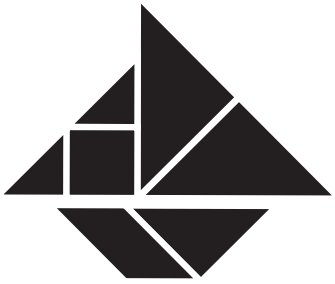

Teachers Guide

GRADE 3 – UNIT 4 – MODULE 3

BRIDGES®
IN MATHEMATICS

Module 3

Fractions as Fair Shares

Session 1 Fair Shares, Unit Fractions 3

Session 2 Comparing & Ordering Unit Fractions 9

Session 3 Pattern Block Fractions 15

Session 4 Fractions as Distances 23

Session 5 Fractions on the Number Line 29

Teacher Masters

Pages renumber with each module.

Measurement Checkpoint T1

Pattern Block Fractions T3

Work Place Guide 4D Hexagon Spin & Fill T4

4D Hexagon Spin & Fill Record Sheet T5

Double Number Line T6

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Choose a Measurement Unit 128

Comparing Unit Fractions 129

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Home Connections Pages

Page numbers correspond to those in the consumable books.

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Module 3

Fractions as Fair Shares

Overview

Students begin their study of fractions, building on their work in first and second grade, and extending their thinking to include new models and new concepts. They begin by folding paper rectangle "cookies" to share with varying numbers of people. They use the fractional portions to compare unit fractions and develop understandings about common fractions. Their work with the paper rectangles in the first two sessions leads to a session and a new Work Place featuring pattern blocks, a familiar material that offers good opportunities to investigate equivalent fractions. Next they investigate fractions as measures, exploring the fact that a unit fraction $\frac{1}{b}$ is the distance from 0 to $\frac{1}{b}$, and a common fraction $\frac{a}{b}$ can be modeled on a number line by making a hops of $\frac{1}{b}$.

Planner

Session & Work Places Introduced	P&I	MF	WP	A	HC	DP
Session 1 Fair Shares, Unit Fractions Students complete a checkpoint on measurement and then begin a multi-session investigation of fractions. Today, they share imaginary cookies with varying numbers of people by folding paper rectangles to create and label halves, thirds, fourths, sixths, and eighths. The class compares the different unit fractions, noting that fractions do not have to be congruent to be equivalent. The teacher displays a rectangle divided into four unequal parts and asks students whether each part can be called a fourth.	●			●	●	●
Session 2 Comparing & Ordering Unit Fractions Students compare and order unit fractions from greatest to least, first using the paper rectangles they folded and labeled last session, and then a set of paper "licorice whips" presented later in the session. The teacher guides students toward the generalization that the larger the number of people sharing something, the smaller the share. This is established after the paper cookies are ordered, and it is tested again after the licorice whips have been folded, cut, labeled, and ordered.	●					●
Session 3 Pattern Block Fractions Students investigate the fractions represented by several of the pattern blocks, and then by combinations of pattern blocks when the hexagon is assigned a value of 1. The class discusses the different values of each block. Then students learn and play Hexagon Spin & Fill, which will later become a Work Place. **Work Place 4D** Hexagon Spin & Fill Each player in turn spins a spinner labeled with fractional amounts. The player takes the correct pattern blocks and sets them on his first hexagon on the record sheet. At the end of each turn, the player must make trades to ensure that he always has the fewest number of pattern blocks possible. Players continue to take turns spinning and collecting pattern blocks until one of them has filled all three hexagons on their section of the record sheet.	●		●		●	●
Session 4 Fractions as Distances Students create a class number line marked with 0 at one end and 1 at the other and work together to place several fractions along the line. Then they each create their own number line and practice locating various points along it, including ½, ¼, and ¾.	●		●			●
Session 5 Fractions on the Number Line Today, students work together to add some more fractions to their class number line. Then they work briefly with the double number lines they constructed last session before sketching some fractions on their own number line diagrams.	●		●		●	●

P&I – Problems & Investigations, **MF** – Math Forum, **WP** – Work Place, **A** – Assessment, **HC** – Home Connection, **DP** – Daily Practice

Materials Preparation

Each session includes a complete list of the materials you'll need to conduct the session, as well as notes about any preparation you'll need to do in advance. If you would like to prepare materials ahead of time for the entire module, you can use this to-do list.

Task		Done
Copies	Run copies of Teacher Masters T1–T6 according to the instructions at the top of each master.	
	Run a single display copy of Student Book pages 134–135.	
	If students do not have their own Student Books, run a class set of Student Book pages 128–136.	
	If students do not have their own Home Connections books, run a class set of the assignments for this module using pages 71–76 in the Home Connections Book.	
Work Place Preparation	Prepare the materials for Work Place 4D using the lists of materials on the Work Place Guides (Teachers Masters T4).	
Charts	Before Session 1, create a 6″ × 9″ rectangle marked into 4 unequal pieces as pictured in preparation instructions.	
Paper Cutting	Before Session 1, cut six 4″ × 6″ rectangles of copy paper per student, plus extras to be used in Sessions 1 and 2.	
	Before Session 2, cut six 1″ × 12″ strips of red construction paper.	
	Before Session 2, cut several sheets of yellow construction paper into a set of unit fractions, according to preparation instructions.	
	Before Session 3, cut one 6″ × 9″ piece of black construction paper per student.	
Special Items	Use heavy cotton string to create a classroom number, and copy paper to create number cards, according to the preparation instructions in Session 4.	

Additional Resources

Please see this module's Resources section of the Bridges Educator site for a collection of resources you can use with students to supplement your instruction.

Session 1
Fair Shares, Unit Fractions

Summary

Students complete a checkpoint on measurement and then begin a multi-session investigation of fractions. Today, they share imaginary cookies with varying numbers of people by folding paper rectangles to create and label halves, thirds, fourths, sixths, and eighths. The class compares the different unit fractions, noting that fractions do not have to be congruent to be equivalent. The teacher displays a rectangle divided into four unequal parts, and asks students whether each part can be called a fourth. Finally, the teacher assigns the Sharing Candy Bars & Measuring Home Connection.

Skills & Concepts

- Demonstrate an understanding of a unit fraction $1/b$ as 1 of b equal parts into which a whole has been partitioned (3.NF.1)
- Represent fractions with denominators of 2, 3, 4, 6, and 8 as parts of a whole (supports 3.NF)
- Partition shapes into parts with equal areas; express the area of each equal part of a whole as a unit fraction of the whole (3.G.2)
- Reason abstractly and quantitatively (3.MP.2)
- Model with mathematics (3.MP.4)

Materials

Teacher Masters	Kit Materials	Classroom Materials
Assessment Measurement Checkpoint		
TM T1–T2 Measurement Checkpoint		
Problems & Investigations Fair Shares, Unit Fractions		
		• six 4″ × 6″ rectangles of copy paper per student, plus extra • one 6″ × 9″ rectangle of copy paper (see Preparation) • rulers marked in inches • regular or legal-size envelopes, 1 per student
Home Connection		
HC 71–72 Sharing Candy Bars & Measuring		
Daily Practice		
SB 128 Choose a Measurement Unit		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master.

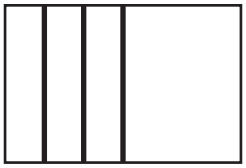
Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

congruent*
eighth/eighths
equivalent
fair share
fourth/fourths
fraction*
half*
sixth/sixths
third/thirds
unit fraction*

Preparation

Cut one 6″ × 9″ rectangle from a piece of copy paper. Fold the rectangle into four sections as shown here. Make the lines dark with a marker so that they are easy to see.



Assessment

Measurement Checkpoint

1 Open the session by telling students they will take a quick checkpoint on measurement. Then they will do some work with fractions and fair shares.

2 Display the Measurement Checkpoint, and give each student a copy. Give students a minute to look over it and ask any questions, and then have them begin.

- Encourage students to read each question carefully, and remind them they can ask you for help reading any of the questions.
- Remind students to work quietly by themselves.
- While students work, circulate around the room to make observations and answer questions.
- Give students 10–15 minutes to do the checkpoint.
- If some students finish earlier than others, ask them to read quietly.

3 Collect students' checkpoints.

SUPPORT Since this is not a timed test, give students who are unable to complete the work more time to finish later in the day or early the next day.

Problems & Investigations

Fair Shares, Unit Fractions

4 Begin by tapping into students' prior experiences with sharing by posing the following questions:

- Think of a recent time when you shared something with someone. What were you sharing?
- When you were sharing, was it fair? Did you each get the same amount?

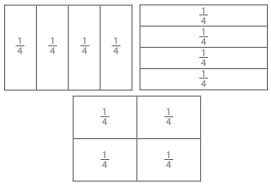
5 During the discussion, demonstrate how to write unit fractions for halves, fourths, sixths, and eighths.

> ***Teacher*** *If Briana and Maria Jose were sharing a candy bar fairly, how much would each of them get?*
>
> ***Students*** *A half.*
>
> ***Teacher*** *How would I write that?*
>
> ***Student*** *One, a line, and then 2 on the bottom.*

About Unit Fractions

Unit fractions are fractions with a numerator of 1, the fractions that represent one person's share when dividing fairly. When 4 people share, for example, each person's share is ¼.

As students compare the ways they've folded their rectangular cookies into fair shares, they encounter differently shaped pieces that are labeled the same. They learn that these pieces are *equivalent* in the sense that they are the same amount, but not *congruent*. As long as the pieces are each ¼ of identical cookies, they do not have to look the same.



Students will review that with unit fractions, the smaller the denominator, the bigger the fractional piece—the fewer people you share with, the bigger your fair share. The more people, the smaller your share will be.

Although students are often taught to think about ¼ as "one out of four," the fraction ¼ literally means 1 whole divided into 4 parts. The name we give to each of the parts is one-fourth. This may seem like a small point, but we want to emphasize the connection between fractions and division from the start. Early on, referring to ¼ as 1 part out of 4 may make sense, but when students encounter fractions such as a/*b* in later grades, the notion of *a* parts out of *b* doesn't hold, whereas *a* divided by *b* does.

> ***Teacher*** *That's correct. I can write the line like this, horizontal, or like this, slanted. When we write ½, it means 1 thing, like a cookie, divided into 2 parts. Each of those parts is called one-half. What if Briana and Maria Jose invited Sara to share the candy bar as well? How many would be sharing then? What would I write to show each girl's share of the candy bar?*

Continue this line of questioning until you have recorded the unit fractions ½, ⅓, ¼, ⅙, and ⅛ on the board.

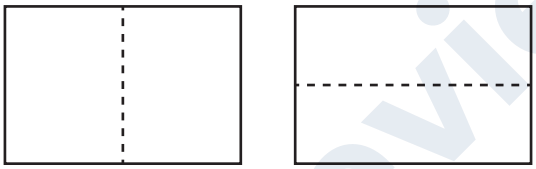
6 Give each student six 4″ × 6″ rectangles of copy paper, and explain that each rectangle represents a cookie.

Ask the students to fold 1 of their paper squares into 2 equal pieces.

SUPPORT If students are folding the paper into unequal pieces, ask them which piece they would want. Why? Press them to acknowledge that for the shares to be fair, each person must get the same amount.

7 Work with the class to compare noncongruent halves, and help them understand that pieces don't need to be *congruent* (exactly the same shape and size) to be *equivalent* (the same amount).

- Watch to see how students fold their rectangles.
- Choose a student who folded the paper horizontally, and one who folded vertically to bring their rectangles to the front of the room where the rest of the class can see them.



- Note with the students that these halves appear to be different from one another. Are they actually the same amount (equivalent), even though they're not the same shape and size? Press students to justify their responses.

> ***Teacher*** *Are these halves the same amount? Are they equivalent? Would each student really get the same amount of cookie? Can someone convince us that these pieces are the same amount of cookie?*

8 Have students label each fair share with the fraction ½.

Explain that the amount of cookie that each person would get is ½ and the line, the fold, represents where you would cut or break the cookie. This will help set the stage for activities later in the module in which students will investigate the measurement definition of fractions by marking distances traveled.

9 Have students fold and label their other rectangles to represent the following numbers of people sharing: 3, 4, 6, 8.

- Let them know that it is OK to fold their rectangles horizontally, vertically, or in both directions. The goal is to create fair shares in each case. Encourage students to compare their pieces as they fold and label, noting again that if two paper rectangles exactly the same size are folded into 3 (or 4, 6, or 8 equal parts), those parts may be the same amount (equivalent) but not congruent.
- After students are satisfied that their shares are reasonably accurate, have them check with their partners and adjust if necessary.
- Then have students label each fair share with the appropriate unit fractions.

- Circulate and note how students are folding their squares.

SUPPORT Have extra rectangles on hand for students who want, or need, to try again. Folding a rectangle into thirds that are reasonably equal may be especially challenging for many of the students. If some of them become frustrated with the task, invite them to use the inch side of their rulers to help, noting with them that the longer dimension of the rectangle measures 6 inches. Can they use that information to help mark and fold thirds that are equal? Sixths are likely to pose a similar challenge. You will also likely have students who are surprised that folding the rectangle 3 times results in eighths rather than sixths.

CHALLENGE If students get done early, invite them to fold one of the paper rectangles into equal shares for 5 people.

10 When most of the students are finished folding and labeling their rectangles to form halves, thirds, fourths, sixths, and eighths, reconvene the class, and pose some more questions about sharing to set the stage for tomorrow's session.

- If you like cookies, would you rather be in a group of 2 people sharing a cookie or 8 people sharing the same sized cookie? Why?
- Would you rather be in a group of 2 people sharing one cookie or 4 people sharing two cookies? Why?
- Would you rather be in a group of 100 people sharing or 20 people sharing? Why, and under what circumstances? (Students may reason that 100 people sharing 50 cookies would each get a larger share than 20 people sharing 4 cookies. If you present this question in an open-ended manner, you may get some interesting responses.)

11 Display the 6″ × 9″ piece of copy paper you folded in preparation for this session, and use it to discuss the fact that fractions must be *equal* parts of the same whole.

Explain that this paper represents a giant cookie. Ask students to discuss, first in pairs and then as a whole group, the fraction of the cookie each of the folded parts represents.

Here, you are likely to get varying responses. Some students may assert that because the paper has been folded into four parts, each part must be a fourth of the cookie. Others may argue that the parts aren't fair because one of them is bigger than the other three. A few may have suggestions for fixing the situation, such as cutting off a section of the large part so it's equivalent to the other three parts. And a few may also have more precise ideas about the fraction of the cookie represented by each piece, arguing that the large part is half, while the smaller parts are each one-third of a half, or one-sixth.

12 Ask students if it would be OK to cut off the extra so that the pieces would be equivalent (the same amount).

Some students will have no problem with changing the whole, the unit, in order to make the pieces equivalent. Remind them that they want ¼ of the whole cookie, not ¼ of part of the cookie.

As you discuss this possibility with the class, reinforce the fact that a fraction must be a fair share. A fourth is 1 of 4 equivalent parts of the same-sized whole.

13 Close the session.

- Give each student an envelope in which to store their folded and labeled paper rectangles for use next session.

- Ask them to reflect on the mathematics they did today by posing the following questions:
  - » What does *fair share* mean?
  - » What does ¼ mean?
  - » What does ⅛ mean?

Home Connection

14 Introduce and assign the Sharing Candy Bars & Measuring Home Connection, which provides more practice with the following skills:

- Demonstrate an understanding of a unit fraction $\frac{1}{b}$ as 1 of b equal parts into which a whole has been partitioned (3.NF.1)
- Represent fractions with denominators of 2, 3, 4, 6, 8, 10 as parts of a whole (supports 3.NF)
- Estimate liquid volume in liters; estimate mass in grams and kilograms (3.MD.2)
- Solve story problems involving multiplication and subtraction of volume measurements given in milliliters (3.MD.2)
- Solve story problems involving multiplication and subtraction of mass measurements given in grams and milligrams (3.MD.2)

Daily Practice

The optional Choose a Measurement Student Book page provides additional opportunities to apply the following skills:

- Estimate liquid volume in liters; estimate mass in grams and kilograms (3.MD.2)
- Solve story problems involving multiplication and subtraction of mass measurements given in grams and kilograms (3.MD.2)

Session 2

Comparing & Ordering Unit Fractions

Summary

In today's session, students compare and order unit fractions from greatest to least, first using the paper rectangles they folded and labeled last session, and then using a set of construction paper "licorice whips" presented later in the session. As they discuss their work, the teacher guides students toward the generalization that the larger the number of people sharing something, the smaller the share. This is established after the paper cookies are ordered, and it is tested again after the licorice whips have been folded, cut, labeled, and ordered.

