English Spanish

3.3 Multiplying Decimals

STATE STANDARDS
MA.6.A.1.1
MA.6.A.1.2
MA.6.A.1.3
MA.6.A.5.3

Essential Question When multiplying decimals, how do you know where to place the decimal point in the product?

1 EXAMPLE: Multiplying Decimals

Find 0.2×0.3.

$$0.2 \times 0.3 = \frac{2}{10} \times \frac{3}{10}$$ Write as fractions.

$$= \frac{6}{100}$$ Multiply the fractions.

$$= \frac{6}{10^2}$$ Rewrite the denominator as a power of 10.

$$= 0.06$$ Rewrite the fraction as a decimal.

∴ So, $0.2 \times 0.3 = 0.06$.

2 ACTIVITY: Multiplying Decimals Using Powers of 10

Work with a partner.

a. Copy and complete the table. Use Example 1 as a model.

Problem	Rewrite as Fractions	Product	Denominator as Base 10	Rewrite as Decimal
0.2×3	$\frac{2}{10} \times \frac{3}{1}$	$\frac{6}{10}$	$\frac{6}{10^1}$	0.6
0.2×0.3	$\frac{2}{10} \times \frac{3}{10}$	$\frac{6}{100}$	$\frac{6}{10^2}$	0.06
0.2×0.03				
0.2×0.003				
0.2×0.0003				
0.2×0.00003				

b. Describe the connection between the first and last columns.

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3 ACTIVITY: Multiplying Decimals Using Powers of 10

Copy and complete the table. Use Example 1 as a model.

Problem	Rewrite as Fractions	Product	Denominator as Base 10	Rewrite as Decimal
2×0.3	$\frac{2}{1} \times \frac{3}{10}$	$\frac{6}{10}$	$\frac{6}{10^1}$	0.6
0.2×0.3				
0.02×0.3				
0.002×0.3				
0.0002×0.3				

What Is Your Answer?

4. **a.** What differences do you notice between the tables in Activities 2 and 3?

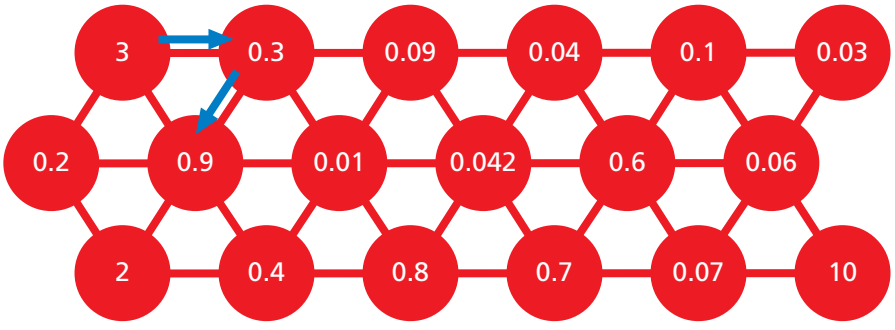
b. What similarities do you notice?

5. **IN YOUR OWN WORDS** When multiplying decimals, how do you know where to place the decimal point in the product? Give examples in your description.

6. Write a general rule for multiplying two decimals. Give examples with your rule.

7. How many products can you find in the circle maze? List each product.

Sample: $3 \times 0.3 = 0.9$



Practice Use what you learned about multiplying decimals to complete Exercises 8–15 on page 122.

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3.3 Lesson

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The rule for multiplying two decimals is similar to the rule for multiplying a decimal by a whole number.

Key Idea

Multiplying Decimals by Decimals

Words Multiply as you would with whole numbers. Then add the number of decimal places in the factors. This sum gives you the number of decimal places in the product.

Numbers

$$\begin{array}{rl} 4.716 & \leftarrow \text{3 decimal places} \\ \times\ 0.2 & \leftarrow \text{+ 1 decimal place} \\ \hline 0.9432 & \leftarrow \text{4 decimal places} \end{array}$$

EXAMPLE 1 Multiplying Decimals

a. Find 4.8×7.2. Estimate $5 \times 7 = 35$

$$\begin{array}{rl} 4.8 & \leftarrow \text{1 decimal place} \\ \times\ 7.2 & \leftarrow \text{+ 1 decimal place} \\ \hline 96 & \\ 336 & \\ \hline 34.56 & \leftarrow \text{2 decimal places} \end{array}$$

So, $4.8 \times 7.2 = 34.56$. Reasonable? $34.56 \approx 35$ ✓

b. Find 3.1×0.05. Estimate $3 \times 0 = 0$

$$\begin{array}{rl} 3.1 & \leftarrow \text{1 decimal place} \\ \times\ 0.05 & \leftarrow \text{+ 2 decimal places} \\ \hline 0.155 & \leftarrow \text{3 decimal places} \end{array}$$

So, $3.1 \times 0.05 = 0.155$. Reasonable? $0.155 \approx 0$ ✓

On Your Own

Now You're Ready
Exercises 8–23

Multiply. Use estimation to check your answer.

