Chapter

7 Fractions

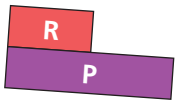
Dear Student,

Welcome to the fractions chapter! You probably have learned about fractions before, and you may have heard people around you using words like **half, quarter,** or **two thirds,** all of which are fractions.

Do you think you could explain what a quarter of a dollar means? Could you write a fraction for it?

In this chapter, you'll be learning about fractions that are **less than 1** (like one fourth) as well as fractions that are **greater than 1** (like two and a half). You'll learn lots of different names for the same fraction, and you'll figure out which of two fractions is greater and which is smaller. Along the way, you'll get to use pattern blocks, Cuisenaire® Rods, and rulers to represent various fractions.

In the pictures below, can you tell which piece is half of another piece? How can you tell?



Have fun! You're already a fraction of the way there!

Mathematically yours,
The authors of ***Think Math!***

THE WORLD ALMANAC FOR KIDS

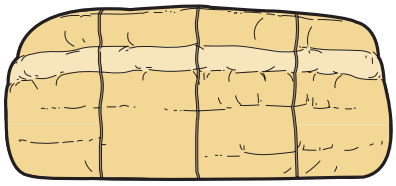
No Loafing Please!

Have you ever heard the expression "the best thing since sliced bread?" Thank Otto Frederick Rohwedde, who is called the "father of sliced bread." He worked for many years to build a machine to slice and wrap bread. The machine was first used by a baker in Michigan in 1928.

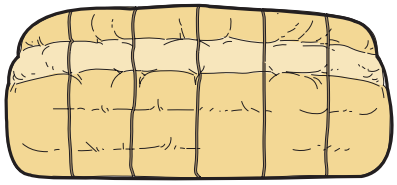
FACT·ACTIVITY 1

The identical loaves of bread to the right are sliced into different numbers of equal slices. Answer the questions using the pictures of the bread.

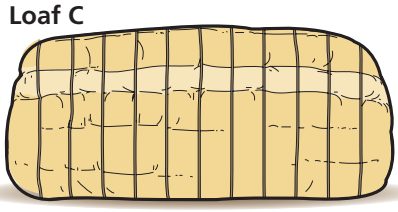
Loaf A



Loaf B



Loaf C

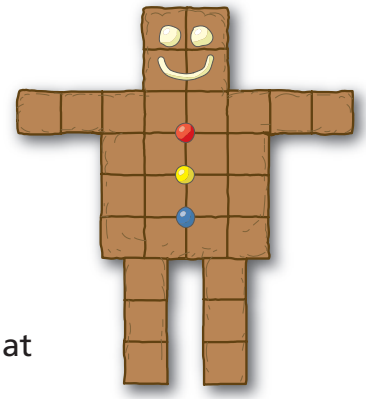


1. Suppose you eat 1 slice of loaf A. What part of the loaf did you eat? What part of the loaf is not eaten?
2. What part of loaf C is 1 slice? What part of the loaf is 6 slices?
3. If you eat 1 slice of loaf A and your friend eats 1 slice of loaf B, who eats the most bread? Explain.
4. Draw a round loaf of bread. Divide it into 8 equal pieces. Shade the pieces to show a fraction greater than $\frac{1}{4}$ and less than $\frac{1}{2}$.

Bread is an important food in many cultures. It comes in all sizes, shapes, and forms. Gingerbread is a sweet bread that came from countries in Europe.

FACT ACTIVITY 2

The "gingerbread man" to the right is cut into 30 equal squares. Use the figure to answer the questions. Copy the figure onto grid paper and use shading to help.



1. How many pieces make up $\frac{1}{10}$ of the figure?
2. John eats the pieces of the gingerbread that make up the head. What part of the gingerbread does he eat?
3. Nikki eats the pieces that make up the legs. Write a fraction addition sentence to find the part of the gingerbread that she eats.
4. Write a word problem involving addition of fractions that can be answered by using the gingerbread figure. Give your problem to a classmate to solve.

CHAPTER PROJECT

Find a recipe for making bread. Select a recipe that has at least two fractional ingredients, such as $\frac{1}{4}$ cup oil. Copy the fraction amounts.

- Make a table that shows how much of those ingredients you will need to make 1 bread, 2 breads, 3 breads, and so on, up to 6 breads.
- Find a classmate whose recipe uses one of the same ingredients. Write a comparison of the fractions of the amounts needed for making 1 loaf of bread.

