

Fractions

5th Grade

Alison Tisdell

Alison_tisdell@bemidji.k12.mn.us

Erin Brooks

Erin_brooks@bemidji.k12.mn.us

Executive Summary

This unit will cover a concept that a lot of 5th graders struggle with; fractions. This unit will take about 15 class periods depending on how students are understanding the material. You can move at a slower pace if that is what is needed. We start out this unit by holding a discussion about what a fraction is. As students begin to grasp the concept of a fraction being a part of a whole we then move on to finding relationships between different parts. This unit will allow students to work on representing fractions in various forms including verbally, symbols, and manipulatives. Students will be learning how to find common denominators as well as adding and subtracting fractions using the common denominator strategy. Once our unit is done students will be exposed to the Minnesota State Standards relating to fractions.

Students will be able to answer the following types of MCA questions once they have completed this unit:

13. Mrs. Torres served half cup scoops of ice cream at the family reunion. She started with one gallon, which contains 32 servings. Seventeen people ate half cup servings, and three people ate 2 half cup servings. Estimate how much ice cream was left over.
- A. 1 gallon
 - B. $\frac{3}{4}$ gallon
 - C. $\frac{1}{2}$ gallon
 - D. $\frac{1}{4}$ gallon

5.1.3.3

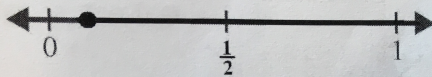
25. Subtract.

$$\frac{11}{12} - \frac{1}{4}$$

- A. $\frac{2}{3}$
- B. $\frac{1}{3}$
- C. $\frac{3}{8}$
- D. $\frac{7}{8}$

5.1.3.1

18. What fraction is represented by the point on the number line below?



- A. $\frac{7}{8}$
- B. $\frac{1}{2}$
- C. $\frac{1}{4}$
- D. $\frac{1}{8}$

5.1.2.3

5th Grade Number and Operations- Fractions

Standard:

Read, write, represent, and compare fractions and decimals; recognize and write equivalent fractions; convert between fractions and decimals; use fractions and decimals in real-world and mathematical situations.

Benchmarks:

5.1.2.3 Order fractions and decimals, including mixed numbers and improper fractions, and locate on a number line.

Examples:

Which is larger 1.5 or $\frac{4}{3}$?

In order to work properly, a part must fit through a 0.23 inch wide space. If a part is $\frac{1}{4}$ inch wide, will it fit?

5.1.2.4 Recognize and generate equivalent decimals, fractions, mixed numbers and improper fractions in various contexts.

Example:

When comparing 1.5 and $\frac{19}{12}$, note that $1.5 = 1\frac{1}{2} = 1\frac{6}{12} = \frac{18}{12}$, so $1.5 < \frac{19}{12}$.

5.1.3.1 Add and subtract decimals and fractions, using efficient and generalizable procedures, including standard algorithms.

5.1.3.2 Model addition and subtraction of fractions and decimals using a variety of representations.

Example:

Represent $\frac{2}{3} + \frac{1}{4}$ and $\frac{2}{3} - \frac{1}{4}$ by drawing a rectangle divided into 4 columns and 3 rows and shading the appropriate parts or by using fraction circles or bars.

5.1.3.4 Solve real-world and mathematical problems requiring addition and subtraction of decimals, fractions and mixed numbers, including those involving measurement, geometry and data.

Example:

Calculate the perimeter of the soccer field when the length is 109.7 meters and the width is 73.1 meters.

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Day One: Pre-test and KWL Chart

Launch: We will begin our fractions unit by having students take a pretest to test their prior knowledge of the unit. Once pretests have been collected students will create a chart to help collect some of their prior knowledge.

Explore: Students will work with their tabletop groups to come up with a list of words that they know deal with fractions. Some of the words they might come up with are numerator, denominator, part, whole, fraction names and so on.

Share: Students will share some of the terms they came up with in their groups. They will present their lists to the class using the document camera.

