Strategies for Multiplying Decimals
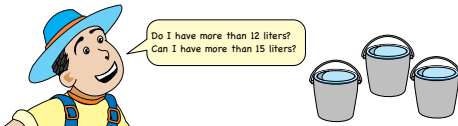
A gardener filled 3 buckets of water. Each bucket contained 4.5 liters of water.

Do I have more than 12 liters?
Can I have more than 15 liters?

1. Work with a partner to find how much water the gardener had.

Patterns in Problems

2. Solve. Look for patterns.
A. 36 × 1 =
B. 36 × 10 =
C. 36 × 100 =
D. 36 × 1000 =
E. 36 × 10,000 =

3. A. Explain a rule for multiplying numbers by multiples of 10.
B. Why does this rule work?

4. Estimate the products. Solve. Use a calculator to check your answers. Look for patterns.
A. 3.6 × 1 =
B. 3.6 × 10 =
C. 3.6 × 100 =
D. 3.6 × 1000 =
E. 3.6 × 10,000 =

The whole is ☐.
What is 10 groups of .36?

Mark

5. A. What happens to the decimal point when you multiply a decimal by a ten?
B. Explain a rule for multiplying decimals by multiples of 10.

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Model and Multiply

You can think of decimals as fractions with denominators of 10, 100, 1000, and so on.

$\frac{1}{10}$ or 0.1 $\frac{25}{100}$ or 0.25 $\frac{52}{1000}$ or 0.052 $\frac{2}{5} = \frac{4}{10}$ or 0.4

Since decimal numbers are fractions, you can use what you know about multiplying fractions to help you think about multiplying decimals.

6. This grid shows $\frac{1}{10}$ or 0.1.   This grid shows 3 × 0.1.

A. Is 3 × 0.1 greater than or less than 3?
B. Describe how the decimal moves from its place in 3 to its place in 0.3 when you multiply 3 × 0.1.
C. How many times smaller is 0.3 than 3?

7. This grid shows $\frac{1}{100}$ or 0.1.   This grid shows 3 × 0.01.

A. Is 3 × 0.01 greater than or less than 3?
B. Describe how the decimal moves from its place in 3 to its place in 0.03 when you multiply 3 × 0.01.
C. How many times smaller is 0.03 than 3?

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*Answers and/or discussion are included in the lesson.
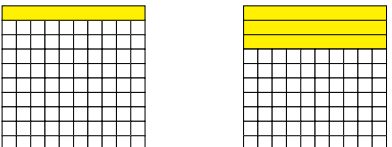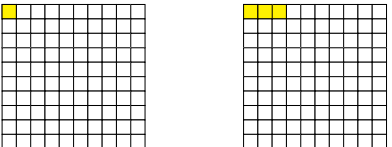

Student Guide

Strategies for Multiplying Decimals
(SG pp. 400–409)
Questions 1–31

1. * 3 × 4.5 = 13.5 liters of water; Solution strategies will vary. Possible strategy: I multiplied the whole numbers, 3 x 4 = 12. I knew 0.5 was one-half, so I added on one-half 3 times: $12\frac{1}{2}$, 13, $13\frac{1}{2}$.

2. A. 36 × 1 = 36
B.* 36 × 10 = 360
C. 36 × 100 = 3600
D. 36 × 1000 = 36,000
E. 36 × 10,000 = 360,000

3. A.* Possible response: To multiply numbers that end in zero, you just multiply the numbers without the zeros on the ends and then put as many more zeros on the end of the product as there are in the numbers.

B.* Possible response: When you multiply a number by ten, you are making it ten times bigger. Adding a zero on to the end shows it is ten times bigger.

4. A. 3.6 × 1 = 3.6
B.* 3.6 × 10 = 36.0
C. 3.6 × 100 = 360.0
D. 3.6 × 1000 = 3600.0
E.* 3.6 × 10,000 = 36,000.0

5. A. The decimal point moves to the right
B.* Possible response: When you multiply a decimal by a ten, you move the decimal point to the right the same number of places that there are zeros in ten.

