MA 1A	Mathematics Embedded Credit
Cape Career & Technology Center	Last Update: September 2004
Topic: Integers	Focus: Order of Operations

Show-Me Standards: MA1, MA5	MO Grade Level Expectations: N2b9, N2C9	NTCM Standard: 2A

OBJECTIVE: Students will be able to use proper order of numeric operations to solve and/or simplify arithmetic and algebraic problems.

Introduction: When working with an arithmetic expression such as 12 + 3 / 5, or an algebraic equation such as 3x + 9 = 18, there is an established order for the arithmetic operations to be performed. If the proper order of operations is not followed, an incorrect answer may result.

When solving, or simplifying, an arithmetic expression, the following order of operations needs to be followed. Each level will be repeated until that operation is no longer used.

RULES FOR ORDER OF OPERATIONS

Operations *MUST* be performed in this order:

- 🕮 Start with grouped symbols, starting with the innermost parentheses and working outward.
- 🕮 Next, perform powers and roots in any order.
- 🕮 Then, multiplication and division in order from *LEFT* to *RIGHT*.
- 🕮 Finally, addition and subtraction in order from *LEFT* to *RIGHT*.

EXAMPLE:

Simplify the following: $4-3^2-(3-2^2+1)$

Step #1: Work inside the parentheses. $(3-2^2+1) = (3-4+1) = (-1+1) = 0$

Step #2: Work out powers and roots. $4-3^2-0 = 4-9-0$

Step #3: Addition and subtraction in order from LEFT to RIGHT. $4-9-0 = -5-0 = -5$

GUIDED PRACTICE:

1.) $\dfrac{25 \bullet 3+25}{5}$ = _____

2.) $\dfrac{9+3 \bullet 2}{6}$ = _____

3.) $(5+3)^2+\dfrac{144}{12}$ = _____

4.) $32+5 \bullet (90-45 \bullet 2)$ = _____

5.) $15-3 \bullet 2+(\dfrac{8}{4})^2$ = _____

6.) $3^2+3^3\!\!\diagup\!\!9+72\!\!\diagup\!\!(5+4)$ = _____

When solving algebraic equations, the order of operations will be reversed. This reversal of the order of operations allows the process of simplification to work. This topic will be explained later in lesson ***MA 6A (Basic Algebra: Evaluate Expressions).***

See "***RULES OF POWERS***", pg. 198; "***RULES OF ROOTS***", pg. 199; "***RULES OF GROUPING SYMBOLS***", pg. 201-202 and "***ORDER OF OPERATIONS***", pg. 202 for additional help.
(Phagan, J. Applied Mathematics. The Goodheart-Wilcox Co., Tinley Park, IL, 2004.)

GUIDED PRACTICE:

1.) $\frac{25 \bullet 3 + 25}{5} =$ _____

2.) $\frac{9 + 3 \bullet 2}{6} =$ _____

3.) $(5+3)^2 + \frac{144}{12} =$ _____

4.) $32 + 5 \bullet (90 - 45 \bullet 2) =$ _____

5.) $15 - 3 \bullet 2 + (\frac{8}{4})^2 =$ _____

6.) $3^2 + 3^3 \diagup 9 + 72 \diagup (5+4) =$ _____