

SESSION THREE DEVELOPING FRACTION CONCEPTS II

Outcomes

- To maintain a positive tone for the class by promoting conversation and success with mathematical endeavors.
- To use pattern blocks as a manipulative for illustrating fraction concepts.
- To explore the fraction concepts of equivalence, mixed numbers, and the relationship between fractions and division.
- To introduce participants to **NCTM Number and Operation Standard**.

Overview

In the third session of Thinking About Fractions, Decimals and Percents, pattern blocks are used to reinforce concepts of equivalence, simplest form, and common denominators from the last session and to introduce new concepts. Unlike the color tiles, pattern blocks are not uniform in size and shape. Some participants may find pattern blocks a more challenging manipulative because it is necessary to use spatial-visual reasoning to arrange and compare the pieces.

Time

- 15-20 minutes** In the first part of the session, participants share their experiences with the **Bringing Mathematics Home 2** activities and their solutions to the homework problems.
- 60-70 minutes** Next participants use pattern blocks to explore concepts about fractions. They work in groups to explore three main ideas: equivalence, mixed numbers, and the relationship between fractions and division. The final activity of this session asks participants to consider the relationship between the patterns blocks when different pieces have a value of one unit. This activity can be omitted if the session runs too long.
- 3-5 minutes** The **NCTM Number and Operation Standard** 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)
One set of pattern blocks for the overhead projector	<i>BLM 15: NCTM Number and Operation Standard</i> <i>BLM 16: Sharing Cookies</i> <i>BLM 17: Pattern Block Chart</i>
Participant	Handouts (English & Spanish)
<ul style="list-style-type: none"> • A supply of pattern blocks for each participant—about 6 yellow, 6 red, 9 blue, 12 green [no orange or tan blocks will be used]. Participants will need to take a supply of pattern blocks home. • A pad of large size Post-it® notes and markers for each table. 	<p>One per participant for class</p> <i>BLM 16: Sharing Cookies</i> <i>BLM 17: Pattern Block Chart</i> <p>One per participant for home</p> <i>BLM 18: Bringing Mathematics Home 3</i> <i>BLM 19: Fraction Problems II</i>

Activities

Preparation of Classroom	Notes
<ol style="list-style-type: none"> 1. Post the Fraction-Decimal-Percent Charts from the previous sessions. 2. Set up the Chart It! 3. Place the name cards from last class near the front of the room where participants can easily find them. 4. Have a supply of pattern blocks on the tables (do not use the tan and orange blocks) and encourage exploration of the materials as participants arrive. 	
Discussion of Homework (10-15 minutes)	
<p>Fraction-Decimal-Percent Charts Ask participants if anyone has any new items to post on the Fraction-Decimal-Percent Charts. As they post, have them share their new examples.</p> <p>Bringing Mathematics Home 2</p> <ol style="list-style-type: none"> 1. Ask participants to share (with others in their group) about their experience of working with color tiles with their children. 2. Circulate among groups listening to their responses. 3. After everyone has had the opportunity to share with their group, ask one or two participants to share with the class. <p>Fraction Problems I</p> <ol style="list-style-type: none"> 1. Invite participants to share (with the people at their table) their solutions to the problems on Fraction Problems I. 2. Hand out a transparency sheet and transparency marker to each group. 3. Instruct each group to write a solution to one or more of the homework problems. 4. Ask volunteers to present their solutions to the class. 	

