ESSENTIAL QUESTION

How can you use operations with decimals to solve real-world problems?

You can represent real-world quantities as decimals, and then solve the problems using the appropriate operation(s).

LESSON 5.1
Dividing Whole Numbers

LESSON 5.2
Adding and Subtracting Decimals

LESSON 5.3
Multiplying Decimals

LESSON 5.4
Dividing Decimals

LESSON 5.5
Applying Operations with Rational Numbers

Real-World Video
The gravitational force on Earth’s moon is less than the gravitational force on Earth. You can calculate your weight on the moon by multiplying your weight on Earth by a decimal.

my.hrw.com
Go digital with your write-in student edition, accessible on any device.
Math On the Spot
Scan with your smart phone to jump directly to the online edition, video tutor, and more.
Animated Math
Interactively explore key concepts to see how math works.
Personal Math Trainer
Get immediate feedback and help as you work through practice sets.
Are You Ready?

Assess Readiness
Use the assessment on this page to determine if students need intensive or strategic intervention for the module’s prerequisite skills.

Response to Intervention

Intervention | Enrichment
--- | ---
Access Are You Ready? assessment online, and receive instant scoring, feedback, and customized intervention or enrichment.

Online and Print Resources

Skills Intervention worksheets
- Skill 14 Represent Decimals
- Skill 41 Multiply Decimals by Powers of 10
- Skill 53 Words for Operations

Differentiated Instruction
- Challenge worksheets

Extend the Math Lesson Activities in TE

Represent Decimals

EXAMPLE

Think: 1 square = 1/100 of a square.

1 square = 1 of 100 equal parts

So, 1 square represents 1/100, or 0.01.

10 squares = 10 of 100 equal parts

So, 10 squares represent 10 × 0.01, or 0.1.

Write the decimal represented by the shaded square.

1. [Shaded square]
2. [Shaded square]
3. [Shaded square]
4. [Shaded square]

Multiply Decimals by Powers of 10

EXAMPLE

Find the product.

5. 0.49 × 10
6. 25.34 × 1,000
7. 87 × 100

Words for Operations

EXAMPLE

Write a numerical expression for the product of 5 and 9.

5 × 9

Think: Product means “to multiply.”

Write 5 times 9.

Write a numerical expression for the word expression.

8. 20 decreased by 8
9. the quotient of 14 and 7
10. the difference between 72 and 16
11. the sum of 19 and 3

© Houghton Mifflin Harcourt Publishing Company

Think: 1 square = 1 of 100 equal parts

1 square = 1 of 100 equal parts

So, 20 squares represent 20 × 0.01, or 0.2.

Count the zeros in 100: 2 zeros.

Move the decimal point 2 places to the right.

0.49 × 10 = 4.9

5.34 × 1,000 = 5,340

87 × 100 = 8,700

20 decreased by 8

20 - 8

the quotient of 14 and 7

14 ÷ 7

the difference between 72 and 16

72 - 16

the sum of 19 and 3

19 + 3

PROFESSIONAL DEVELOPMENT VIDEO

Author Juli Dixon models successful teaching practices as she explores multiplying and dividing decimals in an actual sixth-grade classroom.

Online Teacher Edition
Access a full suite of teaching resources online—plan, present, and manage classes and assignments.

ePlanner
Easily plan your classes and access all your resources online.

Interactive Whiteboards
Engage students with interactive whiteboard-ready lessons and activities.

Personal Math Trainer: Online Assessment and Intervention
Assign automatically graded homework, quizzes, tests, and intervention activities. Prepare your students with updated practice tests aligned with Common Core.
Reading Start-Up

Have students complete the activities on this page by working alone or with others.

Visualize Vocabulary

The chart helps students review vocabulary associated with division to prepare them to multiply and divide decimals. If time allows, discuss any other attributes of division that can be added to the chart.

Understand Vocabulary

Use the following explanation to help students learn the review words. Writing examples of fractions and division problems as you explain may help students understand the vocabulary.

The fraction bar means “divided by.” You can read $\frac{3}{4}$ as 3 divided by 4, where 3 is the numerator and 4 is the denominator.

If you rewrite a fraction as a division problem, the numerator would be the dividend, and the denominator would be the divisor. The answer to the division problem is called the quotient.

Active Reading

Integrating Language Arts

Students can use these reading and note-taking strategies to help them organize and understand new concepts and vocabulary.

Additional Resources

Differentiated Instruction

- Reading Strategies ELL

In this module

Students learn to multiply and divide positive rational numbers fluently:

- multiply decimals
- divide decimals
- solve problems involving multiplication and division of fractions and decimals

Vocabulary

Review Words

- numerator
- denominator
- divide (dividir)
- dividend (dividendo)
- divisor (divisor)
- fraction bar (barra de fracciones)
- multiply (multiplicar)
- product (producto)
- quotient (cociente)
- rational number (número racional)
- symbol (símbolo)
- whole number (número entero)

Active Reading

Booklet Before beginning the module, create a booklet to help you learn the concepts in this module. Write the main idea of each lesson on its own page of the booklet. As you study each lesson, record examples that illustrate the main idea and make note of important details. Refer to your finished booklet as you work on assignments and study for tests.

Before

Students understand multiplication and division:

- multiply whole numbers and fractions
- divide whole numbers and fractions

After

Students will connect rational numbers and integers:

- multiply rational numbers fluently
- divide rational numbers fluently
Unpacking the Standards

Use the examples on the page to help students know exactly what they are expected to learn in this module.

Common Core Standards

Content Areas

The Number System—6.NS

Compute fluently with multi-digit numbers and find common factors and multiples.

6.NS.2
Fluently divide multi-digit numbers using the standard algorithm.

Key Vocabulary:
quotient (cociente)
The result when one number is divided by another.

6.NS.3
Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

Key Vocabulary:
algorithm (algoritmo)
A set of rules or a procedure for solving a mathematical problem in a finite number of steps.

What It Means to You
You will use your prior knowledge of division of whole numbers to perform division with decimals.

UNPACKING EXAMPLE 6.NS.2
Eugenia and her friends bought frozen yogurt for 45 cents per ounce. Their total was $11.25. How many ounces did they buy?

Divide 11.25 by 0.45.

$$
\begin{array}{c|c}
0.45 & 11.25 \\
75 & 90 \\
225 & 225 \\
\hline
0 & 0
\end{array}
$$

They bought 25 ounces of frozen yogurt.

What It Means to You
You will use your prior knowledge of operations with whole numbers to perform operations with decimals.

UNPACKING EXAMPLE 6.NS.3
Estimate and find the exact answer.

A. $3.25 \times 4.8$

3 \times 5 = 15

3.25

4.8

2600

B. 132.5 — 18.9

133 — 19 = 114

3.25

132.5

4.8

18.9

2600

13000

15.600

Visit my.hrw.com to see all of the Common Core Standards unpacked.

Common Core Standards

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Lesson 5.2</th>
<th>Lesson 5.3</th>
<th>Lesson 5.4</th>
<th>Lesson 5.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.NS.2</td>
<td>COMMON CORE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.NS.3</td>
<td></td>
<td>COMMON CORE</td>
<td>COMMON CORE</td>
<td>COMMON CORE</td>
</tr>
</tbody>
</table>
**ENGAGE**

**ESSENTIAL QUESTION**

*How do you divide multi-digit whole numbers?*

Starting from left to right in the dividend, divide the divisor into the dividend to get the first number in the quotient. Multiply this digit by the divisor and subtract the resulting product from the dividend. Then bring down the number in the dividend and repeat this process until all the numbers in the dividend have been divided.

**Motivate the Lesson**

Ask: You want to display your stamp collection using display sheets that can hold 30 stamps. If you have 1,080 stamps in your collection, how many display sheets will you need? Begin the Explore Activity to find out how to solve this type of problem.

**EXPLORE**

**EXPLORE ACTIVITY**

**Engage with the Whiteboard**

Write the following numbers on the whiteboard:

- 256,341
- 968,398
- 1,245,172
- 2,045,917

Then ask students to round each number to the tens, hundreds, thousands, ten thousands, and hundred thousands place. Compare the results and discuss the rules for rounding with the class.

**EXPLAIN**

**EXAMPLE 1**

**Connect Vocabulary**

Review the terms *divisor*, *dividend*, and *quotient* as they relate to the numbers used in this problem and their placement in the problem. Explain that the dividend is the number being divided into, the divisor is the number you are using to divide, and the quotient is the answer to the division problem.

**Questioning Strategies**

- How could you check your answer? Multiply the quotient by the divisor. If your answer is correct, it should equal the dividend.

**YOUR TURN**

**Avoid Common Errors**

Some students may have difficulty keeping a long division problem organized. Encourage them to use graph paper for setting up and working their division problems. Have them write each digit in a separate square to maintain the alignment of columns and rows.
LESSON 5.1 Dividing Whole Numbers

ESSENTIAL QUESTION
How do you divide multi-digit whole numbers?

EXPLORE ACTIVITY
Estimating Quotients

You can use estimation to predict the quotient of multi-digit whole numbers.

A local zoo had a total of 98,464 visitors last year. The zoo was open every day except for three holidays. On average, about how many visitors did the zoo have each day?

A. To estimate the average number of visitors per day, you can divide the total number of visitors by the number of days. To estimate the quotient, first estimate the dividend by rounding the number of visitors to the nearest ten thousand.

98,464 rounded to the nearest ten thousand is 100,000

B. There were 365 days last year. How many days was the petting zoo open?

362

C. Estimate the divisor by rounding the number of days that the zoo was open to the nearest hundred.

362 rounded to the nearest hundred is 400

D. Estimate the quotient: 100,000 ÷ 400 = 250

The average number of visitors per day last year was about 250.

