7th Grade Math Lesson Plans — Keith-Hayes

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Accentuate the Negative
Investigation 3, Problem 3.2
Multiplication Patterns

Mathematical Goals	**State Standards**
• Examine number patterns to confirm the algorithm for multiplication **Vocabulary:** **Materials:**	7.2ABC

1. LAUNCH (10 minutes)

Teacher Notes

Display the series of equations for students to observe, including the next three in the series.

- *What patterns do you notice?*
- *How do the patterns help you determine the next few equations in the series?*

Have students work in pairs to answer the questions.

2. EXPLORE (20 minutes)

Teacher Notes

As students work on the problem, listen to the patterns they are noticing.

If students struggle in Question B, suggest they think about what each sentence is saying and what seems reasonable.

3. SUMMARIZE (15 minutes)

Teacher Notes

For Questions A and B, ask students to share their observations and solutions explaining why they are reasonable and how they fit the patterns they noticed.

Display both series of equations as you ask these questions.

- *If one factor is 0, what will the product be? Is this always true?*
- *The first five equations involve multiplying two positive factors and result in a positive product. Is that always true? Does a positive factor times a positive factor always give a positive product?*
- *In the second series of equations, the first five equations involve multiplying a positive factor times a negative factor and result in a negative product. Is this always true? Does a positive factor times a negative factor always give a negative product?*
- *In Question B parts (2) and (3), you multiplied two negative factors. What is the sign of the product when*

two negative factors are multiplied?

- *When you multiply three numbers together, how do you look at the signs to predict the sign of the product?*

Going Further

- *Regardless of their signs, is the numerical value of the product of two numbers always the product of the two numbers? Explain.*
- *How do you find the sign of the product?*

Accentuate the Negative
Investigation 3, Problem 3.3
Introducing Division of Integers

Mathematical Goals	State Standards
• Explore division of integers using the relationship between multiplication and division found in fact families • Recognize and solve problems involving multiplication and division of integers • Develop algorithms for dividing integers **Vocabulary:** **Materials:** Transparencies 3.3A and 3.3B, Number Line Worksheets, Labsheet 3.3 MSP	7.2ABC

1. LAUNCH (10 minutes)

Teacher Notes

Write 36 ÷ 4 = 9 on the board.

- *What does this sentence mean?*
- *How are the operations of multiplication and division related?*
- *If multiplication and division are opposite operations that undo each other, what number sentence would undo 3 × 12 = 36?*

Discuss the patterns in the examples in the Student Edition. Note what the signs are doing.

Have students work on the examples in the Getting Ready.

For problem 1, draw students' attention to the notion of using 48 ÷ 8. Students can then use their multiplication algorithm to decide whether the 6 should be positive or negative.

Have them work in pairs and then in groups to answer the questions.

2. EXPLORE (20 minutes)

Teacher Notes

As students work on the problem, listen to the patterns they are noticing. If they are struggling, you might stop them after Question B part (1), summarize what they have done so far, and then have them complete the problem.

3. SUMMARIZE (15 minutes)

Have students display the solutions to Question A. If there are disagreements, have students discuss their solutions and explain why they make sense.

Help students generalize some rules for dividing positive and negative integers. Use questions like these as students discuss their solutions.

- *How did you decide if the quotient is positive or negative?*
- *What multiplication problems are related to this division problem?*
- *How can you use your algorithm for multiplication to decide whether the quotient is positive or negative?*

For Question B, ask students to share their answers and their algorithms for the problems in each of the three groups.

- *Why is the rule "a negative divided by a negative is positive" reasonable?*
- *How can you find the quotient when you divide a negative integer by a positive integer? For example, why does it make sense that –99 ÷ 11 = –9?*
- *How can you find the quotient when you divide a positive number by a negative number?*
- *We have found that addition and multiplication are commutative. Is division commutative?*

Teacher Notes

Accentuate the Negative
Investigation 4, Problem 4.1
Order of Operations

Mathematical Goals	State Standards
• Explore the use of the order of operations to order computation in problems **Vocabulary:** order of operations	7.2E

1. LAUNCH (10 minutes)

Teacher Notes

Use the Getting Ready to engage the class in what the challenge of the problem will be. Have the students look at the problem and make their own predictions about which should be correct. Then turn to a discussion of the rules for the order of operations and the examples given. Return to the Getting Ready as an example and decide with the class what the answer is according to the agreed-upon rules of order.

Remind students to go back to these rules as needed throughout the problem.

Talk about the use of parentheses. Make sure that they understand parentheses as a grouping symbol that indicates that what is in the parentheses is to be treated as a single entity. You need to compute what is in the parentheses first. Also, you can insert parentheses to make sure the expressions you write reflect the order of operations you intend. Review what exponential notation means using examples like: $3^2 = 3 \times 3 \times 3$, $2^3 = 2 \times 2 \times 2$ and $2^4 = 2 \times 2 \times 2 \times 2$.

Think-Pair-Share is a good classroom arrangement for this problem.

2. EXPLORE (20 minutes)

Teacher Notes

Ask students to say in words how the mathematical sentences they write or have to interpret should be computed.

For Question C, suggest they use the order of operations rules to find an answer. Then think about which operation can make an answer greater. When most

students have completed at least one problem in Question C, begin the whole-class summary.

3. SUMMARIZE (15 minutes)

Go over Question A and use the discussion to summarize the strategies students have used to help them both write and interpret mathematical sentences. Have students say in words how the expressions should be computed.

Question B provides practice in using the rules for the order of operations. For Question C, ask students to share strategies that helped them use parentheses to make answers less and strategies that helped make answers greater.

Question D is a challenge because of its length and complexity. If all students have not started this problem, give them a few minutes now to work on it before discussing it.

Have students display their thinking and discuss the problem in steps so that students can reason through and apply the order of operations when the string of symbols is long.

Check for Understanding

For each example, tell the sequence of computations needed to get the correct answer and give the answer.

1. $2^2 + 7 \times (-3) - 5$

2. $(2^2 + 7) \times (-3) - 5$

3. $(2^2 + 7) \times (-3 - 5)$

Teacher Notes