



Unit **5**

Place Value Patterns and Decimal Operations

Essential Questions

- How are tenths, hundredths, and thousandths related?
- How can we use place value to add, subtract, multiply, and divide decimals to the hundredths?



Unit Story: Market Day

You can read the Unit Story with your student by visiting the Unit Story page on the Caregiver Hub.



Unit Investigation

Lesson 1 is the Unit Investigation. Students explore and identify numbers between 2 whole numbers, including decimals, to build curiosity and apply their own knowledge in a variety of ways. Use the **Caregiver Connection** to help students continue to explore the math they will see in the unit.

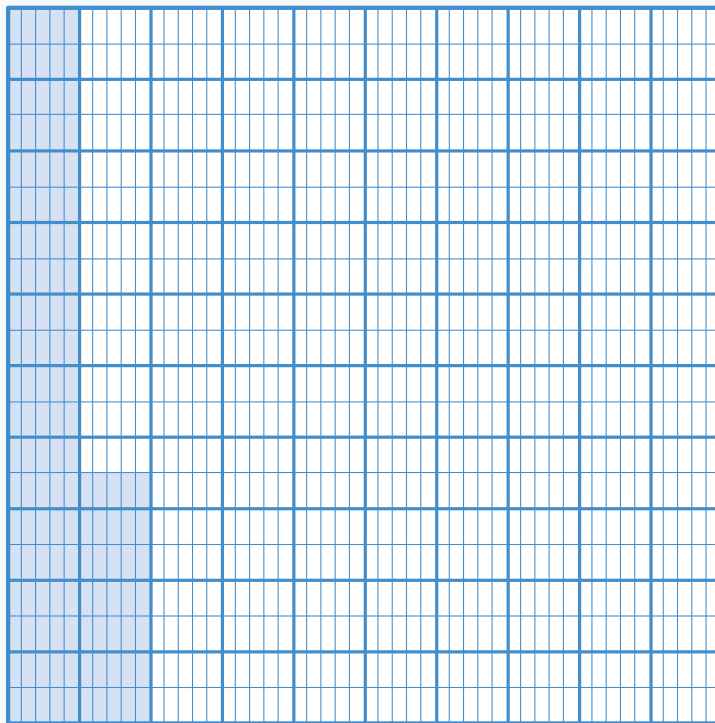
Caregiver Connection

Students may enjoy exploring numbers between numbers in their environment by considering whole number and decimal values. For example, students could think about an age between the ages of 2 friends or family members. Students could also consider the price of an item between 2 advertised prices.

Summary

Lesson 2

You can represent 1 **thousandth** as the fraction $\frac{1}{1,000}$ and as the decimal 0.001. A large number of thousandths can be decomposed in different ways.



0.135 can be decomposed in different ways.

- 1 tenth + 3 hundredths + 5 thousandths
- $0.1 + 0.03 + 0.005$
- 13 hundredths and 5 thousandths

Try This

For Problems 1–3, write the fraction as a decimal.

1 $\frac{1}{10}$ _____

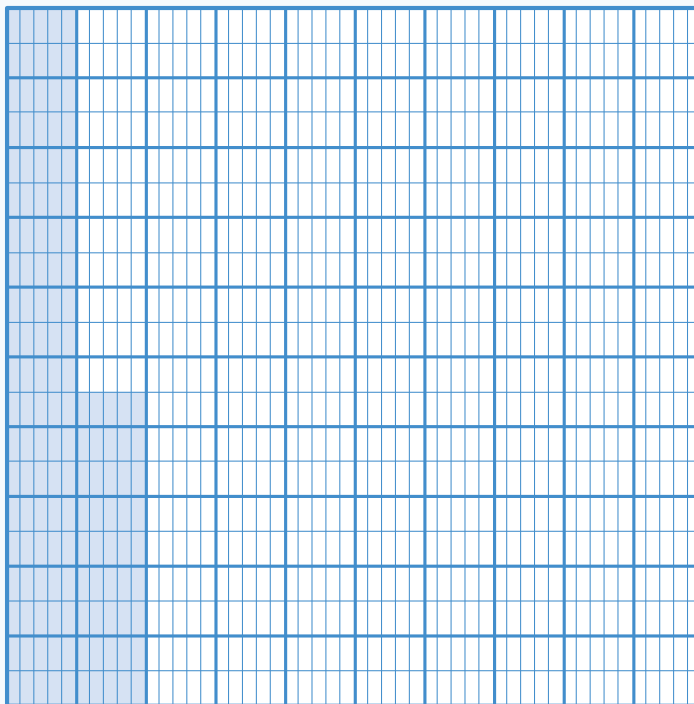
2 $\frac{1}{100}$ _____

3 $\frac{1}{1,000}$ _____

Summary | Lesson 3

You can represent a decimal in many forms, including standard form and expanded form. Expanded form decomposes a number to represent the value of each digit.