Reflect
1. How can you check that your quotient is correct?
   Multiply the divisor and the quotient; if this product is equal to the dividend, then the quotient is correct.

2. Critical Thinking: Do you think that your estimate is greater than or less than the actual answer? Explain.
   Sample answer: Less than; the divisor was rounded up.

YOUR TURN
3. 34,989 ÷ 321 = 109
4. 73,375 ÷ 125 = 587

PROFESSIONAL DEVELOPMENT

Integrate Mathematical Practices MP.6

This lesson provides an opportunity to address the Mathematical Practices standard that calls for students to attend to precision. Throughout this lesson, students need to use precision whether dividing, estimating, or interpreting the remainders to solve both real-world and mathematical problems involving long division.

Math Background

The long division used by students today is related to a fifteenth century method that is sometimes referred to using an Italian phrase a danda, which means “by giving.” In this method, a partial product is found, and then the next digit in the dividend is brought down and “given” to the remainder. One of the earliest printed books illustrating this method dates from the 1490s.
EXAMPLE 2

**Connect Vocabulary ELL**

The term *remainder* is used in this example. Remind students that in this context, “remainder” means the number of books left over.

**Questioning Strategies CC Mathematical Practices**

- Which value represents the dividend? Which represents the divisor? The dividend is 1,850 and the divisor is 12.
- Suppose Callie packs 10 books in each box. Will she have any books left over? How do you know? No; 1,850 ÷ 10 = 185, with no remainder.

YOUR TURN

**Avoid Common Errors**

Exercise 7 Some students interchange the divisor and dividend when translating a problem in the form $a \div b$ into the form $b \mid a$. Remind students that the number after the division sign, ÷, or the number outside the division house, $\div$, is always the divisor.

**Elaborate**

**Talk About It**

**Summarize the Lesson**

Ask: What steps should be used when dividing large numbers? Start from left to right in the dividend, divide the divisor into the dividend to get the first digit in the quotient. Multiply this digit by the divisor and subtract the resulting product from the dividend. Then bring down the next number and repeat the process.

**GUIDED PRACTICE**

**Engage with the Whiteboard**

For Exercises 2–4, have students complete the division problems on the whiteboard. Ask them to explain their reasoning.

**Avoid Common Errors**

**Exercises 1, 5–10** Some students interchange the divisor and dividend when translating a problem in the form $a \div b$ into the form $b \mid a$. Remind students that the number after the division sign, ÷, or the number outside the division house, $\div$, is always the divisor.

**Exercise 11** Point out to students that this problem is asking for an estimate, not an exact answer. Remind them to round each number appropriately.
Dividing with a Remainder
Suppose you and your friend want to divide 9 polished rocks between you so that you each get the same number of polished rocks. You will each get 4 rocks with 1 rock left over. You can say that the quotient 9 ÷ 2 has a remainder of 1.

EXAMPLE 2
Callie has 1,850 books. She must pack them into boxes to ship to a bookstore. Each box holds 12 books. How many boxes will she need to pack all the books?

Divide 1,850 by 12.

\[
\begin{array}{c}
\text{12 } | \text{ 1,850} \\
\underline{12 } \\
\text{60} \\
\underline{60} \\
\text{154 R2} \\
\end{array}
\]

The quotient is 154, remainder 2. You can write 154 R2.

Reflect
5. Interpret the Answer: What does the remainder mean in this situation?
After packing 154 boxes, there will be 2 books left over.

6. Interpret the Answer: How many boxes does Callie need to pack the books? Explain.
155; an extra box is needed for the 2 books left over.

YOUR TURN
Divide.
7. \(5,796 \div 25 = 231 \text{ R21}\)
8. \(67 \div 3,098 = 46 \text{ R16}\)
9. A museum gift shop manager wants to put 1,578 polished rocks into small bags to sell as souvenirs. If the shop manager wants to put 15 rocks in each bag, how many complete bags can be filled? How many rocks will be left over? 105 bags; 3 rocks left over

Guided Practice
1. Estimate: 31,969 ÷ 488 (Explore Activity)
Round the numbers and then divide.
\[
31,969 \div 488 = \underline{60}
\]

Divide. (Example 1, Example 2)
2. \(3,072 \div 32 = \underline{96}\)
3. \(4,539 \div 51 = \underline{89}\)
4. \(9,317 \div 95 = \underline{98 \text{ R7}}\)
5. \(2,226 \div 53 = \underline{42}\)
6. Divide 4,514 by 74. 61
7. \(3,493 \div 37 = \underline{94 \text{ R15}}\)
8. \(2,001 \div 83 = \underline{24 \text{ R9}}\)
9. \(39,751 \div 313 = \underline{127}\)
10. \(35,506 \div 438 = \underline{81 \text{ R28}}\)

11. During a food drive, a local middle school collected 8,982 canned food items. Each of the 28 classrooms that participated in the drive donated about the same number of items. Estimate the number of items each classroom donated. (Explore Activity)

12. A theater has 1,120 seats in 3 equal rows. How many seats are in each row? (Example 1)

13. There are 1,012 souvenir paperweights that need to be packed in boxes. Each box will hold 12 paperweights. How many boxes will be needed? (Example 2)

14. What steps do you take to divide multi-digit whole numbers?
Start from left to right in the dividend, and divide the divisor into the dividend to get the first digit in the quotient. Multiply this digit by the divisor and subtract the resulting product from the dividend. Then bring down the next number and repeat the process.

DIFFERENTIATE INSTRUCTION

Kinesthetic Experience
Have students work in groups of three or four. Give each group a set of index cards labeled 0–9. Have the groups mix and place the cards face down in a pile. Students should then draw four cards to make a dividend and two cards to make a divisor. Have students do the division individually. Group members should compare answers and work a problem together if they do not all get the same quotient.

Cognitive Strategies
Some students may have difficulty remembering the steps of the division algorithm—divide, multiply, subtract, bring down, then repeat. Have students make a study sheet with the steps for the division algorithm.

Additional Resources
Differentiated Instruction includes:
- Reading Strategies
- Success for English Learners
- Reteach
- Challenge
Evaluate

**GUIDED AND INDEPENDENT PRACTICE**

### Concepts and Skills

<table>
<thead>
<tr>
<th>Explore Activity</th>
<th>Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimating Quotients</td>
<td>Exercises 1, 11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Example 1</th>
<th>Using Long Division</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXERCISES 2–3, 5–6, 9, 12, 15, 17, 20, 21, 24</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Example 2</th>
<th>Dividing with a Remainder</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXERCISES 4, 7, 8, 10, 13, 16, 18, 19, 22, 23</td>
<td></td>
</tr>
</tbody>
</table>

### Lesson Quiz

**5.1 LESSON QUIZ**

**COMMON CORE** 6.NS.2

**Divide.**

1. \( \frac{4,183}{47} \)
2. \( \frac{52,114}{71} \)
3. \( \frac{62,152}{342} \)

4. Lisa has 2,134 buttons that need to be sorted equally into 12 jars. How many buttons will be in each jar?

5. There are 3,863 shirts to pack into boxes that hold 120 shirts. How many boxes will be needed if all the shirts have to be packed in a box?

*Lesson Quiz example available online*

**Answers**

1. 89
2. 734
3. 181 R250
4. 177 buttons
5. 33 boxes

### Additional Resources

**Differentiated Instruction** includes:

- Leveled Practice worksheets
### 5.1 Independent Practice

**Divide.**

15. \(44,756 \div 167 = \) ____________ 16. \(87,628 \div 931 = \) ____________

17. \(66,253 \div 317 = \) ____________ 18. \(76,255 \div 309 = \) ____________

19. \(50,779 \div 590 = \) ____________ 20. \(97,166 \div 107 = \) ____________

21. \(216,016 \div 368 = \) ____________

23. Emilio has 8,450 trees to plant in rows on his tree farm. He will plant 125 trees per row. How many full rows of trees will he have? Explain.

24. Camilla makes and sells jewelry. She has 8,160 silver beads and 2,880 black beads to make necklaces. Each necklace will contain 85 silver beads and 30 black beads. How many necklaces can she make? ____________

25. During a promotional weekend, a state fair gives a free admission to every 175th person who enters the fair. On Saturday, there were 6,742 people attending the fair. On Sunday, there were 5,487 people attending the fair. How many people received a free admission over the two days? ____________

26. How is the quotient 80,000 \( \div 2,000 \) different from the quotient 80,000 \( \div 200 \) or 80,000 \( \div 20 \)?

27. Given that 9,554 \( \div 562 = 17 \), how can you find the quotient 95,540 \( \div 562 \)?

28. **Earth Science** The diameter of the Moon is about 3,476 kilometers. The distance from Earth to the Moon is about 384,400 kilometers. How many moons could be lined up in a row between Earth and the Moon? Round to the nearest whole number.

29. **Vocabulary** Explain how you could check the answer to a division question in which there is a remainder.

   Multiply the quotient and the divisor, then add the remainder to the product. If the division was done correctly, the result will equal the dividend.

30. Yolanda is buying a car with a base price of $16,750. She must also pay the options, fees, and taxes shown. The car dealership will give her 48 months to pay off the entire amount. Yolanda can only afford to pay $395 each month. Will she be able to buy the car? Explain. No; the total cost of the car is $16,750 \( \div 2,295 = \) $19,045. If she pays $395 per month it will take 19,045 \( \div 395 = 48 \) R85 or 49 months to pay off the car, more than the car dealership will allow.

