Lesson 6

# Using Diagrams to Find the Number of Groups

## Goals

- Explain (orally) how to create a tape diagram to represent and solve a problem asking "How many groups?"
- Justify (orally and using other representations) the answer to a problem asking "How many groups?" in which the size of a group is a fraction and the number of groups is a fraction greater than 1.

## Learning Target

I can use a tape diagram to represent equal-sized groups and to find the number of groups.

## Lesson Narrative

In this lesson, students learn to use tape diagrams to represent and answer "How many groups?" questions. Tape diagrams are more abstract than are other visual representations that students have used or may have created, but they offer greater flexibility for making sense of problems that involve fractions. Students also continue to write multiplication and division equations for each situation, engaging in abstract and quantitative reasoning as they do so.

At the start of the lesson, students solve problems with a quotient that is a whole number or a multiple of one-half and with a blank tape pre-drawn on a grid. As the lesson progresses, students work with a wider range of numbers and with less scaffolding for creating diagrams. For instance, in the first main activity, a grid is given but students need to draw their own tapes. In the last activity, no grid is given.

As students use diagrams to show known values and to reason about unknown values, they practice communicating with precision.

## Student Learning Goal

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

### Access for Students with Diverse Abilities

- Engagement (Activity 2)

### Access for Multilingual Learners

- MLR2: Collect and Display (Activity 1)
- Add MLR3: Critique, Correct, Clarify (Activity 2)

### Instructional Routines

- MLR3: Critique, Correct, Clarify

### Required Materials

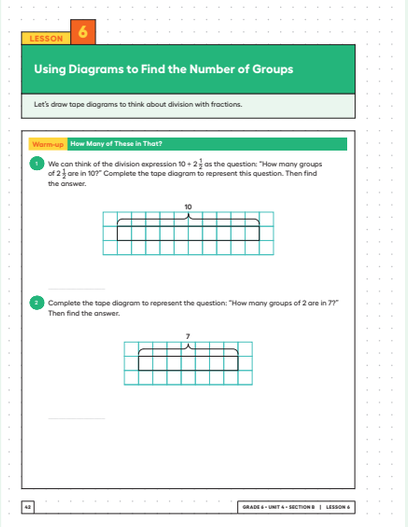
**Materials to Gather**

- Colored pencils: Activity 2
- Geometry toolkits: Activity 3

## Lesson Timeline

| Warm-up | Activity 1 | Activity 2 | Lesson Synthesis | Assessment: Cool-down |
|---|---|---|---|---|
| 5 min | 20 min | 15 min | 10 min | 5 min |

**Student Workbook**


LESSON 6

Using Diagrams to Find the Number of Groups

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

Warm-up How Many of These in That?

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

10

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

7

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## Warm-up

## How Many of These in That?

5 min

### Activity Narrative

This *Warm-up* gives students a chance to create tape diagrams to represent equal-size groups and division expressions in a scaffolded way. Each tape is started on a grid and pre-labeled with the known quantity. Each grid square represents 1.

### Launch

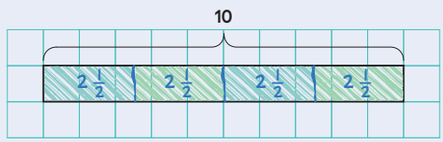
Arrange students in groups of 2.

Give students 2 minutes of quiet work time and another minute to share their diagrams with their partner.

### Student Task Statement

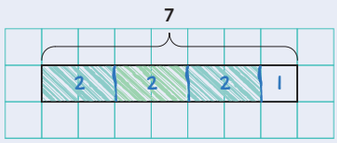
**1.** We can think of the division expression $10 \div 2\frac{1}{2}$ as the question: "How many groups of $2\frac{1}{2}$ are in 10?" Complete the tape diagram to represent this question. Then find the answer.

There are 4 groups of $2\frac{1}{2}$ in 10.




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

There are $3\frac{1}{2}$ groups of 2 in 7.



