

Understand Division with Unit Fractions



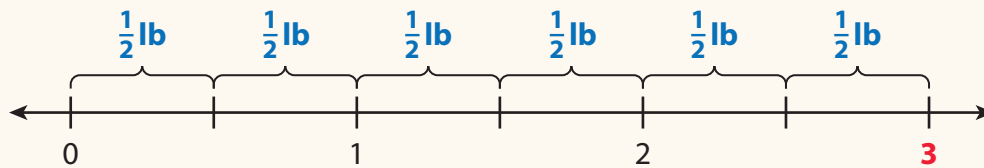
Dear Family,

This week your child is exploring division with unit fractions.

A **unit fraction** is a fraction that has 1 as the numerator. $\frac{1}{6}$ and $\frac{1}{4}$ are examples of unit fractions. To learn about division with unit fractions, your child might see a problem like the one below.

A butcher wants to divide 3 pounds of meat into packages that will each contain $\frac{1}{2}$ pound of meat. How many packages can she make?

This problem can be solved by finding $3 \div \frac{1}{2}$. It can be helpful to use a number line model to understand the problem.



The model shows that $3 \div \frac{1}{2} = 6$. The butcher can make 6 packages that each contain $\frac{1}{2}$ pound of meat.

Another way to say this is that the butcher can make 2 packages of meat per pound. An equation that shows this is $3 \times 2 = 6$.

So, $3 \div \frac{1}{2} = 6$, and $3 \times 2 = 6$. Your child is learning that division and multiplication with fractions are related, just like division and multiplication with whole numbers are related.

Invite your child to share what he or she knows about division with unit fractions by doing the following activity together.

ACTIVITY DIVIDING WITH UNIT FRACTIONS

Do this activity with your child to understand division with unit fractions.

Work together with your child to solve real-life problems involving division with unit fractions.

- Together with your child, use the picture to solve the problem below.
 1. Suppose we want to give each person in our family half of a sandwich. The sandwiches are shown below. How many people can we feed with these 4 sandwiches? Do we have enough for our family, too many, or too few?

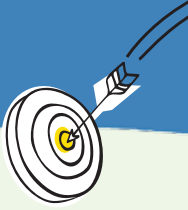


- Look for similar situations in everyday life that involve dividing with a unit fraction. Below are some examples of problems you could solve.
 2. If you divide 2 hours of piano practice into sessions of $\frac{1}{2}$ hour each, how many sessions do you have to practice?
 3. One lap around the track is $\frac{1}{4}$ mile. How many laps do you need to do to run 3 miles?

Answers:

1. $4 \div \frac{1}{2} = 8$; You can feed 8 people with the four sandwiches; 2. $2 \div \frac{1}{2} = 4$ sessions; 3. $3 \div \frac{1}{4} = 12$ laps

Explore Division with Unit Fractions



How is dividing with fractions related to multiplying with fractions?



Learning Targets

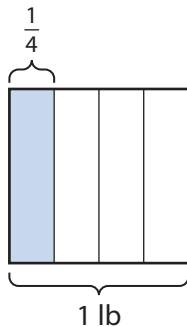
- Interpret division of a unit fraction by a non-zero whole number, and compute such quotients.
- Interpret division of a whole number by a unit fraction, and compute such quotients.

SMP 1, 2, 3, 4, 5, 6, 7, 8

MODEL IT

Complete the problems below.

- Mrs. Cook wants to share $\frac{1}{4}$ pound of fish equally among 3 cats. How much fish will each cat get?
 - Draw on the area model to solve the problem.



- Each cat will get pound of fish.
- Complete the division equation to match your area model.
 $\frac{1}{4} \div 3 = \dots\dots\dots$

- Look at the problem about Mrs. Cook again. Complete the statements below to solve the same division problem using multiplication.
 - Each cat will get of $\frac{1}{4}$ pound of fish.
 - Write a multiplication equation to tell how much fish each cat will get.