ALMANAC Fact

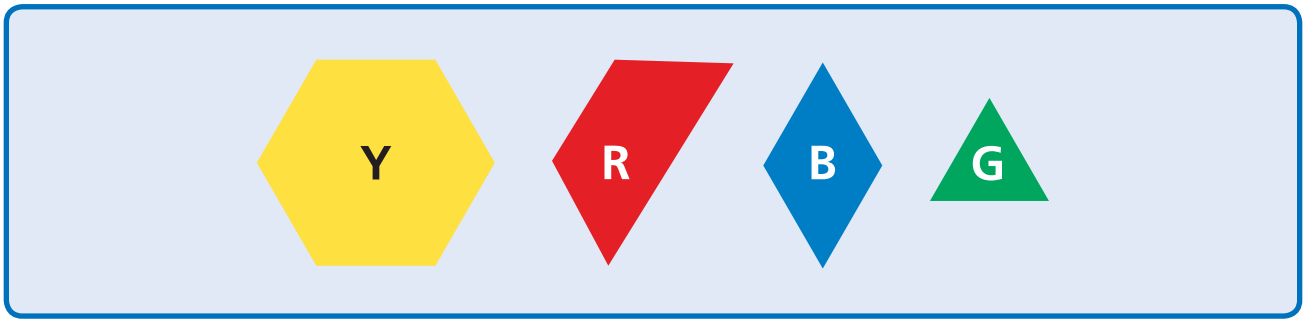
The longest loaf of bread measured in the U.S. was 2,356 feet. It was baked in 1977.

Chapter 7

Lesson 2

EXPLORE
Exploring Fractions With Pattern Blocks

Use pattern blocks like these to answer these questions.



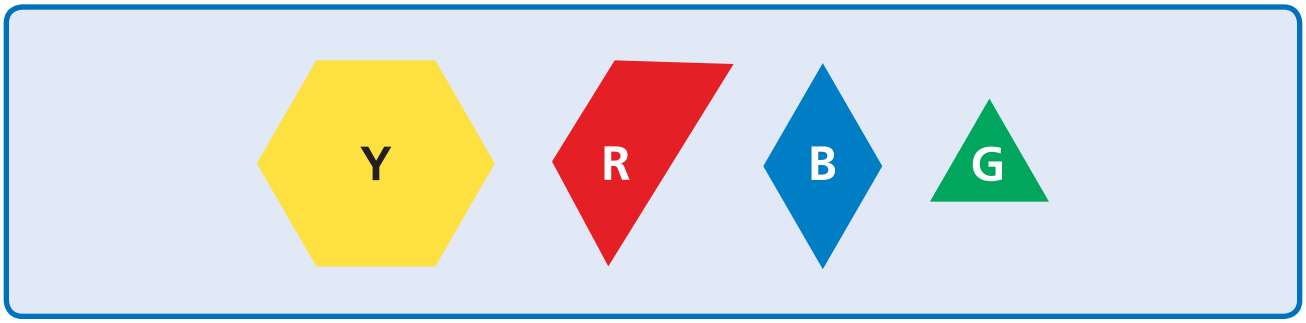
1. If R is 1, then what is Y?
2. If Y is 1, then what is R?
3. If Y is 1, then what is B?
4. If B is 1, then what is G?
5. If G is 1, then what is R?
6. If R is 1, then what is G G G?
7. If R is 1, then what is G G G G?
8. If B is 1, then what is R?

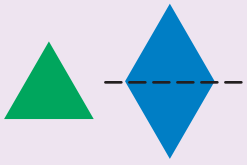
Chapter 7

Lesson 2

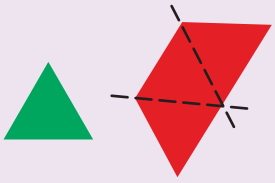
REVIEW MODEL
Using Pattern Blocks to Show Fractions

You can use pattern blocks to model fractions.

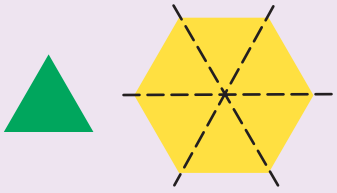




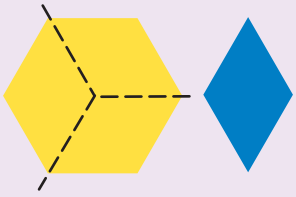
2 triangles match 1 rhombus.
So, 1 triangle is $\frac{1}{2}$ of a rhombus.



3 triangles match 1 trapezoid.
So, 1 triangle is $\frac{1}{3}$ of a trapezoid,
and 2 triangles are $\frac{2}{3}$ of a trapezoid.



6 triangles match 1 hexagon. So,
1 triangle is $\frac{1}{6}$ of a hexagon, and
3 triangles are $\frac{3}{6}$, or $\frac{1}{2}$, of a hexagon.



3 rhombuses match 1 hexagon.
So, 1 rhombus is $\frac{1}{3}$ of a hexagon,
and 2 rhombuses are $\frac{2}{3}$ of a hexagon.

