Order of Operations (DMAS/BODMAS/PEMDAS)

i. Definition and Explanation

What is the Order of Operations? Imagine you have a math problem with many different operations, like $5 + (6 - 2) \times 3^2$. How do you know what to solve first? Do you add, subtract, multiply, or handle the exponent?

The Order of Operations is a set of universal rules that tell us the correct sequence to solve a mathematical expression. Following these rules ensures that everyone who solves the same problem gets the same correct answer. It's like the grammar of mathematics!

We use acronyms to remember this order:

- PEMDAS (Common in the US)

- BODMAS (Common in the UK, India, and Australia)

- DMAS (A simpler version focusing on the four basic operations)

All these acronyms represent the same set of rules.

ii. Key Points and Important Terms

The letters in the acronyms stand for the operations you must perform, in order.

PEMDAS	BODMAS	Meaning
Parentheses	**B**rackets	First, solve anything inside grouping symbols like ( ), [ ], or { }. If there are multiple sets, work from the innermost set outwards.
Exponents	**O**rders	Next, solve any exponents (powers, squares, square roots). For example, 3^2 or $\sqrt{9}$.
Multiplication and **D**ivision	**D**ivision and **M**ultiplication	Then, solve all multiplication and division from left to right, whichever comes first in the expression. These are a pair and have equal importance!
Addition and **S**ubtraction	**A**ddition and **S**ubtraction	Finally, solve all addition and subtraction from left to right, whichever comes first in the expression. These are also a pair with equal importance!

The Most Important Rule:

- Multiplication and Division are partners. You don't always do multiplication first; you solve them as they appear from left to right.
- Addition and Subtraction are partners. You don't always do addition first; you solve them as they appear from left to right.

iii. Detailed Examples with Solutions

Example 1: Basic Operations

Solve: 10 + 6 × 2

Multiplication (M comes before A in PEMDAS) 10 + (6 × 2) -> 10 + 12

Addition 10 + 12 = 22

Final Answer: 22

Example 2: Using Parentheses

Solve: (10 + 6) × 2

Parentheses (P is the very first step) (10 + 6) -> 18 × 2

Multiplication 18 × 2 = 36

Final Answer: 36 (Notice how the parentheses changed the answer from Example 1!)

Example 3: With Exponents and Division

Solve: 30 ÷ 5 + 4² - 1

Exponents (E comes after P, but there are no parentheses)
4² = 16 -> 30 ÷ 5 + 16 - 1

Division (D comes before A and S) 30 ÷ 5 = 6 -> 6 + 16 - 1

Addition (A/S are solved left to right. Addition comes first here.)
6 + 16 = 22 -> 22 - 1

Subtraction 22 - 1 = 21

Final Answer: 21

Example 4: Complex Expression

Solve: 20 - [(4 + 6) ÷ 2] × 3

Innermost Parentheses (Solve the round brackets ( ) first) 4 + 6 = 10 -> 20 - [10 ÷ 2] × 3

Brackets (Now solve what's inside the square brackets [ ]) 10 ÷ 2 = 5 -> 20 - 5 × 3

Multiplication (M comes before S) 5 × 3 = 15 -> 20 - 15

Subtraction 20 - 15 = 5

Final Answer: 5

iv. Summary of Main Concepts

- **Always follow the order:** PEMDAS/BODMAS is the rulebook for solving math expressions.

- **Work from the inside out:** If you have nested parentheses [( )], solve the innermost set first.

- **Partners with equal rank:**

  ✓ Multiplication and Division are a pair. Solve them from left to right.

  ✓ Addition and Subtraction are a pair. Solve them from left to right.

- **One step at a time:** Write down each step clearly to avoid mistakes. Underline or circle the part of the problem you are solving in each step.