DISCUSS IT

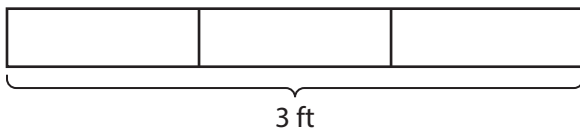
- Compare your model and equations to your partner's model and equations. How are they alike? How are they different?
- I think $\frac{1}{4} \div 3$ is the same as $\frac{1}{3} \times \frac{1}{4}$ because ...

MODEL IT

Complete the problems below.

3 Mr. Putnam wants to cut a 3-foot rope into $\frac{1}{4}$ -foot pieces. How many $\frac{1}{4}$ -foot pieces can he cut?

a. Draw on the bar model to solve the problem.



b. Mr. Putnam can cut pieces of rope that are each $\frac{1}{4}$ foot long.

c. Complete the division equation to match your model.

$$3 \div \frac{1}{4} = \dots\dots\dots$$

4 Look at your model again. Complete the statements below to solve the same division problem using multiplication.

a. There are fourths in each whole foot.

b. Write a multiplication equation to find the number of fourths in 3 feet.

.....

c. Mr. Putnam can cut $\frac{1}{4}$ -foot pieces of rope.

5 REFLECT

Explain what it means to divide 3 by $\frac{1}{4}$. Include a different real-world example from the problem above in your explanation.

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DISCUSS IT

- Look at problems 3 and 4. Why can both a division equation and a multiplication equation be used?
- I think dividing by a unit fraction is like dividing by a whole number because ... I think it is different because ...

Prepare for Division with Unit Fractions

- 1 Think about what you know about unit fractions. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

In My Own Words	My Illustrations
Examples	Non-Examples



unit fraction

- 2 Shade the fraction model to show a unit fraction. Write the unit fraction.

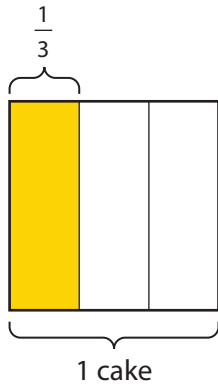
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Solve.

3 Mai See wants to share $\frac{1}{3}$ of a cake equally among 3 people. How much of the cake will each person get?

a. Draw on the area model to solve the problem.



b. Complete the division equation to match your area model.

$$\frac{1}{3} \div 3 = \dots\dots\dots$$

c. Each person will get $\dots\dots\dots$ of the cake.

4 Look at your area model again. Complete the statements below to solve the division problem using multiplication.

a. Each person will get $\dots\dots\dots$ of $\frac{1}{3}$ of the cake.

b. Write a multiplication equation to tell how much of the cake each person will get.

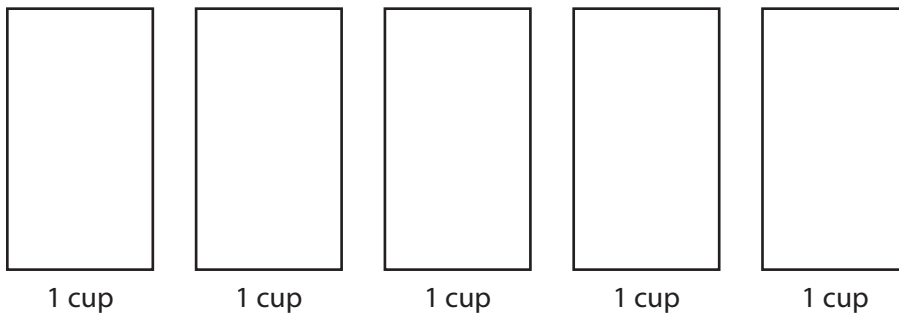


Develop Understanding of Division with Unit Fractions

MODEL IT: AREA MODELS

Try these two problems.

