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MATHEMATICS

Grade 6

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Lesson 4: Order of Operations with Exponents

Focus Standard(s): 6.EE.2

Additional Standard(s): 6.EE.1, 6.EE.3

Standards for Mathematical Practice: SMP.3, SMP.7

Estimated Time: 60 minutes

Materials and Resources:

- Scissors
- Glue
- Chart paper
- Sticky-notes
- Posters from previous lesson
- Stamp and stamp pad (for Around the World game)
- Handout 4.1: Around the World Problem and Posters
- Handout 4.2: Around the World Passport -1 per student

Learning Target(s):

- Students will evaluate numerical expressions involving whole-number exponents.
- Students will use order of operations to solve numerical expressions

Guiding Question(s):

- Why do we need a specific order to solve numerical expressions?
- What are the steps in the order of operations?
- Do brackets and parentheses always affect the value of an expression?

Vocabulary

Academic Vocabulary:

- Evaluate
- Exponent
- Numeric expression
- Order of operations

Instructional Strategies for Academic Vocabulary:

- Introduce words in a mathematical context.
- Model how to use the words in discussion.
- Read and discuss the meaning of word in a mathematical context

Symbol

Type of Text and Interpretation of Symbol



Instructional support and/or extension suggestions for students who are EL, have disabilities, or perform well below the grade level and/or for students who perform well above grade level.



Assessment (Pre-assessment, Formative, Self, or Summative)

Instructional Plan

Understanding Lesson Purpose and Student Outcomes: Students will write and evaluate numerical expressions following the order of operations.

Anticipatory Set/Introduction to the Lesson

Write these numerical expressions on the board:

- a. $[36 - (4 \times 7) + 8]5$
- b. $36 - 4 \times 7 + 8 \times 5$
- c. $(36 - 4 \times 7 + 8)5$

- ✓ Instruct students to find the value for each of the 3 expressions. Allow 10 minutes to solve.

Facilitate whole group discussion using the following prompting questions.

- How do the brackets and parentheses affect the values of the expressions?
- What order of operations will we follow for the first expression?
- What order of operations will we follow for the second expression?
- What order of operations will we follow for the third expression?
- Did you get the same value for each?
- Why do you suppose they have different values?

Answer any questions and clarify any misconceptions about the order of operations.

Note: Students should be able to recognize the structure of the expressions and understand the purpose of brackets and parentheses (SMP.7).

Activity 1: Order of Operations Gallery Walk

Facilitate a Gallery Walk to review the posters from yesterday's lesson. Instruct students to place sticky notes on the posters with their comments and questions (SMP.3). The Gallery Walk is ended when groups return to their poster. Allow time for groups to read the comments on their poster considering the value of the comment and write an answer to the questions. Instruct groups to identify a spokesperson who will give a report about their work, comments, and questions received. Have students return to their seats and lead a whole group discussion to review the comments and questions clarifying any common misconceptions.

Activity 2: Around the World

Note: Before class, create posters using **Handout 4.1: Around the World Problem and Posters** by cutting out the locations along the dotted lines, gluing each to a blank piece of paper, and hanging the posters around the room.

- ✓ Distribute **Handout 4.2: Around the World Passports**.

Explain to students that they will work in groups of 3 or 4 and travel from one poster to the next. Individually, at each poster, students copy the numerical expression on their passport and find the value of the expression using the order of operations. When everyone in their group has found the value of the expression, have them compare, check work, and collaborate to

correct mistakes or misconceptions. When the entire group has the correct work, one person collects the passports for their team and brings them to the teacher to be stamped. If the passports are incorrect, the team will review their work, make changes, and bring the passports back to the teacher. When the passports are stamped, the team will move to another poster and repeat the process. To complete the activity, each team member must have all the cities on their passports stamped.

Note: This activity can be modified to include local cities and landmarks to provide students with exposure to areas they may likely visit.

For students who are EL, have disabilities, or perform well below the grade-level:

- Use the anchor charts and order of operations cards from Lesson 3.

Extensions for students with high interest or working above grade level:

- Students conduct research about the cities and create numerical expressions regarding the cities' populations.

Reflection and Closing:

- ✓ Review Activity 1 with the class using prompting questions.
Prompting questions:
 - Why do we need a specific order to solve numerical expressions?
 - What are the steps in the order of operations?
 - Do brackets and parentheses always affect the value of an expression?
- ✓ Have students complete an exit ticket where they create and evaluate a numerical expression with multiple operations.

Homework

No Homework

Handout 4.1: Around the World Posters



Paris

$$(12-6)10\div 4$$



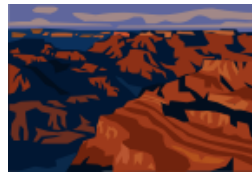
London

$$5+(3\cdot 2)-4^2\div 8$$



Dublin

$$66\div (2^3-2)10$$



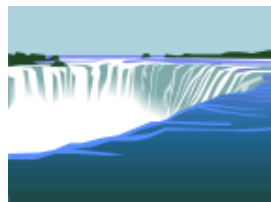
Grand Canyon

$$6^2+(8-2)\div 3-5\cdot 2$$



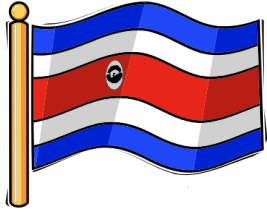
New York

$$4\cdot (3^2-1)\div 2$$



Niagara Falls

$$(5\cdot 7)-(6+7)+(4^3-9)$$



Costa Rica

$$5 \cdot 8 - 12 \div 6 + 4^2$$



Egypt

$$(7+3) \cdot 4 \div 2 - 5 \cdot 6$$



Beijing

$$3 \cdot 11 + (26 \div 2) - 8$$



Puerto Rico

$$14 \cdot 5 \div (9 - 2)$$



Chicago

$$(12 - 9)10 + 13$$




San Francisco

$$22 + (8^2 - 2)2$$


Handout 4.2: Around the World Passport

Name: Date: Block:	1. Paris
2. London	3. Dublin
4. Grand Canyon	5. New York

6. Niagara Falls	7. Costa Rica
8. Egypt	9. Beijing
10. Puerto Rico	11. Chicago
12. San Francisco	 <p>You did it!!!</p>

Handout 4.2: Around the World Passport Key

Name: Answer Key	1. Paris 15
2. London 9	3. Dublin 110
4. Grand Canyon 28	5. New York 16

6. Niagara Falls 77	7. Costa Rica 54
8. Egypt -10	9. Beijing 38
10. Puerto Rico 10	11. Chicago 43
12. San Francisco 146	 You did it!!!

For training or questions regarding this unit,
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