7 Divide Decimals

Chapter Overview

Lesson	Learning Target	Success Criteria
7.1 Division Patterns with Decimals	Find quotients involving decimals and powers of 10.	• Explain how to divide a number by a power of 10. • Explain patterns in the placement of the decimal point when dividing a decimal by a power of 10.
7.2 Estimate Decimal Quotients	Use compatible numbers to estimate quotients involving decimals.	• Rename a dividend to estimate a quotient. • Use compatible numbers to estimate a quotient. • Explain different ways to estimate a quotient.
7.3 Use Models to Divide Decimals by Whole Numbers	Use models to divide decimals by whole numbers.	• Use a model to represent a decimal. • Divide a model to show equal groups. • Use a model to divide a decimal by a whole number.
7.4 Divide Decimals by One-Digit Numbers	Divide decimals by one-digit whole numbers.	• Use place value to divide. • Place the decimal point in the quotient. • Regroup when necessary. • Use estimation to check my answer.
7.5 Divide Decimals by Two-Digit Numbers	Divide decimals by two-digit whole numbers.	• Use place value to divide. • Place the decimal point in the quotient. • Regroup when necessary. • Use estimation to divide.
7.6 Use Models to Divide Decimals	Use models to divide decimals by decimals.	• Use a model to represent a decimal. • Divide a model to show equal groups. • Use a model to divide a decimal by a decimal.
7.7 Divide Decimals	Divide decimals by decimals.	• Multiply a divisor and a dividend by a power of 10 to make the divisor a whole number. • Place the decimal point in a quotient. • Divide a decimal by a decimal.
7.8 Insert Zeros in the Dividend	Insert zeros in the dividend when dividing with decimals and whole numbers.	• Explain when to insert one or more zeros in the dividend to find a quotient. • Insert one or more zeros in a dividend to find a quotient. • Recognize when a division problem is complete.
7.9 Problem Solving: Decimal Operations	Solve word problems involving decimals.	• Understand a problem. • Make a plan to solve. • Solve a problem.

Chapter Learning Target:
Understand dividing decimals.

Chapter Success Criteria:
- ■ Identify a decimal.
- ■ Write a decimal equation.
- ■ Solve a problem using decimals.
- ■ Model different types of decimals as equations.

Progressions

Through the Grades		
Grade 4	**Grade 5**	**Grade 6**
• Fluently add and subtract multi-digit numbers. • Round multi-digit numbers to a given place.	• Explain the relationship between the number of zeros in a product involving a power of 10 and the power of 10. • Explain the relationship between the movement of the decimal point and multiplying or dividing by powers of 10. • Use exponents to show powers of 10. • Explain the relationship between addition and subtraction. • Add, subtract, multiply, and divide decimals to the hundredths. • Use models, place value, properties, and strategies to check for reasonableness. • Round decimals to any given place.	• Write and evaluate numerical expressions with whole-number exponents. • Fluently add, subtract, multiply, and divide multi-digit decimals.

Standard	Through the Chapter								
	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9
5.NBT.A.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.	★								
5.NBT.B.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.	●	●	●	●	●	●	●	●	★
5.NBT.A.4 Use place value understanding to round decimals to any place.		★							

Key: ▲ = Preparing   ● = Learning   ★ = Complete

Laurie's Overview

About the Math

This chapter extends the study of numbers and operations to the division of decimals. At this point students should be fluent with all four operations with whole numbers, and three of the operations with decimals. Place value understanding and properties of operations are essential in the development of these computational skills. As with any computation, we do not want students to memorize rules without understanding. There are many adults who know the rule for division of decimals but have no understanding of why the rule is correct.

Place Value Understanding

Students have just finished a chapter on whole number division. The general strategies used for finding quotients when dividing whole numbers are now applied to dividing decimals, with one additional skill: knowing where to place the decimal point in the quotient. Recall the same understanding was needed when multiplying decimals in Chapter 5, so this chapter begins with a similar approach, finding quotients of decimals and powers of 10.

| Multiply by a Power of 10		Divide by a Power of 10	
$52 \times 10 = 520$	$52 \times 0.1 = 5.2$	$52 \div 10 = 5.2$	$52 \div 0.1 = 520$
10 times as much	$\frac{1}{10}$ as much	$\frac{1}{10}$ as much	10 times as much

It can be confusing to students that a quotient can be greater than the initial amount, as when finding $52 \div 0.1$. The same issue occurred in multiplication when a product was less than the initial amount, as when finding 52×0.1. Students use place value concepts to see that when you multiply by 0.1 or divide a number by 10, each digit in the number shifts one position to the right in a place value chart. Similarly, when you multiply a number by 10 or divide a number by 0.1, each digit in the number shifts one position to the left in a place value chart.

Decimals Divided by Whole Numbers

After dividing decimals by powers of 10 and estimating quotients for decimal division problems, there are three lessons on dividing a decimal by a whole number.

Students learn that the process is the same as dividing whole numbers, and can be modeled by partitioning a decimal (dividend) that has been drawn on decimal grid paper. The divisor is the number of equal groups and the quotient is the size of each group. There is more than one way to draw 32 hundredths as 4 equal groups of 8 hundredths.
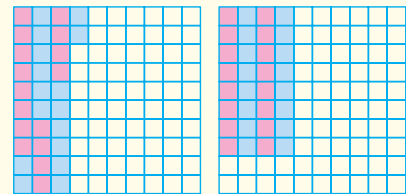
Modeling decimal division by a whole number leads to recording the division problem using the standard division algorithm. Students use place value concepts to divide and place the decimal point in the quotient.

Models, place value understanding, and estimates help students see that you divide decimals by whole numbers using the same procedure as dividing whole numbers. The decimal point in the quotient is placed above the decimal point in the dividend. This means that like place values are aligned.

Decimals Divided by Decimals

A significant step in the learning progression of decimal division is to make sense of dividing a decimal by a decimal. If a model is drawn, the divisor cannot represent the number of groups. The divisor is now a decimal, so we change our interpretation and say it is the size of the group. The quotient is the number of groups.

$$1.2 \div 0.3 = 4$$

amount we have — side of equal groups — number of groups
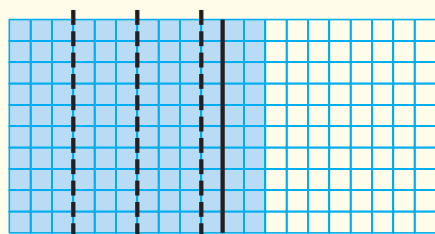
12 tenths ÷ 3 tenths = 4

Drawing a model is not efficient for most decimal division problems and students at this point understand that you divide decimals the same way you divide whole numbers. How the problem is interpreted differs, but the process is the same. What is needed is a way to know where the decimal point in the quotient is located.

A key strategy for dividing decimals is presented in Lesson 7.7. Rewrite an equivalent division problem by multiplying both the dividend and divisor by the same power of 10. You want the divisor to be a whole number so you know where to place the decimal point in the quotient. You then divide as you would with whole numbers.

The division problems in this chapter are written so that the quotient is not a repeating decimal. Lesson 7.8, however, gives problems where there is a need to insert zeros into the dividend. Students gain additional practice with decimal division as they insert zeros in the dividend and learn how to recognize when the division problem is complete.

$$0.32 \div 0.4$$
$$\times 10 \quad \times 10$$
$$3.2 \div 4$$

$$15.6 \div 0.12$$
$$\times 100 \quad \times 100$$
$$1560 \div 12$$

The chapter ends with a lesson on problem solving using decimal division. Student use their strategies and reasoning gained throughout the chapter of decimal quotients to solve multi-step problems.

Chapter Materials and Resources

The primary materials and resources needed for this chapter are listed below. Other materials may be needed for the additional support ideas provided throughout the chapter.

Classroom Materials	Chapter Opener	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	Connect and Grow
calculators		*						•			
whiteboards and markers					•	*		•		+	•
colored pencils				•							
grid paper							+				
string									+		
game piece											•
counters											*
dice											•

Instructional Resources	Chapter Opener	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	Connect and Grow
Divide Around		*									
Find Your Match (Decimals)			+								
Decimal Grids				•							
Race Around the World: Division Cards											*
Divide and Connect Game Board											*
Divide and Connect Game Cards											*
Decimal Division Puzzle											•

• class set   + teacher only   * per pair/group

Suggested Pacing

Day	Section						
Day 1	Chapter Opener	Performance Task Preview	Vocabulary				
Day 2	Lesson 7.1	Warm-Up	Dig In	Explore	Think	Apply: Practice	Think: Modeling Real Life
Day 3	Lesson 7.2	Warm-Up	Dig In	Explore	Think	Apply: Practice	Think: Modeling Real Life
Day 4	Lesson 7.3	Warm-Up	Dig In	Explore	Think	Apply: Practice	Think: Modeling Real Life
Day 5	Lesson 7.4	Warm-Up	Dig In	Explore	Think	Apply: Practice	Think: Modeling Real Life
Day 6	Lesson 7.5	Warm-Up	Dig In	Explore	Think	Apply: Practice	Think: Modeling Real Life
Day 7	Lesson 7.6	Warm-Up	Dig In	Explore	Think	Apply: Practice	Think: Modeling Real Life
Day 8	Lesson 7.7	Warm-Up	Dig In	Explore	Think	Apply: Practice	Think: Modeling Real Life
Day 9	Lesson 7.8	Warm-Up	Dig In	Explore	Think	Apply: Practice	Think: Modeling Real Life
Day 10	Lesson 7.9	Warm-Up	Dig In	Explore	Think	Apply: Practice	Think: Modeling Real Life
Day 11	Connect And Grow	Performance Task		Activity		Chapter Practice	
Day 12	Connect And Grow	Centers					
Day 13	Chapter Assessment	Chapter Assessment					
Day 14	Cumulative Practice	Cumulative Practice			STEAM Performance Task		

Year-to-Date: 80 Days

Mathematical Practices

Students have opportunities to develop aspects of the mathematical practices throughout the chapter. Here are some examples.

1. **Make Sense of Problems and Persevere in Solving Them**
   7.5 Explore and Grow, *p. 323*

2. **Reason Abstractly and Quantitatively**
   7.4 Explore and Grow, *p. 317*

3. **Construct Viable Arguments and Critique the Reasoning of Others**
   7.5 Apply and Grow: Practice Exercise 16, *p. 325*

4. **Model with Mathematics**
   7.2 Homework & Practice Exercise 12, *p. 310*

5. **Use Appropriate Tools Strategically**
   7.6 Apply and Grow: Practice Exercise 9, *p. 331*

6. **Attend to Precision**
   7.8 Homework & Practice Exercise 12, *p. 346*

7. **Look for and Make Use of Structure**
   7.7 Explore and Grow, *p. 335*

8. **Look for and Express Regularity in Repeated Reasoning**
   7.1 Apply and Grow: Practice Exercise 11, *p. 301*

Laurie's Notes

Performance Task Preview

- Preview the page. Before asking the questions, give students time to look at the picture. Listen for students to make personal connections to the picture.
- **?** "Have you ever heard of the adopt-a-highway program? What do program volunteers do?" Listen for student responses.
- **?** "How can you divide a 179.8-mile-long highway into sections of equal length?" Divide 179.8 by the number of sections.
- In the Performance Task at the end of the chapter, students will demonstrate an understanding of dividing decimals using information related to cleaning a highway through the adopt-a-highway program.

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Divide Decimals

Chapter Learning Target:
Understand dividing decimals.

Chapter Success Criteria:
- ☐ I can identify a decimal.
- ☐ I can write a decimal equation.
- ☐ I can solve a problem using decimals.
- ☐ I can model different types of decimals as equations.

- Have you ever heard of the adopt-a-highway program? What do program volunteers do?

- How can you divide a 179.8-mile-long highway into sections of equal length?

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Laurie's Notes

Vocabulary Review

❓ **Preview**: "How is a Venn diagram used?" *Sample answer: It compares and contrasts two topics*

- Have students say each review word out loud.
- Explain that they will only use one review word to complete the Venn diagram. The word is the same for both parts.
- Discuss the information given in the Venn diagram.
- Have students use a review word to complete the label in the Venn diagram.
- Have students write additional examples in each part.
- Direct students to the lower half of the page.
- Have students use the review words to complete the word search.

Newton & Descartes's Math Musicals

with Differentiated Rich Math Tasks

Newton and Descartes team up in these educational stories and songs to bring mathematics to life! Use the Newton and Descartes hand puppets to act out the stories. Encourage students to sing the songs to take full advantage of the power of music to learn math. Visit *www.MathMusicals.com* to access all the adventures, songs, and activities available!
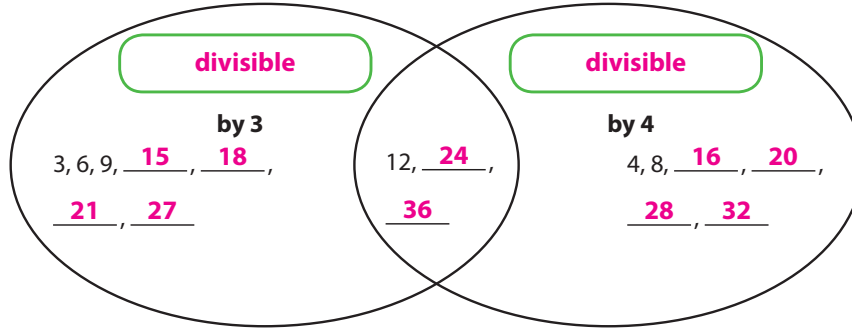
7 Vocabulary

Name _____

Review Words

divisible
hundredth
tenth
thousandth

Organize It

Use a review word and whole numbers to complete the graphic organizer.

divisible by 3
3, 6, 9, **15**, **18**, **21**, **27**

12, **24**, **36**

divisible by 4
4, 8, **16**, **20**, **28**, **32**

Define It

Identify the review word. Find the word in the word search.

1. 1 of 1,000 equal parts of a whole

2. 1 of 100 equal parts of a whole

3. 1 of 10 equal parts of a whole

```
B  H  P  R  M  A  H  L  H  H
S  D  U  N  Q  J  E  U  T  Y
U  L  K  W  D  U  I  D  D  P
N  C  T  S  G  M  N  L  E  O
A  H  I  F  D  A  O  P  R  C
D  J  R  N  S  R  K  S  D  R
T  E  A  U  V  E  T  H  N  W
Z  U  O  F  R  L  U  Y  U  B
O  H  G  D  T  E  N  T  H  S
T  R  N  E  M  S  H  N  A  R
```

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Chapter 7 **298**

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Learning Target

Find quotients involving decimals and powers of 10.

Success Criteria

• Explain how to divide a number by a power of 10.
• Explain patterns in the placement of the decimal point when dividing a decimal by a power of 10.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com.*

• Daily skills
• Vocabulary
• Prerequisite skills

ELL Support

To visually demonstrate $2.5 \div 10$, have students divide $2\frac{1}{2}$ sheets of paper into 10 equal portions. Ask them what each portion represents—what part of one whole is it?

Laurie's Notes

STATE STANDARDS
5.NBT.A.2, 5.NBT.B.7

Preparing to Teach

The standard algorithm for division is built upon an understanding of place value. The general strategies students have used for finding quotients when dividing whole numbers is applied to dividing decimals. There is one additional skill, knowing where to place the decimal point in the quotient. The same understanding was needed when multiplying decimals and so we begin with a similar approach. Today's lesson explores patterns when dividing by powers of 10.

Materials

• Divide Around*
• calculators

Found in the Instructional Resources

Dig In (Motivate Time)

Each pair of students is given a copy of Divide Around and a calculator. Partner A selects a number between 123 and 987 and writes it in the center circle. Partner B uses a calculator to find the five quotients. Reverse roles and repeat.

◉ "We are beginning our study of decimal division. When we began the study of decimal multiplication we learned to multiply by powers of 10. In this lesson, we will divide by powers of 10."

• Explain the rules to students. Each person is going to find five quotients. They should start with circle 1, where they are dividing by 100. FYI: The rationale for numbers between 123 and 987 is to encourage students to select a starting number that is not a multiple of 10!

❓ When students have each had a turn have them look at the quotients. "What patterns do you observe? Could you have predicted some of the quotients without using a calculator? How?"

• "I want you to take two more turns. This time start with a number between 23 and 98, and only use your calculator if you are really not confident." Alternately, suggest that they use their calculator for only two quotients.

❓ **MP2 Reason Abstractly and Quantitatively:** "The dividend (center circle) was the same for five problems. The divisor (along the curved arrow) was a power of 10. What did you notice about the quotient (outer circle) as the power of 10 decreased?"

• **Think-Pair-Share:** Listen to thoughts of students, noting reference to the location of the decimal point in the quotient.

◉ "You are going to look for patterns when dividing by powers of 10. We want to pay attention to place value concepts."
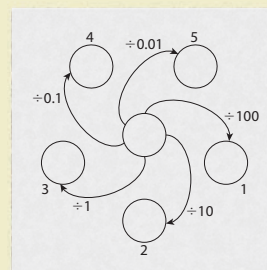
❓ Teaching Prompt   ◉ Learning Target

Learning Target: Find quotients involving decimals and powers of 10.

Success Criteria:
- I can explain how to divide a number by a power of 10.
- I can explain patterns in the placement of the decimal point when dividing a decimal by a power of 10.

Explore and Grow

Use the relationship between positions in a place value chart to find each quotient.

	Hundreds	Tens	Ones	.	Tenths	Hundredths	Thousandths
2.5 ÷ 1			2	.	5		
2.5 ÷ 10			**0**	**.**	**2**	**5**	
2.5 ÷ 100			**0**	**.**	**0**	**2**	**5**

	Hundreds	Tens	Ones	.	Tenths	Hundredths	Thousandths
2.5 ÷ 1			2	.	5		
2.5 ÷ 0.1		**2**	**5**	**.**	**0**		
2.5 ÷ 0.01	**2**	**5**	**0**	**.**	**0**		

What patterns do you notice?

Every time you divide a number by 10, each digit in the number shifts one position to the right in a place value chart. Every time you divide a number by 0.1, each digit in the number shifts one position to the left in a place value chart.

MP **Structure** Describe the placement of the decimal point when dividing a decimal by 10, 100, 0.1, and 0.01.

Shift left by 1 for division by 10.
Shift left by 2 for division by 100.
Shift right by 1 for division by 0.1.
Shift right by 2 for division by 0.01.

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Chapter 7 | Lesson 1

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Explore and Grow

- This is similar to the Dig In, though the powers of 10 are in a different order.
- **MP5 Use Appropriate Tools Strategically:** Note that the place value chart anchors the decimal point. The digits 2 and 5 move to different place values.
- ❓ It can be confusing to students that the quotients can be greater than the initial amount (dividend), as when finding 2.5 ÷ 0.1. Dividing by 0.1 makes the quotient 10 times greater. To help students make sense of this ask, "How many tenths are in 2.5?" There are 10 tenths in 1, 20 tenths in 2, and 25 tenths in 2.5
- A similar line of reasoning can be used to show 250 hundredths in 2.5.

Laurie's Notes

Think and Grow

Getting Started

- A place value chart should be visible for students to refer to.
- **Teaching Tip:** It is helpful to think of the measurement interpretation of division where the number of groups is unknown. To find $74 \div 10$ think, *how many groups of 10 are there in 74?*

Teaching Notes

- **Supporting Learners:** Make sense of the place value concept by focusing on one row in the chart: $74 \div 10$ is the same as $74 \times \frac{1}{10}$.

  Note the digits in 74 shift one position to the right in the place value chart.
- **Model:** "We want to find $74 \div 10^3$. What is 10^3?" 1,000 "To find this we look at the pattern of $74 \div 1$, $74 \div 10$, and $74 \div 100$. How is the quotient related to the dividend?" The quotients all have a 7 and 4. "How would you know where to place the decimal point in the quotient if it weren't written in the chart?" The digits 7 and 4 are shifting to the right the same number of places as the exponent so the decimal point moves to the left that same number of places.
- "When you divide a number by 10, what do you know about the quotient?" The quotient is less than the dividend; it is $\frac{1}{10}$ the dividend.
- Discuss the pattern. The exponent, which is the power of 10 *and* the number of 0's in the divisor, is the number of places the decimal point moves to the left. This a concept to be understood, not a rule to memorized.
- **Model:** You want to use the same type of questioning for the second example. It is not obvious that dividing by 0.1 is the same as multiplying by 10. Demonstrate this by focusing on only one row, $5.8 \div 0.1$.
- **Turn and Talk:** "What pattern do you notice in the chart?" The quotient is getting greater; the decimal point is moving to the right.
- In Exercises 1 and 2, make sure students are not copying a pattern without any understanding. Reading the problem aloud and referencing place value names is helpful. Example: sixty-two and five tenths divided by one hundred. The dividend is less than the divisor. The quotient must be less than one.
- "Do you think you could tell a friend how to divide a decimal by a multiple of ten? Use your thumb signals to show how confident you would be."

Think and Grow: Division Patterns with Decimals

Example Find $74 \div 10^3$.

Use place value concepts. Every time you multiply a number by $\frac{1}{10}$ or divide a number by 10, each digit in the number shifts one position to the right in a place value chart.

$74 \div 1 = 74$

$74 \div 10^1 = 74 \div 10 = 7.4$

$74 \div 10^2 = 74 \div 100 = 0.74$

$74 \div 10^3 = 74 \div 1{,}000 = \underline{\textbf{0.074}}$

Tens	Ones	.	Tenths	Hundredths	Thousandths
7	4	.			
	7	.	4		
	0	.	7	4	
	0	.	0	7	4

So, $74 \div 10^3 = \underline{\textbf{0.074}}$.

Notice the pattern: In each quotient, the number of places the decimal point moves to the left is the same as the exponent.

Notice that you can write quotients as decimals.

Example Find $5.8 \div 0.01$.

Use place value concepts. Every time you multiply a number by 10 or divide a number by 0.1, each digit in the number shifts one position to the left in a place value chart.

$5.8 \div 1 = 5.8$

$5.8 \div 0.1 = 58.$

$5.8 \div 0.01 = \underline{\textbf{580}}$

Hundreds	Tens	Ones	.	Tenths
		5	.	8
	5	8	.	
5	8	0	.	

So, $5.8 \div 0.01 = \underline{\textbf{580}}$.

Notice the pattern: When you divide by 0.1, the decimal point moves one place to the right. When you divide by 0.01, the decimal point moves two places to the right.

Show and Grow   *I can do it!*

Find the quotient.

1. $62.5 \div 10^2 = \underline{\textbf{0.625}}$

2. $1.84 \div 0.1 = \underline{\textbf{18.4}}$

300

Meeting the needs of all learners.

Laurie's Notes

Apply and Grow: Practice

SCAFFOLDING INSTRUCTION

Students have used place value to divide decimals by powers of 10. A place value chart can be used to help students see the connection between the place value names of the dividend and divisor. What patterns do students see when they are dividing by powers of 10? Can they explain why the number shifts to the right or the left of the decimal point? Can they explain how it appears that the decimal point is shifting in the opposite direction of the shift of the digits? (For example, dividing by 10 shifts the digits to the right, but the decimal point shifts to the left.) You want students to understand why these shifts occur – not memorize a rule.

EMERGING students may be unsure of how to use place value when dividing by powers of ten. If they try to memorize the "shift" of the decimal point or digits, they will become confused over which direction and why. There are no place value charts provided to recognize patterns. Referring to the examples will be helpful for students, and some may want to use a chart to help them divide for the time being.

- **Exercises 3–6:** Students who do not recognize the pattern yet will benefit from writing the numbers as they shift left or right based on the power of ten by which they are dividing.
- **Exercises 7–9:** A variable is used in the equation to find a missing dividend or divisor. Remind students that all of the divisors are powers of 10, and they can use the pattern of the digits and/or decimal in the quotient to find the missing value.
- **Exercises 11 and 12:** These reasoning exercises have students continue to recognize decimal patterns as well as make sense of the inverse relationship of multiplication and division.

PROFICIENT students are confident with the pattern of dividing decimals and powers of 10. They can divide correctly, sometimes completing the problem mentally.

- **Exercises 7–9:** Have students explain how they found the missing values. What pattern did they recognize that let them know what the dividend or divisor should be?
- **Exercise 12:** Can students determine what the factor would be that is equivalent to dividing by 0.001? How does this show the inverse relationship of multiplication and division?

Additional Support

- Students will benefit from a place value chart to recognize how numbers (or decimal points) shift.

Name _____

Apply and Grow: Practice

Find the quotient.

3. $76 \div 10 =$ _____

7.6

4. $3.65 \div 0.1 =$ _____

36.5

5. $2.9 \div 0.01 =$ _____

290

6. $18.7 \div 10^2 =$ _____

0.187

Find the value of k.

7. $95.8 \div k = 958$

$k = 0.1$

8. $k \div 10^3 = 0.35$

$k = 350$

9. $245 \div k = 24,500$

$k = 0.01$

10. Newton goes on a 10-day road trip. He takes $435 with him. He spends all of his money and spends the same amount each day. How much money does he spend each day?

$43.50

11. **Repeated Reasoning** For which equations does $b = 100$?

$\boxed{49 \div b = 0.49}$

$247 \div b = 0.247$

$\boxed{1.3 \div b = 0.013}$

$0.5 \div b = 0.05$

12. **YOU BE THE TEACHER** Your friend says $8,705 \div 10^3$ is equivalent to $8,705 \times 0.001$. Is your friend correct? Explain.

yes; Division by 1,000 is equal to multiplication by 0.001.

Chapter 7 | Lesson 1

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Laurie's Notes

Think and Grow: Modeling Real Life

These application problems allow students to show their understanding of dividing a decimal by a power of 10 and solving a multi-step problem.

? "Have you ever seen a new neighborhood being built? Many times you can see how they divide the land on which to build each house."