### HOT Focus on Higher Order Thinking

**Activity** Make a separate index card for each item in the table. Stack the index cards in four groups: context, dividend, divisor, and container. Have students work in groups of four. Have one student from each group pick a card from a different group. Then have the students write a real-world problem using the information on the index cards they selected. When they are ready, have the groups exchange the problems and solve them. Ask students to critique each other’s work offering suggestions.

<table>
<thead>
<tr>
<th>Eggs</th>
<th>16,234</th>
<th>22</th>
<th>Boxes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pieces of Candy</td>
<td>7,654</td>
<td>25</td>
<td>Bags</td>
</tr>
<tr>
<td>Pennies</td>
<td>19,213</td>
<td>42</td>
<td>Jars</td>
</tr>
<tr>
<td>Stickers</td>
<td>321,114</td>
<td>111</td>
<td>Baskets</td>
</tr>
</tbody>
</table>

### Jackson Auto Dealer

<table>
<thead>
<tr>
<th>4-door sedan</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>base price</td>
<td>$16,750</td>
</tr>
<tr>
<td>options</td>
<td>$    500</td>
</tr>
<tr>
<td>fees</td>
<td>$    370</td>
</tr>
<tr>
<td>taxes</td>
<td>$  1,425</td>
</tr>
</tbody>
</table>

### Work Area

- **Date:__**
- **Class:__**
- **Name:__**

---

© Houghton Mifflin Harcourt Publishing Company
Adding and Subtracting Decimals

Engage

ESSENTIAL QUESTION

How do you add and subtract decimals? Align decimal numbers on the decimal points so the place-value positions line up, then add or subtract as you would whole numbers.

Motivate the Lesson

Ask: Suppose you have $50, how much change would you receive if you bought a DVD that cost $27.99? Begin Explore Activity 1 to see how to solve this type of problem.

Explore

EXPLORE ACTIVITY

Engage with the Whiteboard

Show a decimal grid on the whiteboard. Have a volunteer shade the grid to represent the sum $0.32 + 0.45$. Have students use different colored pencils for each decimal. Point out to students that $100 - \text{(the sum)}$ is the same as the number of blocks left unshaded on the grid. Repeat with the sum $0.53 + 0.30$.

Explain

EXAMPLE 1

Connect Vocabulary

Remind students that decimal numbers represent combinations of whole numbers and numbers between whole numbers. The place-value chart can help them to understand, write, and compare decimal numbers. The values to the left of the decimal point are the whole numbers (thousands, hundreds, tens, and ones). The values to the right of the decimal point are the parts (tenths, hundredths, thousandths, ten-thousandths, etc.).

Questioning Strategies

- In Step 2, why was a zero added to 4.7? You use a zero as a placeholder so that both numbers have the same number of digits after their decimal points.

YOUR TURN

Avoid Common Errors

Students may try to align decimal numbers to the right instead of on the decimal point when adding in a vertical format. Remind them that the place-value positions in each number must line up.
Adding and Subtracting Decimals

**ESSENTIAL QUESTION**
How do you add and subtract decimals?

**EXPAND ACTIVITY**
6.NS.3

### Modeling Decimal Addition

You have probably used decimal grids to model decimals. For example, the decimal 0.25, or \( \frac{1}{4} \), can be modeled by shading 25 squares in a 10 × 10 grid. You can also use decimal grids to add decimal values.

A chemist combines 0.17 mL of water and 0.49 mL of hydrogen peroxide in a beaker. How much total liquid is in the beaker?

<table>
<thead>
<tr>
<th>A</th>
<th>How many grid squares should you shade to represent 0.17 mL of water? Why?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17; because 0.17 means 17 ( \frac{1}{100} )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B</th>
<th>How many grid squares should you shade to represent 0.49 mL of hydrogen peroxide?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>49; because 0.49 means 49 ( \frac{1}{100} )</td>
</tr>
</tbody>
</table>

| C | Use the grid at the right to model the addition. Use one color for 0.17 mL of water and another color for 0.49 mL of hydrogen peroxide. |

<table>
<thead>
<tr>
<th>D</th>
<th>How much total liquid is in the beaker? 0.17 + 0.49 = _ _ _ mL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.66 mL</td>
</tr>
</tbody>
</table>

### Reflect

**Multiple Representations**

Show how to shade each grid to represent the sum. Then find the sum.

1. 0.24 + 0.71 = \_ \_ \_ |
2. 0.08 + 0.65 = \_ \_ \_ |

**YOUR TURN**

Add.

5. 0.42 + 0.27 = \_ \_ \_ |
6. 0.61 + 0.329 = \_ \_ \_ |
7. 3.25 + 4.6 = \_ \_ \_ |
8. 17.27 + 3.88 = \_ \_ \_ |

### ADDING DECIMALS

Adding decimals is similar to adding whole numbers. First align the numbers by place value. Start adding at the right and regroup when necessary. Bring down the decimal point into your answer.

#### EXAMPLE 1

Susan rode her bicycle 3.12 miles on Monday and 4.7 miles on Tuesday. How many miles did she ride in all?

**STEP 1**

Align the decimal points.

<table>
<thead>
<tr>
<th></th>
<th>3</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>4</td>
<td>7</td>
<td>0</td>
</tr>
</tbody>
</table>

**STEP 2**

Add zeros as placeholders when necessary.

<table>
<thead>
<tr>
<th></th>
<th>3</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>4</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>+</td>
<td>7</td>
<td>8</td>
<td>2</td>
</tr>
</tbody>
</table>

**STEP 3**

Add from right to left.

Susan rode 7.82 miles in all.

**STEP 4**

Use estimation to check that the answer is reasonable. Round each decimal to the nearest whole number.

| 3.12 | 3 |
| 4.70 | 5 |
| 7.82 | 8 |

Since 8 is close to 7.82, the answer is reasonable.

### Reflect

3. Why can you rewrite 4.7 as 4.70?

Sample answer: 7 tenths has the same area model as 70 hundredths, so 4.7 = 4.70.

4. Why is it important to align the decimal points when adding?

Aligning the decimal points ensures that you are adding digits with the same place value.

### PROFESSIONAL DEVELOPMENT

#### Integrate Mathematical Practices MP.2

This lesson provides an opportunity to address the Mathematical Practices standard that calls for students to reason abstractly and quantitatively. Students will be adding and subtracting decimals using estimation to check the reasonableness of their solutions. Reasoning is applied throughout this lesson as students make decisions about the accuracy of their work as they compare their estimations to their actual solutions.

#### Math Background

Consider the fractional form of a problem such as 4.8 + 3.76 to help students understand why it is possible to align decimal points and add zeros to the right of decimals without changing their values.

\[ 4.8 + 3.76 = \frac{48}{10} + \frac{376}{100} = \frac{480}{100} + \frac{376}{100} \]

Showing the sum in this format relates directly to the addition of the decimals 4.80 and 3.76 and shows why the zero can be written to the right of the 8 without changing the value of the decimal.
EXAMPLE 2

Focus on Math Connections
Remind students that when you are finding the difference between two numbers always place the larger number on top.

Questioning Strategies  Mathematical Practices
• In Step 3, why is regrouping necessary? You need to regroup because 2 > 1. So, it is necessary to regroup a one as 10 tenths. After you regroup, you can subtract 2 from 11 to get 9.

Elaborate

Talk About It
Summarize the Lesson
Ask: What are the most important things to remember when adding or subtracting decimals? Sample answers: Align the decimal points, use zeros as placeholders so the decimals have the same number of place values, add or subtract from right to left, and regroup when necessary.

GUIDED PRACTICE
Engage with the Whiteboard
For Exercises 1–2, have students shade the grids to represent each sum on the whiteboard. Have them use two different colored markers to show each number clearly.
For Exercises 3–8, have students show how to estimate each sum on the whiteboard. Have them explain their choice of values when rounding.

Avoid Common Errors
Exercises 10–11 Remind students to use zeros as placeholders so that the numbers have the same number of place values.
Exercises 9–14 Students may try to align decimal numbers to the right instead of on the decimal point when adding or subtracting in a vertical format. Remind them that the place-value positions in each number must line up.
Subtracting Decimals

The procedure for subtracting decimals is similar to the procedure for adding decimals.

**EXAMPLE 2**

A. Mia is 160.2 centimeters tall. Rosa is 165.1 centimeters tall. How much taller is Rosa than Mia?

**STEP 1** Align the decimal points.

<table>
<thead>
<tr>
<th>Step 2</th>
<th>Add zeros as placeholders when necessary.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>1 6 1</td>
</tr>
<tr>
<td></td>
<td>1 6 0</td>
</tr>
<tr>
<td></td>
<td>4 9</td>
</tr>
</tbody>
</table>

**STEP 2** Subtract from right to left, regrouping when necessary.

Rosa is 4.9 centimeters taller than Mia.

To check that your answer is reasonable, you can estimate. Round each decimal to the nearest whole number.

165.1 - 160.2 = 4.9

Since 5 is close to 4.9, the answer is reasonable.

B. Matthew throws a discus 58.7 meters. Zachary throws the discus 56.12 meters. How much farther did Matthew throw the discus?

**STEP 1** Align the decimal points.

<table>
<thead>
<tr>
<th>Step 2</th>
<th>Add zeros as placeholders when necessary.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>5 8 7</td>
</tr>
<tr>
<td></td>
<td>5 6 1</td>
</tr>
<tr>
<td></td>
<td>2 5 8</td>
</tr>
</tbody>
</table>

**STEP 2** Subtract from right to left, regrouping when necessary.

Matthew threw the discus 2.58 meters farther than Zachary.

To check that your answer is reasonable, you can estimate. Round each decimal to the nearest whole number.

58.7 - 56.12 = 2.58

Since 3 is close to 2.58, the answer is reasonable.

