SESSION 4A.8

Dividing a Whole Number by a Fraction

Math Focus Points

- Using representations to solve problems involving dividing a whole number by a unit fraction
- Using reasoning, and the relationship between division and multiplication, to divide a whole number by a unit fraction

Today's Plan		Materials
1 ACTIVITY **Dividing a Whole Number by a Fraction**	45 MIN, PAIRS, CLASS	• *Student Activity Book*, p. 93 or **C44, Dividing a Whole Number by a Fraction** Make copies. (as needed)
2 DISCUSSION **Dividing by Fractions**	15 MIN, CLASS	• *Student Activity Book*, p. 93 or C44 (completed)
3 SESSION FOLLOW-UP **Daily Practice**		• *Student Activity Book*, p. 94 or **C45, Making Bows** 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:

1. $\frac{3}{11} \times 268 \approx$ 7 70 140
2. $78 \times 13\frac{3}{12} \approx$ 100 500 900

Give students approximately 30 seconds to look at the three possible estimates and determine which is the closest to the actual answer. Ask several students to explain how they chose an estimate, including how they thought about each of the numbers.

45 MIN PAIRS CLASS

ACTIVITY

1 Dividing a Whole Number by a Fraction

Write $6 \div \frac{1}{2} =$ on the board.

Let's think about this problem and what we know about division. What are we trying to figure out? Can someone put the problem into words, or talk about how we might solve it?

Students might say:

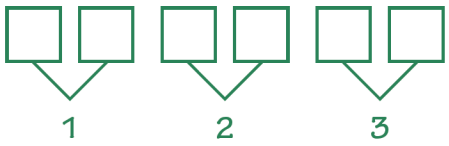
"I think it's saying we have 6 things, and if we divide that in $\frac{1}{2}$, how many things do we have? So it's 3."

"I don't agree with that. What Martin said feels more like $6 \div 2$, and I don't think that's the same thing as $6 \div \frac{1}{2}$."

That's interesting. When we deal with fractions, sometimes it's helpful to first think about a similar problem, only with whole numbers.

Write $6 \div 2 =$ on the board and ask what the answer is.

Everyone knows the answer is 3. Let's think about a story problem. *Talisha is making cakes for Field Day. She has 6 cups of flour, and needs 2 cups to make 1 cake. How many cakes can she make?* How could we draw a picture that shows that?



One way we can think about division is to think about "how many 2s are in 6?" And remember, we also know we can write division problems as a missing-factor problem. So we could think about $6 \div 2$ as "what times $2 = 6$?"

Write $\_\_\_ \times 2 = 6$ on the board next to $6 \div 2 =$.

Do we see how many 2s are in 6 in the drawing? How does it show $3 \times 2 = 6$?

Look at $6 \div \frac{1}{2}$ again. If we want to solve $6 \div \frac{1}{2}$, we can think about it as "How many $\frac{1}{2}$s are there in 6?" or "What times $\frac{1}{2} = 6$?" How would we write it as a missing-factor problem?

Write $\_\_\_\_ \times \frac{1}{2} = 6$ next to the original equation.

If we use the cooking context, we could say that now Talisha is making jumbo muffins. *Talisha has 6 cups of flour, and needs $\frac{1}{2}$ cup of flour to make one muffin. How many muffins can she make?* Work with a partner to solve $6 \div \frac{1}{2}$. Use a representation and think about how it shows $6 \div \frac{1}{2}$.

After a few minutes call the class back together, and have students explain their solutions. Draw attention to the representations and the equation.

$6 \div \frac{1}{2} = 12$

Everyone seems to agree that $6 \div \frac{1}{2} = 12$. Look at the representation. How did you figure out the answer was 12? Where do we see the 6, the $\frac{1}{2}$, and the 12 in the drawing?

Students might say:

"It's a little confusing, but then I remembered I had to count the number of $\frac{1}{2}$s. Each square showed one cup of flour, so she could make two muffins. With 2 cups of flour, she could make 4 muffins. So I just counted by 2s: 2, 4, 6, 8, 10, 12. I guess I should have done 6×2!"

How would we write this as a multiplication problem? *($12 \times \frac{1}{2} = 6$)* Where do we see those numbers in the drawing?

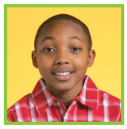
Students might say:

"It really helped me to think about how many $\frac{1}{2}$s are there in six. And then it's sort of the same thing, and you can see it in the drawing. There's two $\frac{1}{2}$s in 1, four $\frac{1}{2}$s in 2. Like that. So there are twelve $\frac{1}{2}$s in 6."

Did it surprise anyone that the answer to $6 \div \frac{1}{2}$ is 12? Why or why not?

Students might say:

"It surprised me! I thought division was supposed to make things smaller. So I didn't expect the answer to be bigger! I mean, I got the answer right, but it doesn't feel right."

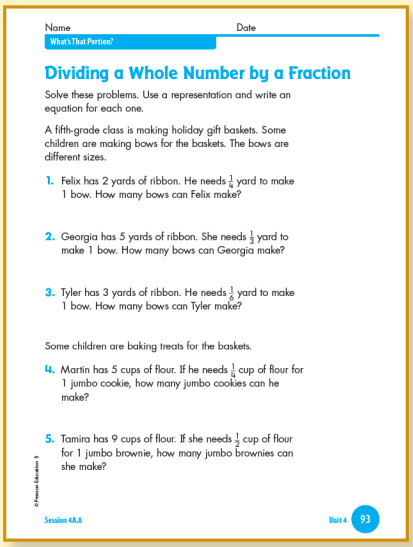


"I sort of agree. But if you think about it, it does start to make sense. It's like if you have 6 things and you divide each of those things into $\frac{1}{2}$, how many things do you have now? You have more things, they're just smaller."

