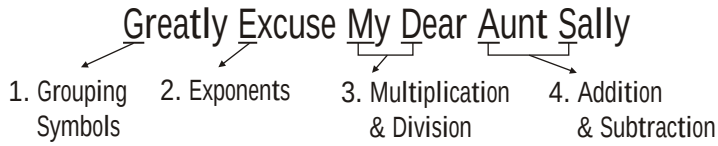
Algebra Basics

Section 3.8
Order of Operations for Algebraic Expressions

You've already practiced using the correct order of operations for signed numbers. Now, let's look at how to use the correct order of operations for simplifying algebraic expressions. Simplifying these types of problems is not brain surgery. You just have to be careful. Do you remember this silly sentence?



Example 1: Simplify $2x + y - 5(x + 4y)$

You have already reviewed all of the skills you need to solve this problem. Now all you have to remember is the order. Study the steps below.

$2x + y \boxed{-5(x + 4y)}$

Grouping symbols must be simplified first. In this problem, the parentheses are a grouping symbol. The terms in the parentheses cannot be combined because they are not *like terms*, BUT you can use the distributive property to multiply both terms by the constant outside of the parentheses.

Be careful with the 5 outside the parentheses. The negative sign goes with the number and must be distributed to both terms inside the parentheses.

$2x + y + \boxed{(-5) \cdot x} + \boxed{(-5) \cdot 4y}$

Multiplication is the next operation to perform.

$2x + y - 5x - 20y$

Use the associative and commutative properties to rearrange the terms and to group like terms together.

$\boxed{(2x - 5x)} + \boxed{(y - 20y)}$

The last step is to combine like terms using addition and subtraction.

$-3x - 19y$

This expression is now simplified!

Example 2: Simplify $6x - \dfrac{5x + x}{2 + 1}$

Now the grouping symbol is the fraction bar. Look at the steps below.

$6x - \dfrac{\boxed{5x + x}}{\boxed{2 + 1}}$ — Since the fraction bar is a grouping symbol, the operations above the bar and below the bar must be performed first. Combine the like terms.

$6x - \dfrac{6x}{3}$

② $6x - \boxed{\dfrac{3 \cdot 2 \cdot x}{3}}$ — Now factor the numerator. Three is a common factor that will cancel out.

$\boxed{6x - 2x}$ — These are like terms that can be combined by subtraction (also known as "collecting terms").

$4x$ — The expression simplifies to $4x$.

Practice

Simplify the following algebraic expressions by using the correct order of operations. Show your work. Record your answers in the blanks.

1. $5(3x + 4) + x$ _____	2. $-3(x - y) - 2x + y$ _____	3. $3x - 8 - (x - 3)$ _____
4. $6x + \dfrac{2x - 4}{2}$ _____	5. $\dfrac{3x - 9x}{3} - 2x$ _____	6. $2x - \dfrac{6x - 9}{3}$ _____