



SAN DIEGO CITY SCHOOLS

Department of Mathematics

Instructional Module to Enhance the Teaching of

PRENTICE HALL

PRE-ALGEBRA

California Edition 2001

GRADE 7

Module 5

Operations with Fractions

KEY MATHEMATICAL CONCEPTS FOR GRADE SEVEN

THE BIG IDEAS:

By the end of grade seven, students will:

- Know the properties of, and compute with, rational numbers by manipulating numbers and equations. Know and use different representations of fractional numbers (fractions, decimals, and percents) and are proficient at changing from one to another. Understand and use factoring of numerators and denominators and properties of exponents.

Note: Negative fractions are formally introduced and studied for the first time.

- Increase their facility with ratio and proportion, compute percents of increase and decrease, and compute simple and compound interest.
- Graph linear functions and understand the idea of slope and its relation to ratio. Solve simple linear equations and inequalities over the rational numbers.
- Know the Pythagorean Theorem and solve problems in which they compute the length of an unknown side.

Note: The Pythagorean Theorem is probably the first true theorem that the students will have seen.

- Know how to compute the surface area and volume of basic three-dimensional objects and understand how area and volume change with a change in scale.
- Make conversions between different units of measurement. Know and use various forms of displays for data sets.

(Notes from Mathematics Framework for California Public Schools, Grade Seven, p. 149-152.)

Key Mathematical Concepts Addressed: Chapter 5, Operations with Fractions

- ***NS 1.2 Add, subtract, multiply, divide fractions; add, subtract, multiply to solve equations involving fractions.**
- NS 1.3 Convert fractions to decimals.
- ***NS 1.5 Convert terminating decimals to reduced fractions.**
- ***NS 2.2 Add & subtract fractions using factors to find common denominator.**
- ***NS 2.3 Simplify rational numbers by using exponent rules.**
- AF 2.1 Find powers of products and quotients

*** Key Standard**

MODULE 5: Operations with Fractions

DAY 1: LESSON 5 – 6 p. 251 *Optional

LESSON FOCUS:	Reasoning Strategy - Work Backward
CA STANDARD:	MR 2.5; 3.3
Purpose of Lesson:	At the end of the lesson, students will be able to use the reasoning strategy of beginning to solve with the end of a problem and working backward to find a solution.
Warm-up/ Routine(s):	<u>Quick Write:</u> Make two columns on paper. List things that you would be more likely to measure with a one-foot ruler; things you would measure with a yardstick. After a minute or two, share out. <i>What makes the deciding point between using a ruler or a yardstick?</i>
LAUNCH: TE p 251 TE p 223, <i>Transparency 55</i>	Refer to TE p 251, <i>Connecting to Students' Lives:</i> "How do you determine what time in the morning you need to get up in order to get to school on time?" (Might use <i>Transparency 55</i> as model of working backward with a clock.) Small group/class discussion.
EXPLORE: p. 253	Pose the following problem situation: "I'm planning a trip to the Grand Canyon. I want to see it before the snows make the roads impassable. It'll take about 5 hours of driving. On the way, I want to make three sightseeing stops. I figure 1/2 hour for each stop. I want to arrive at the hotel at 3:30pm. What time should I plan to leave home?"
Practice:	p. 253, #1 and 3
SUMMARIZE:	Partner Talk & Share Out: <i>When you meet problem situations like these, what in the problem lets you know that you could work backwards to solve it?</i>
Closure:	Time to reflect back on the purpose of the lesson, and help students make meaningful connections.
Homework:	p. 254, #6, 7, 9, 10

