CHAPTER 1

Multiply and Divide Decimals

The BIG Idea
Solve real-world problems involving multiplication and division of decimals.

FOLDABLES
Make this Foldable to help you organize your notes. Begin with two sheets of paper.

1. Stack the pages, placing the sheets of paper 1/2 inch apart.
2. Roll up bottom edges. All tabs should be the same size.
3. Crease and staple along the fold.
4. Label the tabs with the topics from the chapter.

Review Vocabulary
- 
- 
- 

Key Vocabulary
- 
- 
- 

compatible numbers
números compatibles
Money Challenge

This car wash job is great!

Great idea.

Especially for $5.50 an hour!

What are you going to do with your money?

Wow! That's a lot of money!

I know, but I really want it.

$200

How much is it?

I'm saving for a new video game system!

And I've already saved $60!

The question is...

How many more hours do I have to work until I can buy the new game system?

Your Turn!

You will solve this problem in Chapter 1.
## Are You Ready for Chapter 1?

You have two options for checking prerequisite skills for this chapter.

### Text Option
Take the Quick Check below. Refer to the Quick Review for help.

<table>
<thead>
<tr>
<th>QUICK Check</th>
<th>QUICK Review</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Multiply.</strong> <em>(Prior Grade)</em></td>
<td>EXAMPLE 1</td>
</tr>
<tr>
<td>1. 15 × 20</td>
<td>13 [ \times \ 15 ] Multiply the ones.</td>
</tr>
<tr>
<td>2. 21 × 18</td>
<td>65 [ + \ 130 ] Multiply the tens.</td>
</tr>
<tr>
<td>3. 42 × 16</td>
<td>195 [ ] Add.</td>
</tr>
<tr>
<td>4. 19 × 51</td>
<td>EXAMPLE 2</td>
</tr>
<tr>
<td>5. 94 × 30</td>
<td>The table shows the cost per week to rent a dirt bike, moped, and scooter. How much does it cost to rent a moped for 4 weeks?</td>
</tr>
<tr>
<td>6. 49 × 22</td>
<td><strong>Vehicle</strong></td>
</tr>
<tr>
<td></td>
<td>Dirt bike</td>
</tr>
<tr>
<td></td>
<td>Moped</td>
</tr>
<tr>
<td></td>
<td>Scooter</td>
</tr>
<tr>
<td>7. <strong>SHOPPING</strong> Sandra bought 2 dresses for $46 each. How much did Sandra spend for both dresses?</td>
<td>EXAMPLE 3</td>
</tr>
<tr>
<td><strong>Divide.</strong> <em>(Prior Grade)</em></td>
<td>Divide 323 [ \div \ 17 ]</td>
</tr>
<tr>
<td>10. 112 ÷ 8</td>
<td>19 [ 17 ]\ 323 ] Divide the tens.</td>
</tr>
<tr>
<td>11. 204 ÷ 6</td>
<td>-17 [ -153 ] Divide the ones.</td>
</tr>
<tr>
<td>12. 539 ÷ 11</td>
<td>153 [ ]</td>
</tr>
<tr>
<td>13. 779 ÷ 19</td>
<td>0 [ ]</td>
</tr>
<tr>
<td>14. <strong>MUSIC</strong> A musician sold 64 million albums in 16 months. She sold the same amount in each month. How many albums did she sell in each month?</td>
<td></td>
</tr>
</tbody>
</table>

### Online Option
Take the Online Readiness Quiz at glencoe.com
Main Idea
Estimate the product of decimals and judge the reasonableness of the results.

NGSSS
MA.6.A.5.3 Estimate the results of computations with fractions, decimals, and percents and judge the reasonableness of the results.

Estimate Products

SKATEBOARDING The record for the greatest distance traveled on skateboard in 24 hours was set by James Peters in 2007. He traveled about 7.6 miles per hour.

1. Round 7.6 to the nearest whole number.
2. Estimate how many miles James Peters traveled in 24 hours.
3. Is your estimate higher or lower than the actual distance he traveled? Explain.

To estimate products of decimals, round each number. Then multiply.

Key Concept
Round Decimals

To round a decimal, first underline the digit to be rounded. Then look at the digit to the right of the place being rounded.

- If the digit is 4 or less, the underlined digit remains the same.
- If the digit is 5 or greater, add 1 to the underlined digit.
- After rounding, change all digits after the underlined digit to zeros.

EXAMPLE
Estimate Products Using Rounding

Estimate $8.7 \times 2.8$.
Round to the nearest whole number to make it easier to compute mentally.

\[
8.7 \rightarrow 9 \quad \text{Round 8.7 to 9.}
\]
\[
2.8 \rightarrow 3 \quad \text{Round 2.8 to 3.}
\]

$\times \quad \times$

\[
27
\]

The product is about 27.

CHECK Your Progress
Estimate each product.
\[
a. \ 9.6 \times 1.8 \quad b. \ 8.7 \times 2.9 \quad c. \ 68.4 \times 21.3
\]
Real-World Example

2. **DOGS** A greyhound can travel 39.3 miles per hour. At this speed, about how far could a greyhound travel in 6.5 hours?

\[
\begin{align*}
39.3 \times 6.5 &= \quad \text{Round 39.3 to 40.} \\
280 &= \quad \text{Round 6.5 to 7.}
\end{align*}
\]

The greyhound could travel about 280 miles in 6.5 hours.

Study Tip

Rounding Decimals When rounding decimals, such as 99.96 to the tenths, the 9 must round up. So, 99.96 rounded to the nearest tenth is 100.0.

Check Your Progress

d. **MONEY** Suppose one U.S. dollar is equal to 5.3 Egyptian pounds. About how many Egyptian pounds would you receive for $48.50?

e. **ASTRONOMY** The Earth is rotating around the Sun about 18.6 miles per second. About how many miles does it travel in 4.8 seconds?

Real-World Example

3. **SCHOOL SUPPLIES** Patrice has $20 to buy 5 binders for her classes. She found binders that cost $4.29 each. Does she have enough money to buy these binders? Explain your reasoning.

Estimate.

\[
\begin{align*}
5 \times 4 &= 20 \\
5 \times 5 &= 25
\end{align*}
\]

The actual cost of the binders is between $20 and $25. So, Patrice does not have enough money to buy the binders.

Check Your Progress

f. **PROFIT** The art club makes a profit of $1.75 on every batch of cookies they sell at a bake sale. The goal is to earn at least $50 selling batches of cookies. They estimate they will need to sell at least 30 batches. Is this estimate reasonable? Explain your reasoning.
Check Your Understanding

Example 1
Estimate each product.
1. $5.8 \times 4$
2. $27.3 \times 9$
3. $57.1 \times 32$
4. $3.5 \times 1.8$
5. $13.92 \times 2.7$
6. $94.89 \times 3.11$

Example 2
(p. 28)
7. MONEY A grocery store sells American cheese for $3.89 per pound. About how much would 1.89 pounds of the cheese cost?

Example 3
(p. 28)
8. MEMORY Greg has 52 megabytes of free space left on his MP3 player. He wants to download 7 songs that each use 7.9 megabytes of memory. He estimates that he will need 56 megabytes of memory. Explain why his estimate is reasonable.

Practice and Problem Solving

Example 1
Estimate each product.
9. $9.7 \times 3.3$
10. $3.4 \times 5.6$
11. $17.5 \times 8.4$
12. $26.3 \times 9.7$
13. $33.6 \times 82.1$
14. $99.1 \times 11.2$
15. $44.8 \times 5.1$
16. $28.21 \times 8.02$
17. $71.92 \times 2.01$

Example 2
(p. 28)
18. FRUIT On average, the U.S. produces 36.5 million tons of fruit each year. About how much fruit does it produce in 2.25 years?

19. SCIENCE A single year on Saturn is equal to 29.4 years on Earth. About how many Earth-years are equal to 3.2 years on Saturn?

Example 3
(p. 28)
20. CRAFTS Lisha is making headbands using ribbon. She would like to make 12 headbands. Each one requires 15.5 inches of ribbon. She estimates that she will need to buy 160 inches of ribbon. Is her estimate reasonable? Explain your reasoning.

21. GIFT CARDS Miguel received a $50 gift card to a bookstore. He would like to buy 3 books that cost $15.75 each. He estimates that he cannot buy all three books because each book costs about $20, and all three books would cost $60. Is his estimate reasonable? Explain your reasoning.

Use estimation to determine whether each answer is reasonable. If the answer is reasonable, write yes. If not, write no and provide a reasonable estimate.
22. $22.8 \times 4.7 \approx 107.16$
23. $2.1 \times 4.9 \times 7.2 = 105.84$
24. $7.8 \times 1.1 \times 4.2 = 50$
25. $43.8 \times 2.8 \times 3.1 = 371.8$

Lesson 1-1 Multiply Decimals 29
26. **GRAPHIC NOVEL** Refer to the graphic novel frame below for Exercises a–b.

I've already saved $68 for the $200 video game system.

**CAR WASH Paycheck**

<table>
<thead>
<tr>
<th>Hourly wage</th>
<th>Hours worked</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5.50</td>
<td>$</td>
</tr>
</tbody>
</table>

a. How much more does Raj need until he has enough to buy the video game system?

b. If he works for 25 hours, will he have enough to buy the video game system?

27. **MONEY** Hannah’s hourly wage at the ice cream shop is $3.85. The table shows the number of hours she worked. She estimates her earnings to be $120. Without calculating her actual earnings, determine if her estimate is more or less than her actual earnings. Explain your reasoning.

<table>
<thead>
<tr>
<th>Day</th>
<th>Hours Worked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>3.5</td>
</tr>
<tr>
<td>Tuesday</td>
<td>4.25</td>
</tr>
<tr>
<td>Wednesday</td>
<td>3.75</td>
</tr>
<tr>
<td>Thursday</td>
<td>2.5</td>
</tr>
<tr>
<td>Friday</td>
<td>4.75</td>
</tr>
</tbody>
</table>

28. **FUEL** A car releases 19.6 pounds of carbon dioxide for every 1 gallon of gasoline burned. Estimate the number of pounds of carbon dioxide released if 14.5 gallons is burned.

**REASONING** The accuracy of an estimate depends on the place value the numbers are rounded to. For each exercise, round the first factor to the tens and then the ones before estimating. Which way gives an estimate that is closer to the actual product?

29. \(35.1 \times 8\)

30. \(94.1 \times 4\)

31. \(58.8 \times 6\)

32. **NUTRITION** The table shows some nutritional facts about orange juice. Estimate each value for 1 quart of orange juice. (Hint: 4 cups is equal to 1 quart.)

<table>
<thead>
<tr>
<th>Orange Juice (1 cup)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
</tr>
<tr>
<td>Vitamin C</td>
</tr>
<tr>
<td>Carbohydrates</td>
</tr>
<tr>
<td>Calcium</td>
</tr>
</tbody>
</table>

33. **TREES** A King Palm can grow about 2.1 feet a year. Estimate the height of the King Palm, in yards, after 15 years.

**REASONING** Estimate each product to determine if each calculator answer is correct. Explain your reasoning.

34. \(46.85 \times 9.75; 456.7875\)

35. \(90.8 \times 3.1; 271.18\)
36. OPEN ENDED Name three decimals with a product that is about 40.

37. CHALLENGE A scooter can travel between 22 and 28 miles on each gallon of gasoline. If one gallon of gasoline costs between $3.75 and $3.95 per gallon, about how much will it cost to travel 75 miles?

38. WRITE MATH Suppose your friend multiplied 1.2 and 2.6 and got 31.2 as the product. Is your friend’s answer reasonable? Justify your response.

39. Green peppers are on sale for $2.89 per pound. Mrs. Moseley bought 1.75 pounds of peppers. About how much did she pay for the peppers?
   A. less than $4
   B. between $5 and $6
   C. between $6 and $7
   D. more than $7

40. Medina’s school lunch menu is shown.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Friday</td>
<td></td>
</tr>
<tr>
<td>Pizza</td>
<td>$1.75</td>
</tr>
<tr>
<td>Fish and Fries</td>
<td>$2.25</td>
</tr>
<tr>
<td>Salad</td>
<td>$1.15</td>
</tr>
<tr>
<td>Fruit Punch</td>
<td>$0.75</td>
</tr>
<tr>
<td>Milk</td>
<td>$0.80</td>
</tr>
<tr>
<td>Pudding</td>
<td>$0.85</td>
</tr>
</tbody>
</table>

Which of the following is a reasonable estimate for the cost of two slices of pizza, a salad, and fruit punch?
   F. $4
   G. $6
   H. $8
   I. $10

41. Mario and Andrew’s hourly charge for mowing lawns is shown.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mario</td>
<td>$8.25/hr</td>
</tr>
<tr>
<td>Andrew</td>
<td>$5.05/hr</td>
</tr>
</tbody>
</table>

Suppose Mario and Andrew each worked 20 hours. About how much more money did Mario earn?
   A. $30
   B. $40
   C. $60
   D. $70

42. SHORT RESPONSE Javier bought 4 pencil toppers at the school store for $3.69 each. He estimated how much he needs to pay and gave the cashier $16. Is Javier’s estimation reasonable? Explain your reasoning.

DIVING The table gives the scores for the Men’s Synchronized 10-Meter Diving at the 2008 Olympics. (Lesson 1-2)

<table>
<thead>
<tr>
<th>Country</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>468.18</td>
</tr>
<tr>
<td>Germany</td>
<td>450.12</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>445.16</td>
</tr>
<tr>
<td>Australia</td>
<td>444.34</td>
</tr>
<tr>
<td>United States</td>
<td>440.54</td>
</tr>
</tbody>
</table>

43. How many more points did China earn than Germany?

44. What is the difference in the points China and the United States earned?
Multiply Decimals by Whole Numbers

The table shows the relationship between decimals and base-ten blocks. You can use base-ten blocks to multiply decimals.