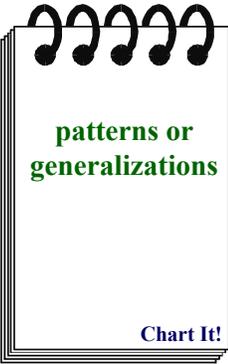
Activities

Exploring with Pattern Blocks (60-70 minutes)	
<p>Introduction to Pattern Blocks</p> <p>1. Introduce the activities for this session by telling participants that they are going to use a different manipulative to illustrate fractional ideas in this session.</p> <p>Say:</p> <ul style="list-style-type: none"> • <i>It is important when developing fraction understanding to be able to picture fractions in a variety of ways.</i> • <i>In the last session, color tiles were used in order to consider fractions as parts of a collection.</i> • <i>Today we will use pattern blocks. Pattern blocks are useful when we think about fractions as describing pieces of a whole.</i> <p>2. Review the geometric names for the shapes of the pattern blocks.</p> <p>Defining Fractions Using Pattern Blocks</p> <p>Tell participants that we will now explore fractions using pattern blocks.</p> <p>1. Say:</p> <p><i>Think of the yellow hexagon as one whole unit. What fraction does each of the other colors represent?</i></p> <p>2. Encourage them to build the hexagon out of other colors to verify the fraction names.</p> <p>3. After about 5 minutes, ask some groups to explain their thinking using overhead pattern blocks.</p> <p>They should conclude that when the yellow hexagon is used as the unit, the red trapezoid is worth $1/2$, the blue parallelogram is worth $1/3$, and the green triangle is worth $1/6$.</p> <p>4. Help participants explore the idea of equivalency through the blocks. Ask:</p> <ul style="list-style-type: none"> • <i>What is the name that could be given for the space taken up by 2 blues?</i> • <i>Is there another name?</i> <p>It is important for participants to see both $2/3$ and $4/6$. If the second name does not come up, suggest they consider finding an equivalent name using a different color block</p>	<p>Posting a chart with the names of the shapes and colors is helpful.</p> <p>Some participants will find it useful to think of the yellow hexagon as one cookie.</p> <p>Point out that it is still important to think about equal parts when determining fraction names.</p> <div style="border: 1px solid black; padding: 10px; margin-top: 20px; text-align: center;">  <p style="color: green; font-weight: bold; margin: 0;">Record significant observations</p> <p style="color: blue; font-weight: bold; margin: 0;">Chart It!</p> </div>

Activities

Exploring with Pattern Blocks (continued)	Notes
<p>5. Ask:</p> <ul style="list-style-type: none"> • <i>What is the fraction name for the space taken up by a red and a blue block together?</i> • <i>How do you know?</i> <p>Circulate while groups do this activity. Make sure all groups are able to successfully name fractions using pattern blocks.</p> <p>6. Demonstrate using pattern blocks on the overhead that a red and a blue could be described using the fraction $\frac{5}{6}$ because this area could also be covered using 5 greens. Point out the importance of trading for equal pieces in order to determine the fraction name.</p> <p>7. Have participants take out 2 yellows and a blue and a green. Ask:</p> <ul style="list-style-type: none"> • <i>What is the fraction name for the space taken up by 2 yellows, a blue and a green block together?</i> • <i>How do you know?</i> <p>Since this collection contains more than a whole unit it will require the use of a mixed number or improper fraction.</p> <p>8. Tell participants to do the following with a partner:</p> <ul style="list-style-type: none"> • <i>Take a random handful of pattern blocks.</i> • <i>Put the pieces together to form as many whole units (hexagons) as you can.</i> • <i>Describe any leftovers using a fraction. If the leftover portion contains more than one color, decide on an appropriate name.</i> <p>9. Ask them to share fraction ideas they have seen so far through the use of the pattern blocks. Remind participants that the purpose in using manipulatives is to clarify important mathematical ideas.</p> <p>Sharing Cookies</p> <p>1. Say:</p> <ul style="list-style-type: none"> • <i>Now we are going to do some sharing problems using the pattern blocks.</i> • <i>Share two hexagons equally among three people Use your blocks to act out how to share them equally.</i> • <i>What fraction describes each person's share?</i> <p>Have participants share their thinking about the problem.</p>	<p>Mixed number names are the easier place to begin. If participants bring up improper fractions, you can introduce them.</p> <div data-bbox="1052 632 1284 995" style="border: 1px solid black; padding: 10px; margin: 10px 0;">  <p style="text-align: center;">Mixed Numbers and Improper Fractions</p> <p style="text-align: right;">Chart It!</p> </div> <div data-bbox="1052 1020 1284 1383" style="border: 1px solid black; padding: 10px; margin: 10px 0;">  <p style="text-align: center;">Shared fraction ideas</p> <p style="text-align: right;">Chart It!</p> </div> <p>Participants who trade hexagons for rhombuses will say $\frac{2}{3}$; participants who trade hexagons for triangles will say $\frac{4}{6}$. Point out the importance of understanding fractional equivalence.</p>

