Algebra/Geometry Institute Summer 2002

Lesson Planning Guide 2

Faculty Name: Betty G. Carter
School: Threadgill Elementary
Grade Level: 6th Grade Math

Institute Content: IVC – Model order of operations to simply and/or evaluate numerical and algebraic expressions.

1 Teaching objective(s)

Students will simply expressions using order of operations, including parentheses.

2 Instructional Activities

1. Students will solve the "Problem of the Day" as they enter the classroom (*teacher is silently taking roll*). Students will give solutions to the problem 3 minutes after the bell. This will involve discussion, questions, and answers. (**Attachment #1**) (*approx. 7 minutes*)
   - The teacher will write the "Problem of the Day" ahead of time on the chalkboard or on an overhead transparency as follows:
     "Kimberly, Amber, and Morgan share the tips they earn waiting on tables at Whitman's Restaurant. Yesterday each person's share was $24. Write division expressions to show the relationship between the total tips and each person's share. (*Use* **T** *to represent total amount of tips, and* **T/3** *to represent each person's share of tips*.)"
   - The students will discuss how they got their solutions to the problem. The answer is T = $72. (*Teacher will draw the following diagrams on chalkboard or transparency for demonstration*.)

     T/3 = $24 [*Write the equation*.]

     T/3 x 3 = $24 x 3 [*Multiply both sides by 3 to undo dividing by 3*.]

     T = $72 [*Write the solution*.]

2. Teacher will begin the introduction of this lesson by passing out **Attachment #2.** Teacher will read the Problem Solving activity aloud to students. "You saved $20 from your allowance to spend at your area high school homecoming football game. During the game you bought 2 hot dog and fries combos at $2.50 each, 3 large soft drinks at $1.25 each, and 3 candy bars at $ .75 each. How much money will you have left at the end of the game?" (*approx. 8 minutes*)

- Students will work in groups of four to solve the problem.
- Teacher will walk around and observe as students work.
- Student groups will discuss how they got their solutions.
- Answer to the problem is $9. The solution to the expression is:

  $20.00 – ($2.50 x 2 + $1.25 x 3 + $.75 x 3)
  $20.00 – ($5.00 + $3.75 + $2.25)
  $20.00 - $11.00
  $9.00

3. Teacher will say, "**What you have just done is a mathematical process called 'Order of Operations.' Can anyone tell me what you think 'Order of Operations' means?**" Students may give responses. Teacher will say, "**Any mathematical expression may have more than one operation. How many were there in this problem?**" Answer is 3 (*multiplication, addition, and subtraction*). "**How did you know which operation to perform first?**" Students may respond. [*Because you bought more than one of each of item, you had to first multiply the total number bought by the cost of the item to find out the total spent on each item. Then all three totals had to be added together to find out the total spent before you could compute what you had left.*] "**Could you have added first to get the correct answer?**" Students may respond. "**No, you would not have computed the correct answer by adding first. It is important for everyone to follow the same rules when solving mathematic expressions. If not everyone would get different answers. That's why we have Rules for Order of Operations. A copy of these rules is being passed out to you**." (*approx. 6 min*.)
   - Teacher will pass out **Attachments 3 and 4** to all students.
   - Students will read the rules aloud and discuss. (*Rules will be discussed to make sure all students have a clear understanding*.)

     <u>Rules for Order of Operation</u> **(Attachment #3a)**
     - First simply within the parentheses.
     - Multiply and divide from left to right.
     - Add and subtract from left to right.
     - If an expression has a variable, <u>substitute</u> a number for the variable. Then simplify, using the rules for the order of operations.

4. Teacher will say, "**Also on this sheet are two problems for you to solve at your tables to see how well you understand the Rules of Order of Operation. Read the problems carefully before trying to solve them**." (**Attachment #3b**) (*approx. 15 min*.)
   - Groups will be allowed 8 minutes to solve both problems.
   - Teacher will walk around and observe students as they work.
   - Students will discuss their solutions to both problems.
   - Answer to problem #1 is $23 and problem #2 is $200.
   - Students will be given five Practice Problems to solve individually. (**Attachment #4)** (*Solutions will be discussed*.)

