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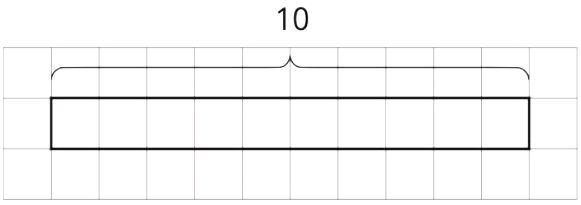
Unit 4, Lesson 6: Using Diagrams to Find the Number of Groups

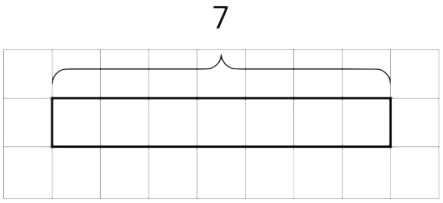
Let's draw tape diagrams to think about division with fractions.

6.1: How Many of These in That?

1. We can think of the division expression $10 \div 2\frac{1}{2}$ as the answer to the question: "How many groups of $2\frac{1}{2}$s are in 10?" Complete the tape diagram to represent the question. Then answer the question.



2. Complete the tape diagram to represent the question: "How many groups of 2 are in 7?" Then answer the question.

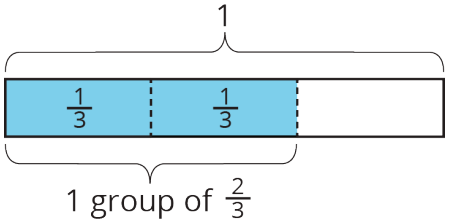


6.2: Representing Groups of Fractions with Tape Diagrams

To make sense of the question "How many $\frac{2}{3}$s are in 1?," Andre wrote equations and drew a tape diagram.

$$? \cdot \frac{2}{3} = 1$$

$$1 \div \frac{2}{3} = ?$$



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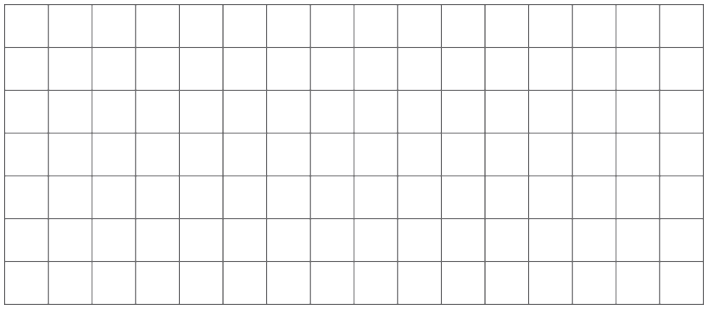
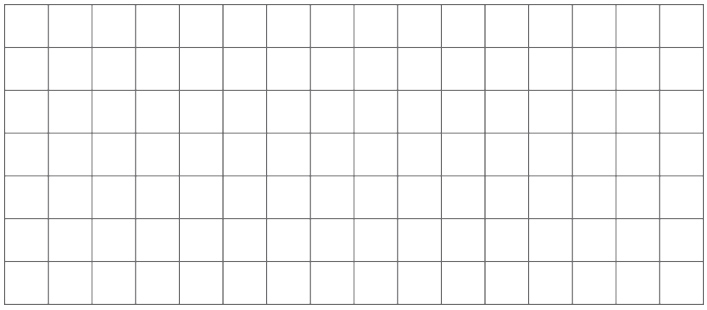
1. In an earlier task, we used pattern blocks to help us solve the equation $1 \div \frac{2}{3} = ?$. Explain how Andre's tape diagram can also help us solve the equation.

2. Write a multiplication equation and a division equation for each of the following questions. Draw a tape diagram to find the solution. Use the grid to help you draw, if needed.

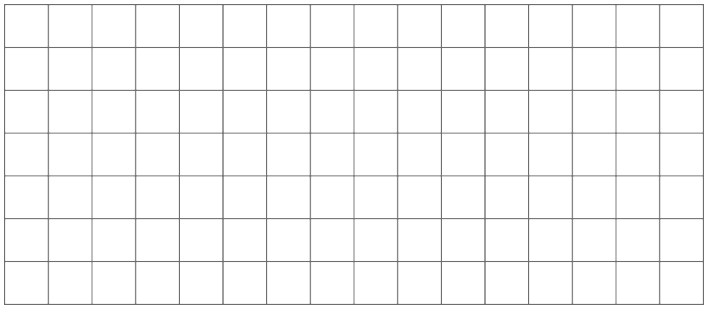
   a. How many $\frac{3}{4}$s are in 1?



   b. How many $\frac{2}{3}$s are in 3?



   c. How many $\frac{3}{2}$s are in 5?



