

Featuring Awadagin Pratt: *Pianist*

Study Guide: Math

Objective: To evaluate problems using the order of operations and variables.

Standard: Grades 3-5 FL Mathematics Standards: Benchmark: MA.A.3.2 The student understands the effects of operations on numbers and the relationships among these operations, selects appropriate operations, and computes for problem solving.

Time: 40 minutes

Materials: Worksheet, overhead projector or whiteboard

Activity:

1. Teacher explains that two of the pieces Mr. Pratt will be playing are called a Fugue (one by Bach and one by Franck.) A Fugue is a composition (or musical piece) for a fixed number of parts. It can be repeated in various ways. In math, we can have parts, or operations, of a problem. We can also have parts that are termed variables (a,b,c...)
2. Teacher explains what the order of operations consists of PEMDAS (parentheses, exponents, multiplication and division, addition and subtraction.) Students follow these rules:

Rule 1: First perform any calculations inside parentheses.

Rule 2: Next perform all multiplications and divisions, working from left to right.

Rule 3: Lastly, perform all additions and subtractions, working from left to right.

3. Teacher will go over the following problems:

Order of Operations		
Expression	Evaluation	Operation
$6 + 7 \times 8$	$= 6 + 7 \times 8$	Multiplication
	$= 6 + 56$	Addition
	$= 62$	
$16 \div 8 - 2$	$= 16 \div 8 - 2$	Division
	$= 2 - 2$	Subtraction
	$= 0$	
$(25 - 11) \times 3$	$= (25 - 11) \times 3$	Parentheses
	$= 14 \times 3$	Multiplication
	$= 42$	

4. Students will work with a partner, or group, to solve the following problems:

Example 1 Evaluate $3 + 6 \times (5 + 4) \div 3 - 7$ using the order of operations.

Solution:

Step 1:	$3 + 6 \times (5 + 4) \div 3 - 7 = 3 + 6 \times 9 \div 3 - 7$	Parenteses
Step 2:	$3 + 6 \times 9 \div 3 - 7 = 3 + 54 \div 3 - 7$	Multiplication
Step 3:	$3 + 54 \div 3 - 7 = 3 + 18 - 7$	Division
Step 4:	$3 + 18 - 7 = 21 - 7$	Addition
Step 5:	$21 - 7 = 14$	Subtraction

Example 2: Evaluate $9 - 5 \div (8 - 3) \times 2 + 6$ using the order of operations.

Solution:

Step 1:	$9 - 5 \div (8 - 3) \times 2 + 6 = 9 - 5 \div 5 \times 2 + 6$	Parenteses
Step 2:	$9 - 5 \div 5 \times 2 + 6 = 9 - 1 \times 2 + 6$	Division
Step 3:	$9 - 1 \times 2 + 6 = 9 - 2 + 6$	Multiplication
Step 4:	$9 - 2 + 6 = 7 + 6$	Subtraction
Step 5:	$7 + 6 = 13$	Addition

In Examples 1 and 2, you will notice that multiplication and division were evaluated from left to right according to Rule 2. Similarly, addition and subtraction were evaluated from left to right, according to Rule 3.

When two or more operations occur inside a set of parentheses, these operations should be evaluated according to Rules 2 and 3. This is done in Example 4 below.

Example 3: Evaluate $150 \div (6 + 3 \times 8) - 5$ using the order of operations.

Solution:

Step 1:	$150 \div (6 + 3 \times 8) - 5 = 150 \div (6 + 24) - 5$	Multiplication inside Parenteses
Step 2:	$150 \div (6 + 24) - 5 = 150 \div 30 - 5$	Addition inside Parenteses
Step 3:	$150 \div 30 - 5 = 5 - 5$	Division
Step 4:	$5 - 5 = 0$	Subtraction

5. Students will complete worksheet independently on Order or Operations.
6. *Optional: Teacher will explain how variables are used in math. Substitute numbers for variables and perform operations. Students complete worksheet and check one another's work.

Assessment: Teacher will assess students by observation and worksheets.

Resources: <http://en.wikipedia.org/wiki/Fugue>
http://www.mathgoodies.com/lessons/vol7/order_operations.html