- Have students read the problem and discuss what they will need to do to determine how much land each house will have. You may need to explain the meaning of *adjacent*. Relate this to *adjacent angles.*
- If students are able to talk about the problem and what it is about *before* they start to think about what numbers are involved, they are more likely to be able to think about what the answer will look like and what it represents.
- Ask guiding and clarifying questions as students work through the example. Have students explain why the land parcels need to be added together. Ask if it would be okay to divide by 10 before adding.
- Exercise 13 is similar to the example in structure. Students will follow the same pattern as in the example. Watch as students work independently to identify any misconceptions.
- Exercise 14 explains that the model of the Space Needle is one-hundredth the height of the actual Space Needle. To find the height of the Space Needle, students should divide the size of the model by 0.01. However, most students will think to multiply by 100 instead. If this is the case, ask why both strategies are correct, and relate the strategies back to the inverse relationship of multiplication and division.

- ⊙ Write $18.9 \div 100$ and $18.9 \div \frac{1}{100}$ on the board. "Take turns with your partner reading the two problems." Pause. "How will the two quotients be different? What is similar about the two problems? Using your thumb signals show how confident you are at dividing a decimal by a power of 10."
- **Supporting Learners:** Students should write the problem before writing the answer. You want to know what computation students are trying to solve. They may want to continue using a place value chart.

Closure

- Write _____ ÷ _____ = 1.456 on the board.
- "Work with your partner. What dividend and divisor would have a quotient of 1.456? Your divisor must be a power of 10. Is there more than one answer? How many can you find?"

Think and Grow: Modeling Real Life

Example A contractor buys 2 adjacent lots of land. One lot is 0.55 acre and the other is 1.65 acres. The contractor divides the land equally for 10 new homes. How much land does each home have?

To find how much land each home has, divide the sum of the lot sizes by 10.

Add the sizes of the lots.

$$\begin{array}{r} 0.55 \\ +\ 1.65 \\ \hline \mathbf{2.20}\ \text{acres} \end{array}$$

Divide the total number of acres by 10. Dividing 2.20 by 10, or 10^1, shifts the digits __**1**__ position to the right in a place value chart. So, the decimal point moves __**1**__ place to the left.

$2.20 \div 10 = 2.20 \div 10^1 =$ __**0.22**__   Each home has __**0.22**__ acre.

Show and Grow   *I can think deeper!*

13. An art teacher has 68.5 pounds of clay and orders 56.5 more pounds. The teacher equally divides the clay among 100 students. How much clay does each student get?

1.25 pounds

14. A museum has a replica of the Space Needle that is 6.05 feet tall. It is one-hundredth of the height of the actual Space Needle. How tall is the actual Space Needle?

605 feet

---

15. **DIG DEEPER!** A pile of 10^2 loonies weighs 627 grams and a pile of 10^2 toonies weighs 730 grams. How much more does a toonie weigh than a loonie? Is there more than one way to solve the problem? Explain.

**1.03 grams; yes;
Divide both by 100 first, then subtract, or subtract first, then divide the difference by 100.**

A Canadian one-dollar coin is called a *loonie* and a Canadian two-dollar coin is called a *toonie*.

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Connect and Extend Learning

Homework & Practice Notes

- Have students make their own "Tip" cards with the explanations on what to do with the decimal point when dividing a number by a power of 10.

Assignment Guide and Concept Check

Level	Assignment	Concept Check
Emerging	1–15 odd, 16, 17	3, 5, 7, 9, 11
Proficient	1–17	

Prior Skills

- **Exercises 16 and 17:** Grade 5, Adding and Subtracting Decimals

Cross-Curricular Connections

Language Arts

- Provide students with a copy of the Solve the Riddle Instructional Resource. Students will solve division problems. Each answer will have a letter associated with it and a key for students to fill in the answers in the correct order to answer the riddle.

What goes up, but never comes down?

1. $43 \div 10 =$ __A__

2. $1.8 \div 0.01 =$ __O__

3. $782 \div 10^2 =$ __Y__

4. $430 \div 10^3 =$ __U__

5. $78.2 \div 0.1 =$ __E__

6. $0.18 \div 0.01 =$ __G__

7. $7,820 \div 100 =$ __R__

____	____	____	____		____	____	____
7.82	180	0.43	78.2		4.3	18	782

Name _____

Learning Target: Find quotients involving decimals and powers of 10.

Example Find $63 \div 10^2$.

$63 \div 10^2 = 63 \div 100 = \underline{.63}$

So, $63 \div 10^2 = \underline{0.63}$.

> When dividing a number by a power of 10, the number of places the decimal point moves to the left is the same as the exponent.

Example Find $92.7 \div 0.1$.

$92.7 \div 0.1 = \underline{927.}$

So, $92.7 \div 0.1 = \underline{927}$.

> When dividing a number by 0.1, the decimal point moves 1 place to the right. When dividing a number by 0.01, the decimal point moves 2 places to the right.

Find the quotient.

1. $810 \div 10 = $ _____

81

2. $7.4 \div 0.01 = $ _____

740

3. $903 \div 10^3 = $ _____

0.903

4. $267.1 \div 0.01 = $ _____

26,710

5. $5.6 \div 0.1 = $ _____

56

6. $0.4 \div 10^2 = $ _____

0.004

Chapter 7 | Lesson 1

Connect and Extend Learning

Extend Student Learning

Visual-Spatial

- Students roll a die three times to make a decimal on a copy of Division Problems Involving Decimals and Powers of 10 Instructional Resource. Then students will complete the equations. They can write their own problems for their partner to solve at the bottom of the page.

Lesson Resources	
Surface Level	**Deep Level**

Resources by Chapter
  • Extra Practice
  • Reteach
  • Chapter Self-Assessment
Differentiating the Lesson
Tutorial Videos
Skills Review Handbook
Skills Trainer
	Resources by Chapter
	  • Enrichment and Extension
	  • Chapter Self-Assessment
	Graphic Organizers
	Dynamic Assessment System
	  • Lesson Practice

Find the value of k.

7. $89 \div k = 8.9$

$k = 10$

8. $k \div 0.01 = 36$

$k = 0.36$

9. $72.4 \div k = 0.724$

$k = 100$

---

10. A box of 100 sanitizing wipes costs $12. How much does one wipe cost?

$0.12

11. 🔴 **Patterns** How does the value of a number change when you divide by 10? 100? 1,000?

The value of a number decreases with each division. The decimal will move to the left 1, 2, and 3 places, respectively.

12. 🔴 **Communicate Clearly** How can you determine where to place the decimal point when dividing 61 by 1,000?

The decimal point moves 3 places to the left because there are 3 zeros in 1,000.

13. **DIG DEEPER!** What is Newton's number?

3.4

My number divided by 0.1 is 23 less than 57.

14. 🔵 **Modeling Real Life** A family buys 2 personal watercrafts for $3,495 each. The family makes 10 equal payments for the watercrafts. What is the amount of each payment?

$699

15. 🔵 **Modeling Real Life** A group of people attempts to bake the largest vegan cake. They use 17 kilograms of cocoa powder, which is one-tenth the amount of kilograms of dates they use. How many kilograms of cocoa power and dates do they use altogether?

187 kilograms

Review & Refresh

Find the sum or difference.

16. $0.75 - 0.23 = $ _____

0.52

17. $1.46 + 1.97 = $ _____

3.43

Learning Target

Use compatible numbers to estimate quotients involving decimals.

Success Criteria

- Rename a dividend to estimate a quotient.
- Use compatible numbers to estimate a quotient.
- Explain different ways to estimate a quotient.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com.*

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

In earlier chapters students learned about estimates and compatible numbers. Ask students to explain what they do when they estimate. Then ask them to explain what compatible numbers are.

Laurie's Notes

STATE STANDARDS
5.NBT.A.4, 5.NBT.B.7

Preparing to Teach

Students used compatible numbers to estimate quotients in the previous chapter. Now, they use compatible numbers and division facts to estimate quotients where the dividend is a decimal and the divisor is a whole number.

Materials

- Find Your Match (Decimals)*

Found in the Instructional Resources

Dig In (Motivate Time)

Students are each given a division expression to estimate. They find the person in the class who has the same estimate. Copy the Find Your Match (Decimals) and cut apart the problems. You might copy on heavier weight paper and laminate for repeated practice with the cards.

Find Your Match (Decimals)		
Column A	Column B	Estimate
39.6 ÷ 4.1	374.5 ÷ 36	10
54.2 ÷ 6	73.24 ÷ 8.19	9
40.2 ÷ 4.9	240.1 ÷ 30.6	8
63.25 ÷ 9	349.3 ÷ 52.43	7
19 ÷ 3.2	236.4 ÷ 38.9	6
25.1 ÷ 4.8	46.38 ÷ 9.37	5
17.4 ÷ 4	276.7 ÷ 71.28	4
20.8 ÷ 6.9	1842.2 ÷ 596.3	3
14.6 ÷ 7	28.8 ÷ 13.7	2
21.6 ÷ 19.8	0.82 ÷ 0.79	1

- There are 20 cards. There is a Find Your Match Template Instructional Resource if you have more than 20 students. The problems in Column B may be more challenging.
- "I am going to distribute cards that have one decimal division problem written. I want you to decide how you would round or use compatible numbers to find an estimate for the quotient." You may wish to tell students that all of the estimates are a number from 1 to 10.
- Give students sufficient time to think about their estimates before you tell them to walk around to find their match. Do not allow students to shout out *I'm 4. Who else is 4?* "Use your partner voice and find a match. Show your expression to one another and explain how you found your estimate."
- When students finish, take time to have each pair of students explain how they used rounding and compatible numbers to estimate the quotient. Hearing students explain their problem is much more valuable than hearing the teacher explain how to do it.
- **Extension:** Allow no talking or hand gesturing. Have students walk around to find your match.
- ⊙ "You used compatible numbers to estimate a quotient. The estimates help you know where to place the decimal point in the quotient. There is also another strategy that we are going to learn. It will help us estimate a quotient when the divisor is greater than the dividend."

❓ Teaching Prompt   ⊙ Learning Target

Estimate Decimal Quotients **7.2**

Learning Target: Use compatible numbers to estimate quotients involving decimals.

Success Criteria:
- I can rename a dividend to estimate a quotient.
- I can use compatible numbers to estimate a quotient.
- I can explain different ways to estimate a quotient.

Explore and Grow

Choose an expression to estimate each quotient. Write the expression. You may use an expression more than once.

32 ÷ 8	36 ÷ 9
35 ÷ 7	30 ÷ 10

Sample answer:

32.7 ÷ 8.8	33.6 ÷ 9.2	34.3 ÷ 8.1	35 ÷ 10.1
32 ÷ **8**	**36** ÷ **9**	**36** ÷ **9**	**36** ÷ **9**

Compare your answers with a partner. Did you choose the same expressions?

Check students' work.

MP **Construct an Argument** Which estimated quotient do you think will be closer to the quotient 8.3 ÷ 2.1? Explain your reasoning.

8.3 rounds to 8 and 2.1 rounds to 2.

8 ÷ 2

9 ÷ 3

Explore and Grow

- If you have done the Dig In you may not want to spend time on the Explore and Grow.
- Emphasize the direction *You may use an expression more than once.* This is not a matching activity, and there are several correct answers.
- If students did not select the same expressions, have them explain to one another why they selected the expression they did.
- **MP3 Construct Viable Arguments:** Listen for students to recognize that 8.3 is closer to 8 than 9 and 2.1 is closer to 2 than 3. Although both estimates are reasonable, 8 ÷ 2 is closer.

Laurie's Notes

Think and Grow

Getting Started

- The Key Idea describes the two strategies that are used in this lesson. Compatible numbers are familiar to students. The situation of the divisor being greater than the dividend will be new. Renaming the dividend is a new strategy.

- **Common Misconception:** Students may say you can't divide a smaller number by a bigger number. Ask if they can share 2 cookies between 4 people. $2 \div 4 = \frac{1}{2}$ and so the quotient in these problems will be less than 1.

Teaching Notes

- ◎ "We are going to use division facts and compatible numbers to estimate a quotient. You will use mental math to find the quotient."

- ❓ **Model:** "We want to estimate 146.26 ÷ 41.2. Think *If I round 41.2 to 40, what multiples of 40 are near 146.26?* Remember, multiples of 40 would be 40, 80, 120, 160, … . What multiples of 40 are near 146.26? Explain." 120 and 160 Students find both quotients. Since 146.26 is closer to 160 than 120, an estimate for 146.26 ÷ 41.2 is 4.

- ❓ "Since 146.26 is between 140 and 150, why didn't we round to those numbers?" We don't know a division fact for 140 ÷ 40 or 150 ÷ 40.

- ◎ "You used division facts and compatible numbers to estimate a quotient. How secure are you feeling with this process?"

- ❓ **Model:** Discuss the relationship between the dividend and divisor. "We are dividing by a greater number. What does that mean about the quotient?" It is less than 1. "In this example, we want to estimate 4.2 ÷ 8. We know that 4.2 < 8 so we can think of four and two tenths as 42 tenths. What compatible numbers do you know for 42 and 8?" 40 and 8 "Remember to say the place values. 40 tenths ÷ 8 is 5 tenths or 0.5. An estimate for 4.2 ÷ 8 is 0.5."

- ❓ "Can someone explain why the estimate of 0.5, which is $\frac{1}{2}$, makes sense for this problem?" 4.2 is about 4 and 4 divided by 8 is one half. They may mention 4 cookies divided between 8 students. Each student receives a $\frac{1}{2}$ cookie.

- **Supporting Learners:** If students are not secure with their basic division facts, provide a fact sheet or multiplication table.

- In Exercises 3 and 4, ask students how they are renaming the dividend.

- ◎ Ask students to reflect on the different steps to rename the dividend to estimate when the dividend is less than the divisor Is there a part they are not clear about? What is challenging? What are they secure with and could help others with?

ELL Support

After reviewing the examples, have students work in pairs to discuss and complete Exercises 1–4. Have one student ask another questions such as, "To what number do you round the divisor? What number(s) do you use for the dividend? What is your estimate?" Have them alternate roles.

Beginner students may write or state numbers.

Intermediate students may use simple sentences, such as, "Round to 40."

Advanced students may use detailed sentences, such as, "Round the divisor 41.2 to 40."

Think and Grow: Estimate Decimal Quotients

🔑 **Key Idea** You can use compatible numbers to estimate quotients involving decimals. When the divisor is greater than the dividend, rename the dividend as tenths or hundredths, then divide.

Example Estimate $146.26 \div 41.2$.

Round the divisor 41.2 to 40.

Think: What numbers close to 146.26 are easily divided by 40?

Use 120. $146.26 \div 41.2$ Use 160. $146.26 \div 41.2 =$

$120 \div 40 = \underline{\textbf{3}}$ $160 \div 40 = \underline{\textbf{4}}$

Choose 160 because 146.26 is closer to 160. So, $146.26 \div 41.2$ is about $\underline{\textbf{4}}$.

Example Estimate $4.2 \div 8$.

Rename 4.2 as tenths.

4.2 is 42 tenths. 42 tenths is close to 40 tenths. 40 and 8 are compatible numbers.

40 tenths $\div 8 = \underline{\textbf{5}}$ tenths, or $\underline{\textbf{0.5}}$

So, $4.2 \div 8$ is about $\underline{\textbf{0.5}}$.

Show and Grow *I can do it!*

Estimate the quotient.   **1–4. Sample answers are given.**

1. $17.4 \div 3.1$

  6

2. $57.5 \div 6.89$

  8

3. $3.7 \div 5$

  0.7

4. $25.8 \div 30$

  0.9

306

Scaffold instruction to support all students in their learning. Learning is individualized and you may want to group students differently as they move in and out of these levels with each skill and concept. Student self-assessment and feedback help guide your instructional decisions about how and when to layer support for all students to become proficient learners.

Meeting the needs of all learners.

Laurie's Notes

Apply and Grow: Practice

SCAFFOLDING INSTRUCTION

Students are applying their understanding of dividing decimals so far and compatible numbers to estimate quotients. These skills require an understanding of place value and division fact fluency. There are many sub-skills and concepts that come together in this lesson. Listen to students' reasoning and look at their written work to assess where students are in their learning.

EMERGING students may not be secure in determining a compatible number for the dividend based on the divisor. If they are not secure with basic division facts they will struggle with determining between what two compatible numbers the dividend is located.

- **Exercises 5–11:** If students struggle with determining an estimate, encourage them to write out the steps to help you determine if they are struggling with rewriting the dividend or with identifying compatible numbers.
- **Exercise 12:** This exercise checks to see if students understand the strategy of choosing a compatible dividend based on the divisor. Look to see that students explain that 42 is divisible by 7 but 43 is not.
- **Exercise 13:** Students may not be able to think of specific situations where estimations are appropriate. Often students want to know the exact answer. This exercise has students reason about the value of estimation in real-world contexts.

PROFICIENT students are able to find a compatible dividend in terms of the divisor. They are confident in their division facts and can use these facts to determine compatible numbers.

- **Exercises 5–11:** Students may be able to determine their estimates mentally. Circulate among the students and ask questions to make their thinking visible to you.

Additional Support

- Use online and math center support for division facts.
- Use a multiplication table to help students determine the multiples of the divisor and therefore determine compatible numbers for the dividend.

Extension: Adding Rigor

- "Newton divides a number by 6.4. He estimates the quotient to be 30. Find three different dividends that Newton could be dividing."

Name _____

Apply and Grow: Practice

Estimate the quotient.   **5–10. Sample answers are given.**

5. $3.5 \div 6$

0.6

6. $1.87 \div 9$

0.2

7. $46 \div 2.3$

20

8. $31.1 \div 6.5$

5

9. $91.08 \div 5.2$

18

10. $137.14 \div 12.2$

11

11. A group of 6 friends goes ice skating. They pay $43.50 altogether for admission and skate rental. The friends share the cost equally. How much does each friend pay?

$7.25

12. **MP Construct an Argument** Descartes estimates $43.2 \div 7.3$ using mental math. Do you think he uses $43 \div 7$ or $42 \div 7$? Explain.

$42 \div 7$; Descartes uses mental math and $42 \div 7$ results in a whole number.

13. **DIG DEEPER!** Describe a situation in which estimating the quotient of two decimals is appropriate.

Check students' work.

Laurie's Notes

Think and Grow: Modeling Real Life

These application exercises provide students an opportunity to use their estimation skills in multi-step problems to determine a reasonable estimate for a quotient.

- ❓ **MP1 Make Sense of Problems:** "Read the example. What are we asked to find?" Some students may say we need to find out how many more words your friend can type each minute than you. The key word students may overlook is the first word in the sentence—*about*. *About* implies that an estimate is what is being asked for, not the exact amount.

- ❓ "What operation or operations will help us determine a reasonable estimate?" division and then subtraction Watch out for students who only want to subtract. They are not attending to *words per minute.* "How do you know?"

- ❓ Work through the example as a class. "Why did we choose the estimates we did (300 and 450)?"

- ❓ Exercise 14 follows the same structure as the example. Students can work independently or with a partner. Ask students to explain why they chose that compatible number for 143.99.

- ❓ Have students work with a partner or independently on Exercises 15 and 16. "Discuss your work with a partner. Did anyone have an estimate that was different from their partner's? Is it possible to have two different estimates?"

- ◉ "Write a note to a friend explaining how you would use compatible numbers to estimate the quotient 33.47 ÷ 5." Have students share their note with a partner. Have the partner critique the note and make necessary additions or deletions.

- • **Supporting Learners:** Students may have difficulty decoding the language in the word problems. Assist them in determining the steps involved in each situation. What operations are involved and in what order? What compatible numbers should be considered?

Closure

- • **Turn and Talk:** "For 746.2 ÷ 8, what compatible numbers would you use to estimate the quotient? Partner A should say a compatible number that is less than the dividend, and Partner B should say a compatible number that is greater than the dividend. Which compatible number will you choose? What is your estimate of the quotient?"

Think and Grow: Modeling Real Life

Example Your friend types 25 words each minute. About how many more words can your friend type each minute than you?

To find how many words you can type each minute, divide the number of words you type in 15 minutes by 15.

Think: What numbers close to 307.5 are easily divided by 15?

Use 300. 307.5 ÷ 15   Use 450. 307.5 ÷ 15 =

300 ÷ 15 = __20__   450 ÷ 15 = __30__

Choose 300 because 307.5 is closer to 300. So, 307.5 ÷ 15 is about __20__.

So, you type about __20__ words each minute.

Subtract the words you type each minute from the words your friend types each minute.

$$\begin{array}{r} 25 \\ -\ \boxed{20} \\ \hline 5 \end{array}$$

Your friend can type about __5__ more words each minute than you.

Show and Grow   I can think deeper!

14. Newton subscribes to a television streaming service and buys a gym membership. He spends $143.99 on the streaming service for 12 months. About how much more does it cost each month for the gym membership than the streaming service?

about $8

Gym Membership

$19.99
each month

15. A fish tank pump filters 158.5 gallons of water each hour. About how many gallons of water does the pump filter each minute?

about 3 gallons

16. **DIG DEEPER!** A group of 32 students goes to a museum and a play. The total cost for the museum is $358.98 and the total cost for the play is $256.48. About how much does it cost for each student to go to the museum and the play?

about $19

Connect and Extend Learning

Homework & Practice Notes

- **Exercise 12:** Explain to students why there is a maximum allowed flow rate.

Assignment Guide and Concept Check

Level	Assignment	Concept Check
Emerging	1–9 odd, 12–16	1, 3, 5, 9, 12
Proficient	1–16	

Prior Skills

- **Exercises 14–16:** Grade 5, Multiplying by Two-Digit Numbers

Cross-Curricular Connections

Art

- Have students design signs for foods that can be hung up in a grocery store. Make sure students show prices with decimals. Then provide a word problem that asks, "If you only have $20.00 to spend, how many _____ can you buy?" Have students estimate the quotient.

Scaffold assignments to support all students in their learning progression. The suggested assignments are a starting point. Continue to assign additional exercises and revisit with spaced practice to move every student toward proficiency.

2.⁴⁹ ea.

Applesauce
48 oz.

New low price!

APPLESAUCE

Chunky

Homework & Practice **7.2**

Learning Target: Use compatible numbers to estimate quotients involving decimals.

Example Estimate $22.19 \div 5.4$.

Round the divisor 5.4 to 5.

Think: What numbers close to 22.19 are easily divided by 5?

Use 20. $22.19 \div 5.4$ Use 25. $22.19 \div 5.4$

$20 \div 5 = \underline{\;\;4\;\;}$ $25 \div 5 = \underline{\;\;5\;\;}$

Choose 20 because 22.19 is closer to 20. So, $22.19 \div 5.4$ is about $\underline{\;\;4\;\;}$.

Estimate the quotient.   **1–6. Sample answers are given.**

1. $2.3 \div 6$

0.4

2. $1.67 \div 8$

0.2

3. $28 \div 4.7$

7

4. $13.8 \div 4.9$

3

5. $42.1 \div 7.3$

6

6. $201.94 \div 18.1$

10

7. A carpenter has a plank of wood that is 121.92 centimeters long. He cuts the plank into 4 equal pieces. About how long is each piece?

about 30 centimeters

Chapter 7 | Lesson 2   **309**

Connect and Extend Learning

Extend Student Learning

Visual-Spatial

- Have students create a draft for a rectangular chalk drawing or poster painting. Tell students an area and a length for their drawing and have them estimate the quotient to find the width. For example, if the given area is 31.4 square inches and the length is 7.2 inches, students can estimate that the width is about 4 inches. Allow time for students to create their chalk drawings outside or provide poster and paint for their paintings.

Lesson Resources	
Surface Level	**Deep Level**

Resources by Chapter
  • Extra Practice
  • Reteach
  • Chapter Self-Assessment
Differentiating the Lesson
Tutorial Videos
Skills Review Handbook
Skills Trainer
Math Musicals
	Resources by Chapter
	  • Enrichment and Extension
	  • Chapter Self-Assessment
	Graphic Organizers
	Math Musicals
	Dynamic Assessment System
	  • Lesson Practice

8. **MP Construct an Argument** A family used 9.8 gallons of gasoline to drive 275.5 miles. To determine how far they drove using one gallon of gasoline, can they use an estimate, or is an exact answer required? Explain.

They can estimate unless precision is required.

9. **MP YOU BE THE TEACHER** Your friend says 9 ÷ 2.5 is about 3. Is your friend's estimate reasonable? Explain.

yes; 2.5 rounds to 3 and 9 divided by 3 is 3.

MP Maintain Accuracy Without calculating, tell whether the quotient is greater than or less than 1. Explain.

10. 4.58 ÷ 0.3

greater than 1; A larger number is being divided by a smaller number.

11. 0.6 ÷ 12

less than 1; A smaller number is being divided by a larger number.

12. **MP Modeling Real Life** The maximum allowed flow rate for a shower head in California is 42.5 gallons of water in 17 minutes. About how much greater is this than the maximum allowed flow rate for a kitchen faucet in California?

California Allowed Flow Rate per Minute (gallons)	
Kitchen faucet	2.2

about 1 gallon per minute

13. **DIG DEEPER!** Which robot vacuum cleans a greater area each hour? About how much greater?

Robot Vacuum	Area Cleaned (square meters)	Time (hours)
A	46.45	1.5
B	139.35	2.5

Robot vacuum B; about 24 square meters more

Review & Refresh

Find the product. Check whether your answer is reasonable.

14. $56 \times 78 =$ _____
4,368

15. $902 \times 27 =$ _____
24,354

16. $4,602 \times 35 =$ _____
161,070

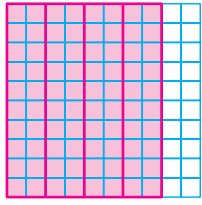## Learning Target

Use models to divide decimals by whole numbers.

Success Criteria

- Use a model to represent a decimal.
- Divide a model to show equal groups.
- Use a model to divide a decimal by a whole number.

Laurie's Notes

STATE STANDARDS
5.NBT.B.7

Preparing to Teach

Students have divided decimals by powers of 10 and estimated quotients for decimal division problems. In the next three lessons, students will be dividing a decimal by a whole number. The goal is for students to understand that the process is the same as dividing whole numbers. Consistency of language will be very important. Since we want to model the dividend, using a decimal grid or base ten blocks, we will refer to the divisor as the number of equal groups. The quotient is the size of each group.

