

# Key Concepts

Lesson  
4-2

## Multiplying Decimals

**Objective** Teach students to apply the standard algorithm for multiplication of whole numbers to multiplying decimals.

**Note to the Teacher** *Point out that when multiplying decimals, the algorithm for multiplying whole numbers can be used. One then only needs to determine where the decimal point should be placed in the result.*

### The Algorithm

First introduce the algorithm for multiplying two decimals.

<b>Multiplication Algorithm for Decimals</b>	<ol style="list-style-type: none"><li>1. First multiply the decimals as if they were whole numbers, without regard to the decimal points.</li><li>2. Determine the number of digits to the right of the decimal point in each of the decimals, and add these two numbers together.</li><li>3. The sum in Step 2 will be the number of digits to the right of the decimal point in the answer. Place the decimal point in the answer accordingly.</li></ol>
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### Example 1 Multiply 2.3 and 1.11.

**Solution** First multiply the numbers as if they were whole numbers, without considering the decimal points.

$$\begin{array}{r} 1.11 \\ \times 2.3 \\ \hline 333 \\ 222 \\ \hline 2553 \end{array}$$

Look at the decimals 1.11 and 2.3. The decimal 1.11 has *two* digits to the right of its decimal point, and 2.3 has *one* digit to the right of its decimal point. Together, there are  $2 + 1$  or 3 digits to the right of the decimal points. So, in the answer, there should be 3 digits to the right of the decimal point. This means the decimal point should be placed between the 2 and the first 5, making the answer 2.553.

**Example 2 Multiply  $3.21 \times 0.02$ .**

**Solution** Ignoring the decimal points leads to multiplying  $321 \times 2$ , which gives 642.

Since 3.21 and 0.02 each have two digits to the right of the decimal point, their product will have four digits to the right of the decimal point.

$$3.21 \times 0.02 = 0.0642$$

**Note to the Teacher** *Make sure that students complete several decimal multiplication problems using this algorithm. Emphasize the placement of the decimal point in the product, since this is the new skill.*

## Estimation

Just as when multiplying whole numbers, estimation should be used to check the reasonableness of the product of two decimals. This check can help students catch any possible mistake in the placement of the decimal point in their answer.

**Example 3 Multiply 3.7 and 4.2. Use estimation to check the reasonableness of your answer.**

**Solution** First, carry out the multiplication.

$$\begin{array}{r} 4.2 \\ \times 3.7 \\ \hline 294 \\ 126 \\ \hline 1554 \end{array}$$

The decimals 3.7 and 4.2 each has one digit to the right of its decimal point. So the decimal point in the answer should be placed between the two 5's, making the answer 15.54.

To check the reasonableness of this result, round 4.2 to 4 and round 3.7 to 4. The answer should be approximately  $4 \times 4$  or 16. Since 15.54 is close to 16, this answer is reasonable.

In addition to checking the reasonableness of a product, estimation can be used to actually determine the correct placement of the decimal point in the product of two decimals.

**Example 4** Multiply  $4.03 \times 3.04$ .

**Solution** Multiply the numbers without regard to the decimal points.

$$\begin{array}{r} 4.03 \\ \times 3.04 \\ \hline 1612 \\ 000 \\ 1209 \\ \hline 122512 \end{array}$$

To help determine where the decimal point should be in the answer, notice that 4.03 is about 4 and 3.04 is about 3. So the answer should be close to  $4 \times 3$  or 12. In order for the answer to be close to 12, the decimal point needs to be placed between the second and third digits from the left, so the answer is 12.2512.

Notice that if the decimal point had been written one place further to the right, the answer would have been 122.512, which is much too large; and if the decimal point had been written one place further to the left, the answer would have been 1.22512, which is too small.