Summarize: Our goal for this lesson is collect data on what terms students already know and what terms they have not had much exposure to yet. We will keep a list of the words students came up with and make sure we have covered all terms that they will be tested on.

Day Two: The Hershey's Milk Chocolate Fractions Book

Launch: We will begin our lesson by having a discussion about what fractions are. Then we will read the book *The Hershey's Milk Chocolate Fractions Book* by Jerry Pallotta. What types of fractions can we create using the Hershey bar and Unifix Cubes? See if you can find the following fractions: $\frac{1}{2}$, $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{6}$, $\frac{2}{6}$, $\frac{3}{6}$, $\frac{4}{6}$, $\frac{5}{6}$, and all twelfths.

Explore: We will explore wholes, halves, fourths, thirds, sixths, and twelfths using a standard size Hershey bar. We will also explore the same fractions using premade bags of Unifix cubes. Students will create the desired fractions by color.

Share: Students will share how they created each fraction and we will compare the different methods and strategies used. They will share their strategies on the Elmo (Document camera) allowing the entire class to view their method of choice.

Summarize: Our goal for this lesson is to give the students an introduction as fractions being part of a whole. We used Hershey bars to gain their attention and move on to Unifix Cubes to solidify the concept.

Day 3: Rational Numbers Project Lesson 1

Launch: To start our lesson we will hand out the premade fraction circles to each student. We will give them time to explore and “play” with the fraction circles. This allows them time to curb their curiosity about the new manipulatives. We will then go into our lesson using the black circle as our whole and compare the pieces to yesterday’s lesson with Hershey bars and Unifix Cubes. We will then start the lesson by having students answer the following questions:

- 1.) How many blues cover the black circle?
- 2.) Which is bigger, 1 brown or 1 gray?
- 3.) How many pinks cover 1 yellow?

Explore: Students need to work with and “play” with the fraction circles to help them form a better understanding of connection and relationship with the pieces. Students will then be asked to complete Students Page A to enrich their exploration of the fraction circles. Some of the questions students will answer are:

- 1.) How many browns cover the black?
- 2.) Which is bigger, one brown or 2 reds?
- 3.) How many purples cover a yellow?
- 4.) How many dark blues are there? Light blues?

Share: To wrap up the lesson, have students work with Transparency 1 on the overhead. Students will determine what combination of parts will cover the shape on the left. The pieces that were selected do not have to be the same color. Students should make prediction prior to using their fraction circles to find the combination that works. Students will be encouraged to make any combination that works to cover the whole shape.

Summarize: Today’s goal is to help students understand that fractional amounts can be shown differently.

Link to Fraction Circles and Rational Numbers Project:

<http://www.cehd.umn.edu/ci/rationalnumberproject/rnp2.html>

Rational Number Project

Initial Fraction Ideas Lesson 1: Overview	Materials
Lesson provides guided exploration with fractions circles. Students start to become familiar with colors and relationships like 3 browns cover 1 black and 1 brown is bigger than 1 red.	= Fraction Circles for students and teacher = Student Page A = Transparency 1
Teaching Actions	Comments
<p>Large Group Introduction</p> <ol style="list-style-type: none">1. Start the Lesson by asking children to sort through their fraction circles to answer these questions:<ol style="list-style-type: none">(a) How many blues cover the black circle?(b) Which is bigger, 1 brown or 1 gray?(c) How many pinks cover 1 yellow?(d) How many browns cover the black?(e) Which is bigger, 1 brown or 2 reds?(f) How many purples cover 1 yellow?(g) How many dark blues are there? Light blues? <p>Small Group/Partner Work</p> <ol style="list-style-type: none">2. Explain to the students that they are to continue their exploration by using the circles to complete Student Page A. <p>Wrap Up</p> <ol style="list-style-type: none">3. End the lesson by working through Transparency 1. The figure on the left represents the circle part you want to cover. To the right are the circle parts. Students are to determine which combination of parts will cover the shape on the left.	<p>Students need to play with the fraction circles before developing a formal language for describing relationships among the pieces.</p> <p>There are two different blues: a set of 4 dark blue pieces; a set of 7 light blue pieces. In the lessons the color "blue" refers to the set of 4 dark blue pieces. "Light blue" will refer to the set of 7 blues.</p> <p>Different ways to approach Student Page A:</p> <p>Students do page individually and then compare with a partner.</p> <p>Students do page with a partner.</p> <p>Do a few problems together and then students finish on their own.</p> <p>If some students finish Student Page A ahead of others, ask them to create their own problems and record them on the back of the page or put them on the board for others to solve.</p>