Materials

- colored pencils
- Decimal Grids*

*Found in the Instructional Resources

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com.*

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

Remind students that a model is a visual representation. Illustrations, charts, and diagrams all serve as models. In this lesson, students will use models to represent division of decimals by whole numbers.

Dig In (Motivate Time)

Students draw a model of how to divide a decimal by a whole number. Note, this could be done with base ten blocks, but the approach in this lesson is to use decimal grid paper.

- Distribute Decimal Grids and colored pencils.
- Write $0.32 on the board. Do NOT write 0.32¢, which is less than 1 cent. "Draw a model on your grid of what it would mean to share $0.32 between four people. You may use more than one color so your model makes it clear how much each person receives." Pause.
- **Note:** Many students will know that dividing $0.32 between four people means each receives $0.08. Without a context, many would not know 0.32 ÷ 4.
- Ask volunteers to share their models.
- **?** "What does the divisor represent in the problem?" how many people you are sharing with "What does the quotient represent?" how much each person receives "So, $0.32 ÷ 4 = $0.08. The divisor (4) is the number of equal groups and the quotient is the size of each group ($0.08). You have divided a decimal by a whole number and the answer was a decimal. 32 hundredths divided by 4 is 8 hundredths."
- **?** "What do you think 32 tenths divided by 4 would be?"
- **Extension:** "Tell your partner a division problem you are confident answering that involves a decimal divided by a whole number."
- ⊙ "You have divided a decimal by a whole number using a model. How did the division fact 32 ÷ 4 help you? How did the model help you?"
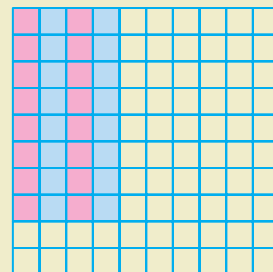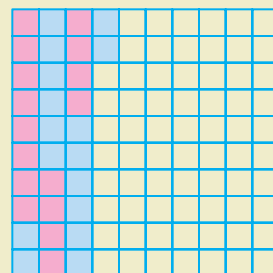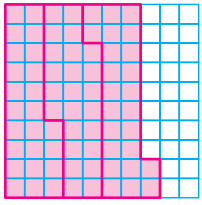
Learning Target: Use models to divide decimals by whole numbers.

Success Criteria:
• I can use a model to represent a decimal.
• I can divide a model to show equal groups.
• I can use a model to divide a decimal by a whole number.

Explore and Grow

Complete the table.

Expression	$0.8 \div 4$	$0.72 \div 3$
Model		
Number of Groups	4	3
Quotient	**0.2**	**0.24**

MP **Analyze a Problem** When you divide a decimal by a whole number, what does the quotient represent?

The quotient represents the number of parts per group.

Explore and Grow

• Students use a decimal grid to model the dividend divided into equal groups. The quotient is the size of the group.
• Remind students that the equal groups in their models should be obvious. Coloring each group or using dark lines to separate the groups will help.
? **MP7 Look for and Make Use of Structure:** "What division facts helped you draw your models?" 8 ÷ 4 and 72 ÷ 3 "So 8 tenths divided by 4 is 2 tenths. 72 hundredths divided by 3 is 24 hundredths."
◉ "You have modeled a decimal divided by a whole number. Knowing a division fact helped you know how to draw the model."

ELL Support

After demonstrating the examples, have students work in groups to discuss and complete Exercise 1. Provide guidance to support their discussion: "How do you divide the whole? How many tenths are in each group? How many hundredths?" Expect students to perform according to their language proficiency level.

Beginner students may write or state numbers.

Intermediate students may use phrases or simple sentences to contribute to discussion.

Advanced students may use detailed sentences and help guide discussion.

Think and Grow

Getting Started

- Remind students that there is no one correct way to draw and shade a decimal. You want the model to be clear and easy to read, meaning the tenths are obvious because they are an entire row or entire column.

Teaching Notes

- **?** **Model:** This example follows from the Explore and Grow. "We can use a decimal grid to find $2.16 \div 3$. Think to yourself, what do you know about the quotient? Why?" The quotient is less than 1 because the dividend is less than the divisor.
- **MP6 Attend to Precision:** "We start by shading 2.16." Be sure to say 2 and 16 hundredths, not two point one-six. Discuss why we can also name this 216 hundredths.
- **?** "We want to divide our model of into three equal groups. Are you already thinking about division facts? $216 \div 3$ isn't a division fact, but perhaps you are thinking about a mental math strategy? Talk to your partner about any predictions you have." Share as a class. It is likely at least one student will note that 21 can be divided by 3 and 6 can be divided by 3.
- Continue to work through the example. It will not be obvious where the 21 tenths comes from. Explain that 216 hundredths is also 21 tenths + 6 hundredths ($2.1 + 0.06 = 2.16$).
- Point to the model and say, "So, 21 tenths divided by 3 is 7 tenths, and 6 hundredths divided by 3 is 2 hundredths. There are 3 equal groups of 72 hundredths."
- In Exercise 1, remind students we want to divide 3.25 into five equal groups. The groups will be less than 1.
- **Supporting Learners:** Have students read the exercise using precise language: three and twenty-five hundredths divided by five. What other equivalent ways can the number be read? What division facts are they thinking about?
- ◉ "You have used a decimal grid to find the quotient of a decimal and a whole number. Are you able to draw the model and explain how division facts can help you?"

Think and Grow: Use Models to Divide Decimals

Example Use a model to find 2.16 ÷ 3.

Think: 2.16 is 2 ones, 1 tenth, and 6 hundredths.

Shade 216 hundredths to represent 2.16.
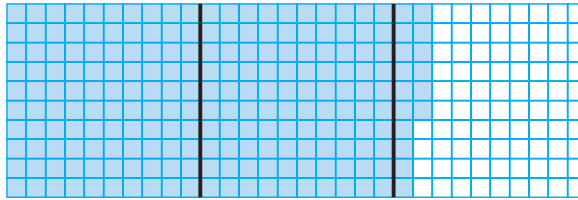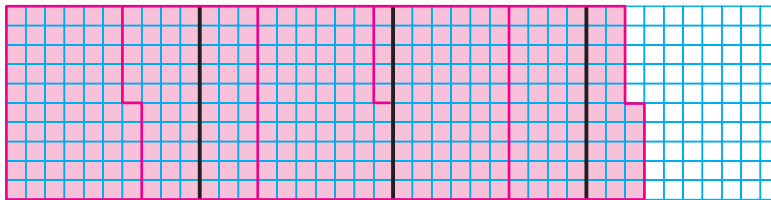
Divide the model to show 3 equal groups.
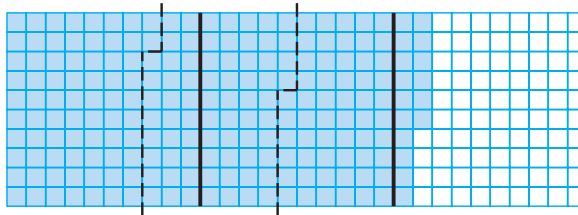
- 21 tenths can be divided equally as 3 groups of **7** tenths.

- 6 hundredths can be divided equally as 3 groups of **2** hundredths.

So, 216 hundredths can be divided equally as 3 groups of **72** hundredths.

So, 2.16 ÷ 3 = **0.72**.

Show and Grow   I can do it!

1. Use the model to find 3.25 ÷ 5.

3.25 ÷ 5 = **0.65**

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Meeting the needs of all learners.

Laurie's Notes

Apply and Grow: Practice

SCAFFOLDING INSTRUCTION

Students are asked to use a decimal model to find the quotient of a decimal by a whole number. The dividends are all less than the divisors, resulting in quotients less than one. They will use grid paper to model the division, clearly showing the equal groupings. This is a model of repeated subtraction just as the multiplication model was repeated addition. Students will use multiplication and division facts to determine a reasonable quotient.

EMERGING students may not fully understand how the model helps them find the quotient or may be unsure of how to model the decimal number with the grids. Emerging students may have difficulty finding the number that will be in each group (quotient).

- **Exercises 2 and 3:** If students struggle with these exercises, use questions to determine if the confusion is with modeling the decimal factor, determining the decimal that will be in each group, or in determining the quotient as the answer.
- **Exercises 4–7:** Provide grid paper for students who have difficulty determining the quotient from the numbers only.
- **Exercise 8:** Just like working with whole numbers, the division process of segmenting or dividing into groups has to begin with the greatest place values and working to lesser place values as regrouping is needed.
- **Exercise 9:** Do students understand the value of 9.85? Can they explain that since 9.85 is less than 10, the quotient will be less than 2? Do they recognize the need to compare the dividend to 10?

PROFICIENT students are able to use a decimal grid or their number facts to determine quotients.

- **Exercise 8:** Have students share their reasoning about place value when dividing a decimal by a whole number.

Additional Support

- Provide a multiplication table to determine the number in each group to be shaded on the grid.
- Review the decimal values within the grid. Base ten blocks may be helpful for the decimal values.

Name _____

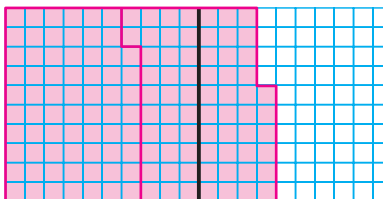## Apply and Grow: Practice

Use the model to find the quotient.

2. $2.4 \div 4$

0.6
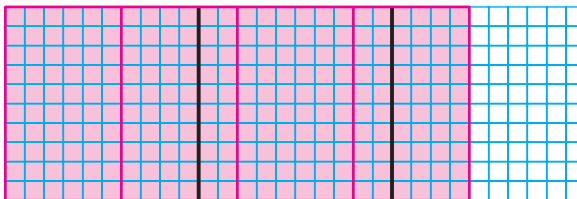
3. $1.36 \div 2$

0.68

Use a model to find the quotient.

4. $1.5 \div 3$

0.5

5. $2.7 \div 9$

0.3

6. $1.44 \div 8$

0.18

7. $3.12 \div 6$

0.52

8. **MP** **Analyze a Problem** Do you start dividing the ones first when finding $5.95 \div 7$? Explain.

no; 7 > 5, so start dividing the tenths.

9. **MP** **Construct an Argument** Without dividing, determine whether the quotient of 9.85 and 5 is greater than or less than 2. Explain.

less than 2;
10 ÷ 5 = 2 and 9.85 < 10,
so 9.85 ÷ 5 < 2.

Chapter 7 | Lesson 3

Laurie's Notes

Think and Grow: Modeling Real Life

These applications allow students to apply their understanding of dividing a decimal by a whole number to solve a real-world problem.

- ❓ "Read the problem. What do you know? What are you trying to find?" Give students time to discuss the problem with a partner before working through the problem as a class.
- ❓ **MP4 Model with Mathematics:** "How can we determine the weight of one racquetball? What does the model show? How does this relate to division?"
- Discuss each step in the division model with students, relating it from the model to the place values. Be sure to have students interpret the regrouping of 1 whole into 10 tens.
- "Tell your partner what $4.2 \div 3$ is."
- ❓ Always refer back to the original problem when answering a word problem. "Did we find out what one ball weighs?"
- **Supporting Learners:** Provide grid paper for students who need it.
- Exercise 10 is similar to the example. Students will divide 3.75 by 5 using grid paper or number facts.
- Exercise 11 is a multi-step problem. Students find the cost of both the plums and peaches before determining the difference in the cost.
- ◉ "Today you used a model to find the quotient of a decimal and a whole number. Tell your partner how to use the model to find a quotient. How does knowing multiplication and division facts help when determining the number in each group? How well can you use the model to find a quotient? How are you at dividing a decimal by a whole number?"

Closure

- "Descartes wants to divide 3.2 by 8. Help Descartes draw a model of the division and find the quotient."
- ❓ "Tell your partner what number fact will help sketch the model. What is the quotient?"
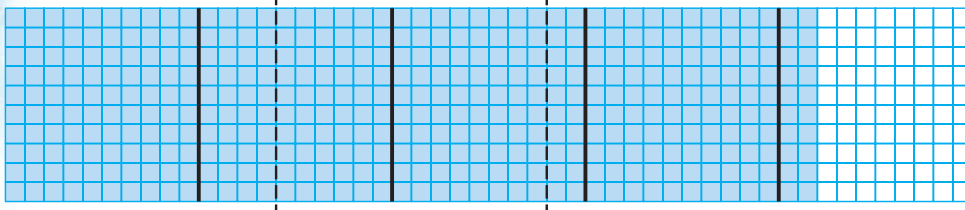
Think and Grow: Modeling Real Life

Example A bag of 3 racquetballs weighs 4.2 ounces. What is the weight of each racquetball?

Divide the weight of the bag by 3 to find the weight of each racquetball.

Think: 4.2 is 4 ones and 2 tenths.

Shade 42 tenths to represent 4.2. Divide the model to show 3 equal groups.

42 tenths can be divided equally as 3 groups of **14** tenths.

$4.2 \div 3 =$ **1.4**

So, each racquetball weighs **1.4** ounces.

Show and Grow   *I can think deeper!*

10. You cut a 3.75-foot-long string into 5 pieces of equal length to make a beaded wind chime. What is the length of each piece of string?

    0.75 foot

11. **DIG DEEPER!** You pay $5.49 for 3 pounds of plums and $6.36 for 4 pounds of peaches. Which fruit costs more per pound? How much more?

    plums; $0.24

Connect and Extend Learning

Homework & Practice Notes

- Remind students to regroup when necessary.

Assignment Guide and Concept Check

Level	Assignment	Concept Check
Emerging	1–9 odd, 10–13	1, 3, 5, 7, 9
Proficient	1–13	

Prior Skills

- **Exercises 11–13:** Grade 5, Using Strategies to Multiply Decimals

Cross-Curricular Connections

Art

- Divide students into pairs or groups. Have each group work together to make a picture by dividing decimal grids equally among the group members. Have students write an equation to determine how many decimal grids they each draw on. For example, you could have a pair of students create a picture on 4.4 decimal grids. Each student would be responsible for drawing on 2.2 decimal grids. Students can create one whole image or create individual images to put together.

$$4.4 \div 2 = 2.2$$

Scaffold assignments to support all students in their learning progression. The suggested assignments are a starting point. Continue to assign additional exercises and revisit with spaced practice to move every student toward proficiency.

Name _____
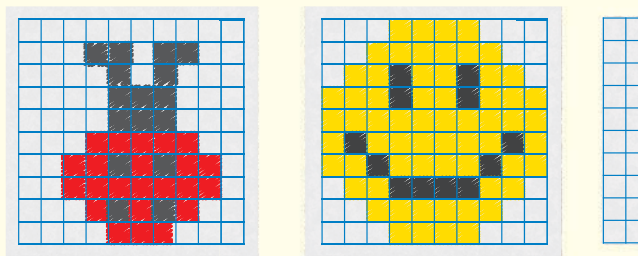
Learning Target: Use models to divide decimals by whole numbers.

Example Use a model to find 1.2 ÷ 6.

Think: 1.2 is 1 one and 2 tenths.

Shade 12 tenths to represent 1.2.
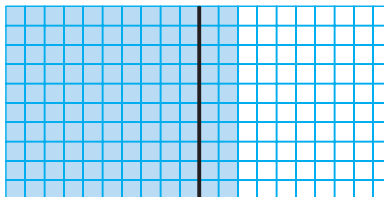
Divide the model to show 6 equal groups.

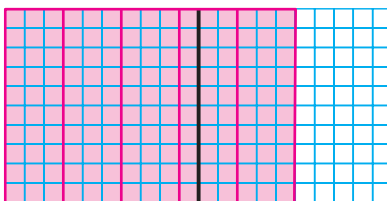12 tenths can be divided equally as 6 groups of __2__ tenths.

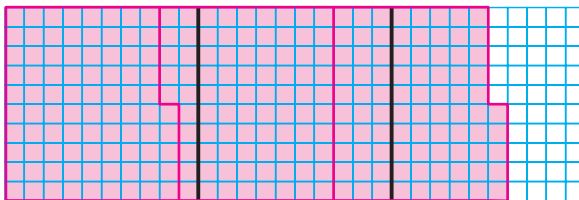So, 1.2 ÷ 6 = __0.2__ .
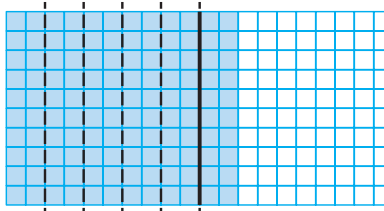
Use the model to find the quotient.

1. 1.5 ÷ 5

0.3

2. 2.55 ÷ 3

0.85

Chapter 7 | Lesson 3

Extend Student Learning

Interpersonal

- Have students draw a model to represent a decimal. Students will then walk around the room and find a partner. They will add their decimals together and then roll a die to divide their total by a whole number. Have students solve and write their answers on a sheet of paper.

Lesson Resources	
Surface Level	**Deep Level**

Resources by Chapter
  • Extra Practice
  • Reteach
  • Chapter Self-Assessment
Differentiating the Lesson
Tutorial Videos
Skills Review Handbook
Skills Trainer
	Resources by Chapter
	  • Enrichment and Extension
	  • Chapter Self-Assessment
	Graphic Organizers
	Dynamic Assessment System
	  • Lesson Practice

Use a model to find the quotient.

3. $1.6 \div 8$

0.2

4. $2.1 \div 7$

0.3

5. $1.56 \div 2$

0.78

6. $2.84 \div 4$

0.71

7. **MP** **Structure** Write a decimal division equation represented by the model.

1.8 ÷ 4 = 0.45
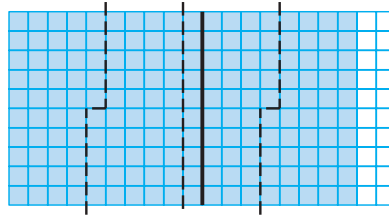
8. **MP** **Communicate Clearly** Explain how dividing a decimal by a whole number is similar to dividing a whole number by a whole number.

You model the dividend and then divide the model into equal groups.

9. **MP** **Modeling Real Life** Newton buys 4 gallons of gasoline. He pays $8.64. How much does 1 gallon of gasoline cost?

$2.16

10. **DIG DEEPER!** A designer learns there are 5.08 centimeters in 2 inches. How many centimeters are in 5 inches?

12.7 centimeters

Review & Refresh

Find the product. Explain the strategy you used.

11. $0.9 \times 1.1 = $ _____
0.99

12. $1.2 \times 2.7 = $ _____
3.24

13. $1.4 \times 0.8 = $ _____
1.12

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Learning Target

Divide decimals by one-digit whole numbers.

Success Criteria

- Use place value to divide.
- Place the decimal point in the quotient.
- Regroup when necessary.
- Use estimation to check my answer.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com.*

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

Have students explain the meaning of the word *pattern.* Then have them predict what pattern they might see in the completed table.

Laurie's Notes

Preparing to Teach

In this lesson, we generalize the patterns observed when dividing a decimal by a whole number. It is important to make connections to whole number division and the language and strategies they have used. They will use place value understanding and estimates to help them know if the quotient is reasonable.

Materials

- whiteboards and markers

Dig In (Motivate Time)

Students use division facts, and calculators if needed, to find quotients in related division problems.

- ◉ "In the previous lesson, you used division facts to help you draw a model of a decimal divided by a whole number. Place value was also important."
- "I have three problems for you where division facts and place value will help you find the quotient. You may have a calculator if you think you need it. Try using mental math first!"
- "Copy the three problems onto your whiteboard and find the quotient."

$$486 \div 2 = 243 \qquad 936 \div 3 = 312$$
$$48.6 \div 2 = 24.3 \qquad 93.6 \div 3 = 31.2$$
$$4.86 \div 2 = 2.43 \qquad 9.36 \div 3 = 3.12$$

- **MP8 Look for and Express Regularity in Repeated Reasoning:** Have students hold their whiteboards up to display their answers. Ask a volunteer to explain how knowing $486 \div 2 = 243$ helped them find the next two quotients. Be sure they use precise language and reference place value.
- Repeat with the next set of three problems.
- ❓ Write just the first problem in the next set. "How is the problem $736 \div 4$ different from the previous problems? If I told you the quotient, could you answer the next two questions?" Write $73.6 \div 4$ and $7.36 \div 4$.

$$736 \div 4 = 184$$
$$73.6 \div 4 = 18.4$$
$$7.36 \div 4 = 1.84$$

- **MP8 Look for and Express Regularity in Repeated Reasoning:** Have students display their whiteboards and explain how place value is helping them to divide.
- ◉ "You have observed how place value can help you find a quotient, including decimals divided by a whole number. Today we are also going to write the division problems in the standard vertical form, just as you did with whole numbers." Rewrite each of the last three problems.

❓ Teaching Prompt   ◉ Learning Target

Divide Decimals by One-Digit Numbers **7.4**

Learning Target: Divide decimals by one-digit whole numbers.

Success Criteria:
• I can use place value to divide.
• I can place the decimal point in the quotient.
• I can regroup when necessary.
• I can use estimation to check my answer.

Explore and Grow

Complete the table.

Expression	Number of Groups	Quotient
225 ÷ 5	**5**	**45**
22.5 ÷ 5	**5**	**4.5**
2.25 ÷ 5	**5**	**0.45**

What pattern do you notice in the placement of the decimal point?

The number of decimal places in the quotient is the same as in the dividend.

MP **Reasoning** How is dividing decimals by one-digit whole numbers similar to dividing whole numbers?

The procedure is the same but you need to place the decimal point in the quotient.

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Explore and Grow

• Students generalize that if they know how to divide ABC by a whole number *n*, they also know AB.C ÷ *n*, A.BC ÷ *n*, 0.ABC ÷ *n*, and so on. (A, B, and C are single digits.)
• **MP6 Attend to Precision:** It will help to say, "225 tenths divided by 5 is ____ tenths; 225 hundredths ÷ 5 = ____ hundredths." Five is the number of groups. What is the size of each group?
• **MP7 Look for and Make Use of Structure:** Many students by this time recognize that dividing a decimal by a whole number is not different than dividing whole numbers. It is the placement of the decimal point in the quotient you want them to be able to reason about and understand.

Think and Grow

Getting Started

• Students write a decimal division problem in the standard algorithmic form for the first time. There are no division facts that give them an immediate clue as to the quotient. The Dig In and the Explore and Grow have helped them see that decimals can be divided just as whole numbers are, you only need to know where to locate the decimal point.

Teaching Notes

• Students estimate the product first.
• **?** "What related whole number division problem will help us solve this problem?" $738 \div 6$ Discuss Newton's thought that relates the two problems.
• **Model:** "To find $7.38 \div 6$ we begin in the greatest place value, the ones, and then we will move to the next smaller place value just as we did with whole numbers. Remember to align the same place values in the dividend and quotient." Work through the first step.
• **? MP6 Attend to Precision:** "Now we divide the tenths, which means we can locate the decimal point in the quotient." Remember, we are not *bringing down the 3*. "Regroup 1 one as 10 tenths and combine with the 3 tenths. There are 13 tenths. "What is 13 tenths $\div$ 6?" Finish recording the step.
• Point out that the decimal point in the quotient is above the decimal point in the dividend. "This helps us know where to place the decimal point in the quotient when dividing by a whole number."
• The last step is to divide 18 hundredths by 6.
• ⊙ "You have just divided a decimal by a whole number! The quotient wasn't a common division fact. How did you use the estimate and place value to help you divide? Tell your partner." Elicit thoughts. Listen for explicit responses so you can make a connection to each success criteria.
• **Supporting Learners:** The example can be modeled with a decimal grid as shown.

1.23   1.23   1.23   1.23   1.23   1.23
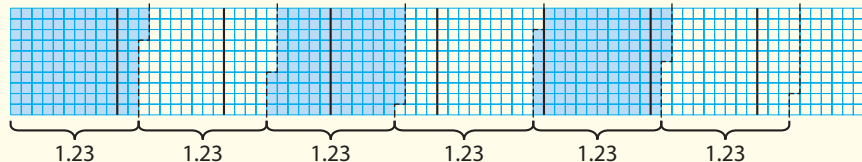
• You may want to walk through Exercises 1–3 with students. Encourage them to identify the reasoning for each step.
• ⊙ "Can you explain how place value tells you how to place the decimal point in the quotient? Use your thumb signals to show how confident you are dividing decimals by whole numbers."

Think and Grow: Divide Decimals by One-Digit Numbers

Example Find $7.38 \div 6$.

Estimate ____1____

> Think: 738×0.01 is 7.38. So, you can multiply the quotient $738 \div 6$ by 0.01 to find $7.38 \div 6$.

Divide the ones.

$$\begin{array}{r} 1 \\ 6\overline{)7.38} \\ -6 \\ \hline 1 \end{array}$$

7 ones ÷ 6
1 one × 6
7 ones − 6 ones
There is 1 one left over.

Divide the tenths.

$$\begin{array}{r} 1.2 \\ 6\overline{)7.38} \\ -6 \\ \hline 1\,3 \\ -1\,2 \\ \hline 1 \end{array}$$

Place the decimal point. Regroup 1 one as 10 tenths and combine with 3 tenths.

13 tenths ÷ 6
2 tenths × 6
13 tenths − 12 tenths
There is 1 tenth left over.

Divide the hundredths.

$$\begin{array}{r} 1.23 \\ 6\overline{)7.38} \\ -6 \\ \hline 1\,3 \\ -1\,2 \\ \hline 18 \\ -18 \\ \hline 0 \end{array}$$

Regroup 1 tenth as 10 hundredths and combine with 8 hundredths.

18 hundredths ÷ 6
3 hundredths × 6
18 hundredths − 18 hundredths
There are 0 hundredths left over.

So, $7.38 \div 6 =$ __1.23__ .

Reasonable? __1.23__ is close to __1__ . ✓

Show and Grow   I can do it!

Find the quotient. Then check your answer.

