English Spanish

3.2 Multiplying Decimals and Whole Numbers

Essential Question What happens to the decimal point when you multiply a whole number by a decimal?

1 ACTIVITY: Multiplying by Powers of 10

Work with a partner. Copy and complete the table. Then describe how to multiply by a power of 10.

Exponent	Power of 10	Product	Evaluate
1	$10^1 = 10$	10×0.825	8.25
2	$10^2 = 100$	100×0.825	82.5
3	$10^3 = 1000$	1000×0.825	825
4	$10^4 = 10{,}000$		
5	$10^5 = 100{,}000$		

2 ACTIVITY: Multiplying a Decimal by a Whole Number

Work with a partner. Your school is selling tickets to the school carnival.

a. Copy and complete the table.

Number of Tickets	Price per Ticket	Find the Total	Total Cost
3	0.25	0.25 + 0.25 + 0.25	$0.75
4	0.25		
5	0.25		
15	0.25		
100	0.25		

b. The example in the table shows how to find the total cost using addition. This works for small numbers of tickets. How did you find the total cost for the last two rows?

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3 ACTIVITY: Back to School Shopping

Game Rules

- Take turns with your partner.
- When it is your turn, choose one item from the list. Decide whether you want to buy 1, 2, or 3 of your item.
- The person who comes closest to $30 without going over, wins.

Back to School List

Ink Pens	$1.41	Paper Clips	$3.49
Pencils	$0.33	Markers	$3.29
Erasers	$0.24	Colored Pencils	$0.89
Poster Board	$0.64	Tissues	$2.29
Rulers	$1.99	Rubber Bands	$3.49
Protractors	$2.29	Notebook Paper	$3.98
Pocket Folders	$0.33	Graph Paper	$3.52
Sticky Notes	$0.99	Stapler	$12.63
Spirals	$1.15	Staples	$2.99
3-ring Binders	$4.26	Stickers	$0.99
Index Cards	$1.99	Calculator	$10.98
Scissors	$3.99	Book Covers	$1.15

What Is Your Answer?

4. **IN YOUR OWN WORDS** What happens to the decimal point when you multiply a whole number by a decimal?

Practice Use what you learned about multiplying decimals and whole numbers to complete Exercises 8–15 on page 116.

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3.2 Lesson

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Key Idea

Multiplying Decimals by Whole Numbers

Words Multiply as you would with whole numbers. Then count the number of decimal places in the decimal factor. The product has the same number of decimal places.

Numbers

$$\begin{array}{r} 13.91 \\ \times \quad 7 \\ \hline 97.37 \end{array}$$ 2 decimal places

$$\begin{array}{r} 6.218 \\ \times \quad 4 \\ \hline 24.872 \end{array}$$ 3 decimal places

EXAMPLE 1 Using Estimation to Find a Product

Find 15.8×4. **Estimate** $16 \times 4 = 64$

$$\begin{array}{r} {\scriptstyle 2\ 3} \\ 15.8 \\ \times \quad 4 \\ \hline 63.2 \end{array}$$

Multiply as you would with whole numbers.

The estimate is 64. So, place the decimal point after the 3.

EXAMPLE 2 Multiplying Decimals and Whole Numbers

a. Find 8.7×5.

Estimate $9 \times 5 = 45$

$$\begin{array}{r} {\scriptstyle 3} \\ 8.7 \\ \times \quad 5 \\ \hline 43.5 \end{array}$$

One decimal place

Count one decimal place from right to left.

So, $8.7 \times 5 = 43.5$.

Reasonable? $43.5 \approx 45$ ✓

b. Find 6×0.91.

Estimate $6 \times 1 = 6$

$$\begin{array}{r} {\scriptstyle 5} \\ 0.91 \\ \times \quad 6 \\ \hline 5.46 \end{array}$$

Two decimal places

Count two decimal places from right to left.

So, $6 \times 0.91 = 5.46$.

Reasonable? $5.46 \approx 6$ ✓

On Your Own

Now You're Ready
Exercises 4–23

Find the product. Use an estimate to place the decimal point.

1. 2.1×3
2. 24.3×7
3. 5.9×11
4. 19.6×2

Multiply. Use estimation to check your answer.

5. 12.3×8
6. 5×14.51
7. 0.7×4
8. 0.88×9

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EXAMPLE 3 Inserting Zeros in the Product

Find 3×0.016.

$$\begin{array}{r} {\scriptstyle 1} \\ 0.016 \\ \times \quad 3 \\ \hline 0.048 \end{array}$$

Three decimal places

To have three decimal places, insert zeros to the left of 48.

∴ So, $3 \times 0.016 = 0.048$.

Study Tip

When multiplying, you may not have enough decimal places in the product. In this case, insert one or more zeros in the product.

EXAMPLE 4 Standardized Test Practice

Which expression is equivalent to $7(n + 0.0013)$?

Ⓐ $n + 0.0091$ Ⓑ $7n + 0.091$

Ⓒ $7n + 0.0091$ Ⓓ $7n + 0.91$

$7(n + 0.0013) = 7(n) + 7(0.0013)$ Distributive Property

$= 7n + 0.0091$ Multiply 7 and 0.0013.

∴ The correct answer is Ⓒ.

