



San Diego Unified School District

Instructional Module to Enhance the Teaching of

H A R C O U R T

Math

California Edition

Grade 3

Module 6: Revised

FRACTIONS AND DECIMALS

–WORK IN PROGRESS–

MODULE 6 – FRACTIONS AND DECIMALS

Modules represent individual units of study that lead to essential learnings

THREADS THROUGHOUT THE YEAR:

The threads represent ongoing learning opportunities in which students should be actively engaged throughout all units of inquiry during the entire school year. These items should not be isolated to any one particular unit of inquiry.

Students will:

- Develop understanding of numbers and the number system and use their understanding to solve problems and recognize reasonable results.
- Develop understanding of and fluency in basic computation and procedural skills.
- Use mathematical reasoning to solve problems.
- Communicate their mathematical thinking by using words, numbers, symbols, graphs and charts.
- Use equations and variables to express generalizations of patterns and relationships.
- Develop logical thinking to analyze evidence and build arguments to support or refute a hypothesis.
- Make connections among mathematical ideas and between other disciplines.
- Develop and use strategies, skills, and concepts to solve problems.
- Use appropriate tools, including technology, as vehicles to learn mathematical concepts.

These are essential learnings that represent bigger ideas/concepts:

- *Students understand the more fractional parts used to make the whole, the smaller the parts.*
- *Students understand that the number of parts used to make the whole is the denominator, and the number of parts being considered is the numerator.*
- *Students know equivalent fractions describe the same amount using different sized fractional parts of the whole.*
- *Students understand that the meanings of the operations for whole numbers are the same as the meanings for operations for fractions, and decimals are another form of representing fractions.*

These are essential questions that learners ask themselves in order to achieve the essential learnings:

- **How do I explain the meaning of a fraction and its numerator and denominator, and use my understanding to represent and compare fractions on a number line?*
- *How do I explain how changing the size of the whole affects the size or amount of a fraction?*
- *How do I use concrete materials and drawings to understand and show equivalent fractions?*
- *How do I use my understanding of numerators and denominators of fractions to read and write mixed numbers and model them with concrete materials and drawings?*
- *How do I use visual models to compare and order fractions with like and unlike denominators?*
- *How do I use my understanding of addition and subtraction of whole numbers to understand addition and subtraction of fractions?*
- *How do I use concrete materials and drawings to understand and show addition and subtraction of fractions?*
- *How do I use concrete materials and drawings to find and recognize the simplest form of a fraction?*
- *How do I use base-ten materials to represent and explain equivalent decimals and fractions for tenths and hundredths?*
- *How do I use a number line and base 10 materials to show that a fraction and a decimal do name the same (equivalent) amount?*
- *How do I use money to find and explain equivalent decimal and fraction representations of the different denominations of coins?*

** Presented in previous grade(s)*

Resources: Van de Walle: Chapters 15 (pp. 242-262)& 17 (pp. 280-288); *Mathematics Source Book: Fractions and Decimals* (pp. 59-78)

UNIT 9: FRACTIONS AND DECIMALS

Chapters 27 – 30

Key Mathematical Concepts:

- Understand that fractions represent equal parts of the whole and accurately label fractional parts of the whole.
- Know that changing the size of the “whole” changes the size or amount of the fraction.
Example: Depending on the size of the whole, $\frac{1}{4}$ of 1 whole could be greater than $\frac{1}{2}$ of another whole.
- Understand and use the relationship between whole numbers, simple fractions, and decimals.
- Compare fractions represented by drawings or concrete materials to show equivalency and to add and subtract simple fractions in context.
- Understand how fractions show parts of set and correctly use fraction notation to identify parts of a set.
- Understand how to compare and order fractions. Understand the meaning of numerators and denominators.
- Solve problems involving addition and subtraction of money amounts in decimal notation.
- Know and understand that fractions and decimals are two different representations of the same concept.
- Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.
- Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.

