

Building the Largest (or Smallest) Number

Purpose

Students will interpret and evaluate mathematical expressions using grouping symbols, order of operations, and properties of real numbers.

Materials

For the teacher: chalk, chalkboard

For each student: paper, pencil, copy of Black Line Master (BLM)

Order of Operations

For each group of students: set of 4 cards

Activity

A. Pre-Activity Preparation

1. Prepare a set of four 3" × 5" index cards for each group.
2. Write the following expressions on the index cards (one expression per card): " $10 \times 2 + 3 - 1$," " $20 \div 5 - 4 \times 2$," " $3 + 6 \times 8 - 5$," " $100 \times 2 + 10 + 3$."

B. Introduction

1. Write the sentence "Robin Lee Travis and I love computers." on the chalkboard.
2. Ask students to tell you how many people love computers. Say: "Are there four people? three people? two people?" Discuss responses.
3. Explain that this is an example of the importance of grouping symbols. Stress that the writer could change the meaning of this sentence by inserting commas. Place a comma after "Robin" and after "Lee" in the sentence. Ask: "Now how many people love computers?" Discuss responses.
4. Tell the students that grouping symbols, such as parentheses, can be used in mathematical expressions. Say: "The placement of these grouping symbols can change the values of each mathematical expression."
5. Distribute a copy of the BLM *Order of Operations* to each student. Review each rule and discuss the examples provided.
6. Discuss the importance of grouping in mathematics. Give an example, such as $4 \times 3 + 2 - 1$, $4 \times (3 + 2) - 1$, and $4 \times 3 + (2 - 1)$. Discuss how the values of the expressions differ based on the placement of parentheses.

(continued)

MEETING INDIVIDUAL



NEEDS

Have students who need additional practice with identifying properties complete the online activity at regentsprep.org/Regents/math/realnum/propPrac.htm. This Web site provides an online "quiz" with immediate feedback and explanations.

EXTENDING THE



ACTIVITY

Have students write sentences like "Robin Lee Travis and I like computers." in their math journals. Direct students to write each sentence without commas then rewrite each with commas inserted. Instruct students to write comments explaining how adding the punctuation changes the meaning of the sentence.

Standards Links
6.2.1, 6.2.2

Activity (continued)

C. Class Activity

1. Separate the class into groups of three or four. Pass out a set of cards to each group. Each student should have one piece of scrap paper and one student should act as group recorder.
2. Tell students that they will be competing with the other groups in the class. Explain to students that the object of the game is to use grouping symbols (parentheses) to make the largest and smallest possible values from a mathematical expression. Tell them to refer to the BLM for possible placement of parentheses.
3. Instruct the group to discuss each problem and use the scrap paper to figure the largest and smallest values. The recorder should keep a master list of the solutions for each question.
4. Draw a table on the chalkboard numbered 1 through 4 while students work on the exercises. Write each expression in the first column of each row. Make a column for each group.
5. Ask each group for their largest and smallest values. Record these values on the chart. Give one point to the group for each winning largest and smallest value. The winner is the group with the most total points.
6. Have a member of each expression's winning group (could be two different groups per expression) come to the board and write the winning expression with grouping symbols included. Verify that the winning expression does produce the largest or smallest number.

Classroom Assessment

Basic Concepts and Processes

During the activity, discuss the following questions with your students to gauge their understanding of the Standard Indicators:



How do you decide which operation to perform first in a mathematical expression?



What is the value of $(3 + 4) \times 12$?



How would your answer differ if the parentheses were left out?

Order of Operations

Rules

If a mathematical expression involves more than one operation, use these steps to evaluate the expression:

1. Parentheses – perform the operations inside the parentheses first
2. Multiplication or Division – perform multiplication or division in order from left to right
3. Addition or Subtraction – perform addition or subtraction in order from left to right

Properties of Real Numbers

For Addition

Associative	The sum of three or more numbers is the same no matter how they are grouped. Example: $(5 + 6) + 7 = 5 + (6 + 7)$
Commutative	The sum of two numbers is the same no matter in which order they are added. Example: $8 + 9 = 9 + 8$
Inverse	The sum of a number and its opposite is 0. Example: $2 + (-2) = 0$
Identity	The sum of any number and zero is that number. Example: $4 + 0 = 4$ or $0 + 4 = 4$

For Multiplication

Associative	The product of three or more numbers is the same no matter in which order they are multiplied. Example: $(3 \times 4) \times 5 = 3 \times (4 \times 5)$
Commutative	The product of two numbers is the same no matter in which order they are multiplied. Example: $2 \times 7 = 7 \times 2$
Inverse	The product of a number and its reciprocal is 1. Example: $6 \times \frac{1}{6} = 1$
Identity	The product of any number and one is that number. Example: $6 \times 1 = 6$ or $1 \times 6 = 6$

Distributive Property

The sum of two numbers multiplied by a third number is the same as the sum of the product of each of the first two numbers and the third number.
Example: $10(3 + 4) = (10 \times 3) + (10 \times 4)$

Order of Operations

Teacher Directions

Distribute one copy of the BLM *Order of Operations* to each student. Review order of operations and properties of real numbers with students. Have students use the facts presented on the BLM to build their numbers.

Answer Key

Not applicable.