## Activity Synthesis

The goal of this discussion is for students to articulate how they represent the quantities in division questions on the blank tape diagrams. Select a few students to share their diagrams and answers. Discuss questions such as:

- *"In the first question, how did you know how large each part of the diagram should be?"*

  The length of the tape represents 10, and there are 10 grid squares, so each grid represents 1. Because the size of each group is $2\frac{1}{2}$, each part needs to have $2\frac{1}{2}$ squares.

- *"In the second question, we see 3 groups of 2 and an extra square of 1. How did you know that the 1 is $\frac{1}{2}$ of a group and not $\frac{1}{7}$ of a group?"*

  The question asks "How many groups of 2 … ," so the size of each group is 2, not 7.

- *"How can you tell the answers to the questions from the completed diagrams?"*

  We can count the number of full groups and partial groups.

## Activity 1

## Representing Groups of Fractions with Tape Diagrams

20 min

## Activity Narrative

In this lesson, students transition away from using concrete tools (pattern blocks and fraction strips) for reasoning about division to using a tool that is more abstract and more flexible. To represent "How many groups?" or "How many of these are in that?" questions, they draw tape diagrams on a grid. As they annotate the diagrams to represent the quantities involved and to show their reasoning, students practice communicating with precision.

Students continue to write multiplication and division equations to make sense of given situations, but here, they also think about the reasonableness of their answers. They see that the solution to a division problem can be checked using the corresponding multiplication equation. As they relate equations to situations and vice versa, students practice reasoning abstractly and quantitatively.

Some students may choose to write fractions in the form of mixed numbers, which is fine. Depending on the situation, one form may be more useful than the other. For example, in a measurement situation, a mixed number is easier to interpret, but if we need to perform further calculations with an answer, a number of the form $\frac{a}{b}$ may be easier to work with. In the course of the unit, students should become comfortable with both forms and be flexible in using them.

### Access for Multilingual Learners (Activity 1, Student Task)

**MLR2: Collect and Display.**
Circulate among the students, and listen for and collect the language that students use as they explain how Andre's tape diagram can be used to solve the equation $1 \div \frac{2}{3} = ?$. On a visible display, record words and phrases such as "equal parts," "same size," and "group of $\frac{2}{3}$s." Invite students to borrow language from the display as needed, and update it throughout the lesson.

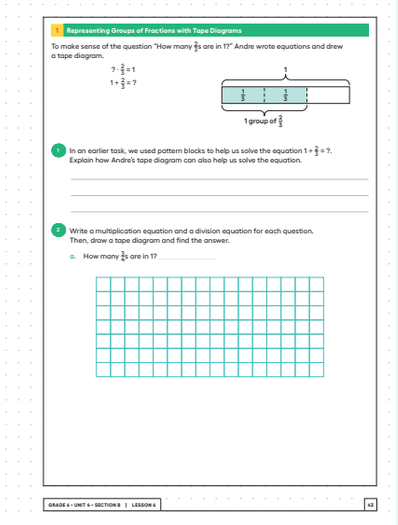
*Advances: Conversing, Reading*

### Building on Student Thinking

Students may think that the answer to the first question can be only a whole number because in the given diagram "1 group" is shaded but the partial group is not. Remind students of their work with pattern blocks in which we saw that the answer to the question "How many rhombuses are in a trapezoid?" could involve a whole number and a fraction. Consider asking

*"What fraction of a group would fit in the unshaded part of the tape?"*

### Student Workbook


1 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.

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

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

1

$\frac{1}{3}$ $\frac{1}{3}$

1 group of $\frac{2}{3}$

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 question. Then, draw a tape diagram and find the answer.

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

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## Launch

Arrange students in groups of 3–4. Tell students that they have used pattern blocks and fraction strips to answer questions that ask

*"How many groups are there?" and "How many of these are in that?"*

Now they will answer such questions by drawing tape diagrams.

Give students 2–3 minutes to discuss the first question and write their response.

Follow that with a brief whole-class discussion. Select 1–2 students to explain how a tape diagram shows us how many $\frac{2}{3}$s are in 1.

Then, give students 8–10 minutes of quiet work time to complete the rest of the task.