1.   **4.58**
$2\overline{)9.16}$

2.   **4.7**
$5\overline{)23.5}$

3.   **2.09**
$3\overline{)6.27}$

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Scaffold instruction to support all students in their learning. Learning is individualized and you may want to group students differently as they move in and out of these levels with each skill and concept. Student self-assessment and feedback help guide your instructional decisions about how and when to layer support for all students to become proficient learners.

Meeting the needs of all learners.

Apply and Grow: Practice

SCAFFOLDING INSTRUCTION

Students are transitioning from using models and estimation in dividing decimal and whole numbers to dividing them through place value and an algorithmic approach based on place value. Students will continue to practice division, and should recognize the pattern of where the decimal is placed in the quotient. It is very important that students make sense of the place values and how it impacts the quotient rather than memorizing a rule for the placement of the decimal.

EMERGING students are not confident in dividing a decimal and whole numbers without a model or using repeated addition. They may struggle with the process of long division.

- **Exercises 4–9:** Students who were not successful on Exercises 1–3 would benefit from small group instruction. Model Exercise 5 and have students try Exercises 4 and 6. Exercises 7–9 should be rewritten in the long division format. Continue to reinforce the place value as they go through each step of division.
- **Exercises 10–12:** These exercises use variables to find missing dividends and a quotient. Students can use multiplication to find the missing dividends.
- **Exercise 13:** This exercise checks students' understanding of place value and the division algorithm.
- **Exercise 14:** This exercise provides a different reasoning process for division.

PROFICIENT students are able to efficiently divide decimal and whole numbers. They can explain their reasoning based on place value.

- **Exercises 10–14:** Have students explain their reasoning to a partner.

Additional Support

- Provide grid paper for students to model the division if needed.
- Remind students of the long division process of whole numbers. Show that this is not different.

Extension: Adding Rigor

- Students create a division problem similar to Exercise 14 for a partner to solve. They can use a division problem already completed from the exercises to make their puzzle. The puzzle should only have two missing numbers.

Name _____

Apply and Grow: Practice

Find the quotient. Then check your answer.

4.   **4.2**
$4\overline{)16.8}$

5.   **0.17**
$9\overline{)1.53}$

6.   **16.5**
$5\overline{)82.5}$

7. $77.4 \div 3 =$ _____
25.8

8. $113.6 \div 8 =$ _____
14.2

9. $129.43 \div 7 =$ _____
18.49

Find the value of *y*.

10. $y \div 2 = 4.8$
y = 9.6

11. $6.05 \div 5 = y$
y = 1.21

12. $y \div 8 = 4.29$
y = 34.32

13. **MP Reasoning** Newton finds $75.15 \div 9$. In what place is the first digit of the quotient? Explain.

ones; 9 is greater than 7, so divide 9 into 75.

14. **DIG DEEPER!** Find the missing digits.

```
      7 .8 9
6)4 7 .3 4
```

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Chapter 7 | Lesson 4

Chapter 7 | Lesson 4   **319**

Laurie's Notes

Think and Grow: Modeling Real Life

These applications allow students to apply their knowledge of dividing a decimal and a whole number to solve a multi-step problem.

- Read the example. Give students time to discuss the problem with a partner before working through the problem as a class.
- **?** "Tell your partner where we will find the information about the amount of gold the miners find. Is there anything in the chart that is confusing?"
- "Share with your partner a plan for determining the number of ounces of gold each miner gets." Share several plans.
- **Turn and Talk:** "Estimate an answer for this problem."
- Work through the problem with the students.
- **Extension:** Find the current value of an ounce of gold. Share this with students and ask the value of the gold each miner receives.
- Exercise 15 follows the same format as the example.
- **?** Observe students as they complete the remaining exercises with a partner. "Remember to read the exercises carefully. What do you know? What do you need to find out?" All the exercises have multiple steps.
- Students may need help developing plans to solve Exercises 16 and 17.
- ◉ "Today you divided a decimal by a whole number using long division. Tell your partner how place value helps with division. Now tell your partner how you know where to place the decimal point in the quotient."
- ◉ "Use your fist to five to describe how you are doing in finding the quotient of a decimal divided by a whole number."
- **Supporting Learners:** Provide multiplication tables to help students with facts so they can concentrate on the process of division and place value with the decimal.

Closure

- "Newton divided 53.6 by 4 as follows. Help find Newton's mistake and correct his work. What went wrong?"
- "Descartes divided 1.35 by 5 as follows. Help find Descartes' mistake and correct his work. What went wrong?"

$$
\begin{array}{r}
1.34 \\
4\overline{)53.6} \\
-4\downarrow \\
\hline
13 \\
-12\downarrow \\
\hline
16 \\
-16 \\
\hline
0
\end{array}
$$

$$
\begin{array}{r}
2.7 \\
5\overline{)1.35} \\
-10\downarrow \\
\hline
35 \\
-35 \\
\hline
0
\end{array}
$$

Think and Grow: Modeling Real Life

Example A group of 5 gold miners finds the amounts of gold shown. They divide the gold equally. How many ounces does each miner get?

Week	Gold (ounces)
1	16.5
2	19.75

To find how many ounces each miner gets, divide the total amount of gold by 5.

Add the amounts of gold.

```
   11
   16.5
+ 19.75
   36.25
```

The miners find **36.25** ounces of gold.

Divide the total amount of gold by 5.

```
      7.25
   5)36.25
    − 35        36 ones ÷ 5
      1 2       12 tenths ÷ 5
    − 10
        2 5     25 hundredths ÷ 5
      − 25
          0
```

Each miner gets **7.25** ounces of gold.

Show and Grow   I can think deeper!

15. A pharmacist combines the medicine from both vials and divides it equally into 7 doses. How much medicine is in each dose?

3.5 milliliters

Vial	Medicine (milliliters)
1	4.5
2	20

16. **DIG DEEPER!** Identical rectangular stepping stones form a path in a garden. What are the dimensions of each stone?

124.8 in.

23.1 in.
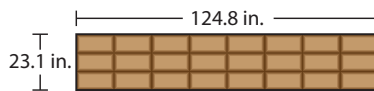
7.7 in. × 15.6 in.

17. **DIG DEEPER!** A set of 6 flying discs is priced $21.36. A customer saves $9.24 by buying the set rather than buying them individually. What is one flying disc priced individually?

$5.10

Connect and Extend Learning

Homework & Practice Notes

- **Exercise 10:** Remind students about the order of operations.
- **Exercise 14:** Remind students how to find the perimeter of a rectangle.

Assignment Guide and Concept Check

Scaffold assignments to support all students in their learning progression. The suggested assignments are a starting point. Continue to assign additional exercises and revisit with spaced practice to move every student toward proficiency.

Level	Assignment	Concept Check
Emerging	1–9 odd, 10, 13–17	5, 7, 9, 10, 13
Proficient	1–17	

Prior Skills

- **Exercises 15–17:** Grade 5, Using Partial Quotients

Cross-Curricular Connections

Physical Education

- Write division expressions involving decimals being divided by one-digit numbers on a beach ball. Have students pass the ball back and forth and wherever their left hand lands is the expression they have to solve. Students will write their expressions, solve, and show their work on a sheet of paper.

Learning Target: Divide decimals by one-digit whole numbers.

Example Find 46.53 ÷ 9.   Estimate 45 ÷ 9 = 5

4 tens cannot be shared among 9 groups without regrouping.
So, regroup 4 tens as 40 ones and combine with 6 ones.

Divide the ones.	Divide the tenths.	Divide the hundredths.

Divide the ones.
```
      5
9)46.53
 − 45
      1
```

Divide the tenths.
```
     5.1
9)46.53
 − 45
     1 5
 −   0 9
       6
```

Divide the hundredths.
```
     5.17
9)46.53
 − 45
     1 5
 −   0 9
       6 3
     − 6 3
         0
```

So, 46.53 ÷ 9 = 5.17 .   Reasonable? 5.17 is close to 5 . ✓

Find the quotient. Then check your answer.

1.   **3.2**
```
3)9.6
```

2.   **1.26**
```
6)7.56
```

3.   **5.3**
```
8)42.4
```

4. 63.6 ÷ 4 = _____

15.9

5. 15.68 ÷ 7 = _____

2.24

6. 143.82 ÷ 9 = _____

15.98

Connect and Extend Learning

Extend Student Learning

Visual-Spatial

- Have students solve the problem, "5 people ate at a restaurant. Their bill came to $57.15. They each spent an equal amount of money. How much money did each person spend?" Students should solve the problem and create a menu with items that the people could have eaten.

Lesson Resources	
Surface Level	**Deep Level**
Resources by Chapter • Extra Practice • Reteach • Chapter Self-Assessment Differentiating the Lesson Tutorial Videos Skills Review Handbook Skills Trainer	Resources by Chapter • Enrichment and Extension • Chapter Self-Assessment Graphic Organizers Dynamic Assessment System • Lesson Practice

Find the value of *y*.

7. $y \div 6 = 7.8$

$y = 46.8$

8. $14.9 \div 5 = y$

$y = 2.98$

9. $y \div 2 = 4.7$

$y = 9.4$

---

10. **MP** **Maintain Accuracy** Evaluate the expression.

$(213.3 - 95.7) \div 8$

14.7

11. **Writing** Write and solve a real-life problem that involves dividing a decimal by a whole number.

Check students' work.

---

12. **MP** **YOU BE THE TEACHER** Your friend finds $197.2 \div 4$. Is your friend correct? Explain.

$$\begin{array}{r} 4.93 \\ 4\overline{)197.2} \\ -16 \\ \hline 37 \\ -36 \\ \hline 1\,2 \\ -1\,2 \\ \hline 0 \end{array}$$

no; Your friend placed the decimal point incorrectly.

13. **MP** **Modeling Real Life** You buy 2 packages of ground beef. One package contains 4.5 pounds and the other contains 2.25 pounds. You put equal amounts of meat into 9 freezer bags. How many pounds of meat are in each bag?

0.75 pound

---

14. **DIG DEEPER!** A homeowner hangs wallpaper on the walls of her bathroom. What is the width of the bathroom?

1.52 meters

w m   Perimeter: 8.52 meters

2.74 m
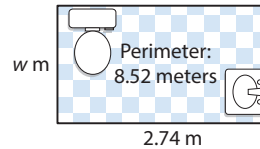
Review & Refresh

Use partial quotients to divide.

15. $607 \div 15 =$ _____

40 R7

16. $4{,}591 \div 33 =$ _____

139 R4

17. $6{,}699 \div 87 =$ _____

77

322

Learning Target

Divide decimals by
two-digit whole numbers.

Success Criteria

- Use place value
  to divide.
- Place the decimal point
  in the quotient.
- Regroup when
  necessary.
- Use estimation to
  divide.

Warm-Up

Practice opportunities
for the following
are available in the
Resources by Chapter or
at *BigIdeasMath.com.*

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

Point out that the areas
of the red and green
rectangles are similar
and that the main
difference is the
placement of the
decimal point. Ask
students to predict how
the width of each
rectangle will differ, then
have them check their
predictions after they
complete the Explore
and Grow.

Laurie's Notes

STATE STANDARDS
5.NBT.B.7

Preparing to Teach

This lesson is the same as the previous but now we are dividing
decimals by two-digit numbers. Not all students have recognized
how decimal division is like whole number division. You want
students to estimate to help them think about how reasonable
their answer is, and draw decimal grid models when the dividends
are reasonable. Alternately, base ten blocks can be used to model
many problems.

Materials

- whiteboards and markers

Dig In (Motivate Time)

- Students use place value, and calculators if needed, to find
  quotients in related division problems.
- ⊙ "In the previous lesson, you saw how dividing decimals by
  whole numbers was very similar to dividing whole numbers.
  You used place value to know where to place the first digit in
  the quotient. Place values in the quotients are aligned with
  place values in the dividend."
- Display the group of three expressions
  and three numbers. "Talk with your
  partner to decide which quotient matches
  each expression. Be prepared to explain
  how you know you are correct."

Match	
1) 15.6 ÷ 12	A. 13
2) 156 ÷ 12	B. 1.3
3) 1.56 ÷ 12	C. 0.13

- ❓ **MP2 Reason Abstractly and
  Quantitatively:** Ask volunteers to explain how they matched a
  quotient to each expression. Explanations should demonstrate
  an understanding of place value.
  - *I knew 156 ÷ 12 > 12 because 12 × 12 = 144.*
  - *1.56 < 12 so the quotient is less than 1; 1.56 ÷ 12 = 0.13.*
  - *I wrote the problems in order like the last lesson and matched
    them that way.*
  - *There are at least 10 groups of 12 in 156 and 13 was the only
    quotient greater than 10.*
- Repeat with another set of three
  problems and three quotients if you feel
  students need to hear more language
  and reasoning about place value. Write
  the problems as shown.

Match	
1) 36⟌8.64	A. 24
2) 36⟌864	B. 0.24
3) 36⟌86.4	C. 2.4

- ⊙ "Are you more confident in thinking
  about how place value helps you find a quotient? We are still
  dividing by whole numbers, and today they will be two-digit
  whole numbers."

❓ Teaching Prompt   ⊙ Learning Target

Divide Decimals by Two-Digit Numbers **7.5**

Learning Target: Divide decimals by two-digit whole numbers.

Success Criteria:
- I can use place value to divide.
- I can place the decimal point in the quotient.
- I can regroup when necessary.
- I can use estimation to divide.

Explore and Grow

Write a division problem you can use to find the width of each rectangle. Then find the width of each rectangle.

11 inches

Area = 253 square inches

11 meters

Area = 25.3 square meters

width = 253 ÷ 11
width = 23 inches

width = 25.3 ÷ 11
width = 2.3 meters

MP **Check Your Work** Explain how you can use estimation to check your answers.
Divide 250 by 10 and 25 by 10.

Explore and Grow

- The Explore and Grow is similar to the Dig In in terms of related division problems. The context is a natural example that relates the operations of multiplication and division.
- **Model:** Use your hands to show what a square inch looks like, and then a square meter. This is an opportunity to make a connection to measurement concepts.
- **?** **MP2 Reason Abstractly and Quantitatively:** "How did the first problem help you find the quotient in the second problem?" Some students may carry out the division, while others use place value to find the quotient of 25.3 ÷ 11.

Think and Grow

Getting Started

- The Dig In and the Explore and Grow have helped students see that you divide decimals by whole numbers using the same procedure as dividing whole numbers. You need to know where the decimal point is located in the quotient, and place value understanding and estimates are used.

Teaching Notes

? Students estimate the quotient first. "Tell you partner how you estimate $79.8 \div 14$. Why is a reasonable estimate less than 10? Why is a reasonable estimate greater than 2?"

? "What related whole number division problem will help us solve this problem?" $798 \div 14$ Some students will find it helpful to work on this problem to the side.

? **Model:** "To find $79.8 \div 14$ what should we be thinking to get started?" We are dividing by a two-digit number. The first two place values in the quotient are 79 ones. "79 ones divided by 14 is how many ones?" Remember to align the same place values in the dividend and quotient. "So we write 5 ones in the quotient. Now we know where the decimal point is placed." Work through the first step.

? In the next step, the 9 ones is regrouped as 90 tenths, and combined with the 8 tenths equals 98 tenths. "98 tenths divided by 14 is how many tenths?" 7

? "How would we know if 7 was too big?" The product would be greater than 98. "How would we know if 7 was too small?" The remainder would be greater than 14.

- **Model:** In the second example, explain that we are going to divide as we do with whole numbers. An estimate is used to make sense of where to place the decimal point in the quotient. Discuss with students why this is okay. "We know the dividend is less than the divisor, so the quotient is less than 1. The related whole number problem is $2,054 \div 26$."

- Have students work with a partner to solve the three exercises. Be sure they estimate the quotient before beginning division. Circulate and observe how students are finding each partial quotient. Can they explain aloud their thinking?

- **Supporting Learners:** Provide large grid paper to help students keep their place values aligned.

⊙ "How are you doing with your learning today? If you are stuck or confused, what will help you with your learning?"

Think and Grow: Divide Decimals by Two-Digit Numbers

Example Find 79.8 ÷ 14. Estimate **5**

Regroup 7 tens as 70 ones and combine with 9 ones.

Divide the ones.

$$\begin{array}{r} 5 \\ 14\overline{)79.8} \\ -\ 70 \\ \hline 9 \end{array}$$

79 ones ÷ 14
5 ones × 14
79 ones − 70 ones
There are 9 ones left over.

Divide the tenths.

$$\begin{array}{r} 5.7 \\ 14\overline{)79.8} \\ -\ 70 \\ \hline 98 \\ -\ 98 \\ \hline 0 \end{array}$$

Place the decimal point.
Regroup 9 ones as 90 tenths
and combine with 8 tenths.
98 tenths ÷ 14
7 tenths × 14
98 tenths − 98 tenths
There are 0 tenths left over.

So, 79.8 ÷ 14 = **5.7**.

Reasonable? **5.7** is close to **5**. ✓

Example Find 20.54 ÷ 26.

Step 1: Estimate the quotient.

2,000 hundredths ÷ 25 = **80** hundredths

Step 2: Divide as you do with whole numbers.

Step 3: Use the estimate to place the decimal point.

$$\begin{array}{r} 0.79 \\ 26\overline{)20.54} \\ -\ 182 \\ \hline 234 \\ -\ 234 \\ \hline 0 \end{array}$$

So, 20.54 ÷ 26 = **0.79**.

Show and Grow I can do it!

Find the quotient. Then check your answer.

1. **4.3**
$12\overline{)51.6}$

2. **8.25**
$17\overline{)140.25}$

3. **0.53**
$61\overline{)32.33}$

324

Scaffold instruction to support all students in their learning. Learning is individualized and you may want to group students differently as they move in and out of these levels with each skill and concept. Student self-assessment and feedback help guide your instructional decisions about how and when to layer support for all students to become proficient learners.

Meeting the needs of all learners.

Apply and Grow: Practice

SCAFFOLDING INSTRUCTION

Students are transitioning from using models and estimation in dividing decimal and whole numbers to dividing them through place value and an algorithmic approach based on place value. Students will continue to practice division, and should recognize the pattern of where the decimal is placed in the quotient. It is very important that students make sense of the place values and how it impacts the quotient rather than memorizing a rule for the placement of the decimal.

EMERGING students are not confident in dividing a decimal and whole number without a model. The dividends in these exercises are too large to warrant the use of a model, so reinforcing place value in each step will be the best method of support.

- **Exercises 4–6:** Students make a mental estimate of the quotient, and place the decimal point as appropriate. If students have difficulty with this, go back to the Dig In exercises and repeat another sequence.
- **Exercises 7–12:** Students will practice division of decimals by two-digit whole numbers. Go back to a decimal divided by a one-digit number to reinforce the process if students are having great difficulty. Students check their answers by multiplying.
- **Exercises 13–15:** Students will solve for a missing dividend as well as a quotient.
- **Exercises 16 and 17:** Students are able to develop number sense through these questions.

PROFICIENT students are able to efficiently divide decimal and two-digit whole numbers. They can explain their reasoning.

- **Exercises 4–6, and 16:** Can students reason about the placement of the decimal and explain their thinking in terms of place value?
- **Exercises 7–12:** Be sure students are checking their work with multiplication.

Additional Support

- Bring a small group of students together to review division. Begin with whole numbers, then a decimal divided by a single digit, and build up to problems like Exercises 7–12.

Extension: Adding Rigor

- Students should estimate their quotients using a strategy such as compatible numbers or rounding to check their answers for reasonableness.

Apply and Grow: Practice

Place a decimal point where it belongs in the quotient.

4. $251.75 \div 19 = 1\ 3.2\ 5$ | **5.** $88.04 \div 62 = 1.4\ 2$ | **6.** $3.22 \div 23 = 0.1\ 4$

Find the quotient. Then check your answer.

7. $54\overline{)97.2}$ **1.8**

8. $91\overline{)200.2}$ **2.2**

9. $2\overline{)56.2}$ **28.1**

10. $6.08 \div 16 =$ _____

0.38

11. $7.45 \div 5 =$ _____

1.49

12. $147.63 \div 37 =$ _____

3.99

Find the value of y.

13. $y \div 44 = 1.82$

$y = 80.08$

14. $106.6 \div 82 = y$

$y = 1.3$

15. $y \div 13 = 2.6$

$y = 33.8$

16. **MP Logic** Newton and Descartes find $44.82 \div 18$. Only one of them is correct. Without solving, who is correct? Explain.

Descartes; There should be 2 decimal places in the quotient, because the dividend has 2 decimal places.

$44.82 \div 18 = 24.9$

$44.82 \div 18 = 2.49$

17. **DIG DEEPER!** Find a decimal that you can divide by a two-digit whole number to get the quotient shown. Fill in the boxes with your dividend and divisor. *Sample answer:*

$12\overline{)7.2}$ 0.6

Laurie's Notes

Think and Grow: Modeling Real Life

These applications allow students to apply their knowledge of dividing a decimal and a two-digit whole number to solve a multi-step problem.

- **?** **Preview:** "Have any of you ever seen a paddleboard before?" Let students share what they know about water sports, or if they have had any paddleboarding, surfing, or other experiences.
- **?** "Read the problem. What are you trying to find?" Give students time to discuss the problem with a partner before working through the problem as a class.
- "Share with your partner a plan for finding the number of miles you paddleboard each day."
- **Turn and Talk:** "Estimate an answer for this problem." a little more than 1
- **?** Observe students as they complete the remaining problems with a partner. "Remember to read the problems carefully. What do you know? What do you need to find out?" All the problems have multiple steps.
- **Extension:** "Choose a division problem from Exercises 4–12. Write a story that the equation would solve."
- ◉ "Today you used two strategies to multiply a decimal and a whole number. Tell your partner two different ways to multiply a decimal and a whole number. Which do you prefer to use and why?" Have several students share their favorite strategy.
- ◉ "There is a pattern in where the decimal point is located in the product. If you think you know the pattern, whisper it to your partner." Have students share patterns they have seen.
- **Supporting Learners:** Color code place values for students to aid in the long division process.

Closure

- Have students sit with a partner with one whiteboard and one marker to share. Write the following problem: 64.8 ÷ 18.
- Students take turns writing a step in the division until the problem is completed. Repeat with a second problem having students alternate who begins.

Think and Grow: Modeling Real Life

Example You practice paddleboarding for 3 weeks. You paddle the same amount each day for 5 days each week. You paddle 22.5 miles altogether. How many miles do you paddle each day?

To find the total number of days you paddle in 3 weeks, multiply the days you paddle each week by 3.

$5 \times 3 = 15$ So, you paddleboard __15__ days in 3 weeks.

To find the number of miles you paddle each day, divide the total number of miles by the number of days you paddle in 3 weeks.

```
        1.5
  15)22.5        22 ones ÷ 15
    - 15
       75        75 tenths ÷ 15
     - 75
        0
```

You paddle __1.5__ miles each day.

Show and Grow   *I can think deeper!*

18. Descartes borrows $6,314.76 for an all-terrain vehicle. He pays back the money in equal amounts each month for 3 years. What is his monthly payment?

$175.41

19. A blue car travels 297.6 miles using 12 gallons of gasoline and a red car travels 358.8 miles using 13 gallons of gasoline. Which car travels farther using 1 gallon of gasoline? How much farther?

**red car;
2.8 miles**

20. **DIG DEEPER!** The rectangular dog park has an area of 2,616.25 square feet. How much fencing does an employee need to enclose the dog park?

226 feet

80.5 ft
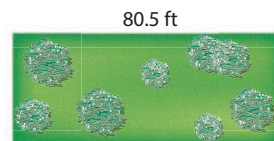
Connect and Extend Learning

Homework & Practice Notes

- **Exercise 16**: Remind students how to find the area and perimeter of a rectangle.

Assignment Guide and Concept Check

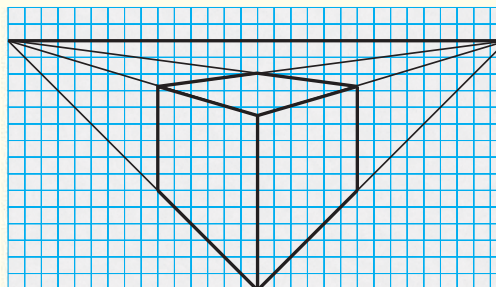| Level	Assignment	Concept Check
Emerging	1–15 odd, 16–19	3, 9, 11, 13, 15
Proficient	1–19	

Prior Skills

- **Exercises 17–19:** Grade 5, Multiplying Decimals

Cross-Curricular Connections

Art

- Research how to teach two-point perspective in art. Provide students with graph paper. Have students define the horizon line ("line of sight" of the viewer) and the vanishing points on paper. Have students draw the corner of the object in between the vanishing points and then lines from each end of the corner to each of the vanishing points. Students will then draw parallel, vertical lines to show where the object ends. Students can erase the lines they no longer need to show the 3D form. Then, have students find the perimeter of the graph paper given the area is 93.5 square inches and one side of the paper is 11 inches. Students will record their work on a separate sheet of paper.

Scaffold assignments to support all students in their learning progression. The suggested assignments are a starting point. Continue to assign additional exercises and revisit with spaced practice to move every student toward proficiency.

Name _____

Learning Target: Divide decimals by two-digit whole numbers.

Example Find 8.52 ÷ 12.

Step 1: Estimate the quotient.

850 hundredths ÷ 10 = __85__ hundredths

Step 2: Divide as you do with whole numbers.

Step 3: Use the estimate to place the decimal point.

$$
\begin{array}{r}
\boxed{71} \\
12\overline{)8.52} \\
-\boxed{84} \\
\hline
12 \\
-\boxed{12} \\
\hline
0
\end{array}
$$

So, 8.52 ÷ 12 = __0.71__ .

Place a decimal point where it belongs in the quotient.

1. 127.2 ÷ 24 = 5.3

2. 48.64 ÷ 32 = 1.52

3. 514.18 ÷ 47 = 10.94

Find the quotient. Then check your answer.

