Constructing Task: Place the Point!

Adapted from "Where Does the Decimal Go?" from Zeroing in on Number and Operations: Key Ideas and Common Misconceptions, Grades 5-6.

In this task, students will use estimation to determine where to place the decimal point in several quotients. The digits remain the same; however, the value will change.

STANDARDS FOR MATHEMATICAL CONTENT

Understand the place value system.

MCC5.NBT.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

Perform operations with multi-digit whole numbers and with decimals to the hundredths.

MCC5.NBT.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Most students struggle with division of whole numbers and become even more confused once decimals are introduced. Make sure that students are proficient with whole number division first. Then, incorporate a lot of varied problems and computations with decimals as they build that proficiency. Some students will come to class having been told by parents or siblings that you just have to move the decimal over in the divisor to make it a whole number and move the decimal in the dividend the same number of places. Students that remember this "trick" should be encouraged to explain why this works. These students may benefit from doing more estimation with decimals before engaging in formal computations that require an exact answer.

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COMMON MISCONCEPTIONS

- *Multiplication can increase or decrease a number*. From previous work with computing whole numbers, students understand that the product of multiplication is greater than the factors. However, multiplication can have a reducing effect when multiplying a positive number by a decimal less than one or multiplying two decimal numbers together. We need to put the term *multiplying* into a context with which we can identify and which will then make the situation meaningful. Also using the terms *times* and *groups of* interchangeably can assist with the contextual understanding.

ESSENTIAL QUESTIONS

- How can we efficiently solve multiplication and division problems with decimals?
- How can we multiply and divide decimals fluently?
- What strategies are effective for finding a missing factor or divisor?
- How can we use estimation to assist in solving problems with decimal operations?

MATERIALS

- "Place the Point" recording sheet
- Calculators (optional)

GROUPING

Small group/Individual task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION:

Comments: A great deal of emphasis has been put on paper-and-pencil algorithms when solving problems with decimals. The focus is often put on how to do the problem rather than on what makes sense. Students should be given many opportunities to calculate decimals mentally. The emphasis shifts from getting exact answers from paper-and-pencil calculations to arriving at estimates and being able to explain why they are reasonable.

TASK:

The digits in the computation below are all correct, but the decimal point has been removed.

$$169 \div 8 = 21125$$

Use only estimation to find the quotients of the following. Justify each response, then check your answers using a calculator. If your solution is incorrect, fix the answer and your justification.

a. $169 \div 0.8 =$
b. $1.69 \div 8 =$
c. $16.9 \div 0.8 =$
d. $169 \div 80 =$

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FORMATIVE ASSESSMENT QUESTIONS

- How did you get your answer?
- How do you know your answer is correct?
- What patterns are you noticing?
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DIFFERENTIATION:

Extension

- Have students create problems of their own, not placing the decimal in the problem as done in the task, and swap with another student

Intervention

- Use small numbers with only a decimal in the dividend

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Name _____Date _____

Place the Point!

The digits in the computation below are all correct, but the decimal point has been removed.

169 ÷ 8 = 21125

Use only estimation to find the quotients of the following. Justify each response.

a. 169 ÷ 0.8 =

b. 1.69 ÷ 8 =

c. 16.9 ÷ 0.8 =

d. 169 ÷ 80 =

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