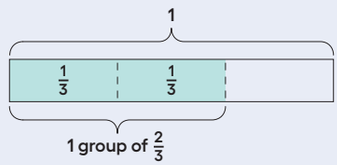
Ask them to discuss their diagrams only after attempting at least 2 of the 3 remaining questions. Provide access to colored pencils. Some students may find it helpful to identify whole groups and partial groups by coloring the tape diagrams.

### Student Task Statement

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

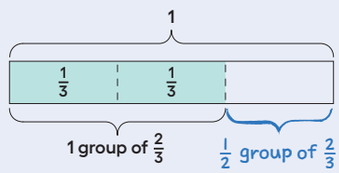
$? \cdot \frac{2}{3} = 1$

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




**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.

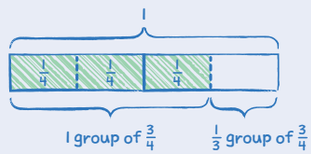
Sample response: The tape diagram shows 1 whole broken into 3 equal parts. Each part is $\frac{1}{3}$, so two parts make $\frac{2}{3}$. There is one group of size $\frac{2}{3}$, plus an extra $\frac{1}{3}$, which is half of a group of size $\frac{2}{3}$. This means there are $1\frac{1}{2}$ groups of size $\frac{2}{3}$ in 1, or $1 \div \frac{2}{3} = 1\frac{1}{2}$.



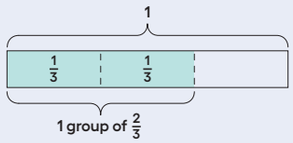

**2.** Write a multiplication equation and a division equation for each question. Then, draw a tape diagram and find the answer.

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

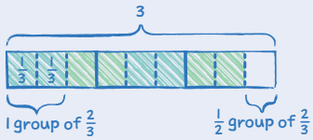
Multiplication equation: $? \cdot \frac{3}{4} = 1$ (or $\frac{3}{4} \cdot ? = 1$), division equation: $1 \div \frac{3}{4} = ?$ (or $1 \div ? = \frac{3}{4}$), solution: $\frac{4}{3}$ (or $1\frac{1}{3}$).



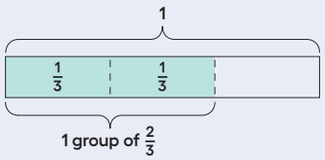
**b.** How many $\frac{2}{3}$s are in 3?



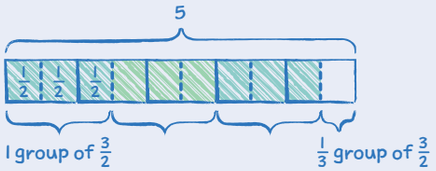

Multiplication equation: $? \cdot \frac{2}{3} = 3$ (or $\frac{2}{3} \cdot ? = 3$), division equation: $3 \div \frac{2}{3} = ?$ (or $3 \div ? = \frac{2}{3}$), solution: $\frac{9}{2}$ (or $4\frac{1}{2}$).




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




Multiplication equation: $? \cdot \frac{3}{2} = 5$ (or $\frac{3}{2} \cdot ? = 5$), division equation: $5 \div \frac{3}{2} = ?$ (or $5 \div ? = \frac{3}{2}$), solution: $\frac{10}{3}$ (or $3\frac{1}{3}$).




## Activity Synthesis

Focus the whole-class discussion on two goals: reflecting on the process of creating and using the diagrams, and discussing how we can check our solutions.

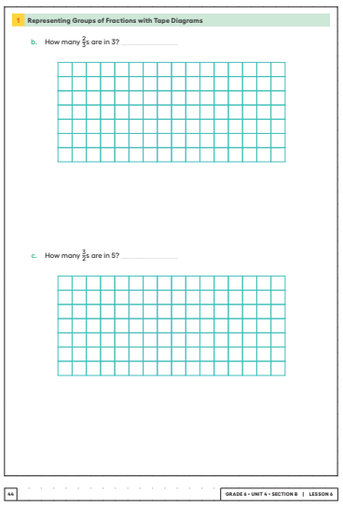
For each problem in the second question, select a student to share their diagram and answer. If time permits, invite others who have a different diagram but the same answer to also share. Reinforce the idea that the size of 1 group is what we use as the unit for counting and to find out how many groups there are.