**Guided Practice**

Shade the grid to find each sum. (Explore Activity)

1. 0.72 + 0.19 = 0.91
2. 0.38 + 0.4 = 0.78

Add. Check that your answer is reasonable. (Example 1)

3. 54.87 + 7.48 = 62.35
4. 2.19 + 34.92 = 37.11
5. 0.215 + 3.74 = 3.955

Subtract. Check that your answer is reasonable. (Example 2)

6. 9.73 - 7.16 = 2.57
7. 18.419 - 6.47 = 11.949
8. 5.006 - 3.2 = 1.806
9. 10.3 - 12.9 = 30.1
10. 28.341 + 37.5 = 65.841
11. 25.36 - 2.004 = 23.356
12. 15.52 - 8.17 = 7.35
13. 25.68 + 12 = 37.68
14. 150.25 - 78 = 72.25

15. Perry connects a blue garden hose and a green garden hose to make one long hose. The blue hose is 16.5 feet. The green hose is 14.75 feet. How long is the combined hose? (Example 1) 31.25 feet

16. Keisha has $20.08 in her purse. She buys a book for $8.72. How much does she have left? (Example 2) $11.36

17. How is adding and subtracting decimals similar to adding and subtracting whole numbers?

You align the digits by place value when you add or subtract decimals, just as you align digits for whole numbers.

**DIFFERENTIATE INSTRUCTION**

**Home Connection**

Have students look through newspaper ads, at home or in the library, for items that, when combined, total less than $50. Have them subtract their totals from $50 to find out how much change they would receive.

Sample answer: I found shoes for $12.95, a CD for $13.98, and a skateboard for $19.49. The total cost is $46.42. The amount of change I would get from $50.00 is $3.58.

**Critical Thinking**

Have students solve a magic square with decimals. A magic square is a square array of numbers in which each row, column, and diagonal have the same sum. Have students find the missing numbers in the following magic square. The sum is 10.2.

<table>
<thead>
<tr>
<th>0.3</th>
<th>7.1</th>
<th>0.5</th>
<th>2.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.3</td>
<td>1.1</td>
<td>3.7</td>
<td>0.1</td>
</tr>
<tr>
<td>1.7</td>
<td>1.3</td>
<td>4.1</td>
<td>3.1</td>
</tr>
<tr>
<td>2.9</td>
<td>0.7</td>
<td>1.9</td>
<td>4.7</td>
</tr>
</tbody>
</table>

**Additional Resources**

Differentiated Instruction includes:

- Reading Strategies
- Success for English Learners
- Reteach
- Challenge

**ESSENTIAL QUESTION CHECK-IN**

17. How is adding and subtracting decimals similar to adding and subtracting whole numbers?

You align the digits by place value when you add or subtract decimals, just as you align digits for whole numbers.
**5.2 LESSON QUIZ 6.NS.3**

**Add or subtract.**

1. $55.867 + 25.6$
2. $8.71 - 4.306$
3. $86 - 9.71$
4. $3.22 + 45.006 + 51.9$
5. Trey has $19.76 in his wallet. He buys a pack of gum for $1.79 and a bottle of water for $2.34. How much money does Trey have left?

Lesson Quiz example available online

**Answers**
1. 81.467
2. 4.404
3. 76.29
4. 100.126
5. $15.63

---

**Evaluate**

**GUIDED AND INDEPENDENT PRACTICE**

**Concepts and Skills**

<table>
<thead>
<tr>
<th>Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercises 1–2</td>
</tr>
<tr>
<td>Exercises 3–5, 9–10, 13, 15</td>
</tr>
<tr>
<td>Exercises 6–8, 11–12, 14, 16</td>
</tr>
</tbody>
</table>

**Concepts and Skills**

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Depth of Knowledge (D.O.K.)</th>
<th>Mathematical Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>18–25</td>
<td>2 Skills/Concepts</td>
<td>MP.2 Reasoning</td>
</tr>
<tr>
<td>26–30</td>
<td>2 Skills/Concepts</td>
<td>MP.4 Modeling</td>
</tr>
<tr>
<td>31</td>
<td>3 Strategic Thinking</td>
<td>MP.2 Reasoning</td>
</tr>
<tr>
<td>32</td>
<td>3 Strategic Thinking</td>
<td>MP.7 Using Structure</td>
</tr>
<tr>
<td>33–34</td>
<td>4 Extended Thinking</td>
<td>MP.3 Logic</td>
</tr>
</tbody>
</table>

**Additional Resources**

- Differentiated Instruction includes:
  - Leveled Practice worksheets
31. A CD of classical guitar music contains 5 songs. The length of each song is in the table.

<table>
<thead>
<tr>
<th>Track</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.5 minutes</td>
</tr>
<tr>
<td>2</td>
<td>8 minutes</td>
</tr>
<tr>
<td>3</td>
<td>3.93 minutes</td>
</tr>
<tr>
<td>4</td>
<td>4.1 minutes</td>
</tr>
<tr>
<td>5</td>
<td>5.05 minutes</td>
</tr>
</tbody>
</table>

a. Between each song is a 0.05-minute break. How long does it take to listen to the CD from the beginning of the first song to the end of the last song? 27.78 minutes

b. What If? Juan wants to buy the CD from an Internet music site. He downloads the CD onto a disc that can hold up to 60 minutes of music. How many more minutes of music can he still buy after downloading the CD? 32.22 minutes

32. Analyze Relationships Use the decimals 2.47, 9.57, and 7.1 to write two different addition facts and two different subtraction facts.

\[
\begin{align*}
2.47 + 9.57 & = 11.94 \\
9.57 - 7.1 & = 2.47
\end{align*}
\]

33. Communicate Mathematical Ideas The Commutative Property of Addition states that you can change the order of addends in a sum. The Associative Property of Addition states that you can change the grouping of addends in a sum. Use an example to show how the Commutative Property of Addition and the Associative Property of Addition apply to adding decimals.

Sample answer: The sum of 2.55 + (3.72 + 1.45) = 2.55 + 5.17 = 7.72. Using the Commutative Property, the sum can be written as 2.55 + (1.45 + 3.72) = 7.72, and using the Associative Property, the sum can be written as (2.55 + 1.45) + 3.72 = 7.72.

34. Critique Reasoning Indira predicts that the actual difference of 19 − 7.82 will be greater than the estimate of 19 − 8 = 11. Is Indira correct? Explain how Indira might have arrived at that prediction without subtracting the actual numbers.

Yes. The number being subtracted is rounded up.

Subtracting a greater number results in a smaller difference than the actual difference.

EXTEND THE MATH

Activity Have students create a brief menu with 10 items and prices. Then have them exchange menus and select 3–4 items to purchase for a meal. Next, have students find the total cost of the meal including tax and a tip. Finally, have students determine the amount of change they would receive if they had $50 to pay for their meal.

Students can also be encouraged to bring in take-out menus from area restaurants to use for this activity.
Multiplying Decimals

Common Core Standards
The student is expected to:
- **The Number System—6.NS.3**
  Fluently add, subtract, multiply and divide multi-digit decimals using the standard algorithm for each operation.

Mathematical Practices
- **MP.5** Using Tools

Engage

**ESSENTIAL QUESTION**
*How do you multiply decimals?* Sample answer: First, multiply as you do whole numbers and then place the decimal point in the product. The number of decimal places in the product equals the sum of the number of decimal places in the factors.

**Motivate the Lesson**
*Ask:* Potato salad costs $1.29 per pound at the deli counter. About how much do you think 4.5 pounds of potato salad will cost? Begin the Explore Activity to learn how to multiply two decimals.

Explore

**EXPLORE ACTIVITY 1**
*Focus on Modeling* **Mathematical Practices**
In B, make sure students understand that the model shows the whole part as large unit squares and the decimal part as smaller rectangles and tiny squares. Each smaller rectangle represents a tenth of a unit square, and each tiny square represents a hundredth of a unit square.

Explain

**EXAMPLE 1**
*Avoid Common Errors*
When multiplying decimals, students sometimes try to place decimal points in partial products. Remind students to complete the entire multiplication before placing the decimal point in the final product.

*Questioning Strategies* **Mathematical Practices**
- Why does the answer have only two decimal places when there should be three decimals based on the multiplication? Money is usually written to two decimals, or to the nearest penny.
- If the third decimal place had a number other than zero, how would you round the number in the hundredths place? A number greater than or equal to 5 rounds the hundredths place up, and a number less than 5 rounds the hundredths place down.

**ADDITIONAL EXAMPLE 1**
Wanda wants to buy 4.35 pounds of chicken salad. The grocery store sells chicken salad for $2.29 a pound. How much does the chicken salad cost?
$9.96

Interactive Whiteboard
*Interactive example available online*

my.hrw.com
Multiplying Decimals

To multiply decimals, first multiply as you would with whole numbers. Then place the decimal point in the product. The number of decimal places in the product equals the sum of the number of decimal places in the factors.

**Example 1**

Delia bought 3.8 pounds of peppers. The peppers cost $1.99 per pound. What was the total cost of Delia’s peppers?

\[ 1.99 \times 3.8 \]

The peppers cost $7.56.

**Reflect**

1. **Communicate Mathematical Ideas** How can you use estimation to check that you have placed the decimal point correctly in your product?

   Estimate to check if your answer is reasonable. For example, if your product is $75.62 and your estimate was 8, then you have likely placed the decimal point incorrectly.

**YOUR TURN**

3. \[ 12.6 \times 15.3 \]

4. \[ 9.76 \times 0.46 \]

**Math Background**

Multiplying decimals is similar to multiplying whole numbers, except for the extra step of correctly placing the decimal point. Simply count the number of decimal places in the factors being multiplied. Then place the decimal point so that the number of decimal places in the product is same as the total number in the factors.