A whole grid represents 1.



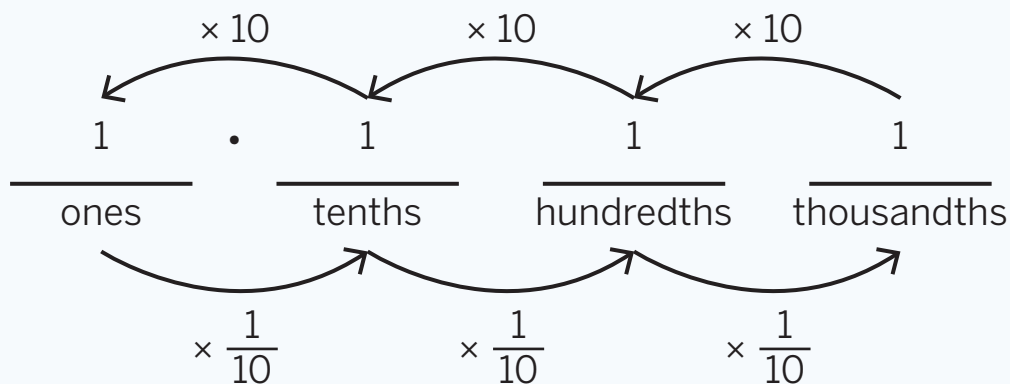
Standard form	Expanded form
0.145	$(1 \times 0.1) + (4 \times 0.01) + (5 \times 0.001)$ $\left(1 \times \frac{1}{10}\right) + \left(4 \times \frac{1}{100}\right) + \left(5 \times \frac{1}{1,000}\right)$ $0.1 + 0.04 + 0.005$

Try This

- 1 Write 2.837 in expanded form.

Summary | Lesson 4

The value of a digit in any place represents $\frac{1}{10}$ of its value when it is in the place to the left. The value of a digit in any place represents 10 times its value when it is in the place to the right.



Try This

For Problems 1 and 2, complete the statement to describe the relationship between the values of the digits.

- 1 The value of the 8 in 36.248 is _____ as much as the value of the 8 in 36.482.
- 2 The value of the 4 in 36.842 is _____ as much as the value of the 4 in 36.284.

Summary | Lesson 5

Place value understanding can be used to locate and label decimals to the thousandths on number lines.



Try This

- 1 Locate and label 0.874 on the number line. Explain your thinking



Summary | Lesson 6

Comparing decimal numbers is similar to comparing whole numbers because you compare the digits using an understanding of place value or equivalence. You can use $<$, $>$, or $=$ to record comparison statements.

$$0.43 > 0.403$$

Place value	$0.4\ 3$ $0.4\ 0\ 3$ There are the same digits in the ones and tenths places. The digits are different in the hundredths place. $3 > 0$, so $0.43 > 0.403$.
Decimal equivalence	0.43 is the same as 0.430 , so $0.430 > 0.403$.
Fraction equivalence	$\frac{43}{100} = \frac{430}{1,000}$, so $\frac{430}{1,000} > \frac{403}{1,000}$

Try This

Write a comparison statement about the 2 decimals.

1 0.654 and 0.658



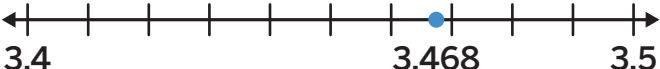
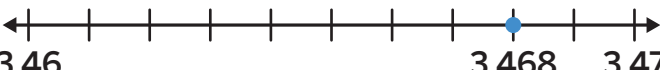
Show your thinking.

answer: _____

Summary | Lesson 7

Similar to rounding whole numbers, you can use number lines or your understanding of which whole number, tenth, or hundredth a decimal is closer to when rounding decimals.

Round 3.468 to the ...

Nearest whole number	3	
Nearest tenth	3.5	
Nearest hundredth	3.47	

Try This

A \$5 gold coin weighs 8.359 grams. Use the information for Problems 1 and 2.

- 1 Locate and label 8.359 on the number line.



- 2 A scale measures to the nearest hundredth gram. What will the scale show for the weight of the coin?