Activities

Exploring with Pattern Blocks (continued)	Notes
<p>2. Ask participants to figure out another sharing situation.</p> <p style="text-align: center;"><i>What would the portions be if five cookies were shared among two people?</i></p> <p>Have participants share their thinking about the problem.</p> <p>3. Hand out the Sharing Cookies worksheet.</p> <ul style="list-style-type: none"> • Allow about 15 minutes for participants to act out these situations. Encourage them to look for patterns or generalizations about these kinds of sharing situations. • While participants are working, pass around an overhead transparency of Sharing Cookies and a transparency marker. • Ask each group to write a solution they have found on the sheet. Collect the sheet and display it on the overhead. This provides for anonymous sharing. • Ask groups to compare their results to those displayed on the transparency. • Ask participants to demonstrate their thinking using overhead pattern blocks to resolve any disagreements. Some "disagreements" will simply be equivalent fractional names. Allow participants to demonstrate for themselves that in such cases, both answers are correct. If improper fractions have not come up, the instructor may include them at this point. • If participants notice any patterns or generalizations, include them on the Chart It! <p>Varying the Whole</p> <p>1. Tell participants that up to this point we have used the condition that the hexagon is the unit or whole. Tell them that they will be able to see some ideas about fractions by allowing the other blocks to be the unit.</p> <p>2. Hand out the Pattern Block Chart worksheet and display the transparency. Fill in the first row of the chart together to show the fractional parts that they have been working with when the hexagon is the unit.</p>	<p>The answers to some problems on the sheet will be greater than one. Some participants may have used mixed numbers to express these, others may have used improper fractions. Accept both answers.</p> <p>Participants might notice the connection between fractions and division. They might see that for each sharing situation, one of the answers is an expression of the original problem. For example, two cookies shared with three people results in $\frac{2}{3}$ of a cookie per person.</p> <p>Having student share solutions anonymously is a way to encourage quieter participants to participate.</p> <div data-bbox="1149 898 1377 1262" style="border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;">  <p style="text-align: center; color: green;">patterns or generalizations</p> <p style="text-align: right; color: blue;">Chart It!</p> </div> <p>This final activity is the most challenging. If time is running short, it may be omitted or used as an additional activity for those who finish the other tasks quickly.</p>

Activities

Exploring with Pattern Blocks (continued)	Notes
<p>3. Explain that we don't have to restrict our thinking to the hexagon be the unit. It is possible for any of the shapes to be the unit. For example, what are the values of all the pieces if triangle is the unit? Fill in the appropriate values when the triangle is the unit.</p> <p>4. Challenge participants to continue to complete the chart working with a partner or small group.</p> <ul style="list-style-type: none"> • In the second row consider the value of all the pieces if blue is worth one. • In the third row the red trapezoid is worth one. • In the last three rows, participants are not given a block that is the unit. Suggest that they first build a shape that is the unit and then determine the relative value of each piece. Encourage them to use creative thinking to decide how to approach these problems. <p>5. It is not necessary for each student to complete each problem. Encourage those who do not finish, to try the remaining problems at home with their children!</p> <p>6. Ask participants to demonstrate their solutions and their reasoning by using the overhead pattern blocks.</p>	<p>It is difficult to make the mental shift away from thinking of the hexagon as the unit. This will likely be confusing to some participants. Be patient and make sure to spend enough time explaining why the blocks now have different values. When green is one unit, blue is 2, red is 3, and yellow is 6.</p>
National Standards (3-5 minutes)	Notes
<p>1. Display NCTM Number and Operation Standard transparency</p> <p>2. Tell participants that the activities of this session provide further illustration of the direction of mathematics instruction today. One of the five content standards described in the Principles and Standards for School Mathematics is the Number and Operation Standard. This standard lists grade-specific concepts for participants. The grades 3-5 portion states:</p> <p><i>During grades 3–5, students should build their understanding of fractions as parts of a whole and as division. They will need to see and explore a variety of models of fractions, focusing primarily on familiar fractions such as halves, thirds, fourths, fifths, sixths, eighths, and tenths. By using an area model in which part of a region is shaded, participants can see how fractions are related to a unit whole, compare fractional parts of a whole, and find equivalent fractions.</i></p>	<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>

Activities

National Standards (continued)	Notes
<p>3. 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 on Chart It!. 	
Take Home Activities (5 minutes)	
<p>1. There are two items for participants to take home: Bringing Mathematics Home 3 and Fraction Problems II.</p> <p>2. Encourage participants to try at least one of the color tile activities on the Bringing Mathematics Home 3 sheet either with their children, their spouse or on their own.</p> <p>3. Ask participants to complete the three problems on Fraction Problems II using color tiles, other objects, or pictures and be ready to share their solutions at the next class.</p>	<p>Participants will need to take a set of pattern blocks home to complete these take home activities.</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>	

