

Order of Operations

Objective 1

Understand the Four Steps of Order of Operations

Problems often have parenthesis, exponents, and arithmetic operations that we need to perform in a specific order. WE always work these problems following the four steps of Order of Operations.

Step 1: Perform all the operations within a **parenthesis** or other **grouping symbols**.

Step 2: Simplify any expressions with **exponents**.

Step 3: **Multiply** or **divide** working left to right, whichever comes first.

Step 4: **Add** or **subtract** working left to right, whichever comes first.

Objective 2

Use the Order of Operations

Example 1: Evaluate each expression below following the Order of Operations.

a) $8 - 5 + 1$

b) $8 - (5 + 1)$

c) $8 + 5 - 1$

Example 2: Evaluate each expression.

$$a) 3^3 - 5^2 \div 5$$

$$b) 6^2 - (4 - 3)^{10}$$

Example 3: Evaluate.

$$7^2 - [(4^2 - 5) - 6] + 10$$

Objective 3

Understand when Parenthesis are needed to define a negative Base.

When evaluating the expression -3^2 , we must pay close attention to what the base is. In the expression -3^2 , the base is positive 3. This is because $-3^2 = -1 \cdot 3^2$.

Note: -3^2 is said "Negative one times three squared".

To correctly evaluate -3^2 , we must follow the Order of Operations and evaluate the exponent before we multiply by -1 .

$$-3^2 = -1 \cdot 3^2 = -1 \cdot 9 = -9$$

Note:
Negative x Positive = Negative

If the base is to be -3 , then parenthesis must be used to indicate this.

$$(-3)^2 = (-3)(-3) = 9$$

Answer the following homework questions.

In Exercises 1 - 9, evaluate each expression.

1) $4^2 - (13 - 10)^2$

4) $3 - 2^2 \div 4 \cdot 2$

7) -5^2

2) $3 + 4[17 - 2(5 - 1)]$

5) $2^3 + 3^3 \div 9 - 2$

8) $(-8)^2$

3) $5[36 \div 2(5^2 - 4^2)]$

6) $48 \div 2^3 \cdot 9 - 2^3$

9) -12^0