Summary | Lesson 8

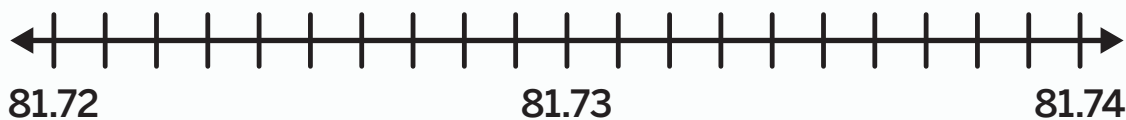
A variety of numbers round to the same number, which is why context matters and why many place values are included for certain contexts.

The table shows the times of a student who ran the 200-meter race twice.

	Nearest second	Nearest tenth of a second	Nearest hundredth of a second
48.561	49	48.6	48.56
48.596	49	48.6	48.60

Try This

- 1 Rounded to the nearest hundredth, a luge rider's fastest speed was 81.73 miles per hour. Write 10 different possible speeds that could have been the rider's fastest speed to the thousandth of a mile per hour. You can use the number line if it is helpful.



_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

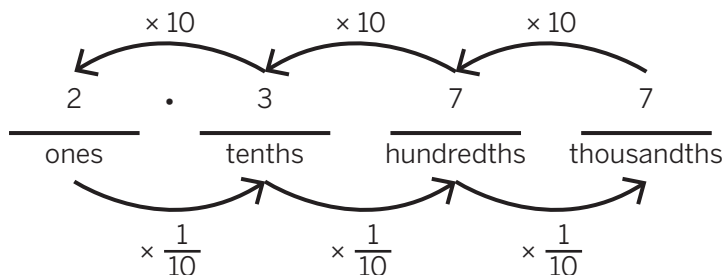
Sub-Unit 1 | Summary

In this sub-unit . . .

- We represented numbers to the **thousandths** in different ways.

Standard form	1.835
Word form	One and eight hundred thirty-five thousandths
Expanded form	$(1 \times 1) + \left(8 \times \frac{1}{10}\right) + \left(3 \times \frac{1}{100}\right) + \left(5 \times \frac{1}{1,000}\right)$ $(1 \times 1) + (8 \times 0.1) + (3 \times 0.01) + (5 \times 0.001)$ $1 + 0.8 + 0.03 + 0.005$

- We described the relationship between digits using *ten times* and $\frac{1}{10}$ as much language.



- We rounded and compared decimals to any place value.

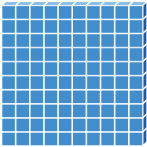
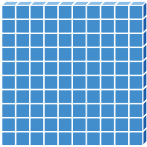
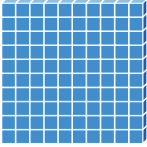
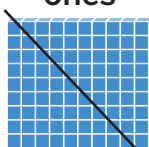
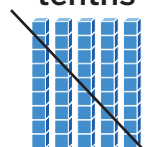
Number	Nearest whole	Nearest tenth	Nearest hundredth
39.482	39	39.5	39.48

39.48 < 39.5 because 48 hundredths is less than 50 hundredths.

 **Math tip:** You can use the same convention to round decimals as you used to round whole numbers.

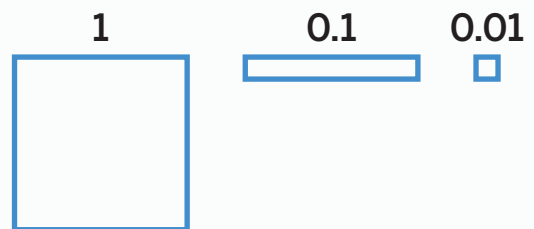
Summary | Lesson 9

You can use the same strategies and representations you used for whole numbers to add and subtract decimals.

Addition	Subtraction
1.62 + 1.54 ones tenths hundredths 1.54  1.62   2 wholes + 11 tenths + 6 hundredths = 3.16	1.62 - 1.54 ones tenths hundredths 1.62   8 hundredths = 0.08

Try This

Determine the sum or difference.
Use diagrams like the ones shown if it is helpful.



 Show your thinking.

1 2.45 - 0.06

answer: _____

Summary | Lesson 10

You can use the same standard algorithm to add 2 whole numbers or 2 decimals. Line up the numbers by place value so that you add digits in the same place value. Estimating before evaluating helps you determine whether your sum is reasonable.

$$5.6 + 2.63$$

Estimate	Exact sum
About 8 because $5 + 2$ is 7, and I will compose 1 whole when combining tenths.	$\begin{array}{r} 1 \\ 5.6 \\ + 2.63 \\ \hline 8.23 \end{array}$

Try This

For Problems 1 and 2, estimate and determine the sum using the standard algorithm.

