

SESSION TWO DEVELOPING FRACTION CONCEPTS I

Outcomes

- To maintain a positive tone for the class by promoting conversation and success with mathematical endeavors.
- To use color tiles as a manipulative for illustrating fraction concepts.
- To explore the fraction concepts of equivalence, simplest form, and common denominators.
- To introduce participants to NCTM's Problem Solving Standard.

Overview

In the second session of Thinking about Fractions, Decimals, and Percents, participants will use color tiles to enhance their understanding of equivalence, simplest form, and common denominators.

Time

- 10-15 minutes** The first part of the session allows participants to share additional fraction, decimal, and percent applications found during the week. They also share their experience with the **Bringing Mathematics Home 1** activities and the homework.
- 70-80 minutes** Next participants use color tiles to explore fraction concepts. They work in groups as three main ideas are developed: equivalence, simplest form, and common denominators.
- 3-5 minutes** NCTM's Learning Principle is then introduced as a way to reinforce the activities of the session.
- 10-15 minutes** In the closing activity parents reflect on what they learned in this session and the way in which they learned it.

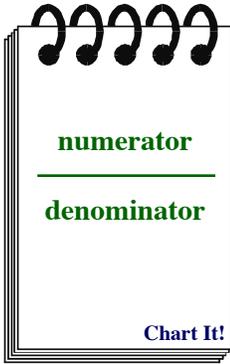
Materials

Facilitator	Transparencies (English & Spanish)
<ul style="list-style-type: none"> • The Fraction-Decimal-Percent Charts (created in Session 1) • One set of color tiles for the overhead projector • Three flip chart sheets (or a long strip of butcher paper, approximately 6 feet by 3 feet) 	<p><i>BLM 10: NCTM Problem Solving Standard</i></p>
Participant	Handouts (English & Spanish)
<ul style="list-style-type: none"> • One set of color tiles for each participant (They will need about 10 each of blue, red, green, yellow and will need to take these home.) • A supply of large-size Post-it® notes for each table 	<p>One per participant for class <i>BLM 11: Color Tile Collections</i> <i>BLM 12: Color Tile Mysteries</i></p> <p>One per participant for home <i>BLM 13: Bringing Mathematics Home 2</i> <i>BLM 14: Fraction Problems I</i></p>

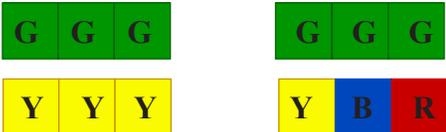
Activities

Preparation of Classroom	Notes
<ol style="list-style-type: none"> 1. Post the Fraction-Decimal-Percent Charts created in the first session. The charts will be used again during this class. 2. Place the name cards from last class near the front of the room where participants can easily find them. 3. Set up the Chart It! 4. Have a supply of color tiles on the tables for participants as they arrive. Encourage them to explore with the materials. 	<p>Learning names is a great way to promote a friendly atmosphere.</p>
Discussion of Homework (10-15 minutes)	
<p>Fraction-Decimal-Percent Charts</p> <ol style="list-style-type: none"> 1. Review the Fraction-Decimal-Percent Charts from the last class. 2. Have them use Post-it® notes and markers to write down any additional uses for fractions, decimals, and percents they have thought of since the last class meeting. 3. Have them share their ideas and post them on the chart (these could be newspaper examples or the Post-its®). 4. Encourage them to keep listening and looking for uses of fractions, decimals, and percents in their world. <p>Homework</p> <ol style="list-style-type: none"> 1. Ask participants to share with others in their group about the experience of working with tangrams with their children. 2. Circulate among groups listening to their responses. 3. Have volunteers share experiences with the whole group. 	
Relate Fractions to Everyday Objects (70-80 minutes)	
<p>Introduction to Using Manipulatives</p> <ol style="list-style-type: none"> 1. Introduce the activities for this session by telling participants that in this class they are going to think about fractions and ways to represent them using objects and pictures. To set the stage, ask these questions: <ul style="list-style-type: none"> • <i>If you were going to explain the fraction $1/2$ to a child, how might you do it?</i> • <i>What objects or pictures might you use?</i> • <i>What words would you use in your explanation?</i> 	<p>Accept all responses. Some participants will likely suggest taking a piece of food (apple, cookie, and sandwich), a picture of a shape and cutting it right down the middle, or dividing a collection of objects into two equal sets.</p>