Note that the term *decimal places* refers to the places to the *right* of the decimal point: tenths, hundredths, thousandths, and so on.
YOUR TURN
Engage with the Whiteboard
Have students make a decimal grid to model the problems and check their work.

Avoid Common Errors
Some students have trouble placing the decimal point in the final product. Remind students to count from right to left when placing the decimal point in the final product.

EXAMPLE 2

Questioning Strategies Mathematical Practices

• Since grass can grow at different rates at different times of the year or in different locations, what does the rate of 3.75 inches per month mean? The rate of 3.75 inches per month represents an average rate of growth.

• When estimating, if you round both of the factors up, what can you say about your estimated answer? Your estimate will be greater than the actual product, because you multiplied two greater numbers.

Talk About it
Check for Understanding

Ask: When do you think estimation can be helpful? When an approximate answer is all that is needed, or when it is a good idea to check for a mistake, such as incorrect decimal placement in a product.

YOUR TURN
Connect to Daily Life Mathematical Practices

For Exercise 7, have students estimate the answer before finding the product. Consider discussing how estimation can be a useful tool for planning everyday activities, such as budgeting an allowance or scheduling work/study time.

Elaborate

Talk About It
Summarize the Lesson

Ask: How do you multiply decimals? Multiply decimals as you do whole numbers and then place the decimal point by counting the total number of decimal places in the factors.

GUIDED PRACTICE
Engage with the Whiteboard

For Exercises 3–10, have students underline and count each decimal place to find the number of decimal places in the answer. This activity can be performed before starting any multiplication.

Avoid Common Errors

Exercises 3–8 If students have difficulty placing the decimal point in the final product, remind them to count from right to left when placing the decimal point in the final product.

Exercises 9–10 Remind students that answers involving money should be rounded to the nearest hundredth.
Estimating to Check Reasonableness

In Example 1, you used estimation to check whether the decimal point was placed correctly in the product. You can also use estimation to check that your answer is reasonable.

**Example 2**

Blades of grass grow 3.75 inches per month. If the grass continues to grow at this rate, how much will the grass grow in 6.25 months?

- 3.75 ← 2 decimal places
- × 6.25 ← 2 decimal places
- 1875
- + 225000
- 23.4375 ← 4 decimal places

The grass will grow 23.4375 inches in 6.25 months. Estimate to check whether your answer is reasonable.

Round 3.75 to the nearest whole number: 4
Round 6.25 to the nearest whole number: 6
Multiply the whole numbers: \(4 \times 6 = 24\)
The answer is reasonable because 24 is close to 23.4375.

**Your Turn**

1. Multiply.
   - 5. 7.14 × 6.78 = 49.980
   - 6. 11.49 × 11.49 = 80.43
   - 7.5712
   - + 428400
   - 484092
   - 8. Use estimation to show that your answer to 7 is reasonable.
     - Sample answer: Round 15.5 to 15 and 2.5 to 3;
     - \(15 \times 3 = 45\); 45 is close to 38.75.

Guided Practice

1. Use the grid to multiply \(0.4 \times 0.7\). (Explore Activity)
   - \(0.4 \times 0.7 = 0.28\)

2. Draw an area model to multiply \(1.1 \times 2.4\). (Explore Activity)
   - \(1.1 \times 2.4 = 2.64\)

3. Multiply. (Example 1 and Example 2)
   - 3. \(0.18 \times 0.06 = 0.0108\)
   - 4. \(35.15 \times 3.7 = 130.055\)
   - 5. \(0.96 \times 0.12 = 0.1152\)
   - 6. \(62.19 \times 3.25 = 202.175\)
   - 7. \(3.4 \times 4.37 = 14.858\)
   - 8. \(3.762 \times 0.66 = 2.48292\)

9. Chan Hee bought 3.4 pounds of coffee that cost $6.95 per pound.
   - How much did he spend on coffee? $23.63

10. Adita earns $9.40 per hour working at an animal shelter.
    - How much money will she earn for 18.5 hours of work? $173.90

Catherine tracked her gas purchases for one month.

11. How much did Catherine spend on gas in week 2?
    - $29.21

12. How much more did she spend in week 4 than in week 1? $1.06

13. How can you check the answer to a decimal multiplication problem?
    - Divide the product by one of the decimals. The quotient should be the other decimal value.

**Differentiate Instruction**

**Visual Cues**

Have students use a colored pencil to write the number of decimal places next to each factor. Have them write the sum of these numbers next to the space in which they would write the answer. This helps students who forget to place the decimal or forget to add the decimal places for each factor.

**Critical Thinking**

Review how a decimal changes when it is multiplied by 10, 100, and 1,000. Then have students find rules for multiplying by 0.1, 0.01, and 0.001. They should see that the decimal point moves but the digits stay the same.

When multiplying by 0.1, the decimal point moves left one place;
0.01, the decimal point moves left two places;
0.001, the decimal point moves left three places.

Zeros may be needed after the decimal point, as they are needed before the decimal point of numbers multiplied by 10, 100, and 1,000. For example, \(12.3 \times 0.001 = 0.0123\).
**Evaluate**

**GUIDED AND INDEPENDENT PRACTICE**

6.NS.3

### Concepts & Skills

<table>
<thead>
<tr>
<th>Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercises 1–2</td>
</tr>
<tr>
<td>Exercises 3–12, 20–23</td>
</tr>
<tr>
<td>Exercises 14–18, 26</td>
</tr>
</tbody>
</table>

#### Explore Activity

**Modeling Decimal Multiplication**

#### Example 1

**Multiplying Decimals**

#### Example 2

**Estimating to Check Reasonableness**

### Exercise Depth of Knowledge (D.O.K.)

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Depth of Knowledge (D.O.K.)</th>
<th>Mathematical Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>14–16</td>
<td>2 Skills/Concepts</td>
<td>MP.4 Modeling</td>
</tr>
<tr>
<td>17–19</td>
<td>2 Skills/Concepts</td>
<td>MP.5 Using Tools</td>
</tr>
<tr>
<td>20–21</td>
<td>2 Skills/Concepts</td>
<td>MP.4 Modeling</td>
</tr>
<tr>
<td>22</td>
<td>3 Strategic Thinking</td>
<td>MP.3 Logic</td>
</tr>
<tr>
<td>23–25</td>
<td>2 Skills/Concepts</td>
<td>MP.5 Using Tools</td>
</tr>
<tr>
<td>26</td>
<td>3 Strategic Thinking</td>
<td>MP.6 Precision</td>
</tr>
<tr>
<td>27</td>
<td>3 Strategic Thinking</td>
<td>MP.7 Using Structure</td>
</tr>
<tr>
<td>28</td>
<td>3 Strategic Thinking</td>
<td>MP.4 Modeling</td>
</tr>
<tr>
<td>29</td>
<td>3 Strategic Thinking</td>
<td>MP.8 Patterns</td>
</tr>
</tbody>
</table>

### Additional Resources

**Differentiated Instruction** includes:

- Leveled Practice Worksheets
Kay goes for several bike rides one week. The table shows her speed and the number of hours spent per ride.

<table>
<thead>
<tr>
<th>Speed (in miles per hour)</th>
<th>Hours Spent on Bike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>8.2, 4.25</td>
</tr>
<tr>
<td>Tuesday</td>
<td>9.6, 3.1</td>
</tr>
<tr>
<td>Wednesday</td>
<td>11.1, 2.8</td>
</tr>
<tr>
<td>Thursday</td>
<td>10.75, 1.9</td>
</tr>
<tr>
<td>Friday</td>
<td>8.8, 3.75</td>
</tr>
</tbody>
</table>

23. How many miles did Kay bike on Thursday? 20.425 miles
24. On which day did Kay bike a whole number of miles? Friday
25. What is the difference in miles between Kay’s longest bike ride and her shortest bike ride? 14.425 miles

Kay estimates that Wednesday’s ride was about 3 miles longer than Tuesday’s ride. Is her estimate reasonable? Explain.
Yes; on Wednesday she rode about 11 miles per hour for about 3 hours, and $11 \times 3 = 33$. On Tuesday she rode about 10 miles per hour for about 3 hours, and $10 \times 3 = 30$.

Explain the Error
To estimate the product $3.48 \times 7.33$, Marisa multiplied $4 \times 8$ to get 32. Explain how she can make a closer estimate.
3.48 is closer to 3 and 7.33 is closer to 7; $3 \times 7 = 21$

Represent Real-World Problems
A jeweler buys gold jewelry and resells the gold to a refinery. The jeweler buys gold for $1,235.55 per ounce, and then resells it for $1,376.44 per ounce. How much profit does the jeweler make from buying and reselling 73.5 ounces of gold?
$10,355.42$

Problem Solving
To find the weight of the gold in a 22 karat gold object, multiply the object’s weight by 0.917. To find the weight of the gold in an 18 karat gold object, multiply the object’s weight by 0.583. A 22 karat gold statue and a 14 karat gold statue both weigh 73.5 ounces. Which one contains more gold? How much more gold does it contain?
The 22 karat gold statue; 24.549 ounces
**Engage**

**ESSENTIAL QUESTION**

*How do you divide decimals?* Sample answer: If necessary, first multiply the dividend and the divisor by the same power of 10 so that the divisor is a whole number. Then divide as you would normally do when dividing a number by a whole number, placing the decimal point in the quotient directly above the decimal point in the dividend.

**Motivate the Lesson**

*Ask:* You are saving $3.75 each week to buy a DVD that costs $26.79, including tax. For how many weeks will you need to save? Begin the Explore Activity to find out how to divide decimals.