"At first it surprised me a little. But since I always solve division problems thinking about multiplication, when I thought "what times $\frac{1}{2} = 6$" I knew the answer had to be bigger than 6, because $6 \times \frac{1}{2}$ is only 3."

We're going to solve some problems similar to these, where we're dividing whole numbers by fractions. It's important to use some sort of representation, and to also continue making sense of the operation of division. We'll discuss Problem 3 at the end of the session.

Have students complete *Student Activity Book* page 93 or C44.



Name Date

What's That Portion?

Dividing a Whole Number by a Fraction

Solve these problems. Use a representation and write an equation for each one.

A fifth-grade class is making holiday gift baskets. Some children are making bows for the baskets. The bows are different sizes.

1. Felix has 2 yards of ribbon. He needs $\frac{1}{6}$ yard to make 1 bow. How many bows can Felix make?
2. Georgia has 5 yards of ribbon. She needs $\frac{1}{3}$ yard to make 1 bow. How many bows can Georgia make?
3. Tyler has 3 yards of ribbon. He needs $\frac{1}{2}$ yard to make 1 bow. How many bows can Tyler make?

Some children are baking treats for the baskets.

4. Martin has 5 cups of flour. If he needs $\frac{1}{4}$ cup of flour for 1 jumbo cookie, how many jumbo cookies can he make?
5. Tamira has 9 cups of flour. If she needs $\frac{1}{2}$ cup of flour for 1 jumbo brownie, how many jumbo brownies can she make?

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▲ **Student Activity Book, Unit 4, p. 93; Resource Masters, C44**

ONGOING ASSESSMENT: Observing Students at Work

Students solve division problems involving dividing a whole number by a unit fraction.

- **How are students solving the problem?** What kind of representation are they using? How are they keeping track of the parts, and how do they know what the answer is?

- **Are students able to write an equation to represent the problem context?** Do they write the equation as a division problem or a multiplication problem? Do they write the division equation correctly? (e.g., For Problem 1, do they write $2 \div \frac{1}{4} = 8$, and not $\frac{1}{4} \div 2 = 8$?)

DIFFERENTIATION: Supporting the Range of Learners

Intervention Most students are able to draw a representation of the initial problem, but then they start to lose track of what the drawing shows and what the problem is asking. As these students are working, keep making connections between their drawing and the problem by asking questions such as these:

What does the [square] represent? Why did you divide each square into 3 parts? What does each part represent? How does that help you answer the question?

Extension Students who quickly solve these problems can be challenged to solve similar problems, using non-unit fractions.

2 DISCUSSION
Dividing by Fractions

15 MIN CLASS

Math Focus Points for Discussion

- Using representations to solve problems involving dividing a whole number by a unit fraction

Ask students to explain their solution for Problem 3 on *Student Activity Book* page 93 or C44. As each student talks, ask the class to look at the representation and think about where they see each of the numbers in the equation in the drawing. Also, encourage students to think about what the related multiplication problem would be.

Students might say:

"I drew 3 rectangles to show the 3 yards. I divided the first yard into sixths, and realized with one yard Tyler could make 6 bows, so in 3 yards, he could make 18 bows."

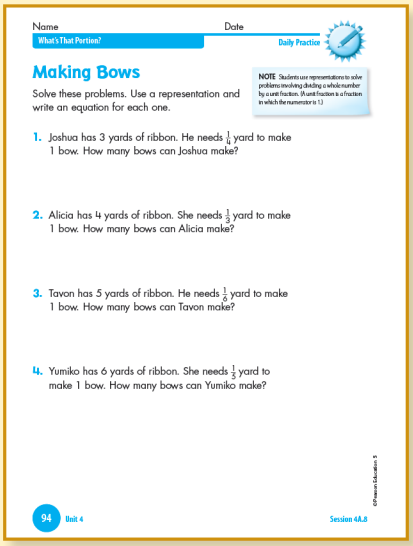
Students might say:

"Even though my picture looks mostly the same, I was thinking, 'How many $\frac{1}{6}$s are there in 3?' So I drew one box and divided it into sixths. Since there are 6 sixths in 1, there are 18 sixths in 3."

If time permits, discuss solutions to other problems on *Student Activity Book* page 93 or C44. Continue emphasizing the connection between the representation and the division (or multiplication) equation.

3 SESSION FOLLOW-UP
Daily Practice

Daily Practice: For reinforcement of this unit's content, have students complete *Student Activity Book* page 94 or C45.



Name Date

What's That Portion? Daily Practice

Making Bows

Solve these problems. Use a representation and write an equation for each one.

NOTE Students use representations to solve problems involving dividing a whole number by a unit fraction. (A unit fraction is a fraction in which the numerator is 1.)

1. Joshua has 3 yards of ribbon. He needs $\frac{1}{6}$ yard to make 1 bow. How many bows can Joshua make?

2. Alicia has 4 yards of ribbon. She needs $\frac{1}{3}$ yard to make 1 bow. How many bows can Alicia make?

3. Tavon has 5 yards of ribbon. He needs $\frac{1}{2}$ yard to make 1 bow. How many bows can Tavon make?

4. Yumiko has 6 yards of ribbon. She needs $\frac{1}{3}$ yard to make 1 bow. How many bows can Yumiko make?

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▲ Student Activity Book, Unit 4, p. 94; Resource Masters, C45

Dividing a Whole Number by a Fraction

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Making Bows

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