Check for Understanding

Solve.

1. How many trapezoids match one hexagon?
2. What fraction of the hexagon is one trapezoid?
3. How many triangles match one hexagon?

Chapter 7

Lesson 3

EXPLORE
What is the Whole?

Use Cuisenaire® Rods to answer these questions.

1. If the **white** cube is 1, then what is the **red** rod?

2. If the **red** rod is 1, then what is the **white** cube?

3. If the **light green** rod is 1, then what is the **red** rod?

4. If the **light green** rod is 1, then what is the **purple** rod?

5. If the **purple** rod is 1, then what is the **red** rod?

6. If the **purple** rod is 1, then what is the **yellow** rod?

7. If the **purple** rod is 1, then what is the **dark green** rod?

8. If the **blue** rod is 1, then what is the **white** cube?

9. If the **blue** rod is 1, then what is the **black** rod?

10. If the **brown** rod is 1, then what is the **orange** rod?

Chapter 7

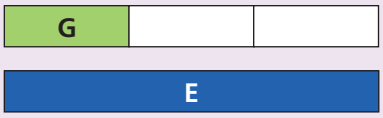
Lesson 4

REVIEW MODEL
Using Cuisenaire® Rods

Activity 1 **The value of the light green rod, G, is $\frac{1}{2}$. The value of the blue rod, E, can be found by using the light green rod.**

Step 1

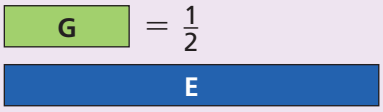
Compare the **lengths** of the rods.



The blue rod is **3** times as long as the light green rod.

Step 2

There are 3 rods, each worth $\frac{1}{2}$.

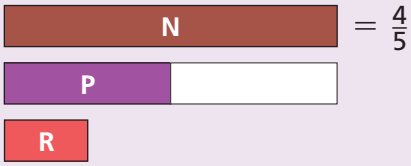


So, the value of the blue rod is $\frac{3}{2}$, or $1\frac{1}{2}$.

Activity 2 **The value of the brown rod, N, is $\frac{4}{5}$. The value of the purple rod, P, can be found by using the brown rod.**

Step 1

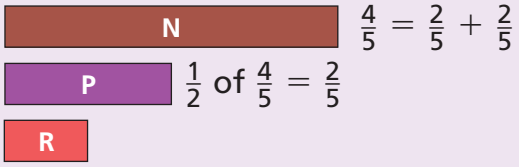
Compare the **lengths** of the rods.



The brown rod is 4 times as long as the red rod. The purple rod is twice as long as the red rod.

Step 2

Use the **value** of the red rod to find the value of the purple rod.

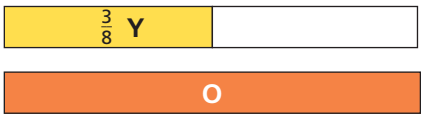


The red rod is $\frac{1}{5}$ because 4 red rods is $\frac{4}{5}$. Two red rods is $\frac{2}{5}$, so the value of the purple rod is $\frac{2}{5}$.

Check for Understanding

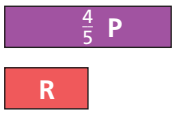
Find the value of the bottom rod.

1



2

3



Chapter 7

Lesson 6

EXPLORE
Finding One Half

You might sketch this rectangle on a piece of scratch paper to help you answer these questions.

1. Imagine that the rectangle is divided into 4 equal pieces. How many pieces would equal $\frac{1}{2}$ of the rectangle?

2. Imagine that the rectangle is divided into 10 equal pieces. How many pieces would equal $\frac{1}{2}$ of the rectangle?

3. Imagine that the rectangle is divided into 20 equal pieces. How many pieces would equal $\frac{1}{2}$ of the rectangle?

