Math Institute Summer 2006
Monica Reece
School: Grenada Middle School, Grenada, MS
Grade: 6

Algebraic Expressions

Objective:
1. The student will evaluate numerical and simple algebraic expressions.

I. Evaluating expressions

Introduction: Western Park Mall offers a gift wrapping service. The cost for gift wrapping is found by adding the length and width of the box and multiplying by 5 cents. The teacher will use a table to show how to find the cost of wrapping the most common size boxes.

Length	Width	Length + Width	Costs (cents)
10 12 16 20	4 6 8 10	10 + 4 12 + 6 16 + 8 20 + 10	(10+4) x 5 (12+6) x 5 (16+8) x5 (20+10) x5

In mathematics, **algebra** is a language of symbols. We could modify the table using the letters **L and W.**

Length	**Width**	**Length+Width**	**Costs (cents)**
L	**W**	**L + W**	**(L + W) x5**

- The letters ***L*** and ***W*** are called **variables**. A variable is a symbol, usually a letter, used to represent a number. Any letter may be used as a variable. In this problem ***L*** represents the length and ***W*** represents the width.

- The expression (L x W) x 5 is called an algebraic expression. Algebraic expressions are combinations of variables, numbers, and at least one operation.
  (L + W) x 5 is an algebraic expression for the cost of gift wrapping.

- The variables can be replaced with any number. Once the variables have been replaced, you can **evaluate,** or find the value of, the algebraic expression.

- Example 1: Evaluate 16 + c if c= 32
  16 + c= 16 + 32 (replace c with 32)
  = 48
- Example 2: Evaluate x-y if x= 57 and y= 23
  x-y = 57 – 23 (replace x with 57 and y with 23)
  = 34

In algebra, there are several ways to show multiplication:

$3 \cdot m$ means 3 x m
3m means 3 x m
mn means m x n

Remind students to always use order of operations when evaluating expressions. Also, that these letters are variables that can be replaced with any number.

- Example 3: Evaluate $3m + 2 \bullet 4$ if m= 12

  $3m + 2 \bullet 4 = 3 \times 12 + 2 \bullet 4$ (replace m with 12)

  $= 36 + 2 \bullet 4$ (multiply 3 and 12)

  $= 36 + 8$ (multiply 2 and 4)

  $= 44$ (add 36 and 8)

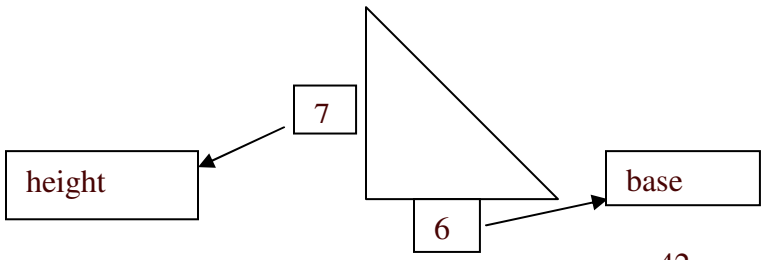
- Example 4: Evaluate $8 + mn$ if m= 6 and n= 2

  $8 + mn = 8 + 6 \times 2$ (replace m with 6 and n with 2)

  $= 8 + 12$ (multiply 6 and 2)

  $= 20$ (add 8 and 12)

- Example 5: Find the area of the triangle. Evaluate: $\frac{bxh}{2}$ if b= 6 and h= 7



$= \frac{42}{2} = 21$

Students use many formulas in math. So, they use many variables without realizing it.

b and ***h*** are variables. The value of b and h change for different triangles.

**Show all of the examples on transparencies using the overhead projector.

- The students will complete the following practice items:

  Evaluate each expression if r = 6, s = 12, and t = 3

  1) t x 18 2) s – r + t 3) 4 + 2r 4) s – 2r ÷t
  5) rt - s

II. Calculator activity

The teacher will explain that graphing calculators follow the order of operations. So, the students can enter algebraic expressions as written. Discuss with the students the different symbols that are used for multiplication and division. For example, the * and ( ) can be used to show multiplication, and the / for division. Tell the students that the expression appears on the screen as they enter it. Each student will work with a partner.

Example: Evaluate 3(x-6) + 1 if x= 8

Talk the students through the steps by saying aloud what buttons to push. Say: Push 3 open parentheses, 8 minus symbol 6, close parentheses, plus symbol 1, and enter key. Discuss the answer or answers the students got. Help students make any necessary corrections. Tell the students that they can use the arrow keys to highlight what's incorrect and type over it, or by using the DEL (delete) key. Say: You can also correct the expression without re-entering it. Press the 2^{nd} [ENTRY] key. Then use the arrow keys to move to the location of the error. After you make the correction, press [ENTER].

Use a graphing calculator to evaluate each expression if x= 4, y= 7, and z= 9

1) $x \div 2 + 12$ 2) xy 3) $x(y + z) - x$

4) $2(z - x)/(y - 2)$ 5) $x + 9$

The teacher will tell the students to rewrite the expression with the number that replaces the variable. Then use the calculator to enter the expression.

**Note: This lesson is designed to introduce students to use of variables in expressions, since they will use variables to solve

equations. Students don't use graphing calculators much in sixth grade, but it is good to start with basic activities that will prepare them and help them feel comfortable using a graphing calculator as they progress in the higher grade levels.

Assessment:
1. The student will complete performance tasks.
2. The student will complete an activity sheet evaluating expressions using given values for a grade.

Materials:
Teacher-made transparencies
Overhead projector
Activity sheet (attachment 1)
Graphing calculator

References:
Glencoe Mathematics (2001) McGraw-Hill Publishing

Attachment 1

Evaluate each expression if x=5, y= 4, and z= 3.

1. $x + 3$

2. $10 – z$

3. $x – 2 + 3$

4. $x + z$

5. $xz – 4$

6. $z + y$

7. $x + z \div y$

8. $x – x + 4$

9. $4 \cdot x$

10. $yz - 10$