Exploring with the Fraction Circles

1. _____ browns equal 1 whole circle.
2. 1 whole circle equals _____ pinks.
3. _____ reds equal 1 whole circle.
4. _____ pinks equal 1 brown.
5. 1 brown equals _____ reds.
6. 1 brown is (less than, equal to, greater than) 1 pink.
7. 1 red is (less than, equal to, greater than) 1 brown.
8. 1 yellow is (less than, equal to, greater than) 1 brown.
9. 1 yellow and 1 brown and 1 _____ equals 1 whole circle.
10. 1 yellow equals 1 brown and 2 _____ .
11. 3 pinks and 1 _____ equal 1 whole circle.
12. _____ grays and 1 blue and 1 yellow equals 1 whole circle.
13. 2 grays and _____ blue equals 1 yellow.
14. 1 pink equals _____ reds.
15. 4 _____ equal 1 yellow.

Day 4: Rational Numbers Project- Lesson 2

Launch: Start out the lesson by having students take out a black circle. Show students how to divide the black circle into two equal parts by showing them that two yellow parts cover the black circle completely. Review yesterday's concept, fractional parts can be written in different ways. Explain to students that they will be working with various situations to show various representations of fractional parts.

Explore: Students pages A & B give students problems comparable to the ones shown during the whole group lesson along with realistic problems. Students will work in groups of four to answer the questions orally with explanations as to why they answered it the way they did.

Share: Close out this part of the lesson with the following problem-

Show how two blues and one yellow cover the black circle. Pick up one blue and state that this piece is one of three parts of the circle, therefore it is one-third of the circle. Is this true? What should I do if I want to figure out what part of the black circle one blue is? Ask students how is it possible that they have given each of these fractions the name $\frac{1}{2}$?

Summarize: $\frac{1}{2}$ can be shown in a variety of ways. Students will have had the chance to explore the connections between various pieces along with combining pieces. One way to test/assess today's main idea is to present the following pieces on the document camera- yellow, red, pink, and blue.

Link to Lesson 2:

<http://www.cehd.umn.edu/ci/rationalnumberproject/RNP2/Lesson02.pdf>

Rational Number Project

Initial Fraction Ideas Lesson 2: Overview	Materials
Students explore relationships among circle pieces, modeling and orally naming fraction amounts for: 1-half, 1-third, and 1-fourth.	<ul style="list-style-type: none"> ∞ Fraction Circles for students and teacher ∞ Student Page A, B

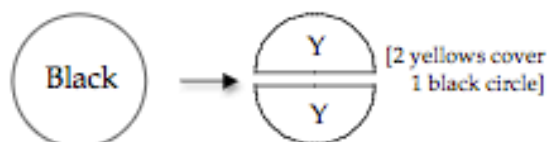
Teaching Actions

Warm Up

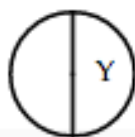
- Find three different ways to cover 1 yellow piece.
- Find three different ways to cover 1 brown piece.

Large Group Introduction

1. Ask students to take out a black circle. Model how to divide the black circle into 2 equal parts by showing that 2 yellow parts cover the whole circle.