If students' diagrams cannot be easily displayed for all to see, consider showing the ones in the *Student Response*. Alternatively, consider using this applet to demonstrate how to represent a division problem on a tape diagram:

The Geogebra applet 'Representing Groups of Fractions' is available here: **geogebra.org/m/atUteypU**.

This video shows how to use the tool to answer the question "How many $\frac{1}{2}$s are in 3?" **vimeo.com/184879045**.

**Student Workbook**


1 Representing Groups of Fractions with Tape Diagrams

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

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

**Instructional Routines**

**MLR3: Critique, Correct, Clarify**

**ilclass.com/r/10695504**

Please log in to the site before using the QR code or URL.

**Access for Multiple Language Learners (Activity 2)**

**MLR3: Critique, Correct, Clarify**

This activity uses the *Critique, Correct, Clarify* math language routine to advance representing and conversing as students critique and revise mathematical arguments.

**Access for Students with Diverse Abilities (Activity 2, Student Task)**

**Engagement: Internalize Self-Regulation.**
Provide students an opportunity to self-assess and reflect on their own progress. For example, ask students how comfortable they are in figuring out what each given quantity represents and how to write a multiplication or a division equation to represent a situation.

*Supports accessibility for: Organization, Conceptual Processing*

To help students reflect on their process, discuss questions such as:

- *"How did you begin the diagram? How did you know how to partition the pieces in the diagram?"*
- *"Which of the two equations—multiplication or division—was helpful in setting up the diagram? How so?"*
- *"How did you determine how many groups there are?"*
- *"Can we use pattern blocks to represent these situations? Why or why not?"*
- *"Which representation might be preferable and why?"*

To prompt students to think about the reasonableness of their answers, ask

- *"How would you know if your answer is correct?"*

If not mentioned by students, point out how to use multiplication to check their solution to the division problem. For example:

We wrote $? \cdot \frac{2}{3} = 1$ to represent "How many $\frac{2}{3}$s are in 1?".

We found the answer to be $1\frac{1}{2}$, so we can substitute $1\frac{1}{2}$ for the "?" and see if $1\frac{1}{2} \cdot \frac{2}{3}$ is indeed 1.

$1\frac{1}{2} = \frac{3}{2}$, so we can rewrite that expression as $\frac{3}{2} \cdot \frac{2}{3}$.

$\frac{3}{2} \cdot \frac{2}{3} = 1$, so the answer is correct.

## Activity 2

## Finding the Number of Groups

10 min

### Activity Narrative

In this activity, students apply the reasoning strategies they learned in earlier activities to solve division problems in context. Though the instructions do not prompt students to draw tape diagrams, students may find them to be a handy option. Students who opt to use available tools to facilitate problem solving (such as referring to fraction strips or using graph paper to set up a diagram and colored pencils to mark up parts of it) practice choosing tools strategically.

Students may decide to express each whole-number or mixed-number dividend as a fraction. For example, they may express the 6 inches as $\frac{48}{8}$ inches and then see how many $\frac{3}{8}$s are in $\frac{48}{8}$. As students work, monitor for the different strategies that they use.

### Launch

Keep students in the same groups.

Give students 4–5 minutes of quiet work time followed by 1–2 minutes to discuss their work with their group.

Provide access to geometry toolkits. Encourage students to think about the tools and strategies at their disposal and to check their solutions using multiplication.

If time is limited, consider "jigsawing" the activity. For example, ask each group member to answer one question, making sure that both questions are answered by the group.

### Student Task Statement

Write a multiplication equation or a division equation for each question, and then find the answer. Explain or show your reasoning.

