 \times 2$ , which operation should be performed first?**

Both division and multiplication have the same precedence, so perform them from left to right: first  $12 \div 3$ , then  $5 \times 2$ .

**For the problem  $7 + 2 \times (3 + 5)$ , which operation should be done first?**

Calculate the expression inside the parentheses,  $3 + 5$ , first.

**In the expression  $9 - 4 \div 2 + 6$ , which operation should be done first?**

Division should be done first, so calculate  $4 \div 2$  before subtraction and addition.

# Additional Resources

## 1. *Order of Operations Made Easy*

This book breaks down the concept of order of operations into simple, understandable steps. It uses clear explanations and plenty of examples to help students grasp which mathematical operations to perform first in complex expressions. Perfect for beginners, it builds a solid foundation for solving equations correctly.

## 2. *The Secrets of PEMDAS*

Focusing on the widely used PEMDAS rule (Parentheses, Exponents, Multiplication and Division, Addition and Subtraction), this book clarifies common misconceptions and pitfalls. It includes practice problems and tips to remember the sequence, making it easier for learners to apply the rule confidently.

## 3. *Mastering Mathematical Operations*

This comprehensive guide covers fundamental operations in mathematics, emphasizing the importance of performing them in the correct order. It explores how different operations interact and offers strategies for tackling complex problems step-by-step.

## 4. *Math Rules You Need to Know*

Aimed at middle school students, this book introduces essential math rules, including the order of operations. It uses colorful illustrations and real-life examples to demonstrate why the sequence of operations matters in everyday math problems.

## 5. *Step-by-Step Math Problem Solving*

This book teaches students how to approach math problems systematically by following the correct operational order. It offers detailed walkthroughs of problems involving multiple operations and highlights common errors to avoid.

## 6. *Mathematics: The Language of Operations*

Exploring the logic behind mathematical operations, this book delves into why the order of operations is critical for accurate results. It connects mathematical theory with practical application to deepen understanding.

## 7. *The Beginner's Guide to Algebraic Expressions*

Focusing on algebraic expressions, this book explains how to apply the order of operations when variables and numbers are combined. It provides plenty of practice problems and explains how to simplify expressions correctly.

## 8. *Fun with Numbers: Understanding Operations*

Designed for younger learners, this book uses games and interactive activities to teach the order of operations. It encourages hands-on learning and helps children see the importance of doing operations in the right sequence.

## 9. *From Addition to Exponents: A Math Journey*

This book takes readers on a journey through basic to advanced operations, highlighting the correct order to perform them. It includes historical context and practical exercises to reinforce the concept of operational hierarchy.

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