**Explore**

**EXPLORE ACTIVITY**

**Engage with the Whiteboard**

For A, have a student show how 3 equal groups can be formed using the given shaded model by circling each group with a different color.

**Focus on Modeling**

Make sure students understand the partially shaded grid in A shows 39 hundredths, and 39 hundredths divided by 3 is 13 hundredths. So the quotient is 2 complete grids plus 13 hundredths of a grid, or 2.13.

**Explain**

**EXAMPLE 1**

**Connect Vocabulary**

Remind students that in a division problem the **dividend** is the number to be divided, the **divisor** is the number you are dividing by, and the **quotient** is the result. Divisors, dividends, and quotients in this lesson may be whole numbers or decimal numbers.

**Questioning Strategies**

- What rule can you write to explain the correct placement of a decimal in a quotient when a decimal is divided by a whole number, as in A? Place the decimal point in the quotient directly above the decimal point in the dividend.
- Explain why multiplication is a logical way to check the answer in B. Multiplication is the inverse operation for division. So, $14 \times 10.99 = 153.86$.

**YOUR TURN**

**Avoid Common Errors**

When dividing decimals, students sometimes align digits incorrectly and produce an answer that has the decimal point in the wrong place. Have students use grid paper (or lined paper turned sideways) to help align the digits correctly.
**Example 1**

A high school track is 9.76 meters wide. It is divided into 8 lanes of equal width for track and field events. How wide is each lane?

Divide using long division as with whole numbers.

Place a decimal point in the quotient directly above the decimal point in the dividend.

Each lane is 1.22 meters wide.

Aerobics classes cost $153.86 for 14 sessions. What is the fee for one session?

Divide using long division as with whole numbers.

Place a decimal point in the quotient directly above the decimal point in the dividend.

The fee for one aerobics class is $10.99.

Reflect

2. Check for Reasonableness
   How can you estimate to check that your quotient in A is reasonable?
   Round 9.76 to 10 and divide by 8. Since 8 goes into 10 once with a small remainder, the answer 1.22 is reasonable.

Multiply

10.99 × 14. Since 10.99 × 14 = 153.86, the answer is correct.

Math Background

The Hindu-Arabic numerals 1 through 9 that we use today are based on older symbols known to have been used as early as 250 B.C.E. By 595 C.E., all numbers were written using the symbols for 1 through 9. The place in which each symbol was written gave the number its value. The symbol that was written in an empty place, zero, was believed to have been first used in 876 C.E.
EXAMPLE 2

Connect Vocabulary ELL
Remind students that a power of 10 is a number such as 10, 100, 1,000, or 10,000 that results from 10 being multiplied by itself.

Questioning Strategies Mathematical Practices
• How is the procedure for finding $3.25 ÷ 0.5$ different from the procedure for finding $3.25 ÷ 5$? For $3.25 ÷ 5$, you can divide as with whole numbers and place the decimal point in the quotient. For $3.25 ÷ 0.5$, it is necessary to multiply the divisor and dividend by the same power of 10 before doing the division.
• How do you know what power of ten to multiply the divisor and dividend by? Multiply both numbers by the least power of ten that will make the divisor a whole number.

Focus on Critical Thinking Mathematical Practices
Point out to students that multiplying the divisor and the dividend by the same number does not change the quotient. For example, $42 ÷ 6 = 7$; $420 ÷ 60 = 7$; $4,200 ÷ 600 = 7$.

YOUR TURN

Avoid Common Errors
Some students may position the decimal point in the quotient before multiplying the divisor and dividend by a power of ten. Remind them that the decimal point is positioned only after multiplication by a power of ten has occurred.

Elaborate

Talk About It
Summarize the Lesson
Ask: How do you divide decimals? To divide a decimal by a whole number, divide as with two whole numbers and place the decimal point in the quotient. To divide a decimal by a decimal, multiply the divisor and the dividend by the same power of 10 to make the divisor an a whole number, divide as with whole numbers, and then place the decimal point in the quotient.

GUIDED PRACTICE

Engage with the Whiteboard
For Exercises 2–3, have a student move the decimal point the same number of places in the divisor and the dividend. Then have another student place the decimal point in its correct position above the long division bar before any division steps are performed.

Avoid Common Errors
Exercises 2–4 Some students may position the decimal point in the quotient before multiplying the divisor and the dividend by a power of ten. Remind them that the decimal point is positioned only after multiplication by a power of ten has occurred.
Exercises 7–14 Some students interchange the divisor and the dividend when translating a problem of the form $a ÷ b$ into the form $b \div a$. Remind them that the number after the division sign, $\div$, or the number outside the division house, $\bar{a}$, is always the divisor.
Dividing a Decimal by a Decimal

When dividing a decimal by a decimal, first change the divisor to a whole number by multiplying by a power of 10. Then multiply the dividend by the same power of 10.

**EXAMPLE**

Ella uses 0.5 pound of raspberries in each raspberry cake that she makes. How many cakes can Ella make with 3.25 pounds of raspberries?

**STEP 1** The divisor has one decimal place, so multiply both the dividend and the divisor by 10 so that the divisor is a whole number.

\[0.5 \times 10 = 5\]

\[0.325 \times 10 = 32.5\]

Ella can make 6 cakes.

**STEP 2** Divide.

\[\frac{5}{32.5} = \frac{2}{6.5}\]

**YOUR TURN**

Anthony spent $11.52 for some pens that were on sale for $0.72 each. How many pens did Anthony buy?

**STEP 1** The divisor has two decimal places, so multiply both the dividend and the divisor by 100 so that the divisor is a whole number.

\[0.72 \times 100 = 72\]

\[0.1152 \times 100 = 11.52\]

Anthony bought 16 pens.

**Guided Practice**

Divide. (Explore Activity, Examples 1 and 2)

1. \(47.295 \div 7 = 6.75\)
2. \(3.17 \div 10 = 0.31\)
3. \(24.7168 \div 7 = 3.531\)
4. \(0.96 \div 0.14 = 6.8\)
5. \(38.5 \div 0.5 = 77\)
6. \(23.85 \div 9 = 2.65\)
7. \(5.6372 \div 0.17 = 33.16\)
8. \(8.19 \div 4.2 = 1.95\)
9. \(66.5 \div 3.5 = 19\)
10. \(0.234 \div 0.78 = 0.3\)
11. \(78.74 \div 12.7 = 6.2\)
12. \(36.45 \div 0.09 = 405\)
13. \(90 \div 0.36 = 250\)
14. \(18.88 \div 1.6 = 11.8\)
15. Corrine has 9.6 pounds of trail mix to divide into 12 bags. How many pounds of trail mix will go in each bag?

0.8 pound

16. Michael paid $11.48 for sliced cheese at the deli counter. The cheese cost $2.73 per gallon. How much cheese did Michael buy?

3.5 pounds

17. A four-person relay team completed a race in 72.4 seconds. On average, what was each runner’s time?

18.1 seconds

18. Elizabeth has a piece of ribbon that is 4.5 meters long. She wants to cut it into pieces that are 0.25 meter long. How many pieces of ribbon will she have?

18 pieces

19. Lisa paid $43.95 for 16.1 gallons of gasoline. What was the cost per gallon, rounded to the nearest hundredth?

$2.73 per gallon

20. One inch is equivalent to 2.54 centimeters. How many inches are there in 50.8 centimeters?

20 inches

**ESSENTIAL QUESTION CHECK-IN**

21. When you are dividing two decimals, how can you check whether you have divided the decimals correctly?

Multiply the divisor by the quotient. The product should match the dividend.

**DIFFERENTIATE INSTRUCTION**

**Visual Cues**

If students are having difficulty keeping division problems organized, encourage them to use graph paper for setting up and working on the problems. Have them write each digit in a separate square to maintain the alignment of columns and rows.

Students also can use lined paper turned sideways to help align the digits correctly if they don’t have graph paper.

**Kinesthetic Experience**

Have students work in groups of three or four. Give each group a set of index cards labeled 0–9. Have the groups mix and place the cards face down in a pile. Students should then draw three cards to make a dividend and two cards to make a divisor. Have students take turns determining where to place decimal points in each number and then do the division individually. Group members should compare answers and work a problem together if they do not get the same quotient.

**Additional Resources**

**Differentiated Instruction** includes:

- Reading Strategies
- Success for English Learners
- Reteach
- Challenge
Evaluate

GUIDED AND INDEPENDENT PRACTICE

6.NS.3

Concepts & Skills | Practice
---|---
**Explore Activity**
Modeling Decimal Division | Exercises 1, 6

**Example 1**
Dividing Decimals by Whole Numbers | Exercises 1, 6, 15, 22–23

**Example 2**
Dividing a Decimal by a Decimal | Exercises 2–5, 7–14, 16–20, 24–26, 28–31

### Additional Resources

Differentiated Instruction includes:
- Leveled Practice Worksheets

---

5.4 LESSON QUIZ

6.NS.3

**Divide.**

1. $7 \div 0.91$
2. $0.6 \div 1.38$
3. $0.08 \div 9.6$
4. $33.475 \div 0.65$
5. $2.46 \div 12.3$

6. Corrine bought 8.4 pounds of almonds. She divided them into 30 snack-size bags. How many pounds are in each bag?

*Lesson Quiz example available online*

**Answers**

1. 0.13
2. 2.3
3. 120
4. 51.5
5. 0.2
6. 0.28 pound
© Houghton Mifflin Harcourt Publishing Company

5.4 Independent Practice

Use the table for 22 and 23.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Mugs</th>
<th>T-shirts</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>$107.25</td>
<td>$237.50</td>
</tr>
<tr>
<td>50</td>
<td>$195.51</td>
<td>$441.00</td>
</tr>
<tr>
<td>75</td>
<td>$261.75</td>
<td>$637.50</td>
</tr>
<tr>
<td>100</td>
<td>$329.00</td>
<td>$829.00</td>
</tr>
</tbody>
</table>

22. What is the price per mug for 25 coffee mugs? $4.29
23. Find the price per T-shirt for 75 T-shirts. $8.50

A movie rental website charges $5.00 per month for membership and $1.25 per movie.