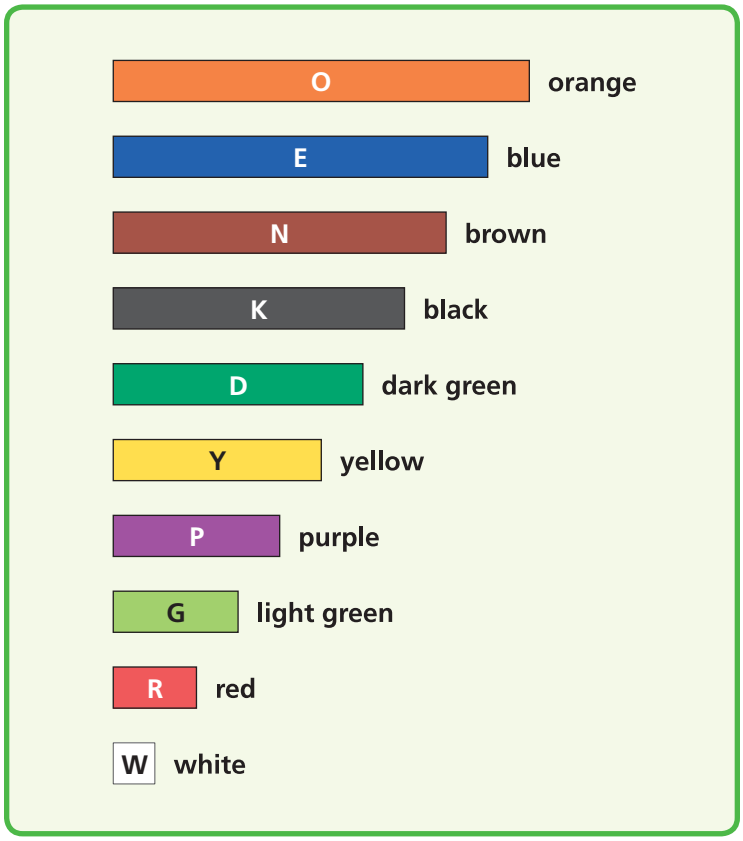
4. Imagine that the rectangle is divided into 100 equal pieces. How many pieces would equal $\frac{1}{2}$ of the rectangle?

5. How did you figure out the number of pieces in $\frac{1}{2}$ of the rectangle?

Chapter 7

Lesson 7

EXPLORE
Comparing Fractions



1. Which rod is $\frac{1}{2}$ of the **orange** rod?

2. Which rod is $\frac{1}{5}$ of the **orange** rod?

3. Which is greater, $\frac{1}{2}$ or $\frac{1}{5}$?

4. Which rod is $\frac{1}{2}$ of the **brown** rod?

5. Which rod is $\frac{1}{4}$ of the **brown** rod?

6. Which is greater, $\frac{1}{2}$ or $\frac{1}{4}$?

7. Which rod is $\frac{1}{3}$ of the **blue** rod?

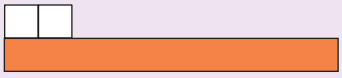
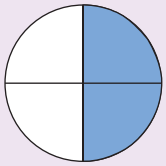
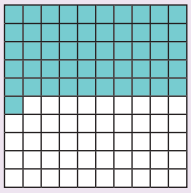
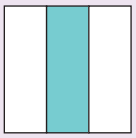
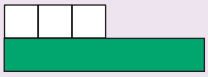
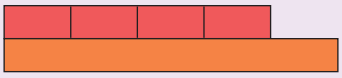
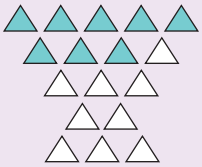
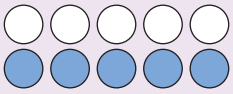
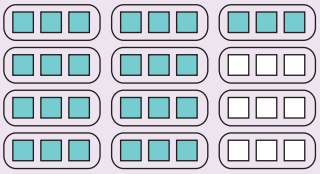
8. Which rod is $\frac{1}{9}$ of the **blue** rod?

9. Which is greater, $\frac{1}{3}$ or $\frac{1}{9}$?

Chapter 7

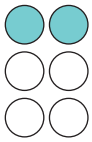
Lesson 7

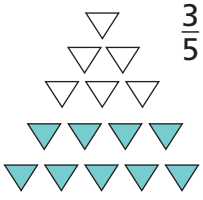
REVIEW MODEL
Comparing Fractions to $\frac{1}{2}$

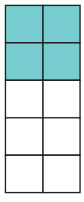
Less than $\frac{1}{2}$	Equal to $\frac{1}{2}$	Greater than $\frac{1}{2}$
 $\frac{2}{10}$	 $\frac{2}{4}$	 $\frac{51}{100}$
 $\frac{1}{3}$	 $\frac{3}{6}$	 $\frac{4}{5}$
 $\frac{8}{17}$	 $\frac{5}{10}$	 $\frac{9}{12}$
Top number is less than half of the bottom number.	Top number is exactly half of the bottom number.	Top number is greater than half of the bottom number.

Check for Understanding

Compare the fraction to $\frac{1}{2}$. On a separate sheet of paper, write <, =, or >.