 Show or explain your thinking.

1 $5.79 + 6.06$

estimate: _____

answer: _____

2 $36.28 + 51.9$

estimate: _____

answer: _____

Lining up the numbers by place value helps you subtract digits in the same place value. Estimating before evaluating helps you determine whether your difference is reasonable.

$$7.41 - 3.68$$

Estimate	Exact difference
Between 3 and 4 because $7 - 4 = 3$, and I will need to decompose 1 whole and 1 tenth to subtract.	$\begin{array}{r} 6 \text{ } 13 \text{ } 11 \\ 7.4\cancel{1} \\ - 3.68 \\ \hline 3.73 \end{array}$

Try This

For Problems 1 and 2, estimate and determine the difference using any strategy.

 Show your thinking.

1 $12.03 - 1.05$

estimate: _____

answer: _____

2 $11.27 - 6.38$

estimate: _____

answer: _____

Summary | Lesson 12

When using the standard algorithm to add and subtract decimals, it is helpful to extend both numbers to the same place value by using equivalent decimals.

$4.53 + 2.7$	$4.5 - 2.49$
$\begin{array}{r} 1 \\ 4.53 \\ + 2.70 \\ \hline 7.23 \end{array}$	$\begin{array}{r} 410 \\ 4.\cancel{5}0 \\ - 2.49 \\ \hline 2.01 \end{array}$

Try This

Determine the sum or difference using the standard algorithm.

 Show your thinking.

1 $15.3 - 8.19$

answer: _____

Summary | Lesson 13

There are often different ways to solve multi-step problems to get the same result. It can be helpful to consider what information you have and how you will use that information before evaluating the problem.

Miguel has \$22. If he buys a piece of fabric for \$9.75, scissors for \$8.99, and a ruler for \$0.25, how much money will he have left?

Subtract	Add then subtract
$22 - 9.75 = 12.25$	$9.75 + 8.99 + 0.25 = 18.99$
$12.25 - 8.99 = 3.26$	$22 - 18.99 = 3.01$
$3.26 - 0.25 = 3.01$	
\$3.01	\$3.01

Try This

- 1 The total length of Priya's 3 pencils is 18.72 inches. If 2 of the pencils measure 7.5 inches and 4.65 inches, how long is the third pencil in inches?

 Show or explain your thinking.

answer: _____

Sub-Unit 2 | Summary

In this sub-unit . . .

- We estimated sums and added decimals to the hundredths using the standard algorithm.

$$5.6 + 2.63$$

Estimate	Use the standard algorithm
The sum is about 9 because $6 + 3 = 9$.	$\begin{array}{r} 1 \\ 5.60 \\ + 2.63 \\ \hline 8.23 \end{array}$

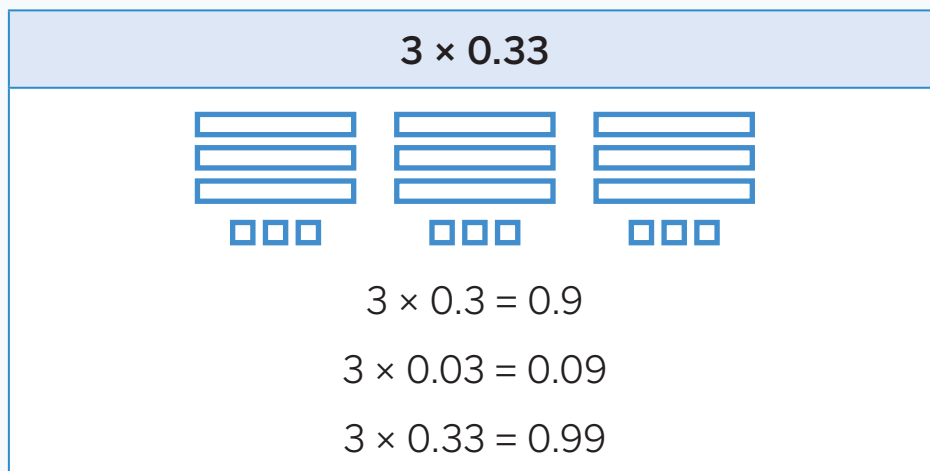
- We estimated differences and subtracted decimals to the hundredths using the standard algorithm.

$$7.41 - 3.68$$

Estimate	Use the standard algorithm
The difference is between 3 and 4 because I know $7.41 - 4 = 3.41$, and 3.68 is a little less than 4.	$\begin{array}{r} 6 \text{ } 1311 \\ 7.41 \\ - 3.68 \\ \hline 3.73 \end{array}$

 **Math tip:** When using the standard algorithm to add or subtract 2 decimals, it is helpful to line the numbers up by place value, which means the decimal points will also line up. You can use zeros to extend both numbers to the same decimal place value.