<table>
<thead>
<tr>
<th>Ones (1.0)</th>
<th>Tenths (0.1)</th>
<th>Hundredths (0.01)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One 10-by-10 flat represents 1 or 1.0.</td>
<td>One 1-by-10 rod represents 0.1.</td>
<td>One 1-by-1 cube represents 0.01.</td>
</tr>
</tbody>
</table>

**Activity**

**Walking** Louisa walked her dog 0.2 mile on Monday, Wednesday, and Friday. Find the total distance Louisa walked all week.

**What do you need to find?** the total distance Louisa walked

**Step 1** Just as \(3 \times 2\) means 3 groups of 2, \(3 \times 0.2\) means 3 groups of 2 tenths. Model three groups of two tenths using base-ten blocks.

**Step 2** Combine the tenths. There are six tenths.

So, \(3 \times 0.2 = 0.6\). Louisa walked a total of 0.6 mile.

**Practice and Apply**

Use base-ten blocks to find each product.

1. \(3 \times 0.3\)  
2. \(2 \times 0.4\)  
3. \(4 \times 0.02\)  
4. \(5 \times 0.01\)  
5. \(3 \times 0.5\)  
6. \(4 \times 0.6\)  
7. \(2 \times 0.08\)  
8. \(8 \times 0.04\)
ACTIVITY

2. Model $2 \times 1.6$ to find the product.

**STEP 1** Model two groups of one and six tenths.

**STEP 2** Combine the ones. Then combine the tenths.

So, $2 \times 1.6 = 3.2$.

Practice and Apply

Use base-ten blocks to find each product.

9. $2 \times 1.3$  
10. $3 \times 1.1$  
11. $4 \times 1.02$  
12. $6 \times 2.01$  
13. $5 \times 2.5$  
14. $2 \times 3.8$  
15. $5 \times 1.09$  
16. $4 \times 3.07$

Analyze the Results

17. Compare and contrast $2 \times 16$ and $2 \times 1.6$. How are the products the same? Different?

18. MAKE A CONJECTURE Explain how to find $5 \times 1.4$ without using base-ten blocks. Justify your procedure. Then check your answer using base-ten blocks.

19. MAKE A CONJECTURE Suppose you multiply a whole number by a decimal greater than one. Is the product less than, greater than, or equal to the whole number? Explain your answer.

20. WRITE MATH Write a rule that you can use to multiply a whole number by a decimal without using base-ten blocks.
Multiply Decimals by Whole Numbers

PLANTS Bamboo can grow about 4.92 feet in height per day. The table shows different ways to find the total height a bamboo plant can grow in two days.

1. Use the addition problem and the estimate to find $2 \times 4.92$.
2. Write an addition problem, an estimate, and a multiplication problem to find the total growth over 3 days, 4 days, and 5 days.
3. MAKE A CONJECTURE Explain how to find $6 \times 4.92$.

Using repeated addition can help you place the decimal point in the product of a whole number and a decimal. The whole number represents the number of times the decimal is used as an addend. So, place the decimal point in the product the same number of places from the right as the decimal factor.

**EXAMPLES** Multiply Decimals

1. Find $4 \times 0.83$.
   
   Estimate $4 \times 1 = 4$
   
   $0.83 \quad \text{two decimal places}$
   $\times 4$
   $3.32 \quad \checkmark$
   
   Place the decimal point two places from the right.
   
   **Check for Reasonableness** $3.31 \approx 4$

2. Find $3 \times 14.2$.
   
   Estimate $3 \times 14 = 42$
   
   $14.2 \quad \text{one decimal place}$
   $\times 3$
   $42.6 \quad \checkmark$
   
   Place the decimal point one place from the right.
   
   **Check for Reasonableness** $42.6 \approx 42$

**CHECK** Your Progress

a. $5 \times 0.25$

b. $8 \times 4.47$

c. $9 \times 2.63$
If there are not enough decimal places in the product, you need to annex zeros to the left.

**EXAMPLE**

**Annex Zeros in the Product**

3. Find \(2 \times 0.018\).

\[
\begin{array}{c}
1 \\
\times 2 \\
0.036
\end{array}
\]

致电 three decimal places

Annex a zero on the left of 36 to make three decimal places

Check by Adding 0.018 + 0.018 = 0.036

**CHECK Your Progress**

d. \(3 \times 0.02\)  

e. \(0.12 \times 8\)  

**Real-World EXAMPLE**

4. **TRAIL MIX** A batch of trail mix calls for 1.2 pounds of dry cereal. Nigela is making 5 batches of trail mix. She already has 2.2 pounds of cereal. How many more pounds of dry cereal does she need?

\[
\begin{array}{c}
1.2 \\
\times 5 \\
6.0
\end{array}
\]

致电 one decimal place

Subtract.

\[
\begin{array}{c}
6.0 \\
- 2.2 \\
3.8
\end{array}
\]

So, Nigela will need 3.8 more pounds of dry cereal.

**CHECK Your Progress**

g. **BIRDS** A bee hummingbird has a mass of 1.8 grams. How many grams are 6 hummingbirds and a 4-gram nest?

h. **MONEY** Rafael has saved $45 for a new computer screen. He is saving $8.75 a week for 5 weeks for the remaining amount. What is the total cost of the computer screen?
CHECK
Your Understanding

Examples 1–3 (pp. 34–35)
Multiply.
1. \(2.7 \times 6\)  
2. \(1.4 \times 4\)  
3. \(0.52 \times 3\)  
4. \(0.83 \times 6\)  
5. \(5 \times 0.09\)  
6. \(4 \times 0.012\)  
7. \(0.065 \times 18\)  
8. \(0.015 \times 23\)

Example 4 (p. 35)

**VACATIONS** The table shows the number of gallons of gasoline the Beckeys purchased on their road trip. What was the total cost for gas for the trip? Justify your procedure.

<table>
<thead>
<tr>
<th>Number of Gallons</th>
<th>Cost per Gallon ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>4.09</td>
</tr>
<tr>
<td>17</td>
<td>4.72</td>
</tr>
<tr>
<td>15</td>
<td>5.08</td>
</tr>
</tbody>
</table>

Practice and Problem Solving

Examples 1–3 (pp. 34–35)
Multiply.
10. \(1.2 \times 7\)  
11. \(1.7 \times 5\)  
12. \(0.7 \times 9\)  
13. \(0.9 \times 4\)  
14. \(2 \times 1.3\)  
15. \(24 \times 8\)  
16. \(0.8 \times 9\)  
17. \(3 \times 0.5\)  
18. \(3 \times 0.02\)  
19. \(7 \times 0.012\)  
20. \(0.0036 \times 19\)  
21. \(0.0198 \times 75\)

22. **MEASUREMENT** Asher recently bought the poster shown at the right. What is its area?  
*(Hint: Use \(A = \text{bh})*

23. **MEASUREMENT** The height of Mount Everest, in meters, can be found by multiplying 8.85 by 1,000. Find the height of Mount Everest. Explain your answer.

Example 4 (p. 35)

24. **SCHOOL SUPPLIES** Sharon buys 14 folders for \$0.75 each. How much change will she receive if she pays with \$15?

25. **TEMPERATURE** The hottest temperature recorded in the world, in degrees Fahrenheit, can be found by multiplying 13.46 by 10. Find this temperature. Justify your procedure.

26. **MEASUREMENT** The thickness of each type of coin is shown in the table. How much thicker is a stack of a dollar’s worth of nickels than a dollar’s worth of quarters? Explain your answer.

<table>
<thead>
<tr>
<th>Coin</th>
<th>Thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>penny</td>
<td>1.55</td>
</tr>
<tr>
<td>nickel</td>
<td>1.95</td>
</tr>
<tr>
<td>dime</td>
<td>1.35</td>
</tr>
<tr>
<td>quarter</td>
<td>1.75</td>
</tr>
</tbody>
</table>
27. **OPEN ENDED** Write a real-world problem involving multiplication by a decimal factor. Then solve the problem.

28. **CHALLENGE** Discuss two different ways to find the value of the expression $5.4 \times 1.17 \times 100$ that do not require you to first multiply $5.4 \times 1.17$.

29. **REASONING** Use the product of $123 \times 47$ to find the product of $123 \times 0.47$. Explain the difference in the two products.

30. **Write MATH** Your friend thinks that $1.5 \times 8 = 1.20$ because you do not count the zero when placing the decimal point. Is your friend correct? Justify your reasoning.

### Practice

**MA.6.A.1.3**

31. **GRIDDED RESPONSE** The school store is selling the following items.

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pennant</td>
<td>$2.49</td>
</tr>
<tr>
<td>Bumper Sticker</td>
<td>$1.79</td>
</tr>
<tr>
<td>Magnet</td>
<td>$0.89</td>
</tr>
</tbody>
</table>

If Miguel buys two pennants, two bumper stickers, and four magnets, how much in dollars will he spend for all the items?

32. The table shows the admission prices to an amusement park.

<table>
<thead>
<tr>
<th>Admission Prices</th>
<th>One-Day Pass</th>
<th>Two-Day Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult</td>
<td>$39.99</td>
<td>$43.99</td>
</tr>
<tr>
<td>Child (ages 3–9)</td>
<td>$20.99</td>
<td>$33.99</td>
</tr>
</tbody>
</table>

What is the total price of one-day passes for two adults and three children?

A. $140.36  
B. $170.95  
C. $179.95  
D. $189.95

### Spiral Review

33. $47.2 \times 1.8$

34. $3.86 \times 5.19$

35. $108.39 \times 72.9$

36. **SPORTS** Kaitlyn recorded the number of hours that she practiced soccer drills. What was the total time she practiced? (Lesson 0-5)

<table>
<thead>
<tr>
<th>Day</th>
<th>Hours Practiced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>2 1/2</td>
</tr>
<tr>
<td>Wednesday</td>
<td>1 1/3</td>
</tr>
<tr>
<td>Friday</td>
<td>1 3/4</td>
</tr>
</tbody>
</table>

37. **GEOMETRY** Find the perimeter of a triangle with side lengths 2.12 centimeters, 2.03 centimeters, and 1.98 centimeters. (Lesson 6-2)
Explore

Main Idea
Use decimal models to multiply decimals.

NGSSS
MA.6.A.1.1 Explain and justify procedures for multiplying and dividing fractions and decimals.
MA.6.A.1.2 Multiply and divide fractions and decimals efficiently.

MULTI-PART LESSON
1-1 Multiply Decimals

PART A B C D E

Activity

ACTIVITY

1. Find 0.7 \times 0.6. Use decimal models.

STEP 1
Draw a 10-by-10 decimal model. Recall that each small square represents 0.01.

STEP 2
Shade a rectangle that is 7 tenths units wide and 6 tenths units long.

STEP 3
Count the number of shaded squares.

There are forty-two hundredths in the shaded region.
So, 0.7 \times 0.6 = 0.42.

Practice and Apply

Use decimal models to show each product.
1. 0.3 \times 0.3
2. 0.4 \times 0.9
3. 0.9 \times 0.5

Analyze the Results

4. Tell how many decimal places are in each factor and in each product of Exercises 1–3 above.
5. Is 0.2 \times 0.3 equal to 0.6 or 0.06? Justify your reasoning with a model.

6. MAKE A CONJECTURE
Use the pattern you discovered in Exercise 4 to find 0.6 \times 0.2. Check your conjecture with a model or a calculator.
7. Find two decimals with a product of 0.24.
**Activity**

2 Model $0.8 \times 0.16$. Use an area model.

**Step 1** Since you are multiplying tenths by hundredths, think about a 10-by-100 grid. There are 1,000 squares in all, but you will not draw them.

**Step 2** Draw and shade 8 tenths of the height to model 0.8 and shade 16 hundredths across to model 0.16.

**Step 3** Find the number of squares shaded. Each square represents one thousandth of the full rectangle.

There are 128 out of 1,000 squares, or 128 thousandths, shaded. So, $0.8 \times 0.16 = 0.128$.

**Practice and Apply**

Use decimal models to show each product.

8. $0.3 \times 0.14$
9. $0.8 \times 0.03$
10. $0.5 \times 0.04$

**Analyze the Results**

11. **MAKE A CONJECTURE** Find the product of 0.04 and 0.08 without using a model.
12. Explain why $0.4 \times 0.5 = 0.2$.
13. **MAKE A CONJECTURE** How does the number of decimal places in the product relate to the number of decimal places in the factors?
14. Analyze each product.
   a. Explain why the first product is less than 0.6.
   b. Explain why the second product is equal to 0.6.
   c. Explain why the third product is greater than 0.6.

<table>
<thead>
<tr>
<th>First Factor</th>
<th>Second Factor</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9</td>
<td>0.6</td>
<td>0.54</td>
</tr>
<tr>
<td>1.0</td>
<td>0.6</td>
<td>0.60</td>
</tr>
<tr>
<td>1.5</td>
<td>0.6</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Multiply Decimals by Decimals

**PLANETS** The table shows the weight of a 1-pound object on each planet.

1. A 0.5-pound object weighs one half as much as a 1-pound object. What would this object weigh on Jupiter?
2. What would an object that weighs 5 pounds on Earth weigh on Jupiter?
3. **MAKE A CONJECTURE** How can you use the results of Exercises 1 and 2 to find 0.5 \(\times\) 2.3?

When multiplying a decimal by a decimal, multiply as with whole numbers. To place the decimal point, find the sum of the number of decimal places in each factor. The product has the same number of decimal places.