MODULE 5: Operations with Fractions

DAY 2: LESSON 5 – 1, pp 224-228

LESSON FOCUS:	Comparing and Ordering Fractions
CA STANDARD:	MR 1.1,
Purpose of Lesson:	At the end of the lesson, students will be able to find the least common multiple (lowest multiple that is shared) and compare fractions in real world problem situations.
Warm-up/ Routine(s): p. 245	p. 245, See <i>Customary Units of Measure</i> chart. As a class decide which would be the most appropriate unit of measure for #1-4, TRY THIS, bottom of p 245.
LAUNCH: TE p. 224 p. 224	Refer to <i>Connecting to Students' Lives</i> - counting by 2's; 5's. What is the smallest multiple that they share? Introduce LCM; do EXAMPLE 1, p. 224 together. For larger numbers, it may be faster to find prime factors of each number. Do EXAMPLE 2 together. Apply to finding common denominator of fractions - EXAMPLE 5, p. 226
EXPLORE: p. 228	Have small groups work together & chart to solve Pizza Problem p. 228, #53 Show in picture and by finding LCM to find common denominator. Explain who ate the most and how they know they are mathematically correct. Extension: You & your best friend share a pizza. You eat $\frac{3}{4}$ of the pizza and your friend eats $\frac{7}{10}$ of the pizza. Who ate the most? Explain your thinking.
Practice:	p. 228; #50 Frank's Snack Shop
SUMMARIZE:	Student groups share their thinking & reasoning.
Closure:	Time to reflect back on the purpose of the lesson, and help students make meaningful connections.
Homework:	p. 227; #2, 3, 10-12

MODULE 5: Operations with Fractions

DAY 3: LESSON 5 – 2, pp. 229-233

LESSON FOCUS:	Writing fractions as decimals
CA STANDARD:	NS 1.3; NS 1.5 - Key Standard
Purpose of Lesson:	At the end of the lesson, students will be able to write fractions as decimals (terminating/repeating) and use them in a real world situation, such as buying fabric.
Warm-up/ Routine(s): TE p. 224	<i>Daily Skills Warm-Up</i> transparency (5-1), #1 & 2 only, TE p. 224 OR "At Frank's Snack Shop, Alana works every fourth day, Jesse works every fifth day & Tynne works every sixth day. <i>How many days will pass before they all work together?</i> " Solve with a partner. Share at table group.
LAUNCH: TE p. 229 p. 230	Refer to <i>Connecting to Students' Lives</i> , TE p. 229. Do PART 1; EXAMPLE 1 together; TRY THIS, p. 229, #1-4 Find decimal amount for $\frac{2}{3}$. Refer to EXAMPLE 2, p. 230
EXPLORE:	Pose the situation: Lashonne needs $\frac{5}{8}$ yd of fabric for a craft project. He goes to the Michaels craft store in Mission Valley only to find out that it has been sold to a Euro business group & is now called <i>Michels</i> and everything in the store is labeled in metric amounts! He finds two remnants marked 0.66 yd and 0.60 yd. <i>"Is either piece long enough? Which should he buy? How do you know?"</i> Have small groups work together to express their solutions in a variety of ways: in inches, as fractions with a common multiple, or as decimal amounts. Share solutions and strategies.
Practice:	p. 232. #22-24; #38-40
SUMMARIZE:	Have students explain to a partner how to write a fraction as a decimal. Record in their own words in math notebook.
Closure:	Time to reflect back on the purpose of the lesson, and help students make meaningful connections.
Homework:	p. 232, #1-3 p. 233; #54, 57, 58, 60, 63

MODULE 5: Operations with Fractions

DAY 4: LESSON 5 – 2, pp 229-233

LESSON FOCUS:	Writing Decimals as Fractions
CA STANDARD:	NS 1.3; NS 1.5 – Key Standard
Purpose of Lesson:	At the end of the lesson, students will be able to read and write decimals as fractions in simplest form and write a repeating decimal as a fraction.
Warm-up/ Routine(s):	As a class, discuss homework problem #54 - justify - "How do you know?"
LAUNCH: TE p. 231	Refer to <i>Connection to Economics</i> , TE p. 231 Do PART 2, p 231, Example 4, together as a class - reading a decimal & writing a mixed number in simplest form. Do <i>TRY THIS, # 11 & 13</i> . Have students suggest another to try. Do Example 5 together as class - <i>TRY THIS, #14-16</i>
EXPLORE: p. 232 TE p 232, Challenge	Give students the solutions to problems #44-47 on p. 232. Students work with a partner to show how these amounts were found. Challenge groups to express $1/17$!! (See Challenge TE p 232.)
Practice:	p. 232, #48, 49
SUMMARIZE:	Develop class definition for "a fraction in simplest form". Chart suggestions from the class. Come to a consensus. Add to math notebooks.
Closure:	Time to reflect back on the purpose of the lesson, and help students make meaningful connections.
Homework	TE p. 228, <i>Enrichment</i>