2. Note that 1 black equals 2 yellows or 2 yellows equal 1 black. Ask: Are the 2 parts covering the whole equal?
3. Conclude by stating that when 2 equal parts equal one whole, each part (pick up 1 yellow) is called one-half. This yellow piece is one-half of the black circle.
4. Show one-half by placing 1 yellow on the black circle. "1 yellow covers half of the black circle."



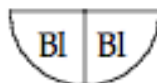
Comments

Most lessons will have a "Warm Up" problem that reviews ideas from previous lessons. These warm ups are not meant to take more than 5 minutes of class time.

Flexibility of unit is stressed right from the beginning by having students find multiple representations for $1/2$, $1/3$, and $1/4$.

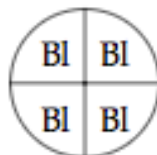
The critical variable with fractions is that a unit is divided into equal parts. A single part can be given a fraction name that depends on what it is being compared to.

Example:



2 blues equal 1 yellow so 1 blue is one-half of the yellow. [Here 1 yellow is the unit]

Example:



4 blues equal 1 black. 1 blue is one-fourth of the black circle. [Here black is the unit]

Teaching Actions

5. Continue by looking for other examples for one-half. Show one blue piece and ask: If one blue is my unit, how can we divide this piece into 2 equal parts? What color pieces will do this?



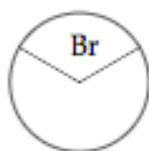
6. Use these questions: Are the 2 parts equal? 1 gray is 1 of 2 equal parts; what fraction of the blue piece is 1 gray? [1-half]



7. Show 1 yellow and ask students to consider the yellow as the unit, divide it into 2 equal parts and orally name each part.
8. Model, using the black circle as the unit, representations for thirds.



9. 3 browns cover 1 black; 1 brown is 1 of 3 equal parts; 1 brown is one-third of the black. Show as:



10. Find other examples for 1-third using 1 yellow and 1 brown and then 1 blue as the unit.
11. Model fourths using 1 black, 1 yellow, and 1 brown as units.

Comments

Students are naming fractions in the verbal mode only. In the next lesson students will record as: 1-fourth.

You may want to show how other units can be partitioned into halves:

1 pink	→	2 reds
1 brow	→	2 pinks
1 orange	→	2 purples

Teaching Actions

12. End the development part of the lesson with a non-example. Show how 2 blues and 1 yellow cover the black circle. Pick up 1 blue and say that this piece is 1 of 3 parts of the circle so it is one-third of the circle. Ask: Is this true? If I wanted to know what part of the black circle 1 blue is, what must I do?
13. [Repeat showing 2 browns and 2 pinks covering the black circle. 1 pink does not equal 1-fourth].

Small Group/Partner Work

14. Student pages A & B present problems similar to ones presented in large group as well as problems within realistic contexts. Assign to students in pairs, as they are to answer the questions orally.

Wrap Up

15. To assess the "big idea" in this lesson present the following scenario:

Lianna said that 1 red piece is one-third; Rodrigo said 1 red is one-fourth. Who is correct?

[Note that 1 red is one-third of the blue; 1 red is also one-fourth of the brown. Both Lianna and Rodrigo are correct once you know what unit they are comparing the red to].

Comments

Another way to assess the lesson's big idea is to put one of each of these colors: yellow, blue, pink, and red on the overhead and ask: "You have called all of these 1-half, yet they are different sizes. How is that possible?"

Translations

- ∞ Manipulative to verbal
- ∞ Pictures to verbal

The class will work together to solve the problems. Answer the questions by drawing a picture. The teacher will provide children that want to use the fraction cards to help solve the problems.

Find three different ways to cover 1 yellow piece. Find three different ways to cover 1 brown piece.