---

**EXAMPLES**

**Multiply Decimals**

1. Find 4.2 \(\times\) 6.7. **Estimate** 4.2 \(\times\) 6.7 \(\approx\) 4 \(\times\) 7 or 28

\[
\begin{align*}
4.2 & \quad \text{one decimal place} \\
\times \quad 6.7 & \quad \text{one decimal place} \\
294 & \quad \text{two decimal places} \\
+ \quad 252 & \\
28.14 & \quad \text{two decimal places} \\
\end{align*}
\]

The product is 28.14. **Compared to the estimate, the product is reasonable.**

2. Find 3.6 \(\times\) 0.05. **Estimate** 3.6 \(\times\) 0.05 \(\approx\) 4 \(\times\) 0 or 0

\[
\begin{align*}
3.6 & \quad \text{one decimal place} \\
\times \quad 0.05 & \quad \text{two decimal places} \\
0.180 & \quad \text{three decimal places} \\
\end{align*}
\]

The product is 0.180 or 0.18. **Once you place the decimal point, you can drop the zero at the right.**

---

**CHECK Your Progress**

a. 5.7 \(\times\) 2.8  

b. 4.12 \(\times\) 0.05  

c. 0.014 \(\times\) 3.7
Annex a Zero

Find \(1.4 \times 0.067\).

\[
\begin{align*}
0.067 & \quad \text{three decimal places} \\
\times 1.4 & \quad \text{one decimal place} \\
268 & \\
+ 67 & \\
0.0938 & \quad \text{Annex a zero to make four decimal places.}
\end{align*}
\]

CHECK Your Progress

d. \(0.04 \times 0.32\)  
e. \(0.26 \times 0.205\)  
f. \(1.33 \times 0.06\)

A certain car can travel 28.45 miles with one gallon of gasoline. The gasoline tank can hold 11.5 gallons. How many miles can this car travel on a full tank of gas? Justify your answer.

**Estimate**  \(28.45 \times 11.5 \approx 36 \times 12 = 360\)

\[
\begin{align*}
28.45 & \quad \text{two decimal places} \\
\times 11.5 & \quad \text{one decimal place} \\
1422.5 & \\
+ 2845 & \\
3271.75 & \quad \text{The product has three decimal places.}
\end{align*}
\]

The car could travel 327.175 miles. Since 327.175 \(\approx 360\), the answer is reasonable.

**NUTRITION FACTS** A nutrition label indicates that one serving of apple crisp oatmeal has 2.5 grams of fat. How many grams of fat are there in 3.75 servings? Justify your answer.

---

**CHECK Your Understanding**

**Examples 1–3** (pp. 40–41)

1. \(0.6 \times 0.5\)  
2. \(1.4 \times 2.56\)  
3. \(27.43 \times 1.089\)  
4. \(0.3 \times 2.4\)  
5. \(0.52 \times 2.1\)  
6. \(0.45 \times 0.053\)  
7. \(2.7 \times 1.35\)  
8. \(0.03 \times 0.09\)  
9. \(0.04 \times 2.12\)

**Example 4** (p. 41)

10. **MEASUREMENT** A mile is equal to approximately 1.609 kilometers. How many kilometers is 2.5 miles? Justify your answer.
Course 1 – Chapter 1

**Example 4** (p. 41)

25. ANIMALS A giraffe can run up to 46.93 feet per second. How far could a giraffe run in 1.8 seconds? Justify your answer.

24. MEASUREMENT Katelyn has a vegetable garden that measures 16.75 feet in length and 5.8 feet in width. Find the area of the garden. Justify your answer.

**Multiply.**

25. \(25.04 \times 3.005\)  
26. \(1.03 \times 1.005\)  
27. \(5.12 \times 4.001\)

28. WALKING Junnie walked for 2.5 hours at a speed of 3.2 miles per hour. Maurice walked for 1.8 hours at a speed of 4.1 miles per hour. 
   (Hint: distance equals speed times time.)
   a. Who walked farther?
   b. How much farther did that person walk?

**ALGEBRA** Evaluate each expression if \(a = 1.3\), \(b = 0.042\), and \(c = 2.01\).

29. \(ab + c\)  
30. \(6.023a - c\)  
31. \(3.25c + b\)  
32. \(abc\)

33. MEASUREMENT Find the area of the figure at the right. Justify your procedure.

34. ALGEBRA Which of the three numbers 9.2, 9.5, or 9.7 is the correct solution of 
   \(2.65l = 25.705\)? Explain your answer.

35. GROCERY SHOPPING Pears cost $0.98 per pound and apples cost $1.05 per pound.
   Mr. Bonilla bought 3.75 pounds of pears and 2.1 pounds of apples.
   How much did he pay for the pears and apples? Explain your answer.

36. FIND THE DATA Refer to the Data File on pages 2-5. Choose some data and write a real-world problem in which you would multiply decimals.

For each statement below, find two decimals \(a\) and \(b\) that make the statement true. Then find two decimals \(a\) and \(b\) that make the statement false. Explain your reasoning.

37. If \(a > 1\) and \(b < 1\), then \(ab < 1\).  
38. If \(ab < 1\), then \(a < 1\) and \(b < 1\).
39. OPEN ENDED Write a multiplication problem in which the product is between 0.05 and 0.75.

40. NUMBER SENSE Place the decimal point in the answer to make it correct. Explain your reasoning. \(3.9853 \times 0.032856 = 320.13341\ldots\)

41. REASONING Determine whether the following statement is always, sometimes, or never true. Give examples to justify your answer.

The product of two decimals less than 1 is less than either of the factors.

42. NUMBER SENSE Is the product of \(0.4 \times 1.8\) greater than or less than 0.4? Explain your reasoning.

CHALLENGE Evaluate each expression.

43. \(0.3(3 - 0.5)\)  
44. \(0.16(7 - 2.8)\)  
45. \(1.06(2 + 0.58)\)

46. WRITE MATH Describe two methods for determining where to place the decimal point in the product of two decimals.

---

**NGSS Practice**  
MA.6.A.1.1, MA.6.A.1.2

47. What is the area of the rectangle?

A. 14.04 cm²  
B. 10.248 cm²  
C. 8.992 cm²  
D. 7.868 cm²

---

48. SHORT RESPONSE A soccer ball and 12 golf balls weigh a total of 1 kilogram. Each golf ball weighs about 0.046 kilogram. What is the weight of the soccer ball? Explain your reasoning.

---

**Spiral Review**

Multiply. (Lesson 1-1C)

49. \(45 \times 0.27\)  
50. \(3.2 \times 109\)  
51. \(24 \times 5.6\)  
52. \(2.94 \times 16\)

53. The distance around Earth at the equator is about 24,889.78 miles. The distance around Earth through the North Pole and South Pole is about 24,805.94 miles. (Lesson 1-1A)
   
a. Estimate how many miles you would travel if you circled the equator 3 times.
   
b. Estimate how many more miles you would travel if you circled the equator 10 times rather than 10 times around the poles.

Add or subtract. (Lesson 0-3)

54. \(\frac{3}{10} + \frac{5}{10}\)  
55. \(\frac{7}{9} + \frac{7}{9}\)  
56. \(\frac{5}{8} - \frac{2}{8}\)  
57. \(\frac{10}{11} - \frac{7}{11}\)
Main Idea
Estimate the quotient of decimals and judge the reasonableness of the results.

NGSSS
MA.6.A.5.3 Estimate the results of computations with fractions, decimals, and percents and judge the reasonableness of the results.

New Vocabulary
compatible numbers

DINING: Latasha and her two friends ordered a pizza from their favorite restaurant for $8.75. The three friends decided to split the cost equally.

1. Is $8.75 closer to $8 or $9? Explain.
2. How could you determine about how much each person will pay for the pizza?

In this situation, the dividend, $8.75, is the number being divided. The divisor, 3, tells the number of equal parts. The quotient tells how much each person will pay.

To estimate quotients of decimals, use rounding and compatible numbers. Compatible numbers are numbers that are easy to divide mentally.

### Example: Estimate by Rounding Dividends

**1.** Estimate 8.75 ÷ 3.

\[
\begin{align*}
3 \overline{)8.75} & \quad 3 \overset{3}{\overline{9}} \\
& \quad \text{Using multiples of 3, 8.75 is closest to 9.}
\end{align*}
\]

Each friend will pay about $3.

### Check Your Progress

Estimate each quotient.

a. 49.3 ÷ 7
b. 25 ÷ 98.1

d. 10.75 ÷ 99

### Example: Estimate by Rounding Divisors

**2.** Estimate 32 ÷ 3.9.

\[
\begin{align*}
3.9 \overline{)32} & \quad 8 \overset{4}{\overline{32}} \\
& \quad \text{Round 3.9 to 4 since 32 and 4 are compatible numbers.}
\end{align*}
\]

So, 32 ÷ 3.9 is about 8.

### Check Your Progress

Estimate each quotient.

c. 54 ÷ 9.16
d. 10.75 ÷ 99

44 Chapter 1 Multiply and Divide Decimals
Course 1 – Chapter 1

Real-World Examples

3. TURTLES A Pacific Leatherback turtle can weigh up to 704.4 kilograms. An Olive Ridley turtle can weigh up to 49.9 kilograms. About how many times heavier is the Pacific Leatherback turtle? Explain why your answer is reasonable.

\[ \frac{704.4}{49.9} \approx 14 \]

Round 49.9 to 50 and 704.4 to 700.

The Pacific Leatherback is about 14 times heavier than the Olive Ridley turtle.

Check for Reasonableness Since \(50 \times 14 = 700\), and \(700 = 704.4\), your answer is reasonable.

4. TICKETS The Jenkins family bought five tickets to a charity auction. The receipt shows the total cost of the tickets. Estimate the cost of each ticket. Justify your answer.

\[ \frac{56.25}{5} = 11.25 \]

Round 56.25 to 56.

Each ticket costs around $12. Since \(5 \times 12 = 60\) and \(60 = 56.25\), the answer is reasonable.

CHECK Your Progress

e. CARS There are approximately 250.9 million cars in the United States. Spain has approximately 25.1 million cars. About how many times more cars does the U.S. have than Spain? Explain why your answer is reasonable.

f. TICKETS Suppose the Jenkins family decided to purchase 5 tickets for a total price of $76.50 using a discount. Estimate the cost of each ticket. Justify your answer.

Check Your Understanding

Examples 1 and 2 (p. 64)

- Estimate each quotient.
  1. \(25.47 \div 4.7\)
  2. \(40.79 \div 7\)
  3. \(38.1 \div 984.76\)

Examples 3 and 4 (p. 65)

- WEATHER The average yearly precipitation for Gulfport, Mississippi, is 65.3 inches. About how much precipitation does the area receive each month? Explain why your answer is reasonable.

- FOOD A recipe for a smoothie calls for 0.75 pound of strawberries. If Kerry has 3.15 pounds of strawberries, how many batches of the recipe can she make?
Practice and Problem Solving

Examples 1 and 2 (p. 44)

Estimate each quotient.

6. \(32.4 \div 3\)  
7. \(54 \div 9.4\)
8. \(76.2 \div 18.4\)
9. \(45.8 \div 23.6\)  
10. \(11.4 \div 35.7\)
11. \(23.3 \div 119\)

Examples 3 and 4 (p. 45)

12. **SEWING** Mauricio bought 6.75 yards of fabric for a total of $47.50. About how much was the cost per yard? Explain why your answer is reasonable.

13. **MONEY** Emily spent a total of $38.04 on four CDs. If each CD cost the same amount, what is a reasonable amount for the cost of each CD? Explain why your answer is reasonable.

Use estimation to determine whether each answer is reasonable. If the answer is reasonable, write yes. If not, provide a reasonable estimate.

14. \(36.75 \div 7.5 = 4.9\)  
15. \(74.5 \div 23.8 = 7.26\)
16. \(108.9 \div 19.8 = 5.5\)
17. \(84.62 \div 22.5 = 1.54\)

18. **PROFIT** For each handmade greeting card Jacqui sells, she makes a profit of $0.35. In one week, she made a profit of $42. She sells the cards for $0.75 each.
   a. How many greeting cards did Jacqui sell that week?
   b. How much did she earn before paying expenses?

19. **STICKERS** Melanie is making homemade stickers. She uses the recipe shown to create the glue for the stickers.
   a. She has 545 milliliters of vinegar. Which is a more reasonable estimate for the number of batches she can make, 5 or 7? Explain your answer.
   b. About how many times as many milliliters of vinegar are needed than lemon extract?

20. **GASOLINE** When full, a 22-gallon gas tank holds 129.8 pounds of gasoline. Estimate the weight of one gallon of gasoline. If it costs $91.30 to fill the gas tank, estimate the cost per gallon.

21. **MILK** The average cow produces about 53 pounds of milk per day. If one gallon of milk weighs about 8.5 pounds, estimate the number of gallons of milk a cow produces each day. Explain why your estimate is reasonable.
**CURRENCY** The table shows different currencies and their equivalence to 1 U.S. dollar. Divide to estimate the cost of each item in U.S. dollars.

<table>
<thead>
<tr>
<th>Currency</th>
<th>$1 U.S. equals…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada dollar</td>
<td>1.288</td>
</tr>
<tr>
<td>Japan yen</td>
<td>91.24</td>
</tr>
<tr>
<td>Mexican peso</td>
<td>13.22</td>
</tr>
<tr>
<td>Russian rubles</td>
<td>27.20</td>
</tr>
</tbody>
</table>

22. DVD; 1,333.36 Japanese yen
23. jeans; 854.96 Russian rubles
24. box of cereal; 56.185 Mexican pesos
25. MP3 player; 161 Canadian dollars

**PETS** Use estimation and mental math to find the four missing values from the receipt.

**NUMBER SENSE** Use estimation to place the decimal point in the quotient for each division sentence.

27. $337.692 \div 52.6 = 6.42$
28. $78.28 \div 8.24 = 9.5$
29. $1,873.715 \div 25.1 = 74.65$
30. $2,219.856 \div 164.8 = 13.47$

**SAVING** Aurelia would like to save $474.72 in a year to purchase a new video camera. She estimates she needs to save $40 per month. Explain why her estimate is reasonable.

**WEIGHT** A piggy bank containing only quarters has a mass of 850 grams when empty and 7,822 grams when filled. If a quarter weighs 5.6 grams, estimate the amount of money inside the piggy bank.

**H.O.T. Problems**

33. **OPEN ENDED** Write a real-world division problem involving decimals in which you would use compatible numbers to estimate the quotient.

34. **REASONING** Is 15 a reasonable estimate of $73.87 \div 6.89$? Explain your answer.

35. **CHALLENGE** Determine where to place the decimal point in each number so that the quotient is between 23 and 25.