24. How many movies did Andrew rent this month if his bill was $16.25? 9 movies
25. Manissa has $18.50 this month to spend on movie rentals.
   a. How many movies can she view this month? 10 movies
   b. Critique Reasoning Manissa thinks she can afford 11 movies in one month. What mistake could she be making? She could be rounding 10.8 up to 11, but she doesn’t have enough money for 11 movies.

Victoria went shopping for ingredients to make a stew. The table shows the weight and the cost of each of the ingredients that she bought.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Weight (in pounds)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potatoes</td>
<td>6.3</td>
<td>$7.56</td>
</tr>
<tr>
<td>Carrots</td>
<td>8.5</td>
<td>$15.30</td>
</tr>
<tr>
<td>Beef</td>
<td>4</td>
<td>$9.56</td>
</tr>
<tr>
<td>Bell peppers</td>
<td>2.50</td>
<td>$1.25</td>
</tr>
</tbody>
</table>

26. What is the price for one pound of bell peppers? $0.50
27. Which ingredient costs the most per pound? beef
28. What If? If carrots were $0.50 less per pound, how much would Victoria have paid for 8.5 pounds of carrots? $11.05

29. Brenda is planning her birthday party. She wants to have 10.92 liters of punch, 6.5 gallons of ice cream, 3.9 pounds of fudge, and 25 guests at the birthday party.
   a. Brenda and each guest drink the same amount of punch. How many liters of punch will each person drink? 0.42
   b. Brenda and each guest eat the same amount of ice cream. How many gallons of ice cream will each person eat? 0.25
   c. Brenda and each guest eat the same amount of fudge. How many pounds of fudge will each person eat? 0.15

To make costumes for a play, Cassidy needs yellow and white fabric that she will cut into strips. The table shows how many yards of each fabric she needs, and how much she will pay for those yards.

<table>
<thead>
<tr>
<th>Fabric</th>
<th>Yards</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow</td>
<td>12.8</td>
<td>$86.40</td>
</tr>
<tr>
<td>White</td>
<td>9.5</td>
<td>$45.60</td>
</tr>
</tbody>
</table>

30. Which costs more per yard, the yellow fabric or the white fabric? yellow
31. Cassidy wants to cut the yellow fabric into strips that are 0.3 yards wide. How many strips of yellow fabric can Cassidy make? 42 strips

FOCUS ON HIGHER ORDER THINKING

32. Problem Solving Eight friends purchase various supplies for a camping trip and agree to share the total cost equally. They spend $85.43 on food, $32.75 on water, and $239.66 on other items. How much does each person owe? $44.73
33. Analyze Relationships Constance is saving money to buy a new bicycle that costs $195.75. She already has $40 saved and plans to save $8 each week. How many weeks will it take her to save enough money to purchase the bicycle? 20 weeks
34. Represent Real-World Problems A grocery store sells twelve bottles of water for $13.80. A convenience store sells ten bottles of water for $11.80. Which store has the better buy? Explain. The grocery store; each bottle costs $1.15, while each bottle at the convenience store costs $1.18.

EXTEND THE MATH

Activity Write a decimal division word problem with no hundredths.

Sample answer: Lana uses 0.2 pounds of peaches in each mini-pie she makes. How many mini-pies can she make with 2.5 pounds of peaches? $2.5 ÷ 0.2 = 12.5$, so she can make 12 mini-pies.

Decide whether or not grids divided into tenths would be useful to help solve it. Explain your reasoning.

Grids divided into tenths would be useful to represent this kind of problem, since there are no hundredths in the dividend or the divisor.
LESSON 5.5 Applying Operations with Rational Numbers

Common Core Standards
The student is expected to:

- **The Number System—6.NS.3** Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

Mathematical Practices

- **MP.1** Problem Solving

ESSENTIAL QUESTION
How can you solve problems involving multiplication and division of fractions and decimals? Sample answer: First, write both numbers in the same form, either fractions or decimals. Then multiply or divide the numbers.

Motivate the Lesson
Ask: Suppose you are buying party favors for a birthday party and you have $25.50 to spend. If each favor cost $1.50 how many favors can you buy? Begin Example 1 to see how to divide decimals to find out.

Explore

Engage with the Whiteboard
Using a visual model may help students remember how to find fraction and decimal equivalents. Draw a number line from −5 to 5 on the whiteboard. Plot some common fractions and decimals, such as $-0.20$, $0.25$, $-\frac{1}{3}$, $\frac{1}{2}$, $-0.5$, $\frac{3}{4}$, $1\frac{1}{2}$, and $-2\frac{1}{4}$. Then ask students to write the decimal or fraction equivalent for each rational number.

Explain

EXAMPLE 1
Focus on Math Connections
Remind students that when the divisor is a decimal, they should multiply both the divisor and the dividend by the same power of ten to make the divisor a whole number.

Questioning Strategies
- In Formulate a Plan, why is it necessary to add 2.5 and 4.25 before dividing? To find Naomi’s hour rate, you need to divide by the total number of hours she worked.

YOUR TURN
Avoid Common Errors
Some students interchange the divisor and dividend when translating a problem in the form $a \div b$ into the form $b\overline{a}$. Remind students that the number after the division sign, $\div$, or the number outside the division house, $\underline{a}$, is always the divisor.

EXAMPLE 2
Connect Vocabulary
Discuss how a multipart question is a question with related parts, such as an exercise with parts labeled A and B. Point out that since Roz got $\frac{1}{2}$ of the parts correct, the question must have had an even number of parts, such as 2 or 4.

Questioning Strategies
- How could you check to if your answer is reasonable? Round 37.5 to 38. Half of 38 is 19, so 18.75 is a reasonable answer.

YOUR TURN
Questioning Strategies
- Why might it be practical to use decimals? Money is usually expressed as decimals.
**Interpreting a Word Problem**

When you solve a word problem involving rational numbers, you often need to think about the problem to decide which operations to use.

**EXAMPLE 1**

Naomi earned $54 mowing lawns in two days. She worked 2.5 hours yesterday and 4.25 hours today. If Naomi was paid the same amount for every hour she worked, how much did she earn per hour?

**Analyze Information**

- Naomi made $54 mowing lawns.
- Naomi worked 2.5 hours yesterday and 4.25 hours today.
- You are asked to find how much she earned per hour.

**Formulate a Plan**

- The total amount she earned divided by the total hours she worked gives the amount she earned per hour.
- Use the expression $54 \div (2.5 + 4.25)$ to find the amount she earned per hour.

**Solve**

Follow the order of operations.

\[
(2.5 + 4.25) = 6.75 \quad \text{Add inside parentheses.}
\]

\[
54 \div 6.75 = 8 \quad \text{Divide.}
\]

Naomi earned $8 per hour mowing lawns.

**Justify and Evaluate**

You added 2.5 and 4.25 first to find the total number of hours worked. Then you divided 54 by the sum to find the amount earned per hour.

---

**Converting Fractions and Decimals to Solve Problems**

Recall that you can use a number line to find equivalent fractions and decimals. If a fraction and a decimal are equivalent, they are represented by the same point on a number line.

**EXAMPLE 2**

Each part of a multipart question on a test is worth the same number of points. The whole question is worth 37.5 points. Roz got $\frac{3}{4}$ of the parts of a question correct. How many points did Roz receive?

**Solution 1**

Convert the decimal to a fraction greater than 1.

\[
\frac{1}{2} \times 37.5 = \frac{1}{2} \times \frac{75}{2} = \frac{75}{4} = 18.75 \quad \text{Write} \; 37.5 \text{as} \; \frac{75}{4} \quad \text{or} \quad 18.75.
\]

Roz received 18.75 points.

**Solution 2**

Convert the fraction to a decimal.

\[
\frac{1}{2} \times 37.5 = 0.5 \times 37.5 \quad \text{Roz received} \; 18.75 \text{points.}
\]

**YOUR TURN**

1. Casey buys 6.2 yards of blue fabric and 5.4 yards of red fabric. If the blue and red fabric cost the same amount per yard, and Casey pays $58 for all of the fabric, what is the cost per yard?

   \[
   \frac{58}{11.6} = 5 \quad \text{dollars per yard.}
   \]

2. The bill for a pizza was $14.50. Charles paid for $\frac{1}{3}$ of the bill. Show two ways to find how much he paid.

   \[
   \frac{14.5}{3} = \frac{29}{6} = 4.8333 \ldots \quad \text{or} \quad 14.5 \times 0.3333 \ldots = 4.8333 \ldots
   \]

**Differentiate Instruction**

**Number Sense**

Students often know common decimal and fractional equivalents. However, decimals greater than one can be confusing. Point out that the digits to the **left** of the decimal are the whole-number part of the mixed-number equivalent, while the digits to the **right** are the fractional part of the mixed-number equivalent.

\[
12.75 = 12\frac{3}{4} \quad \text{and} \quad -53.60 = -53\frac{3}{5}
\]

**Kinesthetic Experience**

Have students work in groups of three or four. Give each group a set of index cards labeled 0–9. Have the groups mix and place the cards face down in a pile. Students should then draw three cards to make a dividend and two cards to make a divisor. Have students take turns determining where to place the decimal points in each number and then do the division individually. Group members should compare answers and work a problem together if they do not all get the same quotient.