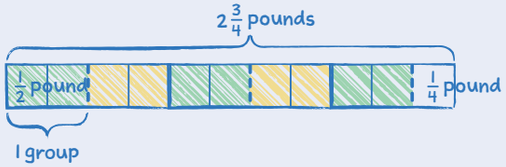
1. How many groups of $\frac{1}{2}$ pound are in $2\frac{3}{4}$ pounds?

   Multiplication equation: $? \cdot \frac{1}{2} = 2\frac{3}{4}$ (or $\frac{1}{2} \cdot ? = 2\frac{3}{4}$)

   Division equation: $2\frac{3}{4} \div \frac{1}{2} = ?$ (or $2\frac{3}{4} \div ? = \frac{1}{2}$)

   Answer: $5\frac{1}{2}$ groups.

   Sample reasoning:



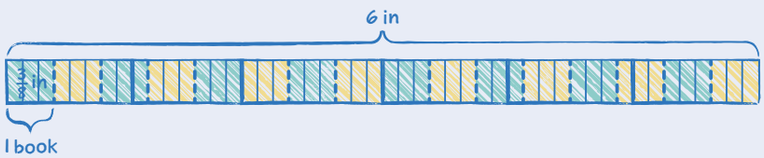

2. How many $\frac{3}{8}$-inch thick books make a stack that is 6 inches tall?

   Multiplication equation: $? \cdot \frac{3}{8} = 6$ (or $\frac{3}{8} \cdot ? = 6$)

   Division equation: $6 \div \frac{3}{8} = ?$ (or $6 \div ? = \frac{3}{8}$)

   Answer: 16 books

   Sample reasoning:




### Are You Ready for More?

Write a story with a question that can be represented by the equation $5 \div 1\frac{1}{2} = ?$, and then find the answer. Show your reasoning.

Sample responses:

- Question: One episode of a TV show is $1\frac{1}{2}$ hours long. How many episodes can one watch in 5 hours if they take no breaks?

  Answer: $3\frac{1}{3}$ episodes. $\frac{10}{3} \cdot \frac{3}{2} = \frac{10}{2} = 5$
- Question: Han is pouring tea into $1\frac{1}{2}$-liter bottles. How many bottles will he fill with 5 liters of tea?

  Answer: $3\frac{1}{3}$ bottles. There are $4\frac{1}{2}$ liters in 3 bottles. The leftover $\frac{1}{2}$ liter fills $\frac{1}{3}$ of a bottle.

### Activity Synthesis

Use *Critique, Correct, Clarify* to give students an opportunity to improve a sample written response to the last question by correcting errors, clarifying meaning, and adding details.

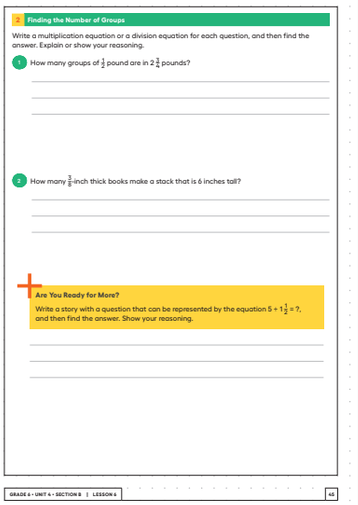
Display this first draft:

> *"In every 1 inch we can fit 2 books that are $\frac{3}{8}$-inch thick, so in 6 inches we can fit 6 · 2 or 12 books."*

### Building on Student Thinking

Some students might interpret the "stack" in the last question as a group because it is commonly used as such in everyday contexts. Clarify that in this case, "a stack that is 6 inches tall" refers to the books being piled up to reach a height of 6 inches.

### Student Workbook


2 Finding the Number of Groups

Write a multiplication equation or a division equation for each question, and then find the answer. Explain or show your reasoning.

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

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

Are You Ready for More?

Write a story with a question that can be represented by the equation $5 \div 1\frac{1}{2} = ?$, and then find the answer. Show your reasoning.

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Ask,

- *"What parts of this response are unclear, incorrect, or incomplete?"*

As students respond, annotate the display with 2–3 ideas to indicate the parts of the writing that could use improvement.

Give students **2 minutes** to work with a partner to revise the first draft.

