# *DO THE MATH* TEACHER GUIDE SAMPLER

FRACTIONS

This Sampler includes select pages from the Fractions Teacher Guide.
You'll see a sample of the:

- Section Overview
- Instructional Principals
- Letter from Marilyn Burns
- Planner
- Lessons
- Annotated *WorkSpace*
- Attitude Survey, Show What You Know, Objectives Tracker, Community News

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Do The Math

Created by **Marilyn Burns**

Teacher Guide

FRACTIONS

B Equivalence and Comparison
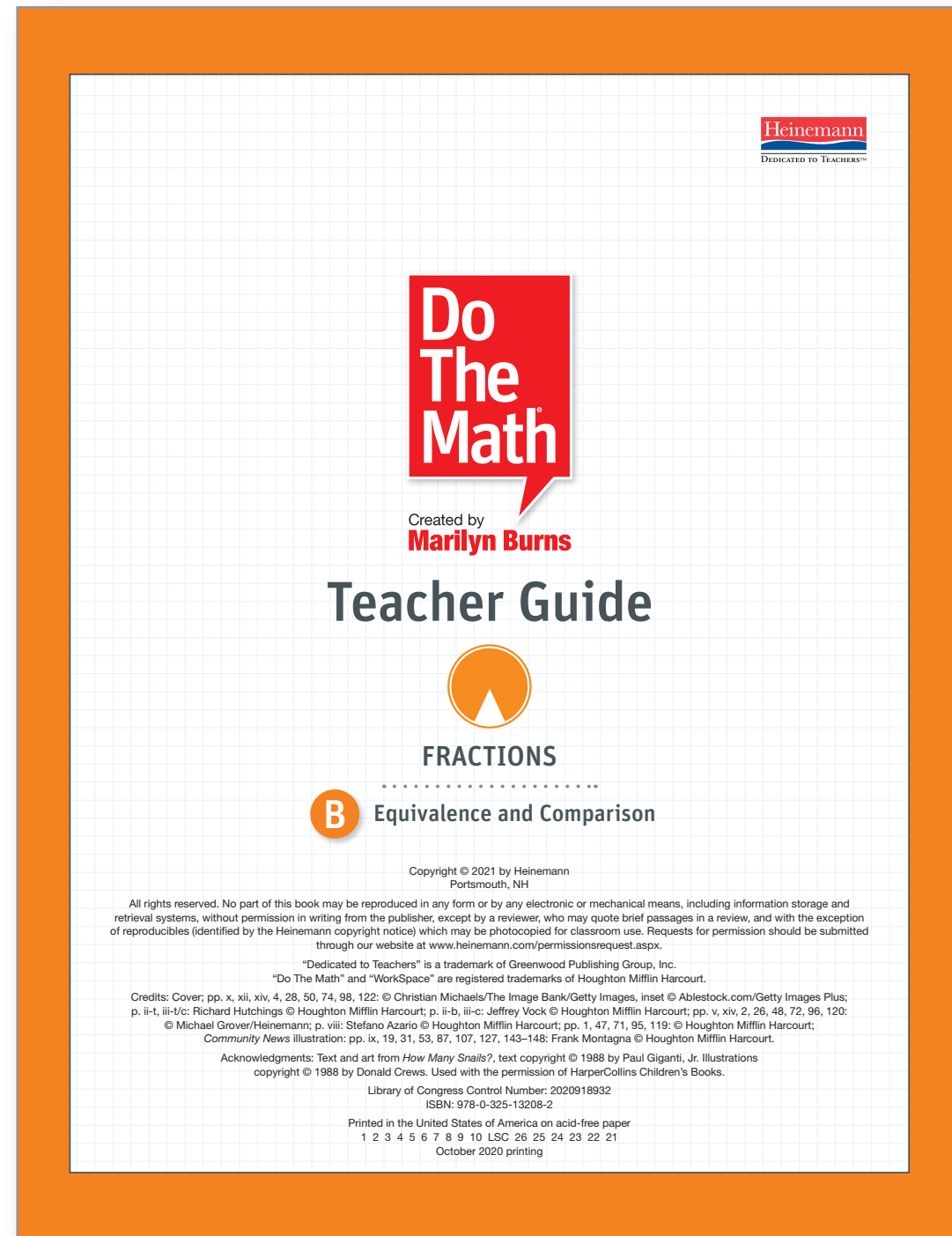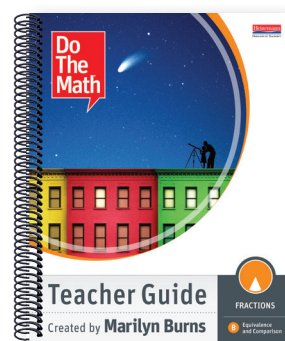
To see additional *Do The Math* samplers, please visit
http://hein.pub/DoTheMathSamplers

To access the eSampler, please visit **Heinemann.com/DoTheMath.**

Overview

➤ The Lessons

LESSONS 1–5

**PAGE 1**

Introduce Comparing Fractions

Students use fraction kits as they begin to develop a *Comparing Fractions Toolkit*. The first two strategies are *compare unit fractions* and *compare fractions with common numerators*.