4.
$$
\begin{array}{r}
\mathbf{1.3} \\
72\overline{)93.6}
\end{array}
$$

5.
$$
\begin{array}{r}
\mathbf{0.56} \\
7\overline{)3.92}
\end{array}
$$

6.
$$
\begin{array}{r}
\mathbf{0.06} \\
29\overline{)1.74}
\end{array}
$$

7. 24.3 ÷ 9 = _____

2.7

8. 244.9 ÷ 31 = _____

7.9

9. 55.62 ÷ 27 = _____

2.06

Chapter 7 | Lesson 5

Connect and Extend Learning

Extend Student Learning

Bodily-Kinesthetic

- Place students into groups of five. Place 1 copy of the Divide Decimals Relay Race Instructional Resource on the opposite side of the room for each group. Have students in each group take turns running from one end of the room to the other where they will solve one exercise. They will then run back to tag a member from their group to repeat the process. They will continue to do this until all exercises on the sheet of paper are solved. The first group to solve all exercises on the paper and make it back to where they started wins.

Lesson Resources	
Surface Level	**Deep Level**
Resources by Chapter • Extra Practice • Reteach • Chapter Self-Assessment Differentiating the Lesson Tutorial Videos Skills Review Handbook Skills Trainer	Resources by Chapter • Enrichment and Extension • Chapter Self-Assessment Graphic Organizers Dynamic Assessment System • Lesson Practice

Find the value of y.

10. $y \div 16 = 0.23$

$y = 3.68$

11. $44.1 \div 21 = y$

$y = 2.1$

12. $y \div 28 = 11.04$

$y = 309.12$

13. **YOU BE THE TEACHER** Your friend finds $21.44 \div 16$. Is your friend correct? Explain.

$$
\begin{array}{r}
13.4 \\
16\overline{)21.44} \\
-16 \\
\hline
54 \\
-48 \\
\hline
64 \\
-64 \\
\hline
0
\end{array}
$$

no; Your friend put the decimal in the wrong place.

14. **DIG DEEPER!** A banker divides the amount shown among 12 people. How can she regroup the money? How much money does each person get? **$0.23**

Change $2.50 to 25 dimes. Then change 3 dimes to 30 pennies and the nickel to 5 pennies.

15. **Modeling Real Life** You have hip-hop dance practice for 5 weeks. You attend practice 5 days each week. Each practice is the same length of time. You practice for 37.5 hours altogether. How many hours do you practice each day?

1.5 hours

16. **DIG DEEPER!** Your rectangular classroom rug has an area of 110.5 square feet. What is the perimeter of the rug?

43 feet

├─────── 13 ft ───────┤
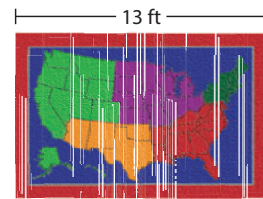
Review & Refresh

Find the product.

17. $0.52 \times 0.4 =$ _____

0.208

18. $0.7 \times 21.3 =$ _____

14.91

19. $1.52 \times 8.6 =$ _____

13.072

Learning Target
Use models to divide decimals by decimals.

Success Criteria
- Use a model to represent a decimal.
- Divide a model to show equal groups.
- Use a model to divide a decimal by a decimal.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com*.

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

Verify that students understand how the models represent the numbers. Point out that the black lines divide the model into three parts. Ask, "What portion would represent 2? How would you represent 0.4?"

Laurie's Notes

STATE STANDARDS
5.NBT.B.7

Preparing to Teach

A significant step in the learning progression of decimal division occurs today. All of the previous problems have involved dividing by a whole number. If a model was drawn, the divisor represented the number of groups. The divisor is now a decimal so we change our interpretation and say it is the size of the group. The quotient is the number of groups.

We still want students to think about the relationship between the dividend and divisor (greater than, less than), estimate a quotient, and recognize that how we divide will still look like whole number division. The placement of the decimal point in the quotient is learning that will be formalized in the next lesson.

Materials
- grid paper

Dig In (Motivate Time)

Students are shown a grid model and asked to identify the problem it represents.
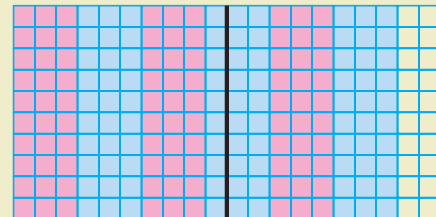
- Display the model shown. "Tell your partner what decimal problem you think this represents. If you can think of more than one, write all possibilities."

$0.3 \times 6 = 1.8$ $6 \times 0.3 = 1.8$

$1.8 \div 6 = 0.3$ $1.8 \div 0.3 = 6$

$0.3 + 0.3 + 0.3 +$
$0.3 + 0.3 + 0.3 = 1.8$

- **? MP3 Construct Viable Arguments:** Ask volunteers to explain why the model represents each equation. You should hear reference to place value names. When a volunteer discusses the division model for $1.8 \div 6$, listen for *1.8 divided into 6 equal groups and each group has a size of 0.3*. "The quotient represents what?" the size of the group

- **?** "I'm curious about the $1.8 \div 0.3$. What does the quotient represent in this problem?" The number of groups. There are six groups of 0.3 in 1.8.

- **?** "We are going to model decimals divided by decimals today. What are you curious about? What do you wonder?" Give discussion time.

- ⊙ "We are going to draw models on decimal grid paper to help us make sense of dividing decimals. What does the large 10-by-10 grid represent?" 1 whole "How do you represent one tenth? one hundredth?"
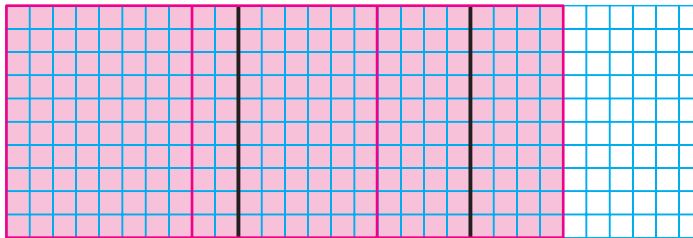
? Teaching Prompt   ⊙ Learning Target

Use Models to Divide Decimals 7.6

Learning Target: Use models to divide decimals by decimals.

Success Criteria:
- I can use a model to represent a decimal.
- I can divide a model to show equal groups.
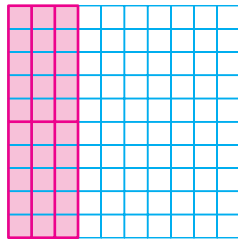- I can use a model to divide a decimal by a decimal.

Explore and Grow

Use the model to find each quotient.

$2.4 \div 0.8$ **= 3**

$0.3 \div 0.05$ **= 6**

MP **Structure** When using a model to divide decimals, how do you determine the number of rows and columns to shade? How do you divide the shaded region?

The dividend decides the number of rows and columns to shade. The divisor divides the shaded region.

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Explore and Grow

- **Model:** The Dig In has prepared students to think about the first problem. As you circulate ask what the divisor means (0.8 is the size of the group) and what the quotient means (3 is the number of groups).
- **MP1 Persevere in Solving Problems:** Do not model the second problem for them. It is a productive struggle for students to think about what the divisor and quotient represent when dividing decimals. *How many groups of size 0.05 are there in 0.3?*
- **Supporting Learners:** Say and write place value language: 3 tenths is equivalent to 30 hundredths; 30 hundredths ÷ 5 hundredths = 6.
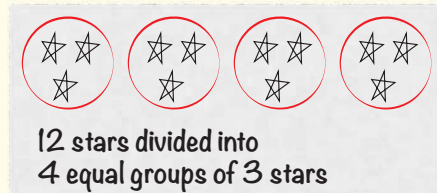
Laurie's Notes

Think and Grow

Getting Started

- **Big Idea:** To model decimal division on a decimal grid we need to remember that the grid represents 1.

- **MP6 Attend to Precision:** When you model and say *12 tenths divided by 3 tenths is 4* students may ask why the quotient isn't 4 tenths. Isn't tenths divided by tenths equal to tenths? They are recalling that the units were alike in addition and subtraction of decimals. Draw a contextual model to remind them of what division means.

$$1.2 \div 0.3 = 4$$

amount we have   size of equal groups   number of groups

12 stars divided into 4 equal groups of 3 stars

Teaching Notes

- **Model:** "We want to model $1.2 \div 0.3$. Notice that the grid is divided into tenths and not hundredths. This will make it easier to show 12 tenths divided by 3 tenths."

- ❓ "How do you represent 1.2?" shade 12 columns "Now we want to divide this quantity into equal groups of 0.3. We can circle groups of 3 tenths or just draw dotted lines to make the groups obvious. There are 4 groups of 0.3 so $1.2 \div 0.3 = 4$."

- **Supporting Learners:** If you have been using base ten blocks at all in this chapter you could use 1 flat and 2 rods and show the flat is exchanged for 10 rods. You can now show four groups of 3 rods.

- ❓ **Model:** "Now we want to model $0.7 \div 0.14$. Since the divisor is hundredths, the grid provided is hundredths." Shade 7 tenths. "What is an equivalent name for 0.7?" 0.70 "The division question is asking how many groups of 14 hundredths are there in 70 hundredths." Finish the problem with student assistance.

- **Big Idea:** Make a point of mentioning that the dividend and divisor have the same place value in both problems.

- **Extension:** "Would estimation help us in either problem?" Many students will note that it's hard to estimate when the numbers are so close to 1 or less than one.

- **MP2 Reason Abstractly and Quantitatively:** "In each problem the dividend was greater than the divisor. What does that tell you?" The quotient will be greater than 1.

- The exercises are similar to the examples. Have students interpret their models. Are they making any connection to whole number division?

- ◉ Point to each success criteria and ask students to identify where in the lesson they demonstrated each criterion successfully.
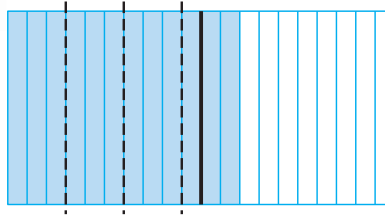
Think and Grow: Use Models to Divide Decimals

Example Use a model to find 1.2 ÷ 0.3.

Shade 12 columns to represent 1.2.

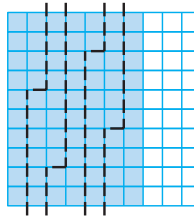Divide the model to show groups of 0.3.

There are ___**4**___ groups of ___**3**___ tenths.

So, 1.2 ÷ 0.3 = ___**4**___.

Example Use a model to find 0.7 ÷ 0.14.

Shade 7 columns to represent 0.7.

Divide the model to show groups of 0.14.

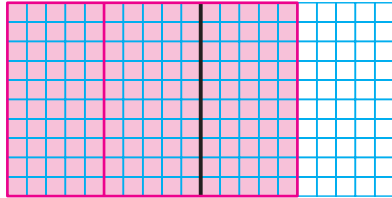There are ___**5**___ groups of ___**14**___ hundredths.

So, 0.7 ÷ 0.14 = ___**5**___.

Remember, 0.7 is equivalent to 0.70.

Show and Grow *I can do it!*

Use the model to find the quotient.

1. 1.5 ÷ 0.5 = ___**3**___

2. 1.72 ÷ 0.86 = ___**2**___
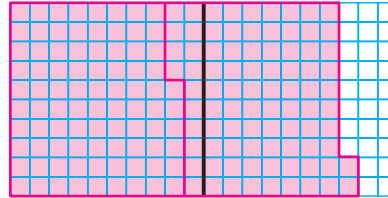
Meeting the needs of all learners.

Laurie's Notes

Apply and Grow: Practice

SCAFFOLDING INSTRUCTION

Students are asked to use an area model to find the quotient of two decimals. They should shade the dividend first, and then partition the dividend into segments equal to the divisor. The quotient is the number of groups partitioned.

EMERGING students may be able to sketch the dividend in the model, but be confused when partitioning. Students may have difficulty recognizing the place values when thinking about the best way to partition.

- **Exercises 3–6:** Students continue to shade the model to show the division. Watch as students shade and partition.
- **Exercise 7:** Students can do this exercise mentally by reasoning about the money. Provide grid paper for students to model the decimal division to confirm what they already know.
- **Exercises 8 and 9:** These exercises have students make sense of place value when dividing decimals with a model. If students are having difficulty with Exercise 9, remind them that they have 72 hundredths put into eight groups.

PROFICIENT students are able to sketch the area and partition correctly to find a quotient.

- **Exercise 7:** Can students sketch their own model to solve? Can they make sense of the division with the model and explain it in terms of the context? They will most likely already know the answer from having money sense.
- **Exercises 8 and 9:** Have students share their reasoning and show their models under a document camera.
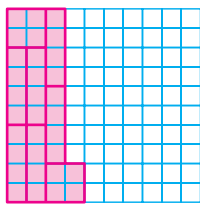
Additional Support

- Give students a marker or dark pen to outline the partitions for clarity.
- Provide students with strategies to determine the value within each partition in the quotient.
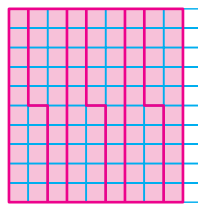- Give students a multiplication table as needed.

Name _____

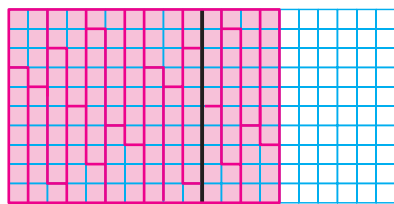## Apply and Grow: Practice

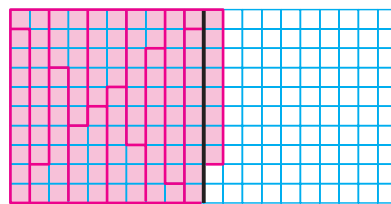Use the model to find the quotient.

3. $0.32 \div 0.04 = \underline{\textbf{8}}$

4. $0.9 \div 0.15 = \underline{\textbf{6}}$

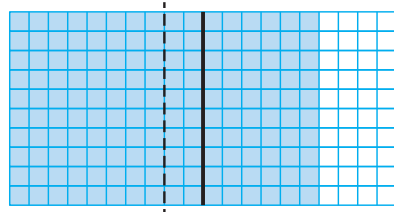**5.** $1.4 \div 0.07 = \underline{\textbf{20}}$

6. $1.08 \div 0.09 = \underline{\textbf{12}}$

7. You have $1.50 in dimes. You exchange all of your dimes for quarters. How many quarters do you get?

6 quarters

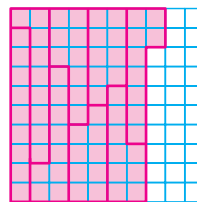**8.** **MP YOU BE THE TEACHER** Your friend uses the model below and says $1.6 \div 0.08 = 2$. Is your friend correct? Explain.
no; The divisor is 0.08 not 0.8.

9. **MP Use Math Tools** Use the model to find the missing number.

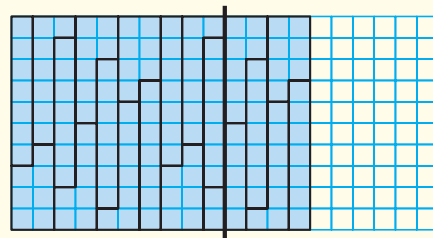$0.72 \div \underline{\textbf{0.09}} = 8$

Think and Grow: Modeling Real Life

These application exercises allow students to apply their understanding of division with an area model to solve a multi-step problem.

- Explain *density* to students. Density is a measure of how compact the matter in an object is. An object that has a greater mass but takes up less space will have a higher density than an object that has a lesser mass but takes up more space. If an object is less dense than the liquid it is put in, it will float.
- Give students time to read and discuss the example with a partner before working through the problem as a class. Students may think about multiplying 0.9 (neon) by 5 and compare to aluminum's density. This will work, but can be confusing as to what the comparison means. Ultimately, it does not reinforce the division concept but does show the inverse relationship.
- **?** "What plan can we use to find how much more dense aluminum is than neon?"
- Ask students to estimate how much more dense aluminum is than neon. "Share with your partner if you think aluminum is more than 5 times as dense as neon."
- Work through the example with students.
- Exercise 10 is the same format as the example, and uses the same table for information.
- **Extension:** "What other questions can you ask and answer from the density table that are like the example and Exercise 10? Trade with a partner and compare your answers."
- Exercises 11 and 12 are both multi-step problems.
- Observe students as they complete the remaining exercises with a partner. They will most likely need grid paper to sketch their models. They should be able to perform any necessary calculations in the space provided.
- ⊙ "Today you used an area model to divide two decimals. What was easy for you? What was a challenge for you? Tell your partner how to use a grid to model decimal division. Be sure to share how you knew how to partition the dividend."
- **Supporting Learners:** Provide grid paper and multiple colored pencils for students to solve the problems on this page.

Closure

- Today's closure is patterned after the Dig In. Show the model and have students work with a partner to list as many different equations it models, such as $0.07 \times 20 = 1.4$.

Think and Grow: Modeling Real Life

> Density is a measure that compares the mass of an object to the amount of space it occupies.

Example Is aluminum more than 5 times as dense as neon?

Divide the density of aluminum by the density of neon to find how many times as dense it is.

Use a model. Shade 27 columns to represent 2.7.

Chemical Elements	
Name	**Density (kg/m³)**
Hydrogen	0.09
Neon	0.9
Oxygen	1.43
Aluminum	2.7

Divide the model to show groups of 0.9.

There are __3__ groups

of __9__ tenths.

So, $2.7 \div 0.9 =$ __3__ .

Compare the quotient to 5.　__3__ $\bigcirc<$ 5

So, aluminum __is not__ more than 5 times as dense as neon.

Show and Grow　_I can think deeper!_

10. Use the table above. Is neon more than 9 times as dense as hydrogen? Explain.

yes; 9 × 0.09 = 0.81, and 0.81 < 0.9

11. You fill a bag with peanuts, give the cashier $5, and receive $3.16 in change. How many pounds of peanuts do you buy?

> Peanuts
> $0.23
> per pound

8 pounds

12. **DIG DEEPER!** You have 2.88 meters of copper wire and 5.85 meters of aluminum wire. You need 0.24 meter of copper wire to make one bracelet and 0.65 meter of aluminum wire to make one necklace. Can you make more bracelets or more necklaces? Explain.

bracelets; 12 bracelets > 9 necklaces

Connect and Extend Learning

Homework & Practice Notes

- Provide students with base ten blocks and grid paper for additional support.
- Remind students that the dividend is the number of columns you shade and the divisor is shown by breaking apart the groups in the model.

Assignment Guide and Concept Check

Scaffold assignments to support all students in their learning progression. The suggested assignments are a starting point. Continue to assign additional exercises and revisit with spaced practice to move every student toward proficiency.

Level	Assignment	Concept Check
Emerging	1–9 odd, 10, 11	3, 5, 7, 9
Proficient	1–11	

Prior Skills

- **Exercises 10 and 11:** Grade 5, Using Number Properties

Cross-Curricular Connections

Science

- Have a discussion with students about density. The density of an object is the mass divided by the volume. Provide students rectangular prisms made of different materials (wood blocks, metal or glass paperweights, polystyrene packing blocks, etc.). Have them use a scale and metric weights to determine the mass. Then have them use a ruler to measure the dimensions and find the volume. Students divide the mass by the volume to find the density.
  Note: If students measure to the hundredths place, they can round or use compatible numbers to find either the volumes or the densities.
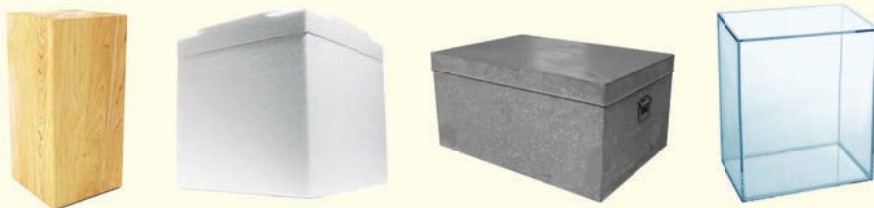
Learning Target: Use models to divide decimals by decimals.

Example Use a model to find $1.8 \div 0.06$.

Shade 18 columns to represent 1.8.

Divide the model to show groups of 0.06.

There are __30__ groups

of __6__ hundredths.

So, $1.8 \div 0.06 = $ __30__ .

Use the model to find the quotient.
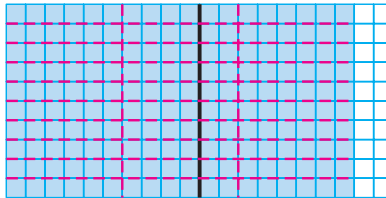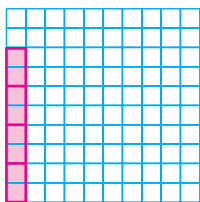
1. $0.08 \div 0.02 = $ __4__

2. $0.4 \div 0.05 = $ __8__

3. $1.7 \div 0.85 = $ __2__

4. $1.5 \div 0.3 = $ __5__

Chapter 7 | Lesson 6
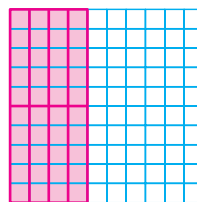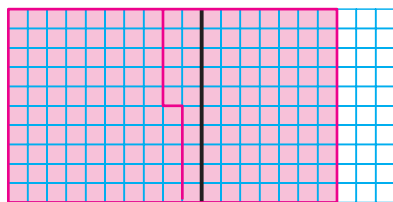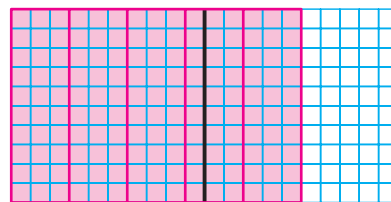
Connect and Extend Learning

Extend Student Learning
Visual-Spatial

- Provide students with grid paper and have them list and describe the steps they should take when dividing decimals by decimals. Provide students with a division expression (for example, $1.7 \div 0.85$) for students to use when describing their models. On the back of their model, have students compare how using models to divide decimals is similar to or different than using models to divide whole numbers.
  Note: Allow time for students to describe their steps to a partner to ensure correctness.

Lesson Resources	
Surface Level	**Deep Level**

Resources by Chapter
  • Extra Practice
  • Reteach
  • Chapter Self-Assessment
Differentiating the Lesson
Tutorial Videos
Skills Review Handbook
Skills Trainer
	Resources by Chapter
	  • Enrichment and Extension
	  • Chapter Self-Assessment
	Graphic Organizers
	Dynamic Assessment System
	  • Lesson Practice

5. You have a piece of scrapbook paper that is 1.5 feet long. You cut it into pieces that are each 0.5 foot long. How many pieces of scrap book paper do you have now?

3 pieces

---

6. 🔴 YOU BE THE TEACHER Your friend uses the model below and says $0.12 \div 0.04 = 0.03$. Is your friend correct? Explain.

no; There are 3 groups of 0.04 in 0.12.

7. Writing Write a real-life problem that involves dividing a decimal by another decimal.

Check students' work.

8. 〽️ **Modeling Real Life** Does the watercolor paint cost more than 3 times as much as the paintbrush? Explain.
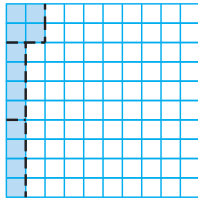
Value Store Items	
Item	**Price**
Coloring book	$1.38
Pack of crayons	$0.49
Watercolor paint	$2.96
Paintbrush	$0.74

yes; $2.96 divided by $0.74 is 4.

9. DIG DEEPER! You have 3.75 cups of popcorn kernels. You fill a machine with 0.25 cup of kernels 3 times each hour. How many hours pass before you run out of kernels? Explain.

5 hours; You use 0.25 × 3 = 0.75 cup each hour, and 0.75 × 5 = 3.75 cups in 5 hours

---

Review & Refresh

Complete the equation. Identify the property shown.

10. $3 \times 14 = 14 \times$ __**3**__
Commutative Property of Multiplication

11. $8 \times (3 + 10) = (8 \times 3) + (8 \times$ __**10**__$)$
Distributive Property of Multiplication

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Chapter 7 | Lesson 6   **334**

Learning Target

Divide decimals by decimals.

Success Criteria

- Multiply a divisor and a dividend by a power of 10 to make the divisor a whole number.
- Place the decimal point in a quotient.
- Divide a decimal by a decimal.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com*.

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

Point out the success criterion that states that a divisor and dividend can be multiplied by a power of 10 to make a whole number divisor. Ask them to predict how this is possible. After the lesson, have them check what they have learned against their prediction.

Laurie's Notes

Preparing to Teach

Students divided decimals by whole numbers and learned it was just like dividing whole numbers, and the decimal point in the quotient is placed above the decimal point in the dividend. This means that like place values are aligned. In the previous lesson, they modeled decimal division and learned that when the dividend and divisor had the same place value name (tenths, hundredths), they find the quotient. Today we generalize division of decimals. The goal is for students to understand why it is helpful to rewrite equivalent values for the dividend and divisor. To accomplish this, they multiply by powers of 10.

Materials

- whiteboards and markers
- calculators

Dig In (Motivate Time)

Students use calculators to explore patterns in decimal division.

- ⊙ "In this chapter, you learned to divide decimals and whole numbers, or two decimals. You used different models and strategies. Today you are going to learn a strategy that will help you know where to place the decimal point in the quotient."
- Distribute calculators and whiteboards. Display the chart.

A	B	C	D	E
$4.2 \div 7$	$42 \div 0.7$	$42 \div 0.07$	$0.42 \div 7$	$420 \div 70$

- "Do not use your calculator, yet! I want you to look at the 5 expressions and put them in order from the greatest quotient to the least quotient. Talk to your partner and write the corresponding letter if you wish. Remember, greatest to least."
- ❓ **MP2 Reason Abstractly and Quantitatively:** Students will know there is a 6 in the quotient. Discussion with their partner should focus on the relationship between the dividend and divisor. Is the dividend greater than or less than the divisor? Are their place value names close together? The reasoning that students offer during the class discussion is very insightful.
- ❓ "Are there any quotients you are more confident about than others?" Students almost always say when they are working with whole numbers. "Why?" I can estimate better.
- Elicit predictions and explanations. Students will want to check their predictions on the calculator.
- ⊙ "The strategy that you will learn today will help you know where to place the decimal point in the quotient."