Activities

Relate Fractions to Everyday Objects (continued)	Notes
<p>2. Have participants think about the questions for a moment and share their thinking with a partner.</p> <p>3. Say:</p> <ul style="list-style-type: none"> • <i>It is important for children (and adults) to understand the importance of <u>equal parts</u> when determining fractional names. Young children often respond to the notion of “fair shares” when first learning about fractions.</i> • <i>It is important for children when developing fraction understanding to be able to picture fractions in a variety of ways. Manipulatives help them develop this kind of flexibility of thinking.</i> • <i>The manipulatives used in this class are manufactured specifically for teaching purposes, but many household objects serve as fraction manipulatives. Things such as folded paper, measuring cups, food items, coins or paperclips work well.</i> • <i>The manipulatives used in this session are called color tiles. They are square tiles in 4 colors: red, blue, green, yellow.</i> <p>Define a Fraction using Color Tiles</p> <p>1. Direct participants to take out this collection of tiles: 1 red, 1 blue, 6 green, and 4 yellow.</p> <p>2. Explain that by simply counting the tiles, fractional names can be generated for each color. Ask: <i>Compare the number of red tiles to the total number of tiles. What fraction do the red tiles represent?</i></p> <p>3. Make sure that everyone understands that red is $\frac{1}{12}$, then ask: <i>What fraction do the other colors represent?</i></p> <ul style="list-style-type: none"> • Have them work in their groups to find the other fractions. • Have volunteers share their answers. • Ask participants to define a fraction in their groups. • Have groups share their ideas. <p>4. Make sure to point out that in each case, the numerator tells the number of tiles for that color and the denominator tells the total number of tiles. Define the terms numerator and denominator.</p>	<p>Model this on the overhead using overheard color tiles.</p> <p>Especially in this initial presentation, do not take for granted that participants understand fraction notation.</p> <p>red $\frac{1}{12}$, blue $\frac{1}{12}$, green $\frac{6}{12}$, yellow $\frac{4}{12}$</p> <p>Definitions on Chart It! should be composed in language that is comfortable for the participants rather than in precise mathematical terms.</p> <div data-bbox="1143 1402 1373 1766" style="border: 1px solid black; padding: 10px; margin: 20px auto; width: fit-content;">  <p style="text-align: center; color: green; font-weight: bold;">numerator</p> <hr style="border: 0.5px solid green; margin: 5px auto; width: 80%;"/> <p style="text-align: center; color: green; font-weight: bold;">denominator</p> <p style="text-align: right; color: blue; font-weight: bold; font-size: small;">Chart It!</p> </div>

Activities

Relate Fractions to Everyday Objects (continued)	Notes
<p>Relate Fractions to Different Groupings of Tiles</p> <p>1. Review the idea that the green tiles represent $\frac{6}{12}$ of the total tiles. Let them know that they are going to explore other names for these green tiles. Have them record the fractions as each grouping occurs.</p> <p>2. Ask participants to consider at the same collection of tiles grouped three different ways. First, group the tiles like this:</p> <p>Group 1:</p>  <p>3. Point out that now we can see two equal groups with one of the groups entirely green. In fraction terms this shows that another name for the green portion is $\frac{1}{2}$ (one green line out of two equal lines).</p> <p>4. Now ask them to consider the tiles grouped in another way:</p> <p>Group 2:</p>  <p>This arrangement shows that another name for green is $\frac{2}{4}$ because we have four equal groups and two of them are entirely green.</p> <p>5. The third grouping looks like this:</p> <p>Group 3:</p>  <p>This arrangement shows that another name for green is $\frac{3}{6}$.</p>	<p>Move the tiles on the overhead to demonstrate the arrangement. Encourage participants to move their tiles in the same manner.</p> <p>Participants may have difficulty seeing fraction names because they are focused on the number of tiles in a group rather than the number of groups formed in the collection. Say that the fraction name in this activity is determined by the number of equal groups that are a given color out of the total number of equal groups</p>