MODULE 5: Operations with Fractions

DAY 5: LESSON 5 – 3, pp 235-239

LESSON FOCUS:	Adding and Subtracting Fractions and Mixed Numbers
CA STANDARD:	NS 1.2 - Key Standard; NS 1.5 - Key Standard
Purpose of Lesson:	At the end of the lesson, students will be able to use skills of adding or subtracting fractions or mixed numbers in real world situations.
Warm-up/Routine:	<i>AFTER THE LESSON: Lesson Quiz, Transparency # 110, Lesson 5-2 (mini-assessment) TE p. 230</i>
LAUNCH: Refer to <i>TE p. 221D, 5-3</i> . Use number lines (Transparency p. 7) to demonstrate why $1/2 + 1/3$ cannot be equal to $2/5$.	<p>Pose the situation: Darren's father told him that he had to share some of his baseball cards with his younger brothers. He decided that he could give Andy $1/2$ of them and Brad $1/3$ of them which would leave him with $3/5$ of them. He was delighted to know that he still would have the most! <i>Where did Darren's thinking go wrong?</i></p> <p>What if he took $1/2$ of his cards and gave Brad $1/3$ of that amount and Andy got the remainder of them. What fractional amount would each brother have then? Would Darren have the most that way?</p>
EXPLORE: Materials: 1 die per table group or 1 die for teacher to use with whole class	<p>Number Sense: Introduce game; "<i>Fitting Fractions</i>" (See next page.) Students set up <u>addition</u> game board on notebook paper.</p> <p>Whole Class: Teacher establishes TARGET (greatest sum, equals 1, less than 1, etc.) Roll one die - students must place on board. Then second die is rolled-must be placed on board & so on. (You may choose to roll an additional digit & have a "reject box" so students can discard one number.) Once board is full, students compute to see who got closest to the targeted amount. Student closest or at target receives a point - if more than one hit target, they get point as well. Then new board is prepared <u>addition and subtraction</u> (if students are ready for both operations) & a new target is chosen.</p> <p>After a number of rounds, table groups can combine their scores to determine a group winner. If played by students at tables, they rotate rolling the die & establishing the target.</p>
Practice:	p. 238, CHECK UNDERSTANDING, #1-4
SUMMARIZE:	<p>QUICK WRITE: <i>If the target is the greatest sum, describe how the game could be won. Share your thinking with a partner. Share out as class.</i></p>
Closure	Time to reflect back on the purpose of the lesson, and help students make meaningful connections.
Homework:	p. 237; The recipe makes 2 loaves of banana bread. You want to make six loaves for the bake sale. Using repeated addition, what would be the amount of each ingredient you would need? For a dozen loaves?