- 1 Jemma made 5 cups of pancake batter. She uses a scoop that holds $\frac{1}{3}$ cup to pour batter onto the skillet to make each large pancake. Use the model to show how many large pancakes Jemma can make.



Jemma can make pancakes.

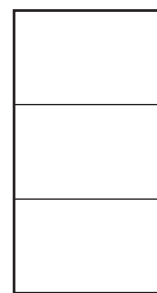
Explain why your model represents $5 \div \frac{1}{3}$.

- 2 Suppose Jemma uses $\frac{1}{3}$ cup of pancake batter to make 4 mini pancakes. Use the model to find the fraction of a cup of batter used for each mini pancake.

Each mini pancake uses cup of batter.

Explain why your model represents the quotient

$$\frac{1}{3} \div 4.$$



1 cup



DISCUSS IT

- How did you and your partner model the division problems?
- I think $5 \div \frac{1}{3}$ is equal to 5×3 because ... I think $\frac{1}{3} \div 4$ is equal to $\frac{1}{3} \times \frac{1}{4}$ because ...

MODEL IT: NUMBER LINES

Use number lines to show dividing with unit fractions.

3 Circle the quotient that matches the question. Then model the quotient on the number line. Write the division equation that represents your model.

a. What is $\frac{1}{4}$ divided into 2 equal parts? $2 \div \frac{1}{4}$ OR $\frac{1}{4} \div 2$



Equation

b. How many groups of $\frac{1}{2}$ are in 4? $4 \div \frac{1}{2}$ OR $\frac{1}{2} \div 4$



Equation



DISCUSS IT

- How did you and your partner decide what to label the tick marks given on the number lines?
- I think a word problem that is described by $\frac{1}{4} \div 2$ is ...

CONNECT IT

Complete the problems below.

4 Look at the area models and the number lines. What do they show about how the quotient compares to the dividend when you divide a whole number by a unit fraction and when you divide a unit fraction by a whole number?

5 Use any model to find $5 \div \frac{1}{2}$.

$5 \div \frac{1}{2} =$

Practice Division with Unit Fractions

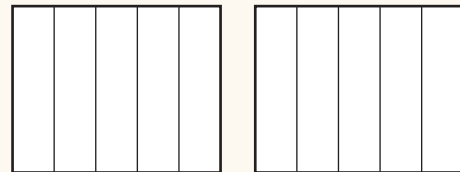
Study how the Example shows dividing a whole number by a unit fraction.
Then solve problems 1–6.

EXAMPLE

Teams of students in Mr. Reed's classroom decorate rectangular bulletin boards to show their team name, colors, and mascot. Each team uses $\frac{1}{5}$ of a bulletin board. The team decorations fill 2 bulletin boards. How many teams are there in all?

The 2 large rectangles represent the 2 bulletin boards.

Each team's decorations use $\frac{1}{5}$ of a board, so each rectangle is divided into 5 equal sections.



From the model, you can write the division equation: $2 \div \frac{1}{5} = 10$

You can also write the multiplication equation: $2 \times 5 = 10$

Both equations show 10 teams in all.

- 1 Explain how the model in the Example shows $2 \div \frac{1}{5} = 10$.
- 2 Explain how the model in the Example shows $2 \times 5 = 10$.
- 3 Suppose Mr. Reed's class has 3 full rectangular bulletin boards showing team decorations. How many teams would there be in all? Show your solution by writing both a division equation and a multiplication equation.

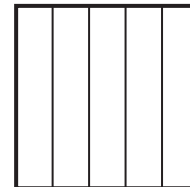
Vocabulary

unit fraction a fraction with a numerator of 1.

Examples: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$

4 Mr. Reed put 3 students on each team. The teams divides its $\frac{1}{5}$ -board space equally so each student decorates the same amount of a board. Complete the steps below to see what fraction of a rectangular bulletin board each student decorates.

a. Use the square at the right. Shade $\frac{1}{5}$ of the square to show $\frac{1}{5}$ of the board for one team.



b. Divide the square into 3 equal parts to represent 3 students on each team.

c. Shade $\frac{1}{3}$ of the square so that the overlapping shading represents 1 student.