Activities

Relate Fractions to Everyday Objects (continued)	Notes
<p>Define equivalent fractions as it relates to groupings of tiles</p> <ol style="list-style-type: none"> 1. Explain to participants that by arranging tiles they have shown that $\frac{6}{12}$, $\frac{1}{2}$, $\frac{2}{4}$, and $\frac{3}{6}$ are equivalent fractions since they are all fractional names that can be demonstrated for green. 2. Define equivalent fractions. 3. Ask participants to find other fractions that represent the yellow tiles. Have them work in their groups to find as many other names as they can. 4. Have participants share the fractions that they have found, using the overhead tiles to show their groupings. <p>Applying what we know</p> <ol style="list-style-type: none"> 1. Direct participants to take out a new collection of tiles: 4 red, 5 blue, 3 green, and 8 yellow. 2. Remind participants that each new fractional name is determined by grouping the tiles into equal groups in which the color being named is not mixed with any other color. 3. Have them work in pairs or small groups to find all equivalent fraction names for each color. 4. Ask volunteers to come to the overhead to demonstrate each fractional name they found. Probe participants' thinking to determine how they can be sure they have found all names for each color. <p>Simplest form</p> <p>Ask participants to consider these questions and discuss with a partner or in small groups:</p> <ul style="list-style-type: none"> • <i>Why is it that some fractions (like $\frac{3}{20}$ in the previous example) have no equivalent names that can be demonstrated in this tile collection?</i> • <i>When a color has several equivalent names (like red in the previous example), which fraction do you think is the easiest to work with or might be considered the "simplest" name?</i> 	<div data-bbox="1101 268 1334 632" data-label="Image"> </div> <p>The fractional name is found by counting the number of equal groups (this is the denominator) and counting the number of groups that are that color (numerator).</p> <p>For the yellow tiles, participants might find $\frac{1}{3}$ or $\frac{2}{6}$.</p> <p>Red $\frac{4}{20}$ or $\frac{2}{10}$ or $\frac{1}{5}$; blue $\frac{5}{20}$ or $\frac{1}{4}$; green $\frac{3}{20}$; yellow $\frac{8}{20}$ or $\frac{4}{10}$ or $\frac{2}{5}$.</p> <p>If participants notice patterns or rules about equivalent fractions, these may be added to the Chart It!. The purpose of the manipulative experience is to give participants a visual understanding of the concept of equivalent fractions.</p> <p>These questions are intended to allow participants to consider the concept of "lowest terms" or "simplest form."</p>

Activities

Relate Fractions to Everyday Objects (continued)	Notes
<p>Equivalent Fraction Activity</p> <p>1. Say: <i>Now we are going to solve a different kind of problem. Instead of being told how many tiles of each color to take out, you will be given a fraction and have to determine the number of tiles to take out.</i></p> <p>2. Write the following on the overhead and say: <i>This collection is $\frac{1}{2}$ red, $\frac{1}{5}$ blue, $\frac{3}{10}$ yellow All of these colors are part of just one big collection.</i></p> <p>3. Ask these questions:</p> <ul style="list-style-type: none"> • <i>How many tiles should we use? Why?</i> • <i>Is there another collection that would also work?</i> • <i>How can you prove that another collection also works?</i> <p>4. Have a whole group discussion, modeling the shared ideas with overhead tiles. At the end of the discussion, participants should come to the conclusion that the number of tiles should be 5 red, 2 blue and 3 yellow, or any multiple of that combination (for instance, 10, 4, 6).</p> <p>5. Model the writing of the equivalent fraction names using the total number of tiles as the denominator. (In this example, write $\frac{5}{10}$ for the red, $\frac{2}{10}$ for the blue and $\frac{3}{10}$ for the yellow.)</p> <p>6. Hand out the sheet called Color Tile Collections.</p> <ul style="list-style-type: none"> • Direct participants to work in pairs or small groups to solve several of the problems on this sheet. • Have participants write equivalent fraction names for each color using the total number of tiles as the denominator. • Encourage those who do not finish to try the remaining problems at home with their children. It is not necessary for each participant to complete each problem. • Ask some participants to share solutions and explain their thinking using overhead tiles. 	<p>The purpose of these activities is to develop conceptual understanding. If some participants solve these without using tiles, encourage them to use tiles to prove or demonstrate their solutions.</p>