MODULE 5: Operations with Fractions

DAY 6: LESSON 5 – 4, pp 240-244

LESSON FOCUS:	Multiplying and Dividing Fractions
CA STANDARD:	NS 1.2 - Key Standard; MR 2.6
Purpose of Lesson:	At the end of the lesson, students will be able to multiply & divide fractions in a game setting to facilitate skills.
Warm-up/ Routine(s):	Partner Talk: p. 238, Error Analysis, #41 Share out thinking with class.
LAUNCH: p.240; Books closed Refer: TE 221E	Refer to p. 240. Do paper folding activity described in <i>Introducing the Concept</i> (multiplication of fractions) OR use Transparency #54 for Multiplication Models. Refer to TE 221E for example to share re: division of fractions.
EXPLORE:	As a whole class, play "Fitting Fractions" using multiplication and then division if students are ready to add this operation. (Depending upon skill levels, students may be able to play on their own as table groups.)
Practice: Success Building Master, p. 18	Students work with partner to solve PUZZLE: <i>Fraction Equation Squares</i> , Success Building Puzzle & Problem Masters, p. 18.
SUMMARIZE:	Partner Talk/Write: <i>If you are trying to get the greatest amount (product or sum), how is the game using multiplication of fractions different from using addition?</i> Share out as a class. (What would the strategy be if you were trying to find the least product or sum?)
Closure:	Time to reflect back on the purpose of the lesson, and help students make meaningful connections.
Homework:	PUZZLE: Egyptian Division, Success Building Masters, p. 19

MODULE 5: Operations with Fractions

DAY 7: LESSON 5 – 4, pp 240-244

LESSON FOCUS:	Multiplying & Dividing Fractions
CA STANDARD:	NS 1.2 - Key Standard; MR 2.6
Purpose of Lesson:	To provide students another opportunity to build upon & apply skills in multiplication & division of fractions in real world situations.
Warm-up/ Routine(s):	QUICK WRITE: <i>Which quotient does not equal 1?</i> p. 244, #57, TEST PREP Explain your thinking. Then explain how you know to a partner; then share thoughts with class.
LAUNCH:	Chin agreed to babysit at \$4.50 an hour for his neighbor's twins for the day. They are a lively pair and he has a plan to totally wear them out during the morning so he can relax and play video games all afternoon. If all goes well, he'll have a great day & make some money as well!
EXPLORE:	His plan involves hiking the 13 1/2 miles of canyon trails that are near his neighborhood. Each boy will carry a backpack with water, trail mix & power bars. Chin thinks that a rest stop every 2 1/4 mi. would be fine but he'd like to make better time. <i>How many rest stops would there be at one every 2 1/4 miles? If they made fewer rest stops, how many miles would they have to walk between each stop? Explain your reasoning.</i>
Practice:	6 1/2 hours later, the neighbors came home to find the twins playing video games and Chin asleep on the couch. Less than a mile into the walk the twins refused to carry their packs any farther. Poor Chin carried all three packs for the rest of the walk & he was exhausted. He tucked his money into his pocket without even counting it. <i>How much should he have received?</i>
SUMMARIZE: TE p. 242, Ex. 5	Partner Talk/Write: <i>"How does dividing mixed numbers differ from multiplying mixed numbers?"</i> Give an example. (Refer to TE p 242, Example 5) Share out with the class.
Closure:	Time to reflect back on the purpose of the lesson, and help students make meaningful connections.
Homework: p. 244	P. 244, <i>Enrichment or Reteaching</i> according to student needs.

MODULE 5: Operations with Fractions

DAY 8: LESSON 5 – 7, pp 255-258

LESSON FOCUS:	Using Subtraction and Addition to Solve Equations
CA STANDARD:	NS 1.2; NS 2.2 - Key Standards; MR 2.8
Purpose of Lesson:	At the end of the lesson, students will be able to solve an equation involving addition of fractions using the inverse operation - "undo" addition by using subtraction - to isolate the variable & solve.
Warm-up/ Routine(s): TE p. 255	TE p. 255, <i>Daily Skills Warm-Up</i> Transparency-Numbers #6 & 7 only. Have students talk at their tables about what they had to do to solve equations with addition & subtraction. Share out understandings.
LAUNCH: p. 255	p. 255, EXAMPLE 1, use recycling problem to begin the conversation. Solve the problem situation together looking closely at the "undoing" that occurs. Talk about how to prove that this answer is reasonable (<i>Check</i>).
EXPLORE:	<p>Pose the situation: Seven years later in 2002 we are no closer to the $\frac{1}{3}$ target - in fact the EPA reported recently that recycling efforts have dropped off across the nation!</p> <p>One 7th grade class at a San Diego school decided to start their own recycling project. They found that in September they recycled about $\frac{1}{3}$ of the waste paper at their school. The student council set a goal to recycle $\frac{3}{4}$ of the school's waste paper by the end of the year. At winter break they were recycling close to $\frac{1}{2}$ of the waste paper. <i>How much of an increase did they make from the beginning of school until December? How much more of an increase do they need to reach $\frac{3}{4}$ by the end of the school year? Several of the students believe they can do even better than the council's goal.</i></p> <p><i>What might that fractional amount be and how much greater would that be than the goal already set? Why do you think that your new fractional amount is reasonable? Chart or share out.</i></p>
Practice:	p. 257, #7 Challenge students to write a similar problem of their own.
SUMMARIZE: p. 258	<p>Table Group Talk & Chart:</p> <p><i>We talk about using inverse operations to "undo" addition or subtraction. What does that mean? Give an example.</i></p> <p>Post charts & have groups explain their thinking.</p>
Closure:	Time to reflect back on the purpose of the lesson, and help students make meaningful connections.
Homework: p. 258	p. 258, #36 - 40 and #52, a. & b.