36. **Write MATH** Explain how you know which compatible numbers to use when estimating a decimal quotient. Support your answer with an example.
37. The table shows the average breakdown of body weight for a 130-pound person.

<table>
<thead>
<tr>
<th>Body Part</th>
<th>Weight (ounces)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>896</td>
</tr>
<tr>
<td>Muscle</td>
<td>710</td>
</tr>
<tr>
<td>Skeleton</td>
<td>260</td>
</tr>
<tr>
<td>Head</td>
<td>118</td>
</tr>
<tr>
<td>Skin</td>
<td>96</td>
</tr>
</tbody>
</table>

About how many times as great is the weight of water than the weight of skin?
A. about 9 times  
B. about 10 times  
C. about 11 times  
D. about 12 times

38. SHORT RESPONSE For a craft activity at a day care, each child will need 1.75 yards of ribbon. If there are 25 yards of ribbon available, estimate the number of children that can participate.

39. The following advertisement was in the local newspaper.

<table>
<thead>
<tr>
<th>Bike Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>26&quot; Bike</td>
</tr>
<tr>
<td>Folding Bike Rack</td>
</tr>
<tr>
<td>Seat Covers</td>
</tr>
<tr>
<td>Bike Lock</td>
</tr>
<tr>
<td>Helmet</td>
</tr>
</tbody>
</table>

The cost of a 26" bike is equal to about how many bike locks?
F. about 7  
G. about 8  
H. about 9  
I. about 10

40. SHORT RESPONSE Rewrite the following division problem using compatible numbers, so the quotient is a whole number.

\[ 485.87 \div 71.54 \]

41. METALS The table gives the weight of one cubic foot of various metals. (Lesson 1-18)

a. How many pounds does 1.5 cubic feet of water weigh?
b. What is the weight of 2.6 cubic feet of aluminum foil?
c. How many pounds does 0.2 cubic foot of gold weigh?

<table>
<thead>
<tr>
<th>Weight of Elements (pounds per cubic foot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>water</td>
</tr>
<tr>
<td>aluminum foil</td>
</tr>
<tr>
<td>copper</td>
</tr>
<tr>
<td>gold</td>
</tr>
</tbody>
</table>

42. HAIR Human hair grows an average of 12.7 centimeters per year. How many centimeters does hair grow in 5 years? (Lesson 1-10)

Estimate the product. (Lesson 1-1A)

43. 37.6 \times 7.5
44. 11.08 \times 4.3
45. 243.9 \times 9.6

48. Chapter 1 Multiply and Divide Decimals
Divide Decimals by Whole Numbers

Dividing decimals is similar to dividing whole numbers. You can also use base-ten blocks to divide decimals by whole numbers.

- Use base-ten blocks to model the dividend.
- Separate the blocks into groups represented by the divisor.
- Begin separating with the ones, tenths, and hundredths.
- Replace any ones with tenths or tenths with hundredths, if needed.
- The quotient is the number in each group.

ACTIVITY

MONEY  Jeff and two of his friends spend $3.63 on three bottles of water. How much does one bottle of water cost?

What do you need to find?  the cost of one bottle of water

Find $3.63 ÷ 3 using base-ten blocks.

STEP 1  Model $3.63 as 3 ones, 6 tenths, and 3 hundredths.

STEP 2  Separate into three equal groups. Start with the ones, tenths, and then the hundredths.

There is 1 one, 2 tenths, and 1 hundredth in each group.
So, $3.63 ÷ 3 = $1.21.
The cost of one bottle of water is $1.21.
### Activity

2. Find 0.94 ÷ 2 using base-ten blocks.

**Step 1**
Model 0.94. 0.94 can be shown using 9 tenths and 4 hundredths.

**Step 2**
Separate the tenths into two groups. Since there is one tenth extra, rename as ten hundredths. Then separate the hundredths into two groups.

There are 4 tenths and 7 hundredths in each group.
So, 0.94 ÷ 2 = 0.47.

### Practice and Apply

Use base-ten blocks to show each quotient.
1. 3.4 ÷ 2  
2. 4.2 ÷ 3  
3. 5.6 ÷ 4  
4. 0.9 ÷ 2

Find each quotient.
5. 34 ÷ 2  
6. 42 ÷ 3  
7. 56 ÷ 4  
8. 9 ÷ 2

### Analyze the Results

9. Compare and contrast the quotients in Exercises 1–4 with the quotients in Exercises 5–8.

10. **FOOD** Four friends are splitting the cost of a birthday cake for another friend. If the cost of the birthday cake is $23.48, how much will each of the four people need to pay?

11. Determine the missing divisor in the sentence 0.39 ÷ 3 = 0.13. Explain your answer.

12. **Write MATH** How is the quotient affected if the dividend is the same but the divisor is doubled? If the divisor were halved? Explain your reasoning.

13. Suppose you need to find the quotient of 0.85 and 3. Is it possible to do with decimal models? Explain.

14. **MAKE A CONJECTURE** Write a rule you can use to divide a decimal by a whole number.

---

50 Chapter 1 Multiply and Divide Decimals
Main Idea
Divide decimals by whole numbers.

NGSS
- MA.6.A.1.1 Explain and justify procedures for multiplying and dividing fractions and decimals.
- MA.6.A.1.2 Multiply and divide fractions and decimals efficiently.

Divide Decimals by Whole Numbers

MOVIES Charlotte, Aaron, Maddle, and Catie went to the movies and ordered snacks from the menu shown.

1. What did they pay for four small popcorons?
2. What is the total cost for two small packages and one large package of candy?
3. How much do four medium drinks cost?
4. What is the total cost for Exercises 1–3?
5. Estimate how much each person should pay if they split the total cost among each person.
6. How can an estimate help you find the actual answer?

When dividing a decimal by a whole number, divide as with whole numbers. Then place the decimal point in the quotient directly above its place in the dividend.

EXAMPLE Divide a Decimal by a 1-Digit Number

1. Find 6.8 ÷ 2.
   - Estimate 6 ÷ 2 = 3
   - \[ \begin{array}{c}
   \phantom{6.8} \\
   2 \overline{)6.8} \\
   \hline
   6 \\
   \hline
   0
   \end{array} \]
   - 6 ones divided by 2 is 3 ones.
   - 8 tenths divided by 2 is 4 tenths.
   - 6.8 ÷ 2 = 3.4 Compared to the estimate, the quotient is reasonable.

CHECK Your Progress
a. 7.5 ÷ 3  
   b. 3.5 ÷ 7  
   c. 9.8 ÷ 2
EXAMPLE Divide a Decimal by a 2-Digit Number

2. Find $7.7 \div 14$.

**Estimate** $10 \div 10 = 1$

\[
\begin{array}{c c c}
10 & 7.7 \\
\hline
7 & 10 \\
\hline
3 & 70 \\
\hline
0 & 70 \\
\hline
& 0 \\
\end{array}
\]

$7.7 \div 14 = 0.55$ Compared to the estimate, the quotient is reasonable.

CHECK Your Progress

d. $9.48 \div 15$  
e. $3.49 \div 4$  
f. $55.08 \div 17$

In some real-world situations, the division is continuous, meaning it does not result in a remainder of zero. In those situations, round the quotient to a specified place-value position.

Real-World EXAMPLE

MAIL Lin is mailing a care package to his brother. The table gives the cost for mailing packages. If Lin’s care package weighs 3 pounds, how much is the cost per pound?

To find the cost per pound, divide $6.74 by 3.

\[
\begin{array}{c c c c c}
2 & .246 \\
\hline
3 & 6.74 \\
\hline
0 & 7 \\
\hline
0 & 6 \\
\hline
1 & 4 \\
\hline
1 & 2 \\
\hline
2 & 0 \\
\hline
& 18 \\
\hline
& 2 \\
\end{array}
\]

The remainder will never be zero.

It costs $2.25 per pound to mail the package.

CHECK Your Progress

g. **MAIL** Find the cost per pound of a two-pound and four-pound package.
**REAL-WORLD EXAMPLE**

**VIDEO GAMES** Ryan and his brother are sharing the cost of a video game. The video game costs $28.60. If Ryan saved $20 to buy the game, how much does he have left after paying his share?

**Estimate** $30 \div 1 = 30$, $30 - 15 = 15$

**Step 1** Determine how much Ryan will pay for the video game.

**Method 1** Paper and Pencil

\[
\begin{array}{c}
14.20 \\
2 (28.60)
\end{array}
\]

\[
\begin{array}{c}
\underline{28.60} \\
\underline{28.00} \\
\underline{60} \\
\underline{60} \\
\underline{0}
\end{array}
\]

Ryan’s share of the video game is $14.30.

**Method 2** Bar Diagram

\[
\begin{array}{c}
\text{Ryan's share} \\
\text{Brother's share}
\end{array}
\]

\[
\begin{array}{c}
\text{Ryan's share} \\
\text{Brother's share}
\end{array}
\]

\[
\begin{array}{c}
28.60 \div 2 = 14.30
\end{array}
\]

**Step 2** Determine how much Ryan will have left after paying his share.

**Method 1** Paper and Pencil

\[
\begin{array}{c}
20.00 \\
- 14.30
\end{array}
\]

\[
\begin{array}{c}
20.00 \\
- 14.30
\end{array}
\]

Ryan has $5.70 left.

**CHOOSE Your Method**

**h. BAGELS** Four dozen bagels costs $30.00. Find the cost of each dozen. How much change will you receive if you pay for a dozen bagels with a ten dollar bill?

**i. CARNIVAL** Kristen and her two friends are sharing the cost of a funnel cake at a carnival. The funnel cake costs $5.49. If Kristen has $2.00, how much will she have left after she pays her share?
Check Your Understanding

Examples 1 and 2 (p. 51-52) Divide. Round to the nearest tenth if necessary.
1. \(3.6 \div 4\)  
2. \(9.6 \div 2\)  
3. \(8.53 \div 6\)  
4. \(1087.9 \div 46\)  
5. \(12.32 \div 22\)  
6. \(69.904 \div 34\)  

Example 3 (p. 52)  
7. **SCIENCE** A light-year, the distance that light travels in one year, is 5,880 trillion miles. How many trillion miles will light travel in one month?

Example 4 (p. 53)  
8. **RUNNING** Percy ran 3 miles in 38.7 minutes. How many minutes did it take him to run 1 mile at this speed? How long would it take him to run 5 miles at this speed?

Practice and Problem Solving

Examples 1 and 2 (p. 51-52) Divide. Round to the nearest tenth if necessary.
9. \(39.39 \div 3\)  
10. \(36.8 \div 2\)  
11. \(118.5 \div 5\)  
12. \(124.2 \div 9\)  
13. \(7.24 \div 7\)  
14. \(6.27 \div 4\)  
15. \(11.4 \div 19\)  
16. \(10.22 \div 14\)  
17. \(55.2 \div 46\)  
18. \(59.84 \div 32\)  
19. \(336.75 \div 31\)  
20. \(751.2 \div 25\)

Examples 3 and 4 (p. 52-53)  
21. **VACATION** The Gonzales family is taking a cruise that costs $3,082.24 for a family of four. How much does it cost per person?

22. **BUILDINGS** Find the average height of the buildings shown in the table. (Hint: To find the average, add the values and divide by the number of values.)

<table>
<thead>
<tr>
<th>World's Tallest Buildings (thousands of feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.667</td>
</tr>
</tbody>
</table>

23. **MEASUREMENT** Mr. Jamison will stain the deck in his backyard. The deck has an area of 732.4 square feet. If the deck is 33 feet long, how wide is it? Justify your procedure.

24. **FOOD** The Student Council is raising money by selling bottled water at a band competition. The table shows the prices for different brands. Which brand costs the least per bottle? Explain your reasoning.

<table>
<thead>
<tr>
<th>Cost of Bottled Water (10-oz bottles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brand A 6-pack</td>
</tr>
<tr>
<td>Brand B 12-pack</td>
</tr>
<tr>
<td>Brand C 24-pack</td>
</tr>
</tbody>
</table>

25. **MEASUREMENT** The Verrazano-Narrows Bridge in New York City is 4,260 thousand feet long and is the seventh longest suspension bridge in the world. There are 3 feet in a yard. How long is the bridge in yards? Justify your procedure.

26. **CAR WASH** The Franklin Middle School jazz band plans to have a car wash to raise $468.75 for a new sound system. In the past, they washed an average of 125 cars at each car wash. What should they charge per car so they reach their goal?
27. **CHALLENGE** Find each of the following quotients. Then find a pattern and explain how you can use this pattern to mentally divide 0.0096 by 3.
   \[
   \begin{align*}
   844 \div 2 & \quad 0.844 \div 2 \\
   84.4 \div 2 & \quad 0.0844 \div 2 \\
   8.44 \div 2 & \quad 0.00844 \div 2
   \end{align*}
   \]

28. **FIND THE ERROR** Amanda is finding \(11.2 \div 14\).
    Find her mistake and correct it.

29. **REASONING** Is the quotient \(2.7 \div 3\) greater than or less than 1? Explain.

30. **Write Math** Explain how you can use estimation to place the decimal point in the quotient \(42.56 \div 22\).

---

**NGSS Practice MA.6.A.1.2**

31. **GRIDDED RESPONSE** Tanner and three neighborhood friends are buying a basketball hoop that costs $249.84. If the cost is divided equally, how much will each person pay in dollars?

32. **GRIDDED RESPONSE** Marvin completed 8 rounds of a trivia game and earned 94.4 points. If he earned the same amount of points each round, how many points did he earn each round?

---

**Spiral Review**

Estimate each quotient. (Lesson 1-2A)

34. \(53.4 \div 6.15\)  
35. \(312.4 \div 2.98\)  
36. \(92.4 \div 8.85\)

Multiply. (Lesson 1-16)

37. \(2.4 \times 5.7\)  
38. \(1.6 \times 2.3\)  
39. \(0.32(8.1)\)  
40. \(2.68(0.84)\)
Divide by Decimals

Main Idea
Use models to divide a decimal by a decimal.

