Understand Division with Unit Fractions

Think It Through

How is dividing with fractions related to multiplying with fractions?

You know that multiplication and division are related. Dividing 8 by 4, for example, gives the same result as multiplying 8 by $\frac{1}{4}$.

$8 \div 4 = 2$

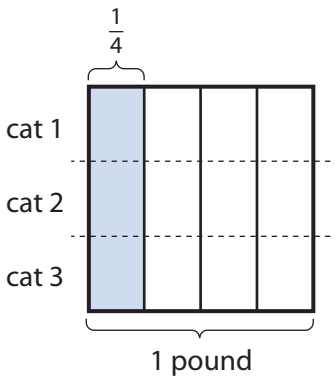
$8 \times \frac{1}{4} = 2$

Dividing with unit fractions works the same way. You can solve a division problem involving fractions by multiplication.

Think **What does dividing a unit fraction by a whole number mean?**

Mrs. Cook wants to share $\frac{1}{4}$ pound of fish equally among 3 cats.

That means she needs to divide $\frac{1}{4}$ into 3 equal parts. You can draw an area model to represent the problem.



$\frac{1}{4} \div 3 = \frac{1}{12}$

If $\frac{1}{4}$ pound of fish is divided into 3 equal parts, each cat will receive $\frac{1}{3}$ of the $\frac{1}{4}$ pound of fish.

$\frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$

Circle the multiplication equation that solves the division situation.

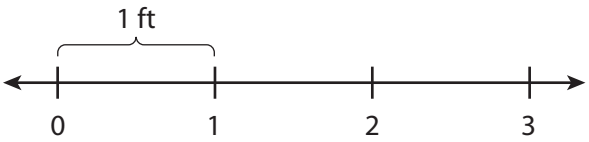
Think What does dividing a whole number by a unit fraction mean?

Mr. Putnam wants to cut a 3-foot rope into $\frac{1}{4}$-foot sections.

To figure out how many sections he will get, Mr. Putnam thinks, "How many fourths are in 3?"

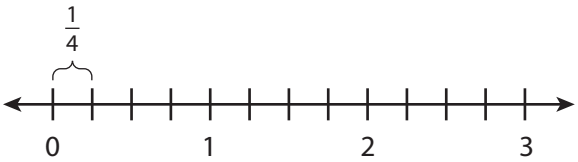
Look at the answer to this division problem. It is greater than 3, the number I started with!

You can draw a number line to represent the 3 feet of rope. There are three 1-foot sections.



You can mark fourths on the number line to represent $\frac{1}{4}$ foot. You can see there are twelve $\frac{1}{4}$-foot sections in 3 feet.

$3 \div \frac{1}{4} = 12$



You can also write a multiplication equation to show how many fourths are in 3. There are 4 fourths in each whole foot. To find the number of fourths in 3 feet, you can multiply.

$3 \times 4 = 12$

When you divide 3 by $\frac{1}{4}$, you are dividing 3 into parts smaller than 1. So there will be more than 3 of those parts.

Reflect

1 Explain what it means to divide 5 by $\frac{1}{4}$.

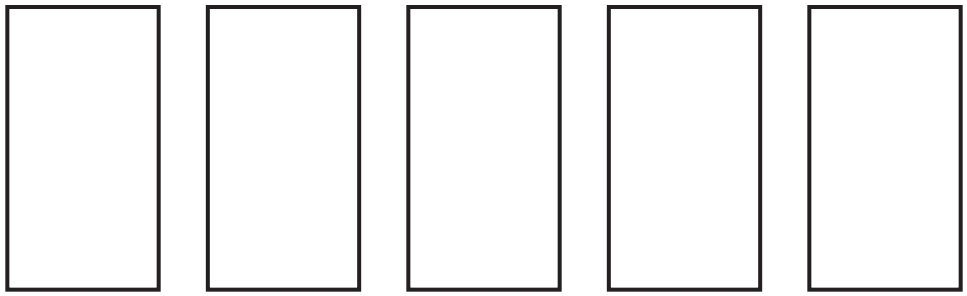
Think About Using Unit Fractions in Division

Let's Explore the Idea

Explore dividing a whole number by a unit fraction with the problem below.

Jemma made 5 cups of pancake batter. She uses a scoop measuring $\frac{1}{3}$ cup to pour batter onto the skillet to make large pancakes. How many pancakes can Jemma make?

The 5 rectangles below represent the 5 cups of pancake batter.



2 You need to find out how many _____ there are in _____.

3 The scoop holds $\frac{1}{3}$ cup of batter. How many scoops are in 1 cup? _____

4 Divide each of the 5 rectangles into sections to show your answer to problem 3.

5 How many scoops are in 5 cups? _____

6 $5 \div \frac{1}{3} =$ _____

7 What multiplication equation will also solve this problem? _____

8 How is 5×3 related to $5 \div \frac{1}{3}$? _____

_____

_____

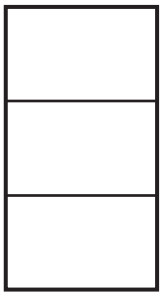
_____

Let's Talk About It

Solve the problems below as a group.

Suppose Jemma wanted to divide $\frac{1}{3}$ cup of pancake batter to make 4 mini pancakes. What fraction of a cup of batter will each pancake get?

9 The rectangle to the right shows 1 cup divided into 3 equal sections. How much does each section represent?



_____

10 Shade $\frac{1}{3}$ of the rectangle to show $\frac{1}{3}$ cup.

11 You need to divide $\frac{1}{3}$ cup equally to make 4 pancakes.
Divide each third of the rectangle vertically into 4 equal parts.
Then shade $\frac{1}{4}$ of the rectangle to show 1 of the 4 pancakes.

12 The overlapping section shows the fraction of a cup of batter that each pancake will get. What is this fraction? _____

13 $\frac{1}{3} \div 4 =$ _____

14 What multiplication equation also solves $\frac{1}{4}$ of $\frac{1}{3}$? _____

15 How is $\frac{1}{3} \div 4$ related to $\frac{1}{3} \times \frac{1}{4}$? _____

_____

Try It Another Way

Explore dividing by a unit fraction using a common denominator.

Another way to think about dividing unit fractions is to write equivalent fractions with a common denominator. What is $5 \div \frac{1}{2}$?

16 Write 5 as a fraction with a denominator of 2. _____

17 Divide $\frac{10}{2}$ into equal groups of $\frac{1}{2}$. How many groups can you make? _____

18 $5 \div \frac{1}{2} =$ _____

Connect Ideas About Dividing with Unit Fractions

Talk through these problems as a class. Then write your answers below.

19 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.

20 Analyze Helena said that $12 \div \frac{1}{3}$ is 4. Draw a model and use words to explain why Helena's statement is not reasonable.

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

Apply Ideas About Dividing with Unit Fractions

22 Put It Together Use what you have learned to complete this task.

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.