Multiplying with decimals is similar to multiplying with fractions. You can use base-ten blocks and grids to represent your thinking.



Try This

1 What is the product of 4 and 0.6?

(A) 24

(B) 0.24

(C) 2.4

(D) 0.024

2 Which does *not* represent the product of 0.2 and 3?

(A) 6 tenths

(B) 60 hundredths

(C) 0.6

(D) 6 hundredths

You can use familiar strategies, including the associative and Distributive Properties, to multiply a whole number and a decimal.

$$5 \times 0.53$$

Fractions	$5 \times \frac{53}{100}$
Associative property	$(5 \times 53) \times 0.01$
Distributive Property	$(5 \times 0.5) + (5 \times 0.03)$

Try This

- 1 Match each expression with its product.

Expression

Product

a. 4×0.7

_____ 8.28

b. 4×2.07

_____ 4.08

c. 4×0.12

_____ 2.8

d. 4×1.02

_____ 0.48

You can use what you know about fraction multiplication, whole number facts, and place value to multiply 2 decimals less than 1.

$$0.7 \times 0.3$$

Fractions	Associative Property of Multiplication
$\frac{7}{10} \times \frac{3}{10}$	$(7 \times 3) \times 0.01$

Try This

For Problems 1–3, determine whether each equation is *true* or *false*. Explain your thinking.

1 $0.2 \times 0.2 = 0.4$

2 $0.9 \times 0.4 = 0.36$

3 $0.3 \times 0.3 = 0.009$

Summary | Lesson 17

When multiplying 2 decimals, you can decompose the factors by place value to determine the partial products.

$$3.4 \times 6.7$$

	3	0.4
6	18	2.4
0.7	2.1	0.28

$$18 + 2.4 + 2.1 + 0.28 = 22.78$$

$3 \times 6 = 18$

$3 \times 0.7 = 2.1$

$0.4 \times 6 = 2.4$

$0.4 \times 0.7 = 0.28$

Try This

- 1 Determine the product of the expression 7.8×3.9 .

 Show your thinking.

answer: _____

Multiplying by 0.1 is the same as dividing by 10. Multiplying by 0.01 is the same as dividing by 100. You can use this equivalence when multiplying decimals.

$$24.8 \times 3.9$$

$$(248 \times 39) \times 0.01$$

$$9,672 \times 0.01 = 96.72$$

$$\frac{248}{10} \times \frac{39}{10} = \frac{248 \times 39}{100}$$

$$\frac{9,672}{100} = 96.72$$

96.72 is a reasonable product because $25 \times 4 = 100$.

Try This

Determine the product.

 Show your thinking.

1 24.7×2.8

answer: _____

When solving multi-step problems, it is important to identify and record the mathematical information and consider how the information is connected.

Use the clues to determine the total area of Rectangles A and B.

Clue 1	Clue 2
The area of Rectangle B is 5 times the area of Rectangle A.	The area of Rectangle A is 25.25 square centimeters.

Rectangle	What I know	Area (sq. cm)
A	Area is 25.25 square centimeters.	25.25
B	$5 \times A$ Area = 5×25.25	126.25
Total area (sq. cm)	$25.25 + 126.25 = 151.5$	

Try This

- 1 A chapter book has 6.5 times as many pages as a comic book. If the comic book has 12 pages, how many more pages are in the chapter book than the comic book?

 Show or explain your thinking.

answer: _____

Sub-Unit 3 | Summary

In this sub-unit . . .

- We used properties of operations to multiply whole numbers and decimals.

Distributive Property	Associative Property of Multiplication
$\begin{aligned} 4 \times 0.78 &= (4 \times 0.7) + (4 \times 0.08) \\ &= 2.8 + 0.32 \\ &= 3.12 \end{aligned}$	$\begin{aligned} 4 \times 0.78 &= 4 \times (78 \times 0.01) \\ &= (4 \times 78) \times 0.01 \\ &= 312 \times 0.01 \\ &= 3.12 \end{aligned}$

 **Math tip:** You can use what you know about place value to rewrite any decimal multiplication expression as a product of whole numbers and a decimal less than 1.