<p>Chapter 27: <u>Understand Fractions</u></p> <p>Lesson 1: Count Parts of a Whole Lesson 2: Count Parts of a Group Lesson 3: Equivalent Fractions Lesson 4: Compare and Order Fractions Lesson 5: Problem Solving Strategy: <i>Make a Model</i></p>	<p>Chapter 28: <u>Add and Subtract Like Fractions</u></p> <p>Lesson 1: Hands On: Add Fractions Lesson 2: Add Fractions Lesson 3: Hands On: Subtract Fractions Lesson 4: Subtract Fractions Lesson 5: Problem Solving Skill: <i>Reasonable Answers</i></p>
<p>Chapter 29: <u>Decimals and Fractions</u></p> <p>Lesson 1: Relate Fractions and Decimals Lesson 2: Hands On: Tenths Lesson 3: Hands On: Hundredths Lesson Lesson 4: Read and Write Decimals Lesson 5: Compare and Order Decimals Lesson 6: Problem Solving Skill: <i>Reasonable Answers</i></p>	<p>Chapter 30: <u>Decimals and Money</u></p> <p>Lesson 1: Relate Fractions and Money Lesson 2: Hands On: Relate Decimals and Money Lesson 3: Add and Subtract Decimals and Money Lesson 4: Problem Solving Strategy: <i>Break Problems into Simpler Parts</i></p>

Unit 9: FRACTIONS AND DECIMALS

<p>Day 1 CHAPTER 27: <i>Understand Fractions</i> Lesson 27.1 Count Parts of a Whole Day 1 of a 2-Day Lesson</p>	<p>Day 2 Lesson 27.1 Count Parts of a Whole Day 2 of a 2-Day Lesson</p>	<p>Day 3 Lesson 27.2 Count Parts of a Group</p>	<p>Day 4 Lesson 27.3 Equivalent Fractions Day 1 of a 2-Day Lesson</p>	<p>Day 5 Lesson 27.3 Equivalent Fractions Day 2 of a 2-Day Lesson</p>
<p>Day 6 Lesson 27.4 Compare and Order Fractions Day 1 of a 2-Day Lesson</p>	<p>Day 7 Lesson 27.4 Compare and Order Fractions Day 2 of a 2-Day Lesson</p>	<p>Day 8 Lesson 27.5 Problem Solving Strategy: Make a Model</p>	<p>Day 9 CHAPTER 28 <i>Decimals and Fractions</i> Lesson 28.1 Hands On: Add Fractions</p>	<p>Day 10 Lesson 28.2 Add Fractions</p>
<p>Day 11 Lesson 28.3 Hands On: Subtract Fractions</p>	<p>Day 12 Lesson 28.4 Subtract Fractions</p>	<p>Day 13 *Lesson 28.5 Problem Solving Skill: Reasonable Answers</p>	<p>Day 14 CHAPTER 29: <i>Decimals and Fractions</i> Lesson 29.1 Relate Fractions</p>	<p>Day 15 Lesson 29.2 Hands On: Tenths</p>
<p>Day 16 Lesson 29.3 Hands On: Hundredths</p>	<p>Day 17 CHAPTER 30 <i>Decimals and Money</i> Lesson 30.1 Relate Fractions and Money</p>	<p>Day 18 Lesson 30.2 Hands On: Relate Decimals and Money</p>	<p>Day 19 *Lesson 30.4 Problem Solving Strategy: Break Problems into Simpler Parts</p>	<p>Day 20 CA Connections Unit Review</p>

MODULE 6 NOTES

- Lessons with an overview with an “ * ” can be optional if additional instructional time is needed for particular unit concepts/topics.

Several of the “* lessons” provide important experiences with problem-solving strategies and can be built into other lessons if they are not taught.

- The focused “Problem Solving” lessons often provide a strong foundation for the concepts of the chapter and can be taught as the first in the chapter’s sequence.
- Module 6 eliminates the following lessons because they do not focus on key standards:
 - 29.4: Read and Write Decimals
 - 29.5: Compare and Order Decimals
 - 29.6: Problem Solving Skill: Reasonable Answers
 - 30.3: Add and Subtract Decimals and Money (concept taught in Number and Operations Unit).
- This module does not have lesson plans for:
 - Day 20: California Connection/Unit Review
- Recommendation:
 - Each Lessons 30.1, 30.2, and 30.4 **before** Chapter 29.