1.  $\frac{2}{6} \bullet \frac{1}{2}$

2.  $\frac{3}{5} \bullet \frac{1}{2}$

3.  $\frac{4}{10} \bullet \frac{1}{2}$

4. $\frac{9}{18} \bullet \frac{1}{2}$

5. $\frac{5}{12} \bullet \frac{1}{2}$

6. $\frac{4}{8} \bullet \frac{1}{2}$

7. $\frac{15}{24} \bullet \frac{1}{2}$

8. $\frac{25}{80} \bullet \frac{1}{2}$

9. $\frac{23}{35} \bullet \frac{1}{2}$

Chapter 7

Lesson 8

REVIEW MODEL
Finding Equivalent Fractions Using Models

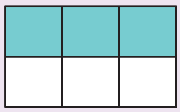
You can find the fraction of a model that is shaded.

number of shaded pieces = 1

total number of pieces = 2

fraction shaded = $\frac{\text{number of shaded pieces}}{\text{total number of pieces}}$

fraction shaded = $\frac{1}{2}$



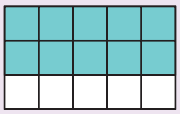
number of shaded pieces = 3

total number of pieces = 6

fraction shaded = $\frac{\text{number of shaded pieces}}{\text{total number of pieces}}$

fraction shaded = $\frac{3}{6}$

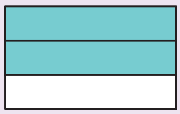
The same portion of each rectangle is shaded, so $\frac{1}{2}$ and $\frac{3}{6}$ are equivalent.



number of shaded pieces = 10

total number of pieces = 15

fraction shaded = $\frac{10}{15}$



number of shaded pieces = 2

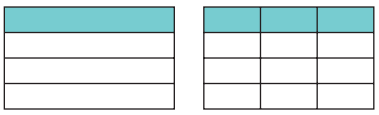
total number of pieces = 3

fraction shaded = $\frac{2}{3}$

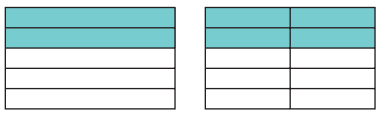
The same portion of each rectangle is shaded, so $\frac{2}{3}$ and $\frac{10}{15}$ are equivalent.

Check for Understanding

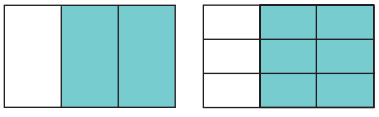
Find the equivalent fractions shown by the models.

1. 

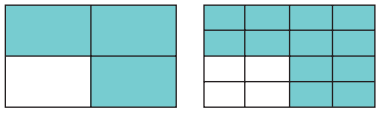
$\frac{\blacksquare}{\blacksquare} = \frac{\blacksquare}{\blacksquare}$

2. 

$\frac{\blacksquare}{\blacksquare} = \frac{\blacksquare}{\blacksquare}$

3. 

$\frac{\blacksquare}{\blacksquare} = \frac{\blacksquare}{\blacksquare}$

4. 

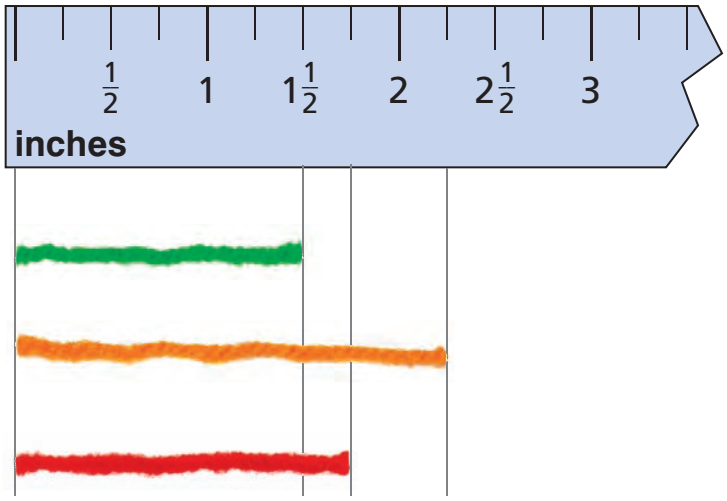
$\frac{\blacksquare}{\blacksquare} = \frac{\blacksquare}{\blacksquare}$

Chapter 7

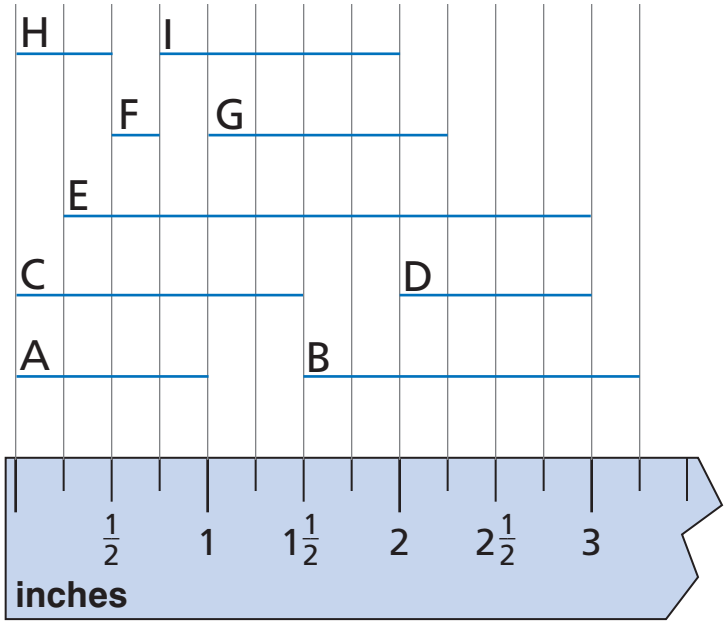
Lesson 10

EXPLORE
Measuring Lengths

Use this measuring tape to find the lengths of the pieces of string.



