Chapter 1 Section 5

The Order of Operations Agreement

More than one operation may occur in a numerical expression. For example, the expression

$$4 + 3(5)$$

includes two arithmetic operations, addition and multiplication, The operations could be performed in different orders.

If we multiply first and then add, we have:

$4 + 3(5)$
$4 + 15$
19

If we add first and then multiply, we have:

$4 + 3(5)$
$7(5)$
35

To prevent more than one answer to the same problem, an Order of Operations Agreement is followed. By this agreement, 19 is the only correct answer.

The Order of Operations Agreement:

Step 1: Do all operations in parentheses

Step 2: Simplify any numerical expressions containing exponents

Step 3: Do all multiplication or division as they occur from left to right.

Step 4: Do addition and subtraction as they occur from left to right.

Or, you could just remember the following acronym:

PEMDAS

Which stands for:

Please	**P = parentheses**
Excuse	**E = exponents**
My	**M = Multiplication *or***
Dear	**D = division**
Aunt	**A = addition *or***
Sally	**S = subtraction**

(*This makes it much easier to remember…)*

Here are some examples:

Simplify: $2(4+1)-2^3 + 6 \div 2$

	$2(4+1) -2^3 + 6 \div 2$
Perform operations in parentheses:	$= 2(5) - 2^3 + 6 \div 2$
Simplify expressions with exponents:	$= 2(5) - 8 + 6 \div 2$
Do multiplication or division L $\rightarrow$ R:	$= 10 - 8 + 6 \div 2$
Do addition or subtraction L $\rightarrow$ R:	$= 2 + 3$
	$= 5$

Examples:

Simplify: $18 \div (6+3) * 9 - 4^2$

$18 \div (6+3) * 9 - 4^2$

$= 18 \div 9 * 9 - 4^2$

$= 18 \div 9 * 9 - 16$

$= 2 * 9 - 16$

$= 18 - 16$

$= 2$

Simplify: $20 + 24(8-5) \div 2^2$

$= 20 + 24(3) \div 2^2$

$= 20 + 72 \div 4$

$= 20 + 18$

$= 38$