LESSONS 6–10

PAGE 25

Name Fractional Parts of Sets

Students learn another strategy from the *Comparing Fractions Toolkit—compare fractions with common denominators*. They also expand their understanding of fractions to include fractions of a set.
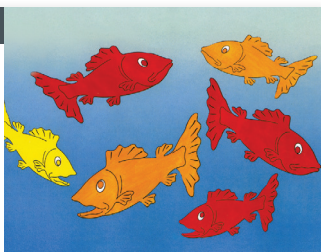
LESSONS 11–15

PAGE 47

Identify Fractions Equivalent to $\frac{1}{2}$

Students learn a strategy from the *Comparing Fractions Toolkit—compare fractions to 1 whole*. They also use the relationships between numerators and denominators to identify fractions equivalent to $\frac{1}{2}$.

LESSONS 16–20

PAGE 71

Compare Fractions to $\frac{1}{2}$

Students learn another strategy from the *Comparing Fractions Toolkit—compare fractions to $\frac{1}{2}$*. They use cube trains to identify whether fractions of a set are less than, equal to, about equal to, or greater than $\frac{1}{2}$.

LESSONS 21–25

PAGE 95

Rename Fractions With Equivalent Fractions

Students learn the last strategy from the *Comparing Fractions Toolkit—change fractions to equivalent fractions*. They use both their fraction kits and circles to identify equivalent fractions.

LESSONS 26–30

PAGE 119
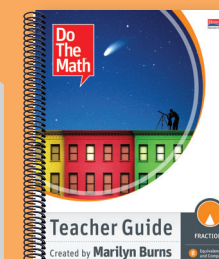
Compare and Order Fractions

Students use all of the strategies in the *Comparing Fractions Toolkit* to compare and order fractions, including improper fractions. Through the creation of a fraction concept web, students review fraction concepts and vocabulary, and make connections.

➤ Additional Resources

Do The Math

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Help At-Risk and Struggling Students
Succeed in Math

Research shows that students with diverse needs succeed in learning mathematics through explicit, intentional teaching based on proven instructional strategies.

TEACHING FOR UNDERSTANDING

Students benefit from instruction based on teaching for understanding.

Step-by-step lessons help students develop understanding, learn mathematical skills, see relationships, and make connections.

- Learning experiences link concepts and skills to their mathematical representations and language.
- Students use concrete and pictorial models to build a strong foundation in key mathematical concepts, operations, and strategies.

SCAFFOLDED CONTENT

Scaffolding of the content makes the mathematics more accessible to students.

Do The Math focuses on key content in mathematics so that students are not overwhelmed with extraneous material.

- The content is organized into manageable chunks.
- The lessons are explicit about the relationships among these chunks.
- The instruction is carefully sequenced to help students build a solid foundation of understanding.

MULTIPLE STRATEGIES

Exploring different strategies for developing concepts and skills builds students' reasoning.

The lessons engage students with each concept and skill in several ways, deepening their mathematics knowledge.

- Hands-on **manipulatives** give students concrete experiences with abstract ideas.
- The **digital mTools** give students the opportunity to translate concrete manipulatives to pictorial representations.
- **Classroom** and **digital partner games** offer engaging experiences that reinforce mathematical understandings and skills.
- **Children's literature** provides a springboard for instruction.
- Contexts make abstract mathematical ideas accessible.

MATHEMATICAL THINKING

These standards help develop mathematical expertise and habits of mind in all students.

- Students **persevere and solve problems** and look for entry points to solutions.
- Students **reason abstractly** to make sense of quantities and their relationships in problem situations.
- Students use stated assumptions, definitions, and previously established results to **construct viable arguments**.
- Students **model with mathematics** to solve real-world and mathematical problems.
- Students apply **mathematical** and **practical tools** strategically when solving problems.
- Students **attend to precision**, using mathematical language to communicate clearly and accurately.
- Students look closely to **discern patterns** or **structure** when solving problems.
- Students **use repeated reasoning** to identify general methods and shortcuts.

FRACTIONS MODELS

Fraction strips help students to identify fractions and understand fraction equivalence.

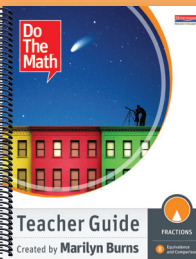**Fraction cards** are used to order fractions from least to greatest.