❓ Teaching Prompt   ⊙ Learning Target

Divide Decimals **7.7**

Learning Target: Divide decimals by decimals.
Success Criteria:
- I can multiply a divisor and a dividend by a power of 10 to make the divisor a whole number.
- I can place the decimal point in a quotient.
- I can divide a decimal by a decimal.

Explore and Grow

Use the model to find 0.96 ÷ 0.32.

Find 96 ÷ 32.

3
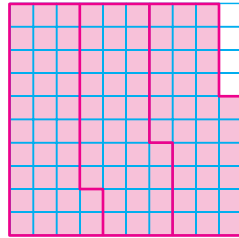
MP **Structure** How can multiplying by a power of 10 help you divide decimals?

When the divisor becomes a whole number, the division is easier.

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Explore and Grow

- This exploration is a good way to see if the reasoning students developed in the Dig In can be applied. They drew models in the previous lesson.
- ❓ Ask a volunteer to interpret the model. *There are 3 groups of 32 hundredths in 96 hundredths.* Write: 96 hundredths ÷ 32 hundredths = 3.
- **Connection:** The model also represents 96 ÷ 32 if we define the small square to be 1. Both models are the same. The quotients are the same.
- ❓ "How can multiplying by a power of 10 help you to divide decimals?" You know where the decimal point is located because you can estimate the quotient. Comfort with whole number division is important.

Laurie's Notes

Think and Grow

Getting Started

- The Key Idea describes a strategy for decimal division problems. Students learned earlier in the chapter that when the divisor is a whole number, we place the decimal point in the quotient above the decimal point in the dividend. It is rewritten as an equivalent division problem by multiplying both the dividend and divisor by the same power of 10. We want the divisor to be a whole number so we know where to place the decimal point in the quotient.

- Discuss the two examples and add them to an anchor chart. In the first example, the divisor is 0.4 so we multiply dividend and divisor by 10. $3.2 \div 4$ is a problem the learned to solve earlier in the chapter. In the second example, you multiply each by 100 so that the divisor 0.12 becomes the whole number 12.

$$0.32 \div 0.4$$
$$\times 10 \quad \times 10$$
$$3.2 \div 4$$

$$15.6 \div 0.12$$
$$\times 100 \quad \times 100$$
$$1560 \div 12$$

Teaching Notes

- **Model:** "We will use the strategy of multiplying by a power of 10 to find $6.12 \div 1.8$. What is a reasonable estimate?" $6 \div 2 = 3$. "What power of 10 can we multiply 1.8 by to have a whole number?" 10 "Multiply both the divisor and dividend by 10." Move to Step 2 and show how we record multiplying by 10.

- **MP6 Attend to Precision:** Avoid saying *move the decimal point one place.* Instead say, "Multiplying 1.8 by 10 equals 18."

- "Now we are dividing by a whole number so place the decimal point in the quotient above the decimal point in the dividend." Have students assist you in finishing the problem. "Is the quotient reasonable?"

- "Let's go back through the exercise now and look at each success criteria. Can you explain why we multiplied both the dividend and divisor by 10? Why did we use 10? How did we know where to place the decimal point in the quotient? What is the related whole number division problem?"

- **Model:** Have students assist you in working through the example. "Is this an easy problem to estimate? What power of 10 do we multiply the dividend and divisor by? Why?"

- **Supporting Learners:** Write: 243 hundredths ÷ 9 hundredths = 27.

- Use guided instruction as students work on Exercise 1–3.

- "You have learned a strategy for dividing decimals. Use your thumb signal to show how confident you are in knowing how to find each quotient. What do you understand now that you didn't at the beginning of class?"

Think and Grow: Divide Decimals by Decimals

Key Idea To divide by a decimal, multiply the divisor by a power of 10 to make it a whole number. Multiply the dividend by the same power of 10. Then divide as you would with whole numbers.

Example Find $6.12 \div 1.8$.   Estimate ___**3**___

Step 1: Multiply 1.8 by a power of 10 to make it a whole number. Then multiply 6.12 by the same power of 10.

$1.8 \times 10 =$ __**18**__

$6.12 \times 10 =$ __**61.2**__

Step 2: Place the decimal point in the quotient above the decimal point in the dividend.

$1.8\overline{)6.12} \longrightarrow 18\overline{)61.2}$

Step 3: Divide.

$$
\begin{array}{r}
\textbf{3.4} \\
18\overline{)61.2} \\
-\underline{\textbf{54}} \\
72 \\
-\underline{\textbf{72}} \\
\boxed{\textbf{0}}
\end{array}
$$

So, $6.12 \div 1.8 =$ __**3.4**__ .   Reasonable? __**3.4**__ is close to __**3**__ . ✓

Example Find $2.43 \div 0.09$.

Step 1: Multiply 0.09 by a power of 10 to make it a whole number. Then multiply 2.43 by the same power of 10.

$0.09 \times 100 =$ __**9**__

$2.43 \times 100 =$ __**243**__

Step 2: Place the decimal point in the quotient above the decimal point in the dividend.

$0.09\overline{)2.43} \longrightarrow 9\overline{)243.}$

Step 3: Divide.

$$
\begin{array}{r}
\textbf{27}. \\
9\overline{)243} \\
-\underline{\textbf{18}} \\
63 \\
-\underline{\textbf{63}} \\
\boxed{\textbf{0}}
\end{array}
$$

So, $2.43 \div 0.09 =$ __**27**__ .

Show and Grow   *I can do it!*

Multiply the divisor by a power of 10 to make it a whole number. Then write the equivalent expression.

1. $3.5 \div 0.5$

35 ÷ 5

2. $9.84 \div 2.4$

98.4 ÷ 24

3. $4.68 \div 0.78$

468 ÷ 78

Meeting the needs of all learners.

Laurie's Notes

Apply and Grow: Practice

SCAFFOLDING INSTRUCTION

Students are asked to divide two decimal numbers. They will multiply both the divisor and the dividend by the same power of ten to make the divisor a whole number. Are students making sense of the process, or are they thinking only in terms of rules? Are they able to explain why they need to multiply both the divisor and the dividend by the same power? Can they explain why they make the divisor a whole number?

EMERGING students may continue to struggle with the standard algorithm for division, and adding the decimals and multiplying the divisor and dividend can add additional steps that can be confusing when not understood. Students can look back on Lessons 7.4 and 7.5 to remember why we want to make the divisor a whole number.

- **Exercises 4–6:** The goal of these exercises is for students to estimate the quotient to place the decimal point, not for students to divide.
- **Exercises 7–15:** Watch to see if students are correctly multiplying the divisor and dividend. If there are errors in the division, is it due to not understanding long division, placement of the decimal, number facts, or other concerns?
- **Common Error:** Be sure students are multiplying both the divisor and dividend by the correct power of ten. It is common to "make" both the divisor and the dividend into whole numbers regardless of the decimal place values in the two numbers.
- **Exercises 16 and 17:** Both of these exercises build number sense in students. Do not let them perform division. This would practice a procedure without developing number sense.

PROFICIENT students can explain when the divisor and dividend need to be multiplied by a power of ten, and what the power of ten needs to be. They accurately perform the division.

- **Exercise 16:** Have students share different ways to reason about why Descartes is correct without showing the division.

Additional Support

- Students may benefit from a color-coded, or a template-like structure for help with the long division algorithm.

Extension: Adding Rigor

- Refer to Exercise 16. Have students change the decimal location in Descartes's dividend, and find the correct quotient for the change.

Name _____

Apply and Grow: Practice

Place a decimal point where it belongs in the quotient.

4. $28.47 \div 0.39 = 7\,3.$ | **5.** $75.85 \div 3.7 = 2\,0.5$ | **6.** $4.51 \div 4.1 = 1.1$

Find the quotient. Then check your answer.

7.
$$1.5\overline{)7.5} = 5$$

8.
$$0.13\overline{)0.91} = 7$$

9.
$$2.4\overline{)2.88} = 1.2$$

10.
$$0.6\overline{)7.8} = 13$$

11.
$$3.6\overline{)4.32} = 1.2$$

12.
$$0.4\overline{)11.2} = 28$$

13. $40.42 \div 8.6 = \underline{\hspace{1cm}}$

4.7

14. $7.2 \div 2.4 = \underline{\hspace{1cm}}$

3

15. $5.76 \div 1.8 = \underline{\hspace{1cm}}$

3.2

16. **YOU BE THE TEACHER**
Descartes says $4.14 \div 2.3 = 1.8$. Is he correct? Explain.

yes; Descartes multiplied the divisor and dividend by 10.

$$23\overline{)41.4} = 1.8$$

17. **Logic** What can you conclude about Newton's quotient?

The dividend is 5.72.
The divisor is less than 1.

The quotient is greater than 5.72.

Laurie's Notes

Think and Grow: Modeling Real Life

These applications allow students to show their understanding of dividing in a real-world setting.

- Have students read the example and discuss with a partner how they can determine how much the bag of papayas weighs.
- ❓ "If the papayas cost $1.30, why does the work show that we are going to divide by 1.3? Why is using 1.3 easier as a divisor than using 1.30 when they are equivalent values?"
- ❓ Work through the example with the students, discussing each step. Ask students guiding questions such as, "Why would we multiply by 10?"
- In the example, students are asked if the answer is reasonable instead of having estimated before dividing. Have students discuss what the quotient should be close to, based on the estimate of $5.46 \div 1.3$.
- Exercises 18–20 are the same type of problems as the example, using the same table of values.
- Exercises 19 and 20 extend to multi-step problems. Students will benefit from drawing a picture or making a plan before beginning with Exercise 20.
- ◉ "Our learning target today was to divide decimal numbers by multiplying the divisor and dividend by a power of ten to make the divisor a whole number. Explain to your partner how you know what power of ten by which to multiply." Have several students share. "Tell your partner why you have to multiply both the divisor and the dividend by the same power of ten. Why can't you just make both the divisor and the dividend whole numbers?" Place value of the divisor determines the power of 10. If the divisor and the dividend have the same decimal place values, or if the dividend has fewer decimal place value than the divisor, both will end up being whole numbers. You must retain equality by multiplying both the dividend and divisor by the same power. "Show me with your thumb signals how you are doing with dividing decimals when the divisor is a decimal."
- **Supporting Learners:** Are there multiplication facts that students are not fluent with? These facts need to be learned so that the lack of fluency does not prevent them from progressing with the operations of multiplication and division.

Closure

- Show students a division problem. "Tell your partner by what power of 10 you will multiply the divisor and dividend. Write the new division problem on your whiteboards, and divide. Compare with your partner." $8.32 \div 0.4$; $51 \div 1.7$

Think and Grow: Modeling Real Life

Example A farmer sells a bag of papayas for $5.46. How much does the bag of papayas weigh?

Divide the price of the papayas by the price per pound to find how much the bag of papayas weighs.

Fruit or Vegetable	Price per Pound
Honeydew	$0.80
Papaya	$1.30
Pineapple	$0.63
Pumpkin	$0.45
Watermelon	$0.33

$5.46 \div 1.3 = ?$ Estimate **4**

Step 1: Multiply 1.3 by a power of 10 to make it a whole number. Then multiply 5.46 by the same power of 10.

$1.3 \times 10 =$ **13**

$5.46 \times 10 =$ **54.6**

Step 2: Place the decimal point in the quotient above the decimal point in the dividend.

1.3)5.46   13)54.6

Step 3: Divide.

```
     4.2
13)54.6
  -52
  ----
    26
   -26
   ----
     0
```

$5.46 \div 1.3 =$ **4.2**   Reasonable? **4.2** is close to **4** . ✓

So, the bag of papayas weighs **4.2** pounds.

Show and Grow   I can think deeper!

Use the table above.

18. You buy a honeydew for $6.08. What is the weight of the honeydew?

7.6 pounds

19. You buy a pumpkin for $7.20 and a watermelon for $5.94. Does the watermelon or the pumpkin weigh more? How much more?

watermelon; 2 pounds

20. **DIG DEEPER!** You pay $5 for a pineapple and receive $2.48 in change. The inedible parts of the pineapple weigh 1.75 pounds. How many pounds of edible pineapple do you have? Explain.

2.25 pounds;
$5 − 2.48 = $2.52, $2.52 ÷ $0.63 = 4 pounds,
4 − 1.75 = 2.25 pounds

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Connect and Extend Learning

Homework & Practice Notes

- Remind students to make the divisor a whole number.
- Remind students to place the decimal point in the quotient above the decimal point in the dividend.

Assignment Guide and Concept Check

Level	Assignment	Concept Check
Emerging	1–15 odd, 16, 17	1, 5, 7, 13, 15
Proficient	1–17	

Scaffold assignments to support all students in their learning progression. The suggested assignments are a starting point. Continue to assign additional exercises and revisit with spaced practice to move every student toward proficiency.

Prior Skills

- **Exercise 17:** Grade 5, Writing Multi-Digit Numbers in Different Forms

Cross-Curricular Connections

Physical Education

- Have students think about a track that they may use during track and field events or that may be around the football field. Usually, one lap around the track on the inside lane is about 400 meters, which is about one-quarter of a mile. For track practice, a coach wants the team to run 5 kilometers (about 3.1 miles). Have students find how many times around the track they will need to run using the measurements in miles and in kilometers.
  Extension: Have students find how many laps would equal a half marathon (13.1 miles) or a full marathon (26.2 miles).

Learning Target: Divide decimals by decimals.

Example Find 32.8 ÷ 0.4.   Estimate 320 tenths ÷ 4 tenths = 80

Step 1: Multiply 0.4 by a power of 10 to make it a whole number. Then multiply 32.8 by the same power of 10.

$0.4 \times 10 = \underline{\ 4\ }$

$32.8 \times 10 = \underline{\ 328\ }$

Step 2: Place the decimal point in the quotient above the decimal point in the dividend.

0.4)32.8 ⟶ 4)328.

Step 3: Divide.

```
      82.
  4)328
  − 32
    ────
     08
    − 8
    ────
      0
```

So, 32.8 ÷ 0.4 = __82__.   Reasonable? __82__ is close to __80__. ✔

Multiply the divisor by a power of 10 to make it a whole number.
Then write the equivalent expression.

1. 16.15 ÷ 1.9

161.5 ÷ 19

2. 0.36 ÷ 0.09

36 ÷ 9

3. 2.04 ÷ 1.7

20.4 ÷ 17

Place a decimal point where it belongs in the quotient.

4. 81.27 ÷ 13.5 = 6.0 2

5. 5.76 ÷ 3.2 = 1.8

6. 47.15 ÷ 2.3 = 2 0.5

Find the quotient. Then check your answer.

7.   **4**
  5.3)21.2

8.   **2,546**
  0.03)76.38

9.   **5.4**
  6.2)33.48

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Connect and Extend Learning

Extend Student Learning
Logical-Mathematical/Bodily-Kinesthetic

- Set up a basket or empty trash can in the middle of the room. Provide students with a notecard. Have each student create and solve a decimal division equation and write the quotient without the decimal on the notecard. Once completed, have students crumple the notecard up into a ball and take turns throwing them into the basket. Students who make their notecard ball into the basket get to choose a notecard from the floor or basket first. The rest of the class follows by choosing notecards and returning to their seats. Students will need to solve the equation correctly to determine where to place the decimal point. Have students exchange their completed notecard equation with a partner to check each other's work.
  Note: This activity can be repeated by having students create another decimal division equation on a notecard and attempting to throw them into the basket.

Lesson Resources	
Surface Level	**Deep Level**
Resources by Chapter • Extra Practice • Reteach • Chapter Self-Assessment Differentiating the Lesson Tutorial Videos Skills Review Handbook Skills Trainer	Resources by Chapter • Enrichment and Extension • Chapter Self-Assessment Graphic Organizers Dynamic Assessment System • Lesson Practice

Find the quotient. Then check your answer.

10. 0.63 ÷ 0.09 = _____

7

11. 10.53 ÷ 3.9 = _____

2.7

12. 33.8 ÷ 2.6 = _____

13

13. (MP) **Logic** Without calculating, determine whether 5.4 ÷ 0.9 is greater than or less than 5.4. Explain.

greater than 5.4; The divisor is less than 1.

14. (MP) **Communicate Clearly** Explain how 35.64 ÷ 2.97 compares to 3,564 ÷ 297.

The quotients are the same. Multiplying the first divisor and dividend by 100 will yield the same divisor and dividend of the second divison problem.

15. (MP) **Modeling Real Life** A farmer sells a bag of grapes for $5.88. How much do the grapes weigh?

Fruit or Vegetable	Price per Pound
Bananas	$0.58
Carrots	$1.00
Celery	$2.00
Asparagus	$0.64
Grapes	$2.80

2.1 pounds

16. **DIG DEEPER!** Descartes makes 2.5 times as many ounces of applesauce as Newton. Newton eats 8 ounces of his applesauce, and then divides the rest equally into 3 containers. How much applesauce is in each of Newton's containers?

7 ounces

Descartes makes 72.5 ounces of applesauce.

Review & Refresh

17. Write the number in two other forms.

Standard form: **230,082**

Word form: two hundred thirty thousand, eighty-two

Expanded form: **(2 × 100,000) + (3 × 10,000) + (8 × 10) + (2 × 1)**

7.8

Laurie's Notes

Preparing to Teach

The division problems in this chapter were written so that the quotient was determined without the need to insert extra zeros into the dividend. No quotient was a repeating decimal, a concept students study in middle school. In this lesson, students gain additional practice with decimal division as they insert zeros in the dividend and learn how to recognize when the division problem is complete. Students may have asked earlier about *remainders* with decimal division and this is how the lesson is motivated in the Dig In.

Materials
• string

Dig In (Motivate Time)

Students are presented a scenario where they are asked to share a piece of string between two people and determine how much string each has.

• "In this chapter, you learned to divide decimals using different models and strategies. Did you notice that none of the quotients had a remainder?" You may have discussed this earlier in the chapter.

❓ **Model:** Hand two volunteers a piece of string. "This string is 3 feet long. I plan to cut it and give you each the same length. Give a decimal answer, how much will you each have?" Students will quickly say $1\frac{1}{2}$ and then modify to 1.5 feet.

❓ "What if there were four people? Can I share the string (still 3 feet) so everyone has the same length? Give a decimal answer, how much will each person have?"

• Students won't be as quick. Elicit explanations as to how they are finding the answer. Write each problem horizontally and then vertically. Do not record the division. You just want students to see both forms right now.

❓ **Model:** Take a new piece of string. "This is 2.7 meters long. Can this be shared evenly between two people? Explain." Record this problem in both formats.

◉ "Write just the quotient above the dividend. Do you have any ideas about how we can record our thinking so that our quotients are 1.5, 0.75, and 1.35 respectively?" Students may or may not have ideas.

$3 \div 2$ $3 \div 4$

$$2\overline{)3.0}^{\,1.5}\qquad 4\overline{)3.00}^{\,0.75}\qquad 2\overline{)2.70}^{\,1.35}$$

❓ Teaching Prompt   ◉ Learning Target

Learning Target

Insert zeros in the dividend when dividing with decimals and whole numbers.

Success Criteria

• Explain when to insert one or more zeros in the dividend to find a quotient.
• Insert one or more zeros in a dividend to find a quotient.
• Recognize when a division problem is complete.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com*.

• Daily skills
• Vocabulary
• Prerequisite skills

ELL Support

Discuss the meaning of the word insert. Demonstrate inserting by putting a coin into a wallet or similar as you say, "I insert the coin." Explain that synonyms may include "add in" or "put into." Then ask students how they think they will insert zeros in a dividend.

Learning Target: Insert zeros in the dividend when dividing with decimals and whole numbers.

Success Criteria:
• I can explain when to insert one or more zeros in the dividend to find a quotient.
• I can insert one or more zeros in a dividend to find a quotient.
• I can recognize when a division problem is complete.

Explore and Grow

Use the model to find each quotient.

$3 \div 2 = \mathbf{1.5}$
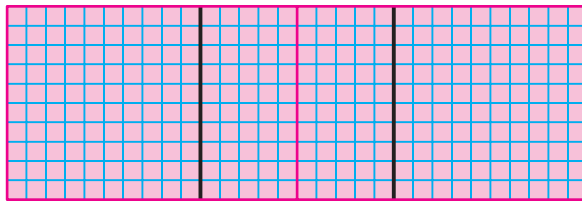
$2.7 \div 2 = \mathbf{1.35}$
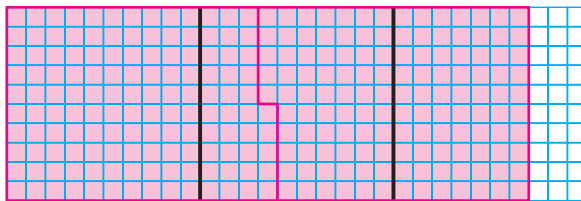
MP **Analyze a Problem** Why is the number of digits in the quotients you found above different than the number of digits in the dividends?

In some cases, more decimal places are needed in the quotient to complete the division and have 0 as a remainder.

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Explore and Grow

• If you have done the Dig In you may choose to go to the Think and Grow.
• Tell students quotients must be in decimal form, meaning no remainders. Also, tell students that any materials in the classroom can be used to help them model $3 \div 2$ and $2.7 \div 2$ (base ten blocks, decimal grid, meter stick).
? "When you divided 3 by 2, how did you share the remainder of 1? How did you share the remaining 0.1 when you divided 2.7 by 2?"
◉ "In today's lesson we are going to look at a strategy for working with remaining amounts in a division problem and how to know we are finished dividing."

Laurie's Notes

Think and Grow

Getting Started

- Explain what it means to *insert zeros* in the dividend. You add zeros to the end of the dividend to assist the written computation. The numbers are equivalent: $3 = 3.0$; $3 = 3.00$; $2.7 = 2.70$.
- If you did the Dig In, you could demonstrate this easily by drawing dotted zeros in the written record.

Teaching Notes

- **?** **Model:** "We want to find $52.6 \div 4$. What is a reasonable estimate for the quotient?" $52 \div 4 = 13$ Point to the vertically written problem and have students assist you in completing Step 1.
- "We know the quotient so far is 13." Place the decimal point in the quotient and divide the tenths. Subtracting, we have 2 more tenths. Note Descartes's comment.
- **?** "Have we changed the value of the dividend?" No; $52.6 = 52.60$
- "Divide the hundredths. 20 hundredths divided by 4 is 5 hundredths." Record the 5 in the quotient.
- **Extension:** "How can we check that our answer is correct?"
- ◉ "You had to insert 1 zero in order to finish dividing. Adding the zero did not change the value of the dividend. What told us we were done dividing?" We subtracted and had 0 hundredths remaining and there are no additional digits in the dividend.
- **Model:** Have students think about what a model for this problem would look like. The divisor is a decimal so we want to know how many groups of 0.08 are in 1. The first step is multiplying by 100 so the divisor is a whole number. In Step 3, it is necessary to insert one zero so that the division can continue.

- Students will ask how many zeros they should insert. "You can insert as many zeros to the end of the decimal as you need. The additional zeros do not change the value of the dividend."
- Provide additional paper for students to work the exercises. Encourage students to think about whether the quotient will be greater than or less than 1 before they begin.
- ◉ "You have used your division skills to find a quotient where you first needed to insert one or two zeros. Explain to your partner what this means and how you know you need to insert zeros."
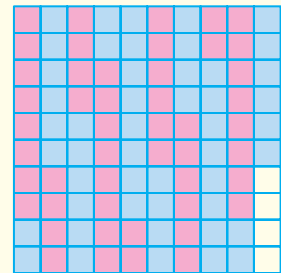
Think and Grow: Inserting Zeros in the Dividend

Example Find 52.6 ÷ 4. Estimate __13__

Step 1: Divide the tens and the ones.

```
   13
4)52.6
 − 4 ↓
   12
 − 12
    0
```

> When a dividend does not have enough digits to divide completely, insert zeros.

Step 2: Place the decimal point. Divide the tenths.

```
   13.1
4)52.6
 − 4
   12
 − 12 ↓
    0 6
  − 4
    2
```

Step 3: Insert a zero in the dividend and continue to divide.

```
   13.15
4)52.60
 − 4
   12
 − 12
    0 6
  − 4 ↓
    20
  − 20
     0
```

So, 52.6 ÷ 4 = __13.15__.

Reasonable? __13.15__ is close to __13__. ✓

Example Find 1 ÷ 0.08.

Step 1: Multiply by a power of 10 to make the divisor a whole number.

$0.08 \times 100 =$ __8__

$1 \times 100 =$ __100__

Step 2: Place the decimal point in the quotient above the decimal point in the dividend.

```
0.08)1.00  ⟶  8)100.
```

Step 3: Divide. Insert a zero in the dividend and continue to divide.

```
   12.5
8)100.0
 − 8 ↓
   20
 − 16 ↓
    4 0
  − 40
     0
```

So, 1 ÷ 0.08 = __12.5__.

Show and Grow *I can do it!*

Find the quotient. Then check your answer.

1. **170**
   0.5)85

2. **0.64**
   15)9.6

3. **10.5**
   0.24)2.52

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Scaffold instruction to support all students in their learning. Learning is individualized and you may want to group students differently as they move in and out of these levels with each skill and concept. Student self-assessment and feedback help guide your instructional decisions about how and when to layer support for all students to become proficient learners.

Meeting the needs of all learners.

Apply and Grow: Practice

SCAFFOLDING INSTRUCTION

Students are asked to divide two decimal numbers. They will continue to multiply both the divisor and the dividend by the same power of ten to make the divisor a whole number. Now they will have to insert additional zeros for the dividend when dividing in order to find the exact divisor rather than writing some kind of a remainder. Are they able to explain when and how many zeros to insert? Do they understand that inserting zeros to the right of the decimal point does not change the value, but any other location will change the value? Inserting a zero allows us to write a quotient in three ways: with a remainder, a mixed number, and a decimal.