Record the lengths of these lines.



Chapter 7

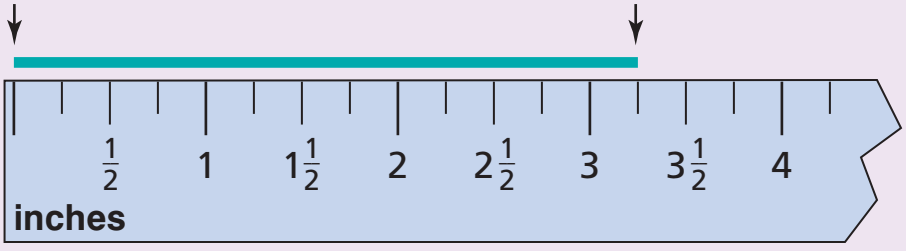
Lesson 10

REVIEW MODEL
Finding the Length of a Line

You can use an inch-ruler to find how long a line is.

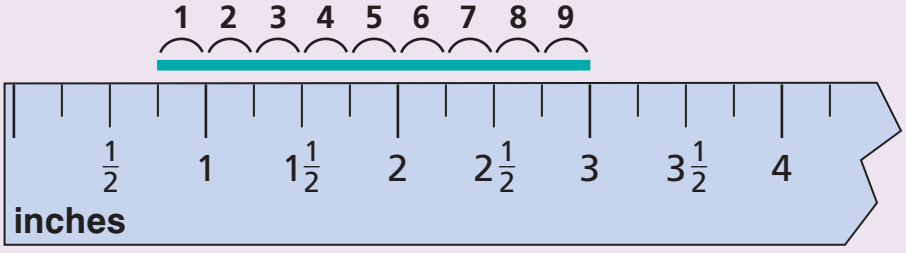
If one end of the line is at 0 on the ruler . . .

read the measurement on the ruler:



The line is $3\frac{1}{4}$ inches long.

If one end of the line is **not** at 0 on the ruler, count by quarter inches from the beginning to the end of the line.

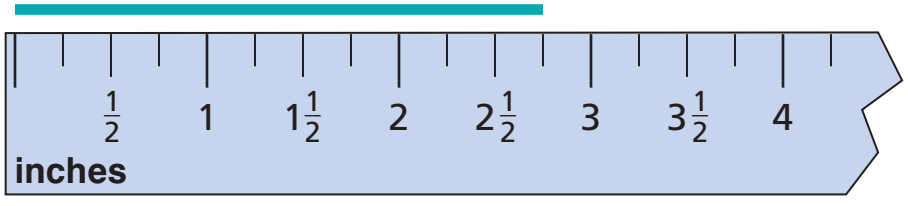


The line is 9 quarter inches long. Since there are 4 quarter inches in 1 inch, the line is $2\frac{1}{4}$ inches long.

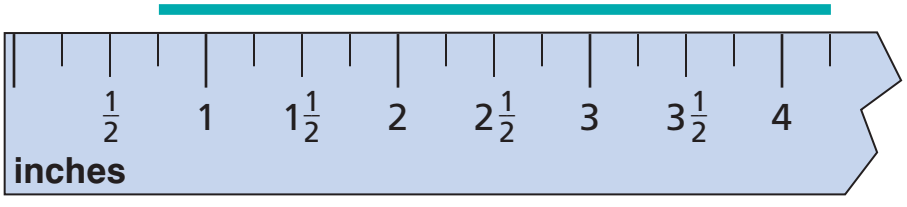
Check for Understanding

Find the length of the line.

1.



2.



Chapter 7

Lesson 12

REVIEW MODEL

Problem Solving Strategy

Draw a Picture

A pizza was cut into 8 equal-size pieces. Tanya ate $\frac{1}{4}$ of the pizza. Rick ate $\frac{3}{8}$ of the pizza. What part of the pizza did Tanya and Rick eat in all? Was the part of the pizza they ate greater than, less than, or equal to $\frac{1}{2}$?

Strategy: Draw a Picture

Read to Understand

What do you know from reading the problem?