Connecting cubes create fraction trains and represent parts of a set.

Fraction circles are divided to represent sharing problems.

Fraction cubes determine random numbers in fraction games.

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Created by **Marilyn Burns**

Help Students Build Their
Mathematical Reasoning

CLASSROOM ROUTINES

Routines such as "think, pair, share" promote engagement and deepen student understanding.

THINK
Students collect their thoughts individually.

PAIR
Students discuss with a partner.

SHARE
Students report ideas to the whole group. Expressing ideas and hearing other perspectives help students clarify their thinking.

- The listening and speaking that occur during "think, pair, share" are especially valuable for English language learners.

- Teachers can pair English language learners with other students who speak the same first language to allow them to discuss concepts.

- Teachers can also pair a student with early English skills and a student with strong English skills to encourage language development.

INDEPENDENT STUDENT WORK

Assignments provide students with opportunities to practice, strengthen, and extend their learning.

- *WorkSpace®* **assignments** are carefully constructed to motivate students and maximize their success through games, assignments for reinforcement, and problem-solving situations.

- The **digital experience** gives students the flexibility to explore mathematical tools and games within and outside the classroom.

VOCABULARY AND LANGUAGE

Explicit vocabulary instruction helps students communicate effectively about the math they are learning.

Vocabulary is introduced after students experience concepts. Vocabulary lessons follow a consistent routine—the teacher writes the vocabulary on the *Math Vocabulary* chart and provides an example; students see, hear, say, and write it; the vocabulary is then incorporated throughout the lessons to support students' learning.

- Key **mathematical** and **academic vocabulary** is highlighted at the start of each lesson, and **Spanish translations** are provided.

- A **glossary** in the *WorkSpace®* provides students with a reference for definitions.
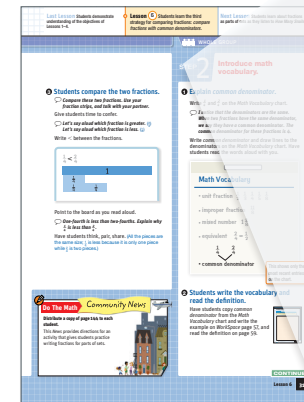
ASSESSMENT AND DIFFERENTIATION

Ongoing assessment is built into the program to help teachers meet individual student needs.

During lessons, teachers observe students working in the whole group, with partners, and independently.

- Specific guidance for how to promote understanding and **address student misconceptions** is integrated into all lessons.

- Suggestions for **differentiating instruction** are included after every "Assessing Student Understanding" lesson, both for students who need additional help and those who are ready for a challenge.

FROM MARILYN BURNS

In Lessons 6–10, students…

- Compare fractions with common numerators and with common denominators.

- Name parts of a set as fractions and use standard notation.

- Solve problems using fractions.

- Communicate ideas with key math vocabulary: *numerator*, *common numerator*, *denominator*, *unit fraction*, and *common denominator*.

Dear Colleague,

Students now learn the third strategy in the *Comparing Fractions Toolkit*—*comparing fractions with common denominators*. For this strategy, students compare two fractions with the same denominator. First they review that fractions with the same denominator each represent 1 whole cut into the same number of equal pieces. Then they reason that the fraction with the greater numerator has more pieces and, therefore, is the greater fraction. Finally they confirm by comparing with their fraction kit pieces.
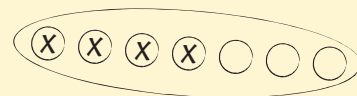
$$\frac{6}{8} > \frac{5}{8}$$
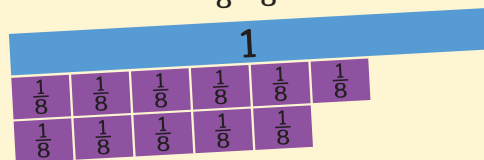
The lessons also engage students in relating fractions to parts of sets, rather than parts of a single whole. The illustrations in the book *How Many Snails?* provide contexts for identifying the numerators and denominators of fractional parts of sets. Each spread in the book presents questions that ask readers to observe differences among sets of similar objects—clouds, flowers, fish, trucks, books, and others. The questions in the book were written with the intention of being answered with whole numbers; however, for these lessons, they are reworded so that students respond with answers that are fractions.