Skills & Concepts

- Demonstrate an understanding of a unit fraction $1/b$ as 1 of b equal parts into which a whole has been partitioned (3.NF.1)
- Demonstrate an understanding of a fraction a/b as a equal parts, each of which is $1/b$ of a whole (3.NF.1)
- Represent fractions with denominators of 2, 3, 4, 6, and 8 as parts of a whole (supports 3.NF)
- Compare two fractions with the same numerator (3.NF.3d)
- Use the symbols >, =, and < to record comparisons of two fractions (3.NF.3d)
- Explain why one fraction must be greater than or less than another fraction (3.NF.3d)
- Order fractions that have denominators of 2, 3, 4, 6, and 8 (supports 3.NF)
- Partition shapes into parts with equal areas; express the area of each equal part of a whole as a unit fraction of the whole (3.G.2)
- Model with mathematics (3.MP.4)
- Look for and express regularity in repeated reasoning (3.MP.8)

Materials

Copies	Kit Materials	Classroom Materials
Problems & Investigations Comparing & Ordering Unit Fractions		
		• several sheets of 9″ × 12″ yellow construction paper (see Preparation) • several pieces of 4″ × 6″ white copy paper for demonstration purposes • students' folded and labeled paper rectangles from the previous session • scissors, class set • six 1″ × 12″ strips of red construction paper • masking tape or magnets • glue sticks (optional) • 12″ × 18″ construction paper, any color (optional, class set)
Daily Practice		
SB 129 Comparing Unit Fractions		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master.

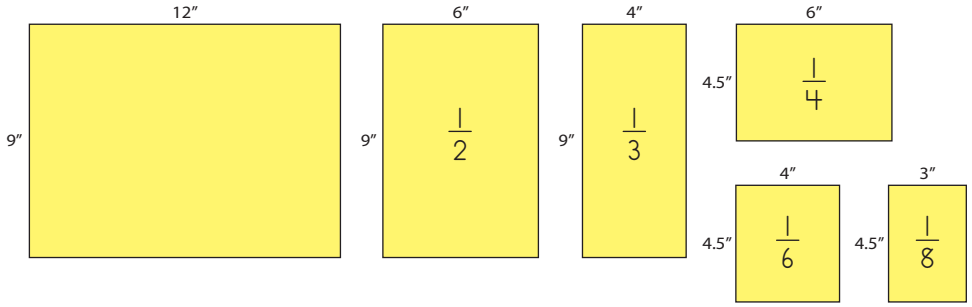
Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

common fractions
compare
denominator*
fraction*
greatest
least
less than
more than
numerator*
order
unit fraction*

Preparation

- Use the sheets of yellow construction paper to cut and label a set of unit fractions, as shown in the illustration. You will also need one sheet left whole and unlabeled for now. Have these ready to stick on your whiteboard with magnets or tape. You will be ordering the fractions from least to greatest as a class so you need to be able to move the pieces around easily as you implement students' suggestions.



About Common Fractions

Last session, students considered one person's portion in the context of fair shares, represented by a unit fraction. Today, the teacher introduces conventions for describing and recording the fraction if someone gets more than one of the shares. If three people are sharing a cookie, for example, but one person gives her share to one of the others, the recipient gets two of the thirds. This can be written as ⅓ + ⅓, or ⅔, introducing the concept of non-unit or *common fractions*. A common fraction is one that has a numerator greater than 1.

Problems & Investigations

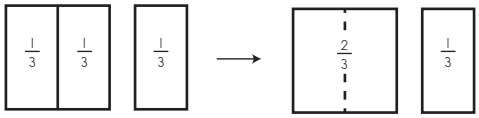
Comparing & Ordering Unit Fractions

1 Open the session by reviewing the work students did with paper cookies last session. Ask questions such as the following:

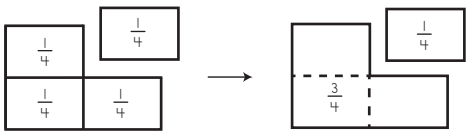
- If you like cookies, would you rather be in a group of 2 people sharing one cookie or 3 people sharing one cookie? Why?
- Would you rather be in a group of 2 people sharing 1 cookie or 6 people sharing two cookies? Why?
- Would you rather be in a group of 50 people sharing or 25 people sharing? Why?

2 Explain to students that they are going use the paper rectangles they folded and labeled last session to create a set of unit fractions, and model the process for them.

- Work with their input to fold one of the 4″ × 6″ paper rectangles from the previous session into 3 equal parts and label each part. Then cut out one-third and leave the other two-thirds together.
- Flip the larger of the two parts over, and ask the students to talk in pairs about how to label it. Invite a couple of volunteers to share their ideas with the class, and then solicit agreement that the piece represents ⅓ plus ⅓, or ⅔, and label it accordingly.



- Repeat this process with fourths, again working with input from the students to fold another of the 4″ × 6″ paper rectangles into 4 equal parts and label each. Then cut out one-fourth and leave the other three-fourths intact. Flip the larger of the two pieces over and work with the class to name and label it as ¼ + ¼ + ¼, or ¾.



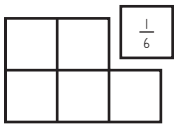
3 Ask students to carefully cut out one of the shares from each rectangular cookie they folded yesterday, and then flip the remaining, larger, portion of each over and label it.

As they work, encourage the students to help one another generate the labels for the larger portions of each cookie. If there appears to be a lot of confusion among the students about how to label their left-over pieces, pull the class back together briefly to consider the problem together.

Students *We're stuck!*

We don't know what to call this big piece.

We know the little piece is a sixth, but we don't know what to write on the back of the leftover piece.



Teacher *What do you know about the leftover piece? What can you tell me about it?*

Tom *There are 5 little pieces in it, and they're all the same size, so maybe they're like fifths?*

Teacher *When you folded that cookie, how many people were going to share it?*

Students *Six?*

Yep, it was 6. So we folded it into 6 parts all the same size, for everyone to get a fair share.

Teacher *When you cut one of the sixths out of that cookie, how many were left?*

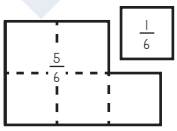
Students *Five of them.*

But they're still sixths—those are like the pieces for the other 5 kids.

So there are 1, 2, 3, 4, 5 sixths. How do you write that?

Like this.

Oh, right—because it's like ⅙ + ⅙ + ⅙ + ⅙ + ⅙. There are 5 of them.



4 As students finish, ask them to line up their unit fraction pieces in order from largest to smallest.

Circulate and ask scaffolding questions.

CHALLENGE Ask students who order their unit fractions quickly and accurately to order the larger portions of the cookies from largest to smallest and share observations about the two collections with others.

Aaron *This is weird! With the first fractions, half is the biggest, then one-third, one-fourth, and keep going down to one-eighth. But with the leftover parts, the half is the smallest. It goes seven-eighths, five-sixths, three-fourths, and keep going. See what I mean?*

Bianca *Well, it kind of makes sense, because the leftover part that's seven-eighths only had one little piece taken out. Then the next leftover piece had a sixth taken out of it.*

Math Practices in Action 3.MP.8

While repeating the process of dividing the rectangle into equal pieces and removing one of them, students will make use of the regularity they see in their reasoning to make sense of unit fractions. The repetition, and the patterns that emerge, help them develop a stronger understanding of unit fractions.

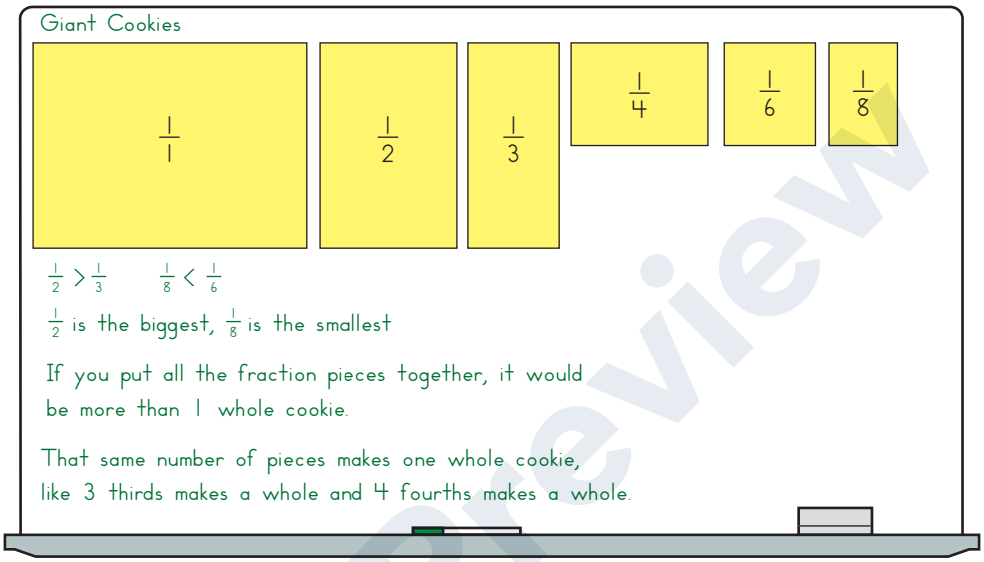
5 When most students have completed the task, reconvene the class and have them work together to order a set of the unit fractions on the board, using the yellow construction paper pieces you prepared prior to the session.

- Start the display by posting one whole rectangle. Explain that this is a giant cookie, and establish with the class that if one person were to eat this entire cookie by himself, his share would be written as 1/1. Label the rectangle 1/1 = 1.
- Then post the rest of your unit fractions on the board in no particular order. Ask students how they would order your set, and move the pieces as they suggest the order in which to place them.

SUPPORT Stay in the context of fair sharing as you compare and order the pieces.

6 Once the fractions have been posted in order on the board, ask students to share observations, first in pairs and then as a whole class. What do they notice?

Invite volunteers to share their observations with the class. Record some of their ideas on the board.



7 When students have had an opportunity to share some of their observations about the display, guide them to making some generalizations about unit fractions by posing the following prompts and questions.

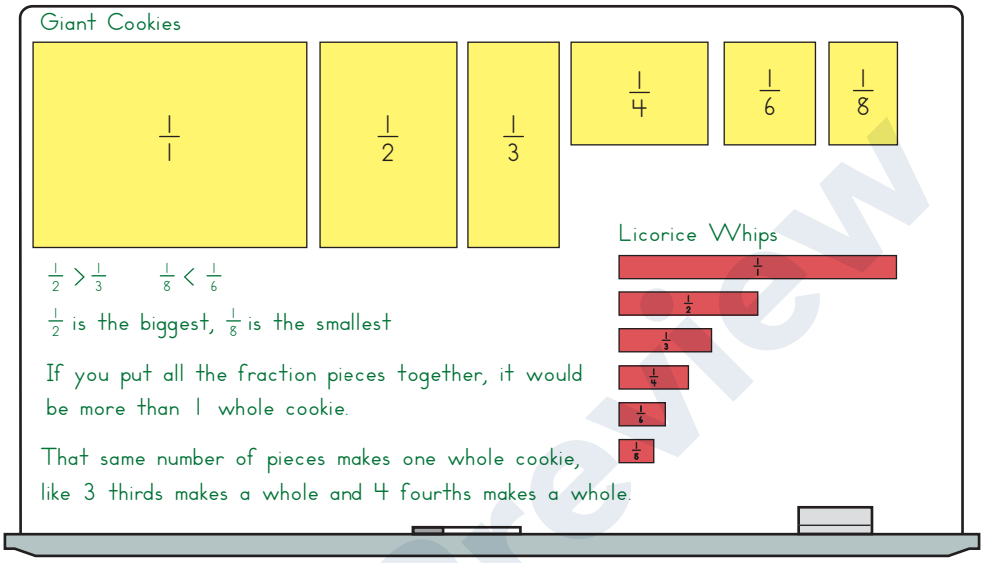
- If 4 is greater than 2, why is ½ greater than ¼?
- Why is ⅛ less than ¼ when 8 is twice as big as 4?
- What happens when you share one cookie with more and more people? Why?
- What does the denominator (number on the bottom of each fraction) mean in the context of fair shares? (It's the number of people sharing the cookie; the number of pieces into which the cookie has been divided.)
- What happens as the denominator gets larger? Why? (The pieces get smaller because you're sharing with more and more people.)

8 Next, show students the red construction paper strips you prepared, and explain that these are imaginary licorice whips. Explain that you're going to work together to fold, cut, label, and order a set of unit fractions, much as the students just did with their paper cookies.

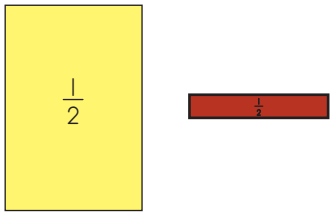
Before you start, ask students to predict what will happen. Using these long strips, which are quite different in appearance than the paper rectangles, will ½ still be more than ¼? Will ⅛ of one of the strips be smaller than ¼ of another? How do they know?

9 As a class, create a set of unit fractions ½, ⅓, ¼, ⅙, ⅛ from the strips of construction paper.

- Hold up the first strip, and work with input from the students to label it as the amount one person would get if she didn't share it with anyone else. (1/1 = 1)
- Hold up the second strip. Ask students to suggest how to find one person's share if that person is sharing the licorice strip with one friend. Follow their instructions to fold and cut the strip. Then work with their input to label one of the resulting pieces with its fraction name. (½)
- Repeat for ⅓, ¼, ⅙, and ⅛.
- Have students post the licorice strip fractions on the board from greatest to smallest.
- Ask if their ideas about sharing with less and more people hold up with the licorice strips.
  - » Is it still true that the more people you share with, the less you get?
  - » Is it still true that the bigger the denominator, the smaller the fraction?



10 Display a ½ cookie piece and a ½ licorice piece next to each other. Ask students to discuss and compare the two. Use questions such as those below to guide them to an understanding that the size of the whole matters.



- Are these both one-half? How can that be?
- Which half would you rather have? Why?
- Which half is bigger? How do you know?
- Does the size of the whole matter? Why?

11 Finally, have students put all their paper fraction pieces back in the envelopes you gave them last session.

Have them mix up the pieces quite thoroughly as they put them back in the envelope. Then suggest that they take these home and challenge someone —a parent or a sibling—to put the pieces back together to form whole rectangles, much as they might work a puzzle.

Extension

Give each student a 12″ × 18″ or larger sheet of construction paper, and have the students create a display of unit and common fractions with the pieces they cut and labeled this session and last. You might leave this activity quite open ended, or you might structure it a bit by writing a list of terms and concepts students are to address in their posters (e.g., unit fraction, common fraction, fair shares, cookies, numerator, denominator, halves, thirds, fourths, sixths, eighths, greater than, less than).

Daily Practice

The optional Comparing Unit Fractions Student Book page provides additional opportunities to apply the following skills:

- Demonstrate an understanding of a unit fraction $^1/_b$ as 1 of b equal parts into which a whole has been partitioned (3.NF.1)
- Represent fractions with denominators of 2, 3, 4, 6, 8, 10 as parts of a whole (supports 3.NF)
- Compare two fractions with the same numerator: explain why one fraction must be greater than or less than another fraction (3.NF.3d)
- Use the symbols >, =, and < to record comparisons of two fractions (3.NF.3d)

Session 3
Pattern Block Fractions

Summary

Students investigate the fractions represented by several of the pattern blocks, and then by combinations of pattern blocks when the hexagon is assigned a value of 1. Next they learn how to play Hexagon Spin & Fill, which will later become a Work Place. Finally, the teacher introduces and assigns the Measurement & Fractions Home Connection.

