Grade Level	Content Area	Course Title *(For 9-12 Samples Only)*	Unit Title
Grade 5	**Mathematics**		Order of Operations

Length of Unit	Time of Year Taught	Expected Prior Knowledge
6 days	Winter Quarter	Computation skills (addition, subtraction, multiplication, and division); computer skills

Unit Description Students will use the order of operations to solve numerical expressions and will be able to make a numerical expression if given a word problem.

Standards: Common Core State Standards for Mathematics	**Domain:** Operations and Algebraic Thinking **Cluster:** Write and interpret numerical expressions. **Standard**: #1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.
Summative Assessment *In addition to the description, include a copy of the summative assessment in the application package.*	In this assessment on **order of operations**, students review 2 examples that show the proper **order of operations**. Then they apply the information to 4 problems (questions 1 through 4 on the assessment). Then they examine 8 equations, determine which operation should be done first, and solve for *n* (questions 5 through 12 on the assessment).
Scoring for Summative Assessment *In addition to the description, include a copy of the answer key and scoring rubric (if applicable) for the summative assessment in the application package.*	12 Problems: 1 – 4 = 1 point each 5 – 12 = 2 points each (1 point for operation; 1 point for solving for *n*. Total 20 points Mastery is set at 80%. Students must achieve 16 points on the assessment to demonstrate mastery.
Materials/Resources Needed *Include all items for the entire unit.*	Poster board, markers, crayons; index cards; dice; individual Student whiteboards; computer access and/or magazines

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Instruction and Timeline Each lesson is designed to take one period/75 minutes of math each day with the exception of Lesson 4 which will take approximately 2 class periods.	Compare punctuation marks in a sentence with grouping symbols in a numerical expression. Write the following on the board: Robin Lee Travis and I love computers. Without commas, the sentence implies two people love computers. Depending on where the commas are inserted, the sentence can state that three people love computers. Follow same process with: Slow children playing. Ask students to simplify 10+2x3-1 Discuss all the answers they come up with. Discuss the standard order of operations: 1. Solve all operations in parenthesis 2. Solve all exponents 3. Solve any multiplication/ division problems 4. Solve any addition/ subtraction problems **If one or more of the	Review: Write the following problem on the board- 17 - 2 x 6 = Warn students they must be prepared to defend their answers. Discuss their solutions. Explain that the different results are due to the order in which the equation was worked. In order for mathematicians and scientists to communicate accurately with numbers, they must agree to the steps, or order in which to perform the operations. Review order of operations by discussing acronyms produced by small groups in lesson one. Show how parentheses can be used to give different meanings to the same expression: (10 + 2) x 3 – 1 and (10 + 2) x (3 – 1) Explain that in expressions with more than one operation, grouping symbols such as parentheses or division bars are often used to indicate the order in which to do the operations. These grouping symbols can change the meaning of an	Ask students for examples of where order matters. Example: Getting ready for school every day- The order in which you get dressed each day matters. If you shower after you get dressed, you will get your clothes wet. If you put your clothes on in the wrong order, it could be embarrassing. Ask students what the order of operations is and how they might remember the order. Review the Order of Operations. Write problems on the board and ask for volunteers to come up and work out. Students should work them at their seats as well. Play "Math Bowling". Roll 3 dice to obtain 3 numbers. Using the parenthesis, addition, subtraction, multiplication and division, students will write equations that will equal a whole number from 1-10. The equation will knock down the pin. The numbers may be used in any order. All three numbers must be used.	**Order of Operations in the Real World** Start off by showing an example of what they will be doing. Students will be placed in groups of four and each group will get a word problem. (Example: I buy 2 shirts for $8 each and a pair of jeans that gets a $3.00 discount. Write a numerical expression and solve.) Students will make numerical expressions using real world situations. The final product should result in many different word problems in digital story form; each with pictures and numerical expressions. Give the word problems to the whole class so they can solve the problems. They can play the corresponding digital story to check their	Ask students for the correct order of operations. List on the board as they respond. Give a problem for students to work. Have the students underline the part they are working on to keep track of what they have done, then they replace the underline part with the answer and copy the rest of the problem, this is done until you have one single answer. The below example will show how this works. Ask the students to tell you what part to do next. Do at least 3 examples with the students before you let them try on their own. Teacher Example: {30 ÷ 6} x 2 – 8 + 9 {30 ÷ 6} x 2 – 8 + 9 5 x 2 – 8 + 9 10 – 8 + 9 2 + 9 11

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
	above, students should solve them from left to right. Show how they would be used to simplify the first expression. Provide problems for students to practice. Pair students up. Each student will work the problems and compare their answers with their partner. Continue for approx. 15 minutes. Introduce the acronym of "Please Excuse My Dear Aunt Sally". Tell students they will work in small groups and come up with their own acronym, which they will illustrate. Examples: "Purple elephants may dance and sing." "People enjoy my daily apple slices." *Evaluation/Assessment:* 1. Final product produced by small group 2. Teacher observation	expression, just as commas or other punctuation marks can change the meaning of a sentence. Whenever grouping symbols do not indicate the order of operations, the standard order of operations should be followed. Provided examples for students to practice on individual whiteboards: 13 – 4 x 2 – 3 2 x 3 + 2 – 4 (8 + 5) x 3 8 + (5 x 3) *Evaluation/Assessment:* Teacher observations and student responses.	For example, we rolled 2, 3, and 4. Using our example, 4 - 3 + 2 = 3, I just knocked down the 3 pin. Using 4/2 + 3 = 5, I just knocked down the 5 pin. (note: the same operation may be used in an equation.) The goal is to get a strike in which 10 equations have been written to knock down all 10 pins using the first set of numbers. After a few minutes of trying for a strike, ask students if they would like to try for a spare. For a spare, we roll a second time. The first numbers are void, and students may only use the numbers generated from the second roll. Walk around and observe student work. Point out any errors. Praise students for creative thinking. The first person to correctly knock down all 10 pins, wins. Share solutions. There are generally several ways to knock down the same pin. *Evaluation/Assessment:* 1. Teacher observation 2. Student responses during group activity	answer. Close the topic and relate back to how the order of operations is used in real life situations. *Evaluation/Assessment:* Students should be able to create numerical expressions and solve them to get an answer.	