Invite students to include a labeled diagram, if it could further clarify their revised explanation.

Select 1–2 individuals or groups to read their revised draft aloud slowly enough to record for all to see. Scribe as each student shares, and then invite the whole class to contribute additional language and edits to make the final draft even more clear and more convincing.

## Lesson Synthesis

Focus the discussion on how to create a tape diagram to represent and reason about "How many groups?" questions.

Display the question: "How many $\frac{4}{5}$s are in 2?" Consider drawing a tape diagram on a blank grid and annotating it while students respond to questions such as:

- *"What would the length of the entire tape represent?"*

  The total amount, which is 2, or $\frac{10}{5}$

- *"How long should the tape be? Should we use one grid box for each 1 whole?"*

  Since we're dealing with $\frac{4}{5}$, it'd be helpful to show fifths and use 5 grid boxes for each 1 whole.

- *"What is the size of each group?" ($\frac{4}{5}$) "How can we show the groups on the tape?"*

  Partition the tape into pieces of $\frac{4}{5}$ each.

- *"How does the diagram help us answer the question?"*

  We can count the number of groups of $\frac{4}{5}$.

- *"What if the total amount cannot be partitioned equally into $\frac{4}{5}$s? How do we deal with the extra $\frac{2}{5}$ in this case?"*

  We can think of it as a partial group and compare it to the size of 1 group. We can see that $\frac{2}{5}$ is half of $\frac{4}{5}$.

If time permits, invite students to compare and contrast the visual reasoning tools they have used so far:

- *"We have used pattern blocks, fraction strips, and tape diagrams to help us think about 'How many groups?' questions involving fractions. How are these tools alike?"*

  They all show groups of fractions and allow us to count the number of groups.

- *"How are tape diagrams different from pattern blocks and fraction strips?"*

  With tape diagrams, we can specify what the length of the tape and each segment represent. With pattern blocks or fraction strips, we may need a lot of blocks or much longer strips to represent certain numbers. Also, fractions with certain denominators are not shown on the strips and cannot be shown with available pattern block shapes.

## Lesson Summary

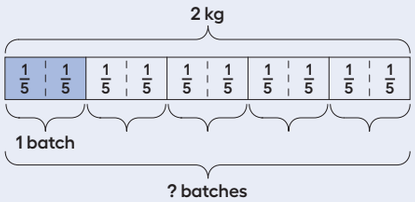
One batch of a recipe calls for $\frac{2}{5}$ kg of flour. If a baker used 2 kg of flour, how many batches did she make?

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

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

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

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.



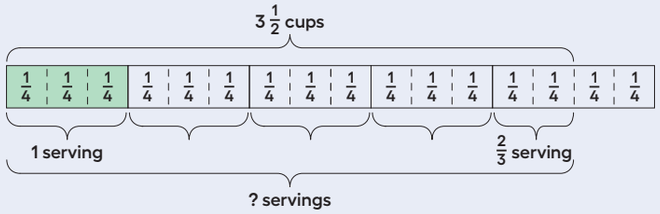

We can see that there are 5 groups of $\frac{2}{5}$ in 2. Multiplying 5 and $\frac{2}{5}$ gives $\frac{10}{5}$ or 2, so $2 \div \frac{2}{5}$ is 5.

Sometimes the number of groups or the result of dividing is not a whole number. Suppose one serving of rice is $\frac{3}{4}$ cup. How many servings are there in $3\frac{1}{2}$ cups?

Here are two equations and a diagram that represent the situation:

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

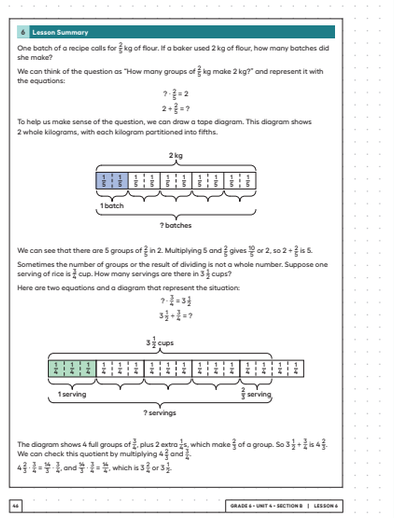
$$3\frac{1}{2} \div \frac{3}{4} = ?$$




The diagram shows 4 full groups of $\frac{3}{4}$, plus 2 extra $\frac{1}{4}$s, which make $\frac{2}{3}$ of a group. So $3\frac{1}{2} \div \frac{3}{4}$ is $4\frac{2}{3}$. We can check this quotient 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 $3\frac{2}{4}$ or $3\frac{1}{2}$.

