# Methods for Multiplying Decimals

Let's look at some ways we can represent multiplication of decimals.

## 6.1 Which Three Go Together: Multiplication Expressions

Which three go together? Why do they go together?

A

$$(0.1) \cdot 2 \cdot 3$$

B

$$3 \cdot (0.2)$$

C

$$(0.1) \cdot 3$$

D

$$6 \cdot \frac{1}{10}$$

## 6.2 Using Properties of Numbers to Reason about Multiplication

Elena and Noah used different methods to compute $(0.23) \cdot (1.5)$. Both calculations were correct.

| Elena's Method | Noah's Method |
|---|---|
| $(0.23) \cdot 100 = 23$ | $0.23 = \frac{23}{100}$ |
| $(1.5) \cdot 10 = 15$ | $1.5 = \frac{15}{10}$ |
| $23 \cdot 15 = 345$ | $\frac{23}{100} \cdot \frac{15}{10} = \frac{345}{1,000}$ |
| $345 \div 1,000 = 0.345$ | $\frac{345}{1,000} = 0.345$ |

1. Analyze the two methods, then discuss these questions with your partner.
   - Which method makes more sense to you? Why?
   - What might Elena do to compute $(0.16) \cdot (0.03)$?
   - What might Noah do to compute $(0.16) \cdot (0.03)$?
   - Will the two methods result in the same value?
2. Compute each product using the equation $21 \cdot 47 = 987$ and what you know about fractions, decimals, and place value. Explain or show your reasoning.
   a. $(2.1) \cdot (4.7)$

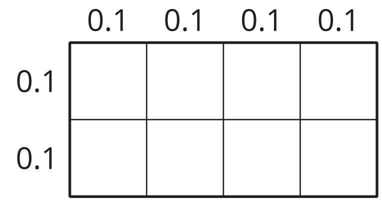
   b. $21 \cdot (0.047)$

   c. $(0.021) \cdot (4.7)$

## 6.3 Using Area Diagrams to Reason about Multiplication

1. In the diagram, the side length of each square is 0.1 unit.

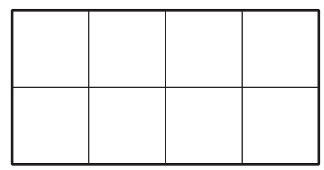
   a. Explain why the area of each square is *not* 0.1 square unit.




   b. Explain how you can use the area of each square to find the area of the rectangle.

   c. What does the equation $(0.4) \cdot (0.2) = 0.08$ represent in this situation?

2. Label the squares with their side lengths so the area of this rectangle represents $40 \cdot 20$.

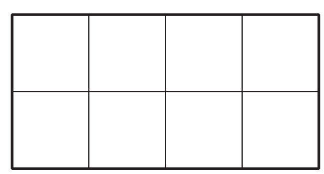


   a. What is the area of each square?

   b. Use the squares to help you find $40 \cdot 20$. Be prepared to explain your reasoning.

3. Label the squares with their side lengths so the area of this rectangle represents $(0.04) \cdot (0.02)$.

   Next, use the diagram to help you find $(0.04) \cdot (0.02)$. Be prepared to explain your reasoning.



## Lesson 6 Summary

Here are three other ways to calculate a product of two decimals, such as $(0.04) \cdot (0.07)$.

- First, we can multiply each decimal by the same power of 10 to obtain whole-number factors.

  $$(0.04) \cdot 100 = 4$$
  $$(0.07) \cdot 100 = 7$$

  Because we multiplied both 0.04 and 0.07 by 100 to get 4 and 7, the product 28 is $(100 \cdot 100)$ times the original product, so we need to divide 28 by 10,000.

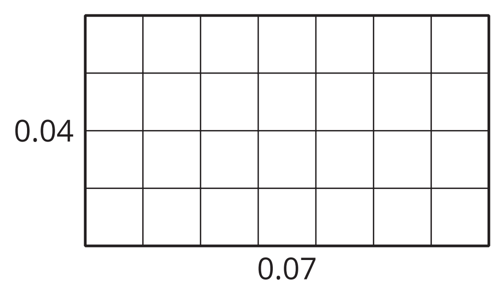
  $$4 \cdot 7 = 28$$
  $$28 \div 10{,}000 = 0.0028$$

- Second, we can write each decimal as a fraction and multiply them.

  $$\frac{4}{100} \cdot \frac{7}{100} = \frac{28}{10{,}000} = 0.0028$$

- Third, we can use an area diagram. The product $(0.04) \cdot (0.07)$ can be thought of as the area of a rectangle with side lengths of 0.04 unit and 0.07 unit.

  In this diagram, each small square is 0.01 unit by 0.01 unit. The area of each square, in square units, is therefore $\left(\frac{1}{100} \cdot \frac{1}{100}\right)$, which is $\frac{1}{10{,}000}$.

  Because the rectangle is composed of 28 small squares, the area of the rectangle, in square units, must be:

  $$28 \cdot \frac{1}{10,000} = \frac{28}{10,000} = 0.0028$$

All three calculations show that $(0.04) \cdot (0.07) = 0.0028$.