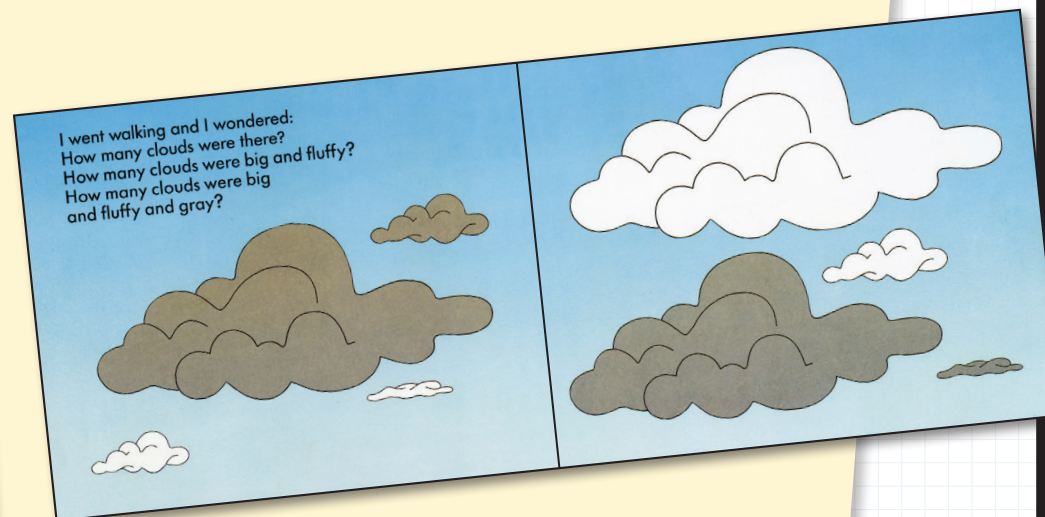$\frac{3}{8}$ of the 8 clouds are big and fluffy.

$\frac{4}{8}$ of the 8 clouds are white.

Students then move beyond the book to identify fractional parts of other sets. Also, they draw their own representations of fractions as parts of sets. These lessons extend students' experience beyond the fractions that are in the Fraction Kit.

$\frac{4}{7}$ of the circles have an X in them.

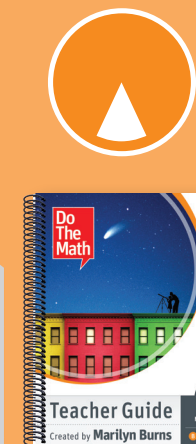> The lessons also engage students in relating fractions to parts of sets, rather than parts of a single whole.

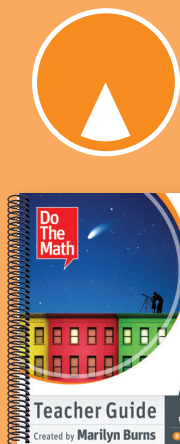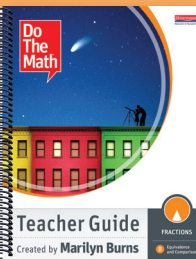I went walking and I wondered:
How many clouds were there?
How many clouds were big and fluffy?
How many clouds were big
and fluffy and gray?

PLANNER

Name Fractional Parts of Sets

mTools

In these lessons, you will use:
- Fraction strips
- Fraction cubes

Professional Learning Online

To support teaching these lessons:
- View **"Using Children's Literature to Teach Math."**
- Read **"Using Story Books to Teach Math."**

Take a deeper dive into **Problem Types** in **Fractions.**

	LESSON 6	LESSON 7	LESSON 8	LESSON 9	LESSON 10
					✔ **Progress Monitoring**
	Using *Comparing Fractions Toolkit* Strategy 3	Naming Fractions for Parts of Sets	Naming Fractions for Parts of Sets *(continued)*	Representing Fractional Parts of Sets	Assessing Student Understanding
	Students learn the third of six strategies for comparing fractions: *compare fractions with common denominators.*	Students learn about fractions as parts of sets as they listen to *How Many Snails?* by Paul Giganti, Jr.	Students continue to name fractional parts of sets.	Students make drawings to show fractional parts of sets.	Students demonstrate understanding of the objectives of Lessons 6–9 by completing *WorkSpace* pages independently.
OBJECTIVES	• Compare fractions with common denominators.	• Compare fractions with common denominators. • Name parts of sets as fractions and use standard notation. • Solve problems using fractions.	• Compare fractions with common denominators. • Name parts of sets as fractions and use standard notation. • Solve problems using fractions.	• Compare unit fractions and fractions with common denominators. • Name parts of sets as fractions and use standard notation. • Solve problems using fractions.	• Compare fractions with common numerators and common denominators. • Name parts of sets as fractions and use standard notation. • Represent fractional parts of sets with drawings and fractions. • Solve problems using fractions.
PURPOSE	Creating the *Comparing Fractions Toolkit* **builds a routine** students can follow as they compare fractions that depend on students' knowledge about fraction numbers and notation.	Answering questions based on the **visual representations** presented in the book *How Many Snails?* supports students' growing understanding of fractions as parts of sets.	Using **graphic organizers**—word problem frames—when creating questions about fractional parts of sets gives students opportunities to practice new strategies to compare fractions.	Students create **visual representations** of fractions as parts of sets, **reinforcing their understanding** of the concept.	Assessing with **visual models** and **symbolic representation** they have been using in Lessons 6–9 allows students to show their understanding without having to approach the material in an unfamiliar format.
KEY MATH VOCABULARY	• common denominator **NEW** • common numerator • denominator • numerator • unit fraction	• common denominator • denominator • is greater than • is less than • numerator • unit fraction	• common denominator • denominator • is greater than • is less than • numerator	• common denominator • is less than • unit fraction • is greater than	• common denominator • common numerator • is greater than • is less than • unit fraction
MATERIALS Physical manipulatives are also available as digital tools for teachers and students. mTools Digital Games	• *WorkSpace* pages 1, 9–10, 57, and 59 • Fraction strips • Magnetic fraction strips • Red and blue fraction cubes • *Math Vocabulary* chart • *Comparing Fractions Toolkit* chart • *Community News*	• *WorkSpace* page 11 • *How Many Snails?* by Paul Giganti, Jr. • Fraction strips • Magnetic fraction strips	• *WorkSpace* pages 12–13 and 49 • Fraction strips • Magnetic fraction strips • Red and blue fraction cubes • *Uncover*	• *WorkSpace* pages 14–15 and 49 • Fraction strips • Red and blue fraction cubes • *Uncover*	• *WorkSpace* pages 16–17 and 49 • Fraction strips • Red and blue fraction cubes • *Uncover*