### Student Workbook



6 Lesson Summary

One batch of a recipe calls for $\frac{2}{5}$ kg of flour. If a baker used 2 kg of flour, how many batches did she make?

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

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

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

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.

2 kg

1 batch

? batches

We can see that there are 5 groups of $\frac{2}{5}$ in 2. Multiplying 5 and $\frac{2}{5}$ gives $\frac{10}{5}$ or 2, so $2 \div \frac{2}{5}$ is 5.

Sometimes the number of groups or the result of dividing is not a whole number. Suppose one serving of rice is $\frac{3}{4}$ cup. How many servings are there in $3\frac{1}{2}$ cups?

Here are two equations and a diagram that represent the situation:

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

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

$3\frac{1}{2}$ cups

1 serving

$\frac{2}{3}$ serving

? servings

The diagram shows 4 full groups of $\frac{3}{4}$, plus 2 extra $\frac{1}{4}$s, which make $\frac{2}{3}$ of a group. So $3\frac{1}{2} \div \frac{3}{4}$ is $4\frac{2}{3}$. We can check this quotient 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 $3\frac{2}{4}$ or $3\frac{1}{2}$.

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**Responding To Student Thinking**

**Points to Emphasize**
If students struggle with creating a tape diagram to represent a division situation, as opportunities arise discuss how relevant quantities should be featured in a diagram. For example, when reviewing the practice problem referred to here, ask students which value—3 or $\frac{3}{5}$—corresponds to the length of an entire tape and which corresponds to the size of the parts in the tape.

Grade 6, Unit 4, Lesson 6, Practice Problem 2

## Cool-down

### How Many in 2?

5 min

**Launch**

Provide continued access to colored pencils.

**Student Task Statement**

How many $\frac{3}{4}$s are in 2?

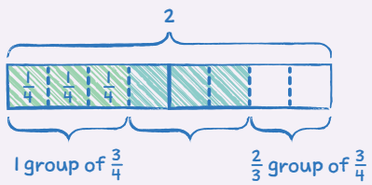
1. Write a multiplication equation and a division equation that can be used to answer the question.

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

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

2. Draw a tape diagram, and answer the question. Use the grid to help you draw, if needed.

   There are two and two-thirds $\frac{3}{4}$s in 2.



Lesson 6

## Practice Problems

6 Problems

### Problem 1

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

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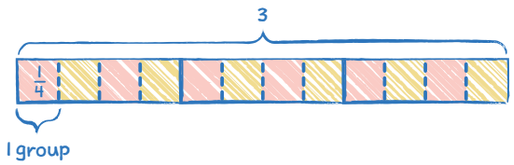
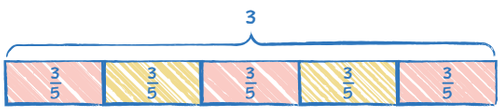
Sample reasoning:




### Problem 2

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

Sample reasoning: Draw a rectangle whose length represents 3. Partition it into 3 equal parts to show 3 groups of 1. Partition each 1 whole into 5 fifths. There are 15 fifths in 3. Shade each group of 3 fifths, then count how many groups there are in 3.




### Problem 3

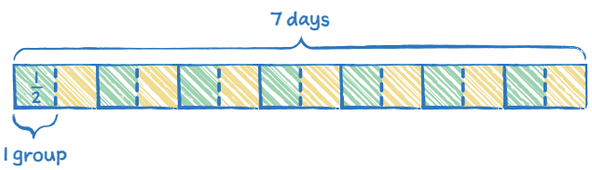
How many groups of $\frac{1}{2}$ day are in 1 week?