EMERGING students may continue to struggle with the standard algorithm for division. Adding decimals values, multiplying the divisor and dividend by a power of ten, and now inserting zeros add additional steps that can be confusing when not understood. Break down each additional step with students and ask, "Do we need to multiply the divisor and dividend by a power of 10? Why? Which power? Will we need to insert zeros? Why? How many? Where do the zeros get written?"

- **Exercises 4–6:** The goal of these exercises is for students to estimate the quotient to place the decimal point, not for students to divide.
- **Exercises 7–13:** Watch to see if students are correctly multiplying the divisor and dividend and inserting zeros. If there are errors in the division, determine the step at which it occurs.
- **Exercise 14:** This will assess if students understand the purpose of inserting zeros.

PROFICIENT students are making sense of how to place the decimal point in the quotient, and why this works based on place value models.

- **Exercise 13:** Ask students how they solved. If any student used repeated subtraction or addition, pair them with a student who used division and have them explain their methods to each other.

Additional Support
- Students may benefit from a color-coded or a template-like structure for help with the long division algorithm.

Name _____

Apply and Grow: Practice

Place a decimal point where it belongs in the quotient.

4. $3.24 \div 0.48 = 6{.}75$

5. $35 \div 0.5 = 70{.}$

6. $12.8 \div 2.5 = 5{.}12$

Find the quotient. Then check your answer.

7. $2.4\overline{)0.84}$ → **0.35**

8. $0.32\overline{)2.08}$ → **6.5**

9. $4\overline{)45.8}$ → **11.45**

10. $9 \div 1.2 =$ _____ **7.5**

11. $3.5 \div 2.5 =$ _____ **1.4**

12. $1.8 \div 12 =$ _____ **0.15**

13. You read 2.5 chapters of the book each night. How many nights does it take you to finish the book?

6 nights

Dylan's Pet
DINOSAUR
15 CHAPTERS

14. **MP Analyze a Problem**
Why does Newton place zeros to the right of the dividend but Descartes does not?

Newton needed to insert zeros in order to continue dividing. Descartes problem had enough digits in the dividend to divide completely.

```
        23.25
  4.4)102.300
    − 88
      143
    − 132
      110
    −  88
      220
    − 220
        0
```

```
       4.
 5.6)22.4
   − 22 4
        0
```

Laurie's Notes

Think and Grow: Modeling Real Life

These applications allow students to show their understanding of multiplying decimal numbers in a real-world setting.

? **Preview:** "How many of you have ever hiked? Have you ever been on a walking or hiking trail?"

- Have students read the example and discuss with a partner how they can determine the number of miles the hiker travels each day.
- Take your time as you work through the division. Students may not understand why there is a zero in the ones place when dividing, and want instead to put the decimal point after the 1 in the tens place. Remind students that $20 \times 1 = 20$, but $20 \times 10 = 200$. Which makes sense for the dividend? Once 10 is in the quotient, then place the decimal point and insert zeros to continue dividing.
- Exercise 15 is a simple set up, but students will continue to need to insert zeros for their division.
- Exercises 16 and 17 are multi-step applications. Students can work with a partner to discuss their explanations prior to writing or showing their mathematical explanations. Continue to ask guiding questions of students about when and how many zeros are needed to insert.
- ◉ "Our learning target today was to insert zeros for the dividend whenever it is needed. Tell your partner what it means to insert a zero. How can you tell when you need to insert a zero? How do you know how many zeros to insert? How do you know when you are finished dividing?" Have students share responses after each question, taking several different responses. "Show with your thumb signals how you are doing with inserting zeros when dividing."

Closure

- "True or False? If it is false, explain why and correct the statement."
  "You need to multiply the divisor and dividend and make them both whole numbers when dividing." False. You must multiply both by the same power of 10. The divisor will be a whole number, but the dividend may not be.
- "When inserting a zero for division, you can insert as many zeros as you need." True.
- "You can insert a zero anywhere in the dividend you want." False. You can only insert to the right of the last decimal place.
- "You are finished dividing when you subtract and the remainder is 0 and there are no additional digits in the dividend." True.

Think and Grow: Modeling Real Life

Example The John Muir Trail in Yosemite National Park is 210 miles long. A hiker completes the trail in 20 days by hiking the same distance each day. How many miles does the hiker travel each day?

Divide 210 miles by 20 to find how many miles the hiker travels each day.

Step 1: Divide the tens and the ones.

$$
\begin{array}{r}
\textbf{10} \\
20\overline{)210} \\
-\ \textbf{20} \\
\hline
10 \\
-\ \ \textbf{0} \\
\hline
\textbf{10}
\end{array}
$$

Step 2: Place the decimal point. Insert a zero in the dividend and continue to divide.

$$
\begin{array}{r}
\textbf{10.5} \\
20\overline{)210.0} \\
-\ 20 \\
\hline
10 \\
-\ \ 0 \\
\hline
10\ 0 \\
-\ \textbf{100} \\
\hline
\textbf{0}
\end{array}
$$

So, the hiker travels __10.5__ miles each day.

Show and Grow   *I can think deeper!*

15. A box of 15 tablets weighs 288 ounces. Each tablet weighs the same number of ounces. What is the weight of each tablet?

19.2 ounces

16. Which bag of dog food costs less per pound? Explain why it makes sense to write each quotient as a decimal in this situation.

16 lb: $20   40 lb: $48

**16 lb bag $1.25
40lb bag $1.20
The second bag costs $0.05 less per pound. Cost per pound contains fractional portion.**

17. **DIG DEEPER!** A farmer sells a pound of rice for $0.12 and a pound of oats for $0.08. Can you buy more pounds of rice or oats with $3? How much more? Explain.

**oats; 12.5 pounds;
Oats are cheaper per pound, so more oats can be purchased.**

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Connect and Extend Learning

Homework & Practice Notes

- Remind students to insert a zero in the dividend in order to continue dividing.

Scaffold assignments to support all students in their learning progression. The suggested assignments are a starting point. Continue to assign additional exercises and revisit with spaced practice to move every student toward proficiency.

Assignment Guide and Concept Check

Level	Assignment	Concept Check
Emerging	1–13 odd, 14–16	1, 5, 7, 11, 13
Proficient	1–16	

Prior Skills

- **Exercises 15 and 16**: Grade 5, Adding Decimals

Cross-Curricular Connections

Social Studies

- Discuss currency and exchange rates with students, showing them pictures of currencies from other countries and how to convert a value in a different currency to U.S. dollars. Create a scenario about visiting another country and buying a souvenir, and have students find the price in U.S. dollars. For example, "A suncatcher souvenir from Ireland costs 36 Euros. The exchange rate is €0.83 = $1. What is the cost in dollars?"
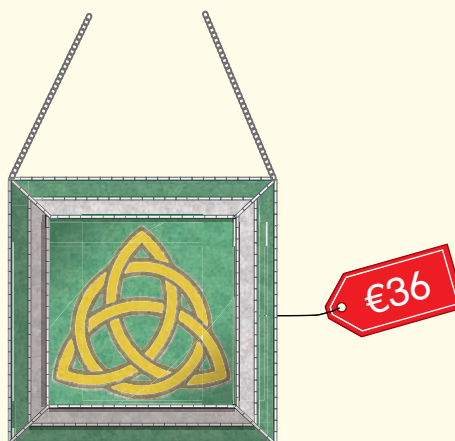
Learning Target: Insert zeros in the dividend when dividing with decimals and whole numbers.

Example Find $5 \div 0.8$.   Estimate 48 tenths $\div$ 8 tenths $= 6$

Step 1: Multiply by a power of 10 to make the divisor a whole number.

$0.8 \times 10 = \underline{\ 8\ }$

$5 \times 10 = \underline{\ 50\ }$

Step 2: Place the decimal point in the quotient above the decimal point in the dividend.

$0.8\overline{)5.0} \longrightarrow 8\overline{)50.}$

Step 3: Divide. Insert a zero in the dividend and continue to divide.

$$
\begin{array}{r}
6.25 \\
8\overline{)50.00} \\
-48\ \ \downarrow \\
\hline
20 \\
-16\ \downarrow \\
\hline
40 \\
-40 \\
\hline
0
\end{array}
$$

So, $5 \div 0.8 = \underline{\ 6.25\ }$.   Reasonable? $\underline{\ 6.25\ }$ is close to $\underline{\ \ 6\ \ }$. ✔

Place a decimal point where it belongs in the quotient.

1. $9.3 \div 0.31 = 3\,0\textbf{.}$

2. $10 \div 0.8 = 1\,2\textbf{.}5$

3. $0.76 \div 0.25 = 3\textbf{.}0\,4$

Find the quotient. Then check your answer.

4.   **37.5**
$0.8\overline{)30}$

5.   **6.08**
$15\overline{)91.2}$

6.   **2.78**
$35\overline{)97.3}$

7. $3.57 \div 0.84 = $ _____

4.25

8. $20.2 \div 4 = $ _____

5.05

9. $1.74 \div 0.25 = $ _____

6.96

Connect and Extend Learning

Extend Student Learning

Bodily-Kinesthetic

- Provide pairs of students with a division expression (for example, $1.74 \div 0.25$), and five sets of number cards 0 through 9. Use masking tape to make a long division symbol on the floor. Students will arrange the cards to model the expression in the division bar on the floor. Both students will help perform division by walking through each step to find the quotient. One student will be responsible for moving the decimal and the other will be responsible for placing the number cards on the floor. Students should continue to divide until they find the quotient.

Lesson Resources	
Surface Level	**Deep Level**
Resources by Chapter • Extra Practice • Reteach • Chapter Self-Assessment Differentiating the Lesson Tutorial Videos Skills Review Handbook Skills Trainer	Resources by Chapter • Enrichment and Extension • Chapter Self-Assessment Graphic Organizers Dynamic Assessment System • Lesson Practice

10. A painter has 5 gallons of paint to use in a room. He uses 2.5 gallons of paint for 1 coat. How many coats can he paint?

2 coats

---

11. 🍎 **YOU BE THE TEACHER** Your friend says he can find 5.44 ÷ 0.64 by dividing both the divisor and dividend by 0.01 to make an equivalent problem with a whole-number divisor. Is he correct? Explain.

yes; Dividing both by 0.01 is the same as multiplying both by 100.

12. 〰 **Communicate Clearly** Explain when you need to insert a zero in the dividend when dividing.

Keep inserting zeros in the dividend until the remainder is zero.

13. 〰 **Modeling Real Life** You cut a 12-foot-long streamer into 8 pieces of equal length. How long is each piece in feet? in inches?

1.5 feet; 18 inches

14. **DIG DEEPER!** How many days longer does the bag of dog food last for the 20-pound dog than the 40-pound dog? Explain.

40-pound dog: eats 1.25 cups twice each day

20-pound dog: eats 1.25 cups in all each day

80 days; 200 cups divided by 2.5 cups is 80 days and 200 cups divided by 1.25 cups is 160 days. 160 − 80 = 80

Review & Refresh

Find the sum. Check whether your answer is reasonable.

15. 1.7 + 6.8 = _____

8.5

16. 150.23 + 401.79 = _____

552.02

Laurie's Notes

STATE STANDARDS
5.NBT.B.7

Preparing to Teach

In this chapter, students have been modeling real-life problems that could be solved using division of decimals, and in some cases an additional operation. The problems in this lesson use several operations and there is additional practice with reading and writing verbal models.

Materials

• whiteboards and markers

Dig In (Motivate Time)

Students work in a small group to discuss and make sense of a problem-solving scenario.

• Set up a scenario where students have a $40 gift card to purchase online items. The game apps are $2.99, $3.99, and $5.99. Songs cost $0.99. The phone case costs $8.49.

❓ "You have a $40 gift card to purchase online apps and music. You have to buy a phone case. You really want two songs. You want to have the least amount of money left on the gift card when you finish shopping. How many apps of each price will you buy? Explain your decisions."

> Gift Card - $40
>
>   Game apps
> $2.99, $3.99, $5.99
>
>   Songs
> $0.99
>
>   Phone case
> $8.49

• Check to see that students understand the scenario. They can decide how many apps at each price level they want to purchase after they purchase the phone case and two songs. They have $29 remaining to spend. $40 − ($8.49 + 2 × $0.99) = $29.53

• Give several minutes for students to talk and then do a share out. You will hear students explain why they would purchase two apps at $2.99 versus one app at $5.99 and vice versa. Their combinations must sum to less than $29.53.

◉ "What skills did you use in answering the question?" You want to hear the approach. Did they add all of the items each time and compare to $40 or did they think about the money remaining after purchasing the case and two songs? Did they use estimation? rounding? decimal operations?

◉ "It is helpful to have a plan before you begin to solve. Talking with others is helpful."

Learning Target

Solve word problems involving decimals.

Success Criteria

• Understand a problem.
• Make a plan to solve.
• Solve a problem.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com.*

• Daily skills
• Vocabulary
• Prerequisite skills

ELL Support

Remind students about the different uses of the word operation. Ask them to describe them. Then explain that they will learn how to apply math operations to decimals.

❓ Teaching Prompt   ◉ Learning Target

Learning Target: Solve word problems involving decimals.

Success Criteria:
- I can understand a problem.
- I can make a plan to solve.
- I can solve a problem.

Explore and Grow

Make a plan to solve the problem.

Three friends take a taxi ride that costs $4.75 per mile. They travel 10.2 miles and tip the driver $8. They share the total cost equally. How much does each friend pay?

$18.82

MP **Check Your Work** Explain how you can work backward to check your answer.
Multiply your answer by 3, subtract 8, and divide by 10.2. The result should be $4.75.

Explore and Grow

- **MP1 Make Sense of Problems:** Look for a verbal model.
  Cost per person = (cost per mile × # of miles driven + tip) ÷ # of people.
- Can students describe the plan for solving without referencing the actual numbers? This verbal model can be used to solve any problem of this type. The actual numbers in the problem can be changed and an answer can still be found. The plan explains how to solve problems of this type.
- **MP6 Attend to Precision:** Students' plans should pay attention to the units of *dollars*, *miles*, and *cost per mile*.

Laurie's Notes

Think and Grow

Getting Started

- Students should note that not all of the information is written. There is information in the graphics that they need to recognize.

Teaching Notes

- Students use the problem-solving plan to solve a problem that involves using more than one operation.
- **? Model:** Read the example. "Let's make sure we understand the problem." Point to *What do you know?* Elicit information from students. "There is information you might be curious about, like what brand controller they bought or the names of the video games. Would it be helpful to know this information?" no
- **Turn and Talk:** "Tell your partner how you could solve this problem. Remember, it is not important to mention specific numbers, simply, how you can find the cost of each game." Give wait time.
- **MP4 Model with Mathematics:** Ask several students to share their plan. One student might solve as shown in the verbal model. Others might add the cost of the headset and controller and subtract that amount from the total spent. Discuss different strategies.
- Finding the amount spent on just the videos is the hidden question that must be answered first before the unit cost of each video can be found.
- **?** "In the verbal model shown, why are the parentheses needed in the equation?" You have to find the cost of the headset and controller, and subtract that amount from the amount of money you spent before you divide by 3. Students may mention the order of operations as well.
- Have several students share their work at the board. Learning to record work so that others can read and follow it is a skill you want to develop in all students.
- **Extension:** Discuss what a sales tax is and how this problem does not take it into account. Most states have a sales tax.
- **◉** "You read the problem to make sense of what you knew and what the question was asking. You described your plan for solving to a friend. You then solved the problem. How well do you understand the problem-solving plan? Are there any steps that are difficult for you? What do you need to do next to help you learn how to solve word or story problems?"

Example You spend $67.45 on the video game controller, the gaming headset, and 3 video games. The video games each cost the same amount. How much does each video game cost?

$15.49

$21.99

Understand the Problem

What do you know?
- You spend a total of $67.45.
- The controller costs $15.49 and the headset costs $21.99.
- You buy 3 video games that each cost the same amount.

What do you need to find?
- You need to find the cost of each video game.

Make a Plan

How will you solve?
Write and solve an equation to find the cost of each video game.

Solve

$$\boxed{\text{Cost of each game}} = \left(\boxed{\text{Total spent}} - \boxed{\text{Cost of controller}} - \boxed{\text{Cost of headset}} \right) \div \boxed{\text{Number of games}}$$

Let v represent the cost of each video game.

$v = (67.45 - 15.49 - 21.99) \div 3$

$= \underline{\textbf{29.97}} \div 3$

$= \underline{\textbf{9.99}}$

So, each video game costs <u>**$9.99**</u>.

Show and Grow   I can do it!

1. Explain how you can check whether your answer above is reasonable.

    Multiply your answer by 3 and add 15.49 and add 21.99 to get $67.45.

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Scaffold instruction to support all students in their learning. Learning is individualized and you may want to group students differently as they move in and out of these levels with each skill and concept. Student self-assessment and feedback help guide your instructional decisions about how and when to layer support for all students to become proficient learners.

Meeting the needs of all learners.

Apply and Grow: Practice

SCAFFOLDING INSTRUCTION

Students apply the structure of the problem-solving plan to the exercises. Can students identify the known information that is to be used? Can students identify what is needed beyond the direct question asked? Are they able to separate out two operations in the order to be performed? Can students choose an appropriate model or strategy to solve? If unreasonable answers are produced, do they notice?

EMERGING students recognize the numbers in the problem as the information to be used, but may use the numbers incorrectly with operations that do not relate to what they need to find. Students need assistance breaking the problem into smaller parts to solve and understanding how to use the problem-solving plan efficiently.

- **Exercises 2 and 3:** Have students explain what they are trying to find in each exercise. This is the first step in the problem-solving process.
- **Exercises 4 and 5:** Students should use the problem-solving plan to understand and plan how to solve the problems. Have students share their plan and possibly create a verbal model.
- **Exercise 6:** This exercise should be a more familiar process than some of the others. Have students tell their partner how they will determine which package costs less per ounce, and then solve. Students share their work and answers.

PROFICIENT students understand how to use the problem-solving plan, but may still need additional time and support when adjusting to each new problem-solving situation.

Additional Support

- Provide the Problem-Solving Plan Instructional Resource, and have students work with a partner or in small groups. Hearing the problem read aloud may be helpful.

Extension: Adding Rigor

- Refer to Exercise 4. "Create a pentagonal frame and determine a perimeter for it. How do the side lengths of this frame compare to the two frames in the problem?"

Name _____

Apply and Grow: Practice

2–5. Check students' work.

MP **Analyze a Problem** What do you know? What do you need to find? Explain.

2. Your friend pays $84.29 for a sewing machine and 6 yards of fabric. The sewing machine costs $59.99. How much does each yard of fabric cost?

3. There are 25.8 grams of fiber in 3 cups of cooked peas. There are 52.5 grams of fiber in 5 cups of avocados. Which contains more fiber in 1 cup, cooked peas or avocados?

MP **Make a Plan** How will you solve? Explain.

4. Your friend makes a hexagonal frame with a perimeter of 7.5 feet. You make a triangular frame with a perimeter of 5.25 feet. Whose frame has longer side lengths? How much longer?

5. You spend $119.92 on the wetsuit, the snorkeling equipment, and 2 research books. The books each cost the same amount. How much does each book cost?

$14.99 $64.95

6. **DIG DEEPER!** You pour goop into molds and bake them to make plastic lizards. You run out of goop and go shopping for more. Which package costs less per ounce of goop? Explain.

Fluorescent Goop;
2.25 fl oz × 6 = 13.5 fl oz
$40.50 ÷ 13.5 = $3 per ounce

1.8 fl oz × 2 = 3.6 fl oz
$16.20 ÷ 3.6 = $4.50 per ounce
$3 per ounce < $4.50 per ounce

$40.50

$16.20

Each bottle: 2.25 fl oz   Fluorescent

Color-Changing
Each bottle: 1.8 fl oz

Chapter 7 | Lesson 9   **349**

Laurie's Notes

Think and Grow: Modeling Real Life

These application problems allow students to show their understanding of multi-step problem solving.

- **Preview:** Discuss the information given in the problem and the in-app purchase.
- ❓ **Turn and Talk:** "Read the example. Without giving details about actual numbers, what is this problem about?" Give students time to talk and then share.
- **MP1 Make Sense of Problems:** You want to hear the essence of the problem without details. Example: *Descartes buys a game app, 5 songs, and an e-book. The songs cost the same and the e-book was 4 times as expensive as the app. We need to figure out the price of each song.* This is the big view of the problem that students need to understand before they look for the known information and so on.
- A verbal model is shown for the problem. In equation form it states what was described in *making sense of the problem*. No numbers are used at this stage.
- **MP6 Attend to Precision:** "Notice that the variable c is defined. We know what it represents in the equation."
- Students use the problem-solving plan in Exercises 7 and 8.
- **Supporting Learners:** Continue to provide the Problem-Solving Plan Instructional Resource or additional paper. Help students devise sub-goals as they determine what they need to find.
- ◉ "You have learned to make a problem-solving plan. Tell your partner how the plan helped you solve a problem today."

Closure

- **Exit Ticket:** "Solving a problem also includes looking back to see if a solution is reasonable. Can you make up two unreasonable answers for Exercise 8 that would tell you something is wrong with your solution? Explain how you would know the answer is unreasonable."

Example Descartes spends $16.40 on the game app, an e-book, and 5 songs. The e-book costs 4 times as much as the game app. The songs each cost the same amount. How much does each song cost?

Confirm Purchase

Do you want to buy Coin Chaser for $1.99?

Cancel   Buy

Think: What do you know? What do you need to find? How will you solve?

Step 1: Multiply the cost of the app by 4 to find the cost of the e-book.

$1.99 \times 4 = 7.96$ The e-book costs **$7.96**.

Step 2: Write and solve an equation to find the cost of each song.

| Cost of each song | = | (| Total spent | − | Cost of game app | − | Cost of e-book |) | ÷ | Number of songs |

Let c represent the cost of each song.

$c = (16.40 - 1.99 - 7.96) \div 5$

$= \underline{\textbf{6.45}} \div 5$

$= \underline{\textbf{1.29}}$ So, each song costs $\underline{\textbf{1.29}}$.
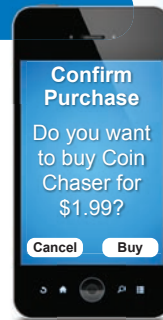
Show and Grow   I can think deeper!

7. You spend $2.24 on a key chain, a bookmark, and 2 pencils. The key chain costs 3 times as much as the bookmark. The pencils each cost the same amount. How much does each pencil cost?

READING IS FUN!
READING IS GREAT!
$0.45

$0.22

8. Newton buys an instant-print camera, a camera bag, and 2 packs of film. He pays $113.96 after using a $5 coupon. The camera costs $69.40, which is 5 times as much as the camera case. How much does each pack of film cost?

$17.84

Scaffold assignments to support all students in their learning progression. The suggested assignments are a starting point. Continue to assign additional exercises and revisit with spaced practice to move every student toward proficiency.

Connect and Extend Learning

Homework & Practice Notes

- Provide students with the Problem-Solving Plan Instructional Resource to organize their work.
- Remind students to circle what they know and underline what they need to find.

Assignment Guide and Concept Check

Level	Assignment	Concept Check
Emerging	1–5 odd, 6–9	1, 3, 5
Proficient	1–9	

Prior Skills

- **Exercises 7–9**: Grade 5, Using Division Patterns

Cross-Curricular Connections

Language Arts

- Students will be creating their own word problems that involve decimals. Students should choose one object from around the classroom which will become the topic of their word problem. Students should ensure their problem works and include an answer key (with work) to ensure their word problem can be completed.

  Extension: Have students create an illustration for their word problem. Exchange word problems with a partner and have them solve to find the answer.

Learning Target: Solve word problems involving decimals.

Example Newton has 1.5 gallons of gasoline in his lawn mower. He adds 2.25 gallons of gasoline to it. He uses the same amount of gasoline each of 15 times that he mows his yard. How much gasoline does he use each time?

Think: What do you know? What do you need to find? How will you solve?

Amount of gasoline used each time	=	(Amount of gasoline to start	+	Amount of gasoline added)	÷	Number of times mowed

Let g represent the amount of gasoline he uses each time.

$g = (1.5 + 2.25) \div 15$

$= \underline{3.75} \div 15$

$= \underline{0.25}$

So, he uses $\underline{0.25}$ gallon of gasoline each time.

1 and 2. Check students' work.

MP **Analyze a Problem** What do you know? What do you need to find? Explain.

1. A 20-ounce bottle of ketchup costs $2.80. A 14-ounce bottle of mustard costs $2.38. Which item costs less per ounce? How much less?

2. Gymnast A scores the same amount in each of his 4 events. Gymnast B scores the same amount in each of his 3 events. Which gymnast scores more in each of his events? How much more?

Gymnast	Total Points
A	33.56
B	25.05

Connect and Extend Learning

Extend Student Learning
Logical-Mathematical/Visual-Spatial

- Have students create an anchor chart that models and describes how to add, subtract, multiply, and divide decimals. The chart should list the steps students should take when finding the answer to a decimal expression, as well as a description of where the decimal will be placed. Students should create and solve an example to model each operation.

Lesson Resources	
Surface Level	**Deep Level**
Resources by Chapter • Extra Practice • Reteach • Chapter Self-Assessment Differentiating the Lesson Tutorial Videos Skills Review Handbook Skills Trainer	Resources by Chapter • Enrichment and Extension • Chapter Self-Assessment Graphic Organizers Dynamic Assessment System • Lesson Practice

Make a Plan How will you solve? Explain.

3 and 4. Check students' work.

3. Three children's tickets to the circus cost $53.85. Two adult tickets to the circus cost $63.90. How much more does 1 adult ticket cost than 1 children's ticket?

4. A chef at a restaurant buys 50 pounds of red potatoes for $27.50 and 30 pounds of sweet potatoes for $22.50. Which kind of potato costs more per pound? How much more?

5. **Modeling Real Life** You download 2 music videos, a TV series, and a movie for $42.95 total. The TV series costs 2 times as much as the movie. How much does each music video cost?