How many reds cover the blue piece? _____
1 red is _____ of the blue.
(Say the word)

3. The brown piece is the unit.
How many reds cover the brown piece? _____
1 red is _____ of the brown.
(Say the word)

4. What color is 1/2 of the blue? _____

5. What color is 1/3 of the yellow? _____

6. Draw a picture of a pizza. Show on your drawing the pizza cut into 2 fat slices.

Each fat slice is _____ of the whole pizza.
(Say the word)

Name _____

The class will work together in groups or in pairs on these problems. Answers are to be given orally or by drawing a picture. On some of the problems children may want to use the fraction circles to help solve the problem.

1. The yellow piece is the unit.

How many blues cover the yellow piece? _____

1 blue is _____ of the yellow.

(Say the word)

2. The blue piece is the unit.

How many reds cover the blue piece? _____

1 red is _____ of the blue.

(Say the word)

3. The brown piece is the unit.

How many reds cover the brown piece? _____

1 red is _____ of the brown.

(Say the word)

4. What color is 1-half of the blue? _____

5. What color is 1-third of the yellow? _____

6. Draw a picture of a pizza. Show on your drawing the pizza cut into 2 fair shares.

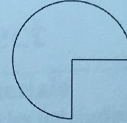
Each fair share is _____ of the whole pizza.

(Say the word)

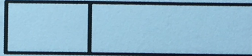
Name _____

7. Here is a picture of a pizza with one piece removed.

The piece is _____ of the whole pizza.
(Say the word)



8. Here is a picture of a candy bar that someone has started to cut into pieces.

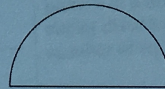


The small piece is _____ of the whole candy bar.
(Say the word)

Draw lines to finish cutting the candy bar into equal parts.

9. Mary's patio is a whole circle. Draw a picture of Mary's patio. Show on your drawing that the patio is in 3 equal-size parts. Each part is _____ of Mary's patio.
(Say the word)

10. John has a patio that looks like this:



Draw on John's patio to show it divided into 3 equal-size parts. Each part is _____ of John's patio.
(Say the word)

Mary said, "John's patio is really one-half (not a whole)." What would you say to Mary?

Day 5: Rational Numbers Project- Lesson 3

Launch: Today's lesson is started out by having students divide one yellow piece into six equal parts. Explain that since six reds cover one yellow, one red is one-sixth of the yellow. Ask students to divide a black circle into six equal parts. What fraction piece is one-sixth of the black?

Explore: Students will be given a variety of different situations to work through. Students will work individually to various combinations to equal each piece that is given, see students page A.

Share: Once students have completed Student Page A, finding different representations for fractional amounts, they can come to the board and show what they found. This lesson will be wrapped-up with a review of random colors or pieces of the fraction circles, and fractional parts that will cover it.

Summarize: Students will again be reassured that there are a variety of ways that fraction can be represented. Students should be very comfortable and find it easier and easier to use the fraction circles.

Link to Lesson 3:

<http://www.cehd.umn.edu/ci/rationalnumberproject/RNP2/Lesson03.pdf>

Rational Number Project

Initial Fraction Ideas Lesson 3: Overview	Materials
Students model and name (orally and in written words) unit fractions with denominators greater than 4.	<ul style="list-style-type: none"> ∞ Fraction Circles for students and teacher ∞ Student Page A

Teaching Actions

Warm Up

Find the piece that is 1-half of each of these colors: yellow, blue, brown, orange.

Large Group Introduction

1. Show one yellow piece. Ask students to divide it into six equal parts.
2. Explain that since 6 reds cover 1 yellow, 1 red is one-sixth of the yellow.
3. Ask students to divide a black circle into 6 equal parts. What fraction piece is one-sixth of the black?
4. Make this chart to show the relationship between the number of equal parts a unit is divided into and the word name for that number of divisions.