Students may develop a better understanding of decimals by connecting their understanding of money to decimals before working with tenths and hundredths.

DAY: 1
 Unit 9: FRACTIONS AND DECIMALS
 Chapter 27: Understand Fractions
 LESSON 27.1, pp. 482-485
 Day 1 of a 2-Day Lesson

MATERIALS:	*Transparency 27.1; 1 sheet of paper and scissors for each student; 2 rectangular pieces of paper per student.
LESSON FOCUS:	Count Parts of a Whole
CALIFORNIA STANDARDS:	<p>Mathematical Reasoning 1.1: Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.</p> <p>Number Sense 3.0: Understand the relationship between whole numbers, simple fractions, and decimals.</p>
PURPOSE OF LESSON:	<ul style="list-style-type: none"> • Understand that fractions represent part of a whole and identify, read, and write them. • Understand how to interpret pictorial models of fractional amounts by finding and naming the parts of the whole. • Understand that the fraction names equal parts of a whole. • Know how to represent fractions on a number line. • Understand why a fraction is equal to one when the numerator and denominator are equal.
<p>LAUNCH: Introduce students to concepts.</p> <p>*Transparency 27.1</p> <p>Student have books closed.</p> <p>Rectangular pieces of paper</p>	<p>Begin by asking students to explain/describe what they know about fractions. Chart their responses.</p> <p>Discussion Question: “Sharing Candy Equally”</p> <ul style="list-style-type: none"> • Use a rectangular piece of paper to represent the candy bar. • Ask students how this candy bar can be shared equally between two friends. Show/write the fraction that represents how much each friend would get if the candy was shared equally between them. ($\frac{1}{2}$; one-half) • Students suggest strategies for dividing the whole candy bar into halves. (folding, finding _ and drawing a line, etc). • Discuss the fraction notation of writing 1 over 2 to show one piece of the 2 needed to make the whole. • Ask students what the fraction notation would be for the whole candy bar (2 halves out of 2 halves needed for 1 whole). Refer to how many <u>equal</u> pieces of this size are needed for 1 whole bar. Confirm that 2 halves = the whole. Record $\frac{2}{2} = 1$ • Continue by asking what if four friends shared this candy bar? Ask students what portion of the candy bar would each person get if the candy bar was equally divided between four friends. • Students put their 2 halves together, fold them in half and cut along the fold to make 4 congruent pieces. Discuss how many equal pieces they have created and what the fraction notation of each piece is.

	<p>$\left(\frac{1}{4}\right)$ Ask students how many equal pieces of this size are needed for 1 whole bar. Record $4/4 = 1$.</p> <ul style="list-style-type: none"> Ask students to consider a bag with four candy bars. What fraction of the group of bars would each of 4 friends get if they each got the same amount? This is to help students recognize that a fraction is a number that names equal parts of a <u>whole</u> or equal parts of a group.
<p>EXPLORE: Work with the concept. Focus on students “doing mathematics.”</p> <p>Students have books closed.</p> <p>1 piece of paper for each student.</p>	<p>Learn, P. 482: All Together.</p> <ul style="list-style-type: none"> Write problem on board/overhead. Students sketch a pizza (circles, squares, or rectangles that are divided easily). Ask students to use their sketch and divide the pizza into 6 equal parts, as you discuss SE p. 482. <p>Teach, P. 482; Guided Instruction questions to guide discussion, including Examples A, B, C.</p> <ul style="list-style-type: none"> Ask students to sketch another pizza and divide into 4 equal parts. Repeat discussion as with p. 482. Highlight fractions as representations of division. See Reasoning section, margin TE p. 482. Counting Equal Parts, p. 483. See bullets top margin TE p. 483 to guide discussion. Ask students to draw a number line as you discuss it’s use.
<p>PRACTICE: Focus on Communication and Representation.</p>	<p>Check, P. 483: #1 – 4.</p> <ul style="list-style-type: none"> Do with students. <p>Practice & Problem Solving, p. 483, # 8 – 10; 12 – 14; 19.</p> <ul style="list-style-type: none"> Discuss.
<p>SUMMARIZE: Connect purpose to activities.</p>	<ul style="list-style-type: none"> Discuss meaning of a fraction. Students give examples of how fractions they use fractions in their lives. Write new vocabulary words (<u>fraction</u>, <u>numerator</u>, and <u>denominator</u>) to dictionary/classroom chart. Include pictures/models to illustrate each term and write meanings/definitions. Students record information in journals.
<p>HOMEWORK:</p>	<p>Practice & Problem Solving, P. 484: # 17-18. Include representations/models for each fraction for all problems.</p>

