Pre-Algebra
Order of Operations

To the non-mathematician, there may appear to be multiple ways to evaluate an algebraic expression. For example, how would one evaluate the following?

$$3 \cdot 4 \cdot 7 + 6 \cdot 5^2$$

You could work from left to right, or you could work from right to left, or you could do any number of other things to evaluate this expression. As you might expect, mathematicians do not like this ambiguity, so they developed a set of rules to make sure that any two people evaluating an expression would get the same answer.

PEMDAS

In order to evaluate expressions like the one above, mathematicians have defined an order of operations that must be followed to get the correct value for the expression. The acronym that can be used to remember this order is **PEMDAS**. Alternatively, you could use the mnemonic phrase "**P**lease **E**xcuse **M**y **D**ear **A**unt **S**ally" or make up your own way to memorize the order of operations. The components of **PEMDAS** are:

P Anything in **P**arentheses is evaluated first.
E Items with **E**xponents are evaluated next.
M **M**ultiplication and …
D **D**ivision are performed next.
A **A**ddition and …
S **S**ubtraction are performed last.

Usually when there are multiple operations in the same category, for example 3 multiplications, they can be performed in any order, but it is easiest to work from left to right.

Parenthetical Device. A useful device is to use apply parentheses to help you remember the order of operations when you evaluate an expression. Parentheses are placed around the items highest in the order of operations; then solving the problem becomes more natural. Using PEMDAS and this parenthetical device, we solve the expression above as follows:

Initial Expression:	$3 \cdot 4 \cdot 7 + 6 \cdot 5^2$
Add parentheses/brackets:	$= (3 \cdot 4 \cdot 7) + [6 \cdot (5^2)]$
Solve using PEMDAS:	$= (84) + (6 \cdot 25)$
	$= (84) + (150)$
Final Answer	$= 234$

Note: Any expression which is ambiguous, like the one above, is poorly written. Students should strive to ensure that any expressions they write are easily understood by others and by themselves. Use of parentheses and brackets is a good way to make your work more understandable.