

Lesson 7

Divide Decimals by Whole Numbers

What You'll Learn

Scan the lesson. List two real-world scenarios in which you would divide decimals by whole numbers.

Sample answers:

- **splitting a cost among a number of people**
- **finding average height of several buildings**

Essential Question

HOW can estimating be helpful?

Common Core State Standards

Content Standards
6.NS.3
Mathematical Practices
1, 3, 4, 5, 6

Real-World Link

Movies Charlotte, Aaron, Maddie, and Catie went to the movies and ordered snacks from the menu shown.

Cinema 15		
Popcorn	small	\$2.45
	large	\$5.60
Candy	small	\$2.25
	large	\$3.20
Drink	small	\$2.75
	medium	\$3.35
	large	\$3.95

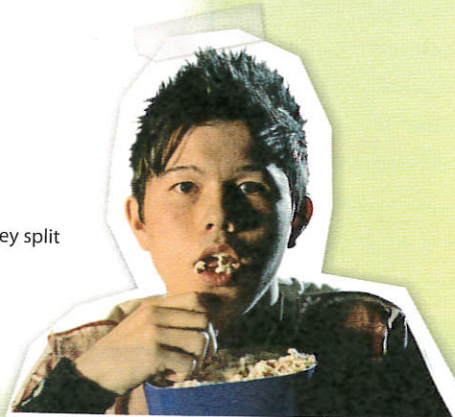


- How much did they pay for four small popcorns?
 $\$2.45 \times 4 = \9.80
- What is the total cost for two small packages and one large package of candy?
 $\$7.70$
- How much do four medium drinks cost?
 $\$3.35 \times 4 = \13.40
- What is the total cost for Exercises 1–3?

Popcorn	\$	9	80
Candy	\$	7	70
Drinks	+ \$	13	40
	\$	30	90

- Estimate how much each person should pay if they split the total cost evenly.

----- \$32 -----			
\$8	\$8	\$8	\$8



Quick Check

Answer each question. Explain the reason for your answer.

1. 14 ÷ 7 = 2 18 ÷ 9 = 2 36 ÷ 18 = 2
2. The Popcorn Stand has 100 bags for each of the 12 different movie titles that the theater shows. How many bags of popcorn are there?
3. Carl is planning to buy the movie for popcorn. He has \$10.00. How many bags of popcorn can he buy? How many bags will he have to save for next time?

Essential Question

HOW can estimating be helpful?

Common Core State Standards

6.NS.3

Find unknown whole numbers in multiplication and division equations involving whole numbers.

1. Find the unknown in $8 \times ? = 48$.
2. Find the unknown in $36 \div ? = 9$.
3. Find the unknown in $48 \div 8 = ?$.
4. Find the unknown in $36 \div 9 = ?$.
5. Find the unknown in $48 \div ? = 6$.
6. Find the unknown in $36 \div ? = 4$.

Skills Trace

Focus

Objective Divide decimals by whole numbers.

Coherence

Previous

Students divided with multi-digit numbers.

Now

Students will divide decimals dividends by whole number divisors.

Next

Students will divide decimals dividends with decimal divisors.

Building on the Essential Question

At the end of the lesson, students should be able to answer "How can estimating quotients help you to place the decimal correctly?"

ENGAGE EXPLORE EXPLAIN ELABORATE EVALUATE

1 Launch the Lesson

Ideas for Use

You may wish to launch the lesson using a whole group, small group, think-pair-share activity, or independent activity.



Numbered Heads Together After completing the Real-World Link, assign students to 3- or 4-person learning teams. Ask students to brainstorm how to find the amount each person would pay if two people shared a large popcorn and a large candy bar. Call on a specific number from each team to describe their strategy and present their solutions.

Alternate Strategy

AL Provide each student with \$3.75 in play money: three \$1 bills and three quarters. Have them model how to split \$3.75 into three equal parts. Ask them to write a number sentence to represent the situation.

2 Teach the Concept

Ask the scaffolded questions for each example to differentiate instruction.

Examples



1. Divide a decimal by a one-digit number.

- AL** • When setting up this long division problem, what number goes inside the long division symbol? **6.8**
- What number goes outside the long division symbol? **2**
- OL** • When using long division, where do you place the decimal point in the quotient? **directly above the decimal point in the dividend**
- BL** • How can you use mental math to solve problems like this? **Sample answer: Ignore the decimal point and divide the two numbers. Use estimation to determine where the decimal point should be placed.**

Need Another Example?