6. A.* less than 3
B.* The decimal moves one place to the left when you multiply 3 × 0.1.
C.* 10 times smaller

7. A. less than 3
B.* The decimal moves two places to the left when you multiply 3 × 0.01.
C.* 100 times smaller

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8. 7.4 liters

9. A. $3 \times 1 = 3$

  B. $3 \times 0.1 = 0.3$

  C. $3 \times 0.01 = 0.03$

  D. $3 \times 0.001 = 0.003$

  E. $3 \times 0.0001 = 0.0003$

10. A.* $12 \times 12 = 144$

  B.* $12 \times 1.2 = 14.4$

  C.* $12 \times 0.12 = 1.44$

  D.* $12 \times 0.012 = 0.144$

  E.* $12 \times 0.0012 = 0.0144$

11. A. Possible response: All the products have the same digits 0, 1, and two 4s.

  B. Possible response: The decimal points are in different places.

12. A. $25 \times 1 = 25$

  B. $25 \times 0.1 = 2.5$

  C.* $25 \times 0.01 = 0.25$

  D. $25 \times 0.001 = .025$

  E. $25 \times 0.0001 = .0025$

13. A. $2.5 \times 1 = 2.5$

  B. $2.5 \times 10 = 25.0$

  C.* $2.5 \times 100 = 250$

  D. $2.5 \times 1000 = 2500$

  E. $2.5 \times 10,000 = 25,000$

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*Answers and/or discussion are included in the Lesson.

✓ **Check-In: Questions 14–17**

14. A. 25 × 2 =
   B. 25 × 0.2 =
   C. 25 × 0.02 =
   D. 25 × 0.002 =
   E. 25 × 0.0002 =

15. A. 2 × 2.5 =
   B. 20 × 2.5 =
   C. 200 × 2.5 =
   D. 2000 × 2.5 =
   E. 20000 × 2.5 =

16. A. How does a decimal point move to show that the product is larger?
   B. How does a decimal point move to show that a product is 10 times larger?
   C. How does a decimal point move to show that the product is smaller?
   D. How does a decimal point move to show that a product is 100 times smaller?
   E. How does a decimal point move to show that a product is 1000 times smaller?

17. A. In which number is the digit 2 larger: 2.50 or 0.25? How much larger?
   B. In which number is the digit 5 smaller: 2.50 or 0.25? How much smaller?
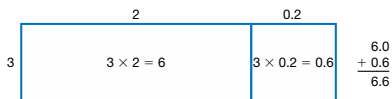
Discuss

Mr. Moreno presented the class with this problem:

I have 3 strips of tape. Each piece is 2.2 meters long.

How much tape do I have in all?

Nicholas used a rectangle model to multiply. He broke 2.2 into 2.0 + 0.2. He multiplied 3 × 2 and got 6. He multiplied 3 × 0.2 and got 0.6. He added 6 + 0.6 for a sum of 6.6.
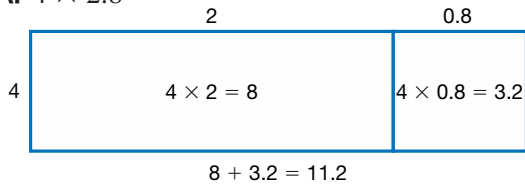
	2	0.2
3	3 × 2 = 6	3 × 0.2 = 0.6

6.0
+ 0.6
6.6

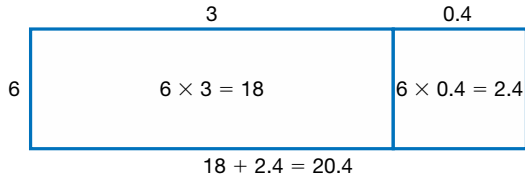Strategies for Multiplying Decimals   SG · Grade 5 · Unit 8 · Lesson 10   **403**

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14. A. $25 \times 2 = 50$
   B. $25 \times 0.2 = 5.0$
   C. $25 \times 0.02 = 0.50$
   D. $25 \times 0.002 = 0.050$
   E. $.25 \times 0.0002 = 0.0050$

15. A. $2 \times 2.5 = 5.0$
   B. $20 \times 2.5 = 50.0$
   C. $200 \times 2.5 = 500.0$
   D. $2000 \times 2.5 = 5000.0$
   E. $20000 \times 2.5 = 50,000.0$

16. A. The decimal point moves to the right to show that the product is larger.
   B. The decimal point moves one place to the right to show that a product is 10 times larger.
   C. The decimal point moves to the left to show that the product is smaller.
   D. The decimal point moves two places to the left to show that a product is 100 times smaller.
   E. The decimal point moves three places to the left to show that a product is 1000 times smaller.