5. Teacher will pass out Independent Activity Sheets to all students to be completed by the end of the class period. (**Attachment #5**) Teacher will say, "**I am giving you an Independent Activity Sheet. These problems are similar to those we solved today using the Rules for Order of Operation. Each student must work alone. Solutions to these problems are due at the end of this class period. Your homework assignment for tonight is on the chalkboard. Are there any questions? You may begin.** (*approx.14 min*.)
    - Students will solve three mathematic expressions and complete a mathematic expression table.
    - Students will turn in Independent Activity Sheets at the end of the class period.

6. Students will be assigned homework problems (**Attachment #6**).

3 Materials and Resources

Chalkboard / Chalk
Overhead Projector
Overhead Transparencies
Manfre, Edward, James M. Moser, Joanne E. Lobato, and Lorna Morrow. "Order of Operations." *Heath Mathematics Connections Grade 6*, (1994): pp. 80-81 and 436.
Attachment #1 – Problem of the Day
Attachment #2 – Lesson Introduction Problem
Attachment #3 – Rules of Order of Operation / Problem Solving
Attachment #4 – Practice Problems
Attachment #5 – Independent Activity Sheet
Attachment #6 – Homework Problems
Attachment #7 – Answer Sheet
Attachment #8 – Order of Operation/Enrichment Problems

4 Assessment

Students will solve ten (10) problems on their Independent Activity Sheet with 80% accuracy.

5 Enrichment (Optional)

Students who complete Independent Activity Sheet before the end of class and those who complete all problems with 90%-100% accuracy will be given Order of Operations/ Enrichment Problems. (**Attachment #7**)

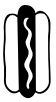
MATH
"Problem of the Day"

NAME_____ DATE_____

Kimberly, Amber, and Morgan share tips they earn waiting on tables at Whitman's Restaurant. Yesterday each person's share was $24. Write division expressions to show the relationship between the total tips and each person's share. (Show your work.)

ATTACHMENT #1

MATH
Lesson Introduction Problem



NAME_____ DATE_____

GROUP ACTIVITY

INSTRUCTIONS: ***Read the problem carefully. Write an expression showing how your group solved this problem. (Show your work.)***

You saved $20 of your allowance to spend at your area high school homecoming game. During the game you bought 2 hot dog and fries combos at $2.50 each, 3 large soft drinks at $1.25 each, and 3 candy bars at $.75 each. How much money will you have left at the end of the game?

ATTACHMENT #2

MATH

NAME_____ **DATE**_____

A. Rules of Order of Operations

- **First simply within the parentheses.**
- **Multiply and divide from left to right.**
- **Add and subtract from left to right.**
- **If an expression has a variable, substitute a number for the variable. Then simplify, using the rules for order of operations.**

B. Problem Solving: OPERATION SENSE

INSTRUCTIONS: Read each problem carefully. Solve each problem using the order of operations. Write an expression for each. (*Show your work.*)

1. John and Sam work at Brooks Bakery. This morning they sold 5 loaves of rye bread and 4 loaves of banana bread. How much money did they take in this morning?

Brooks Price List

Banana Bread	$2.00 / loaf
Rye Bread	$3.00 / loaf
Cakes	$4.00 each
Pies	$4.00 each

2. For 5 days in a row John and Sam sold 6 pies and 4 cakes. How much money did they take in for cakes and pies for those days?

MATH
PRACTICE PROBLEMS

NAME_____
DATE_____

Order of Operations

INSTRUCTIONS: Read each expression carefully and write the value of each using the rules for order of operations.

1. **5 - 12 ÷ 6**

2. **2 x 14 - 3 ÷ 3**

3. **4 ÷ 4 + 4 x 4**

4. **(7 + 49) ÷ 7**

5. **2 + 11 - (13 - 4)**

ATTACHMENT #4

MATH
Independent Activity Sheet

NAME_____ **DATE**_____

Order of Operations

INSTRUCTIONS: Read each expression carefully and write the value of each using the rules for order of operations.