MODULE 5: Operations with Fractions

DAY 9: LESSON 5 – 7, pp 255-258

LESSON FOCUS:	Using Addition and Subtraction to Solve Equations
CA STANDARD:	NS 1.2; NS 2.2 - Key Standards; MR 2.8
Purpose of Lesson:	At the end of the lesson, students will have had an opportunity to deepen understandings and be able to apply skills in using inverse to "undo" addition & subtraction in equations.
Warm-up/Routine:	Daily Skills Warm-Up Transparency, Lesson 5-5, TE p. 245, #5 & 6 only. OR discuss one of the homework "real world" problems, p 258, #36-38.
LAUNCH:	"The Amazing Math Trick" (To illustrate Undoing Operations) Think of a number from 1-25. Add 9 to it. Multiply the result by 3. Subtract 6 from the current answer. Divide this answer by 3. Now subtract your original number. (No matter what number chosen, final answer will be 7!) Try again. <i>Did you get 7 again? Did everyone at your table get 7? How does this number trick work?</i>
EXPLORE:	From Work in the Launch: Have students work collaboratively to write the sequence of expressions to show what is happening at each step. Then suggest they explore working backwards " undoing " each step to understand exactly what is occurring. Have student write in their own words how they think this mathematical trick works.
Practice:	<i>Does it work with fractions? Positive & negative numbers?</i>
SUMMARIZE:	QUICK WRITE: In solving equations using addition & subtraction, we use inverse operations to "undo" the addition or subtraction. In your own words, explain what this means and give an example. Share your thinking with a partner. How is your thinking the same? Different?
Closure:	Time to reflect back on the purpose of the lesson, and help students make meaningful connections.
Homework:	Can you design your own number trick similar to this one? Be prepared to share it tomorrow with a friend.

MODULE 5: Operations with Fractions

DAY 10: LESSON 5 – 8, pp 259-263

LESSON FOCUS:	Using Multiplication to Solve Equations
CA STANDARD:	NS 1.2 - Key Standard
Purpose of Lesson:	At the end of the lesson, students will be able to solve equations by multiplying fractions & mixed numbers.
Warm-up/ Routine(s):	Play whole class game of "Fitting Fractions" to continue to further understanding of addition, subtraction, multiplication & division of fractions.
LAUNCH: TE p. 259	Refer to TE p 259, <i>Background for the Lesson</i> and <i>Connecting to Prior Knowledge</i> . Do EXAMPLE 1 & EXAMPLE 2 to refresh students thinking about "undoing" multiplication by multiplying each side of the equation by the reciprocal. (Discuss what would happen if one of the amounts were negative.) How do you know? Can you show us?
EXPLORE: p. 260	Give problem from EXAMPLE 4. Have students work in pairs to solve. Share as a class. Have students write their own word problems similar to this for these equations (or equations of your choice): $3\frac{1}{2}n = 28 \quad \frac{1}{3}y = 12 \quad \frac{7}{8}x = 3\frac{1}{2}$
Practice:	p. 262, #55 TEST PREP
SUMMARIZE:	Pose this problem: $\frac{2}{3}a = \frac{4}{5}$ Have students tell each other what they understand about solving an equation like this that involves multiplying fractions. Share out thinking as a class.
Closure:	Time to reflect back on the purpose of the lesson, and help students make meaningful connections.
Homework:	P. 261, #46, <i>Critical Thinking</i> ; P. 262, #49, 50, 54, 56 <i>Writing</i> P. 263, #19 <i>Choose a Strategy</i>