Estimate $45.9 \div 3$. **5**

2. Divide a decimal by a two-digit number.

- AL** • What does it mean to “annex a zero”? **Add a zero.**
- Have you ever had to annex a zero before? If so, when? **yes; Sample answer: when multiplying with decimals to provide enough place values in the product**
- OL** • Why do you need to annex a zero in this example? **Sample answer: I need to keep dividing until the remainder is zero. Annexing a zero allows me to continue dividing without changing the value of the dividend.**
- BL** • How can you check that your answer is correct? **Sample answer: Multiply the quotient by the divisor: $0.55 \times 7.7 = 14$, so our answer is correct.**

Need Another Example?

Find $8.69 \div 22$. **0.395**

Work Zone

a. 2.5

b. 0.5

c. 4.9



Checking Answers

To check that the answer is correct, multiply the quotient by the divisor.

In Example 2,
 $0.55 \times 14 = 7.7$ ✓

Divide a Decimal by a 1-Digit Number

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

Example

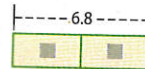


1. Find $6.8 \div 2$. **Estimate** $6 \div 2 = 3$

$$\begin{array}{r} 3.4 \\ 2 \overline{)6.8} \\ \underline{-6} \\ 08 \\ \underline{-8} \\ 0 \end{array}$$

6 ones divided by 2 is 3 ones.

8 tenths divided by 2 is 4 tenths.



$6.8 \div 2 = 3.4$ **Compared to the estimate, the quotient is reasonable.**

Got It? Do these problems to find out.

a. $7.5 \div 3$

b. $3.5 \div 7$

c. $9.8 \div 2$

Divide a Decimal by a 2-Digit Number

The decimal point in the quotient is placed directly above its place in the dividend. In real-world situations where the division does not result in a remainder of zero, round the quotient to a specified place.

Example



2. Find $7.7 \div 14$. **Estimate** $10 \div 10 = 1$

$$\begin{array}{r} 0.55 \\ 14 \overline{)7.70} \\ \underline{-70} \\ 70 \\ \underline{-70} \\ 0 \end{array}$$

Place the decimal point.

Annex a zero and continue dividing.

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



Example

3. Divide decimals by whole numbers to solve a real-world problem.

- AL** • *What are you trying to find?* the cost per pound of Lin's package
- *How much does it cost for Lin to mail his package?* \$6.74
- *How much does Lin's package weigh?* 3 pounds
- *What expression can be used to represent this situation?* $6.74 \div 3$
- OL** • *In this situation why did the division stop at the thousandths place?* Since the problem involved money, you only need to divide to the thousandths place to be able to round to the nearest cent.
- BL** • *The table below shows the cost when purchasing practice T-shirts for the soccer team. Which configuration offers the best price per T-shirt? Explain.* 12 shirts; the cost for 4 shirts is \$4.19 per shirt, for 10 shirts and 20 shirts, \$4.21 per shirt, for 12 shirts, \$4.15 per shirt. \$4.15 is the lowest cost.

Number of T-shirts	Total Cost (\$)
4	16.75
10	42.05
12	49.80
20	84.10

Need Another Example?

Meg is purchasing lumber to build a porch. The table shows the cost of the boards. If Meg buys a 12-foot board, how much does it cost per foot? **\$0.54 per foot**

Length (feet)	Total Cost (\$)
6	3.56
8	4.66
10	5.76
12	6.48

Got It? Do these problems to find out.

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



Example



3. 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?

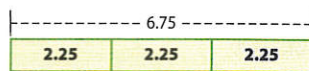
Weight (Pounds)	Cost (\$)
1	4.80
2	5.63
3	6.74
4	7.87

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

$$\begin{array}{r}
 2.246 \leftarrow \text{Place the decimal point after dividing to thousandths.} \\
 3 \overline{)6.740} \\
 \underline{-6} \\
 07 \\
 \underline{-6} \\
 14 \\
 \underline{-12} \\
 20 \text{ Annex a zero and continue dividing.} \\
 \underline{-18} \\
 2 \text{ The remainder will never be zero.}
 \end{array}$$

Round 2.246 to 2.25 because hundredths are the smallest denomination used in money. It costs about \$2.25 per pound to mail the package.

