Constructing Task: Multiplication Teasers

Adapted from Marilyn Burns' lesson "Multiplication Puzzlers" in About Teaching Mathematics

In this task, students will be challenged to find the missing factor in a multiplication number sentence by first using estimation strategies, then refining their guesses by using a calculator.

STANDARDS FOR MATHEMATICAL CONTENT

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

Students often do not understand that if a whole number if multiplied by a decimal, the product will be less than the larger factor. This task can provide students with problems that will make this evident.

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 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

- "Multiplication Teasers" 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

For each problem, find the missing factor. Do not solve problems by dividing. Instead, use your calculator and the guess and check problem solving strategy. See how many guesses it takes for you to solve each one! For example, to solve 4 x _____ = 87, you might start with 23 and then adjust. See the solution steps below as an example of how to record your guesses.

4 x _____ = 87
4 x 23 = 92
4 x 22 = 88
4 x 21 = 84
4 x 21.5 = 86
4 x 21.6 = 86.4
4 x 21.7 = 86.8
4 x 21.8 = 87.2
4 x 21.74 = 86.96
4 x 21.75 = 87 ☆

It took 9 guesses!

Try the following:

4 x _____ = 97	5 x _____ = 66
8 x _____ = 108	6 x _____ = 99

FORMATIVE ASSESSMENT QUESTIONS

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

DIFFERENTIATION

Extension
- Provide students with problems that incorporate factors to the thousands and repeating decimals to challenge their thinking.

Intervention
- Work with small groups of struggling students to model the problem solving process by doing a think-aloud to work through an example problem.
- Incorporate the use of manipulatives (grid paper, base ten blocks, etc.) to assist with student guesses.

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Name _____ Date _____

Multiplication Teasers

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