The Order of Operations Agreement

Step 1	Perform operations inside grouping symbols. Grouping symbols include parentheses ( ), brackets [ ], braces { }, and the fraction bar (division line).
Step 2	Simplify exponential expressions (including those under a radical sign).
Step 3	Do multiplication and division as they occur from left to right.
Step 4	Do addition and subtraction as they occur from left to right.

The following three examples illustrate applications of the steps in the Order of Operations Agreement.

I. <u>Example 1</u>.   Evaluate $12 - 24(8 - 5) \div 2^2$

1. Perform operations inside grouping symbols: $12 - 24\underbrace{(8 - 5)} \div 2^2$

2. Simplify exponential expressions: $12 - 24(3) \div \underbrace{2^2}$

3. Do multiplication and division as they occur from left to right: $12 - \underbrace{24(3)} \div 4$
$$12 - \underbrace{72 \div 4}$$
$$12 - 18$$

4. Do addition and subtraction as they occur from left to right: $\underbrace{12 - 18} = -6$. Do this last step mentally.

One or more of the above steps may not be needed to evaluate an expression. In that case, proceed to the *next* step in the Order of Operations Agreement.

II. <u>Example 2</u>.   Evaluate $\dfrac{4 + 8}{2 + 1} - (3 - 1) + 2$.

1. Perform operations inside grouping symbols: $\underbrace{\dfrac{4 + 8}{2 + 1}} - \underbrace{(3 - 1)} + 2$

3. Do multiplication and division as they occur from left to right: $\underbrace{\dfrac{12}{3}} - 2 + 2$

4. Do addition and subtraction as they occur from left to right: $\underbrace{4 - 2} + 2$
$$2 \quad + 2 = 4. \text{ Do this step men-}$$
tally.

When an expression has grouping symbols inside grouping symbols, perform the operations inside the *inner* grouping symbols first.

III. <u>Example 3</u>.   Evaluate $6 \div [4 - (6 - 8)] + 2^2$.

1. Perform operations inside grouping symbols: $6 \div [4 - \underbrace{(6 - 8)}] + 2^2$
$$6 \div [4 - \underbrace{(-2)}] + 2^2$$
$$6 \div \underbrace{(4 + 2)} + 2^2$$
$$6 \div 6 + 2^2$$

2. Simplify exponential expressions: $6 \div 6 + \underbrace{2^2}$

3. Do multiplication and division as they occur from left to right: $\underbrace{6 \div 6} + 4$
$$1 \quad + 4$$

4. Do addition and subtraction as they occur from left to right: $1 + 4 = 5$. Do this step mentally.