**Additional Resources**

**Differentiated Instruction** includes:

- Reading Strategies
- Success for English Learners
- Reteach
- Challenge

**ELL**

**PRE-AP**
**Elaborate**

**Talk About It**
Summarize the Lesson

**Ask:** How can you solve problems that include both fractions and decimals?

**Convert** either the fractions or the decimals so that all the numbers are expressed in the same form. Then perform the necessary computations according to the order of operations.

**GUIDED PRACTICE**

**Engage with the Whiteboard**

For Exercises 1–2, have students identify the important information and write an expression to represent each situation on the whiteboard. Then have the students solve the problems using the order of operations.

**Evaluate**

**GUIDED AND INDEPENDENT PRACTICE**

<table>
<thead>
<tr>
<th>Concepts &amp; Skills</th>
<th>Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example 1</td>
<td>Exercise 1</td>
</tr>
<tr>
<td>Interpreting a Word Problem</td>
<td></td>
</tr>
<tr>
<td>Example 2</td>
<td>Exercise 2</td>
</tr>
<tr>
<td>Converting Fractions and Decimals to Solve Problems</td>
<td></td>
</tr>
</tbody>
</table>

**Exercise** | **Depth of Knowledge (D.O.K.)** | **Mathematical Practices** |
--- | --- | --- |
3–7 | 2 Skills/Concepts | MP.4 Modeling |
8 | 3 Strategic Thinking | MP.2 Reasoning |
9–10 | 2 Skills/Concepts | MP.1 Problem Solving |
11 | 3 Strategic Thinking | MP.4 Problem Solving |
12 | 3 Strategic Thinking | MP.3 Modeling |
13 | 3 Strategic Thinking | MP.2 Reasoning |

**Additional Resources**

Differentiated Instruction includes:

- Leveled Practice worksheets

**Exercises 12–13** combine concepts from the Common Core cluster “Compute fluently with multi-digit numbers and find common factors and multiples.”

---

**5.5 LESSON QUIZ**

Elaine bought $\frac{3}{5}$ pounds of apples for $1.99 per pound, $\frac{5}{4}$ pound of pears for $2.25 per pound, and $\frac{3}{5}$ pounds of bananas for $1.75 per pound.

1. What did Elaine spend on apples?
2. What did Elaine spend on pears?
3. What did Elaine spend on bananas?
4. If Elaine brought a $20 bill to the store, how much change did she get?
5. Orlando earned $92.25 washing windows on the weekend. He worked 3.5 hours on Saturday and 6.75 hours on Sunday. If Orlando charges the same amount for every hour he works, how much does he earn per hour?

Lesson Quiz example available online

**Answers**

1. $7.56
2. $1.69
3. $6.42
4. $4.33
5. $9 per hour
NAME ___________________________ CLASS ___________________ DATE __________

5.5 Guided Practice

1. Bob and Cheryl are taking a road trip that is 188.3 miles. Bob drove \( \frac{1}{2} \) of the total distance. How many miles did Bob drive? Answer: \( 134 \frac{1}{2} \) miles

2. The winner of a raffle will receive \( \frac{1}{3} \) of the $350.40 raised from raffle ticket sales. How much money will the winner get? Answer: $397.80

5.5 Independent Practice

3. Chanasia has 8.75 gallons of paint. She wants to use \( \frac{2}{3} \) of the paint to paint her living room. How many gallons of paint will Chanasia use? Answer: 3 \( \frac{1}{2} \) gallons

4. Harold bought 3 pounds of red apples and 4.2 pounds of green apples from a grocery store, where both kinds of apples are $1.75 a pound. How much did Harold spend on apples? Answer: $12.60

Samuel and Jason sell cans to a recycling center that pays $0.40 per pound of cans. The table shows the number of pounds of cans that they sold for several days.

5. Samuel wants to use his earnings from Monday and Tuesday to buy some batteries that cost $5.60 each. How many batteries can Samuel buy? Show your work. Answer: 2 batteries

6. Jason wants to use his earnings from Monday and Tuesday for online movie rentals. The movies cost $2.96 each to rent. How many movies can Jason rent? Show your work. Answer: 3 movies

7. Multistep Samuel and Jason spend \( \frac{1}{3} \) of their combined earnings from Wednesday to buy a gift. How much do they spend? Is there enough left over from Wednesday's earnings to buy a card that costs $3.25? Explain. Answer: $5.88; Yes, they earned $7.84 on Wednesday.

8. Multiple Representations Give an example of a problem that could be solved using the expression \( 9.5 \times (8 + 12.5) \). Solve your problem.

Sample problem: Nestor charged $9.50 an hour to rake leaves. He worked 8 hours one week and 12.5 hours the next. How much did Nestor earn raking leaves?

Answer: He earned $194.75.

Tony and Alice are trying to reduce the amount of television they watch. For every hour they watch television, they have to put $2.50 into savings. The table shows how many hours of television Tony and Alice have watched in the past two months.

<table>
<thead>
<tr>
<th></th>
<th>Hours watched in February</th>
<th>Hours watched in March</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tony</td>
<td>35.4</td>
<td>18.2</td>
</tr>
<tr>
<td>Alice</td>
<td>21.8</td>
<td>26.6</td>
</tr>
</tbody>
</table>

9. Tony wants to use his savings at the end of March to buy video games. The games cost $35.75 each. How many games can Tony buy? Answer: 3 games

10. Alice wants to use her savings at the end of the two months to buy concert tickets. If the tickets cost $17.50 each, how many can she buy? Answer: 6 tickets

11. Represent Real-World Problems A caterer prepares three times as many pizzas as she usually prepares for a large party. The caterer usually prepares 5 pizzas. The caterer also estimates that each party guest will eat \( \frac{1}{2} \) of a pizza. Write an expression that represents this situation. How many party guests will the pizzas serve?

Answer: \( \frac{5 \times 3}{\frac{1}{2}} = 15 \) guests

Nadia charges $7.50 an hour for babysitting. She babysits 18.5 hours the first week of the month and 20 hours the second week of the month.

12. Explain the Error To find her total earnings for those two weeks, Nadia writes \( 7.5 \times 18.5 + 20 = 158.75 \). Explain her error. Show the correct solution.

She should have used parentheses to group the addition to find the total number of hours first.

\( 7.5 \times (18.5 + 20) = 7.5 \times 38.5 = 288.75 \)

13. What If? Suppose Nadia raises her rate by $0.75 an hour. How many hours would she need to work to earn the same amount of money she made in the first two weeks of the month? Explain.

Answer: \( 35; \frac{7.50 + 0.75}{8.25}; \frac{288.75}{8.25} = 35 \)

EXTEND THE MATH PRE-AP

Activity available online my.hrw.com

Activity Gina ate \( \frac{3}{4} \) cup of lowfat yogurt. The serving size listed on the container is 6 ounces, or \( \frac{3}{2} \) cup. How many servings did Gina eat? There are 100 calories in one serving. How many calories did Gina eat?

Gina ate \( \frac{8}{9} \) of a serving, which is about 88.9 calories.
5.5 Applying Multiplication and Division of Rational Numbers

10. Doors for the small cabinets are 11.5 inches long. Doors for the large cabinets are 2.3 times as long as the doors for the small cabinets. How many large doors can be cut from a board that is 10 \(\frac{1}{2}\) feet long?

\[ \text{Number of large doors} = \frac{10 \cdot 12}{2.3 \times 11.5} \]

11. Describe a real-world situation that could be modeled by dividing two rational numbers.

Sample answer: Finding how many \(\frac{3}{4}\) cup servings of rice are in a 4.75 cup container.
Assessment Readiness

Assessment Readiness Tip  Students can use estimation to eliminate some or all of the answer choices.

Item 2  0.4 is close to 0.5, and 4.2 is close to 4. The answer should be approximately $0.5 \times 4 = 2$. Students can eliminate choices C, D, and D.

Item 7  0.55 is close to 0.5, and 1.4 is close is 1.5. Keri walks approximately $0.5 \times 5 + 0.75 \times 2 = 2.5 + 1.5 = 4$ km per week. Students can eliminate choices A and D.

Avoid Common Errors

Item 3  Students may make the mistake of multiplying the two quantities instead of dividing them. Remind them that although they must multiply the number of pounds by the price per pound to find the total cost, they must do the opposite to find the number of pounds purchased.

Item 8  Students may read the last question quickly and may think the question refers to the unit price and who paid more per candle rather than realize the difference asked for is the difference between two amounts. Remind them to read each part of the question carefully to be sure what each step requires them to do.

Additional Resources

Additional Resources

Common Core Standards

<table>
<thead>
<tr>
<th>Items</th>
<th>Grade 6 Standards</th>
<th>Mathematical Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>6.NS.2</td>
<td>MP.4</td>
</tr>
<tr>
<td>2</td>
<td>6.NS.3</td>
<td>MP.4</td>
</tr>
<tr>
<td>3</td>
<td>6.NS.3</td>
<td>MP.4</td>
</tr>
<tr>
<td>4</td>
<td>6.NS.3</td>
<td>MP.4</td>
</tr>
<tr>
<td>5</td>
<td>6.NS.3</td>
<td>MP.4</td>
</tr>
<tr>
<td>6</td>
<td>6.NS.2</td>
<td>MP.4</td>
</tr>
<tr>
<td>7</td>
<td>6.NS.3</td>
<td>MP.4</td>
</tr>
<tr>
<td>8</td>
<td>6.NS.3</td>
<td>MP.4</td>
</tr>
</tbody>
</table>

* Item integrates mixed review concepts from previous modules.