1. 45 ÷ **9 - 3**

2. 4 (15 - 2) ÷ 13

3. 6 + 64 ÷ 8 - 6

Complete the table below and write the value of each expression.

P	40 ÷ (p - 11)	Value of Expression
15	40 ÷ (15 - 11)	10
12		
21		

ATTACHMENT #5

MATH
Homework Problems

NAME_____

DATE_____

Order of Operations

INSTRUCTIONS: Read the problems carefully and solve each one using the rules for order of operations.

1. **8 ÷ 2 + 3 x 1**

2. **6 x 3 - 4 ÷ 2**

3. **6 + 8 ÷ 2 - 2**

4. **16 + 10 - (4 + 6)**

5. **(24 + 48) ÷ 8**

6. **27 ÷ 9 + 4 x 5**

7. **1 + (25 - 1) x 2**

8. **125 - 6 x 2**

9. **60 - 16 x 3**

10. **10 + 3 x 6 - 5**

11. **50 - 25 ÷ 5 x 2**

12. **100 - 3 x 25**

ATTACHMENT #6

MATH
Answer Key

ATTACHMENT #1: Problem of the Day Homework

1. Write the equation. **T** ÷ 3 = $24
2. Multiply both sides by 3. **T** ÷ 3 x 3 = $24 x 3
3. Write the solution. **T** = $72

There was **$72** total tips ÷ 3 people
= $24 each person.

ATTACHMENT #2 : Group Activity

$20 - (2 x $2.50) + (3 x $1.25) + (3 x $.75)
$20 - ($5.00 + $3.75 + $2.25)
$20.00 - $11.00
You had **$9.00** left at the end of the game.

ATTACHMENT #3: Problem Solving

1. 5 rye bread x $3.00 + 4 banana bread x $2.00
$15.00 + $8.00
John and Sam took in **$23.00** this morning.

2. 5 days [(6 pies x $4) + (4 cakes x $4)]
5 x ($24 + $16)
5 x $40
They sold **$200** in cakes and pies for the past 5 days.

ATTACHMENT #4: Practice Problems

1. 5 – 12 ÷ 6
5 - 2
3

2. 2 x 14 - 3 ÷ 3
28 - 1
27

3. 4 ÷ 4 + 4 x 4
1 + 16
17

4. (7 + 49) ÷ 7
56 ÷ 7
8

5. 2 + 11 – (13 – 4)
2 + 11 - 9
13 - 9

ATTACHMENT #6:

1. 8 ÷ 2 + 3 x 1
4 + 3
7

2. 6 x 3 – 4 ÷ 2
18 - 2
16

3. 6 + 8 ÷ 2 – 2
6 + 4 - 2
10 – 2
8

4. 16 + 10 – (4 + 6)
16 + 10 - 10
16

5. (24 + 48) ÷ 8
72 ÷ 8
9

6. 27 ÷ 9 + 4 x 5
3 + 20
23

7. 1 + (25 – 1) x 2
1 + 24 x 2
1 + 48
49

8. 125 – 6 x 2
125 – 12
113

9. 60 – 16 x 3
60 – 48
12

10. 10 + 3 x 6 – 5
10 + 18 – 5
28 – 5
23

11. 50 – 25 ÷ 5 x 2
50 – 5 x 2
50 – 10
40

12. 100 – 3 x 25
100 – 75
25

4

ATTACHMENT #5: Independent Activity Sheet

1. $45 \div 9 - 3$ 2. $4(15 - 2) \div 13$ 3. $6 + 64 \div 8 - 6$ 4. $40 \div (12 - 11)$ 5. $40 \div (21 - 11)$

$5 - 3$ $4 \times 13 \div 13$ $6 + 8 - 6$ $40 \div 1$ $40 \div 10$

2 $52 \div 13$ $14 - 6$ **40** **4**

4 8

ATTACHMENT #7