Skills & Concepts

- Demonstrate an understanding of a unit fraction $\frac{1}{b}$ as *1* of *b* equal parts into which a whole has been partitioned (3.NF.1)
- Demonstrate an understanding of a fraction $\frac{a}{b}$ as *a* equal parts, each of which is $\frac{1}{b}$ of a whole (3.NF.1)
- Identify equivalent fractions by comparing their size (3.NF.3a)
- Recognize and generate simple equivalent fractions; explain why two fractions must be equivalent (3.NF.3b)
- Recognize fractions that are equivalent to whole numbers (3.NF.3c)
- Compare two fractions; use the symbols >, =, and < to record comparisons; explain why one fraction must be greater than or less than another fraction (3.NF.3d)
- Partition shapes into parts with equal areas; express the area of each equal part of a whole as a unit fraction of the whole (3.G.2)
- Make sense of problems and persevere in solving them (3.MP.1)
- Construct viable arguments and critique the reasoning of others (3.MP.3)

Materials

Copies	Kit Materials	Classroom Materials
Problems & Investigations Pattern Block Fractions		
TM T3 Pattern Block Fractions **SB 130** More Pattern Block Fractions	• pattern blocks (see Preparation)	• one piece of 6″ × 9″ black construction paper for each student • a piece of copy paper to mask portions of the display master
Work Places Hexagon Spin & Fill		
TM T4 Work Place Guide 4D Hexagon Spin & Fill **TM T5** 4D Hexagon Spin & Fill Record Sheet **SB 131*** Work Place Instructions 4D Hexagon Spin & Fill	• pattern blocks • clear spinner	
Home Connection		
HC 73–74 Measurement & Fractions		
Daily Practice		
SB 133 Comparing Fractions		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master.
** Run 1 copy of this page to be kept in a clear plastic sleeve in the Work Place bin.*

Preparation

- Organize your pattern blocks for use by students at their tables or desks. Each student will need access to several of the following shapes: hexagons, trapezoids, blue rhombuses, and triangles. The squares and white rhombuses won't be needed at all today; if you think they'll be distracting, you might have a few student helpers remove them from the sets before you conduct this session.
- In today's session, you'll introduce Work Place 4D Hexagon Spin & Fill, which replaces Work Place 3B Add & Round Tens. Before this session, you should review the Work Place Guide, as well as the Work Place Instructions. Make one copy of the 4D Hexagon Spin & Fill Record Sheet for use today, and store the rest in the Work Place 4D Hexagon Spin & Fill bin, along with any materials listed on the guide. The Work Place Guide also includes suggestions for differentiating the game to meet students' needs.

Problems & Investigations

Pattern Block Fractions

1 Open the session by letting students know that they're going to use a familiar material, pattern blocks, to do some more work with fractions today.

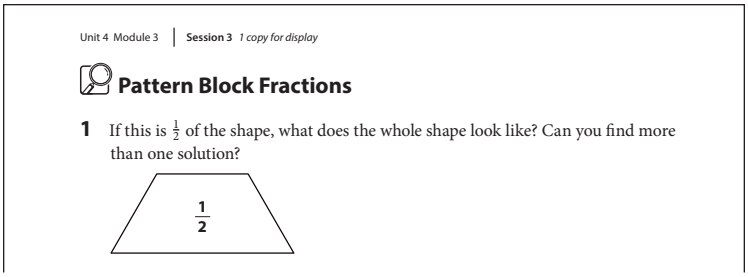
Explain that the students will work on some fraction problems together, and then on their own or with a partner. After that, you'll share a new pattern block fraction game that will be available as a Work Place soon.

2 Give students the materials they're going to need for the first part of the session.

- Give each student a 6″ × 9″ piece of black construction paper to use as a work space.
- Have helpers place containers of pattern blocks on each table or near each cluster of desks, and tell students they'll each need several of each of the following shapes: hexagons, trapezoids, blue rhombuses, and triangles.

SUPPORT Although most of your students will likely have had several years of experience with the pattern blocks, the urge to play with these manipulatives never quite goes away. You may find that students are more focused on the problems you're about to pose if you give them a couple of minutes to make designs or structures with their small collections of blocks.

3 When students have their materials ready, display just the first problem on the Pattern Block Fractions Teacher Master, keeping the rest of the sheet covered for now. Read the problem to the class and provide clarification if necessary, but don't tell the students how to deal with the situation.


Unit 4 Module 3 | Session 3 *1 copy for display*

Pattern Block Fractions

1 If this is $\frac{1}{2}$ of the shape, what does the whole shape look like? Can you find more than one solution?

$\frac{1}{2}$

4 Have the students use their pattern blocks to build what they believe the whole shape to be.

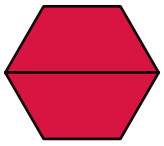
- Ask them to build on their black work mats so their work shows up more clearly.
- Encourage them to find more than one solution to the problem, and to share and compare their ideas as they're working.

5 Invite volunteers up to the front of the class to share their solutions and explain their reasoning.

- If possible, have them build their solutions at the document camera so all of their classmates can see.
- As each individual shares, encourage the other students to ask questions.

Teacher *As I look around, I see some interesting solutions to this problem. Who would like to share one of their solutions with the class and explain their reasoning? Theo? Why don't you come up to the projector with your blocks, show us what you built, and explain how you know it's the whole shape?*

Theo *OK, I knew that the trapezoid was half, so I put two of them together into a hexagon. I think the hexagon has to be the whole shape, because it's made out of two trapezoids.*



Teacher *Talk to the person sitting next to you. Do you agree with what Theo just showed and explained? Does anyone have any questions for Theo?*

Ashley *I don't really have a question, but I have another idea. Can I share?*

Teacher *Sure—come on up.*

Ashley *I agree that if something is half, then the whole must be two of that. So if the trapezoid is half, then the whole shape must be made out of two trapezoids. I just thought of a different way to arrange the trapezoids because it said to come up with more than one way to solve the problem. So I just turned the hexagons like this.*

Teacher *What do you think of Ashley's idea? Do you agree that this is another solution to the problem?*

Max *Ashley, I have a question. Is that—what you built—a real shape? I mean, a hexagon is a real shape we all know about, but what you made is kind of a weird shape.*

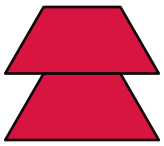
Ashley *I think it is. I mean, if you could the whole thing as one shape, it has 6 sides—see? It's weird, all right, but it's also a hexagon if you count the sides, right?*

Teacher *You're raising some interesting questions here. Does anyone else have a question for Ashley or a different solution they'd like to share? Sienna, you built something interesting on your work mat. Would you be willing to share it with the class?*

Sienna *Well, OK… I'm not sure it's right, but I put two trapezoids together like this.*

Math Practices in Action 3.MP.3

Students use the pattern blocks, and their emerging understanding of fractions, to construct viable arguments about what the whole must be. In constructing and defending their own arguments, and critiquing others' reasoning, students grapple with the relationships between halves and wholes, and between incongruent figures with the same area.



Teacher *Why did you use two trapezoids? Why not three or four?*

Sienna *Because up there, it says that the trapezoid is half of the whole shape. That means there has to be two of them, because two halves make a whole. My shape looks like a tree, but it has eight sides, so I guess it's a really weird octagon.*

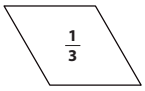
6 When several students have shared, summarize their thinking.

At least some of your students may be dubious about the solutions other than the hexagon shared by their classmates. Most of them have had enough experience with pattern blocks to know that two trapezoids make a hexagon, and many may regard that as the only "real" solution to this problem. What they are likely to agree on, however, and what you can reinforce is the fact that a whole is made of 2 equal halves; that if the trapezoid is said to be half, the whole shape must be composed of 2 trapezoids. Don't rush to resolve the other questions or points of disagreement right now, however.

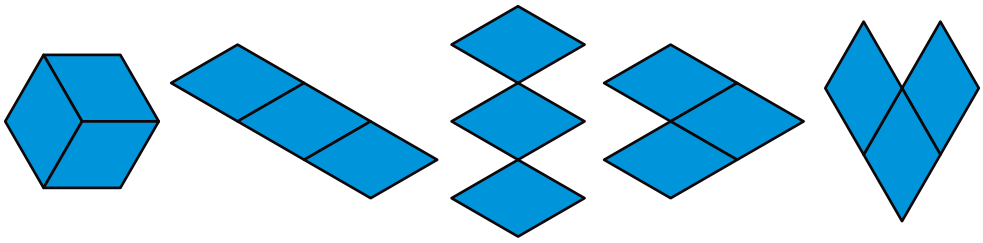
7 Then have students clear their work mats, and reveal the next problem on the teacher master. Again, read it to the class, provide clarification if necessary, and repeat steps 4–6.

As thirds are generally more problematic, and not as well understood by all students, this situation may prove to be more difficult. Let the students wrestle with it for a minute or two before you invite volunteers to share with the class.

2 If this is $\frac{1}{3}$ of the shape, what does the whole shape look like? Can you find more than one solution?



As students share their solutions and you facilitate discussion, the most important point to reinforce is the fact that it takes 3 thirds to make a whole. Here again, some students may be convinced that the only "real" solution is a hexagon, but at least a few of them will surely propose other solutions, such as these.



8 Have students clear their work mats, and reveal the last problem on the teacher master. Repeat steps 4-6 as you facilitate discussion, again taking the opportunity to reinforce that it takes 6 sixths to make a whole.

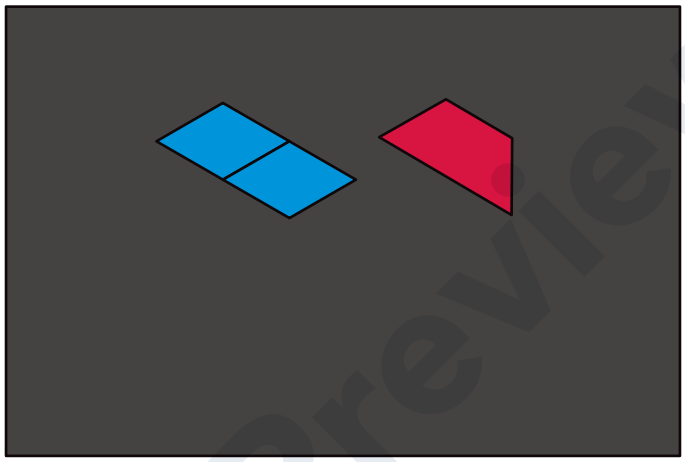
3 If this is $\frac{1}{6}$ of the shape, what does the whole shape look like? Can you find more than one solution?

9 Next, display your copy of the More Pattern Block Fractions Student Book page, and have students find the page in their books.

Read and review the instructions on the page.

10 Discuss the problems on the sheet briefly with the class before they start work, using the following questions and prompts.

- If the hexagon is assigned a value of 1 whole, what fraction of the whole does the trapezoid represent? Why? How do you know?
- What about the blue rhombus? What fraction of the hexagon is the blue rhombus? How do you know?
- Ask the students to set a single block on their work mat that is worth ½ if the hexagon is assigned a value of 1.
- Now ask them to set out 2 halves on their work mats. Review the fact that this fraction is written as ²⁄₂, and read as *two halves*.
- Have students clear their mats and then set out a single block that is worth ⅓ if the hexagon is assigned a value of 1.
- Now ask them to show two-thirds, or 2 one-thirds. How does this compare with one-half?



Students *It's bigger—two-thirds is definitely bigger than a half.*

It's easy to see that a third is smaller than a half with these blocks.

If you set the trapezoid on top of the two rhombuses, you can see that put together, they're bigger.

- Write a statement on the board comparing the two fractions.

2/3 > 1/2

- Have students build and compare several other pairs of fractions, including ²⁄₆ and ⅓, ³⁄₆ and ½, and ³⁄₃ and ⁵⁄₆.

11 When most of the students are working comfortably with the pattern blocks, able to build and compare different fractions, give them time to work on the assignment.

- Consider giving them the option of working alone or with a partner.
- Circulate as they are working to observe and provide differentiated instruction as needed.

CHALLENGE Invite students who complete the assignment quickly and easily to find the fractional value of each piece if the red trapezoid is assigned a value of 1.

Students *OK, well the hexagon is worth 2 if the trapezoid is worth 1. That's easy.*

The blue rhombus is tricky. It's not half, and it's not a third, because one of the green triangles is ⅓ if the trapezoid is the whole.

Wait, I have an idea! The triangle is worth ⅓, and it takes two of them to make the blue rhombus, so the rhombus must be ⅔ of the trapezoid.

Other interesting problems for these students to consider include the following:

- What if the blue rhombus is assigned a value of 1? What are the values of the other three pieces?
- What if the hexagon is assigned a value of ½? Then what are the values of the other three pieces?

12 About 10 minutes before the end of the session, reconvene the class, and let them know that you want to introduce a new game that will give them more practice working with fractions, comparing them, and thinking about how they relate to each other—Hexagon Spin & Fill.

SUPPORT Let students who weren't able to finish the assignment know that you'll give them time to complete their work within the next day or so.

Work Places

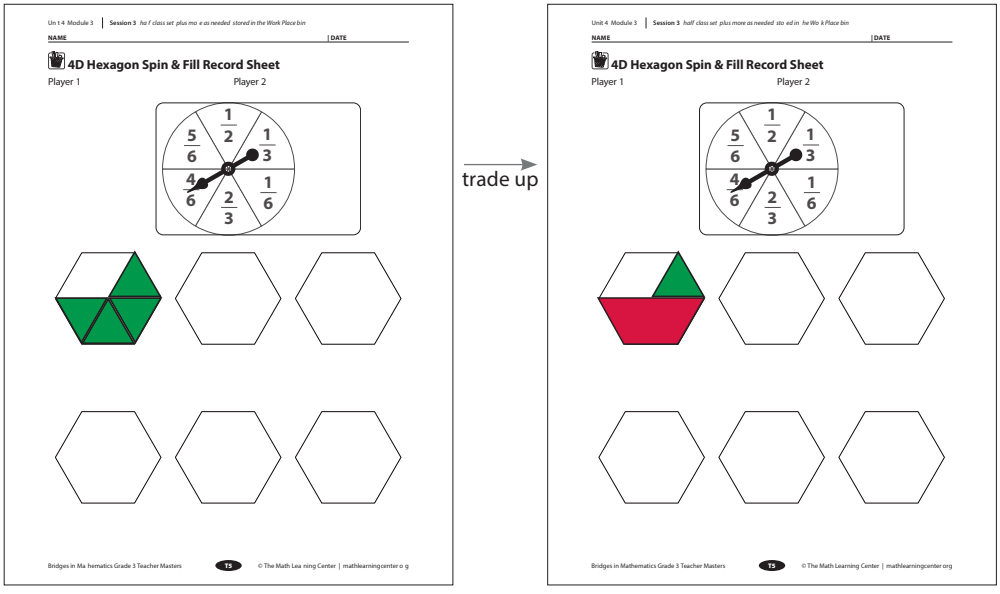
Introducing Work Place 4D Hexagon Spin & Fill

13 Introduce Hexagon Spin & Fill.

- Display the 4D Hexagon Spin & Fill Record Sheet where everyone can see.
- Explain that the game will help students identify equivalent fractions.

14 Briefly summarize the game before playing against the class.

Each player in turn spins a spinner labeled with fractional amounts. The player takes the correct pattern block or blocks and sets them on the first hexagon on his section of the record sheet. At the end of each turn, the player must make trades to ensure that he always has the fewest number of pattern blocks possible. Players continue take turns spinning and collecting pattern blocks until one of them has filled all three hexagons.



15 Play a game of Hexagon Spin & Fill against the class. Use your copy of the Work Place Instructions as needed.

> ***Teacher*** *Let's play a game. I'll go first and then you as a class will take a turn. We'll play until either you or I fill all three of our hexagons.*

Pose questions like the following to promote flexible thinking and strategy development while you play:

- How do you know which block or blocks to take?
- When do you make a trade?
- How do you know what blocks to trade for?
- What fraction of your first (second, third) hexagon have you filled? How do you know?
- Who is ahead right now? By how much? What would the other team need to spin on their next turn to catch up? Is it possible for that team to catch up in a single spin?