17. A. The digit 2 is larger in 2.50. It is ten times larger.
   B. The digit 5 smaller in 0.25. It is one-tenth as large as the 5 in 2.50. Or, the 5 in 2.50 is ten times as large as the 5 in 0.25.
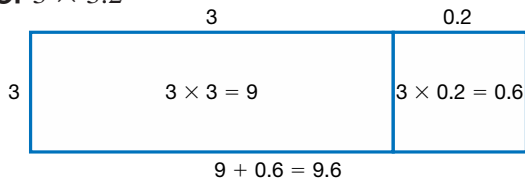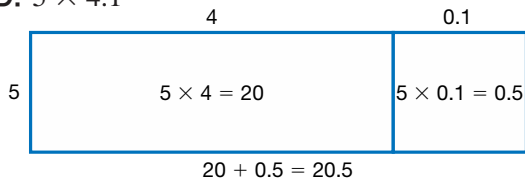
18. A. 4×2.8

	2	0.8
4	$4 \times 2 = 8$	$4 \times 0.8 = 3.2$

$8 + 3.2 = 11.2$

B. 6×3.4

	3	0.4
6	$6 \times 3 = 18$	$6 \times 0.4 = 2.4$

$18 + 2.4 = 20.4$

C. 3×3.2

	3	0.2
3	$3 \times 3 = 9$	$3 \times 0.2 = 0.6$

$9 + 0.6 = 9.6$

D. 5×4.1

	4	0.1
5	$5 \times 4 = 20$	$5 \times 0.1 = 0.5$

$20 + 0.5 = 20.5$

19. A. $0.2 \times 3 = 0.6$

B. $0.2 \times 0.3 = 0.06$

C. $0.2 \times 0.03 = 0.006$

D. $0.2 \times 0.003 = 0.0006$

E. $0.2 \times 0.0003 = 0.00006$

20. A. $0.3 \times 3 = 0.9$

B. $0.3 \times 0.3 = 0.09$

C. $0.3 \times 0.03 = 0.009$

D. $0.3 \times 0.003 = 0.0009$

E. $0.3 \times 0.0003 = 0.00009$

21. A. $6.5 \times 1 = 6.5$

B. $6.5 \times 0.1 = 0.65$

C. $6.5 \times 0.01 = 0.065$

D. $6.5 \times 0.001 = 0.0065$

E. $6.5 \times 0.0001 = 0.00065$

22. A. $0.65 \times 1 = 0.65$

B. $0.65 \times 0.1 = 0.065$

C. $0.65 \times 0.01 = 0.0065$

D. $0.65 \times 0.001 = 0.00065$

E. $0.65 \times 0.0001 = 0.000065$

*Answers and/or discussion are included in the lesson.

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18. Use rectangles to solve the following problems.

A. $4 \times 2.8 =$ **B.** $6 \times 3.4 =$

C. $3 \times 3.2 =$ **D.** $5 \times 4.1 =$

Explore

Multiply a Decimal by a Decimal

For Questions 19–22, use a calculator to solve the problems. Look for patterns.

19. A. $0.2 \times 3 =$

B. $0.2 \times 0.3 =$

C. $0.2 \times 0.03 =$

D. $0.2 \times 0.003 =$

E. $0. \times 0.0003 =$

20. A. $0.3 \times 3 =$

B. $0.3 \times 0.3 =$

C. $0.3 \times 0.03 =$

D. $0.3 \times 0.003 =$

E. $0.3 \times 0.0003 =$

21. A. $6.5 \times 1 =$ **22. A.** $0.65 \times 1 =$

B. $6.5 \times 0.1 =$ **B.** $0.65 \times 0.1 =$

C. $6.5 \times 0.01 =$ **C.** $0.65 \times 0.01 =$

D. $6.5 \times 0.001 =$ **D.** $0.65 \times 0.001 =$
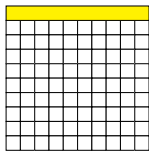
E. $6.5 \times 0.0001 =$ **E.** $0.65 \times 0.0001 =$