Check Use a bar diagram and multiplication to check your work.



$$2.25 \times 3 = 6.75$$

$$6.75 \approx 6.74 \checkmark$$

Got It? Do this problem to find out.

- g. Find the cost per pound of a two-pound and four-pound package.



- d. 0.632
- e. 0.8725
- f. 3.24

Dividing Money

When dividing money, it is sometimes necessary to divide to the thousandths place and then round to the hundredths.

- g. \$2.82; \$1.97

Example

4. Divide decimals by whole numbers to solve a real-world problem.

- AL** • What division expression can be used to find the amount each Ryan will pay? $28.60 \div 2$
- What is $28.60 \div 2$? **14.30**
- How would you find how much Ryan will have left? **Subtract \$14.30 from \$20.**
- OL** • Why is it important to annex two zeros when subtracting \$14.30 from \$20? **You need to have the zeros in place to use for borrowing in order to subtract.**
- BL** • Suppose Ryan offered to pay his share plus half of his brother's share. Does Ryan have enough money saved to pay his share plus half of his brother's share? Explain. **No; Ryan would need to pay a total of $\$14.30 + \7.15 , or $\$21.45$. Since $\$21.45 > \20 , Ryan does not have enough money.**

Need Another Example?

Elena and her sister are sharing the cost of a digital camera. The camera costs \$88.50. If Elena saved \$50 to buy the camera, how much does she have left after paying her share of the camera? **\$5.75**



Example

Tutor

4. 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?

Step 1 Determine how much Ryan will pay.

$$\begin{array}{r} 14.30 \\ 2 \overline{)28.60} \\ \underline{-2} \\ 08 \\ \underline{-8} \\ 06 \\ \underline{-6} \\ 0 \end{array}$$

Place the decimal point.

Ryan's share is \$14.30.

Step 2 Determine how much Ryan will have left.

$$\begin{array}{r} 20.00 \\ -14.30 \\ \hline 5.70 \end{array}$$

So, Ryan has \$5.70 left.

Got It? Do this problem to find out.

- h. Kristen and her two friends are sharing the cost of a funnel cake. The funnel cake costs \$5.49. If Kristen has \$2.00, how much will she have left after she pays her share?

h. **\$0.17**

Show your work.

Guided Practice



Divide. Round to the nearest tenth if necessary. (Examples 1 and 2)

1. $3.6 \div 4 =$ **0.9**

2. $12.32 \div 22 =$ **0.6**

3. $69.904 \div 34 =$ **2.1**

4. Light travels 5.88 trillion miles in one year. How far will light travel in one month? (Examples 1 and 3) **0.49 trillion miles**

5. Four dozen bagels costs \$30.00. How much change will you receive if you pay for a dozen bagels with a ten-dollar bill? (Examples 2 and 4) **\$2.50**

6. **e** **Building on the Essential Question** How can estimating quotients help you to place the decimal correctly? **Sample answer: The estimate can help you to determine if you have misplaced the decimal.**

Rate Yourself!

How confident are you about dividing decimals by whole numbers? Check the box that applies.



For more help, go online to access a Personal Tutor.

Tutor

FOLDABLES Time to update your Foldable!

3 Practice and Apply

Name _____ My Homework _____

Independent Practice

Go online for Step-by-Step Solutions



Divide. Round to the nearest tenth if necessary. (Examples 1 and 2)

1. $39.39 \div 3 = 13.1$

2. $7.24 \div 7 = 1.0$

3. $118.5 \div 5 = 23.7$

4. $11.4 \div 19 = 0.6$

5. $55.2 \div 46 = 1.2$

6. $336.752 \div 31 = 10.9$



7. The Gonzalez family is taking a cruise that costs \$3,082.24 for a family of four. How much does it cost per person? (Example 3)

\$770.56

8. 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.) (Example 4)

