

Dividing Decimals

Math Focus Points

- ◆ Estimating quotients of decimal numbers
- ◆ Dividing decimals to the hundredths through reasoning about place value and division

Today's Plan		Materials
1 <small>ACTIVITY</small> Introducing Dividing Decimals	  	
2 <small>ACTIVITY</small> Dividing Decimals	 	<ul style="list-style-type: none"> • <i>Student Activity Book</i>, p. 82 or C85, Dividing Decimals Make copies. (as needed)
3 <small>DISCUSSION</small> Making Sense of Dividing Decimals	 	<ul style="list-style-type: none"> • <i>Student Activity Book</i>, p. 82 or C85 (completed)
4 <small>SESSION FOLLOW-UP</small> Daily Practice		<ul style="list-style-type: none"> • <i>Student Activity Book</i>, p. 83 or C86, Division Problems with Decimals Make copies. (as needed)

Ten-Minute Math

Estimation and Number Sense: Closest Estimate Write each of the following problems on the board, one at a time:

- $6.8 \times 2.3 \approx$ 1.4 14 140
- $74 \times 8.1 \approx$ 5.6 56 560
- $166 \times 0.08 \approx$ 1.66 16.6 166

Give students approximately 30 seconds to look at the three possible estimates and determine which is the closest to the actual answer. Have two or three students explain their reasoning for each problem. Ask students:

- How were you thinking about the numbers?
- How did that help you find the estimate?
- How did you decide where the decimal point should be?

Also, ask if the closest estimate is greater than or less than the actual answer and how students know.

1

ACTIVITY

Introducing Dividing Decimals



20 MIN



CLASS



PAIRS

We're going to continue dividing with decimals. You're going to think about how the strategies you already know and use for dividing whole numbers work, and how you might have to change or extend those ideas to divide decimals. You're also going to be thinking about the relationship between division and multiplication.

Write the following problems on the board:

$$18 \div 6 =$$

$$18 \div 0.6 =$$

How would we write these two problems as missing factor problems?

As students respond, write the missing factor equations under the division equations.

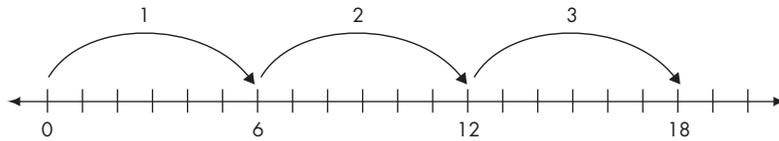
$$\underline{\quad} \times 6 = 18$$

$$\underline{\quad} \times 0.6 = 18$$

Let's use running, again, as a context for these problems. If Cecilia ran 6 miles a day and ran 18 miles in all, how many days did she run? Let's show this on a number line.

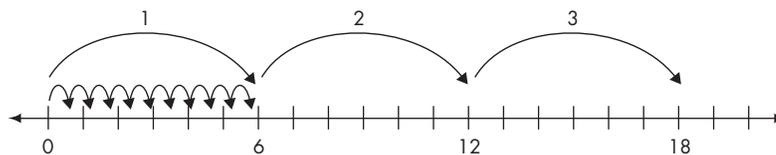
Draw a number line through 20 on the board and mark 0.

How far did she run the first day? [Make a jump of 6 on the number line and label 6.]. We're going to continue making jumps of 6. How do we know where to stop? Why? [Make two more jumps on the number line, labeling 12, 18.] What's our answer? Where do we see the 18, 6, and 3 in the diagram?



What if she only ran 0.6 mile a day? How many days would she have to run until her total was 18 miles? Do you think the answer is going to be more or less than 3? Why? Let's look at the number line again. How far did she run on the first day?

Show a jump of 0.6 on the number line. Encourage students to count by 0.6 (0.6, 1.2, 1.8, 2.4, ...) as you make 10 total jumps landing on 6.



We're at 6. How many jumps have we made so far? (10) How many jumps will it be to 12? (10 more, 20 total) To 18? (10 more, 30 total) So how many days will it take Cecilia to run 18 miles? (30) Does the answer 30 days seem reasonable? If we think about the multiplication problem, does $30 \times 0.6 = 18$? How do you know?

Students might say:



"Six tenths is a little more than a half, and half of 30 is 15. So it makes sense."



"Plus it makes sense if you look at the number line. It takes 10 times as many jumps, and 3×10 is 30."

Just like when we multiplied decimals, one of the ways we can solve division problems with decimals is to divide like they're whole numbers, and then use reasoning about the size of the answer.

Write the following problems on the board:

$$105 \div 0.7 = \quad \quad \quad \quad \quad \times 0.7 = 105$$

First let's just think about this. Is the answer going to be bigger than 1? 10? 100? How do you know? Talk to a neighbor.

Students might say:



"I think it's going to be more than 100. Seven tenths is less than 1, and 105×1 is 105, so the answer has to be more than 100."



"I agree. I was thinking 'what times 0.7 is 105,' and 0.7×100 is only 70, so it has to be more than 100."

Think about $105 \div 7$. What's the answer?

Give students a brief amount of time and ask for the answer. (15)
Then write the following on the board:

$$105 \div 0.7 = 1.5 \quad 15 \quad 150$$

So which of these is the correct answer to $105 \div 0.7$? (150) Does $0.7 \times 150 = 105$ make sense? Let's try one more problem, and then you can get to work.