Number of Equal Parts Unit is divided into	Word Name	
2	half	halves
3	third	thirds
4	fourth	fourths
5	fifth	fifths
6	sixth	sixths
7	seventh	sevenths
[Continue to include 8, 9, 10, 12, 15]		

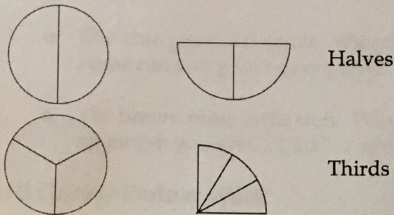
Comments

Make a large classroom chart for students to use as a reference for the rest of the fraction unit. You might include a third column showing a picture of a unit (not always a whole circle) divided into the appropriate number of equal parts.

You may want to have students make their own personal chart.

Teaching Actions

For each item in the chart show at least 2 physical models. For example:



Students should model each example with their fraction circles.

5. Students should help you find these different representations.
 - ∞ You may suggest the unit and ask them to divide it into a certain number of equal parts.
 - ∞ You might ask students to suggest the unit. For example, say: *"The next value in the chart is to model sixths. What unit can we use?"*
6. Once the chart is completed, work through these problems:
 - ∞ Using the black circle as the unit, ask students to find the color that divides the unit into 4 equal parts. Hold up 1 of 4 parts, call it "one-fourth", and record the written name as 1-fourth.
 - ∞ Using the yellow circle as the unit, ask students to find the color that divides the unit into 4 equal parts. Hold up all for parts; call it "one-fourth"; record 1-fourth.
 - ∞ Ask: "How are the two models for 1-fourth alike? Different?"
7. Repeat for sixths and twelfths using two different units.

Comments

Students initially record fractions in words like: *1-fourth; 1-sixth*. Research suggests that students make fewer reversals with the symbols (for example, writing $3/2$ for $2/3$) when they first write fractions in words.

You may want to do more examples.

Teaching Actions

8. To prepare students for Student Page A ask the following questions. Have students record answers using word names.
- o The blue piece is the unit. What fraction name can you give 1 gray piece? 1 red piece?
 - o The brown piece is the unit. What fraction name can you give 1 pink? 1 white? 1 gray?

Small Group/ Partner Work

9. Assign Student Page A.

Wrap Up

10. End the class with this game: Teacher says: "Two of the colors I am thinking of equal one yellow. What color is it? What fractional name can I give each piece?"

Comments

You might consider assigning students Page A without this introduction. This will make the activity more of a problem solving activity.

Extra challenges:

If the yellow piece is the unit, what value does the black circle have?

If the blue piece is the unit, what value does the yellow piece have? The black one?

These questions may lead to a nice discussion. Students may question how to express the answer. If the yellow piece is the unit (or one) then the black circle is 2 units, 2 wholes or just 2.

Translations

- ∞ Manipulative to verbal to written symbols

Naming Fraction Amounts
Using Colors

Find the piece that is 1-half
of each of these pieces:

- 1- yellow
- 1- blue
- 1- brown
- 1- orange

Name _____

Lesson 3 / Student Page A

Naming Fraction Amounts Using Circles

Use fraction circles to find the names of the different fraction pieces.

I. The black circle is the unit. What fraction name can you give these pieces?

1 yellow _____ 1-half _____ 1 brown _____

1 blue _____ 1 gray _____

1 white _____ 1 green _____

1 red _____ 1 pink _____

II. Now make 1 yellow unit. What fraction name can you give these pieces?

1 blue _____ 1 gray _____

1 pink _____ 1 red _____

III. Change the unit to 1 blue. What fraction name can you give these pieces?

1 gray _____ 1 red _____

IV. Change the unit to 1 orange. What fraction name can you give these pieces?

1 purple _____ 1 green _____

Day 6 and 7: Ration Number Project- Lesson 4

Launch: Review the lesson we started this unit with by talking about the different shapes we have used so far for fractions. Tell students that fractions can be shown in various shapes. Throughout the last three lessons students have worked with fractions in the form of circles. Today's lesson will have them making fractions out of folding paper. Before we begin making fractions out of the paper strips we will practice folding paper into 2, 3, 4, 6, 8, and 12 equal pieces. Students should follow along as you model how to fold the paper strips into the equal parts.