LESSON ⑧ **Naming Fractions for Parts of Sets (continued)**

Last Lesson Students learn about fractions as parts of sets as they listen to *How Many Snails?*

Lesson ⑧ Students continue to name fractional parts of sets.

Next Lesson Students make drawings to show fractional parts of sets.

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Created by Marilyn Burns

Summary

Students continue to name fractional parts of sets.

Objectives

- Compare fractions with common denominators.
- Name parts of sets as fractions and use standard notation.
- Solve problems using fractions.

Materials

- *WorkSpace* pages 12–13 and 49
- Fraction strips
- Magnetic fraction strips
- Red and blue fraction cubes
- *Uncover*

Language Development

Key Math Vocabulary

ENGLISH	SPANISH
common denominator	*común denominador*
denominator	*denominador*
is greater than	*es mayor que*
is less than	*es menor que*
numerator	*numerador*

Academic Vocabulary

ENGLISH	SPANISH
compare	*comparar*
part	*parte*
set	*conjunto*
circle	*círculo*

Cognates are shown in italics; pointing out the similarity of these words to their English equivalents will help your Spanish-speaking students acquire vocabulary.

WHOLE GROUP

STEP 1 **Students practice a toolkit strategy.**

❶ **Introduce the lesson.**

💬 *Today you will practice comparing two fractions that have a common denominator. Then we will continue to figure out parts of sets and name fractions to represent them based on the book* How Many Snails?

❷ **Present two fractions for students to compare.**

Write $\frac{9}{8}$ and $\frac{7}{8}$ on the board, and have students read each fraction aloud.

$\frac{9}{8}$	$\frac{7}{8}$

💬 *Compare these fractions. Talk with your partner and use your fraction strips.*

Give students time to confer.

💬 *Let's say aloud which fraction is greater.* ($\frac{9}{8}$) *Let's say aloud which fraction is less.* ($\frac{7}{8}$)

Write > between the fractions and have students read aloud with you as you point: $\frac{9}{8}$ *is greater than* $\frac{7}{8}$.

Choose a student to explain the comparison. Verify with magnetic fraction strips.

$$\frac{9}{8} > \frac{7}{8}$$

WHOLE GROUP

STEP 2 **Guide students to name fractions for parts of sets.**

❶ **Guide students to complete two problems.**

Have students turn to *WorkSpace* page 12 and look at the first problem.

💬 *What will the denominator of the fraction show?* (the number of birds in the whole set) *What is the denominator of the fraction?* (8)

How many birds are red? (5) *So, the fraction of birds that are red is* $\frac{5}{8}$.

Have students write the fraction on the *WorkSpace* page.

💬 *Now let's look at the second problem. How many blue birds are there?* (3)

We already know the denominator, because the number in the whole set hasn't changed. So what fraction of the birds is blue?

Have students think, pair, share. ($\frac{3}{8}$)

Have students write the fraction on the *WorkSpace* page.

❷ **Students complete *WorkSpace* page 12.**

Have students complete the *WorkSpace* page.