- We multiplied whole numbers and decimals using what we know about whole number multiplication and place value.

$$17.5 \times 3.3$$

$$\begin{array}{r} 175 \\ \times 33 \\ \hline 21 \\ 315 \\ + 21 \\ \hline 3,150 \\ + 3,150 \\ \hline 5,775 \end{array}$$

$$5,775 \div 100 = 57.75$$

or

$$5,775 \times 0.01 = 57.75$$

Summary | Lesson 20

You can use equivalent decimals to help you divide decimals by whole numbers. When dividing by a number greater than 1, the quotient is less than the dividend.

$$0.5 \div 2$$

$$0.5 = 0.50$$

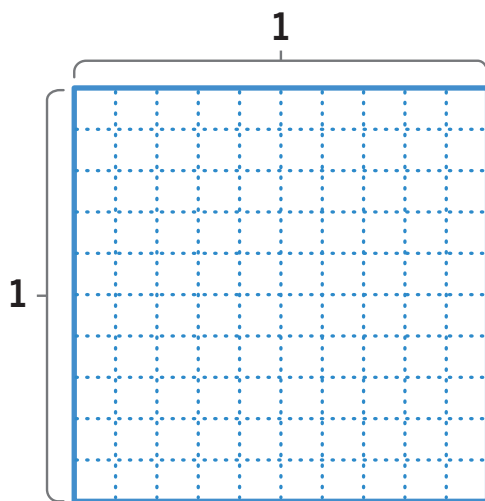
$$50 \text{ hundredths} \div 2 = 25 \text{ hundredths}$$

$$0.50 \div 2 = 0.25$$

Try This

- 1 Determine the quotient $0.9 \div 2$. Use the grid if it is helpful.

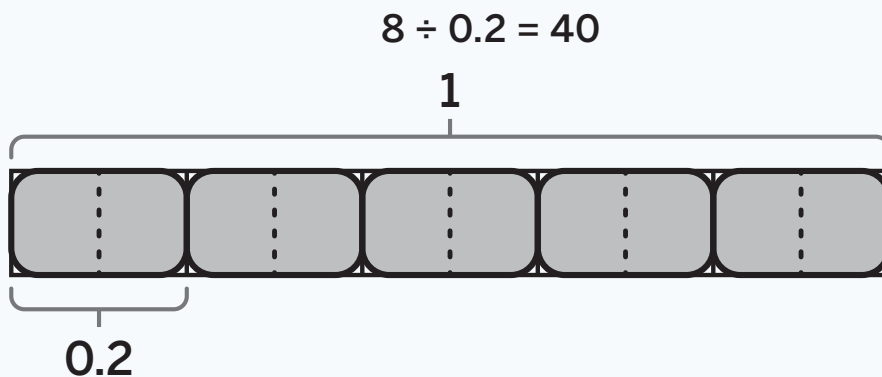
 Show your thinking.



answer: _____

Summary | Lesson 21

When you are dividing a whole number by a decimal less than 1, you are using the “how many groups?” interpretation of division. Just like when dividing whole numbers by unit fractions, when dividing by a decimal less than 1, the quotient is greater than the dividend.



There are 5 groups of 0.2 in 1, so there are 40 groups of 0.2 in 8.

Try This

- 1 Jada says that there are 10 hundredths in 1, so $1 \div 0.01$ is 10. Do you agree with Jada? Explain your thinking.

You can determine whether quotients are reasonable by considering the type of division you are doing and the size of the dividend and divisor.

Diego has 0.6 pounds of clay. He uses the same amount of clay to make 2 mugs. How much clay does he use to make each mug?

$$0.6 \div 2 = 0.3$$

The quotient is reasonable because 0.6 is being divided into 2 groups, so the quotient will be less than 0.6.

Try This

For Problems 1–3, determine the quotient. Explain how you know your quotient is reasonable.

1 $2.7 \div 9$

2 $81 \div 0.9$

3 $0.63 \div 9$

You can use what you know about place value to divide a decimal by a decimal. You can also represent a decimal division expression with an equivalent whole-number division expression.

$$1.5 \div 0.01$$

How many parts?	Equivalent whole number equation
There are 100 groups of 0.01 in 1. There are 50 groups of 0.01 in 0.5. $100 + 50 = 150$	$1.5 \div 0.01 = 150 \div 1$ $150 \div 1 = 150$

Try This

For Problems 1 and 2, determine the quotient.