Explore: Ask the following questions- How can you show one-fourth on a paper strip? Have students fold the paper strip into four equal parts and color or shade in one of the four parts. Write that fraction name as 1-fourth. Talk about how the two representations for one-fourth are similar and how they are different. Continue this process for 1-third, 1-eighth, and 1-twelfth. Review the different representations for one-third. Students will have seen two examples for fractions. The practice pages that come after this lesson allow students the opportunity to show their new learning and apply it to pictures of units in various shapes.

Share: After students have finished their practice pages, we will hold a group discussion about how we see fraction using the paper folding strips we used today and the circle fractions previously used. We will talk about which of these methods was easier to comprehend and why it seemed easier.

Summarize: Students have gained a better understanding of more ways to see and model fractions. They will use this knowledge and apply it to real-life concepts and problems. Students will be able to use represent fractions into fourths, fifths, sixths, twelfths, and so on.

Link to Lesson 4:

<http://www.cehd.umn.edu/ci/rationalnumberproject/RNP2/Lesson04.pdf>

Rational Number Project

Initial Fraction Ideas

Lesson 4: Overview

Students use paper folding to model and name unit and non-unit fractions. Students compare the paper-folding model to fraction circles. Students record fractions in words: one-fourth, two-thirds.

Materials

- ∞ Paper strips for folding for students
- ∞ Fraction Circles for teacher
- ∞ Student Pages A-L

Teaching Actions

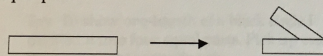
Warm Up

Name the red piece in three different ways by changing the unit. What different units did you use?

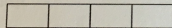
Large Group Introduction

1. Prior to using paper strips to model fractions it is necessary to practice folding strips into 2, 3, 4, 6, 8, and 12 equal parts.

Ask students to follow along with you as you model how to fold paper strips. Fold paper strip into two equal parts:



2. Keep it folded. Now fold it again into two equal parts. Ask: how many equal parts do you think we have? Unfold:



3. Ask students to verbalize how to fold paper strips to form four equal parts.
4. Model folding into three equal parts. Form the letter "S" with a paper strip to get close to 3 equal parts. Press down on paper.

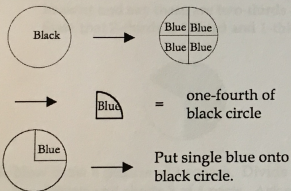
Comments

This lesson may take two class periods. Students are still recording fractional amounts using word names; symbols are introduced in lesson 5.

Cut paper strips from 8.5" by 11" sheets of paper about 1 inch wide and 8.5" long.

Teaching Actions

5. Model sixths. Fold paper strip into thirds and then fold into two equal parts. Have students do this and guess, before unfolding, the number of equal parts they expect.
6. Ask students if they could have obtained sixths by folding first in halves and then in thirds? Try it.
7. Ask students to think of strategies for folding 8ths and 12ths. Encourage trial and error strategy. Have them verbalize successful ways. For 12ths reinforce multiple ways.
8. Students can shade equal parts of paper strips to show fractions. Using fraction circles, show one-fourth using a black circle as the unit.



Say: To show one-fourth of a black circle I divided it into four equal parts. Pick up one of the parts to show one-fourth.

9. Ask: How can you show me one-fourth with a paper strip? Have students fold into 4 equal parts and shade in one of the 4 equal parts. Record fraction name as 1-fourth.
10. Discuss how the two displays for one-fourth are alike and different.
11. Repeat for 1-third, 1-eighth, 1-twelfth.

Comments

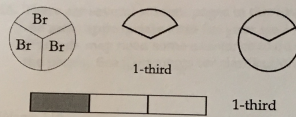
Students often will expect 5 equal parts (3+2). They are more apt to think additively than multiplicatively.