1.493 thousand feet

World's Tallest Buildings (thousands of feet)				
1.667	1.483	1.483	1.451	1.381

9. **Be Precise** Mr. Jamison will stain the deck in his backyard. The deck has an area of 752.4 square feet. If the deck is 33 feet long, how wide is it? Justify your procedure. **22.8 ft; Area of a rectangle is length times width,**

so divide the area by the length to find the width. $752.4 \div 33 = 22.8$

10. **Be Precise** The Verrazano-Narrows Bridge in New York City is 4.26 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. **1.42 thousand yards;**

$4.26 \div 3 = 1.42$

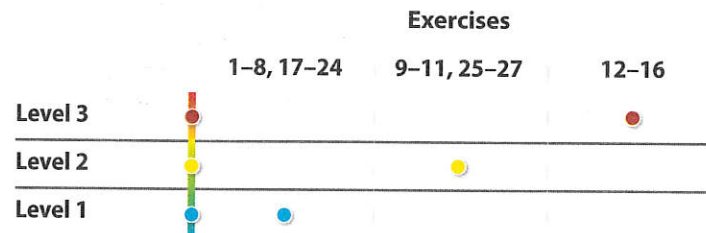


Independent Practice and Extra Practice

The Independent Practice pages are meant to be used as the homework assignment. The Extra Practice page can be used for additional reinforcement or as a second-day assignment.

Levels of Complexity

The levels of the exercises progress from 1 to 3, with Level 1 indicating the lowest level of complexity.



Suggested Assignments

You can use the table below that includes exercises of all complexity levels to select appropriate exercises for your students' needs.

Differentiated Homework Options		
AL	Approaching Level	1-9, 11, 13-16, 26, 27
OL	On Level	1-7 odd, 9-11, 13-16, 26, 27
BL	Beyond Level	9-16, 26, 27

Watch Out!

Common Error Students may continue dividing after the hundredths place in Exercise 6. Remind them to divide only to the hundredths place and then round to the nearest tenth.

CCSS MATHEMATICAL PRACTICES

Emphasis On	Exercise(s)
1 Make sense of problems and persevere in solving them.	12
3 Construct viable arguments and critique the reasoning of others.	13, 14
4 Model with mathematics.	16
5 Use appropriate tools strategically.	15, 25
6 Attend to precision.	9, 10

Mathematical Practices 1, 3, and 4 are aspects of mathematical thinking that are emphasized in every lesson. Students are given opportunities to be persistent in their problem solving, to express their reasoning, and apply mathematics to real-world situations.

Formative Assessment

Use this activity as a closing formative assessment before dismissing students from your class.

TICKET
Out the Door

Have students solve the following problem: Anina bicycled 13.5 miles in 5 days. She rode the same number of miles each day. How many miles did Anina bicycle each day?
2.7 miles

11. 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. **Brand B; The cost of each bottled water for Brand B is about \$0.44. For Brand A the cost is about \$0.58 and for Brand C the cost is about \$0.46. So Brand B has the best cost per bottle.**

Brand A	6-pack	\$3.45
Brand B	12-pack	\$5.25
Brand C	24-pack	\$10.99

H.O.T. Problems Higher Order Thinking

12. **CCSS Persevere with Problems** 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.
 $844 \div 2$ $0.844 \div 2$ $84.4 \div 2$ $0.0844 \div 2$ $8.44 \div 2$ $0.00844 \div 2$
422; 0.422; 42.2; 0.0422; 4.22; 0.00422; Sample answer: You can first mentally divide 96 by 3 which is 32. Since 0.0096 has four decimal places, place four decimal places in the quotient 32. So, $0.0096 \div 3 = 0.0032$.
13. **CCSS Find the Error** Amanda is finding $11.2 \div 14$. Find her mistake and correct it. **Amanda placed the decimal point in the wrong place of the quotient.**
 $11.2 \div 14 = 0.8$
14. **CCSS Reason Inductively** Is the quotient $2.7 \div 3$ greater than or less than 1? Explain.
less than; The first number in the dividend, 2, is less than the divisor, 3.
15. **CCSS Use Math Tools** Explain how you can use estimation to place the decimal point in the quotient $42.56 \div 22$.
Since $40 \div 20 = 2$, the answer is about 2.
16. **CCSS Model with Mathematics** Write a real-world problem that involves dividing a decimal by a whole number.
Sample answer: Two friends decided to split the cost of a large popcorn at the movies. If the popcorn costs \$5.50, how much will each friend pay?