On Your Own

Now You're Ready
Exercises 24–31 and 41–46

9. Find 0.012×8.

10. Find 0.003×3.

11. Use the Distributive Property to rewrite $4(p + 0.0021)$.

EXAMPLE 5 Use Mental Math

How high is a stack of 100 dimes?

1.35 millimeters

Method 1: Multiply 1.35 by 100.

$$\begin{array}{r} 1.35 \\ \times \; 1\,00 \\ \hline 0\;00 \\ 00\;0 \\ 135 \\ \hline 135.00 \end{array}$$

Two decimal places

Method 2: You are multiplying by a power of 10. Use mental math.

There are two zeros in 100. So, move the decimal point in 1.35 two places to the right.

$1.35 \times 100 = 135. = 135$

∴ So, a stack of 100 dimes is 135 millimeters high.

On Your Own

12. A quarter is 1.75 millimeters thick. How high is a stack of 1000 quarters? Solve using both methods.

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3.2 Exercises

Check It Out
Help with Homework
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Vocabulary and Concept Check

1. **NUMBER SENSE** How many decimal places are in the product of 0.0087 and 23? Explain.
2. **NUMBER SENSE** Is the product 1.23×8 greater than or less than 8? Explain.
3. **DIFFERENT WORDS, SAME QUESTION** Which is different? Find "both" answers.

What is the product of 7.6 and 3?	How much is 7.6 times 3?
7.6 is how much more than 3?	Multiply 7.6 and 3.

Practice and Problem Solving

Find the product. Use an estimate to place the decimal point.

1 **4.** 0.2×6 **5.** 0.7×8 **6.** 4.6×3 **7.** 3.1×13

Multiply. Use estimation to check your answer.

2 **8.** 2.8×7 **9.** 6.1×9 **10.** 0.36×18 **11.** 7.43×3

12. 1.7×12 **13.** 9.5×5 **14.** 4.08×8 **15.** 1.24×2

16. 4.8×7 **17.** 6.3×5 **18.** 7.19×16 **19.** 0.87×21

20. 1.95×11 **21.** 5.89×5 **22.** 3.472×4 **23.** 8.188×12

Multiply.

3 **24.** 0.024×3 **25.** 0.013×7 **26.** 0.083×2 **27.** 0.017×5

28. 7×0.007 **29.** 19×0.004 **30.** 0.0038×9 **31.** 0.0093×6

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

32.

$$\begin{array}{r} 0.0045 \\ \times \quad 9 \\ \hline 4.05 \end{array}$$

33.

$$\begin{array}{r} 0.32 \\ \times \quad 5 \\ \hline 0.160 \end{array}$$

34. MOON The weight of an object on the moon is about 0.167 of its weight on Earth. How much does a 180-pound astronaut weigh on the moon?

35. BAMBOO A bamboo plant grows about 1.25 feet each day. Find the growth in one week. Use an estimate to place the decimal point.

36. NAILS A fingernail grows about 0.1 millimeter each day. How much does a fingernail grow in 30 days? 90 days?

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MENTAL MATH **Use mental math to find the product.**

37. 2.83×10

38. 7.1×100

39. 9.67×1000

40. $0.332 \times 100{,}000$

Use the Distributive Property to rewrite the expression.

41. $5(x + 0.31)$

42. $3(y - 0.17)$

43. $7(b + 0.052)$

44. $8(w + 0.0065)$

45. $12(w + 0.0022)$

46. $9(r - 0.00082)$

Evaluate the expression.

47. $3.4 \times 6 + 8$

48. $3 + 9 \times 2.3$

49. $8.82 \times 4 \times 8$

50. $2.84 \times 3 \times 100$

51. **REASONING** Show how to evaluate $7.12 \times 8.22 \times 100$ without multiplying the two decimals.

52. **BUILDING HEIGHTS** One meter is approximately 3.28 feet. Find the height of each building in feet by multiplying its height in meters by 3.28.

Continent	Tallest Building	Height
Africa	Carlton Centre Office Tower	223 m
Asia	Taipei 101	509 m
Europe	Naberezhnaya Tower C	268 m
North America	Sears Tower	442 m
Australia	Q1 Tower	323 m
South America	Parque Central Torre Este	221 m

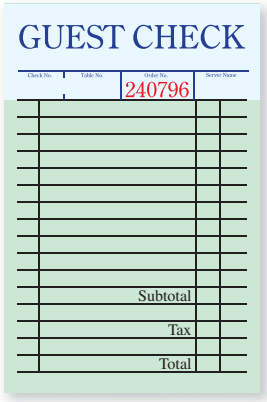
53. Open-Ended You and four friends have dinner at a restaurant.

a. Draw a restaurant menu that has main items, desserts, and beverages, with their prices.

b. Write a guest check that shows what each of you ate. Find the subtotal.

c. Multiply by 0.07 to find the tax. Then find the total.

d. Round the total to the nearest whole number. Multiply by 0.20 to estimate a tip. Including the tip, how much did you spend?



Fair Game Review What you learned in previous grades & lessons

Multiply. SKILLS REVIEW HANDBOOK

54. 124×20

55. 571×32

56. 364×121

57. 289×163

58. **MULTIPLE CHOICE** You buy a shirt for \$9.99 and a hat for \$6.60. You give the cashier a \$20 bill. How much change do you receive? SKILLS REVIEW HANDBOOK

(A) \$3.41 (B) \$4.41 (C) \$9.35 (D) \$11.33