16 Ask students to turn to a partner to summarize the directions for Hexagon Spin & Fill.

17 Close the session.

Home Connection

18 Introduce and assign the Home Connection, Measurement and Fractions, which provides more practice with the following skills:

- Demonstrate an understanding of a unit fraction $1/b$ as 1 of b equal parts into which a whole has been partitioned (3.NF.1)
- Demonstrate an understanding of a fraction a/b as a equal parts, each of which is $1/b$ of a whole (3.NF.1)
- Compare two fractions with the same numerator; use the symbols >, =, and < to record comparisons (3.NF.3d)
- Explain why one fraction must be greater than or less than another fraction (3.NF.3d)
- Solve story problems involving addition, and subtraction of time intervals in minutes (3.MD.1)
- Solve story problems involving subtraction and division of volume measurements given in liters and milliliters, and mass measurements given in grams (3.MD.2)

Daily Practice

The optional Comparing Fractions Student Book page provides additional opportunities to apply the following skills:

- Demonstrate an understanding of a unit fraction $1/b$ as 1 of b equal parts into which a whole has been partitioned (3.NF.1)
- Demonstrate an understanding of a fraction a/b as a equal parts, each of which is $1/b$ of a whole (3.NF.1)
- Compare two fractions with the same numerator (3.NF.3d)
- Use the symbols >, =, and < to record comparisons of two fractions (3.NF.3d)
- Explain why one fraction must be greater than or less than another fraction (3.NF.3d)
- Estimate liquid volume in liters (3.MD.2)

Session 4
Fractions as Distances

Summary

In today's session, students create a class number line marked with 0 at one end and 1 at the other and work together to place several fractions along the line. Then they each create their own number line and practice locating various points along the line, including ½, ¼, and ¾. If time remains toward the end of the session, students go to Work Places.

Skills & Concepts

- Demonstrate an understanding of a unit fraction $\frac{1}{b}$ as 1 of *b* equal parts into which a whole has been partitioned (3.NF.1)
- Show a unit fraction $\frac{1}{b}$ on a number line by defining the interval from 0 to 1 as the whole and then partitioning it into *b* equal parts (3.NF.2a)
- Show that if the interval from 0 to 1 on the number line is partitioned into *b* equal parts, each part is $\frac{1}{b}$ of the whole (3.NF.2a)
- Locate $\frac{1}{b}$ on the number line after partitioning the interval from 0 to 1 into *b* equal parts (3.NF.2a)
- Compare two fractions with the same numerator (3.NF.3d)
- Explain why one fraction must be greater than or less than another fraction (3.NF.3d)
- Reason abstractly and quantitatively (3.MP.2)
- Model with mathematics (3.MP.4)

Materials

Copies	Kit Materials	Classroom Materials
Problems & Investigations Fractions as Distances		
TM T6 Double Number Line (see Preparation)	• 2 super magnets with hooks (see Preparation) • a measuring tape	• heavy cotton string (see Preparation) • copy paper (see Preparation) • scissors, class set • a large paperclip for each student
Work Places in Use		
3C Round Ball Hundreds (introduced in Unit 3, Module 1, Session 4) **3D** Round & Add Hundreds (introduced in Unit 3, Module 3, Session 1) **4A** Tic-Tac-Tock (introduced in Unit 4, Module 1, Session 2) **4B** Measurement Scavenger Hunt (introduced in Unit 4, Module 2, Session 2) **4C** Target One Thousand (introduced in Unit 4, Module 2, Session 3) **4D** Hexagon Spin & Fill (introduced in Unit 4, Module 3, Session 3)		
Daily Practice		
SB 132 The Broken Ruler, Part 1		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master.

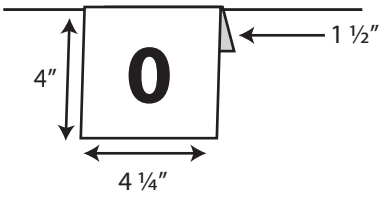
Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

distance
eighth/eighths
fourth/fourths
fraction*
half*/halves

Preparation

- Write a list of Work Places from which students can choose today. You can just write the numbers (3C–4D) or write out the full names if you prefer. (See the Work Places in Use row of the Materials Chart for the complete list of Work Places in use today.)
- Run a half-class set of the Double Number Line Teacher Master on card stock, and cut the sheets in half.
- Cut a length of heavy cotton string a little longer than 12 feet to serve as a life-sized number line. Hang it across the front of your classroom or in another location where all the students can see it, and where you can leave it up for the remainder of this unit. It should be stretched fairly tight and anchored firmly at either end, at a level students can easily reach. (You can use the magnets with hooks provided in your Bridges kits, tacks, or blue masking tape to anchor the two ends of the string.)
- To make the number cards students will hang on the line, cut several sheets of copy paper in quarters to form 4 ¼″ × 5 ½″ pieces. Fold down the top of each piece, making a small crease that can then be used to hang the number card on the number line. (See illustration.)



- Use a wide-tipped marker to write the numbers 0, 1, ½, ¼, ¾, ⅛, ⅞, ⅓, ⅔, ⅙, and ⅚, one on each card. You will need the cards for 0, 1, ½, ¼, ¾, and ⅛ today, and the others next session.

Note

Resist the temptation to use heavier paper or to hang the cards with clothespins until you've tried the folded paper cards at least once. Even though they sound a little flimsy, they work really well because they're fast and easy to make and to replace. They slide very easily along the string and the crease you make in each card actually holds it on the line quite well.

Fractions on a Number Line

Prior to this session, students have been working with fractions as parts of geometric shapes—rectangles and hexagons. Today, they will consider fractions as distances along a line. This is a cognitive shift. Some students may want to put the ½ label in the middle of the half of the rope. You can recall for students that when they folded, labeled, and cut out fractional parts of the cookies, they labeled each part but there was also the fold—the line along which they cut the pieces. This line represents the end of the span. Fractions of a whole represent parts of that whole. Fractions on a number line represent various distances from 0.

Problems & Investigations

Fractions as Distances

1 Open the session by letting students know they will continue to work with fractions today, using a different model.

2 Draw students' attention to the string you hung in preparation for this session, and explain that it will serve as a life-sized number line for the next few days. Then work with the students to establish that the entire length of the string, from one end to the other, represents a distance of 1 today.

- Ask two of the students to stand beside the string, one at either end.
- Have one of them turn and to walk to his classmate at the other end of the line.
- Establish with the class that this student walked the entire length of the line, and then have the student return to his original location.

> ***Teacher*** *Marco, would you please walk over to Alexandra? Thank you. Now, does everyone agree that Marco just walked the whole way to Alexandra? Not some part of the way, but the whole way? Great. Go ahead and walk back.*

3 Give the students standing at either end of the line the cards for 0 and 1, and have them hang the cards. Then ask the class how they would go about locating the point exactly halfway between the two.

> ***Teacher*** *Now everyone, if I asked Marco to walk exactly halfway to Alexandra, where would he stop? How do you know? What could you do to verify your answer?*

Students may respond with some of the suggestions below. Implement two or three of their suggestions until the class generally agrees that they have correctly located the point halfway between 0 and 1 on the line.

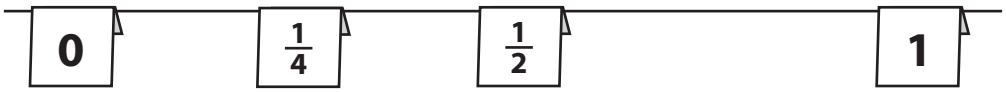
- Take the string down, fold it in half, and mark it at the halfway point.
- Walk the whole way again and count the steps. Then walk half of those steps.
- Measure the whole distance with a tape measure. Divide that number by 2. Then walk that far.
- Estimate the halfway point by eyeballing.
- Have both students start walking at the same pace until they meet in the middle.

4 Have your two volunteers sit down, and ask the class how the halfway point should be labeled. Discuss the question briefly. Then give one of the students the number card for ½, and ask her to hang it in the designated location along the line.

5 Have the class discuss and place the cards for ¼, ¾, and ⅛, in that order. Take time to discuss and entertain students' ideas about why a card should be placed in a certain spot. If you need to, cards can be moved as needed to make room for other cards.

ELL Show the number card with the fraction written on it as you discuss its placement with the class.

> ***Teacher*** *OK, now we've got 0, 1, ½, and ¼ up there. Where do you think we should put the card with ¾ written on it? If you were to start at 0 and walk three-fourths of the way from 0 to 1, where would you stop? Talk to the person next to you for a few moments, and then let's hear some ideas.*



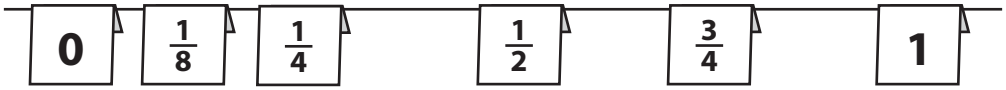
> ***Students*** *We think it should go in the middle between ½ and 1.*
>
> *We know from folding paper the other day that ¼ is like half of a half. So, if you cut the distance between the ½ and the 1 up there in half, that's where the cards with ¾ should go.*
>
> ***Teacher*** *OK, Alex, would you come and hang the card where you think it goes? Thanks! Thumbs up if you agree with the location of the card for ¾. Looks like everyone agrees. What about this card—the one for ⅛?*
>
> ***Students*** *It should go between the 0 and the ¼!*
>
> *Exactly halfway! When we folded the paper, I had it in fourths, and when I folded it in half again, it made eighths.*
>
> *Yeah! An eighth is like half of a fourth.*
>
> ***Teacher*** *OK, I'm a little puzzled here. Eight is more than 4, but you're telling me that ⅛ is less than ¼?*

Math Practices in Action 3.MP.4

The number line model for fractions is quite different from the area models students have been using so far in this unit. Using a variety of contextual problems and models, and drawing connections among them, profoundly deepens students' conceptual understanding and comfort with fractions.

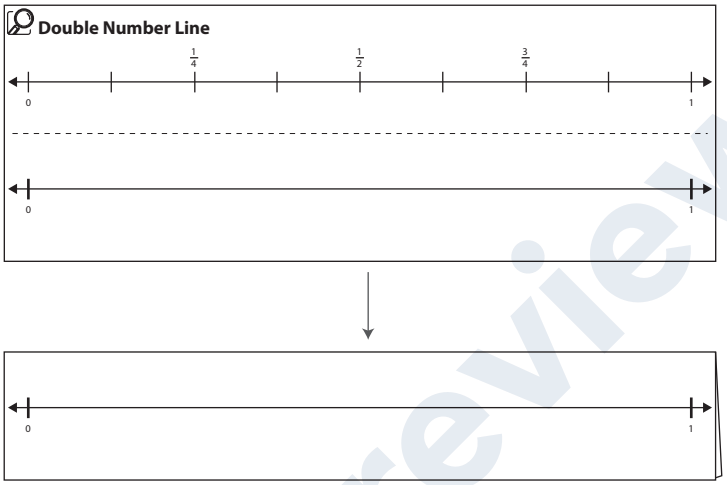
Students *It's because there are more and more pieces. With half, you only have to split something between 2 people. With ¼, you have to divide it up with 4 people, and with ⅛, it's 8.*

The more times you have to divide the same thing, the smaller the pieces are. It's the same with the string.



6 Now explain that the students will each make their own number line and see how accurately they can locate fractions along the line now that they've had some practice as a group.

7 Give each student a half-sheet copy of the Double Number Line Teacher Master. Ask them to cut it out along the heavy lines and fold it in half along the dotted line.



8 Ask students to share with a partner any mathematical observations they can make about their Double Number Lines, and then invite volunteers to share their thinking with the class.

Students *It's like our string number line!*

I think it looks kind of like a ruler.

It's like a giant inch or something, with 0 at one end and 1 at the other.

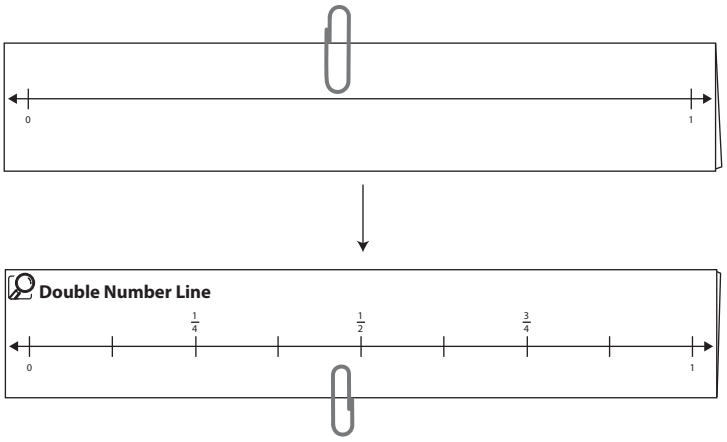
There are fractions on the other side: ¼, ½, and ¾.

Some of the marks don't have any numbers, but I can see where ⅛ would go.

The mark in the middle says ½. That's because it's halfway between the 0 and the 1.

When you turn it over, the numbers are still right-side up, but there's only a 0 and a 1.

9 Give students each a paperclip, and ask them to slide the clip down over the fold. Working with the side marked only with 0 and 1, have them slide the paperclip along the fold until they think they've gone exactly halfway. Then have them flip the line over to check. Did the clip land on the mark labeled with the fraction ½?



Student *Whoa! Almost! I almost got it exactly. I'm going to turn it over and try again to see if I can get the paperclip to land right on the ½ mark.*

10 Give students a minute to experiment with their number lines.

- Can they develop strategies for getting the paperclip to land exactly on the ½ mark without peeking?
- Then ask them to slide their paperclip one-fourth of the way along the unmarked line.
- Can they come up with some strategies for getting the clip to land on or very near the mark labeled with ¼?

Student *I just moved my clip what I thought was halfway down the line and then cut that in half. I got pretty close.*

11 Now talk with students about the marks that haven't yet been labeled with fractions. How would they label some of those marks?

Give them a few moments to discuss ideas in pairs. Then call on volunteers to share their thinking with the class. As they share, press these students to explain their reasoning.

Ted *It should say ⅛ on that first mark.*

Teacher *How are you thinking about that, Ted?*

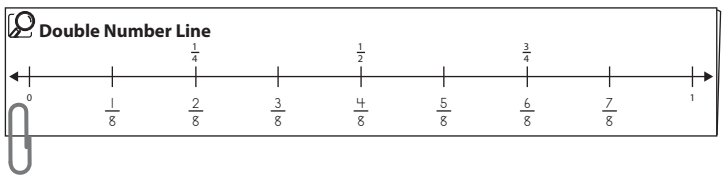
Ted *Well, the line is divided into 8 parts, right? So each one is one-eighth.*

Abby *We said the next one would be ⅜ because that's the same as ¼, plus what Ted just said. It goes ⅛, ⅜, ⅜, ⅝, like that. It just keeps going.*

Kendra *I think you could also put ¾ right under where it says ½ because we know from the papers we folded that ¾ is the same as ½, plus it's right between ¼ and ¾.*

12 After some discussion, make a sketch of the line on the board and work with input from the class to label each of the marks.

Then have students label each of the marks on their own number lines.



13 Now ask them to turn their number line back over to the unmarked side. Challenge them to slide their paperclip three-fourths of the way along the line, and then ask them to check the other side. How close did they come to hitting the mark labeled ¾? Ask them to share some of their strategies.

14 Repeat step 13 with some of the following fractions.

Vary these as needed to meet the needs of your students.

$\frac{1}{8}$ $\frac{6}{8}$ $\frac{3}{8}$ $\frac{1}{4} + \frac{1}{4}$ $\frac{1}{8} + \frac{1}{8}$

Extension

Pose story problems such as the ones below, and ask students to enact them by moving their paperclip along the unmarked side of their number line. After each, have them turn their number line over to see how close they came to hitting the mark.

- I ran ¼ of a mile. Then I took a rest and ran another ¼ of a mile. How far did I go in all?
- I had 1 whole fruit strip. I ate half of it. How much did I have left?
- Sam's brother gave him 1 whole piece of licorice. He ate ¼ of it and saved the rest for later. How much did he have left?
- We walked $\frac{2}{8}$ of a mile and then another $\frac{1}{8}$ of a mile. How far did we go in all?