WORKSPACE PAGE 12

Fractional Parts of a Set

INDIVIDUALS

STEP 3 **Students name fractions for parts of sets.**

❶ **Students complete *WorkSpace* page 13.**

Have students turn to *WorkSpace* page 13. Explain that they will answer the questions by writing a fraction for the part of the set described. Remind them that they must first figure out how many are in the whole set.
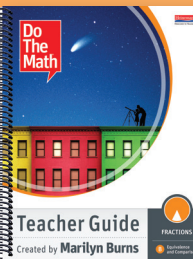
Then read the questions aloud and, if necessary, explain meanings of words such as *stripes* and *circle*.

WORKSPACE PAGE 13

Circles

❷ **Students practice with *Uncover* or *Roll Five*.**

Students who complete the *WorkSpace* assignment and have extra time should play *Uncover* or *Roll Five*. Students may use either the blue fraction cube or the red fraction cube.

If students choose *Roll Five*, have them record their equations on one of the recording pages that start on *WorkSpace* page 49.

STOP

Last Lesson Students make drawings to show fractional parts of sets.

Lesson 10 Students demonstrate understanding of the objectives of Lessons 6–9.

Next Lesson Students learn a new strategy for comparing fractions—*comparing fractions that are one unit fraction from 1 whole.*

LESSON 10 Assessing Student Understanding

Summary
Students demonstrate understanding of the objectives of Lessons 6–9 by completing *WorkSpace* pages independently.

Objectives
- Compare fractions with common numerators and common denominators.
- Name parts of sets as fractions and use standard notation.
- Represent fractional parts of sets with drawings and fractions.
- Solve problems using fractions.

Materials
- *WorkSpace* pages 16–17 and 49
- Fraction strips
- Red and blue fraction cubes
- *Uncover*

Language Development

Key Math Vocabulary

ENGLISH	SPANISH
common denominator	*común denominador*
common numerator	*común numerador*
is greater than	es mayor que
is less than	es menor que
unit fraction	*fracción unitaria*

Academic Vocabulary

ENGLISH	SPANISH
compare	*comparar*
part	*parte*
set	conjunto

Cognates are shown in italics; pointing out the similarity of these words to their English equivalents will help your Spanish-speaking students acquire vocabulary.

WHOLE GROUP

STEP 1 — Students practice toolkit strategies.

❶ Introduce the lesson.

💬 *Today you will practice comparing fractions. Then you will complete an assignment that will help me know what you've learned about fractions so far and how I can help you learn more. If there is still time, you can choose* **Uncover** *or* Roll Five.

❷ Present two pairs of fractions to compare.

Write the two pairs of fractions on the board: $\frac{9}{13}$ and $\frac{12}{13}$, $\frac{5}{6}$ and $\frac{5}{11}$. Then have students read each fraction aloud.

💬 *Compare the first pair of fractions. Talk with your partner.*

Give students time to confer.

💬 *Let's say aloud which fraction is greater.* ($\frac{12}{13}$)
Let's say aloud which fraction is less. ($\frac{9}{13}$)

Write < between the fractions and have students read aloud with you as you point: $\frac{9}{13}$ *is less than* $\frac{12}{13}$.

$$\frac{9}{13} < \frac{12}{13}$$
$$\frac{5}{6} \qquad \frac{5}{11}$$

Choose a student to explain. ($\frac{9}{13}$ and $\frac{12}{13}$ have common denominators; twelve one-thirteenths is greater than nine one-thirteenths.)

❸ Students compare the second pair of fractions.

Repeat the process for $\frac{5}{6}$ and $\frac{5}{11}$.

$$\frac{9}{13} < \frac{12}{13}$$
$$\frac{5}{6} > \frac{5}{11}$$

INDIVIDUALS

STEP 2 — Students complete an assessment.

❶ Explain the directions for the assessment.

Have students turn to *WorkSpace* page 16. Explain that these are pairs of fractions for them to compare using their *Comparing Fractions Toolkit* strategies. They should write < or > between each pair of fractions on the page.

Then have them look at page 17. Tell them that they will make a drawing for each sentence.

❷ Students complete both pages independently.

❸ Students practice with *Uncover* or *Roll Five*.

If students finish the assessment, and if time allows, they can choose either *Uncover* or *Roll Five*.

If students choose *Roll Five*, have them record their equations on one of the recording pages that start on *WorkSpace* page 49.

WORKSPACE PAGE 49

Roll Five

WORKSPACE PAGE 16

Show What You Know

WORKSPACE PAGE 17

Show What You Know

AFTER THE LESSON

## LESSON 10 continued Assessing Student Understanding

ASSESSMENT ✓ Progress Monitoring

Objectives
- Compare fractions with common numerators and common denominators.
- Name parts of sets as fractions and use standard notation.
- Represent fractional parts of sets with drawings and fractions.
- Solve problems using fractions.
- Communicate ideas with key math vocabulary: *common numerator*, *unit fraction*, and *common denominator*.