Write the following problems on the board.

$$12 \overline{)16.8} \qquad 12 \times \underline{\quad} = 16.8$$

Again, think about these like they're whole numbers, and think about what you know about division and decimals. Is the answer going to be bigger than 1? 10? 100? How do you know? Talk to a neighbor. What's $168 \div 12$? (14)

If necessary, spend a few minutes reviewing with students strategies for solving division problems.

$$168 \div 12 =$$

$12 \times 10 = 120$	4
$12 \times 4 = 48$	10
168	$12 \overline{)168}$
$12 \times 14 = 168,$	$- 120$
$\text{so } 168 \div 12 = 14$	48
	$- 48$
	0
	$168 \div 12 = 14$

Write the following on the board:

$$16.8 \div 12 = 1.4 \quad 14 \quad 140$$

Which of these answers is correct? How do you know?

Students should recognize the answer is 1.4 because $16 \div 12$ is a little more than 1.

Name _____ Date _____

Decimals on Grids and Number Lines

Dividing Decimals

In Problems 1–4, circle the correct answer and explain your thinking.

- $121 \div 1.1 =$ 11 110 1,100
- $35 \div 0.07 =$ 5 50 500
- $9\overline{)72}$ 0.8 8 80
- $28.8 \div 24 =$ 0.12 1.2 12

Solve Problems 5–8 and show your work. Use estimation and number sense to determine the size of the answer.

- $3\overline{)45.6}$ 6. $140 \div 3.5 =$ _____
- $97.5 \div 6.5 =$ 8. $0.8\overline{)21.52}$

9. What are some tips for helping solve division problems with decimals?

82 Unit 6 Session 3A.6

▲ Student Activity Book, Unit 6, p. 82; Resource Masters, C85

2 ACTIVITY

Dividing Decimals



As you solve the division problems on *Student Activity Book* page 82 or C85, use what you know about decimals and the operation of division. The last problem is about tips you might give others when you're solving these types of problems. The discussion will focus on Problem 7, so make sure you solve that problem.

ONGOING ASSESSMENT: Observing Students at Work



Students use division strategies they already know, and reasoning, to solve division problems with decimal numbers.

- **Do students use reasoning about the size of the numbers and division to find the correct quotient?** For example, for Problem 3, do they think $7 \div 9$ is going to be less than one, so the answer is 0.8?
- **What division strategies do students use?** Are they able to divide/multiply correctly? Do they keep track of all the parts of the problem?

DIFFERENTIATION: Supporting the Range of Learners



Intervention Give possible solutions for students who are still working on understanding decimal numbers and ask them to explain their thinking. For example, for Problem 5, ask students if the answer is going to be 1.52, 15.2 or 152 and what their thinking is. Use the context of running, or another context that might be more familiar to students.

3 DISCUSSION

Making Sense of Dividing Decimals



Math Focus Points for Discussion

- ◆ Dividing decimals to the hundredths through reasoning about place value and division

Ask several students to explain their solution to Problem 7 on *Student Activity Book* page 82 or C85. Students likely divided with whole numbers: $975 \div 65$. Ask if anyone has questions about the division strategies used. Then discuss in detail how it was determined that 15 is the answer to the original problem.

How do we know the answer isn't 1.5 or 150?

Some students might reason that the original problem is close to $90 \div 6 = 15$. Others might argue that since $6 \times 10 = 60$ and $6 \times 100 = 600$, the answer is greater than 10 but less than 100. Stress that for all problems, it is important to make sense of the place value of the numbers in the problems so that the answer is correct.

You were asked to write down some tips for solving division problems that involve decimal numbers. What were some of the tips you wrote down?

Accept student responses, asking after each response if anyone in the class has questions or wants to clarify what has been said. The following ideas should be highlighted. If no one brings them up, you may choose to bring them up yourself.

- Problems can be solved thinking about both numbers as whole numbers.
- Thinking about the division problem as a missing factor problem is a good way to solve or to check the reasonableness of the answer.

If students suggest using the rule of “counting decimal places” they used for multiplication, discuss why this rule does not work, using examples such as the solutions to Problems 7 and 8. (In Problem 7, both factors have one decimal place in them; the answer is a whole number. In Problem 8, there are three decimal places in the factors; the answer has one decimal place.)

Name _____ Date _____

Decimals on Grids and Number Lines Daily Practice

Division Problems with Decimals

Circle the correct answer, and explain your thinking.

NOTE: Students use reasoning about division and decimals to determine the correct answer. They solve these problems mentally.

1. $84.7 \div 7 =$	1.21	12.1	121
2. $5.6 \overline{)168}$	3	30	300
3. $73.6 \div 23 =$	3.2	32	320
4. $816 \div 5.1 =$	16	160	1,600
5. $3.2 \overline{)96.4}$	0.27	2.7	27

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Session 3A.6 Unit 6 83

▲ Student Activity Book, Unit 6, p. 83; Resource Masters, C86

4 SESSION FOLLOW-UP

Daily Practice



Daily Practice: For reinforcement of this unit's content, have students complete *Student Activity Book* page 83 or C86.

Dividing Decimals

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2. $35 \div 0.07 =$ 5 50 500

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4. $28.8 \div 24 =$ 0.12 1.2 12

Solve Problems 5–8 and show your work. Use estimation and number sense to determine the size of the answer.

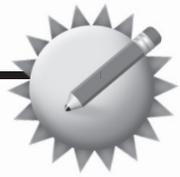
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Division Problems with Decimals

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NOTE Students use reasoning about division and decimals to determine the correct quotient. They solve these problems mentally.

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1.21

12.1

121

2. $5.6 \overline{)168}$

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