ROUTINES:**P. 485: Linkup to Social Studies**

Read and do *Linkup to Social Studies* with students.

Have them draw and color a flag to show fractional parts colored with different colors. Share student flags.

Reteach/reinforce any skills and concepts identified in homework check as needing attention.

DAY: 2
 Unit 9: FRACTIONS AND DECIMALS
 Chapter 27: Understand Fractions
 LESSON 27.1, pp. 482-485
 Day 2 of a 2-Day Lesson

MATERIALS:	4 paper strips (about 2" x 11") for each student.									
LESSON FOCUS:	Count Parts of a Whole									
CALIFORNIA STANDARDS:	<p>Mathematical Reasoning 1.1: Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.</p> <p>Number Sense 3.0: Understand the relationship between whole numbers, simple fractions, and decimals.</p>									
PURPOSE OF LESSON:	<ul style="list-style-type: none"> • Understand that fractions represent part of a whole and identify, read, and write them. • Understand how to interpret pictorial models of fractional amounts by finding and naming the parts of the whole. • Understand that the fraction names equal parts of a whole. • Know how to represent fractions on a number line. • Understand why a fraction is equal to one when the numerator and denominator are equal. 									
LAUNCH: Introduce students to concepts.	<p>Warm Up:</p> <ul style="list-style-type: none"> • Discuss how we know how many fractional pieces are needed to make the whole. Refer to number line, p. 483. • Record/discuss/chart patterns. • Students make a chart and sketches/diagrams or use models to determine the number needed to make wholes for the following denominations: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{5}$, and $\frac{1}{8}$. <p>Example:</p> <p style="margin-left: 40px;">CHART:</p> <table style="margin-left: 100px; border: none;"> <tr> <td style="text-align: center;">Fraction</td> </tr> <tr> <td style="text-align: center;"># Needed to Make the Whole</td> </tr> <tr> <td style="text-align: center;">Fraction Counting Pattern to 1</td> </tr> <tr> <td style="text-align: center;">$\frac{1}{2}$</td> </tr> <tr> <td style="text-align: center;">$\frac{1}{3}$</td> </tr> <tr> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">3</td> </tr> <tr> <td style="text-align: center;">$\frac{1}{2}$, $\frac{2}{2}$, or 1</td> </tr> <tr> <td style="text-align: center;">$\frac{1}{3}$, $\frac{2}{3}$, $\frac{3}{3}$, or 1</td> </tr> </table> <ul style="list-style-type: none"> • Review fraction concepts and vocabulary. 	Fraction	# Needed to Make the Whole	Fraction Counting Pattern to 1	$\frac{1}{2}$	$\frac{1}{3}$	2	3	$\frac{1}{2}$, $\frac{2}{2}$, or 1	$\frac{1}{3}$, $\frac{2}{3}$, $\frac{3}{3}$, or 1
Fraction										
# Needed to Make the Whole										
Fraction Counting Pattern to 1										
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2										
3										
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<p>EXPLORE: Work with the concept. Focus on students “doing mathematics.”</p> <p>2” x 11” strips of paper for each student.</p>	<ul style="list-style-type: none"> • Fraction Strips: Use 2” x 11” paper: Students make a point at the top left end of the strip and another point at the top right end to make fraction number lines. The top edge is the line. • Students fold strip, first in half, then half again, to approximate fourths, and write numbers just below the line. <div style="text-align: center;"> <table border="1" style="margin: auto;"> <tr> <td style="text-align: center;">•</td> <td style="text-align: center;">•</td> <td style="text-align: center;">•</td> <td style="text-align: center;">•</td> <td style="text-align: