

## Illustrative Mathematics

### 5.NBT Marta's Multiplication Error

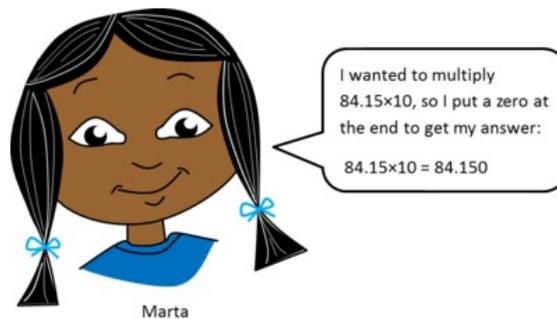
#### Alignments to Content Standards

- [Alignment: 5.NBT.A.2](#)

#### Tags

- *This task is not yet tagged.*

Marta made an error while finding the product  $84.15 \times 10$ .



In your own words, explain Marta's misunderstanding. Please explain what she should do to get the correct answer and include the correct answer in your response.

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## Commentary

This task highlights a common misconception among students deriving the rules for multiplying a number by a power of 10. Many students correctly recognize that multiplying a whole number by a power of 10 will result in a product with as many 0s at the end as were in the power of 10. When students transition to multiplying decimals by powers of 10, they often generalize this "rule" without thinking about the value that results. It is important to create dialogue around this misconception, especially during the initial stages of deriving rules for multiplying and dividing numbers by powers of 10. This task could be used to ground a classroom discussion during the first day of multiplying decimals by powers of 10. It would also be appropriate for a formative assessment to check for student understanding of this pivotal transition from whole number reasoning to decimal reasoning.

This task offers students the opportunity to think critically about place value, but also to critique the reasoning of others (MP3). Students must recognize that Marta's misunderstanding comes from an understandable, but erroneous student line of thinking; if students use this rule for whole numbers, then they are likely to try to apply it to decimals as well. Students working on this task should see that while Marta's rule does work for whole numbers being multiplied by powers of 10, it will not work for decimals being multiplied by powers of 10 for the reasons stated in the solution.

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## Solutions

### Solution: 1

Marta is mistakenly trying to continue a pattern dealing with multiplying whole numbers by powers of 10: the product will have the same digits as the whole number followed by the same number of 0s as the power of 10. Marta tried to place a 0 after 84.15 in her problem to continue this pattern, but placing a 0 in the thousandths place did not change the value of 84.15. Instead, Marta can shift the decimal one place to the right so that each digit occupies ten times its original place. Her correct answer is 841.5. Another way of finding the product of 84.15 and 10 is to rewrite 84.15 in expanded notation and use the distributive property:

$$\begin{aligned}(80 + 4 + 0.1 + 0.05) \times 10 &= (80 \times 10) + (4 \times 10) + (0.1 \times 10) + (0.05 \times 10) \\ &= 800 + 40 + 1 + 0.5 \\ &= 841.5\end{aligned}$$

Using expanded notation also highlights that the place value of each digit needs to be multiplied by a factor of 10. It should be noted that the digit 8 in the original expression represented 8 tens, but will be 8 hundreds in our product. In Marta's solution, the 8 still only represents 8 tens and the magnitude of the number has not changed.

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