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6.3: Finding Number of Groups

1. For each question, draw a diagram to show the relationship of the quantities and to help you answer the question. Then, write a multiplication equation or a division equation for the situation described in the question. Be prepared to share your reasoning.

   a. How many $\frac{3}{8}$-inch thick books make a stack that is 6 inches tall?

   b. How many groups of $\frac{1}{2}$ pound are in $2\frac{3}{4}$ pounds?

2. Write a question that can be represented by the division equation $5 \div 1\frac{1}{2} = ?$. Then answer the question. Show your reasoning.

Lesson 6 Summary

A baker used 2 kilograms of flour to make several batches of a pastry recipe. The recipe called for $\frac{2}{5}$ kilogram of flour per batch. How many batches did she make?

We can think of the question as: "How many groups of $\frac{2}{5}$ kilogram make 2 kilograms?" and represent that question with the equations:

$$? \cdot \frac{2}{5} = 2$$

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

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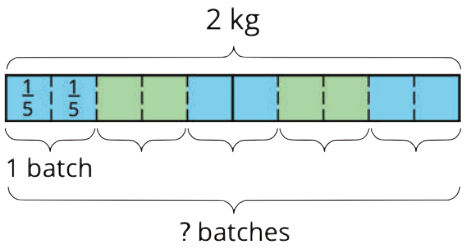
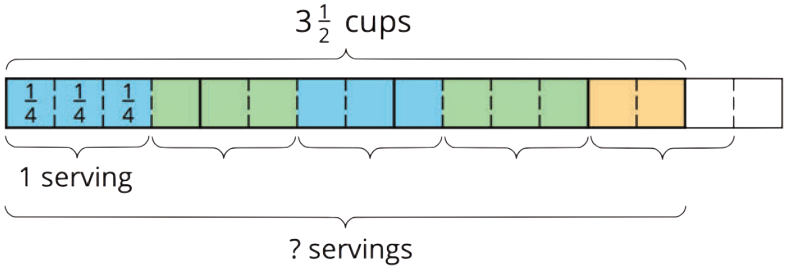
To help us make sense of the question, we can draw a tape diagram. This diagram shows 2 whole kilograms, with each kilogram partitioned into fifths.



We can see there are 5 groups of $\frac{2}{5}$ in 2. Multiplying 5 and $\frac{2}{5}$ allows us to check this answer: $5 \cdot \frac{2}{5} = \frac{10}{5}$ and $\frac{10}{5} = 2$, so the answer is correct.

Notice the number of groups that result from $2 \div \frac{2}{5}$ is a whole number. Sometimes the number of groups we find from dividing may not be a whole number. Here is an example:

Suppose one serving of rice is $\frac{3}{4}$ cup. How many servings are there in $3\frac{1}{2}$ cups?



$$? \cdot \frac{3}{4} = 3\frac{1}{2}$$

$$3\frac{1}{2} \div \frac{3}{4} = ?$$

Looking at the diagram, we can see there are 4 full groups of $\frac{3}{4}$, plus 2 fourths. If 3 fourths make a whole group, then 2 fourths make $\frac{2}{3}$ of a group. So the number of servings (the "?" in each equation) is $4\frac{2}{3}$. We can check this by multiplying $4\frac{2}{3}$ and $\frac{3}{4}$.

$4\frac{2}{3} \cdot \frac{3}{4} = \frac{14}{3} \cdot \frac{3}{4}$, and $\frac{14}{3} \cdot \frac{3}{4} = \frac{14}{4}$, which is indeed equivalent to $3\frac{1}{2}$.

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Unit 4, Lesson 6: Using Diagrams to Find the Number of Groups

1. We can think of $3 \div \frac{1}{4}$ as the answer to the question "How many groups of $\frac{1}{4}$ are in 3?" Draw a tape diagram to represent the question. Then answer the question.

2. Describe how to draw a tape diagram to represent and answer $3 \div \frac{3}{5} = ?$ for a friend who was absent.

3. How many groups of $\frac{1}{2}$ days are in 1 week?

   a. Write a multiplication equation or a division equation to represent the question.

   b. Draw a tape diagram to show the relationship between the quantities and to answer the question. Use graph paper, if needed.

4. Diego said that the answer to the question "How many groups of $\frac{5}{6}$ are in 1?" is $\frac{6}{5}$ or $1\frac{1}{5}$. Do you agree with his statement? Explain or show your reasoning.

5. Select **all** equations that can represent the question: "How many groups of $\frac{4}{5}$ are in 1?"

   A. $? \cdot 1 = \frac{4}{5}$

   B. $1 \cdot \frac{4}{5} = ?$

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C. $\frac{4}{5} \div 1 = ?$

D. $? \cdot \frac{4}{5} = 1$

E. $1 \div \frac{4}{5} = ?$

(from Unit 4, Lesson 5)

6. Calculate each percentage mentally.

a. What is 10% of 70?

b. What is 10% of 110?

c. What is 25% of 160?

d. What is 25% of 48?

e. What is 50% of 90?

f. What is 50% of 350?

g. What is 75% of 300?

h. What is 75% if 48?

(from Unit 3, Lesson 14)