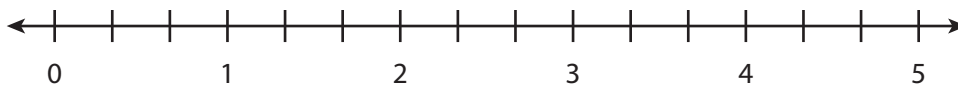
d. What fraction of the board does each student decorate?

e. $\frac{1}{5} \div 3 =$

5 Look at the model in problem 4. Write the multiplication equation you can also use to find $\frac{1}{3}$ of $\frac{1}{5}$.

6 a. Write a word problem that can be represented by the quotient $3 \div \frac{1}{3}$.

b. Use the number line below to solve your problem. Then write a multiplication equation that also solves the problem.



$3 \div \frac{1}{3} =$

..... \times =

Refine Ideas About Division with Unit Fractions

APPLY IT

Complete these problems on your own.

1 COMPARE

Draw a model to represent $\frac{1}{4} \div 4$ and a model to represent $\frac{1}{4} \times \frac{1}{4}$.

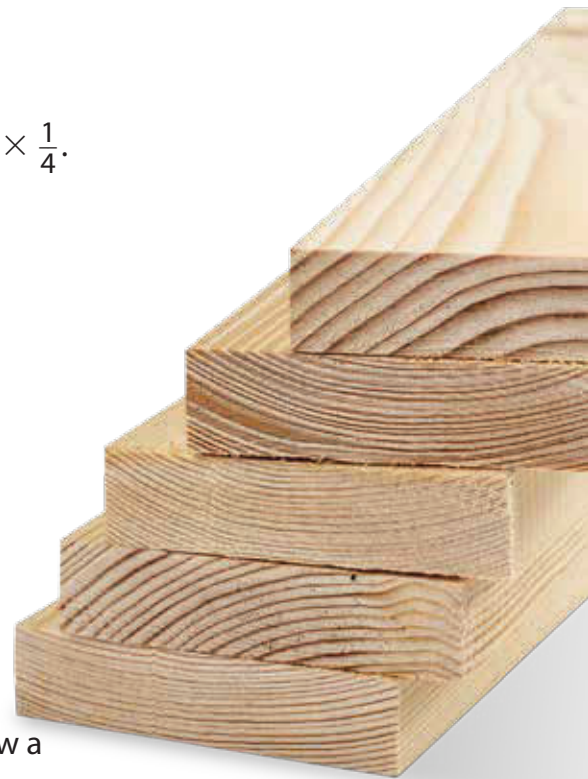
Explain the relationship between the two expressions.

2 ANALYZE

Mary has 12 boards. She cuts each board into pieces that are each $\frac{1}{3}$ of a board long. Helena tells Mary that $12 \div \frac{1}{3}$ is 4. Draw a model and use words to explain why Helena's statement is not reasonable.

3 JUSTIFY

Show that $\frac{1}{2} \div 3 = \frac{1}{6}$ by using a model. Explain why the quotient is less than the number you started with, $\frac{1}{2}$.



PAIR/SHARE

Discuss your solutions to these three problems with a partner.

Use what you have learned to complete problem 4.

- 4 Choose one of the following problems to solve.
Circle the problem you choose.

Drew wants to run at least 6 miles this month. He plans to run $\frac{1}{4}$ mile each day. How many days will it take Drew to run 6 miles?

Maya made $\frac{1}{2}$ quart of strawberry jam. She plans to share it equally among 4 friends. How much jam will each friend get?

Part A Draw a model to represent the problem.



Part B Write a division equation and a multiplication equation that represent the problem.

5 **MATH JOURNAL**

Find $2 \div \frac{1}{3}$. Write a word problem and use a visual model to show the problem.