NGSSS
MA.6.A.1.1 Explain and justify procedures for multiplying and dividing fractions and decimals.
MA.6.A.1.2 Multiply and divide fractions and decimals efficiently.

Activity

SNACKS Yolanda bought bags of pretzels that cost a total of $1.20. If each bag costs $0.40, how many bags of pretzels did she buy?

What do you need to find? how many bags she bought

Find $1.20 ÷ $0.40.

STEP 1 Model one and 20 hundredths.

STEP 2 Each bag costs $0.40, which is 4 dimes or 4 tenths of one dollar. So, replace the ones block with tenths and 20 hundredths with 2 tenths. You should have a total of 12 tenths.

STEP 3 Separate the tenths into groups of four tenths to show dividing by $0.40 or 0.4.

So, $1.20 ÷ $0.40 = 3.
Yolanda bought three bags of pretzels.

Practice and Apply

Use base-ten blocks to find each quotient.
1. 2.4 ÷ 0.6  
2. 1.2 ÷ 0.4  
3. 1.8 ÷ 0.6
Course 1 – Chapter 1

Multiplication and division families are related operations.

\[0.3 \times 0.5 = 0.15 \quad 0.15 \div 0.5 = 0.3\]

\[0.5 \times 0.3 = 0.15 \quad 0.15 \div 0.3 = 0.5\]

You can use fact families and missing factors to model division.

**ACTIVITY**

2. Find \(0.32 \div 0.8\).

**STEP 1**
Using a 10-by-10 area model, show 0.32 by shading in 32 hundredths. Because the divisor is 8 tenths, there should be 8 columns.

**STEP 2**
Determine the number of rows that make up the shaded area.

There are 4 rows, and each row represents one tenth.
So, \(0.32 \div 0.8 = 0.4\).

**Practice and Apply**

Use an area model to find each quotient.

4. \(0.24 \div 0.6\)  
5. \(0.28 \div 0.4\)  
6. \(0.25 \div 0.5\)

**Analyze the Results**

7. Refer to Activity 1. When using base-ten blocks to find a quotient, explain why you should always replace the dividend with the smallest place value of the divisor.

8. Explain why the quotient \(0.2 \div 0.04\) is a whole number. What does the quotient represent?

9. Determine the missing divisor in the sentence \(0.8 \div \quad = 20\). Explain your answer.

10. **MAKE A CONJECTURE**
Tell whether \(1.2 \div 0.03\) is less than, equal to, or greater than 1.2. Justify your procedure.
Divide Decimals by Decimals

**Explore** Use a calculator to copy and complete the table.

<table>
<thead>
<tr>
<th>Division Problem</th>
<th>Quotient</th>
</tr>
</thead>
<tbody>
<tr>
<td>$36 \div 9$</td>
<td>4</td>
</tr>
<tr>
<td>Set A</td>
<td></td>
</tr>
<tr>
<td>$36 \div 0.9$</td>
<td></td>
</tr>
<tr>
<td>$36 \div 0.09$</td>
<td></td>
</tr>
<tr>
<td>$36 \div 0.009$</td>
<td></td>
</tr>
<tr>
<td>Set B</td>
<td></td>
</tr>
<tr>
<td>$3.6 \div 9$</td>
<td></td>
</tr>
<tr>
<td>$0.36 \div 9$</td>
<td></td>
</tr>
<tr>
<td>$0.036 \div 9$</td>
<td></td>
</tr>
<tr>
<td>Set C</td>
<td></td>
</tr>
<tr>
<td>$3.6 \div 0.9$</td>
<td></td>
</tr>
<tr>
<td>$0.36 \div 0.09$</td>
<td></td>
</tr>
<tr>
<td>$0.036 \div 0.009$</td>
<td></td>
</tr>
</tbody>
</table>

1. Describe a pattern among the division problems and their quotients for each set.
2. Use the pattern in Set A to find $36 \div 0.009$ without a calculator.
3. Use the pattern in Set B to find $0.0036 \div 9$ without a calculator.
4. Use the pattern in Set C to find $0.0036 \div 0.009$ without a calculator.
5. Find $0.042 \div 0.07$ without a calculator. Explain your answer.

When dividing by decimals, change the divisor into a whole number. To do this, multiply both the divisor and the dividend by the same power of 10. Then divide as with whole numbers.

**Example** Divide by Decimals

**Find** $1.71 \div 0.9$.

*Estimate* $2 \div 1 = 2$

Multiply by 10 to make a whole number.

$$
\begin{array}{c}
0.9)1.71 \\
\hline
81 \\
\hline
91 \\
\hline
91 \\
\hline
0
\end{array}
$$

Place the decimal point. Divide as with whole numbers.

1.71 divided by 0.9 is 1.9. Compared to the estimate, the estimate is reasonable.

**Check** $1.9 \times 0.9 = 1.71$

**Check Your Progress**

a. $54.4 \div 1.7$

b. $8.424 \div 0.36$

c. $0.063 \div 0.007$
Course 1 – Chapter 1

**EXAMPLES**

**Zeros in the Quotient and Dividend**

2. Find $52 \div 0.4$.

```
\[
\begin{array}{c|cc}
0.4 & 52 & 0 \\
\hline
4 & 52 & 0 \\
- & 4 & \\
- & 12 & \\
- & 12 & 0 \\
\end{array}
\]
```

So, $52 \div 0.4 = 130$.

Study Tip 3. Check your answer to a division problem by multiplying the quotient by the divisor.

5. Find $0.009 \div 0.18$.

```
\[
\begin{array}{c|cc}
0.18 & 0.009 \\
\hline
18 & 0.009 \\
- & 0 \\
- & 9 \\
- & 9 \\
\hline
0 & 0 \\
\end{array}
\]
```

So, $0.009 \div 0.18 = 0.05$.

CHECK Your Progress
d. $5.6 \div 0.014$
e. $6.24 \div 200$
f. $0.4 \div 25$

**Real-World EXAMPLE**

4. **INTERNET** How many times as many Internet users are there in Japan than in Spain? Round to the nearest tenth.

Find $127.4 \div 40.4$.

```
\[
\begin{array}{c|cccc}
40.4 & 127.4 & 0.000 & 3.15 \\
\hline
1212 & 1274 & 0.000 & 3.15 \\
- & 1212 & 1274 & 0.000 \\
- & 620 & 620 & 3.15 \\
- & 404 & 404 & 3.15 \\
- & 2160 & 2160 & 3.2 \\
- & 2020 & 2020 & 3.2 \\
\hline
0 & 140 & 140 & 3.2 \\
\end{array}
\]
```

To the nearest tenth, $127.4 \div 40.4 = 3.2$. So, there are about 3.2 times as many Internet users in Japan than in Spain.

CHECK Your Progress

g. **INTERNET** How many times as many Internet users are there in the U.S. than in France? Round to the nearest tenth.
Divide.

Example 1
1. 3.69 ÷ 0.3
2. 9.92 ÷ 0.8
3. 0.45 ÷ 0.3
4. 13.95 ÷ 3.1
5. 0.6 ÷ 0.0024
6. 0.462 ÷ 6
7. 0.321 ÷ 0.4
8. 2.943 ÷ 2.7

Example 4
9. MEASUREMENT Alicia bought 5.75 yards of fleece fabric to make blankets for a charity. She needs 1.85 yards of fabric for each blanket. How many blankets can Alicia make with the fabric she bought?

Practise and Problem Solving

Divide.

Examples 1–3
10. 1.44 ÷ 0.4
11. 0.68 ÷ 0.8
12. 16.24 ÷ 0.14
13. 2.07 ÷ 0.9
14. 0.0038 ÷ 1.3
15. 0.16728 ÷ 3.4
16. 9.66 ÷ 0.42
17. 1.08 ÷ 0.27
18. 13.5 ÷ 0.03
19. 8.4 ÷ 0.02
20. 0.12 ÷ 0.15
21. 0.242 ÷ 0.4

Example 4
22. MEASUREMENT A submarine sandwich 1.5 feet long is cut into 0.25-foot pieces. How many pieces will there be?

23. MEASUREMENT The average person’s stride length, the distance covered by one step, is approximately 2.5 feet long. How many steps would the average person take to travel 50 feet?

24. POPULATION The table shows the five most populated countries in the world. How many times as many people live in China than in the United States? Round to the nearest tenth if necessary.

<table>
<thead>
<tr>
<th>Country</th>
<th>Approximate Population (billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>1.325</td>
</tr>
<tr>
<td>India</td>
<td>1.3</td>
</tr>
<tr>
<td>United States</td>
<td>0.304</td>
</tr>
<tr>
<td>Indonesia</td>
<td>0.355</td>
</tr>
<tr>
<td>Brazil</td>
<td>0.19</td>
</tr>
</tbody>
</table>

25. GEOGRAPHY Alaska has a coastline of about 6.64 thousand miles. Florida has about 1.35 thousand miles of coastline. How many times as much coastline does Alaska have than Florida? Round to the nearest tenth if necessary. Justify your procedure.

26. MEASUREMENT Lake Superior, along the U.S.-Canadian border, has a maximum depth of 1.333 thousand feet. There are 5,280 feet in one mile. How deep is Lake Superior in miles? Round to the nearest hundredth if necessary. Explain your answer.
ALGEBRA Use the order of operations to evaluate each expression if $m = 88.2$, $n = 3$, and $p = 17.5$. Round to the nearest tenth if necessary.

27. $\frac{m}{n}$  
28. $\frac{mp}{n}$  
29. $\frac{mn}{p}$  
30. $\frac{m}{p}$  
31. $\frac{p}{n}$  
32. $\frac{m - p}{n}$  
33. $\frac{p + n}{n}$  
34. $\frac{m + n + p}{p}$

35. CARS Use the table that shows the most popular sports car colors in North America.

<table>
<thead>
<tr>
<th>Color</th>
<th>Portion of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver</td>
<td>0.2</td>
</tr>
<tr>
<td>Gray</td>
<td>0.17</td>
</tr>
<tr>
<td>Blue</td>
<td>0.16</td>
</tr>
<tr>
<td>Black</td>
<td>0.14</td>
</tr>
<tr>
<td>White</td>
<td>0.1</td>
</tr>
<tr>
<td>Red</td>
<td>0.09</td>
</tr>
<tr>
<td>Green</td>
<td>0.06</td>
</tr>
<tr>
<td>Other</td>
<td>0.08</td>
</tr>
</tbody>
</table>

a. How many times more respondents chose silver than red? Round to the nearest tenth if necessary.

b. How many times more respondents chose either silver or black than red? Round to the nearest tenth if necessary.

36. MEASUREMENT The longest vehicle tunnel in the world is the Laerdal Tunnel in Norway with a length of 15.2 miles. How many vehicles could fit in the tunnel bumper to bumper, in one lane, if the average vehicle length is 0.004 mile? Justify your procedure.

37. FIND THE DATA Refer to the Data File on pages 2–5. Choose some data and write a real-world problem in which you would divide decimals.

38. COINS A U.S. quarter has a mass of 5.67 grams. Find the weight in pounds of $500$ in quarters. Explain your procedure. (Hint: 1 pound = 2,000 grams.)

39. BEADS A necklace is being made with beads that are 1.25 centimeters in diameter. The necklace is 30 centimeters long. How many beads are needed?

40. GRAPHIC NOVEL Refer to the graphic novel frame below for Exercises a–b.

I still need $132 to pay for the video game system.

CAR WASH Paycheck

<table>
<thead>
<tr>
<th>Hourly wage</th>
<th>Hours worked</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5.50</td>
<td>$</td>
</tr>
</tbody>
</table>

**Lesson 1-2** Divide Decimals 61
**H.O.T. Problems**

41. **CHALLENGE** Find two positive decimals $a$ and $b$ that make the following statement true. Then find two positive decimals $a$ and $b$ that make the statement false.

   \[
   \text{If } a < 1 \text{ and } b < 1, \text{ then } a \div b < 1.
   \]

42. **Which One Doesn’t Belong?** Identify the problem that does not have the same quotient as the other three. Explain your reasoning.

   \[
   49 \div 7 \quad 49 \div 7 \quad 0.49 \div 0.7 \quad 0.049 \div 0.07
   \]

43. **Write MATH** Refer to the table in Exercise 24 on the world’s most populated countries. Write and solve a problem in which you would divide decimals. Include instructions for rounding in your problem.

44. To the nearest tenth, how many times as many people in the U.S. own dogs as own birds?

   \[
   \text{Number of People (millions)}
   \]
   
   \[
   \begin{array}{c|c|c|c}
   \text{Type of Pet} & \text{Dogs} & \text{Cats} & \text{Birds} \\
   \hline
   \text{Owning Pets} & 31.2 & 27.0 & 4.6 \\
   \end{array}
   \]

   A. 6.8  
   B. 12.2  
   C. 26.6  
   D. 35.8

45. The table shows the approximate number of people in the world who speak either Spanish or French.

   \[
   \begin{array}{|c|c|}
   \hline
   \text{Language} & \text{Speakers (billions)} \\
   \hline
   \text{Spanish} & 0.425 \\
   \text{French} & 0.129 \\
   \hline
   \end{array}
   \]

   To the nearest tenth, how many times as many people speak Spanish as French?

   F. 0.2  
   G. 1.1  
   H. 0.3  
   I. 3.3

**Spiral Review**

46. Find the quotient when 68.52 is divided by 12. (Lesson 1-2C)

47. **STICKERS** Anna bought 5 packs of stickers for a total of $11.18. Estimate the cost per pack of stickers. Explain your reasoning. (Lesson 1-2A)

**Multiply.** (Lesson 1-1E)

48. $19.2 \times 2.45$

49. $8.25 \times 12.42$

50. $9.016 \times 51.9$

51. $6.32 \times 14.5$

62 **Chapter 1** Multiply and Divide Decimals
CHAPTER 1  Mid-Chapter Check

Estimate each product. (Lesson 1-1A)
1. 4.7 \times 3 \quad 2. 7.1 \times 5

3. **MEMORY** An 8-gigabyte memory card costs $34.99. If Francis bought 3 memory cards, what is the estimated total cost? (Lesson 1-1A)

4. **GAS MILEAGE** Ashton used 12.6 gallons of gasoline to drive his car on a weekend trip. He averaged 21.5 miles per gallon. About how many miles did he travel? (Lesson 1-1C)

Multiply. (Lessons 1-1C and 1-1E)
5. 2.3 \times 5 \quad 6. 0.6 \times 8
7. 3.4 \times 5.2 \quad 8. 1.2 \times 0.015

9. **TRAILS** The table shows a list of walking trails in the United States.