Assess

Use the annotated pages to correct *WorkSpace* pages 16 and 17.
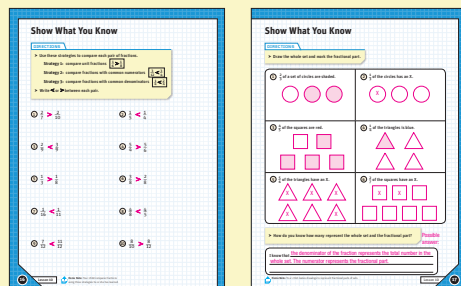
Note the progress of each student in the appropriate rows on the tracking chart on page 142.

Differentiating Instruction

Although the lessons are carefully scaffolded and paced at a rate most likely to give students a chance for optimal learning, there will be instances when some students are still struggling and need extra support. Likewise, there will be instances when some students would benefit from additional challenges or practice. Try the teaching ideas below.

For Students Who Need More Support
- If students have difficulty comparing fractions using the three toolkit strategies that have been presented, have them practice comparing fractions that can be verified with their fraction strips. Have students think and predict which fraction will be greater, then check using the fraction strips.

For Students Ready for a Challenge
- Have students grab a handful of change and use it to describe parts of a set.

In this example, the set of coins can be described in the following ways:
- $\frac{4}{10}$ quarters
- $\frac{6}{10}$ pennies
- $\frac{7}{10}$ heads
- $\frac{3}{10}$ tails

Students can ask each other questions about their sets of coins. It is easy to grab different handfuls of coins to come up with many different sets and fractions of sets.

ATTITUDE SURVEY

Name: _____ Date: _____

➤ **Fill in the circle of the answer that best fits you.**

1. I like math.
- ○ not at all
- ○ a little
- ○ some, but it's not my favorite
- ○ it's my favorite subject

2. I am good at math.
- ○ not at all
- ○ not very good
- ○ fairly good
- ○ very good

3. I need good math skills so I can get a good job when I am older.
- ○ agree a lot
- ○ agree a little
- ○ disagree a little
- ○ disagree a lot

4. I can get better in math if I work hard.
- ○ agree a lot
- ○ agree a little
- ○ disagree a little
- ○ disagree a lot

5. I like solving different problems.
- ○ agree a lot
- ○ agree a little
- ○ disagree a little
- ○ disagree a lot

6. I believe that math problems can often be solved using different strategies.
- ○ agree a lot
- ○ agree a little
- ○ disagree a little
- ○ disagree a lot

➤ **Which of these do you agree with? You may choose more than one answer.**

7. When math is challenging, I _____.
- ○ take on the challenge.
- ○ give up easily.
- ○ put in a little effort.
- ○ put in a lot of effort.
- ○ ask my teacher for help.

➤ **Write an answer to each question.**

8. What do you like most about math? Explain.
_____
_____
_____
_____

9. What do you like least about math? Explain.
_____
_____
_____
_____

Students complete "Show What You Know" assignments every fifth lesson. These assignments help you monitor student progress and assess understanding of the concepts and skills from the previous four lessons.

Show What You Know

DIRECTIONS

➤ Use these strategies to compare each pair of fractions.

Strategy 1: compare unit fractions $\quad \frac{1}{6} > \frac{1}{8}$

Strategy 2: compare fractions with common numerators $\quad \frac{3}{12} < \frac{3}{4}$

Strategy 3: compare fractions with common denominators $\quad \frac{1}{4} < \frac{2}{4}$

➤ Write < or > between each pair.

① $\frac{2}{7} > \frac{2}{10}$
② $\frac{1}{5} < \frac{1}{4}$

③ $\frac{2}{9} < \frac{3}{9}$
④ $\frac{5}{4} > \frac{5}{6}$

⑤ $\frac{1}{3} > \frac{1}{8}$
⑥ $\frac{3}{8} > \frac{2}{8}$

⑦ $\frac{1}{16} < \frac{1}{11}$
⑧ $\frac{4}{8} < \frac{4}{5}$

⑨ $\frac{7}{12} < \frac{11}{12}$
⑩ $\frac{8}{10} > \frac{8}{12}$

Home Note: Your child compares fractions using three strategies he or she has learned.

Show What You Know

DIRECTIONS
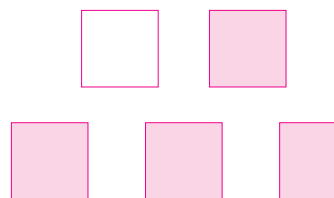
➤ Draw the whole set and mark the fractional part.

