

Lesson 4-1

Monday, September 30, 2019 1:47 PM

The Four Facts of Multiplying Decimals:

Name _____

Solve & Share

Javier is helping his parents put up posters in their movie theater. Each poster has a thickness of 0.012 inch. How thick is a stack of 10 posters? 100 posters? 1,000 posters?

Lesson 4-1
Multiply Decimals by Powers of 10

I can ...
 find the product of a decimal number and a power of 10.

Content Standard: 5.NF.A.2
 Mathematical Practices: MP.2, MP.3, MP.7

$0.012 \times 10 = 0.120 = 0.12$
 $3dp + 0dp = 3dp$

$0.012 \times 100 = 1.200 = 1.2$
 $3dp + 0dp = 3dp$

$0.012 \times 1,000 = 12.000 = 12$
 $3dp + 0dp = 3dp$

How can you use the structure of our number system and mental math to help you?

$0.012 \times 0.1 = 0.0012$
 $3dp + 1dp = 4dp$

Look Back! **MP.7 Use Structure** How does your answer for 1,000 posters compare to 0.012?

$0.012 \times 1,000 = 12.000$
 The decimal moved to the right 3 places for each zero in 1,000.
 0.012

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- When multiplying a **decimal by a whole number**, the product is **less than the whole number**.
 $2 \times 0.5 = 1.0$ $1.0 < 2$
- When multiplying **two decimal numbers less than 1**, the product is less than either decimal.
 $0.4 \times 0.7 = 0.28$ $0.28 < 0.4$ & $0.28 < 0.7$
- When multiplying **two numbers greater than 1**, the product is greater than either factor.
 $1.2 \times 1.2 = 1.44$ $1.44 > 1.2$
- The number of decimal places (dp) in the factors is the same as the number of decimal places (dp) in the product.***
 $1.1 \times 1.1 = 1.21$
 $1dp + 1dp = 2dp$
 *** $12 \times 1.25 = 15.00 = 15$
 $0dp + 2dp = 2dp$
 ***equivalent decimals will drop the extra zeros

Essential Question What Patterns Can Help You Multiply Decimals by Powers of 10?

A baker has a 10-lb bag of pecans and a 100-lb bag of flour. How many cups of each ingredient does the baker have?

3.63 cups per lb (for flour)
4.2 cups per lb (for pecans)

Multiplying decimals is like multiplying whole numbers.
You can use multiplication to join equal groups.

a Use patterns to find the products.

Multiply by		Examples
Standard Form	Exponential Form	
10	10^1	$3.63 \times 10^1 = 36.3$
100	10^2	$3.63 \times 10^2 = 363$
1,000	10^3	$3.63 \times 10^3 = 3,630$

So, $3.63 \times 10^2 = 363$ and $4.2 \times 10^1 = 42$.
The baker has 363 cups of flour and 42 cups of pecans.

c Continue the pattern to find the number of cups for 100 lb, 1,000 lb, or 10,000 lb of pecans.

$4.2 \times 10^2 = 420$
 $4.2 \times 10^3 = 4,200$
 $4.2 \times 10^4 = 42,000$

So, 100 lb of pecans has 420 cups, 1,000 lb of pecans has 4,200 cups, and 10,000 lb of pecans has 42,000 cups.

Convince Me! ● MP.7 Use Structure Complete the chart. What patterns do you see in the placement of the decimal point?

Move the decimal point to the right one place for each power of 10.

	10	100	1,000
	$\times 10^1$	$\times 10^2$	$\times 10^3$
1.275	12.75	127.5	1,275
26.014	260.14	2,601.4	26,014
0.4	4	40	400

Name _____

Another Example
You can use patterns to multiply by decimals.
Multiply 3.63 by 1, 0.1, and 0.01.

$3.63 \times 1 = 3.63$
 $3.63 \times 0.1 = 0.363$
 $3.63 \times 0.01 = 0.0363$

What pattern do you notice in the products?
- Move decimal left

Guided Practice

Do You Understand?
1. Tell how you can use mental math to find 45.8×10^3 and 45.8×0.01 .
 45.8×10^3 moves the decimal 3 spots to the right.
 45.8×0.01 moves the decimal 2 places to left.

Do You Know How?
In 2-5, find each product.
2. 0.009×10 → 0.09
3. 30.09×10^3 → 30,090
4. 0.062×10^2 → 6.2
5. 3.62×0.01 → 0.0362

Independent Practice

Leveled Practice In 6 and 7, find each product.

6. $42.3 \times 1 = 42.3$
 $42.3 \times 0.1 = 4.23$
 $42.3 \times 0.01 = 0.423$

7. $0.086 \times 10^1 = 0.86$
 $0.086 \times 10^2 = 8.6$
 $0.086 \times 10^3 = 86$

Place-value patterns can help you solve these problems.



In 8–15, find each product.

8. $63.7 \times 0.01 = 0.637$ 9. $5437 \times 10^2 = 543700$ 11. $5.02 \times 0.1 = 0.502$

12. $94.6 \times 10^3 = 94,600$ 13. $0.9463 \times 10^2 = 94.63$ 14. $0.678 \times 0.1 = 0.0678$ 15. $0.678 \times 0.01 = 0.00678$

*For another example, see Set A on page 227.

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Complete
 #12, 14, 20, 9
 22

Math Practices and Problem Solving

In 16–18, use **structure** and the table to find the answers.

16. Monroe uses a microscope to observe specimens in science class. The microscope enlarges objects to 100 times their actual size. Find the size of each specimen as seen in the microscope.
17. Monroe's teacher wants each student to draw a sketch of the longest specimen. Which specimen is the longest?
18. Seen through the microscope, a specimen is 0.75 cm long. What is its actual length?

Specimen	Actual Length (cm)	Size Seen in the Microscope (cm)
A	0.008	
B	0.011	
C	0.0025	
D	0.004	

19. **MP.7 Use Structure** Jon's binoculars enlarge objects to 10 times their actual size. If the length of an ant is 0.43 inches, what is the length as seen up close through his binoculars?
20. **Higher Order Thinking** Jefferson drew a line 9.5 inches long. Brittany drew a line 10 times as long. What is the difference in length between the two lines?

$9.5 \times 10 = 95$
 95.00
 $- 9.5$
 85.5

85.5 inches

21. **MP.2 Reasoning** José ran 2.6 miles. Pavel ran 2.60 miles. Who ran farther? Explain your reasoning.

Common Core Assessment

22. Choose all equations that are true.
- $4.82 \times 1,000 = 482,000$
 $4.82 \times 10^2 = 482$
 $0.482 \times 10^1 = 48.2$
 $0.482 \times 10^3 = 482$
 $0.0482 \times 10^4 = 4,820$
23. Choose all equations that are true.
- $37 \times 0.01 = 0.37$
 $0.37 \times 0.1 = 0.037$
 $370 \times 0.1 = 3.7$
 $0.37 \times 0.01 = 0.037$
 $3.7 \times 0.01 = 0.037$