23. Do you see a pattern in the problems that could help you place the decimal point? How is the sum of the number of digits after the decimal points in the factors related to the number of digits after the decimal point in the product?
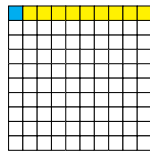
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23.* The sum of the number of digits after the decimal points in the factors is equal to the number of digits after the decimal point in the product. You can just count up how many numbers are after the decimal point in *both* numbers you are multiplying, and then the answer should have that many numbers after *its* decimal point.
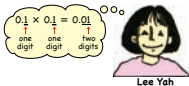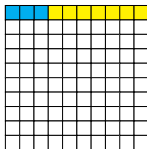
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24. **A.** $0.1 \times 0.3 = 0.03$

   B. $0.1 \times 0.3 = 0.03$ and it is less than 0.1 and less than 0.3.

   C.* Yes, because there are 2 digits after the decimal point in 0.03, and there was a total of 2 digits after the decimal points in the factors 0.1 and 0.3.

25. A.

	4	0.3
3	$3 \times 4 = 12$	$3 \times 0.3 = 0.9$
0.4	$0.4 \times 4 = 1.6$	$0.4 \times 0.3 = 0.12$

$12 + 0.9 + 1.6 + 0.12 = 14.62$

B. Yes because there are 2 digits after the decimal point in 14.62, and there was a total of 2 digits after the decimal points in the factors 3.4 and 4.3.

26.

	3	0.6
2	$2 \times 3 = 6$	$2 \times 0.6 = 1.2$
0.5	$0.5 \times 3 = 1.5$	$0.5 \times 0.6 = 0.30$

$6 + 1.2 + 1.5 + 0.30 = 9.0$ sq. ft.

27. Strategies for second solutions will vary. Possible strategies given.

A. 5.3 ft. $\times$ 2.5 ft.

	2	0.5
5	$5 \times 2 = 10$	$5 \times 0.5 = 2.5$
0.3	$0.3 \times 2 = 0.6$	$0.3 \times 0.5 = 0.15$

$10 + 2.5 + 0.6 + 0.15 = 13.25$ sq. ft.

Using compact method:
$$\begin{array}{r} 5.3 \\ \times\, 2.5 \\ \hline 265 \\ 1060 \\ \hline 13.25 \text{ sq. ft.} \end{array}$$

B. 3.5 ft. by 12.1 ft.

	12	0.1
3	$3 \times 12 = 36$	$3 \times 0.1 = 0.3$
0.5	$0.5 \times 12 = 6$	$0.5 \times 0.1 = 0.05$

$36 + 0.3 + 6 + 0.05 = 42.35$ sq. ft.

Using expanded form:
$$\begin{array}{r} 12.1 = 12 + 0.1 \\ \times\ 3.5 = \ \ 3 + 0.5 \\ \hline 36.0 \\ 0.3 \\ 6.0 \\ 0.05 \\ \hline 42.35 \text{ sq. ft.} \end{array}$$

25. Jerome multiplied 3.4×4.3 this way:

	4	0.3
3	$3 \times 4 =$	$3 \times 0.3 =$
0.4	$0.4 \times 4 =$	$0.4 \times 0.3 =$

A. Write the partial products to find the product.

B. Does your answer follow Lee Yah's rule? Why or why not?

26. Mr. Moreno decided to carpet other rooms in his house. John helped him find the area of a closet floor. Use his rectangle model to find the area of the closet floor.

	3	0.6
2		
0.5		

27. Find the area of the floors of each of the following rooms in two ways. Use a rectangle model and another method. Estimate to place the decimal accurately.
A. Coat closet is 5.3 ft. $\times$ 2.5 ft.
B. Upstairs hall is 3.5 ft. by 12.1 ft.
C. Bedroom closet is 4.3 ft. by 2.1 ft.
D. Bedroom is 9.25 ft. by 10.3 ft.

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C. 4.3 ft. $\times$ 2.1 ft.

	2	0.1
4	$4 \times 2 = 8$	$4 \times 0.1 = 0.4$
0.3	$0.3 \times 2 = 0.6$	$0.3 \times 0.1 = 0.03$

$8 + 0.4 + 0.6 + 0.03 = 9.03$ sq. ft.

Using all partials:
$$\begin{array}{r} 4.3 \\ \times 2.1 \\ \hline 8.0 \\ 0.6 \\ 0.03 \\ 0.4 \\ \hline 9.03 \end{array}$$

For Questions 28-30, solve the first multiplication problem using any method you choose. Then use estimation to decide where the decimal goes for each of the following problems. Write the products.