Work Places

15 If time permits, have students put their double number lines away for next session, and go to Work Places.

Have students pick up their Work Place folders and a pencil. Remind them to fill out their Work Place Logs as they finish each activity.

16 Close the session by having students put their materials away and then take a few minutes to reflect on the mathematics they did today.

- Which is closer to 0, $\frac{1}{5}$ or $\frac{1}{100}$? How do you know?
- What is closer to 0, $\frac{1}{50}$ or $\frac{1}{5}$? How do you know?

Daily Practice

17 You can assign The Broken Ruler, Part 1 Student Book page as homework for this session, as morning seatwork the following day, or at another time that makes sense for your students. This optional practice page provides additional opportunities for students to apply the following skills:

- Demonstrate an understanding of a unit fraction $\frac{1}{b}$ as 1 of b equal parts into which a whole has been partitioned (3.NF.1)
- Demonstrate an understanding of a fraction a/b as a equal parts, each of which is $\frac{1}{b}$ of a whole (3.NF.1)
- Locate fractions on a number line (3.NF.2)

Session 5
Fractions on the Number Line

Summary

Today, students work together to add some more fractions to their class number line. Then they work briefly with the double number lines they constructed in the last session before sketching some fractions on their own number line diagrams. As they finish the assignment, they go to Work Places. Finally, the teacher introduces and assigns the Fractions, Fractions & Fractions Home Connection.

Skills & Concepts

- Locate fractions on a number line, and place them in their correct positions on a number line (3.NF.2)
- Show a unit fraction $\frac{1}{b}$ on a number line by defining the interval from 0 to 1 as the whole and then partitioning it into *b* equal parts (3.NF.2a)
- Show that if the interval from 0 to 1 on the number line is partitioned into *b* equal parts, each part is $\frac{1}{b}$ of the whole (3.NF.2a)
- Locate $\frac{1}{b}$ on the number line after partitioning the interval from 0 to 1 into *b* equal parts (3.NF.2a)
- Show a fraction $\frac{a}{b}$ on a number line by marking off, starting at 0, *a* lengths of $\frac{1}{b}$ each and labeling the resulting interval $\frac{a}{b}$ (3.NF.2b)
- Compare two fractions with the same numerator; use the symbols >, =, and < to record comparisons of two fractions (3.NF.3d)
- Explain why one fraction must be greater than or less than another fraction (3.NF.3d)
- Make sense of problems and persevere in solving them (3.MP.1)
- Reason abstractly and quantitatively (3.MP.2)

Materials

Teacher Masters	Kit Materials	Classroom Materials
Problems & Investigations Fractions on the Number Line		
SB 134–135* Number Line Sketches		• class number line (from Session 4) • additional number cards (see Preparation) • students' double number lines and paperclips (from Session 4)
Work Places in Use		
3C Round Ball Hundreds (introduced in Unit 3, Module 1, Session 4) **3D** Round & Add Hundreds (introduced in Unit 3, Module 3, Session 1) **4A** Tic-Tac-Tock (introduced in Unit 4, Module 1, Session 2) **4B** Measurement Scavenger Hunt (introduced in Unit 4, Module 2, Session 2) **4C** Target One Thousand (introduced in Unit 4, Module 2, Session 3) **4D** Hexagon Spin & Fill (introduced in Unit 4, Module 3, Session 3)		
Home Connection		
HC 75–76 Fractions, Fractions & Fractions		
Daily Practice		
SB 136 The Broken Ruler, Part 2		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master.

** Run 1 copy of this page for display.*

Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

distance
eighth
fraction*
half*
fourth

Preparation

- If you had to take down the class number line from the previous session, hang it back up in the same place with the number cards for 0, 1, ½, ¼, ¾, and ⅛ placed correctly. You will need the rest of the number cards you prepared prior to last session: ⅞, ⅓, ⅔, ⅙, and ⅚.
- Write a list of Work Places from which students can choose today. You can just write the numbers (3C–4D) or write out the full names if you prefer. (See the Work Places in Use row of the Materials Chart for the complete list of Work Places in use today.)

Problems & Investigations

Fractions on the Number Line

1 Open the session by letting students know they're going to place some more fractions on the class number line, do some work with the double number lines they made last session, and then go to Work Places.

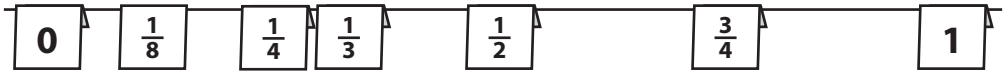
2 Draw students' attention to the class number line. Ask them to recall how they placed the cards last session.

As you talk with them, be sure to reinforce the fact that the card showing ½ is placed along the line one-half of the way from 0 to 1, the card showing ¼ is placed along the line one-fourth of the way from 0 to 1, and so on. Having worked in previous years with fractions as parts of shapes, some students may still be a little uncertain in their thinking about fractions as distances along a line.

3 Have the class discuss and place the cards for ⅓ and ⅙, in that order. Take time to discuss and entertain students' ideas about why a card should be placed in a certain spot. If you need to, cards can be moved as needed to make room for other cards.

ELL Show the number card with the fraction written on it as you discuss its placement with the class.

> ***Teacher*** *Here's a new fraction to hang on the line today. Let's read it together—ready?*
>
> ***Students*** *One-third!*
>
> ***Teacher*** *If you were to start at 0 and walk one-third of the way from 0 to 1, where would you stop? Talk to the person next to you for a few moments, and then let's hear some ideas.*
>
> ***Students*** *We think it should go sort of between the fourth and the half.*
>
> *We know from the cookies that one-third is bigger than one-fourth, but smaller than one-half.*
>
> *Also, you can think about the pattern blocks, like how the blue rhombus is one-third of a hexagon, and the trapezoid is half. You know that the blue rhombus is smaller than the trapezoid, but not half as small.*



> ***Teacher*** *OK, you're going to have to help me again. Three is more than 2, but you're telling me that one-third is less than one-half? And 4 is more than 3, but you're telling me that one-third is more than one-fourth. What's going on?*

Students *It's because there are more and more pieces. With half, you only had to split something between 2 people. With one-third, it's 3, and with one-fourth, it's 4.*

The more times you have to divide the same thing, the smaller the pieces are. It's the same with the string.

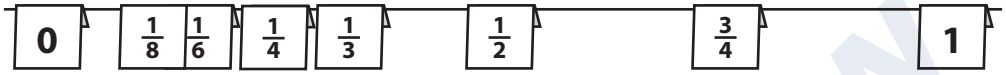
Teacher *What about the card with ⅙ written on it? Should it come before or after the card with ¼? Talk to the person next to you about that.*

Dante *We said it should come before, because a sixth is smaller than a fourth.*

Teacher *Thumbs up if you agree with Dante. How do you know a sixth is less than a fourth?*

Tory *Because you have to cut the thing—the cookie or the string—in 6 parts instead of 4, so each part is smaller.*

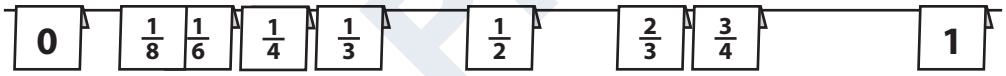
Ben *I know where the card for ⅙ goes! Right in the middle between 0 and ⅓—because of the pattern blocks! The triangle is half the size of the rhombus, and we know that the rhombus is one-third, and the triangle is one-sixth.*



4 Show students the card for ⅔ now, and ask them to share with a partner their ideas about its placement on the line.

When they've had a minute to discuss the problem, invite a volunteer up to the number line to hang the card where she thinks it belongs and explain her reasoning. Ask the others to watch and listen carefully to see if they agree, and to raise their hand if they have a comment, suggestion, or question.

Elle *OK, I think the card belongs right here, between the card for half and the one for three-fourths. I know half is the same as ¾, so I think ⅔ comes next.*



Teacher *Theo, did you have a question or comment for Elle?*

Theo *I agree with Elle about where she put the card. It's two-thirds, so it's twice as far from 0 as one-third, and it looks about right up there.*

Willa *And, plus, I'm thinking about the blue rhombuses. Each one is a third of a hexagon. If you put two of them together, they cover two-thirds of a hexagon, but it's not quite as much as it would be with three-fourths.*

- Review how students decided yesterday where to play ⅙.
- Ask students if ⅙ is greater or less than ¼, and have them explain their answers.
- Elicit comments about fair sharing and the relationship between a hexagon candy bar and a triangle.
- If ⅙ is one-sixth of the way from 0 to 1, then ⅚ must by ⅙ away back from 1. In other words, the distance from ⅙ to 0 is the same as the distance from ⅚ to 1.

5 Repeat step 4 for the cards marked with ⅚ and then ⅞.

- As you discuss the placement of the card for ⅚, note with the students that ⅚ is one-sixth less than the entire distance, 1 (or ⅙), and see if they can use the information to help place the card for ⅚.
- Guide students to see that ⅞ is similar, in that it is one-eighth less than the total distance of 1 (or ⅛), and challenge them to use the information to place the card for ⅞ on the line.

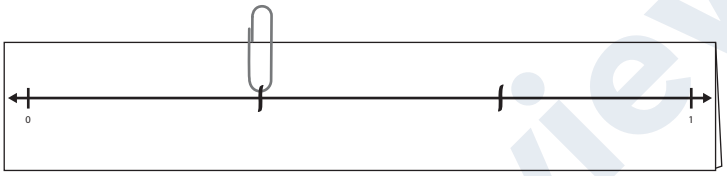
6 When all the cards have been placed on the line, ask students to get out the double number lines and paperclips from the previous session.

Let them know that this is another opportunity to see how accurately they can place fractions on a number line.

7 Working with the side marked 0–1, and starting with 0, have students slide the paperclip along the fold until they think they've located the fraction ⅓.

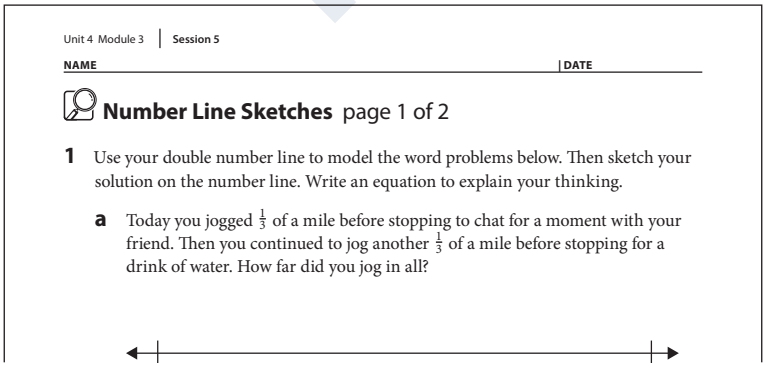
Give students time to talk about their reasoning with a neighbor. Then invite 2 or 3 volunteers to share their thinking with the class, using their number lines to demonstrate.

> ***Becca*** *It's on the end by the zero, but pretty close to where ½ is. In my mind, I divided the number line into three parts to make thirds. I put my paperclip at the first mark I was imagining.*



> ***Michael*** *I slid my paperclip from 0-1 and stopped three times, counting ⅓, ⅔, ⅓. Three-thirds is at the end—that's the same as 1. Then I put my paperclip back where I said ⅓.*

8 Once most of the students have come consensus about the placement of ⅓, display the first page of your copy of the Number Line Sketches Student Book pages. Share the problem at the top of the page.



Unit 4 Module 3 | **Session 5**

NAME | **DATE**

Number Line Sketches page 1 of 2

1 Use your double number line to model the word problems below. Then sketch your solution on the number line. Write an equation to explain your thinking.

a Today you jogged $\frac{1}{3}$ of a mile before stopping to chat for a moment with your friend. Then you continued to jog another $\frac{1}{3}$ of a mile before stopping for a drink of water. How far did you jog in all?

9 Ask students to move their paperclip along their own number line to the place they would stop for a drink of water.

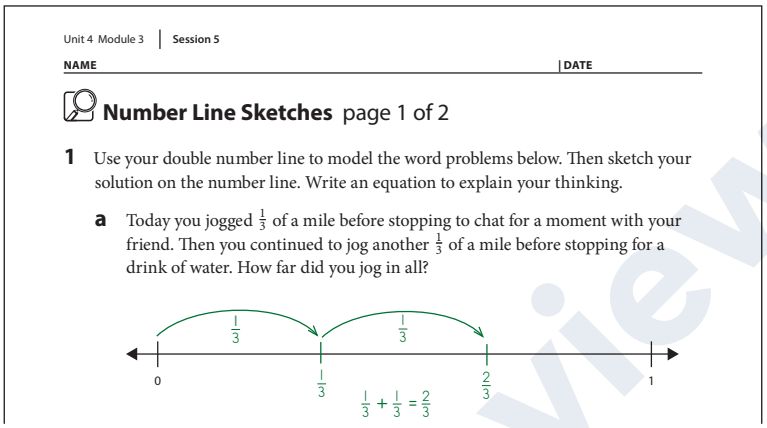
Give students time to share in pairs, followed by group discussion, coming to an agreement about both the fraction and its location on the number line.

10 Now have students find the Number Line Sketches pages in their Student Books. Work with input from the class to model the problem and its solution on the first number line.

> ***Teacher*** *How might we model the distance we traveled on this number line?*
>
> ***Students*** *We'd have to show thirds. Divide the number line into three parts.*
>
> *Then put ⅓ under the first mark and ⅔ under the next mark.*
>
> *Then you could show the hops like we usually do on the number line, like when we add and subtract.*

11 Have students construct the same visual in their books.

Then record ⅓ + ⅓ = ⅔ on your sheet as students do so on theirs.


Unit 4 Module 3 | Session 5

NAME | DATE

Number Line Sketches page 1 of 2

1 Use your double number line to model the word problems below. Then sketch your solution on the number line. Write an equation to explain your thinking.

a Today you jogged $\frac{1}{3}$ of a mile before stopping to chat for a moment with your friend. Then you continued to jog another $\frac{1}{3}$ of a mile before stopping for a drink of water. How far did you jog in all?

12 Repeat steps 8–11, providing students opportunity to model problems from Number Line Sketches on their double number lines before sketching them. As students feel comfortable, they may continue on their own.

SUPPORT If some of your students seem to be struggling to model fractions on the number line, you might have them continue to work with you as the others work independently.

CHALLENGE Encourage students who are working comfortably and accurately with fractions on a number line to do the last problem on the second page of the Number Line Sketches assignment.

13 As students complete the assignment, have them share and compare their solutions and strategies with a classmate.

If there are differences in answers and ideas, encourage student pairs to resolve them on their own by reworking the problem(s) together.

Work Places

14 Have students pick up their folders and go to Work Places when they are finished with the assignment.

15 Close the session.

- Have students clean up and put their materials away.
- Let them know that they can take their double number lines home to share with their families if they like, or keep them at school for use in working with fractions over the next few months.