1. 8.1×5.6
2. 2.7×9.04
3. 6.32×0.09
4. 1.785×0.2

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EXAMPLE 2 Evaluating Expressions

Evaluate the expression $2.4x$ for the given value of x.

a. $x = 3.95$

$2.4x = 2.4(3.95)$ Substitute.

$$\begin{array}{r} 3.9\,5 \\ \times\ \ 2.4 \\ \hline 1\,5\,8\,0 \\ 7\,9\,0 \\ \hline 9.4\,8\,0 \end{array}$$

3.95 ← 2 decimal places
× 2.4 ← + 1 decimal place
9.480 ← 3 decimal places

∴ So, $2.4x = 9.48$ when $x = 3.95$.

b. $x = 0.016$

$2.4x = 2.4(0.016)$ Substitute.

$$\begin{array}{r} 0.0\,1\,6 \\ \times\ \ 2.4 \\ \hline 6\,4 \\ 3\,2 \\ \hline 0.0\,3\,8\,4 \end{array}$$

0.016 ← 3 decimal places
× 2.4 ← + 1 decimal place
0.0384 ← 4 decimal places

∴ So, $2.4x = 0.0384$ when $x = 0.016$.

On Your Own

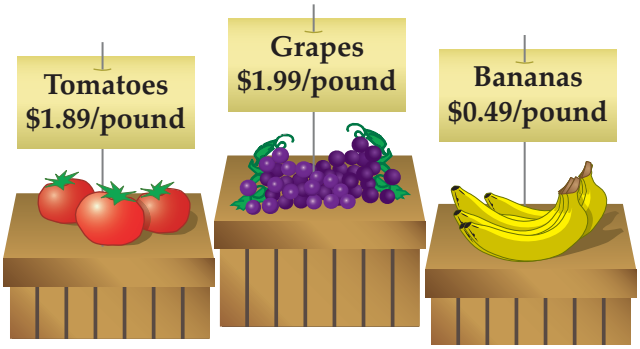
Now You're Ready
Exercises 28–35

Evaluate the expression $3.5x$ for the given value of x.

5. $x = 2.41$ **6.** $x = 18.4$ **7.** $x = 1.062$ **8.** $x = 0.007$

EXAMPLE 3 Real-Life Application

You buy 2.75 pounds of tomatoes. You hand the cashier a $10 bill. How much change will you get back?



Step 1: Multiply 1.89 by 2.75.

$$\begin{array}{r} 1.8\,9 \\ \times\ 2.7\,5 \\ \hline 9\,4\,5 \\ 1\,3\,2\,3 \\ 3\,7\,8 \\ \hline 5.1\,9\,7\,5 \end{array}$$

1.89 ← 2 decimal places
× 2.75 ← + 2 decimal places
5.1975 ← 4 decimal places

The cost of 2.75 pounds of tomatoes is $5.20.

Step 2: Subtract $5.20 from $10.

$$\begin{array}{r} 10.00 \\ -\ 5.20 \\ \hline 4.80 \end{array}$$

∴ So, you will get $4.80 back.

On Your Own

9. You buy 2.25 pounds of grapes. You hand the cashier a $5 bill. How much change will you get back?

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3.3 Exercises

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Vocabulary and Concept Check

1. NUMBER SENSE If you know $12 \times 24 = 288$, how can you find 1.2×2.4?

Copy the problem and place the decimal point in the product.

2.
$$\begin{array}{r} 1.7\,8 \\ \times\ 4.9 \\ \hline 8\,7\,2\,2 \end{array}$$

3.
$$\begin{array}{r} 9.2\,4 \\ \times\ 0.6\,8 \\ \hline 6\,2\,8\,3\,2 \end{array}$$

4.
$$\begin{array}{r} 3.7\,5 \\ \times\ 5.2\,2 \\ \hline 1\,9\,5\,7\,5\,0 \end{array}$$

How many decimal places are in the product?

5. 6.17×8.2 **6.** 1.684×10.2 **7.** 0.053×2.78

Practice and Problem Solving

Multiply. Use estimation to check your product.

