Chapter 1.1.3: Order of Operations and Introduction to Expressions

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Order of Operations

When we have expressions with multiple operations, we cannot simplify them in any order we would like. We must follow **the order of operations**.

PE(MD)(AS) is a mnemonic device to remember the order of operations. This means that the order is:

P - Parentheses

E - Exponents (this will be incorporated later)

(MD) - Multiplication and Division (taken together from left to right)

(AS) - Addition and Subtraction (taken together from left to right)

Order of Operations

NOTE: Scientific calculators will perform the correct order of operations. However, take care when entering calculations as part of a fraction into a calculator, and use brackets around the denominator and numerator of any fractions involving calculations.

Examples:

- $10 + 4(2 - (-3))$
- $-2 - 5 - 2(-2 \cdot 3 - 4)$
- On Your Own: $3(1\frac{1}{4} - \frac{5}{12}) - \frac{1}{2}$

Introduction to Expressions

Expression: An expression is a combination of numbers, variables (letters that represent numbers), operations and parentheses that can be evaluated when 'appropriate' numbers are substituted in place of the variables following the order of operations which will be discussed.

Variables: letters that represent numbers

Given an expression, we can evaluate it by replacing every instance of a variable with a single number. Which numbers are being substituted for which variables should be made clear in the wording. This will be more important when we look at examples with more than one variable.

Introduction to Expressions

Examples:

- Evaluate the expression $5x + 1 - 3(-x + 2)$ at $x = 2$.
- Evaluate $\frac{1}{2}a(b + c)$ when $a = 6$, $b = 8$, and $c = 1$.