center;">•</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1/4</td> <td style="text-align: center;">2/4</td> <td style="text-align: center;">3/4</td> <td style="text-align: center;">4/4</td> </tr> <tr> <td style="text-align: center;">0/4</td> <td></td> <td style="text-align: center;">1/2</td> <td></td> <td style="text-align: center;">1</td> </tr> </table> </div> <ul style="list-style-type: none"> • Ask students what number they should write at the top left end, (0), and what number they should write at the top right end if this whole number line to stand for 1. (1) • Make a point at the each of the folds. Discuss the number of equal parts on the strip. (4) • Ask students to label the middle point by counting how many fourths it shows. (2/4) <p>Note: Some students may also say that this is 1/2 of the line. Ask how they know and have them show/explain to class, and students record _ below 2/4.</p> <ul style="list-style-type: none"> • Finish labeling the points by counting by fourths: _, 2/4, _, 4/4. Discuss the labeling of the last point using fourths. (4/4 and 1) • Students work with partners and repeat process for halves, thirds, and eighths. Students arrange strips: <div style="text-align: center;"> <table border="1" style="margin: auto;"> <tr> <td style="text-align: center;">•</td> <td style="text-align: center;">•</td> <td style="text-align: center;">•</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1/2</td> <td style="text-align: center;">2/2</td> </tr> </table> <table border="1" style="margin: auto;"> <tr> <td style="text-align: center;">•</td> <td style="text-align: center;">•</td> <td style="text-align: center;">•</td> <td style="text-align: center;">•</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1/3</td> <td style="text-align: center;">2/3</td> <td style="text-align: center;">3/3</td> </tr> </table> </div> <ul style="list-style-type: none"> • Ask students questions about the relationship of specific fractions, Ex: 2/3, and make comparison statements: “2/3 is greater than 1/2 and less than 3/4.” <p>Note: Students keep fraction number lines for use in future lessons. (Lesson 27.3 and others)</p>	•	•	•	•	•	0	1/4	2/4	3/4	4/4	0/4		1/2		1	•	•	•	0	1/2	2/2	•	•	•	•	0	1/3	2/3	3/3
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<p>PRACTICE: Focus on Communication and Representation.</p>	<p>Practice & Problem Solving, p. 484 – 485, #20 – 24.</p> <ul style="list-style-type: none"> • Students work individually/with partners. • Make “models” to represent each fraction on the number line. <p>For example: Draw a square or rectangle and divide it into 8 equal parts and write: 2/8 = 8 equal parts with 2 parts shaded.</p> <ul style="list-style-type: none"> • Share strategies and thinking. 																													
<p>SUMMARIZE: Connect purpose to activities.</p>	<p>ASSESS, P. 485: DISCUSS. ASSESS, P. 485: WRITE. Share responses.</p>																													
<p>HOMEWORK:</p>	<p>Mixed Review and Test Prep. P. 485</p>																													

ROUTINES:**What Comes Next? (Number Patterns: Skip Counting)**

Write and say the following. Students supply missing numbers and explain how they determined the counting pattern.

Remind students to refer to the 100 grid.

7, 11, 15, 19, ____, ____

1, 4, 7, 10, ____, ____

9, 12, 15, 18, ____, ____

75, 80, 85, 90, ____, ____

14, 21, 28, 35, ____, ____

18, 27, 36, ____, ____

22, 20, 18, 16, ____, ____

25, 23, 21, 19, ____, ____

12, 16, 20, 24, ____, ____

85, 80, 75, 70, ____, ____

16, 24, 32, ____, ____

14, 12, 10, ____, ____

Continue as desired. Have students make up patterns and share with class. Student who completes pattern first becomes new leader.