Home Connection

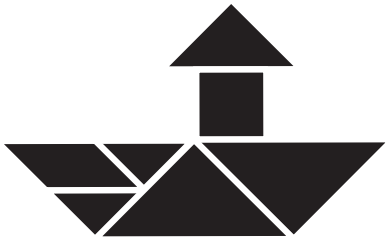
16 Introduce and assign the Fractions, Fractions & Fractions Home Connection, which provides more practice with the following skills:

- Locate fractions on a number line; place fractions in their correct positions on a number line (3.NF.2)
- Show a unit fraction $\frac{1}{b}$ on a number line by defining the interval from 0 to 1 as the whole and then partitioning it into b equal parts (3.NF.2a)
- Show that if the interval from 0 to 1 on the number line is partitioned into b equal parts, each part is $\frac{1}{b}$ of the whole (3.NF.2a)
- Locate $\frac{1}{b}$ on the number line after partitioning the interval from 0 to 1 into b equal parts (3.NF.2a)
- Show a fraction $\frac{a}{b}$ on a number line by marking off, starting at 0, a lengths of $\frac{1}{b}$ each and labeling the resulting interval $\frac{a}{b}$ (3.NF.2b)
- Identify equivalent fractions by comparing their locations on a number line (3.NF.3a)
- Recognize fractions that are equivalent to whole numbers (3.NF.3c)
- Compare two fractions with the same numerator; use the symbols >, =, and < to record comparisons (3.NF.3d)
- Explain why one fraction must be greater than or less than another fraction (3.NF.3d)
- Solve story problems involving addition, multiplication, and division of mass measurements given in grams (3.MD.2)

Daily Practice

The optional Broken Ruler, Part 2 Student Book page provides additional opportunities to apply the following skills:

- Demonstrate an understanding of a unit fraction $\frac{1}{b}$ as 1 of b equal parts into which a whole has been partitioned (3.NF.1)
- Demonstrate an understanding of a fraction $\frac{a}{b}$ as a equal parts, each of which is $\frac{1}{b}$ of a whole (3.NF.1)
- Locate fractions on a number line (3.NF.2)



Teacher Masters

GRADE 3 – UNIT 4 – MODULE 3

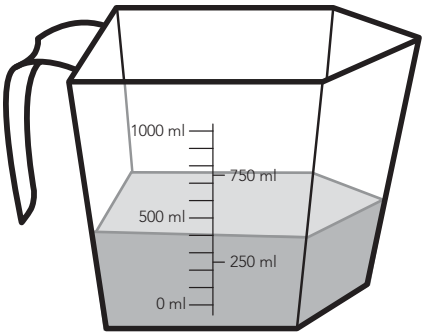
BRIDGES®
IN MATHEMATICS

NAME | **DATE**

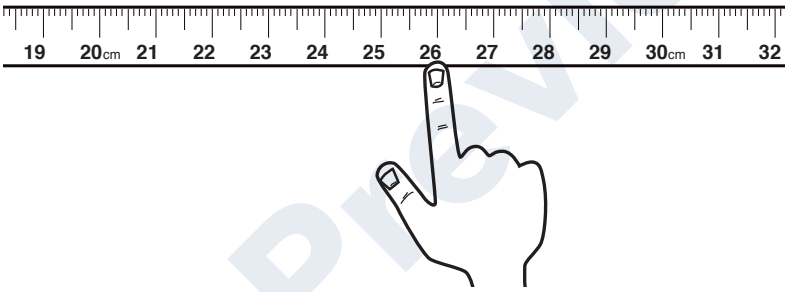
Measurement Checkpoint page 1 of 2

1 Use the pictures to help answer each of the questions below. Be sure to label your answers with the correct units.

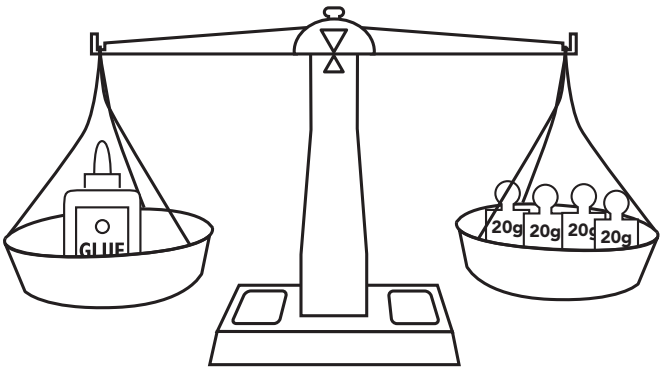
a Mike is measuring water. How much water does he have in the measuring cup?



b Michelle is measuring her big brother's foot in centimeters. How long is her brother's foot?



c Mickey is measuring the mass of a bottle of glue. What is the mass of the bottle of glue?



(continued on next page)

NAME | **DATE**

Measurement Checkpoint page 2 of 2

2 Circle the appropriate words to fill in the blank.

a This pencil is short! I would measure its _____ with _____.

mass	length	volume

meters	grams	centimeters

b This cup doesn't hold very much water. I would measure its _____ with _____.

mass	length	volume

milliliters	kilograms	liters

c A box of books is heavy! I would measure its _____ with _____.

mass	length	volume

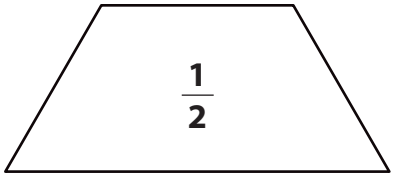
milliliters	kilograms	grams

3 Each of Tracy's 3 pet frogs has a mass of 112 grams. Hannah's pet iguana has a mass of 453 grams. How much more mass does the iguana have than all 3 frogs put together? Show your work using numbers, labeled sketches, or words. Label your answer with the correct units.

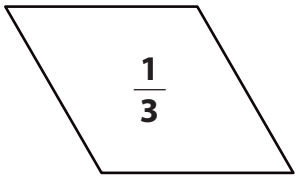
The iguana has a mass of _____ more than all three frogs put together.

Pattern Block Fractions

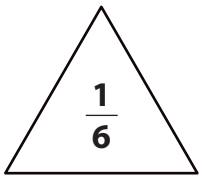
1 If this is $\frac{1}{2}$ of the shape, what does the whole shape look like? Can you find more than one solution?



2 If this is $\frac{1}{3}$ of the shape, what does the whole shape look like? Can you find more than one solution?



3 If this is $\frac{1}{6}$ of the shape, what does the whole shape look like? Can you find more than one solution?



Work Place Guide 4D Hexagon Spin & Fill

Summary

Each player in turn spins a spinner labeled with fractional amounts. The player takes the correct pattern block or blocks and sets them on the first hexagon on his section of the record sheet. At the end of each turn, the player must make trades to ensure that she always has the fewest number of pattern blocks possible. Players continue take turns spinning and collecting pattern blocks until one of them has filled all 3 hexagons on their section of the record sheet.

Skills & Concepts

- Demonstrate an understanding of a unit fraction 1/*b* as 1 of *b* equal parts into which a whole has been partitioned (3.NF.1)
- Demonstrate an understanding of a fraction *a/b* as *a* equal parts, each of which is 1/*b* of a whole (3.NF.1)
- Represent fractions with denominators of 2, 3, and 6 as parts of a set and a whole (supports 3.NF)
- Identify equivalent fractions by comparing their size (3.NF.3a)
- Recognize and generate simple equivalent fractions; explain why two fractions must be equivalent (3.NF.3b)
- Recognize fractions that are equivalent to whole numbers (3.NF.3c)

Materials

Copies	Kit Materials	Classroom Materials
TM T4 Work Place Guide 4D Hexagon Spin & Fill **TM T5** 4D Hexagon Spin & Fill Record Sheet **SB 131** Work Place Instructions 4D Hexagon Spin & Fill	• 3 spinner overlays • 3 containers of pattern blocks (each containing 80–85 pattern blocks, or ⅓ of a 250-block bucket)	

Assessment & Differentiation

Here are some quick observational assessments you can make as students begin to play this game on their own. Use the results to differentiate as needed.

If you see that…	Differentiate	Example
Students are unsure which pattern blocks represent the fractional amounts from the spinner.	SUPPORT Use a yellow hexagon and remind students that it represents a whole candy bar. Work with students to share the candy bar fairly and represent the fair shares: When 6 people share, the share per person is ⅙. When 3 people share, the share per person is ⅓.	Ask questions such as: "If 3 people are sharing this candy bar, how do we write 1 person's share?" "If 6 people are sharing , how do we write 1 person's share?"
Students are not trading up correctly.	SUPPORT Remind students that they should always have the fewest number of pattern blocks possible.	Ask questions such as: "How many pattern blocks do you have here?" "Are any groups of your pattern blocks equivalent to any bigger blocks?" "Can you trade any 2 of your pattern blocks for 1 bigger one?" "Are there any more trades you could make?"
Students quickly substitute equivalent fractions instead of refiguring the equivalence every time.	CHALLENGE Pair students of similar skill level, and encourage them to play Game Variation B.	

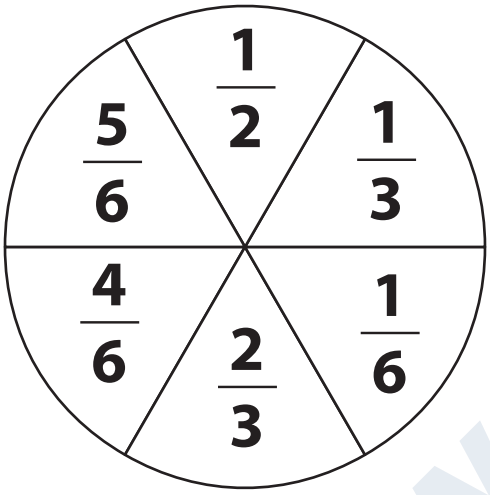
English-Language Learners Use the following adaptations to support the ELL students in your classroom.

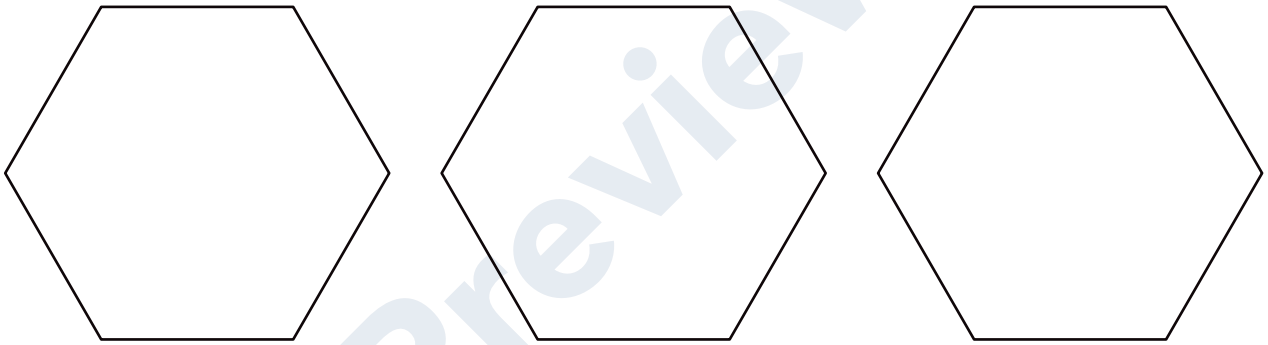
- As you talk about the pattern blocks, hold them up each time. Use the color and shape name to identify the blocks.
- Write the fractions when you say them. Point to the numerator and the denominator when referring to each. For example, when referring to ⅙ say, "This is one-sixth; it's the part 1 person gets when you divide something into 6 equal parts."
- When referring to common fractions, alternate calling the fraction ⅔ "two-thirds" and "two one-thirds."

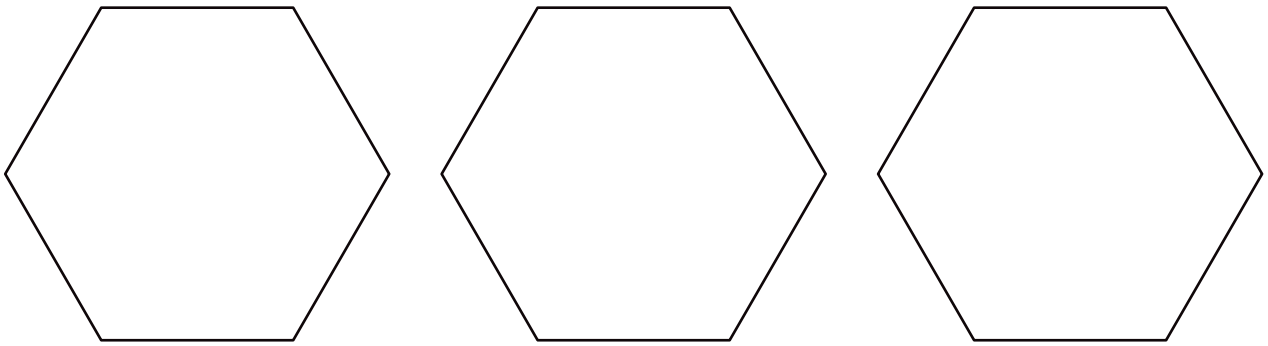
NAME | **DATE**

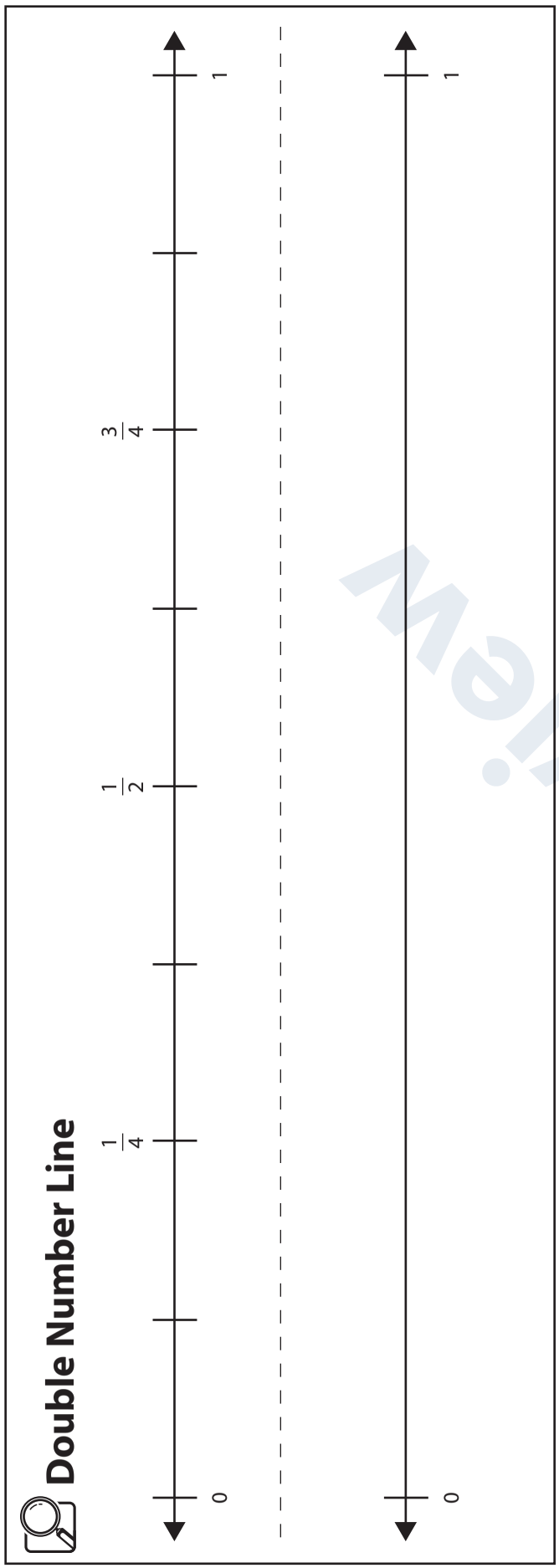
4D Hexagon Spin & Fill Record Sheet

Player 1 _____ Player 2 _____








Double Number Line
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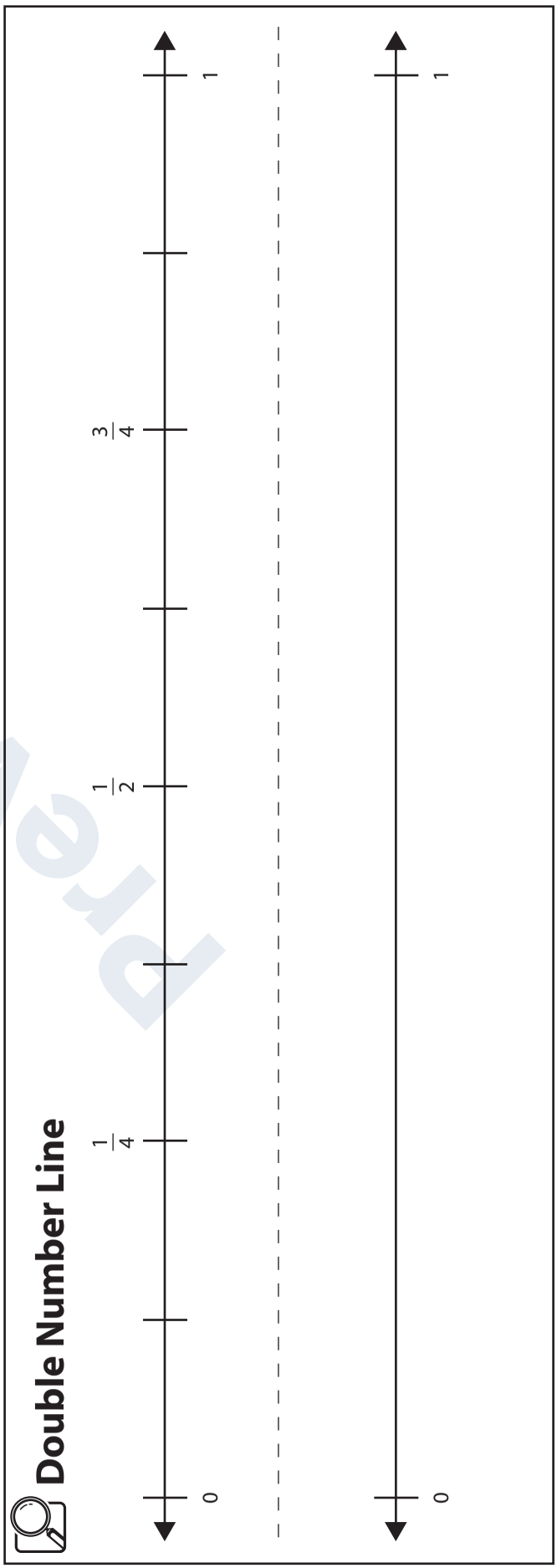
Double Number Line
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1/4
1/2
3/4
1
0
1