8.
$$\begin{array}{r} 0.7 \\ \times\ 0.2 \\ \hline \end{array}$$

9.
$$\begin{array}{r} 0.08 \\ \times\ 0.3 \\ \hline \end{array}$$

10.
$$\begin{array}{r} 0.007 \\ \times\ 0.03 \\ \hline \end{array}$$

11.
$$\begin{array}{r} 0.0008 \\ \times\ 0.09 \\ \hline \end{array}$$

12.
$$\begin{array}{r} 0.004 \\ \times\ 0.9 \\ \hline \end{array}$$

13.
$$\begin{array}{r} 0.06 \\ \times\ 0.5 \\ \hline \end{array}$$

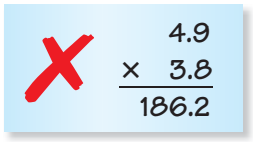
14.
$$\begin{array}{r} 0.0008 \\ \times\ 0.004 \\ \hline \end{array}$$

15.
$$\begin{array}{r} 0.0002 \\ \times\ 0.06 \\ \hline \end{array}$$

16. 12.4×0.2 **17.** 18.6×5.9 **18.** 7.91×0.72 **19.** 1.16×3.35

20. 6.478×18.21 **21.** 1.064×7.216 **22.** 0.0021×18.2 **23.** 6.109×8.407

24. ERROR ANALYSIS Describe and correct the error in the solution.



25. TAKEOUT A Chinese restaurant offers buffet takeout for \$4.99 per pound. How much does your takeout meal cost?

26. CROPLAND Alabama has about 2.51 million acres of cropland. Florida has about 1.15 times as much cropland as Alabama. How much cropland does Florida have?

27. GOLD On a tour of an old gold mine, you find a nugget containing 0.82 ounce of gold. Gold is worth \$904.62 per ounce. How much is your nugget worth?

ALGEBRA Evaluate the expression when $x = 3.7$, $y = 6.19$, and $z = 0.072$.

28. $5x$ **29.** $8z$ **30.** $2.21y$ **31.** $0.006x$

32. xy **33.** xz **34.** $3.6y + 3.2$ **35.** $2.7x - 3.79$

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Describe the pattern. Find the next three numbers.

36. 1, 0.6, 0.36, 0.216, . . .

37. 15, 1.5, 0.15, 0.015, . . .

38. 0.04, 0.02, 0.01, 0.005, . . .

39. 5, 7.5, 11.25, 16.875, . . .

Convert the fractions or mixed numbers to decimals. Then multiply.

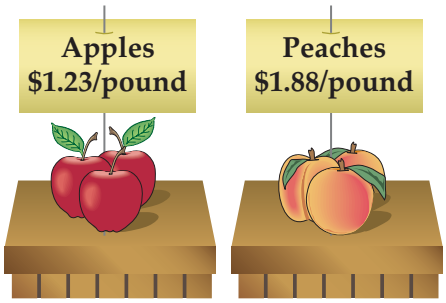
40. $\frac{7}{8} \times \frac{3}{5}$

41. $\frac{9}{20} \times \frac{3}{4}$

42. $1\frac{1}{16} \times 3\frac{37}{50}$

43. $5\frac{21}{40} \times 6\frac{16}{25}$

44. **FOOD** You buy 2.6 pounds of apples and 1.475 pounds of peaches. You hand the cashier a \$20 bill. How much change will you get back?



45. **MILEAGE** A car can travel 22.36 miles on one gallon of gasoline.

a. How far can the car travel on 8.5 gallons of gasoline?

b. A hybrid car can travel 33.1 miles on one gallon of gasoline. How much farther can the hybrid car travel on 8.5 gallons of gasoline?

46. **REASONING** Without multiplying, how many decimal places does 3.4^2 have? 3.4^3? 3.4^4? Explain your reasoning.

47. Geometry A rectangular painting has an area of 9.52 square feet.

a. Draw three different ways in which this can happen.

b. The cost of a frame depends on the perimeter of a painting. Which of your drawings from part (a) is the least expensive to frame? Explain your reasoning.

c. The thin black framing costs \$1 per foot. The fancy framing costs \$5 per foot. Will the fancy framing cost five times as much as the black framing? Explain why or why not.

Fair Game Review What you learned in previous grades & lessons

Divide. SKILLS REVIEW HANDBOOK

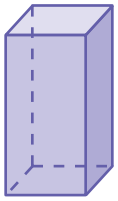
48. 78 ÷ 3

49. 65 ÷ 13

50. 57 ÷ 19

51. 84 ÷ 12

52. **MULTIPLE CHOICE** How many edges does the rectangular prism at the right have? SKILLS REVIEW HANDBOOK



Ⓐ 4 Ⓑ 6

Ⓒ 8 Ⓓ 12