

# Decimal Operation Review Game

by Kate Farb-Johnson

**RATIONALE:** Fluency in working with decimals (non-whole) numbers is critical for problem solving in a variety of contexts, most notably working in currency, doing scientific calculations, and understanding decimal numbers in the media.

**LEARNING GOALS AND OBJECTIVES:** This lesson encourages practice of decimal operations (+, -, ×, ÷) while encouraging discovery of the structure of decimal numbers and the usefulness of scientific notation.

**GRADE LEVEL:** 6<sup>th</sup> grade (but variations could make this appropriate for students up to 9<sup>th</sup> grade)

**EXPECTED STUDENT BACKGROUND:** Student should have learned how to do decimal operations and how to convert to scientific notation.

## MA STRANDS AND LEARNING STANDARDS:

6.N.13 Accurately and efficiently add, subtract, multiply, and divide (with double-digit divisors) whole numbers and positive decimals

6.N.9 Select and use appropriate operations to solve problems involving addition, subtraction, multiplication, division, and positive integer exponents with whole numbers, and with positive fractions, mixed numbers, decimals, and percents.

## NATIONAL STANDARDS AND THEMES:

work flexibly with fractions, decimals, and percents to solve problems;

develop an understanding of large numbers and recognize and appropriately use exponential, scientific, and calculator notation;

select appropriate methods and tools for computing with fractions and decimals from among mental computation, estimation, calculators or computers, and paper and pencil, depending on the situation, and apply the selected methods;

**REFERENCES/MATERIALS:** Cards with one or two digit decimal numbers printed on them. (See attached for printable cards). Extra blank cards.

## PROCEDURES:

1. Give each student one decimal card.
2. Explain the game.
  1. Two players get together and choose an operation (+, -, ×, ÷) to combine their numbers
  2. Then the two players each calculate (by hand) the result of using the operation to combine their numbers. They compare answers, and if they disagree attempt to find where an error was made.
  3. When the players agree on an answer they should check their answer with a calculator or teacher. If the answer is correct, they write the answer on a single new card. Students can write an answer in either “normal” or scientific notation.
  4. The two players now join as a team and repeat steps 1-to-3.
  5. The game ends when the entire class has a single number.
  6. The goal is to have the final number be as large as possible.
3. Have students play the game once, and write the final number on the board. Circulate with students to check answers, and field questions.
4. Discuss the results. Some possible discussion questions follow, grouped by theme. You don't need to touch on all of these, but choose based on observations of the game and your knowledge of the students background.
  1. Are you surprised by the size of the final number? Do you think you could come with an even larger number if you tried again?

2. Discuss interpretations of the result. If we had this made paper clips, how much would they weigh? If we stacked this many pennies up, how high would the stack be and how much would it be worth? What other questions could help us get a sense of the scale of this number?
3. What operations did you use most often? Did anyone use subtraction? How did you choose which operation to use?
4. Who used scientific notation? Why did you decide to use scientific notation? Did scientific notation make your calculations easier or more difficult? Is there some other notation that would have made calculations easier?
5. Who wanted to round answers? How would rounding have affected
6. Does anyone have any interesting observations they would like to share?
5. Play the game again. Compare the new final number with the first. Discuss, using some of the same questions, but also some addressing the comparison.
  1. Were we able to get a larger number? If so, how did you do that?
6. If time allows, play again or play a variation.

**ASSESSMENT:** Informal assessment occurs during game play and discussion. Formal assessment would be a unit test on decimal operation.

**VARIATIONS:**

This game can be adjusted for a variety of students. Here are some variations.

1. Make the goal creating the smallest number (slightly more challenging)
2. Make the goal creating the number closest to 1 in value (more challenging)
3. Include negative numbers on the original cards (to include sign operations in this review)
4. Expand the range of initial numbers, including number less than 0.001 and greater than 1000. Write these numbers in scientific notation. (slightly more challenging)
5. Give each original number a letter (A, B, C, etc). Have students write an expression for each number they compute in a corner of the new card. Use this record to have a more detailed discussion of strategy and order of operations. (for use in an algebra class)