 Show your thinking.

1 $3.5 \div 0.1$

answer: _____

2 $3.5 \div 0.01$

answer: _____

You can use what you know about decimal and whole number operations to solve complex real-world problems. Sometimes, there is more than 1 way to solve a problem.

Diego is listening to an audiobook that is 150 minutes long at 1.5 speed. If he starts listening at 6:00 p.m., at what time will he be finished?

Strategy A	Strategy B
$150 \div 1.5 = 1,500 \div 15$ $1,500 \div 15 = 100$ $100 = 60 + 40$ He will be finished at 7:40 p.m.	There are 10 groups of 1.5 in 15, so there are 100 groups of 1.5 in 150 because 150 is 10 times as much as 15. 100 minutes = 1 hour and 40 minutes He will be finished at 7:40 p.m.

Try This

1 Which equations are false? Select *all* that apply.

(A) $0.54 \div 6 = 0.09$

(B) $0.3 \div 6 = 0.05$

(C) $9 \div 0.6 = 1.5$

(D) $2 \div 0.25 = 8$

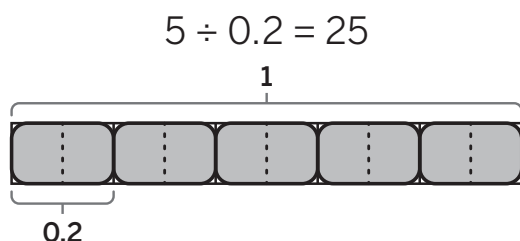
(E) $4.5 \div 0.1 = 450$

(F) $0.72 \div 0.8 = 9$

Sub-Unit 4 | Summary

In this sub-unit . . .

- We divided a whole number by a decimal and a decimal by a whole number using different strategies.



$$0.4 \div 5 = 0.08$$

$$0.4 = 0.40$$

40 hundredths $\div$ 5 is
8 hundredths.

There are 5 groups of 0.2 in 1, so
there are 25 groups of 0.2 in 5.

 **Math tip:** You can rename a decimal dividend as an equivalent number of hundredths or thousandths to help you divide evenly.

- We reasoned about the size of quotients to estimate answers and determine whether our answers were reasonable.

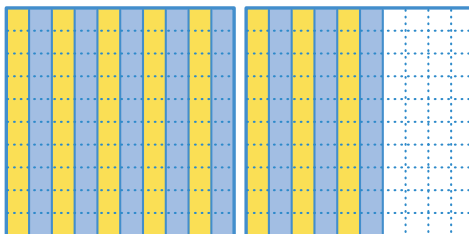
$$2 \div 0.5$$

The quotient is greater than the dividend because 0.5 is less than 1, and more than 2 groups of 0.5 can fit into 2.

$$0.5 \div 2$$

The quotient is less than the dividend because 0.5 is being shared equally into 2 groups, so the amount in each group will be less than 0.5.

- We divided decimals by 0.1 and 0.01 by using equivalent whole number expressions.



$$1.6 \div 0.1 = 16 \div 1$$

$$1.6 \div 0.01 = 160 \div 1$$

Try This | Answer Key

Lesson 2

- 1 0.1 2 0.01 3 0.001

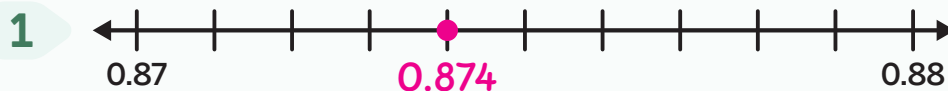
Lesson 3

- 1 $(2 \times 1) + \left(8 \times \frac{1}{10}\right) + \left(3 \times \frac{1}{100}\right) + \left(7 \times \frac{1}{1,000}\right)$
or
 $(2 \times 1) + (8 \times 0.1) + (3 \times 0.01) + (7 \times 0.001)$

Lesson 4

- 1 $\frac{1}{10}$ 2 10 times

Lesson 5



Sample explanation: The tick marks represent thousandths. 0.874 is 4 tick marks to the right of 0.87 because it has 4 thousandths.

