

Section 1.5: Order of Operations

P	E	M	D	A	S
Parentheses	Exponents	Multiplication	Division	Addition	Subtraction

Rules for the Order of Operations:

1. Operations that are within parentheses and other grouping symbols are performed first. These operations are performed in the order established in the following steps. If grouping symbols are nested, evaluate the expression within the innermost grouping symbol first and work outward.
2. Exponential expressions and roots are evaluated first.
3. Multiplication and division are performed next, moving left to right and performing these operations in the order that they occur.
4. Addition and subtraction are performed last, moving left to right and performing these operations in the order that they occur.

Upon removing all of the grouping symbols, repeat the steps 2 through 4 until the final result is obtained.

Examples:

1. $(3 + 7)^2 - 8 \cdot 9$

2. $12 \div 6 + 2 - 10 \cdot 2$

3. $8 \cdot 3 \div 2 + 9 - 4 \cdot 4 + 5^2 - 10 \cdot (2 - 4)$

4. $\frac{(3 - 6)^3 - (-2 + 4)^3}{5}$

5. $\frac{4(-5) + 1.5 \cdot (-4)}{(5^2 - 15) + (-3 - 5)}$

6. $4 \div \left[\frac{3 + 7(-5 + 6)}{6} \right]$

7. $(2^3 - 5)(1^{15} + 3) + 3\sqrt{7^2}$

8. $|3 \cdot (2^4 - 5) - 8^2|$

9. Evaluate the expression if $a = -2, b = \frac{1}{3}, c = 6, d = 2$

$b(a^3d - bc - c^2) =$