<table>
<thead>
<tr>
<th>Location</th>
<th>Length of Trail (mi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Florida Trail (FL)</td>
<td>4.8</td>
</tr>
<tr>
<td>Long Path (NI)</td>
<td>3.3</td>
</tr>
<tr>
<td>Ohio &amp; Erie Canal Trail (OH)</td>
<td>4.3</td>
</tr>
<tr>
<td>KATY Trail (MO)</td>
<td>5.7</td>
</tr>
<tr>
<td>Point Reyes National Seashore (CA)</td>
<td>5.0</td>
</tr>
</tbody>
</table>

If Latisha walked the Florida Trail 6 days each week, how many miles did she walk in a week? (Lesson 1-1C)

10. **POOL TABLE** The length of a pool table is 7.1 feet and the width is 3.6 feet. Find the area of the surface of the pool table by multiplying length times width. (Lesson 1-1E)

Estimate each quotient. (Lesson 1-2A)
11. 17.7 \div 3.2 \quad 12. 25.9 \div 7.8

Divide. (Lessons 1-2C and 1-2E)
13. 19 \div 4.75 \quad 14. 62 \div 7.75
15. 76.219 \div 8.45 \quad 16. 101.84 \div 7.6

17. **NGSS** **PRACTICE** Scientists often use soil samples to monitor environmental changes. A soil sample is 126.5 centimeters deep. Every 1.15 centimeters of the sample represents soil from 1 year. How many years are represented by the sample? (Lesson 1-2E)
   A. 145 years \quad C. 110 years
   B. 120 years \quad D. 90 years

18. **TICKETS** The total cost of 5 Miami Dolphins tickets was $212.50. What was the cost of one ticket? (Lesson 1-2C)
   F. 1 \quad H. 3
   G. 2 \quad I. 4

19. **NGSS** **PRACTICE** In a recent year, Florida’s population was about 18.2 million people. That same year, Alabama’s population was about 4.55 million people. How many times greater was Florida’s population than Alabama’s? (Lesson 1-2E)
   E. 1 \quad F. 3
   G. 2 \quad H. 4

20. **EXTENDED RESPONSE** Coleen is making 30 necklaces out of leather string. Each necklace requires 30 centimeters of string.

   **Part A** How many centimeters of string does she need?

   **Part B** If the total cost of the string was $4.41, how much did she spend per meter? Explain your reasoning. (Lesson 1-2E)
Multiply by Powers of 10

Explore  Numbers like 10, 100, and 1,000 are called powers of 10 because they can be obtained by raising 10 to a whole number power.
1. Copy and complete the table shown.

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Power of 10</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.24</td>
<td>× 1</td>
<td>1.24</td>
</tr>
<tr>
<td>1.24</td>
<td>× 10</td>
<td>12.4</td>
</tr>
<tr>
<td>1.24</td>
<td>× 100</td>
<td></td>
</tr>
<tr>
<td>1.24</td>
<td>× 1,000</td>
<td></td>
</tr>
<tr>
<td>1.24</td>
<td>× 10,000</td>
<td></td>
</tr>
</tbody>
</table>

2. Look for a pattern in the products. Write one or two sentences that describe this pattern.
3. How can you find the product of a number and a power of 10 without using paper and pencil or a calculator?

Multiplying a decimal by a power of 10 greater than 1 moves the decimal point to the right the same number of places as the number of zeros in the power 10.

**EXAMPLES**

Find each product.

1. \(0.35 \times 100\)
   
   \(0.35 \times 100 = 35\)
   
   Since 35 is a whole number, remove the leading zero and decimal point.

2. \(8.5 \times 1,000\)
   
   \(8.5 \times 1,000 = 8,500\)
   
   1,000 has 3 zeros, so move the decimal point 3 places to the right. Annex zeros as needed.
   
   Remove the decimal and add a comma.

**CHECK Your Progress**

a. \(2.72 \times 1,000\)
   
   b. \(5.98 \times 10,000\)
VIDEO GAMES  In a recent year, a football video game sold 3.2 million copies. Write this number in standard form.

3.2 million = $3.2 \times 1,000,000$

The word *million* means $1,000,000$.

$= 3,200,000$

$1,000,000$ has 6 zeros. So, move the decimal point 6 places to the right. Annex zeros as needed.

$= 3,200,000$

Remove the decimal point and add commas.

So, 3,200,000 copies of the video game were sold.

CHECK Your Progress

c. **ROADS** There are about 39 million miles of roads in the United States. Write the amount of roads in standard form.

d. **SUN** The diameter of the Sun is about 1.39 million kilometers. Write this diameter in standard form.

On page 64, you investigated a pattern when multiplying a decimal by powers of 10 greater than 1. A similar pattern is found when multiplying a decimal by powers of 10 like 0.1 and 0.01 that are less than one. In these numbers, $0.1 = \frac{1}{10}$ and $0.01 = \frac{1}{100}$.

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Power of 10</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.4 $\times 0.1$</td>
<td>$-1.24$</td>
<td></td>
</tr>
<tr>
<td>12.4 $\times 0.01$</td>
<td>$0.124$</td>
<td></td>
</tr>
<tr>
<td>12.4 $\times 0.001$</td>
<td>$0.0124$</td>
<td></td>
</tr>
</tbody>
</table>

The table above suggests that multiplying a decimal by a power of 10 less than one moves the decimal point to the left the same number of places as there are after the decimal point.

**EXAMPLE**  **Multiply by a Power of 10 Less than 1**

Find $5.4 \times 0.01$.

$5.4 \times 0.01 = 0.054$

$0.01$ has 2 places after the decimal point. So, move the decimal point 2 places to the left.

$= 0.054$

Annex zeros as needed.

**CHECK Your Progress**

e. $93.6 \times 0.1$

f. $7.84 \times 0.001$
Course 1 – Chapter 1

CHECK Your Understanding

Examples 1 and 2 (p. 64)

Find each product.
1. $0.67 \times 10$
2. $1.6 \times 100$
3. $8.95 \times 1,000$

Example 3 (p. 65)

4. **SPORTS** The seasonal attendance at a baseball stadium was 3.45 million people. Write the number of people in standard form.

Example 4 (p. 65)

5. $0.45 \times 0.1$
6. $0.8 \times 0.01$
7. $3.2 \times 0.001$

Practice and Problem Solving

Examples 1 and 2 (p. 64)

Find each product.
8. $0.25 \times 100$
9. $6.55 \times 100$
10. $0.9 \times 10$
11. $3.48 \times 10$
12. $7.62 \times 1,000$
13. $0.5 \times 1,000$
14. $0.78 \times 10$
15. $9.53 \times 10,000$
16. $18.50 \times 10$

Example 3 (p. 65)

Write each number in standard form.
17. **SCIENCE** The planet Mercury is 28.6 million miles from the Sun.

Example 4 (p. 65)

Find each product.
19. $0.3 \times 0.01$
20. $4.63 \times 0.01$
21. $8.7 \times 0.1$
22. $16.89 \times 0.1$
23. $346 \times 0.01$
24. $5.872 \times 0.01$
25. $0.02 \times 0.1$
26. $0.007 \times 0.001$
27. $0.45 \times 0.001$

28. **MONEY** The soccer ball shown is on sale for 0.1 off the original price. What is the sale price? Justify your procedure.

29. **MOVIES** One week, a movie theater sold 6,500 tickets. The next week, the number of tickets sold decreased by 0.01. How many tickets were sold in the second week? Justify your procedure.

**ALGEBRA** Evaluate each expression if $a = 0.1$, $b = 0.01$, and $c = 10$.
30. $3.2a$
31. $1.47 \times c^3$
32. $12 \times b$
33. $c^2 \times 8.4$

34. **EARTHQUAKES** The Richter scale is used to compare the size of earthquakes. The scale uses counting numbers. Each number represents a magnitude 10 times greater than the previous number. An earthquake has a magnitude of 5 on the Richter scale. How much stronger is it than an earthquake with a magnitude of 2?
Course 1 – Chapter 1

35. **FIND THE ERROR** Dwayne is finding $0.60 \times 1,000$ mentally. Find his mistake and correct it.

$$0.60 \times 1,000 = 600.6 = 0.0006$$

36. **REASONING** By what power of ten would you multiply each number to get a product of 65? Explain your answer.
   a. 6.5  
   b. 6,500  
   c. 0.0065

37. **CHALLENGE** Explain how you could find the product of 0.3 and a number mentally. Then, use your procedure to find $0.3 \times 25$.

38. **Write MATH** Suppose you plan to purchase 10 items that each cost $4.95. Explain how you can use mental math to find the cost of the 10 items.

   - Which item listed costs about one hundred times more than a snack bar?

<table>
<thead>
<tr>
<th>Item</th>
<th>Price ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Television</td>
<td>498.95</td>
</tr>
<tr>
<td>Lunch Combo</td>
<td>5.25</td>
</tr>
<tr>
<td>6-Pack Soft Drink</td>
<td>3.25</td>
</tr>
<tr>
<td>Snack Bar</td>
<td>0.50</td>
</tr>
<tr>
<td>Pair of Shoes</td>
<td>40.08</td>
</tr>
</tbody>
</table>

   A. 6-pack soft drink  
   B. pair of shoes  
   C. lunch combo  
   D. television

40. The length of a blue whale is approximately 10 times the length of a polar bear. What is the approximate length of a blue whale?

   - F. 0.75 ft  
   - H. 75 ft  
   - G. 7.5 ft  
   - I. 750 ft

41. **CYCLING** Isla biked 13.5 miles in 1.2 hours. How many miles did she bike in one hour? (Lesson 1-25)

42. **SHOPPING** The table shows the cost of packages of water bottles. What is the cost of one water bottle from a 12-pack? (Lesson 1-2C)

<table>
<thead>
<tr>
<th>Water Bottles</th>
<th>6-pack</th>
<th>12-pack</th>
<th>24-pack</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$1.85</td>
<td>$5.73</td>
<td>$7.40</td>
</tr>
</tbody>
</table>

Lesson 1.3 Powers of 10 67
Divide by Powers of 10

**Main Idea**
Divide decimals mentally by powers of ten.

**NGSS**
- **MA.6.A.1.1** Explain and justify procedures for multiplying and dividing fractions and decimals.
- **MA.6.A.1.2** Multiply and divide fractions and decimals efficiently.
  Also addresses **MA.6.A.1.3**.

**Explore** There is also a pattern when you divide a number by a power of 10.

1. Copy and complete the table shown.

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Power of 10</th>
<th>Quotient</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.5</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td>12.5</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>0.001</td>
<td></td>
</tr>
</tbody>
</table>

2. For which divisors are the quotients less than 12.5? greater than 12.5?
3. Look for a pattern in the quotients. Write one or two sentences to describe this pattern.

Dividing by a power of 10 greater than 1 moves the decimal point to the left the same number of places as the number of zeros in the power of 10.

**EXAMPLES** Divide by a Power of 10 Greater than 1

Find each quotient.

1. \(81.7 \div 100\)

\[
81.7 \div 100 = 0.817
\]

Since all digits are decimal digits, insert a leading zero.

2. \(0.48 \div 1,000\)

\[
0.48 \div 1,000 = 0.00048
\]

Since all digits are decimal digits, insert a leading zero.

**CHECK Your Progress**

a. \(6.743 \div 100\)

b. \(3,142 \div 1,000\)
Real-World Example

STATUES The height of the Statue of Liberty from base to torch is about 152 feet. This is 10 times the height of the Goddess of Liberty Statue. Find the height of the Goddess of Liberty.

The height of the Goddess of Liberty statue can be found by dividing the height of the Statue of Liberty by 10.

\[
152 \div 10 = 15.2
\]

10 has one zero, so move the decimal 1 place to the left.

= 15.2

The height of the original Goddess of Liberty statue was 15.2 feet.

CHECK Your Progress
c. SCHOOL The enrollment at Harrison Middle School was 730 students, which is 10 times the number of new students that enrolled the previous year. How many students enrolled the previous year?

Dividing a decimal by a power of 10 less than one moves the decimal point to the right the same number of places as there are after the decimal point.

Study Tip

Mental Math Dividing by 0.1 can be thought of as dividing a number into tenths. Think: How many tenths make up the number? This will result in a quotient greater than the original number when the dividend is at least 0.1.

Examples

Divide by a Power of 10 Less than 1

Find each quotient.

4. 4.57 \div 0.1

4.57 \div 0.1 = 45.7

There is 1 place after the decimal point, so move the decimal point 1 place to the right.

= 45.7

5. 0.14 \div 0.01

0.14 \div 0.01 = 14

There are 2 places after the decimal point, so move the decimal point 2 places to the right.

= 14

Remove the decimal point.

CHECK Your Progress
d. 15.8 \div 0.001

e. 0.02 \div 0.1
**CHECK Your Understanding**

Find each quotient.

1. \(26.8 \div 10\)  
2. \(19.75 \div 100\)  
3. \(0.52 \div 1,000\)  
4. \(592 \div 0.1\)  
5. \(62.54 \div 0.01\)  
6. \(0.18 \div 0.001\)

**Example 3**

**Pets** The number of registered Aby cats is 0.01 the number of registered Labrador retriever dogs in the U.S. If there are about 1,400 Aby cats registered in the U.S., about how many Labs are registered?

**Practice and Problem Solving**

Find each quotient.

