LESSON 4

Is There Action in Fractions?

Number Sense and Fractions

Objectives . . . Students will be able to:

- *Develop number sense of fractions.*
- *Use models to represent fractions.*
- *Apply fractions to problem situations.*

NCTM Standards and NAEP Strand

Concepts learned and applied in Lesson 4 correlate to NCTM Standards 1, 2, 3, 4, 6, and 12; and NAEP Strand 1 (Number Sense, Properties, and Operations).

Materials List

The Class

- scissors or plastic knives (for cutting the licorice)
- paper and pencil
- *Optional*: rulers (some students/groups may want them to divide the items "fairly")
- *Optional*: licorice (10 pieces for each group)

Sugar/Diabetic Concerns

- Substitute any snack item that can be easily divided into halves, fourths, eighths, e.g., apples, pretzel sticks.

For the Pizza Shop Scene

- Coffee filters: the circular paper type used for drip coffee makers work best; or colored construction paper.

Each Student

- A copy of BLMs 4-A and 4-B for the "You Try It at Home" activities.

To Prepare Your Students

Introduce today's video topic and ask questions designed to ascertain if the students are familiar with the Student Prerequisites and Key Words and Terms. Present some simple examples of the type of problem we will be exploring—e.g., could you cut an apple into two equal parts? Why are quarters (25-cent pieces) called quarters? . . .

Student Prerequisites

- Concept of fractions as parts of a whole.
- Language of fractions (numerator, denominator, equal parts).
- Recognition of fractions in real-world settings.

Key Words and Terms

whole	*denominator*
equal parts	*fair shares*
numerator	*equivalent*

Video Overview

In the opening montage, we see a child cutting an apple into equal parts, someone making change, a boy using a measuring cup, and highway signs with mileage in fractions. Fractions are important in everyday life!

Video Lesson

Sharing Sandwiches

At a table, four children think about the best way to divide three peanut butter sandwiches among them. How can they do it fairly?

STOP **YOUR CLASS MAY WANT TO DISCUSS THIS NOW.**

Discuss with your students the problem of how to fairly share three sandwiches among four children. Have your students explain and justify their strategies for solving this problem. Discuss the different strategies and solutions.

If desired, put your students into groups of four and give each group three pieces of paper. Have them use the paper to solve the problem.

NOTE: The video presents the solution as being three-fourths. Some students may find the solution to be one-half and one-fourth—a perfect opportunity to discuss equivalent fractions!

Play

Sharing Licorice

We join Sue Gehn of Nichols Elementary as she gives each group of four students a problem. She asks them to come up with as many ways as possible to share ten pieces of licorice fairly among four students.

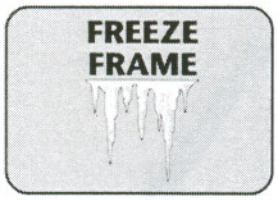
YOUR CLASS MAY WANT TO TRY THIS NOW.

Organize your students into groups of four. Pose the problem: "How many different ways can you share 10 pieces of licorice among four kids?"

(**NOTE:** Any item that can be easily divided will work.)

Remind the groups that they will need to present their solutions and strategies for solving the problem. Each group should devise a way to record its solution. The groups' records need to clearly show how they solved the problem and utilized fractions. After they have worked out the problem, but before they present their solutions, play the video showing how other kids solved the problem.

Watch the ways the children on the video solve the problem. The video then asks:



WERE THESE SOLUTIONS LIKE YOURS?

Note: Question is on-screen but there is no stop sign. Teachers should pause at this point and ask each group to present its solution. Encourage your class to think about all the solutions and remind them that there are many possible solutions. When they have completed the strategy presentations, you may want to give them the licorice to test their solution!

Pizza Place

Three children and an adult are at a pizza shop. They order two pizzas and when their order comes they see that one is cut into four pieces and one into sixteen pieces. Although they each get half a pizza, one child complains that he has only two pieces, while his friend has eight. Is that fair?

YOUR CLASS MAY WANT TO TALK ABOUT THIS NOW.

How would your students solve the problem? Have them determine the equivalences among halves, fourths, eighths, twelfths, and sixteenths. Also, equivalences among thirds, sixths, and twelfths.

If you have circular fraction pieces, coffee filters, or colored construction paper, use

them with your students to explore the problem. Have the students fold and cut the filters to show halves, fourths, eighths, and sixteenths. Have them identify the equivalences.