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DAY 11: LESSON 5 – 9, pp 265-268

LESSON FOCUS:	Finding Powers of Products and Quotients
CA STANDARD:	NS 2.3 - Key Standard; AF 2.1, 2.2
Purpose of Lesson:	At the end of the lesson, students will be able to find powers of products and find powers of quotients.
Warm-up/ Routine(s):	Number Sense: Refer to Routine/Warm-Up Bank OR AFTER THE LESSON, Lesson Quiz Transparency, TE p. 260, #1-3 Solving equations with fractions.
LAUNCH: TE p. 265 p. 265	TE p. 265, <i>Connecting to Students' Lives</i> Do p. 265, PART 1 as a class. Do a couple of additional examples. Challenge students to verbalize a rule for what happens to each factor in the equation. (See p 265, Rule for Raising a Product to a Power)
EXPLORE:	Allow students to explore: "How this rule might apply when finding powers of quotients?" Give them $(\frac{4}{5})^3$ and have them experiment with how it might be solved. (Refer to PART 2, Problem Example.) Share Student Thinking Ask: <i>Can a rule be written for finding powers of quotients?</i> <i>How might we write such a rule?</i> <i>How is it like or unlike the one for Raising a Product to a Power?</i>
Practice:	Application: p. 266, EXAMPLE 3. Do TRY THIS, #8-10.
SUMMARIZE: p. 268	PARTNER TALK/WRITE: Discuss <i>Error Analysis</i> - p. 268 Share thinking as a class.
Closure:	Time to reflect back on the purpose of the lesson, and help students make meaningful connections.
Homework:	P. 267, #16, 17, #43 & 44 P. 268, #55, 56

MODULE 5: Operations with Fractions

DAY 12: LESSON 5 – 7&8, pp 255-263

LESSON FOCUS:	Solving Equations by Adding, Subtracting, and Multiplying Fractions
CA STANDARD:	NS 1.2; 2.2 - Key Standards
Purpose of Lesson:	Enrich/Reteach as necessary - At the end of the lesson, students will better be able to use Addition, Subtraction, and Multiplication of Fractions to Solve Equations.
Warm-up/ Routine(s):	Number Sense: Refer to Routine/Warm Up Bank.
LAUNCH:	<i>"Fitting Fractions"</i> - Continue to extend skills with fractions. Use the day as needed for Reteaching, Reflecting, Enriching . . .
EXPLORE:	
Practice:	
SUMMARIZE:	
Closure:	Time to reflect back on the purpose of the lesson, and help students make meaningful connections.
Homework:	Teacher Choice

MODULE 5: Operations with Fractions

DAY 13: ASSESSMENT

LESSON FOCUS:	Assessment of Operations with Fractions
CA STANDARD:	NS 1.2; 1.5, 2.2, 2.3 - Key Standards for this Chapter
Purpose of Lesson:	Assessment
Warm-up/ Routine(s):	
LAUNCH:	
EXPLORE:	
Practice:	Play Number Sense Game from Routine/Warm-Up Bank
SUMMARIZE:	<u>REFLECTION:</u> <i>What was the most important learning piece for you in this chapter? Why?</i>
Closure:	Time to reflect back on the purpose of the lesson, and help students make meaningful connections.
Homework:	Teacher Choice Suggestion: Have students do selected problems from p. 275; <i>Skills & Concepts You Need for Chapter 6</i> . This might be a "heads up" for them to know what this chapter will be dealing with . . .