8. \(64.52 \div 100\)  
9. \(728 \div 100\)  
10. \(0.37 \div 10\)  
11. \(2.95 \div 10\)  
12. \(92.3 \div 1,000\)  
13. \(0.82 \div 1,000\)  
14. \(4.5 \div 0.1\)  
15. \(64.65 \div 0.01\)  
16. \(28 \div 0.001\)  
17. \(81.6 \div 0.01\)  
18. \(981.6 \div 0.01\)  
19. \(4.91 \div 1\)

**Example 3**

**Charity** Mrs. McCullough’s homeroom has collected $578.92 in pennies to donate to charity. A penny is equal to $0.01. How many pennies did the students collect?

21. **Saving** Mateo is saving $10 a week until he has enough to buy a bike that costs $185. How many weeks will he need to save?

22. **Geology** A landmass has moved a total of 4.3 meters. How many years did it take for it to move if it moved at a speed of 0.001 meter per year? Explain your answer.

23. **Party Favors** Keisha purchased 2.5 pounds of chocolate candies to make party favor bags. How many party favor bags can she make if each bag will hold 0.1 pound of candies? Justify your procedure.

24. **Waterfalls** Niagara Falls, located between the United States and Canada, drains water from Lake Erie into Lake Ontario.
   a. At its current rate, the Falls will recede 30 meters in 100 years. How far will it recede in one year?
   b. It drains 12 million gallons of water every ten minutes. How many gallons, in standard form, does it drain every minute?

**Algebra** Evaluate each expression if \(a = 10\), \(b = 0.1\), and \(c = 0.01\).

25. \(42 \div b\)  
26. \(34.8 + a^3\)  
27. \(15 \div b\)  
28. \(7.6 \div c\)
29. **NUMBER SENSE** Explain how you could find $0.01 ÷ 0.0001$ mentally.

30. **REASONING** Compare and contrast multiplying by a power of ten greater than 1 and dividing by a power of ten less than 1.

31. **CHALLENGE** Determine what number you must divide the given number by to get a quotient of 1.8. Explain your answer.
   a. 18
   b. 180
   c. 0.0018

32. **Write MATH** Explain the relationship between the number of places a decimal is moved to the left and the change in the value of the number.

33. Which of the following will change 3.56 to 0.00356?
   a. multiplying by 100
   b. multiplying by 0.1
   c. dividing by 1,000
   d. dividing by 0.001

34. **GRIDDED RESPONSE** The distance around the figure shown is 36.7 feet. If each side is the same, what is the length, in feet, of each side?

35. How many dimes are in $82.80?
   a. $828
   b. $8,280
   c. 82,800
   d. 828,000

36. The rates for Lorenzo’s cell phone service are shown in the table.

<table>
<thead>
<tr>
<th>Rates (per 100 minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday $13</td>
</tr>
<tr>
<td>Weeknight $9</td>
</tr>
<tr>
<td>Weekend $6</td>
</tr>
</tbody>
</table>

   How much does it cost for one minute during the weekday?
   a. $0.13
   b. $0.10
   c. $0.08
   d. $0.06

37. **GEOGRAPHY** The state of Florida covers 6.5758 × 10,000 square miles. Express this number in standard form.

   Find each product.
   38. $82.9 \times 1.6$
   39. $0.07 \times 1.2$
   40. $4.04 \times 2.5$
   41. $7.43 \times 5.6$

   42. **SHOPPING** What is the cost of one month of the magazine shown?

---

Lesson 1-3 Powers of 10
Problem-Solving Investigation

Main Idea: Determine reasonable answers to solve problems.

Determine Reasonable Answers

**STEPHANIE:** I am burning a CD. I have picked out the first 5 songs. The CD’s capacity is 72 minutes. I estimated the number of minutes left on the CD to be 50 minutes. Is my estimation reasonable?

<table>
<thead>
<tr>
<th>Song</th>
<th>Length (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.20</td>
</tr>
<tr>
<td>2</td>
<td>6.60</td>
</tr>
<tr>
<td>3</td>
<td>5.75</td>
</tr>
<tr>
<td>4</td>
<td>4.40</td>
</tr>
<tr>
<td>5</td>
<td>5.50</td>
</tr>
</tbody>
</table>

**YOUR MISSION:** Determine a reasonable estimate.

**Understand**
You know the lengths of the first 5 songs and the capacity of the CD. You need to determine a reasonable estimate for the remaining minutes on the CD.

**Plan**
Estimate the length of each song. Then add the estimated lengths. Finally, subtract that amount from 72, the capacity of the CD.

**Solve**

\[
\begin{align*}
\text{Song 1} & \rightarrow 5.20 \rightarrow 5 \\
\text{Song 2} & \rightarrow 6.60 \rightarrow 5 \\
\text{Song 3} & \rightarrow 5.75 \rightarrow 6 \\
\text{Song 4} & \rightarrow 5.50 \rightarrow 4 \\
\text{Song 5} & \rightarrow 4.40 \rightarrow 4 \\
\end{align*}
\]

Since \(72 - 25 = 47\), a reasonable estimate for the number of minutes left is 50.

**Check**
Since \(5.20 + 6.60 + 5.75 + 5.50 + 4.40 = 22.5\), and \(72 - 22.5 = 47.5\), 50 minutes is a reasonable estimate.

**Analyze the Strategy**

1. Describe a situation where determining a reasonable answer would help you solve a problem. Justify your answer.

2. **Write MATH** Write a problem that can be solved by determining a reasonable answer. Then tell the steps you would take to solve the problem.

**NGSSS**

MA.6.A.5.3 Estimate the results of computations with fractions, decimals, and percents and judge the reasonableness of the results. Also addresses MA.6.A.1.3.

Chapter 1 Multiply and Divide Decimals
Mixed Problem Solving

- Determine reasonable answers.
- Draw a diagram.
- Guess, check, and revise.
- Choose an operation.

Use the determine reasonable answers strategy for Exercises 3–5.

3. **CLOTHES** Annie wants to buy 2 pairs of capris for $34.99 each and 3 pairs of flip flops for $7.99 each. Does she need to save $150, or is $100 enough?

![Image of clothes and flip flops]

**CAPRIS $34.99**  
**FLIP FLOPS $7.99**

7. **MAGAZINES** The table below shows the number of magazines a company sold from 2005 to 2009.

<table>
<thead>
<tr>
<th>Year</th>
<th>Magazines Sold (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>17.3</td>
</tr>
<tr>
<td>2006</td>
<td>4.5</td>
</tr>
<tr>
<td>2007</td>
<td>8.3</td>
</tr>
<tr>
<td>2008</td>
<td>3.1</td>
</tr>
<tr>
<td>2009</td>
<td>2.8</td>
</tr>
</tbody>
</table>

a. Which year had about 3 times as many magazines sold as in 2009?

b. Which year had about 5 million fewer magazines sold than 2007?

8. **MUSIC** Vaughn downloaded 3 songs on his MP3 player for $2.97. How much does one song cost?

![Image of music player]

9. **NUMBERS** John wrote down two numbers. The product of the numbers is 48 and the difference between the two numbers is 8. What are the two numbers John wrote down?

10. **WHALES** The table below shows the weight of whales. Is the weight of a blue whale about 3 times, 4 times, or 5 times the weight of a gray whale?

<table>
<thead>
<tr>
<th>Whale</th>
<th>Weight (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>151.0</td>
</tr>
<tr>
<td>Bowhead</td>
<td>95.0</td>
</tr>
<tr>
<td>Fin</td>
<td>69.9</td>
</tr>
<tr>
<td>Gray</td>
<td>38.5</td>
</tr>
<tr>
<td>Humpback</td>
<td>38.1</td>
</tr>
</tbody>
</table>

11. **SHOPPING** An online store sells magnets for $3.25 each and keychains for $5.79 each. If Mrs. Anderson spent $56.78 on magnets and keychains, how many of each did she buy?

---

Lesson 1-3 Powers of 10
Do you have a passion for sports and a strong interest in science? Are you a creative thinker who always has new ideas or better ways of doing things? If so, then you should consider a career designing sports equipment. Sports equipment designers combine creativity and engineering principles to create equipment that is cutting edge and helps improve athletic performance. They design everything from baseball bats and footballs to lacrosse protective gear and racing wheelchairs.

Choose a Major
Are you interested in a career as a sports equipment designer? Take some of the following courses in high school.

- Algebra
- Biology
- Calculus
- Computer Science
- Physics
When a punter kicks a football, the ball has both horizontal motion and vertical motion. The table shows these values when a football is kicked at 25 meters per second.

### Punting a Football

<table>
<thead>
<tr>
<th>Angle of Kick</th>
<th>Horizontal Motion (m/s)</th>
<th>Vertical Motion (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>27°</td>
<td>22.3</td>
<td>11.3</td>
</tr>
<tr>
<td>45°</td>
<td>17.7</td>
<td>17.7</td>
</tr>
<tr>
<td>62°</td>
<td>11.7</td>
<td>22.1</td>
</tr>
</tbody>
</table>

---

**Real-World Math**

Use the information in the table to solve each problem. Assume that each football is kicked at 25 meters per second. Round to the nearest tenth if necessary.

1. The hang time, or time that a football is in the air, of a football that is kicked at a 27° angle is given by $0.204 \times 11.3$. What is the approximate hang time?

2. How much greater is the hang time of a football that is kicked at a 62° angle than one that is kicked at a 45° angle? Use the expression $0.204 \times 22.1$ and $0.204 \times 17.7$.

3. The final distance from the punter to a football kicked at a 27° angle is approximately $22.3 \times 11.3 \times 0.2$. What is the distance from the punter to the football?

4. Find the distance of a football that is kicked at an angle of 62° if the distance is found by using the expression $11.7 \times 22.1 \times 0.2$.

5. The hang time of a football is about 3 seconds. Find $3 \div 0.204$ to determine the vertical motion of the football.

6. A football reaches its maximum height in $y \div 9.8$ seconds. A football is kicked at a 62° angle. At the same time, another football is kicked at a 27° angle. Which reaches its maximum height first? Explain.
**Key Concepts**

**Multiply Decimals** (Lesson 1-1)
- When multiplying decimals, multiply as with whole numbers. The product has the same number of decimal places as the sum of the number of decimal places in each factor.

**Divide Decimals** (Lesson 1-2)
- To divide decimals, change the divisor into a whole number. Place the decimal point directly above the decimal point in the dividend, then divide as with whole numbers.

**Powers of 10** (Lesson 1-3)

| To...          | move the decimal point to the...
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>multiply by a power of 10 less than 1</td>
<td>left</td>
</tr>
<tr>
<td>multiply by a power of 10 greater than 1</td>
<td>right</td>
</tr>
<tr>
<td>divide by a power of 10 less than 1</td>
<td>right</td>
</tr>
<tr>
<td>divide by a power of 10 greater than 1</td>
<td>left</td>
</tr>
</tbody>
</table>

**Key Vocabulary**

**compatible numbers** (p. 44)

**Vocabulary Check**

Choose the correct term or number to complete each sentence.

1. (Dividends, Compatible numbers) can be used to estimate the quotient of 32.1 ÷ 7.93 by rounding 32.1 to 32 and 7.93 to 8, and then dividing.

2. The product of 0.423 × (0.01, 100) is 42.3.

3. To mentally divide 385.7 by 1,000, move the decimal point three places to the (left, right).

4. When multiplying decimals and placing the decimal point, find the (sum, product) of the number of decimal places in each factor.

5. The quotient of 95.21 ÷ 0.001 is (9521, 95,210).

6. When dividing decimals, place the decimal point in the quotient directly above the decimal point in the (dividend, divisor).

7. (Powers, Factors) of ten are used in dividing decimals.

8. The quotient of 45 ÷ 0.9 is the same as the quotient of 4.5 ÷ (0.09, 9).
Multi-Part Lesson Review

1-1 Multiply Decimals

Estimate Products (pp. 27–31)

Estimate each product.
9. \(62.7 \times 6.1\)
10. \(8.06 \times 0.7\)
11. \(483 \times 9.2\)
12. \(3.3 \times 54.2\)
13. \(2.09 \times 6.76\)
14. \(41.9 \times 7.16\)
15. SPEED A car travels 57.9 miles per hour for 3.2 hours. Estimate the number of miles driven.

Example 1
Estimate the product of \(32.8 \times 5.1\).

Use rounding.
\[
32.8 \quad \rightarrow \quad 30 \\
\times 5.1 \quad \rightarrow \quad \times 5 \\
\quad \text{Round 32.8 to 30.} \\
\quad \text{Round 5.1 to 5.} \\
150
\]
So, \(32.8 \times 5.1\) is about 150.

Multiply Decimals by Whole Numbers (pp. 34–37)

Multiply.
16. \(1.4 \times 6\)
17. \(3 \times 9.95\)
18. \(2.6 \times 38\)
19. \(12.09 \times 19\)
20. \(16 \times 6.65\)
21. \(24.7 \times 31\)
22. \(5 \times 0.048\)
23. \(0.082 \times 17\)
24. GROCERIES A loaf of bread costs $1.79. How much would five loaves cost?

Example 2
Find \(6.45 \times 7\).

Estimate \(6.45 \times 7 \rightarrow 6 \times 7 = 42\)

\[
\begin{align*}
3.3 & \quad \leftarrow \text{two decimal places} \\
6.45 & \quad \leftarrow \text{two decimal places} \\
\times 7 & \\
45.15 & \quad \leftarrow \text{two decimal places} \\
\end{align*}
\]
So, \(6.45 \times 7 = 45.15\).

Multiply Decimals by Decimals (pp. 40–43)

Multiply.
25. \(0.6 \times 1.3\)
26. \(8.74 \times 2.23\)
27. \(0.04 \times 5.1\)
28. \(2.6 \times 3.9\)
29. \(0.002 \times 50\)
30. \(0.04 \times 0.0063\)
31. MEASUREMENT What is the area of the base of the fountain below?