Activities

Relate Fractions to Everyday Objects (continued)	Notes
<p>Mystery Fraction Activity</p> <p>1. Say:</p> <p><i>Now we will solve some mysteries! You will be given the fractional names for some colors, but not for all of them. Your task will be to find the mystery fractions, represented by the symbol: ?/?.</i></p> <p>2. Hand out the sheet called Color Tile Mysteries.</p> <ul style="list-style-type: none"> • Ask participants to work in pairs or groups to solve as many as they can. • Encourage them to try the rest with their children at home. • When groups have had sufficient time to work, ask some participants to share their solutions and explain their thinking. • Allow participants to develop their own methods for determining the total number of tiles required. • If participants do not bring out the idea of common denominators, the instructor should introduce this concept. • Hearing many strategies presented is of benefit to all participants. It is important to validate every participant's contribution. 	<p>It might help to have participants read this symbol $\frac{?}{?}$ as the mystery amount.</p> <p>Notice that for problems 1-5, the largest denominator in the set of fractions will indicate the total number of tiles that can be used to build the collection. In problems 6-8, this is not the case.</p>
National Standards (3-5 minutes)	
<p>1. Display the NCTM Problem Solving Standard transparency. Say:</p> <ul style="list-style-type: none"> • <i>The activities of this session provide an illustration of the direction of mathematics instruction today.</i> • <i>The National Council of Teachers of Mathematics (NCTM) has published a document called Principles and Standards for School Mathematics. In it are guidelines for educators and policy makers in the area of mathematics education.</i> <p>2. Tell them that one of the five process standards described in the document is the Problem Solving Standard which states:</p> <ul style="list-style-type: none"> • Instructional programs from pre-kindergarten through grade 12 should enable participants to: <ul style="list-style-type: none"> a. Build new mathematical knowledge through problem solving. 	

Activities

National Standards (continued)	Notes
<p>b. Apply and adapt a variety of appropriate strategies to solve problems.</p> <p>3. Ask: <i>How do the activities of this session and the previous class session promote this standard?</i></p> <p>Ask participants to share ways that the activities of this session and previous class sessions have promoted this standard.</p>	
Closure (15-20 minutes)	
<p>Participants reflect on the activities of this class session and their experience of using color tiles to investigate fraction concepts.</p> <ul style="list-style-type: none"> • Direct them to share with a partner one mathematical idea they learned or saw differently as a result of this session. • Circulate and listen to this sharing. • Ask a few participants to share their reflections. • Record significant insights. 	
Take Home Activities (5 minutes)	
<p>1. There are two items for participants to take home:</p> <ul style="list-style-type: none"> • Bringing Mathematics Home 2 • Fraction Problems I. <p>2. Encourage participants to try at least one of the color tile activities on the Bringing Mathematics Home 2 sheet either with their children, their spouse or on their own.</p> <p>3. Ask participants to complete the three problems on Fraction Problems I using color tiles, other objects, or pictures and be ready to share their solutions at the next class.</p>	
Preparation for the Next Session (5 minutes)	
<p>1. Collect name cards for use in the next sessions.</p> <p>2. Fold or roll the Fraction-Decimal-Percent Charts in a way that preserves the items posted on them and bring them to the next class.</p> <p>3. Save the Chart It! and bring it to the next class. If desired, you may have the log typed and distributed to participants at the next class.</p>	