Lesson 6

- 1 Sample work:



0.658 is greater than 0.654 because it is farther to the right on the number line.

answer: $0.654 < 0.658$ or $0.658 > 0.654$

Lesson 7



- 2 8.36 grams

Lesson 8

- 1 81.725, 81.726, 81.727, 81.728, 81.729,
81.730, 81.731, 81.732, 81.733, 81.734

Try This | Answer Key

Lesson 9

1 Sample work:

$$2\frac{45}{100} - \frac{6}{100} = 2\frac{39}{100} = 2.39$$

answer: 2.39

Lesson 10

1 Sample estimate:
estimate: 12

$$\begin{array}{r} 1 \\ 5.79 \\ + 6.06 \\ \hline 11.85 \end{array}$$

answer: 11.85

2 Sample estimate:
estimate: 88

$$\begin{array}{r} 1 \\ 36.28 \\ + 51.90 \\ \hline 88.18 \end{array}$$

answer: 88.18

Lesson 11

1 Sample estimate and work:
estimate: less than 11

$$\begin{array}{r} 9 \\ 1\cancel{1}0\cancel{1}3 \\ 12.0\cancel{3} \\ - 1.05 \\ \hline 10.98 \end{array}$$

answer: 10.98

2 Sample estimate and work:
estimate: less than 5

$$\begin{array}{r} 0\ 1117 \\ 1\cancel{1}.2\cancel{7} \\ - 6.38 \\ \hline 4.89 \end{array}$$

answer: 4.89

Lesson 12

1

$$\begin{array}{r} 210 \\ 15.\cancel{3}0 \\ - 8.19 \\ \hline 7.11 \end{array}$$

answer: 7.11

Lesson 13

1 Sample work:
length of 2 pencils:

$$\begin{array}{r} 1 \\ 7.50 \\ + 4.65 \\ \hline 12.15 \end{array}$$

answer: 6.57 inches

length of third pencil:

$$\begin{array}{r} 612 \\ 18.\cancel{7}2 \\ - 12.15 \\ \hline 6.57 \end{array}$$

Try This | Answer Key

Lesson 14

1 c

2 D

Lesson 15

1 b 8.28

 d 4.08

 a 2.8

 c 0.48

Lesson 16

1 False. Sample explanation: $\frac{2}{10} \times \frac{2}{10} = \frac{4}{100}$, so the answer should be 0.04.

2 True. Sample explanation: $\frac{9}{10} \times \frac{4}{10} = \frac{36}{100}$

3 False. Sample explanation: 3 tenths $\times$ 3 tenths = 9 hundredths, or 0.09.

Lesson 17

1 Sample work:

	7	0.8
3	21	2.4
0.9	6.3	0.72

$$21 + 2.4 + 6.3 + 0.72 = 30.42$$

answer: 30.42

Lesson 18

1 Sample work:

$$\begin{array}{r} 1 \\ 35 \\ 247 \\ \times 28 \\ \hline 1,976 \\ + 4,940 \\ \hline 6,916 \end{array}$$

$$6,916 \div 100 = 69.16$$

answer: 69.16

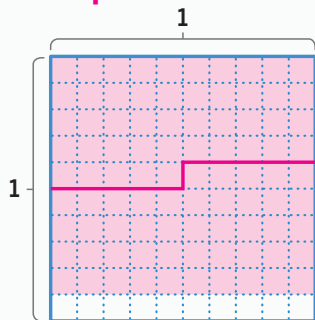
Try This | Answer Key

Lesson 19

- 1 Sample work:
chapter book: $12 \times 6.5 = 78$
 $78 - 12 = 66$
answer: 66 pages

Lesson 20

- 1 Sample work:



answer: 0.45

Lesson 21

- 1 No. Sample explanation: There are 100 hundredths in 1, not 10, so $1 \div 0.01 = 100$.

Lesson 22

- 1 0.3. Sample explanation: I know that $9 \times 3 = 27$, so $9 \times 0.3 = 2.7$ because 2.7 is $\frac{1}{10}$ the value of 27.
- 2 90. Sample explanation: 90 is reasonable because I am dividing 81 by a number a little less than 1, so it'll be a little greater than 81.
- 3 0.07. Sample explanation: 0.07 is reasonable because $63 \div 9 = 7$, so 63 hundredths divided by 9 is 7 hundredths.

Lesson 23

- | | |
|---|--|
| <p>1 Sample work:
$3.5 \div 0.1$ is the same as $35 \div 1$.
$35 \div 1 = 35$
answer: 35</p> | <p>2 Sample work:
$3.5 \div 0.01$ is the same as $350 \div 1$.
$350 \div 1 = 350$
answer: 350</p> |
|---|--|

Lesson 24

- 1 C, E, F