The pizza was cut into 8 equal-size pieces. Tanya ate $\frac{1}{4}$ of the pizza and Rick ate $\frac{3}{8}$ of the pizza.

Plan

How can you solve this problem?

You can draw a picture to show how much each person ate.

Solve

How can you draw a picture of the problem?

Draw and divide a circle into 8 equal parts to represent the cut pizza. Shade $\frac{1}{4}$ to represent Tanya's part and $\frac{3}{8}$ to represent Rick's part. More than half the circle is shaded, so they ate more than $\frac{1}{2}$.

Check

Look back at the problem. Did you answer the questions that were asked? Does the answer make sense?

Problem Solving Practice

***Draw a picture* to solve.**

1. Juan spent $\frac{2}{5}$ hour mowing his lawn and $\frac{1}{2}$ hour practicing the piano. Which activity did he spend more time on?

2. Kyle used toothpicks to form some triangles and quadrilaterals on his desk. He used 22 toothpicks to make 6 figures. How many triangles and how many quadrilaterals did he make?

Problem Solving Strategies

- ✔ Act It Out
- ✔ **Draw a Picture**
- ✔ Guess and Check
- ✔ Look for a Pattern
- ✔ Make a Graph
- ✔ Make a Model
- ✔ Make an Organized List
- ✔ Make a Table
- ✔ Solve a Simpler Problem
- ✔ Use Logical Reasoning
- ✔ Work Backward
- ✔ Write an Equation

Mixed Strategy Practice

Use any strategy to solve. Explain.

3. Kari built a low brick wall along the side of her house. The wall is 30 bricks wide. Each brick in the wall is 8 inches wide. How many feet wide is the wall?

4. Jeff spent $12.00 for a pizza and two drinks. The pizza costs twice as much as the two drinks. How much did each item cost?

For 5–6, use the yard-sale chart.

5. Jake bought 2 books and 4 games. How much change did he get from $10.00?

6. Anne bought 1 truck, 1 car, and 3 books. Scott bought 4 books. How much more did Anne spend than Scott?

7. A rectangle is made from a 6 in. × 6 in. square and an 8 in. × 6 in. rectangle. What is the perimeter of the large rectangle?

8. John is 5 years older than his brother. The product of their ages is 36. How old is John?

Chapter 7 Vocabulary

Choose the best vocabulary term from Word List A for each sentence.

1. The symbol < means ___?___.
2. The ___?___ tells the number of equal parts in the whole.
3. The ___?___ is the top number in a fraction.
4. Three inches is one ___?___ of a foot.
5. To read $\frac{1}{2} = \frac{3}{6}$, you say "one half ___?___ three sixths."
6. The symbols <, >, and = are used to ___?___ numbers.
7. A(n) ___?___ is a number that can represent a part of a whole.
8. When you ___?___ 4 and 7, the result is 11.
9. If two fractions name the same value, then they are ___?___.
10. The symbol > means ___?___.

Word List A

- add
- compare
- denominator
- distance
- eighth
- equal
- equivalent
- fourth
- fraction
- greater than
- greatest
- is equal to
- least
- length
- less than
- numerator

Complete each analogy using the best term from Word List B.

11. Equal is to = as ___?___ is to >.
12. Four is to whole number as one fourth is to ___?___.
13. Two is to half as five is to ___?___.

Word List B

- combine
- fifth
- fraction
- greater than
- less than
- ninth

Talk Math

Discuss with a partner what you have learned about fractions. Use the vocabulary terms *denominator, fraction,* and *numerator.*

14. How can you compare a fraction to $\frac{1}{2}$?
15. How can you tell whether two fractions are equivalent?
16. How can you order fractions from least to greatest?

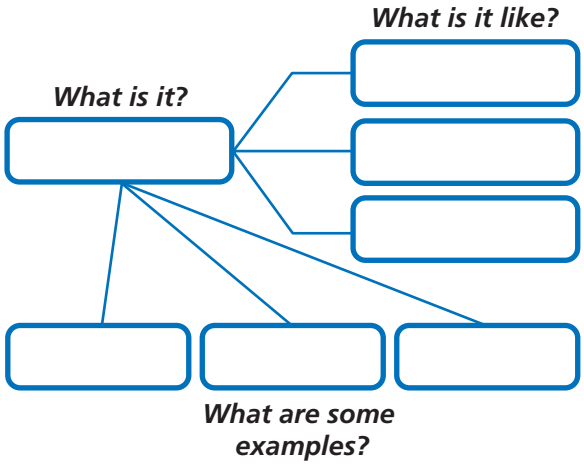
Word Definition Map

17 **Create a word definition map for the word *fraction*.**

A What is it?

B What is it like?

C What are some examples?