DAY: 3
 Unit 9: FRACTIONS AND DECIMALS
 Chapter 27: Understand Fractions
 LESSON 27.2, pp. 486-487

MATERIALS:	<ul style="list-style-type: none"> • Transparency 27.2; 8 counters for each student. • Classroom objects or pieces of fruit.
LESSON FOCUS:	Count Parts of a Group
CALIFORNIA STANDARDS:	<p>Mathematical Reasoning 1.1: Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.</p> <p>Number Sense 3.0: Understand the relationship between whole numbers, simple fractions, and decimals.</p>
PURPOSE OF LESSON:	<ul style="list-style-type: none"> • Understand that fractions can represent part of a group and identify, read, and write such fractions. • Recognize that the numerator names the parts in the group being counted and that the denominator names the total parts in the group. • Understand how and why the numerator and denominator can be changed.
<p>LAUNCH: Introduce students to concepts.</p> <p>Transparency 27.2</p> <p>8 counters for each student.</p> <p>Classroom objects or pieces of fruit.</p>	<p>HW: Collect and correct <i>Mixed Review</i>.</p> <ul style="list-style-type: none"> • Question: <i>What's the fraction of the group?</i> • Students use counters and 8 students are in front of the room. • Students use counters to model the action of the students in the front of the class. • <i>How do we divide the group of 8 students into 2 equal size groups or into halves?</i> • Ask students to divide the 8 counters/students into 4 equal size groups. Discuss students' understanding/thinking about this task. • Ask students what fractional parts the counters/students are divided into what fractional parts. (fourths) • Ask students to divide the counters/students into 8 equal size groups and name the fractional parts. (eighths) • *Special Needs, TE p. 486B for all students. This can be used while 8 students are standing in front of the room. <p>Alternative Teaching Strategy, p. 486B.</p>
<p>EXPLORE: Work with the concept. Focus on students "doing mathematics."</p> <p>Students have books closed.</p> <p>Students combine counters to make group of 16.</p>	<p>Learn, p. 486: Go Fish. Write problem on board/overhead.</p> <ul style="list-style-type: none"> • Suggestion: Show fish as 1 group of 8 for Allison and 1 group of 8 for the father, and not show the fish grouped by 2s as shown in the book. <p>Teach, p. 486; Guided Instruction questions to discuss problems.</p> <ul style="list-style-type: none"> • Students explain and represent answers to explain/justify solutions. <p>Check, P. 487, #1 – 3. Do with students orally.</p>

PRACTICE: Focus on Communication and Representation.	Practice & Problem Solving, p. 487, # 4-7 do with students. • Discuss. Then, #8 – 10. Discuss strategies and solutions. • Practice & Problem Solving, p. 487, #11 – 15. Students work with partners. * Practice & Problem Solving, P. 487: # 16-17.
SUMMARIZE: Connect purpose to activities.	ASSESS, P. 487: DISCUSS. • Students show a group with 8 objects and decide how many objects represent: 1/2 of this group? 1/4 of this group? • Students use objects in groups to explain/show the amount in _ and _ .
HOMEWORK:	Mixed Review and Test Prep, P. 487, # 18 – 22. • Write 4 fractions, explain and show what each means, e.g., 3/8 means 3 of 8 equal parts.

ROUTINES:**Divide and Compare**

Go around class writing and saying the following problems.

Explain that students find the quotient and compare it with the other given number, e.g., $4 \div 2 ? 2$. (The “?” can be read as “is what compared to,” i.e., 4 divided by 2 is what compared to 2.)

Students reply with one of the following: equals; is less than; or is greater than.
 (Ex: $4 \div 2$ equals 2)

$6 \div 2 ? 3$

$10 \div 2 ? 4$

$24 \div 6 ? 6$

$14 \div 7 ? 3$

$5 \div 1 ? 4$

$16 \div 8 ? 8$

$20 \div 5 ? 4$

$36 \div 6 ? 6$

Continue with above or vary by asking:

$64 \div 8 = ?$

$72 \div 9 = ?$

$25 \div 5 = ?$

$32 \div 4 = ?$

If students are having trouble – review strategies for learning basic facts.

Continue providing additional practice.

Reteach/reinforce any skills and concepts identified in homework check as needing attention.