28. A. $24 \times 63 =$
    B. $0.24 \times 6.3 =$
    C. $24 \times 0.63 =$
    D. $2.4 \times 63 =$
    E. $0.24 \times 0.63 =$

29. A. $15 \times 72 =$
    B. $0.15 \times 7.2 =$
    C. $15 \times 0.72 =$
    D. $1.5 \times 72 =$
    E. $0.15 \times 0.72 =$

30. A. $53 \times 38 =$
    B. $0.53 \times 3.8 =$
    C. $53 \times 0.38 =$
    D. $5.3 \times 38 =$
    E. $0.53 \times 0.38 =$

✓ **Check-In: Question 31**

31. Solve the problems using any strategy. Use either Lee Yah's or Shannon's method for placing the decimal in the answer.

    A. $3.4 \times 0.4 =$ B. $0.47 \times 7.9 =$
    C. $0.003 \times 0.8 =$ D. $5.42 \times 0.5 =$

Play the *Three in a Row* game in the *Student Activity Book* for practice with estimating decimal products.
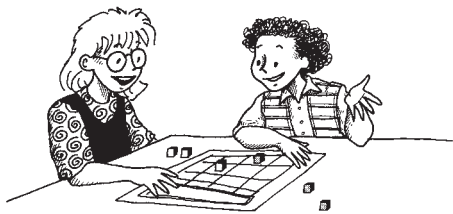
Strategies for Multiplying Decimals   SG · Grade 5 · Unit 8 · Lesson 10 **409**

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D. 9.25 ft. by 10.3 ft.

	10	0.3
9	$9 \times 10 = 90$	$9 \times 0.3 = 2.7$
0.2	$0.2 \times 10 = 2$	$0.2 \times 0.3 = 0.06$
0.05	$0.05 \times 10 = 0.5$	$0.05 \times 0.3 = 0.015$

$90 + 2.7 + 2 + 0.06 + 0.5 + 0.015 = 95.275$ sq. ft.

Using compact method:
$$\begin{array}{r} 9.25 \\ \times 10.3 \\ \hline 2775 \\ 92500 \\ \hline 95.275 \end{array}$$

28. A. $24 \times 63 = 1512$
    B. $0.24 \times 6.3 = 1.512$
    C. $24 \times 0.63 = 15.12$
    D. $2.4 \times 63 = 151.2$
    E. $0.24 \times 0.63 = 0.1512$

29. A. $15 \times 72 = 1080$
    B. $0.15 \times 7.2 = 1.080$
    C. $15 \times 0.72 = 10.80$
    D. $1.5 \times 72 = 108.0$
    E. $0.15 \times 0.72 = 0.1080$

30. A. $53 \times 38 = 2014$
    B. $0.53 \times 3.8 = 2.014$
    C. $53 \times 0.38 = 20.14$
    D. $5.3 \times 38 = 201.4$
    E. $0.53 \times 0.38 = 0.2014$

31. Solution strategies will vary. Possible strategies given.

    A. Using compact method:
    $$\begin{array}{r} 3.4 \\ \times 0.4 \\ \hline 1.36 \end{array}$$

    B.* Using all partials:
    $$\begin{array}{r} 0.47 \\ \times 7.9 \\ \hline 0.063 \\ 0.36 \\ 0.49 \\ 2.800 \\ \hline 3.713 \end{array}$$

    C. 0.003×0.8
    Using mental math: Ignore the decimal points and multiply the whole numbers. $3 \times 8 = 24$, so $0.003 \times 0.8 = 0.0024$

    D. Using expanded form:
    $$\begin{array}{l} 5.42 = 5 + 0.4 + 0.02 \\ \times 0.5 = 0.5 \\ \hline 2.5 + 0.20 + 0.010 = 2.71 \end{array}$$

*Answers and/or discussion are included in the lesson.

Homework (SG p. 410)
Questions 1–16

I. 21.05

2. 37.89

3. 2.105

4. 23.9

5. 1.195

6. 1.673

7. 84.8

8. 0.424

9. 0.848

10. 60

11. 0.5

12. 0.1

13. $59.37

14. $87.87

15. 62.60

16. $65.70

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