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Student Activities and Timeline	Students will simplify math expressions using the standard order of operations. Students will work in small groups and come up with their own acronym for the order of operations, which they will illustrate.	Students will simplify math expressions using the standard order of operations. Play "Order of Operations War" Students will be placed into groups of five. Each group will sit in a row. The group leader will give each student a card with the same problem. The first person writes the problem down, passes the card to the next team member, and then works the problem. This continues until the last person in the group to receive the card gets finished. That person stands up. The teacher calls on the student and everyone must put down their pencils. If the student answered correctly, the teacher will figure up the score by giving 1 point for each correct answer on that team. If the student answers incorrectly, the next student to stand up will be called on. Students will participate in "Order of Operations War" by simplifying math expressions using order of operations.	Students will simplify math expressions using the standard order of operations. Students will participate in "Math Bowling" by arranging 3 numbers into math expressions to come up with different answers. They may use parenthesis, addition, subtraction, multiplication and division.	Using digital photos or the internet, students will find pictures to tie into their word problem. After they find the appropriate pictures, students will create step-by-step instructions on how they made their numerical expression into a PowerPoint presentation. Narration can be added. Students will simplify expressions using the order of operations.	Have students do at least 10 examples on their own. Write problems on the board for them to do on their whiteboards. As the students are working, walk around to check for progress, make sure they are underlining and rewriting the problem as they work. Allow students to choose which game they would like to play to review: "Order of Operations" or "Math Bowling" Students will participate in group activity to reinforce the skills learned during the unit. Student will complete the final assessment.

Name _____

Order of Operations

R 4-2

Evaluate $20 + 4 \times 2$.

Example 1

$20 + 4 \times 2$ If you add first, the problem becomes $24 \times 2 = 48$

$20 + 4 \times 2$ If you multiply first, the problem becomes $20 + 8 = 28$

To avoid having different answers, follow the order of operations below.

- First, do all the operations inside parentheses.
- Next, do all multiplication and division from left to right.
- Last, do all addition and subtraction from left to right.

Example 2

Find n if $5 + 12 \times (3 \times 4) - 8 \times 2 = n$.

- First, do operations inside parentheses: $5 + 12 \times (12) - 8 \times 2 = n$.
- Next, do multiplication and division from left to right: $5 + 144 - 16 = n$.
- Last, do all addition and subtraction from left to right: $133 = n$.

Write which operation should be done first.

1. $3 \times 4 + 9$ _____

2. $12 - 3 \times 4$ _____

3. $12 \div 3 \times 4 - 2$ _____

4. $(12 - 3) \times 4 \div 2$ _____

Write which operation should be done first. Then find each n.

5. $4 \times 8 + 6 = n$ _____

6. $(3 + 5) \div 2 = n$ _____

7. $1 + 8 \times 7 = n$ _____

8. $12 \div 2 \times 3 = n$ _____

9. $1 \times 7 + (5 \div 1) = n$ _____

10. $(15 - 5) + 7 \times 2 = n$

11. $12 \div (5 + 1) \times 2 = n$ _____

12. $12 - (3 + 2) \div 5 = n$ _____

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Use with Chapter 4, Lesson 2.

Name Answer Key

Order of Operations

R 4-2

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$20 + 4 \times 2$ If you multiply first, the problem becomes $20 + 8 = 28$

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Example 2

Find n if $5 + 12 \times (3 \times 4) - 8 \times 2 = n$.

- First, do operations inside parentheses: $5 + 12 \times (12) - 8 \times 2 = n$.
- Next, do multiplication and division from left to right: $5 + 144 - 16 = n$.
- Last, do all addition and subtraction from left to right: $133 = n$.

Write which operation should be done first.

1. $3 \times 4 + 9$ multiplication

2. $12 - 3 \times 4$ multiplication

3. $12 \div 3 \times 4 - 2$ division

4. $(12 - 3) \times 4 \div 2$ Parentheses (subtraction)

Write which operation should be done first. Then find each n.

5. $4 \times 8 + 6 = n$ mult. / n=38

6. $(3 + 5) \div 2 = n$ parentheses (+) / n=4

7. $1 + 8 \times 7 = n$ mult / n=57

8. $12 \div 2 \times 3 = n$ division / n=18

9. $1 \times 7 + (5 \div 1) = n$ parentheses (div.) n=12

10. $(15 - 5) + 7 \times 2 = n$ parentheses (subt.) n=24

11. $12 \div (5 + 1) \times 2 = n$ parentheses (add) n=4

12. $12 - (3 + 2) \div 5 = n$ parentheses (add) n=11

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Use with Chapter 4, Lesson 2.