Student Book

GRADE 3 – UNIT 4 – MODULE 3

BRIDGES®
IN MATHEMATICS

NAME | DATE

Choose a Measurement Unit

1 A box of cereal has 10 servings. Each serving is 240 grams (g).

a How many grams of cereal are in the box? Show your work.

b Is that more or less than 2 kilograms? (Hint: 1 kilogram = 1,000 grams)

2 Circle the appropriate words to fill in the blanks.

a A work boot is heavy! I would measure its _____ with _____.

mass	length	volume	liters	kilograms	grams

b An elephant is tall. I would measure its _____ with _____.

mass	height	volume	centimeters	kilograms	meters

c A pencil box is short! I would measure its _____ with _____.

mass	length	volume	liters	centimeters	meters

d An eyedropper doesn't hold much. I would measure its _____ with _____.

mass	length	volume	liters	kilograms	milliliters

e A marking pen is light! I would measure its _____ with _____.

mass	length	volume	liters	kilograms	grams

f That pitcher holds lots. I would measure its _____ with _____.

mass	length	volume	liters	kilograms	meters

g An eel is long! I would measure its _____ with _____.

mass	length	volume	liters	kilograms	meters

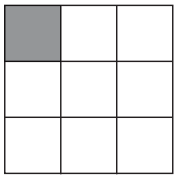
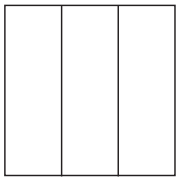
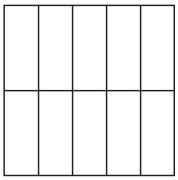
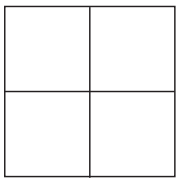
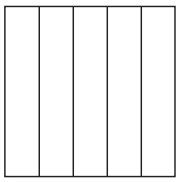
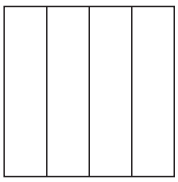
h A pool holds lots of water! I would measure its _____ with _____.

mass	length	volume	liters	kilograms	meters

NAME | DATE

Comparing Unit Fractions

1 Fill in the shapes to show each fraction.

ex $\frac{1}{9}$ 	**a** $\frac{1}{3}$ 	**b** $\frac{1}{10}$ 
c $\frac{1}{4}$ 	**d** $\frac{1}{5}$ 	**e** $\frac{1}{4}$ 

2 Look at the fractions you shaded in above. Use them to help complete each number sentence by writing <, >, or =.

ex $\frac{1}{3} > \frac{1}{9}$	**a** $\frac{1}{5}$ ___ $\frac{1}{3}$	**b** $\frac{2}{9}$ ___ $\frac{1}{9}$
c $\frac{1}{10}$ ___ $\frac{1}{9}$	**d** $\frac{1}{5}$ ___ $\frac{1}{10}$	**e** $\frac{1}{2}$ ___ $\frac{1}{3}$

3 Use what you know about fractions to complete each number sentence by writing <, >, or =.

a $\frac{1}{100}$ ___ $\frac{1}{50}$	**b** $\frac{7}{25}$ ___ $\frac{5}{25}$	**c** $\frac{1}{4}$ ___ $\frac{1}{16}$

4 My friends and I are sharing a watermelon. I got $\frac{1}{3}$ of the watermelon and my friend Michelle got $\frac{1}{6}$ of the watermelon. Who got more? Explain your answer.

5 Divide the shape and shade in the fraction.

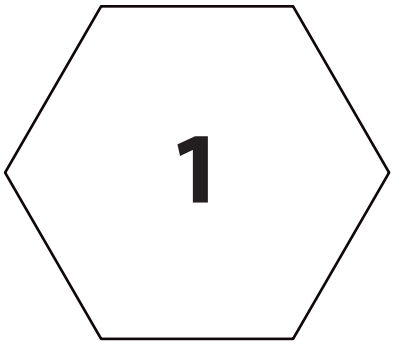
a $\frac{1}{4}$

b $\frac{3}{4}$

NAME | DATE

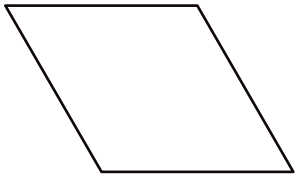
More Pattern Block Fractions

1 Today, we're going to call the hexagon from our pattern blocks one whole. Tell what fraction of the whole each of the blocks below is, and explain how you know.

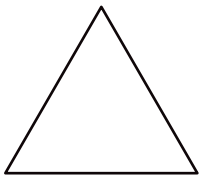


a If the hexagon is 1, the trapezoid is _____ because

b If the hexagon is 1, the blue rhombus is _____ because



c If the hexagon is 1, the triangle is _____ because



2 Write >, =, or < in the circle between each pair of fractions to show how they compare. Use your pattern blocks to help. The first one is done for you.

$\frac{1}{2} \; > \; \frac{2}{6}$ $\qquad$ $\frac{1}{3} \; \bigcirc \; \frac{2}{6}$ $\qquad$ $\frac{3}{6} \; \bigcirc \; \frac{2}{3}$ $\qquad$ $\frac{2}{2} \; \bigcirc \; \frac{3}{3}$

$\frac{2}{3} \; \bigcirc \; \frac{1}{2}$ $\qquad$ $\frac{2}{3} \; \bigcirc \; \frac{5}{6}$ $\qquad$ $\frac{3}{6} \; \bigcirc \; \frac{1}{2}$ $\qquad$ $\frac{4}{6} \; \bigcirc \; \frac{2}{3}$

Work Place Instructions 4D Hexagon Spin & Fill

Each pair of players needs:

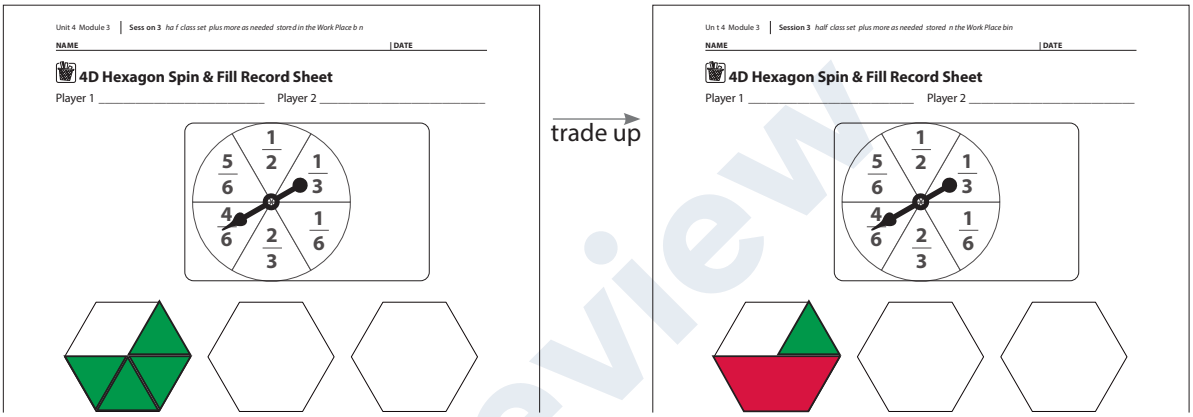
- 2 Hexagon Spin & Fill Record Sheets (1 per player)
- 1 spinner overlay
- container of pattern blocks

1 Players write their names and the date on their record sheets. Both partners fill out a record sheet.

2 Player 1 spins the spinner and takes the pattern block(s) to represent the fraction spun. She places the block or blocks on the first hexagon on the record sheet.

3 If she can, Player 1 trades pieces so she always has the fewest pattern blocks possible.

> ***Player 1*** *I landed on $\frac{4}{6}$, so I'll put down 4 triangles. Oh, but 3 triangles cover half of the hexagon, so I'll trade them in for a trapezoid, because that's the same as half a hexagon.*



4 Players alternate turns, repeating steps 2 and 3.

5 Players continue playing until they fill up all three hexagons on their entire record sheet. They should always try to trade to have the fewest pattern blocks. Players should also fill the first hexagon before moving to the second hexagon and then fill the second hexagon before moving to the third hexagon.

6 The player who fills the entire sheet first wins.

Players can have a "leftover piece" at the end of the game. For example, if they need to fill in $\frac{1}{6}$ of the last hexagon, but they spin $\frac{1}{2}$, they can use a $\frac{1}{6}$ green triangle to fill the last hexagon and have a $\frac{1}{3}$ blue rhombus left over.

Game Variations

A Players can write equations that represent the fractional amounts that made up each cookie before they traded up.

B Players can also spin twice. They add the two amounts and take that amount in pattern blocks. They place them on the record sheet, making sure to trade up so that they always have the fewest pieces.

C The game is played according to the usual rules, except at the end, players have to fill the three hexagons exactly. If they spin a piece that is too large, they miss that turn and keep spinning until they spin the piece or pieces that exactly fill the last hexagon.

NAME | DATE

Comparing Fractions

1 Circle your answers.

a Which is longer, **half of recess** or **half of Saturday**?

b Which is longer, **half of a minute** or **half of an hour**?

c Which is more, **half of an apple** or **half of a watermelon**?

d Which is more, **half of a cookie** or **half of a cake**?

e Which is heavier, **half of a kilogram** or **half of a gram**?

f Which is heavier, **half of a book** or **half of feather**?

g Which holds more, **half of a water bottle** or **half of a swimming pool**?

h Which is more, **half of a liter** or **half of a milliliter**?

2 Write the correct symbol: < or > or =

$\frac{1}{2}$ ▭ $\frac{1}{3}$ $\frac{1}{4}$ ▭ $\frac{1}{3}$ $\frac{1}{8}$ ▭ $\frac{1}{7}$

3 Choose one pair of fractions from problem 2. Discuss your answer. How do you know which is more?

4 My friends and I are sharing a watermelon. I got $\frac{1}{4}$ of the watermelon, and my friend Michelle got $\frac{2}{4}$ of the watermelon. Who got more? Explain your answer.

5 Divide the shape into the number of parts you need, and shade in the fraction.

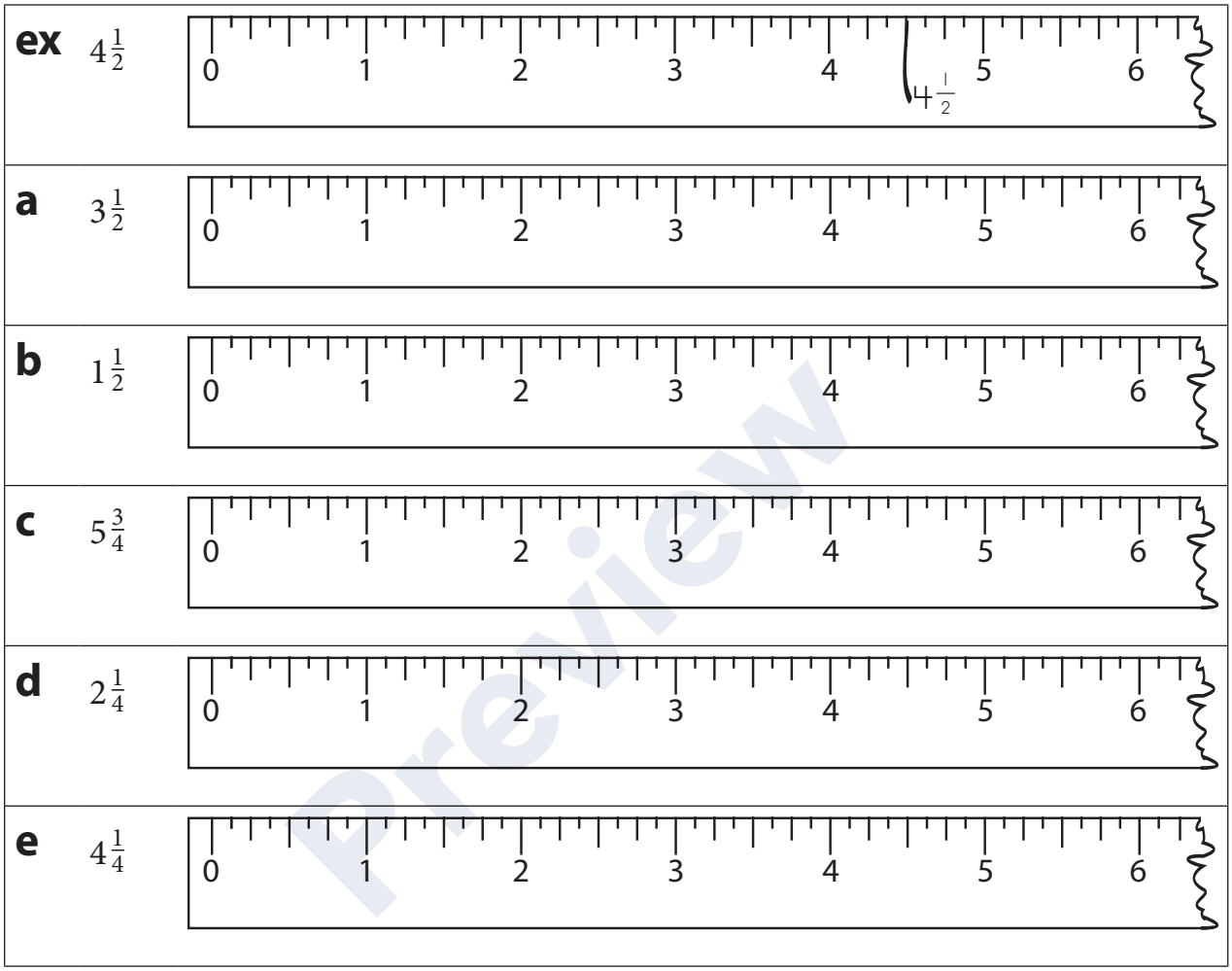
a $\frac{1}{6}$

b $\frac{1}{3}$

NAME | DATE

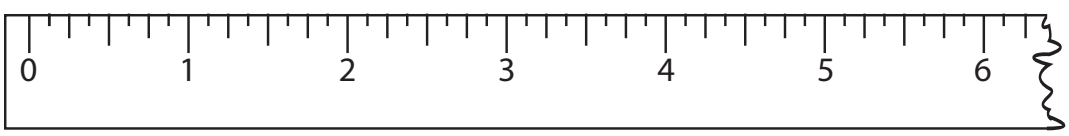
The Broken Ruler, Part 1

1 Find, mark, and label the measurements on the rulers below. The first one has been done for you.



2 Share your work with a partner. Does he or she agree with each of the marks you made on the rulers? If not, decide who's correct and fix your work.