Word Line

18 **Create a word line using the words *eighth, fifth, fourth, ninth, seventh, sixth,* and *tenth*.**

Words:

Sequence:

FRACTION In everyday language, the word *fraction* might not be a specific amount. "A *fraction*" could mean "some" or "part" or "not all." If someone says "I paid a *fraction* of the price," you know that the person paid less than full price—but you don't know exactly how much less.

In math, a *fraction* is a specific number. A fraction tells exactly how many parts there are and how many of those parts are being used. If you someone says "I paid half price," the person is talking about a specific *fraction* of the price, $\frac{1}{2}$.

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GAME

Where is $\frac{1}{2}$?

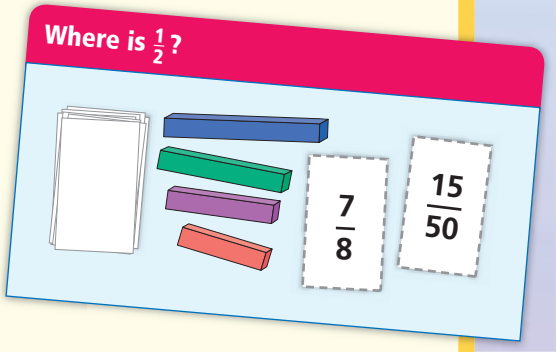
Game Purpose

To practice comparing fractions with $\frac{1}{2}$

Materials

- Activity Masters 60 and 61 (*Fraction Cards*)
- Cuisenaire® Rods

How To Play The Game



1. Play this game with a partner. Cut out the *Fraction Cards* from Activity Masters 60 and 61. Decide who will be Player 1 and who will be Player 2.
   - Mix up the cards.
   - Place them in a pile face down between you.

2. Player 1 and Player 2 each pick one card from the pile.
   - Compare your fraction to $\frac{1}{2}$. You can use Cuisenaire® Rods.
   - Follow the chart to see which player keeps both cards.

How the Fractions Compare	Who Keeps the Cards
Both fractions are greater than $\frac{1}{2}$.	Player 1
Both fractions are less than $\frac{1}{2}$.	Player 1
One fraction is greater than $\frac{1}{2}$. The other fraction is less than $\frac{1}{2}$.	Player 2

3. Continue playing until all the *Fraction Cards* are gone.

4. The player with more cards at the end of the game wins.

GAME

Fraction Least to Greatest

Game Purpose
To practice comparing fractions

Materials
- Activity Masters 66 and 67 (*Fraction Cards*)
- Stopwatch or clock with a second hand

How To Play The Game

1. This is a game for two players. The object of the game is to place the fraction cards in order. Decide who will be the Placer. The other player will be the Timer.

2. The Placer mixes up all the Fraction Cards and arranges them in a stack.

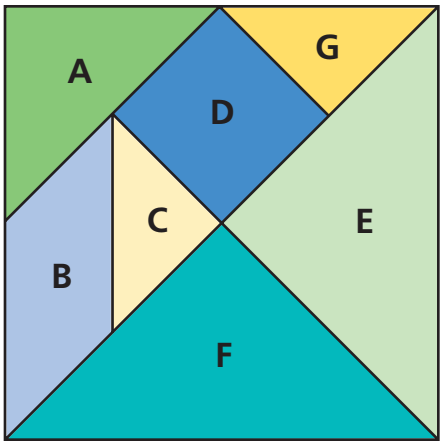
3. When the Timer says to start, the Placer turns over one card at a time and makes a row of cards with the fractions in order from least to greatest.

4. The Timer stops play at the end of 60 seconds.
   - The Timer checks the order of the cards.
   - If the Timer finds an error, the Placer may remove one or more cards to correct the line of cards. The Placer may not rearrange the cards.
   - The Placer gets 1 point for each card in the line.

5. Switch roles, and play again. The first player to reach 50 points wins.

CHALLENGE

A tangram is a Chinese puzzle square cut into 7 different shapes and sizes. Tangrams are usually made from plastic or cardboard. Suppose you could buy a tangram-shaped candy bar. You could buy the whole tangram. Or you could buy each piece separately.



If the piece labeled F were to sell for $1.00, what would be the cost of each of the other pieces?

- **Piece E would also cost $1.00 because pieces E and F are congruent.**
- **Piece A would cost $0.50 because piece A is $\frac{1}{2}$ of piece F.**
- **Pieces C and G would each cost $0.25 because each of them is $\frac{1}{4}$ of piece F.**
- **Pieces B and D would each cost $0.50, the same as piece A. All 3 pieces have the same area.**

Use the tangram model above to solve each problem.

What would each of the other pieces cost:

1. if piece D cost $1.00?
2. if piece A cost $0.50?
3. if piece B cost $0.30?
4. if piece F cost $2.40?
5. if pieces A and D together cost $2.00?