Play

As the video continues, we see a boy making his favorite snack treat. His mother says he can make only one-third of what the recipe calls for. We watch as he reduces each ingredient by one-third.

The video asks, "How do fractions play a part in your life?" Ask your students to make a diary that records ten different ways fractions are used in their lives.

You Try It!

Extended Activities

These activities are designed to extend the mathematics learning introduced in this lesson.

1. The activities in the video utilize a "sharing among four" model. Each of the activities could be repeated using different numbers of people in the group and/or different numbers of objects.
2. Explore the concept of fractions as parts of a set. For example: How many kids represent half of your class? John has a collection of shells; the 5 scallop shells represent one-third of his collection. How many shells does John have?

Cross-curricular Activity

Make a *Personalized Fraction Poster*: Fold an unlined sheet of paper into an appropriate number of equal parts, e.g., sixteenths, twelfths. In each part, ask students to draw a picture that represents something of importance to them, e.g., a pet, toy, symbol, etc. When done, the poster could be colored or painted. Then ask the class to describe in fractions what each poster represents when categorized—e.g., one third are animals, etc.

Writing Activity

In order to provide students with a set of meaningful data about which they can construct fraction statements, have students gather categorical information about their classmates, e.g., place of birth, birth month, country of origin, eye color, hair color, favorite color, favorite sport, etc. Construct and write fraction sentences that convert the data into a story. For example: One-fourth of us like red.

You Try It At Home

Two handout masters, numbered 4-A and 4-B, are provided in a booklet accompanying the Teacher's Guide; reproduce as many of these as you need. Reduced examples are also provided at the end of this lesson. These activities are designed to extend and reinforce concepts taught in the lesson, and to enable parents or other caregivers to become more involved with students' mathematics learning.

Assessment and Criteria for Scoring

The following four proficiency categories may be used to evaluate student performance in response to Lesson 4. You may use these evaluation categories to assess student classroom performance and extended activity performance.

The problem: Students are given bags of licorice and asked to explain how the ten pieces of licorice can be divided evenly among four students.

Advanced Response: The student response is complete in all ways and the fractional thinking is correct, with evidence of accurate reasoning and of a problem solving approach which is communicated clearly and concisely. In addition, at least one of the following is true:

- There is evidence of reflection upon work.
- The response includes more than one solution.
- The response is creatively unique and/or elegant.

Proficient Response: The student response is complete in all ways and the fractional thinking is correct, with evidence of accurate reasoning and of a problem-solving approach which is communicated clearly.

Nearly Proficient Response: The student response shows some evidence of accurate fractional thinking, reasoning, and problem solving, but is incomplete in the communication of the student's mathematical thinking or contains minor misunderstandings of the mathematics.

Minimal Response: The student response contains little or no communication of fractional thinking, mathematical reasoning, or problem solving and may contain major misunderstandings of the mathematics.

These criteria may be used for both the written and oral explanations of the problem solution.

References and Resources

National Council of Teachers of Mathematics (1989) Curriculum and Evaluation Standards for School Mathematics. Reston, VA: The Council.
Standard 1 : Mathematics as Problem Solving.
Standard 2 : Mathematics as Communication.
Standard 3 : Mathematics as Reasoning.
Standard 4 : Mathematical Connections.
Standard 6 : Number Sense and Numeration.
Standard 12 : Fractions and Decimals.
NAEP Strand 1 (Number Sense, Properties, and Operations).

Suggested Children's Literature

Bruce McMillan, *Eating Fractions.*
Louise Mathews, *Gator Pie*
Richard Dennis, *Fraction Are Parts of Things*
Barbara Comber, *Dad's Diet*
Shel Silverstein, *18 Flavors*; poem found in *Where the Sidewalk Ends*

You Try It At Home 1 and 2

Fraction Scavenger Hunt

Ask an adult at home or other care-giver to help you find fractions around the home. Here are some places you might look:

Kitchen: recipes, measuring cups, clocks

Cupboard: ingredients, how to prepare, number of servings

Workshop: inches and feet fractions

TV and newspapers: first half, third quarter, timing of events

In the space below, write what you found.

Survey Said!

Survey adults about when, where, and how fractions are part of their lives. Write in the space below what you found out.