3 **CHALLENGE** What other fractions do you know? Mark and label them on this ruler.

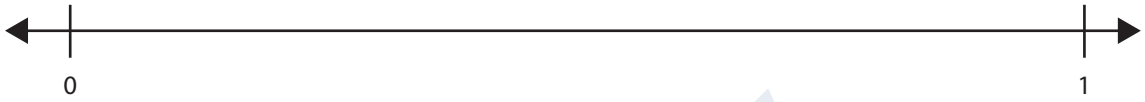


NAME | DATE

Number Line Sketches page 1 of 2

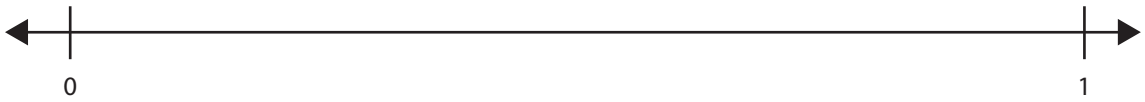
1 Use your double number line to model the word problems below. Then sketch your solution on the number line. Write an equation to explain your thinking.

a Today you jogged $\frac{1}{3}$ of a mile before stopping to chat for a moment with your friend. Then you continued to jog another $\frac{1}{3}$ of a mile before stopping for a drink of water. How far did you jog in all?



b During P.E., teams of 3 people run a relay. Each person runs $\frac{1}{4}$ of the way around the track. Where does the race end?

c My mom bought a long length of ribbon to make bows for my sister and me. We each get $\frac{2}{6}$ of the ribbon. How much of the total ribbon is used?



(continued on next page)

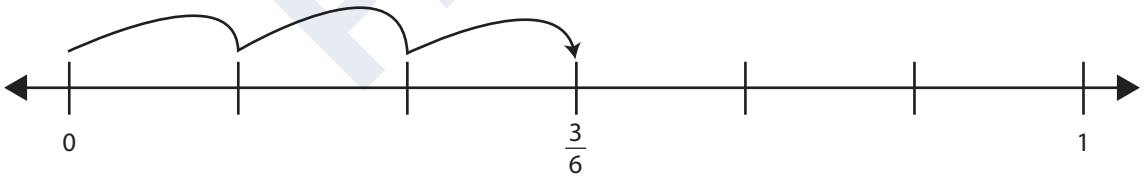
NAME | DATE

Number Line Sketches page 2 of 2

d On the ranch, fences are located every $\frac{1}{6}$ of a mile. If I stop at the fifth fence, how much of a mile did I travel?

e In our city, drinking fountains are located every $\frac{1}{8}$ of a mile. If I go a mile, stopping at every fountain, how many times will I stop?

2 I'm walking my dog $\frac{3}{6}$ of the way to the park this morning. Another fraction name for $\frac{3}{6}$ is _____.



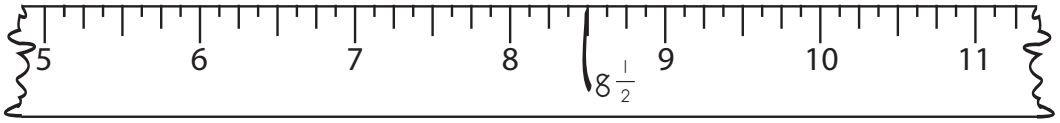
3 **CHALLENGE** Write your own fraction word problem below using a number line to model your answer. Write an equation to show your computation.

NAME | DATE

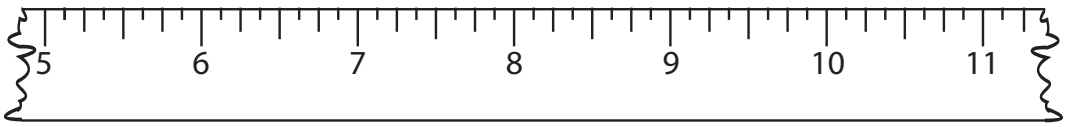
The Broken Ruler, Part 2

1 These rulers have been broken at both ends so they fit on the page. Find, mark, and label the measurements on each. The first one has been done for you.

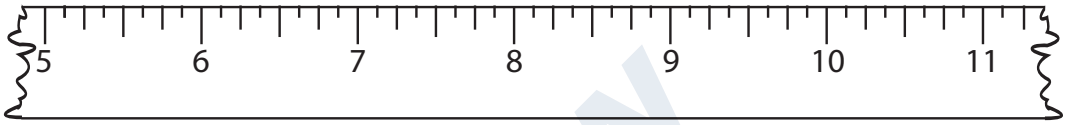
ex $8\frac{1}{2}$



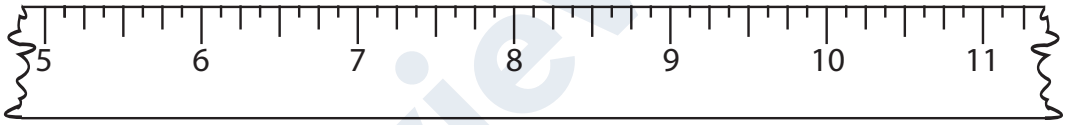
a $6\frac{1}{2}$



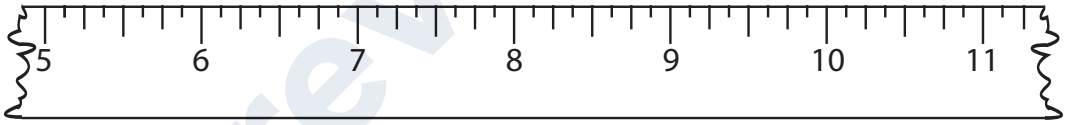
b $9\frac{3}{4}$



c $8\frac{1}{4}$

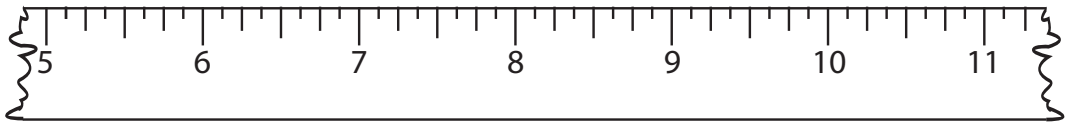


d $10\frac{1}{4}$



2 Share your work with a partner. Does he or she agree with each of the marks you made on the rulers? If not, decide who's correct and fix your work.

3 **CHALLENGE** What other fractions do you know? Mark and label them on this ruler.



Home Connections

GRADE 3 – UNIT 4 – MODULE 3

BRIDGES®
IN MATHEMATICS

NAME | DATE

Sharing Candy Bars & Measuring page 1 of 2

1 You are sharing a candy bar with friends.

a If you share with one person, there are two of you sharing. How do you write your share?

b If you share with two people, there are three of you sharing. How do you write your share?

c Would you have more candy if you share with one person or two people? Explain your answer.

2 Circle the appropriate words to fill in the blanks.

a A bowling ball is heavy! I would measure its _____ with _____.

mass	length	volume	liters	kilograms	grams

b A sun jellyfish is pretty long. I would measure its _____ with _____.

mass	length	volume	liters	kilograms	centimeters

c A water bottle doesn't hold much. I would measure its _____ with _____.

mass	length	volume	liters	kilograms	milliliters

d A giraffe is tall. I would measure its _____ with _____.

mass	height	volume	liters	kilograms	meters

e An elephant eats lots! I would measure the _____ of its food with _____.

mass	length	volume	liters	kilograms	meters

f An Etruscan shrew is short. I would measure its _____ with _____.

mass	length	volume	liters	kilograms	centimeters

g An Etruscan shrew is light. I would measure its _____ with _____.

mass	length	volume	grams	kilograms	meters

h That bucket holds a lot! I would measure its _____ with _____.

mass	length	volume	liters	kilograms	meters

(continued on next page)

NAME | DATE

Sharing Candy Bars & Measuring page 2 of 2

Show all your thinking with numbers, words, or sketches for each of the problems below. Label your answers with the correct units.

3 A bottle of Charlie's favorite brand of orange juice has 7 servings. Each serving is 240 milliliters (ml).

a How many milliliters of orange juice are in the whole bottle?

b Is that more or less than 2 liters? (Hint: 1 liter = 1,000 milliliters)

4 **CHALLENGE** A box of soup contains 4 servings. Each serving has $4\frac{1}{2}$ grams of fat and 720 milligrams of sodium.

a If someone was really hungry and ate all 4 servings in the box, how many grams of fat would that person eat?

b How many milligrams (mg) of sodium would that person eat? (1 gram = 1,000 milligrams)

c It is recommended that people eat no more than 2,400 mg of sodium in a day. If a person ate a whole box of the soup, would that person take in more or less than 2,400 mg?

d How many milligrams more or less?

NAME | DATE

Measurement & Fractions page 1 of 2

1 Circle the appropriate words to fill in the blank.

a A piece of paper is light! I would measure its _____ with _____.

mass	length	volume	milliliters	grams	centimeters

b That pencil is short! I would measure its _____ with _____.

mass	length	volume	milliliters	grams	centimeters

c A soda can doesn't hold very much. I would measure its _____ with _____.

mass	length	volume	milliliters	grams	centimeters

2 Circle your answer.

a Which is longer—half of a day or half of an hour?

b Which is heavier—half of a gram or half of a kilogram?

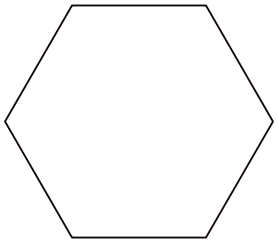
c Which holds more—half of a milliliter or half of a liter?

3 Write the correct symbol: < or > or =

$\frac{1}{4}$ ☐ $\frac{1}{10}$ $\frac{1}{4}$ ☐ $\frac{1}{2}$ $\frac{1}{4}$ ☐ 1

4 Choose one pair of fractions from problem 3. Discuss your answer. How do you know that one of the numbers is more than the other?

5 Divide the shape into the number of parts you need, and shade in the fraction $\frac{1}{3}$.



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NAME | DATE

Measurement & Fractions page 2 of 2

6 My friends and I are sharing a candy bar. I got $\frac{1}{4}$ of the candy bar, and my friend Abby got $\frac{1}{4}$ of it. How much is left? Explain your answer.

7 Tam filled his wading pool with 150 liters of water. Then 138 liters splashed out. How many liters are still in the pool? Write and solve an equation to represent the problem.

8 A bottle of Lilly's favorite soda contains 590 milliliters of soda, has 260 calories, and 70 grams of carbohydrates. Lilly is going to share the bottle with Maddy, so each will get half the bottle. Show your work. Include the unit of measurement in your answer.

a How many milliliters of soda will Lilly drink?

b How many calories will Maddy get?

c How many grams of carbohydrates will each girl get?

Use a separate sheet of paper to show your thinking using words, sketches, or numbers to solve the problems below.

9 **CHALLENGE** Chris is looking at a map to see how many miles it is from Golden Valley, where he lives, to Willow Lake, where his grandmother lives. The map uses a scale where $1\frac{1}{2}$ inches represents 12 miles.

a Chris measured the map distance between the two towns and found that it is 6 inches. How many miles is it from Golden Valley to Willow Lake?

b Chris will take the train to Willow Lake. The train goes 60 miles an hour. If Chris takes the 2:20 train, about what time will he get to Willow Lake?

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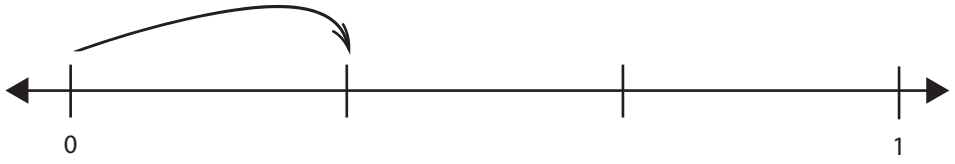
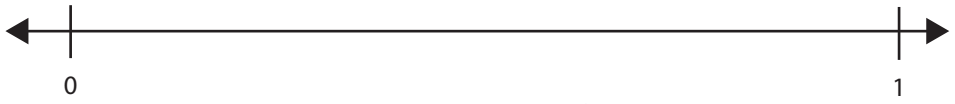
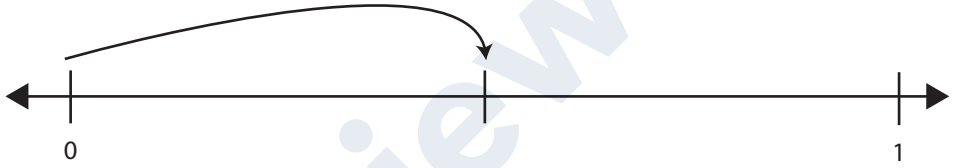
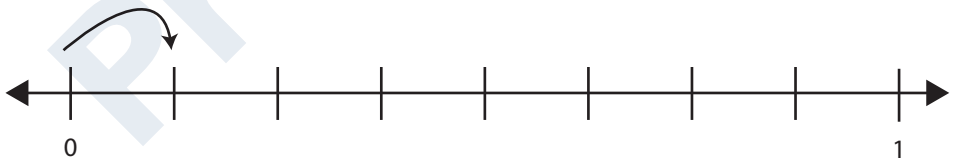
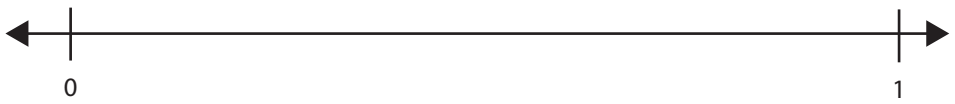
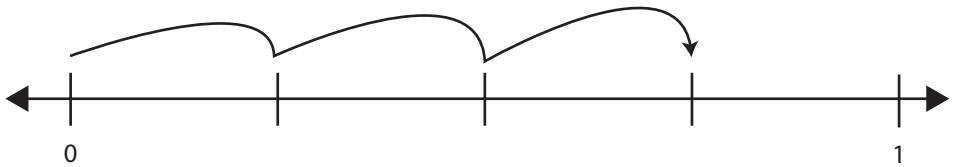
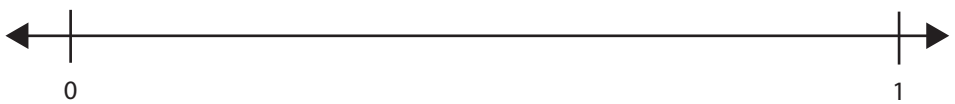
1 Complete the missing information below by writing in the fraction number or sketching the given fraction on a number line.

Fraction	Number Line
ex $\frac{1}{3}$	
a $\frac{1}{4}$	
b	
c $\frac{1}{6}$	
d	
e $\frac{2}{4}$	
f	
g $\frac{3}{3}$	

(continued on next page)

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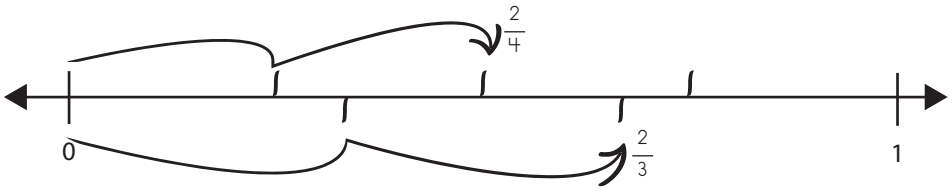
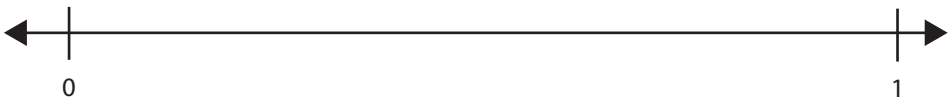
2 Use a < (less than), > (greater than) or = (equal) symbol to compare the following fraction pairs. Show your thinking by placing the fractions on the number line.

Fraction	Number Line
ex $\frac{2}{4} < \frac{2}{3}$	
a $\frac{1}{2} \square \frac{6}{8}$	
b $\frac{3}{6} \square \frac{1}{4}$	
c $\frac{3}{4} \square \frac{6}{8}$	
d $\frac{2}{4} \square \frac{1}{3}$