Example 3
Find \(38.76 \times 4.2\).

\[
\begin{align*}
38.76 & \quad \leftarrow \text{two decimal places} \\
\times 4.2 & \quad \leftarrow \text{one decimal place} \\
7752 & \\
+ 15504 & \\
162.792 & \quad \leftarrow \text{three decimal places} \\
\end{align*}
\]
So, \(38.76 \times 4.2 = 162.792\).
1-2 Divide Decimals

Estimate Quotients (pp. 44-48)

Estimate each quotient.

32. \(478.1 \div 11.9\)  33. \(4.77 \div 2.45\)
34. \(9.46 \div 3.14\)  35. \(63.4 \div 14.87\)
36. \(417.25 \div 87.01\)  37. \(89.7 \div 9.04\)
38. \(478.2 \div 81.3\)  39. \(725.6 \div 88.9\)

40. **RAINFALL** The rainfall for one year was 35.8 inches. What was the approximate rainfall per month?

Example 4

Estimate the quotient of \(\frac{71.06}{34.1}\).

Round 71.06 to 70 and 34.1 to 35 by using compatible numbers.

\[
\begin{align*}
34.1 & \overline{)71.06} \\
2 & \rightarrow & 35 \overline{)70}
\end{align*}
\]

So, \(\frac{71.06}{34.1}\) is about 2.

Divide Decimals by Whole Numbers (pp. 51-55)

Divide.

41. \(4.41 \div 5\)  42. \(26.96 \div 8\)
43. \(136.5 \div 35\)  44. \(37.1 \div 14\)
45. \(12.24 \div 36\)  46. \(203.84 \div 32\)
47. \(624.8 \div 16\)  48. \(948.45 \div 15\)

49. **MONEY** In one year, Marcy made $214.68 in interest from her savings account. If she made the same amount of interest each month, how much did she make each month?

Example 5

Find the quotient of \(\frac{16.1}{7}\).

\[
\begin{align*}
7 & \overline{)16.1} \\
-1 & \rightarrow & 2.3 \text{ Place the decimal point.}
\end{align*}
\]

Divide as with whole numbers.

\[
\begin{align*}
2 & \rightarrow & -1 \rightarrow 2 \rightarrow 1 \\
0 & &
\end{align*}
\]

Divide Decimals by Decimals (pp. 58-62)

Divide.

50. \(0.96 \div 0.6\)  51. \(11.16 \div 6.2\)
52. \(0.276 \div 0.6\)  53. \(5.88 \div 0.4\)
54. \(18.45 \div 0.5\)  55. \(0.155 \div 0.25\)
56. \(51.667 \div 6.1\)  57. \(2.214 \div 0.41\)

58. **MARATHONS** A marathon race is 26.2 miles long. Lacey ran the marathon in 3.6 hours. On average, how many miles did she run per hour? Round to the nearest tenth.

Example 6

Find \(\frac{11.48}{8.2}\).

\[
\begin{align*}
8.2 & \overline{)11.48} \\
8 & \rightarrow & 1.4 \text{ Place the decimal point.}
\end{align*}
\]

Multiply the divisor and the dividend by 10.

\[
\begin{align*}
14 & \rightarrow & -82 \\
328 & \rightarrow & -328 \\
0 & &
\end{align*}
\]
1-3 Powers of 10

Multiply by Powers of 10 (pp. 64–67)

Find each product.

59. $0.81 \times 100$
60. $0.94 \times 1,000$
61. $62.3 \times 0.1$
62. $17.5 \times 0.01$

63. PHYSICS The speed of light is $1.86 \times 100,000$ miles per second. Write this number in standard form.

EXAMPLE 7

Find $0.98 \times 1,000$.

$0.98 \times 1,000 = 980$

1,000 has 3 zeros. So, move the decimal point 3 places to the right.

EXAMPLE 8

Find $623.45 \times 0.01$.

$623.45 \times 0.01 = 6.2345$

0.01 has 2 places after the decimal point. So, move the decimal point 2 places to the left.

Divide by Powers of 10 (pp. 68–71)

Find each quotient.

64. $50.14 \div 10$
65. $2.35 \div 1,000$
66. $0.106 \div 0.01$
67. $451 \div 0.1$

68. MONEY How many dimes are in $8,590?

EXAMPLE 9

Find $34.6 \div 100$.

$34.6 \div 100 = 0.346$

100 has 2 zeros. So, move the decimal point 2 places to the left.

EXAMPLE 10

Find $0.418 \div 0.001$.

$0.418 \div 0.001 = 418$

0.001 has 3 places after the decimal point. So, move the decimal point 3 places to the right.

PSI: Determine Reasonable Answers (pp. 72–73)

69. HEIGHT Evan is 5.75 feet tall. His sister, Cindy, is 0.8 times his height. Which is a reasonable height for Cindy: about 4 feet, 4.5 feet, or 6 feet? Explain your reasoning.

70. MONEY Derek has $23.80 in his pocket. He spent about 0.51 of this amount on a CD. Would $8, $12, or $20 be a reasonable price for the CD?

EXAMPLE 11

There are 24 students in the Spanish club. If the number of students in the school is 19.5 times this amount, would about 400, 500, or 600 be a reasonable number of students in the school? $24 \times 19.5$ is about $25 \times 20$ or 500. So, 500 is a reasonable number of students in the school.
Multiply.
1. 7.8 \times 6 
2. 0.92 \times 4 
3. 12 \times 0.034 
4. 4.56 \times 9.7 

5. **NGSSS PRACTICE** Armando and his 3 friends ordered a 4-foot sub for $25.99, 4 large drinks for $1.79 each, and a salad for $5.89. Which of the following represents the total cost, not including tax?
   A. $136.68 
   B. $39.04 
   C. $37.25 
   D. $33.67 

Divide.
6. 7.2 ÷ 3 
7. 0.45 ÷ 15 
8. 36.08 ÷ 8.2 
9. 10.79 ÷ 4.15 

10. **MINIMUM WAGE** The table shows the minimum wage in the United States during various years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Wage ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>5.15</td>
</tr>
<tr>
<td>2007</td>
<td>5.85</td>
</tr>
<tr>
<td>2008</td>
<td>6.55</td>
</tr>
<tr>
<td>2009</td>
<td>7.25</td>
</tr>
</tbody>
</table>

Estimate the number of hours someone would need to work in 2008 to earn $210.

Estimate each product or quotient.
11. \( \text{11}. \quad 21.5 \times 4.85 \) 
12. \( \text{12}. \quad 53.46 ÷ 9.03 \) 
13. \( \text{13}. \quad 7.08 \times 11.29 \) 
14. \( \text{14}. \quad 832 ÷ 39.1 \) 

15. **DOGS** A greyhound can run as fast as 39.35 miles per hour. Without calculating, would about 12, 14, or 16 be a reasonable answer for the number of miles a greyhound could run at this rate in 0.4 hour? Explain your reasoning.

16. **POPULATION** The table shows the population density of several countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Population Density (per square kilometer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>338.96</td>
</tr>
<tr>
<td>Austria</td>
<td>97.66</td>
</tr>
<tr>
<td>United States</td>
<td>31.27</td>
</tr>
<tr>
<td>Australia</td>
<td>2.6</td>
</tr>
</tbody>
</table>

About how many times as great is the population density of Japan than Australia?

Find each product or quotient.
17. \( \text{17}. \quad 43.89 \times 0.01 \) 
18. \( \text{18}. \quad 5.82 \times 1,000 \) 
19. \( \text{19}. \quad 7.63 \times 0.1 \) 
20. \( \text{20}. \quad 14.9 ÷ 100 \) 
21. \( \text{21}. \quad 83.71 ÷ 0.1 \) 
22. \( \text{22}. \quad 0.63 ÷ 0.001 \) 

25. **EXTENDED RESPONSE** An exchange rate is the rate at which a dollar can be exchanged in a foreign country. The table below gives the exchange rates for various foreign currency.

<table>
<thead>
<tr>
<th>1 U.S. Dollar is equal to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>109.86 Japanese yen</td>
</tr>
<tr>
<td>0.68 Euros</td>
</tr>
<tr>
<td>1.06 Canadian dollars</td>
</tr>
<tr>
<td>0.54 United Kingdom pounds</td>
</tr>
</tbody>
</table>

**Part A** Raul cashes $175 for euros. How many euros will he get?

**Part B** Sasha buys a sweater in Ontario that costs 75 Canadian dollars. What is the approximate value in American dollars?

**Part C** Would you rather have 50 United Kingdom pounds, 50 Canadian dollars, or 50 euros? Explain.
Gridded Response: Whole Numbers

When a test question has the symbol shown at the right, you must fill in a grid on your answer sheet. First, write your answer in the boxes at the top of the answer grid. Then fill in a bubble under each box to match your answer.

**Practice Example**

Gia bought 106 red beads and 44 blue beads for $0.08 per bead. How much did the beads cost altogether?

total number of beads = 106 + 44 or 150

150 × 0.08 = 12

The total cost is $12. So, grid in 12.

**Correct**

![Correct Grid]

**NOT Correct**

![NOT Correct Grid]

- Do NOT leave blank answer boxes in the middle.
- Do NOT fill in bubbles under unused answer boxes.

**Work on It**

Derek walked 4.75 miles in 66.5 minutes. If he walked the same pace the entire time, how many minutes did it take him to walk one mile? Fill in your answer on an answer grid.

---

Glencoe McGraw-Hill Florida Math Connects Plus Course 1 – Chapter 1
Read each question. Then fill in the correct answer on the answer sheet provided by your teacher or on a sheet of paper.

1. Justin was estimating the area of the square sticky note shown below. Which would be a reasonable estimate of the area of the note?

   ![Sticky Note Image]

   A. 49 square centimeters  
   B. 52 square centimeters  
   C. 64 square centimeters  
   D. 72 square centimeters

2. Marlene purchased 20 stamps at the post office for $8.40. What is the cost of one stamp?

   E. $0.41  
   F. $0.42  
   G. $0.43  
   H. $1.68  
   I. $2.38

3. **SHORT RESPONSE** Manuel bought supplies for making party favors. The table shows the cost of each supply. If Manuel made 12 party favors, how much did it cost to make each party favor?

<table>
<thead>
<tr>
<th>Supply</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bags</td>
<td>2.00</td>
</tr>
<tr>
<td>Candy</td>
<td>5.75</td>
</tr>
<tr>
<td>Stickers</td>
<td>6.39</td>
</tr>
<tr>
<td>Pencils</td>
<td>4.82</td>
</tr>
</tbody>
</table>

4. **GRIDDED RESPONSE** Shellie spent $10.56 on oranges that cost $0.88 per orange. How many oranges did she purchase?

5. **GRIDDED RESPONSE** The average weight of a bass in a neighborhood lake is 5.1 pounds. Norman and his friend caught 4 bass. Assuming the bass were all average weight, what was the total weight in pounds of the fish they caught?

6. Bartholomew went hiking over the weekend. He hiked all 4 trails in 3 hours. Which is the best estimate for the number of miles he hiked per hour?

<table>
<thead>
<tr>
<th>Trail</th>
<th>Length (mi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great Fork</td>
<td>1.7</td>
</tr>
<tr>
<td>Stoney Creek</td>
<td>0.8</td>
</tr>
<tr>
<td>Sippo Lake</td>
<td>2.6</td>
</tr>
<tr>
<td>Rock Falls</td>
<td>0.5</td>
</tr>
</tbody>
</table>

   A. 2 miles  
   B. 2.5 miles 
   C. 15 miles  
   D. 18 miles

7. The area of Trina’s bedroom is 96.9 square feet. What is the base of her bedroom?

   ![Bedroom Diagram]

   F. 10.2 feet  
   G. 10.0 feet  
   H. 9.2 feet  
   I. 9.0 feet

8. **GRIDDED RESPONSE** Find the area in square meters of a rectangle with a base of 2.1 meters and a height of 0.8 meter.
9. A model plane is 100 times smaller than an actual plane. The length of the model is 4.5 inches. What is the actual length of the plane?
   A. 480 feet  
   B. 40 feet  
   C. 20 feet  
   D. 8 feet

10. **SHORT RESPONSE**  
    Rita bought 5.7 pounds of bananas and 2.8 pounds of apples. Write a multiplication expression and find the total cost for the fruit. Round to the nearest cent.

11. Malabar Middle School is raising money for a local charity. Their goal is to raise $500 by their holiday break. If they have 10 days before their break, what is a reasonable amount that they should collect each day to reach their goal?
   F. $5  
   G. $25  
   H. $50  
   I. $100

12. Ignacio cut the board shown into 4.5-inch pieces. How many pieces can he cut?

A. 6  
B. 7  
C. 8  
D. 9

13. The table below shows times from the Men’s 4 × 100 meter Medley. The four swimmers each swim 100 meters.

<table>
<thead>
<tr>
<th>Team</th>
<th>Time (min:sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>3:29.34</td>
</tr>
<tr>
<td>Australia</td>
<td>3:30.04</td>
</tr>
<tr>
<td>Japan</td>
<td>3:31.18</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>3:31.92</td>
</tr>
</tbody>
</table>

Suppose each swimmer swam the same amount of time. How long did each United States swimmer swim in the race?

F. 67.335 s  
G. 67 s  
H. 52.335 s  
I. 52 s

14. **EXTENDED RESPONSE**  
    Wesley lives in an apartment and would like to have his own vegetable garden. His city offers garden plots, but he has to pay for the fencing.

<table>
<thead>
<tr>
<th>Plot A</th>
<th>Plot B</th>
<th>Plot C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area: 201 ft²</td>
<td>Area:</td>
<td>Area: 204.45 ft²</td>
</tr>
<tr>
<td>Base: 12.78 ft</td>
<td>Base:</td>
<td>Base: 14.3 ft</td>
</tr>
<tr>
<td>Height: 10.2 ft</td>
<td>Height:</td>
<td>Perimeter: 57.56 ft</td>
</tr>
<tr>
<td>Perimeter:</td>
<td>Perimeter:</td>
<td></td>
</tr>
</tbody>
</table>

**Part A**  
Find the missing measurement for each plot.

**Part B**  
Which plot requires the least amount of fencing?

**Part C**  
Which plot has the greatest area?