$1.99

Movie:
Lost Treasure

Order Confirmation
Total **$12.99**

WATCH NOW

6. **DIG DEEPER!** Which item costs more per ounce? How much more?

paste; $0.07 per ounce

$23.04

$4.00

Glue
1 gal

Paste
2 cups

Review & Refresh

Find the quotient

7. $4{,}000 \div 20 = \underline{\hspace{1cm}}$

200

8. $900 \div 300 = \underline{\hspace{1cm}}$

3

9. $5{,}600 \div 800 = \underline{\hspace{1cm}}$

7

Performance Task

In this task, students demonstrate an understanding of dividing decimals by whole numbers and decimals using information related to cleaning a highway. In Exercise 3, encourage students to label the length of each pathway in order to have an accurate answer. Use student responses to gauge their thinking about dividing decimals.

- Decide ahead of time whether students will be working independently, in pairs, or in groups.
- Pause between direction lines for students to complete each step.
- Have students share their work and thinking with others. Discuss as a class.

Exercise	Answers and Notes	Points
1a	A: 5 miles, B: 5.2 miles, C: 3.6 miles	3
1b	Team C	2
1c	Team B	2
2	14.7 square meters; *Sample answer:* $w = 3$ m, $\ell = 4.9$ m	3
	Total	10

Performance Task (7)

1. Multiple teams adopt different sections of a state highway to clean. The teams must clean both sides of their adopted section of the highway.

	Highway Adoptions		
Team	Number of Members	Section Distance (miles)	Litter Collected (pounds)
A	5	2.0	42.75
B	16	20.8	184
C	9	14.4	88.2

a. The teams clean their section of the highway over 4 days. They clean the same distance each day. How many miles of the highway does each team clean each day?

A: 0.5 mile, B: 5.2 miles, C: 3.6 miles

Analyze a Problem
How do you determine which values to use for each exercise?

b. Each team divides their daily distance equally among each team member. Which team's members clean the greatest distance each day?
Team C

----

c. The team that collects the greatest amount of litter per team member wins a prize. Which team wins the prize?

Team B
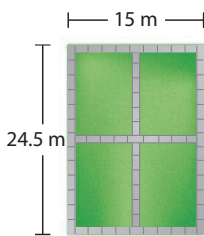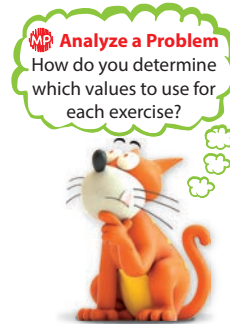
2. **Make a Plan** In a community, 25 people volunteer to clean the rectangular park shown. The park is divided into sections of equal area. One section is assigned to each volunteer. What is the area of the section that each volunteer cleans? What is one possible set of dimensions for each section?

├── 15 m ──┤

24.5 m

14.7 square meters;
Sample answer: $w = 3$ m, $l = 4.9$ m

Laurie's Notes

Race Around the World: Division

Materials

- 1 set of Race Around the World: Division Cards* per group
- 1 game piece per student

*Found in the Instructional Resources

Race Around the World: Division reviews dividing decimals. Students will solve division problems that involve decimals to race around the world.

? "Which country would you most like to visit? Which continent is it on?"
- Review the directions with the class while modeling how to play, relating it to Race Around the World: Multiplication. Explain how they will use the highlighted digit of their answer to move along the board.
- **Note:** Students may use their whiteboards to solve the problem.
- Have students tell you the directions in their own words.
- Partner students and distribute materials. Have students begin playing.

Closure

- **Exit Ticket:** Write $53.6 \div 0.5$ on the board. Have students solve and explain their work.

Race Around the World: Division

Directions:

1. Players take turns.
2. On your turn, flip a Race Around the World: Division Card and find the quotient.
3. Move your piece to the next number on the board that is highlighted in the quotient.
4. The first player to make it back to North America wins!

Learning Target Correlation

Lesson	Learning Target	Exercises
7.1	Find quotients involving decimals and powers of 10.	1–9
7.2	Use compatible numbers to estimate quotients involving decimals.	10–13
7.3	Use models to divide decimals by whole numbers.	14–17
7.4	Divide decimals by one-digit whole numbers.	18–21
7.5	Divide decimals by two-digit whole numbers.	22–27
7.6	Use models to divide decimals by decimals.	28–31
7.7	Divide decimals by decimals.	32–34
7.8	Insert zeros in the dividend when dividing with decimals and whole numbers.	35–40
7.9	Solve word problems involving decimals.	41

Have students complete the Chapter Self-Assessment in the Resources by Chapter to reflect on their knowledge of the chapter.

Chapter Practice 7

7.1 Division Patterns with Decimals

Find the quotient.

1. $25 \div 10^2 =$ _____
0.25

2. $1.69 \div 0.01 =$ _____
169

3. $681 \div 10^3 =$ _____
0.681

4. $5.7 \div 0.1 =$ _____
57

5. $200 \div 0.01 =$ _____
20,000

6. $41.3 \div 10 =$ _____
4.13

Find the value of k.

7. $74 \div k = 7{,}400$
$k = 0.01$

8. $k \div 0.1 = 8.1$
$k = 0.81$

9. $0.35 \div k = 0.035$
$k = 10$

7.2 Estimate Decimal Quotients

Estimate the quotient.   **10–13. Sample answers are given.**

10. $9.6 \div 2$
5

11. $37.2 \div 6.4$
6

12. $44.8 \div 4.7$
9

13. $78.2 \div 10.8$
7

Chapter 7

355

Chapter Resources		
Surface Level	**Deep Level**	**Transfer Level**

Resources by Chapter
  • Extra Practice
  • Reteach
  • Chapter Self-Assessment
Differentiating the Lesson
Tutorial Videos
Skills Review Handbook
Skills Trainer
Game Library
Math Musicals
	Resources by Chapter
	  • Enrichment and Extension
	  • Chapter Self-Assessment
	Graphic Organizers
	Game Library
	Math Musicals
		STEAM Video
		Dynamic Assessment System
		  • Chapter Test
		Assessment Book
		  • Chapter Tests A and B

7.3 Use Models to Divide Decimals by Whole Numbers

Use the model to find the quotient.

14. 1.4 ÷ 2

0.7
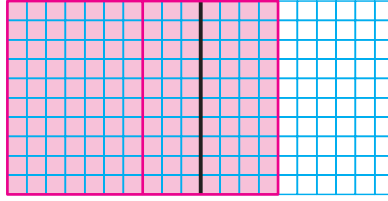
15. 2.85 ÷ 3

0.95
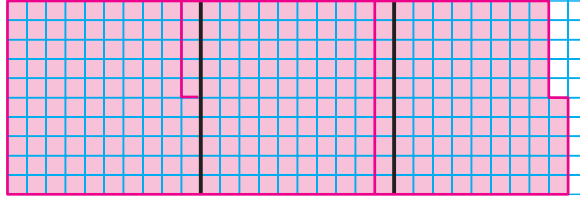
Use a model to find the quotient.

16. 1.28 ÷ 4

0.32

17. 3.5 ÷ 5

0.7

7.4 Divide Decimals by One-Digit Numbers

Find the quotient. Then check your answer.

18. **4.7**
$3\overline{)14.1}$

19. **11.28**
$6\overline{)67.68}$

20. **13.2**
$8\overline{)105.6}$

21. **Number Sense** Evaluate (84.7 + 79.8) ÷ 7.

23.5

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7.5 **Divide Decimals by Two-Digit Numbers**

Find the quotient. Then check your answer.

22. **1.41**
$32\overline{)45.12}$

23. **0.61**
$15\overline{)9.15}$

24. **1.4**
$73\overline{)102.2}$

25. $17.4 \div 87 =$ _____

0.2

26. $245.82 \div 51 =$ _____

4.82

27. $5.88 \div 42 =$ _____

0.14

7.6 **Use Models to Divide Decimals**

Use the model to find the quotient.

28. $0.9 \div 0.45 =$ __**2**__
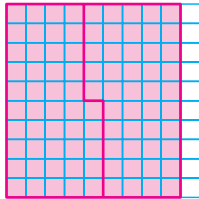
29. $0.1 \div 0.05 =$ __**2**__
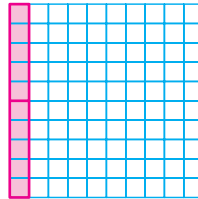
30. $1.6 \div 0.4 =$ __**4**__
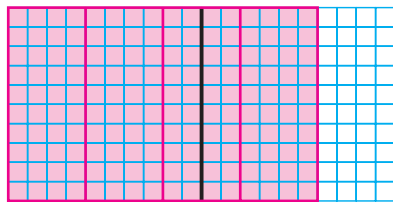
31. $1.9 \div 0.38 =$ __**5**__
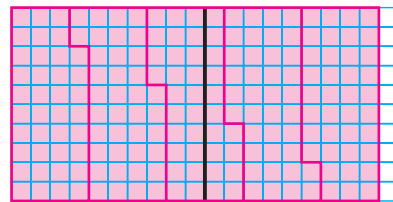
7.7 Divide Decimals

Find the quotient. Then check your answer.

32.   **8**
2.57)‾20.56

33.   **3.6**
4.7)‾16.92

34.   **12**
5.3)‾63.6

7.8 Insert Zeros in the Dividend

35. **9.05**
4)‾36.2

36. **17.75**
4.8)‾85.2

37. **4.35**
12)‾52.2

38. $5 \div 0.8 =$ _____
6.25

39. $23.7 \div 6 =$ _____
3.95

40. $138.4 \div 16 =$ _____
8.65

7.9 Problem Solving: Decimal Operations

41. You spend $28.08 on the fabric scissors, buttons, and two craft kits. The kits each cost the same amount. How much does each kit cost?

$8.99

$6.13

CRAFT BUTTONS ASSORTED

$3.97

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Centers

Center 1: Race Around the World: Division

Materials per group: Student Edition page 354, Race Around the World: Division Cards*, game piece

Have students complete the activity. See page T-354 for the directions.

Center 2: Skills Trainer

Materials: computers or devices with Internet access

Have students go to *BigIdeasMath.com* to access the Skills Trainer.

Center 3: Divide and Connect

Materials per pair: Divide and Connect Game Board*, Divide and Connect Game Cards*, counters

Cut out the Divide and Connect Game Cards and place face down in between pairs of students. Player A will flip over the first card and solve to find the quotient. Player B will check Player A's answer. If Player A correctly answers the card, he/she finds the quotient on the Divide and Connect Game Board and covers it with their color counter. If Player A answers incorrectly, he/she loses their turn and it becomes the next player's turn. The first player to connect four of their counters in a row (vertically, horizontally, or diagonally) wins!

Center 4: Decimal Division Puzzle

Materials: Decimal Division Puzzle*

Provide students with the cut-out pieces from the Decimal Division Puzzle. Students will complete the puzzle by matching the division expressions with their corresponding quotient.

Note: This activity can be completed individually or with a partner. If played with a partner, time each player as they complete the puzzle. The player who completes the puzzle faster wins!

Found in the Instructional Resources

Chapter tests are available in the Assessment Book.
An alternative assessment option is listed below.

Linguistic

Provide students with the following help ad from a student who is struggling to find the quotient of a division problem. Have students write a response to "Decimal in Distress" by describing and modeling the steps they should take to solve 24.3 ÷ 6.

Dear Math Master,

While completing my homework last night, I came across a problem that really confused me! I remember how to divide whole numbers by whole numbers, but am getting confused when dividing with decimals. Can you help explain how to divide 24.3 by 6?

Thank you!

-Decimal in Distress

Allow time for students to share their models that describe the steps for dividing 24.3 by 6.

Task	Points
Problem is solved correctly.	2 points
Describe the steps to divide 24.3 by 6.	5 points
Model the steps to divide.	3 points
Total	10 points

My Thoughts on the Chapter

What worked...

What did not work...

What I would do differently...

Learning Target Correlation

Item Analysis

1. **Learning Target:** Use order of operations to evaluate numerical expressions. (Lesson 2.2)

   A. The student does not complete the order of operations.

   B. The student divides incorrectly.

   C. Correct Answer

   D. The student does not complete the order of operations.

2. **Learning Target:** Use rounding and compatible numbers to estimate products. (Lesson 4.2)

   A. Correct Answer

   B. The student confuses the definitions of underestimate and overestimate.

   C. The student sees that 80 is rounded down and chooses this answer.

   D. This student confuses the definitions of underestimate and overestimate.

3. **Learning Target:** Use models to multiply decimals and whole numbers. (Lesson 5.3)

   9×0.5: The student multiplies incorrectly.

   8×0.05 Correct Answer

   2×0.2 Correct Answer

   4×0.1 Correct Answer

   0.01×40 Correct Answer

   50×0.8: The student multiplies incorrectly

4. **Learning Target:** Understand the relationship between place value positions. (Lesson 1.1)

   A. The student multiplies by $\frac{1}{1,000}$.

   B. The student multiplies by $\frac{1}{100}$.

   C. Correct Answer

   D. The student divides by $\frac{1}{10}$.

1. Which statement is true?

Ⓐ $(2 \times 4) + 4 \div 8 \overset{?}{=} 2$

Ⓑ $(2 \times 4 + 4) \div 8 \overset{?}{=} 2$

Ⓒ $2 \times (4 + 4) \div 8 \overset{?}{=} 2$

Ⓓ $2 \times 4 + (4 \div 8) \overset{?}{=} 2$

---

2. You round 23×84 and get an underestimate. How did you estimate?

Ⓐ 20×80

Ⓑ 30×90

Ⓒ 25×80

Ⓓ 25×90

---

3. Which expressions have a product that is shown?
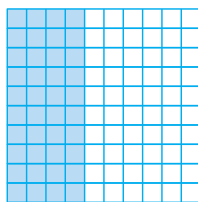
☐ 9×0.5

◼ 8×0.05

◼ 2×0.2

◼ 4×0.1

◼ 0.01×40

☐ 50×0.8

---

4. What number is $\frac{1}{10}$ of 800?

Ⓐ 0.8

Ⓑ 8

Ⓒ 80

Ⓓ $8,000$

Item Analysis (continued)

5. **Learning Target:** Find quotients involving decimals and powers of 10. (Lesson 7.1)

   A. Correct Answer

   B. The student divides by 0.1.

   C. The student only thinks about the 14 more than 37 part of the question.

   D. The student multiplies by 0.01.

6. **Learning Target:** Use place value and division facts to find quotients. (Lesson 6.2)

   $2{,}800 \div 70$ Correct Answer

   $160 \div 4$ Correct Answer

   $1{,}200 \div 300$: The student divides incorrectly.

   $3{,}600 \div 90$ Correct Answer

   $200 \div 50$: The student divides incorrectly.

   $8{,}000 \div 200$ Correct Answer

7. **Learning Target:** Use models to add or subtract decimals. (Lesson 3.2)

   A. The student subtracts what is crossed out from what is in the first row.

   B. Correct Answer

   C. The student thinks the first number is shown by the entire ones column and the top tenths column.

   D. The student subtracts an incorrect amount.

8. **Learning Target:** Find products involving decimals and powers of 10. (Lesson 5.1)

   A. The student multiplies incorrectly.

   B. Correct Answer

   C. The student multiplies incorrectly.

   D. The student disregards place value.

5. Which number divided by 0.01 is 14 more than 37?

(A) 0.51   (B) 5.1

(C) 51   (D) 5,100

---

6. Which expressions have a quotient of 40?

■ 2,800 ÷ 70	■ 160 ÷ 4	☐ 1,200 ÷ 300
■ 3,600 ÷ 90	☐ 200 ÷ 50	■ 8,000 ÷ 200

---

7. Which equation is shown by the quick sketch?

Ones	Tenths
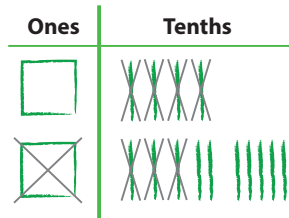
(A) $1.4 - 1.7 \overset{?}{=} 1.7$ (B) $3.4 - 1.7 \overset{?}{=} 1.7$

(C) $2.14 - 1.7 \overset{?}{=} 1.7$ (D) $3.1 - 1.0 \overset{?}{=} 1.7$

---

8. What is the value of k?

$$0.036 \times k = 36$$

(A) 10   (B) 10^3

(C) 100   (D) 36

Learning Target Correlation

Item Analysis (continued)

9. **Learning Target:** Divide decimals by one-digit whole numbers. (Lesson 7.4)

   A. Correct Answer

   B. The student does not regroup to find 11–8.

   C. The student places the decimal incorrectly.

   D. The student multiplies.

10. **Learning Target:** Write decimals in different forms and compare the values of digits. (Lesson 1.5)

    A. Correct Answer

    B. The student does not know decimal place value.

    C. The student does not know decimal place value.

    D. The student disregards the –th at the end of thousandths.

11. **Learning Target:** Use order of operations to evaluate expressions with grouping symbols. (Lesson 2.4)

    A. The student completes the operation inside the parentheses first, and then subtracts.

    B. The student divides first and then adds 2 and 9. They then subtract that from 30.

    C. The student completes the operations from left to right, disregarding the order of operations.

    D. Correct Answer

12. **Learning Target:** Multiply multi-digit numbers by one-digit numbers. (Lesson 4.3)

    A. The student forgets the leading number in the product because there is no place to regroup it.

    B. The student does not regroup.

    C. Correct Answer

    D. The student multiplies the regrouped numbers instead of adding them to the product.

13. **Learning Target:** Divide multi-digit numbers by one-digit numbers. (Lesson 6.4)

    Gridded Response: Correct Answer: 1,507

    Common Error: The student forgets to place a zero in the quotient when dividing 2 by 3 and gets 157.

9. What is the quotient of 11.76 and 8?

    (A) 1.47   (B) 1.97

    (C) 14.7   (D) 94.08

---

10. Newton wins a race by seven thousandths of a second. What is this number in standard form?

    (A) 0.007   (B) 0.07

    (C) 0.7   (D) 7,000

---

11. Evaluate $30 - (9 + 6) \div 3$.

    (A) 5   (B) 19

    (C) 9   (D) 25

---

12. A food truck owner sells 237 gyros in 1 day. Each gyro costs $7. How much money does the owner collect in 1 day?

    (A) $659   (B) $1,419

    (C) $1,659   (D) $11,249

---

13. What is the quotient of 4,521 and 3?

1,507

Item Analysis (continued)

14. **Learning Target:** Write numbers using exponents. (Lesson 1.3)

   A. Correct Answer

   B. The student thinks the answer is 4 because the only other exponent labeled is 4.

   C. The student adds the exponents.

   D. The student thinks the answer is 10 because that is the base number.

15. **Learning Target:** Multiply decimals. (Lesson 5.8)

   Part A

   Correct Answer: 14.875 square meters

   Common Error: The student places the decimal point incorrectly and gets 1,487.5.

   Part B

   Correct Answer: 29.75 square meters;
   Area $= 14.875 \times 2 = 29.75$

   Common Error: The student places the decimal point incorrectly and gets 2,975.

16. **Learning Target:** Find products involving multiples of 10 and powers of 10. (Lesson 4.1)

   30×40 Correct Answer

   12×10^2 Correct Answer

   60×200: The student multiplies incorrectly.

   $2 \times 6,000$: The student multiplies incorrectly.

   40×10^3: The student multiplies 40 by 30.

   120×10 Correct Answer

17. **Learning Target:** Solve word problems involving decimals. (Lesson 7.9)

   A. The student only finds the price of a 5-day pass each day.

   B. Correct Answer

   C. The student only finds the price of a 2-day pass each day.

   D. The student adds the costs of the passes.

18. **Learning Target:** Divide four-digit numbers by two-digit numbers. (Lesson 6.8)

   $4,536 \div 56$ Correct Answer

   $6,750 \div 45$: The first digit of the quotient is in the hundreds place.

   $2,403 \div 89$ Correct Answer

   $1,496 \div 17$ Correct Answer

14. What is the value of b?

$$10^4 = 10^b \times 10$$

(A) 3   (B) 4

(C) 5   (D) 10

---

15. **Part A** What is the area of the sandbox?

14.875 square meters

4.25 m

3.5 m

Part B The playground committee wants to make the area of the sandbox 2 times the original area. What is the new area? Explain.

29.75 square meters; Area = 2 × 14.875 = 29.75

---

16. Which expressions have a product of 1,200?

⬛ 30 × 40   ⬛ 12 × 10^2 ⬜ 60 × 200

⬜ 2 × 6,000   ⬜ 40 × 10^3 ⬛ 120 × 10

---

17. A 5-day pass to a theme park costs $72.50. A 2-day pass to the same park costs $99.50. How much more does the 2-day pass cost each day than the 5-day pass each day?

(A) $14.50   (B) $35.25

(C) $49.75   (D) $64.25

---

18. Which expressions have a quotient with the first digit in the tens place?

⬛ 4,536 ÷ 56   ⬜ 6,750 ÷ 45

⬛ 2,403 ÷ 89   ⬛ 1,496 ÷ 17

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Laurie's Notes

STEAM Performance Task

In this task, students demonstrate their understanding of multiplying whole numbers and decimals and dividing whole numbers and decimals. Demonstrate the experiment from Exercise 1 using data from the table. Use student responses to gauge their thinking about multiplying and dividing whole numbers and decimals.

- Decide ahead of time whether students will be working independently, in pairs, or in groups.
- Pause between direction lines for students to complete each step.
- Have students share their work and thinking with others. Discuss as a class.

STEAM Video: The QR code leads to a video related to planning an event, such as a party or science fair. The students can still complete the performance task, even if they have not seen the video.

STEAM Performance Task 1 – 7

You experiment with levers for your school's science fair.

1. You balance the seesaw lever by placing different weights on either side at different distances from the middle. You find the formula for balancing the seesaw lever is (left weight) × (left distance) = (right weight) × (right distance). You test the formula using various combinations of weights.

a. Use the formula to complete the table for the 2nd and 3rd attempts.

b. For your 4th attempt, you have up to 25 pounds in weights to place on each side of the lever. Choose a whole pound weight for the left side and balance the lever to complete the table. *Sample answer:*

Balanced Seesaw Lever				
Attempt	**Left Weight (pounds)**	**Left Distance (inches)**	**Right Weight (pounds)**	**Right Distance (inches)**
1st	10	10	5	20
2nd	$15\frac{1}{2}$	7	$7\frac{3}{4}$	14
3rd	30	**8.75**	50	5.25
4th	**10**	6.5	**5**	13

c. 🔴 **Construct an Argument** The total length of your seesaw lever is 40 inches. Can you balance a 50-pound weight with a 1-pound weight? Explain.
yes; 50 pounds at 0.4 inch = 1 pound at 20 inches

d. For your science fair display, you balance the lever by placing another gram weight on the right side. Which gram weight should you use?

20 g   10 g   5 g   1 g
Gram weights

⊢ 3 in. ⊣ ⊢ 6 in. ⊣

5 grams
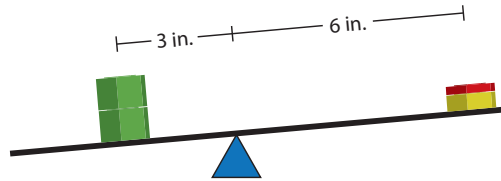
e. How can you apply what you learn from the science fair project to a playground?
When balancing a seesaw at a playground, the heavier person should sit closer to the middle than the lighter person.

STEAM Performance Task

Exercise	Answers and Notes	Points
1a	2nd attempt: $7\frac{3}{4}$ 3rd attempt: 8.75	2
1b	*Sample answer:* 10 pounds, 5 pounds	2
1c	50 pounds at 0.4 inch = 1 pound at 20 inches	2
1d	5 grams	3
1e	When balancing a seesaw at a playground, the heavier person should sit closer to the middle than the lighter person.	2
2a	The display board needs to open up more than 24 inches and less than 48 inches.	2
2b	By arranging the display boards back to back, you can fit 6 display boards on one table.	2
2c	18 tables; 93 displays ÷ 6 displays per table = 16 tables, add 2 tables for snacks and awards	2
2d	Check students' diagrams.	3
3	Check students' work.	2
	Total	22

You help set up tables for the science fair. There are 93 science fair displays. You use the display boards to determine how many tables to use.

2. Each display board opens up to form three sides of a trapezoid as shown.

24 in.

12 in.　　　　　12 in.

a. How much room do you think each display board needs to open up? Explain.
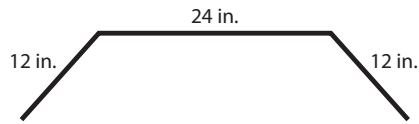
The display board needs to open up more than 24 inches and less than 48 inches.

b. You place the display boards next to each other on 12-foot long tables. How many display boards can you fit on one table?
**By arranging the display boards back to back, you can fit 6 display boards on one table.**

c. 🔴 **Communicate Clearly** You use one table for snacks and one table for award ribbons. What is the least number of tables you can use? Explain.
18 tables; 93 displays ÷ 6 displays per table = 16 tables, add 2 tables for snacks and awards

d. 🔴 **Make a Plan** The diagram shows the room where the science fair is held. Each table for the science fair is 3 feet wide. Your teacher says the ends of the tables can touch to save space. Complete the diagram to arrange the tables so that visitors and judges can see each display board.
Sample answer:

75 feet

30 feet
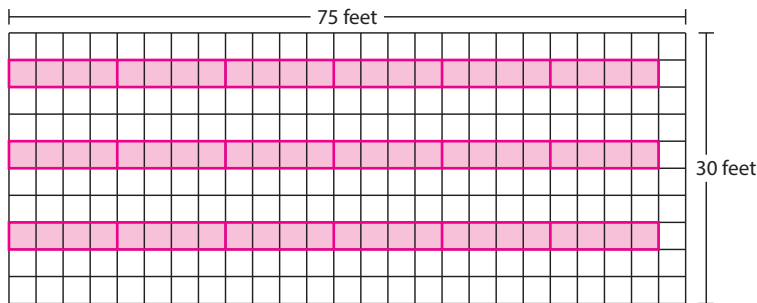
3. 🔴 **Use Technology** Use the Internet or some other resource to learn about other types of science fair projects. Describe one interesting science fair project you want to complete.

Check students' work.

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