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

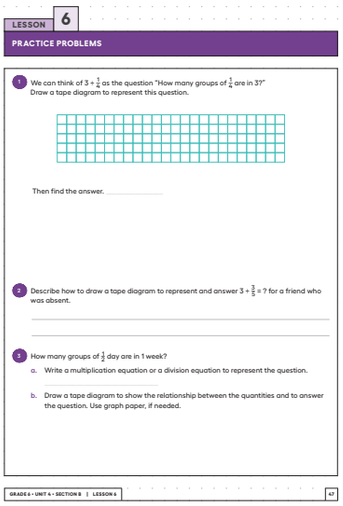
Sample responses: $? \cdot \frac{1}{2} = 7$ (or equivalent), $7 \div \frac{1}{2} = ?$

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

There are 14 groups of $\frac{1}{2}$-day in a week. Sample reasoning:




### Student Workbook


LESSON 6

PRACTICE PROBLEMS

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

Then find the answer. _____

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 $\frac{1}{2}$ day 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.

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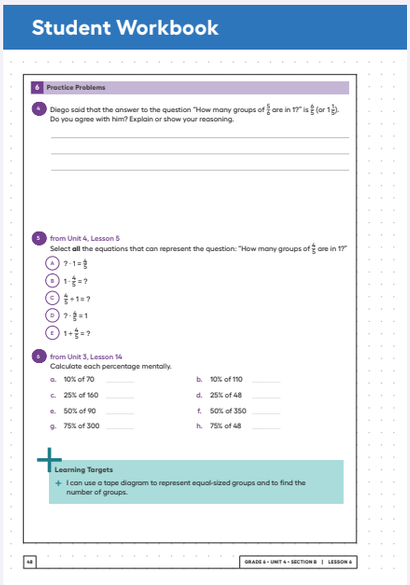
**Student Workbook**



Practice Problems

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 him? Explain or show your reasoning.

5. from Unit 4, Lesson 5
Select **all** the equations that can represent the question: "How many groups of $\frac{4}{5}$ are in 1?"
A. $? \cdot 1 = \frac{4}{5}$
B. $1 \cdot \frac{4}{5} = ?$
C. $\frac{4}{5} + 1 = ?$
D. $? \cdot \frac{4}{5} = 1$
E. $1 \div \frac{4}{5} = ?$

6. from Unit 3, Lesson 14
Calculate each percentage mentally.
a. 10% of 70 ____ b. 10% of 110 ____
c. 25% of 160 ____ d. 25% of 48 ____
e. 50% of 90 ____ f. 50% of 350 ____
g. 75% of 300 ____ h. 75% of 48 ____

Learning Targets
+ I can use a tape diagram to represent equal-sized groups and to find the number of groups.

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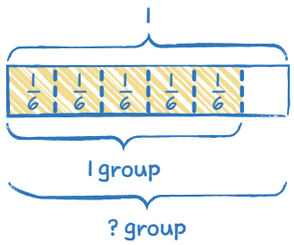
## Problem 4

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 him? Explain or show your reasoning.

Agree

Sample reasoning:

- $\frac{6}{5} \cdot \frac{5}{6} = \frac{30}{30}$, which equals 1.
- There are 6 sixths in 1. We can make 1 group of $\frac{5}{6}$s and have $\frac{1}{6}$ remaining. $\frac{1}{6}$ is one fifth of $\frac{5}{6}$, so there are $1\frac{1}{5}$ groups of $\frac{5}{6}$ in 1.
- 


## Problem 5

from Unit 4, Lesson 5

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

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

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

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

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

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

## Problem 6

from Unit 3, Lesson 14

Calculate each percentage mentally.

**a.** 10% of 70 7

**b.** 10% of 110 11

**c.** 25% of 160 40

**d.** 25% of 48 12

**e.** 50% of 90 45

**f.** 50% of 350 175

**g.** 75% of 300 225

**h.** 75% of 48 36