MA 1B	Mathematics Embedded Credit
Cape Career & Technology Center	Last Update: April 2017
Topic: Integers	Focus: Basic Operations

Show-Me Standards: MA1, MA5	MO Grade Level Expectations: N2B8, N3C8	NCTM Standards: 2A, 3A

OBJECTIVE: Students will be able to solve problems using basic operations with integers.

Introduction: Integers are positive and negative whole numbers and zero. Rules for integers, once mastered, can also be applied to fractions and decimals. Important to your understanding of integers is the use, and concepts, of a number line. Negative numbers can be used to represent many things: direction, payment, loss, and temperature below zero degrees are a few examples of how negative numbers can be used in everyday living.

Mastering the rules for integers will allow you to solve problems using integers. In later lessons these same procedures will be applied to fractions, decimals and other types of equations. The most common problems with solving 'signed number' (integers) problems are recognizing the format for a negative number. Signed numbers, when negative, may be represented in the following ways: (-4); ($^-$4), -4, and $^-$4. Notice that the negative sign may be raised as a 'superscript' or it may remain on the level of the number. Technically, an integer is a negative number if it is represented with a 'superscript' and a 'minus sign' if the integer is not represented with a 'superscript'. You can treat integers represented either way the same, however, without changing the results of the problem. Positive integers are usually NOT represented with the "+" sign. Basically, the world works under the assumption that this sign is understood to be there.

ADDITION RULES:
If the sign of the numbers is the same, add them and keep the common sign.
If the sign of the numbers is different, subtract the smaller number from the larger number and keep the sign of the larger number.
SUBTRACTION RULES:
Change the operation (the "-" sign) to addition and change the sign of the second number. Then follow the rules for addition of integers.
MULTIPLICATION/DIVISION RULES (they are the same):
If the signs are the same, or there is an even number of elements, the answer is positive.
If the signs are different, or there are an odd number of elements, the answer is negative.
MULTI-STEP PROBLEMS:
Treat them the same as a series of one- step problems using the rules stated above.

Many problems in the workplace require several steps to resolve. The key to solving multiple step integer problems is to work them one step at a time. It is recommended that you solve multiple step problems using the one-step method and re-write the problem each time. Many times multiple-step problems are solved incorrectly by an omission of a step as one tries to work the problem "in your head". The method that is demonstrated below (the second example) applies for integers, decimals and fractions. The method used will also work in solving word problems, with a little effort to get the formula out of the wording of the problem. Remember, solving problems like those in the examples below are just for practice; the real world is almost always made up of verbal and/or written word problems.

PRACTICE PROBLEMS:

One-step: $12 + (-10) = 12 - 10 = 2$ $\qquad \frac{-32}{4} = -\left(\frac{32}{4}\right) = -(8) = -8$

Multiple-step: $12 \bullet -3 + \frac{24}{-6} = -36 + \frac{24}{-6} = -36 + (-4) = -36 - 4 = -40$

$$\frac{125}{-25} + -8 = -\left(\frac{125}{25}\right) + -8 = -5 + -8 = -5 - 8 = -13$$

ABSOLUTE VALUE- *a number's distance from zero on a number line. The symbol* |n| *represents " the absolute value of n " and is always either positive or zero since it represents a distance.*

< ----|-------------|---------|------------ >
-5 0 3

$|3| = 3 \qquad |-5| = 5 \qquad |0| = 0$

PRACTICE PROBLEMS:

Evaluate:

$|3ab|$ when $a = -1$ and $b = 4$

$|3(-1)(4)| = |-12| =$ **12**

$|efg|$ when $e = -4$, $f = 2$, and $g = -3$

$|(-4)(2)(-3)| = |24| =$ **24**

$2|6cd| + 7$ when $c = 3$ and $d = -2$

$2|6(3)(-2)| + 7 = 2|-36| + 7 = 2 \cdot 36 + 7 = 72 + 7 =$ **79**

PROBLEMS:

a. $-5+{}^{-}8=$ ______ b. $64+({}^{-}32)=$ ______ c. $45-{}^{-}13=$ ______

d. ${}^{-}84-38=$ ______ e. ${}^{-}98-(-15)=$ ______ f. $6\bullet{}^{-}3=$ ______

g. ${}^{-}12*5=$ ______ h. ${}^{-}3\bullet{}^{-}6=$ ______ i. $\frac{12}{{}^{-}3}=$ ______

j. $\frac{{}^{-}25}{{}^{-}5}=$ ______ k. ${}^{-}53+{}^{-}45/{}^{-}9=$ ______ l. $10*{}^{-}3+10*3=$ ______

m. $14+(8/{}^{-}4)-14-{}^{-}5=$ ______ n. $15/{}^{-}5\bullet(8-{}^{-}5)=$ ______

o. $90+-40\bullet{}^{-}4=$ ______ p. $32-{}^{-}8+(12/{}^{-}6)\bullet{}^{-}2=$ ______

q. $5-{}^{-}5(6-8)^2=$ _______ r. $3+{}^{-}5*(81/{}^{-}9)=$ ______

Evaluate:

s. $|5mn|$ when m = 6 and n = 10 t. $4\,|sq|-5$ when s = -1 and q = 7

_______ _______

See "***RULES OF ADDITION OF SIGNED NUMBERS***", pg. 192; "***RULES OF SUBTRACTION OF SIGNED NUMBERS***", pg. 192; and "***RULES OFMULTIPLICATION/DIVISION OF SIGNED NUMBERS***", pg. 195 for additional help.
(Phagan, J. Applied Mathematics. The Goodheart-Wilcox Co., Tinley Park, IL, 2004.)