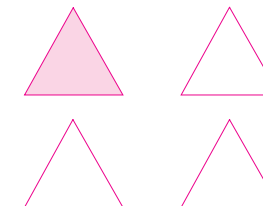① $\frac{2}{3}$ of a set of circles are shaded.
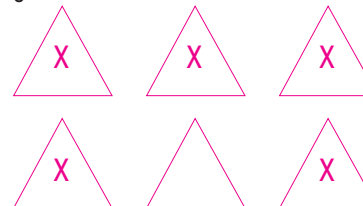
② $\frac{1}{3}$ of the circles has an X.

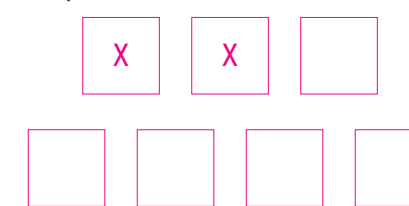③ $\frac{4}{5}$ of the squares are red.

④ $\frac{1}{4}$ of the triangles is blue.

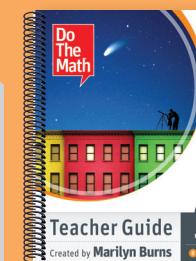⑤ $\frac{5}{6}$ of the triangles have an X.

⑥ $\frac{2}{7}$ of the squares have an X.

➤ How do you know how many represent the whole set and the fractional part?

Possible answer:

I know that the denominator of the fraction represents the total number in the whole set. The numerator represents the fractional part.

Home Note: Your child makes drawings to represent fractional parts of sets.

FRACTIONS B

Objectives Tracker

➤ Record the date in the appropriate box as students are assessed on each of the objectives. When the student consistently performs an objective with accuracy, add a checkmark to the box.

STUDENT NAMES

✓ MODULE OBJECTIVES								
Name parts of a whole and parts of a set as fractions and use standard notation.								
Compare and order fractions using benchmarks, common numerators, common denominators, and fractions one unit fraction away from 1 whole.								
Identify equivalent fractions.								
Solve problems using fractions.								
Communicate ideas with key math vocabulary: *numerator*, *common numerator*, *denominator*, *unit fraction*, *improper fraction*, *mixed number*, *equivalent*, and *common denominator*.								

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142

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Community News

Do The Math

Notes of interest to the classroom teachers and families of students participating in the *Do The Math* program
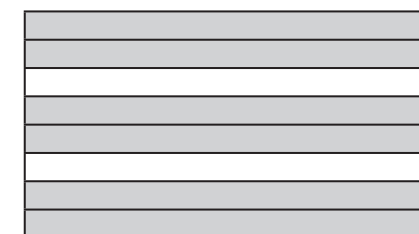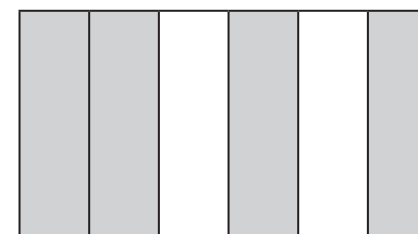
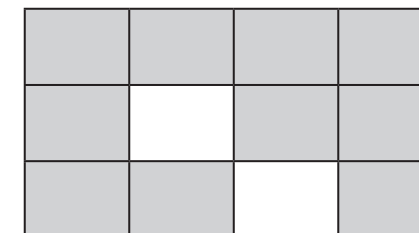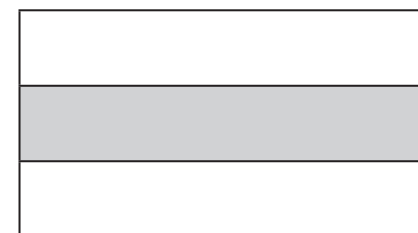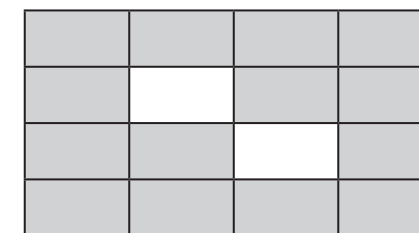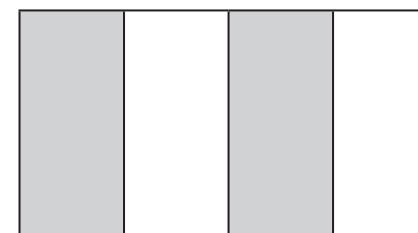▲ FRACTIONS B Equivalence and Comparison LESSONS 1–5

UPDATE: Students learn strategies for comparing fractions with the same numerator. For example, they learn that $\frac{1}{4}$ is greater than $\frac{1}{8}$ and $\frac{2}{3}$ is greater than $\frac{2}{5}$.

Fraction Flags

➤ Here is an activity that will give your child practice comparing fractions.

In each of the flags below, part of the flag is white. Write a fraction for the white part of each flag. Then put the fractions in order from least to greatest.

Here is a hint: write each fraction with the same numerator, 2.

143