To get 12ths
Halves → halves → thirds
Thirds → halves → halves
Halves → thirds → halves

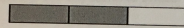
The similarity between the two displays is what's important. A unit is divided into equal parts and one or more equal parts are highlighted in some way. This is a *manipulative to manipulative* translation.

Teaching Actions

12. Look at two displays for one-third:



13. Shade in another third on the paper strip.



Ask: how many thirds are shown now? How can I show two-thirds with circles? (Pick up two browns and say these are two-thirds of black.) State that 2-thirds is 1-third and 1-third more:



14. Now draw a picture of a square. Divide it into 4 equal parts and shade 3 of 4 parts. Ask students to fold paper to show the same fraction that you drew. Record fractions as 3-fourths: 1-fourth + 1-fourth + 1-fourth.
15. Return to fraction circles. Model problems as in lesson 3, this time with non-unit fractions.

Examples:

- ∞ The black circle = 1. What is the value of 1 blue; 3 blues; 1 brown; 2 browns; 3 reds.
- ∞ The yellow piece = 1. What is the value of 1 blue; 2 reds; 3 grays; 2 pinks.

Comments

Non-unit fractions are introduced as sums of unit fractions: 2-fourths is 1-fourth and 1-fourth.

Students now have seen two models for fractions. Practice pages that follow this lesson give students a chance to apply their new learning to pictures of units in different shapes.

Teaching Actions

Small Group/Partner Work


16. There are several student pages in this lesson. **Select the most appropriate ones for your students.** Students may need some assistance to do some of the pages. See Comments for clarification.

Wrap Up


17. Go over problems 6 and 7 from Student Page B. Have students share their solutions. Pick and choose other problems for students to share.

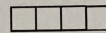
Comments

Teacher Notes for Student Pages:

B: Problems 6 and 7 provide some problem solving. Students reconstruct the unit given one part. For example if  equals 1-half, then the whole must be two of those parts:



If  equals 1-fourth, then the whole must be four of those parts:



G: Clarify with students that a picture may need to be modified to determine if 2-fourths are shaded in. For example:



Is 2-fourths shaded?



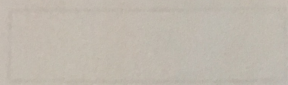
2-fourths can easily be seen once the picture is completed by drawing in the needed lines.

Translations

- ∞ Manipulative to verbal
- ∞ Manipulative to manipulative to verbal
- ∞ Manipulative to verbal to written symbols (word names)

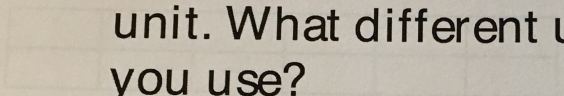
Name the red piece in three different ways by changing the unit. What different units did you use?

1. Here is a square of candy bar.



One part is

2. Now

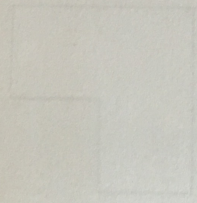


Each part is _____ of the whole bar.

Each piece is _____ of the whole bar.

3. On On-Go! candy bars are in the shape of a square. A 10" bar is all the pieces of an On-Go! candy bar. It looks like the shape below.

The red part is _____ of the whole candy bar.



4. Here is a rectangle of M&M's candy. Draw a picture of M&M's candy. Show off your drawing that mega can be in several ways.

Each part is _____ of M&M's candy.

Day 8 and 9: Fraction Approximation- TeachersPayTeachers.com

Launch: We will start today's lesson by drawing a random line on the board. Discuss with students how much "space" the line takes up and come to the conclusion with students that we will call this distance. We will then discuss how we can mark fractions on a number line. In order to find half we need to measure the line or fold it in half. Once we have determined this, I will take out a meter stick or tape measure to measure the line.

Explore: Students will figure out where the middle of the line is and mark that as $\frac{1}{2}$. Once students have figured out where $\frac{1}{2}$ would be have them figure out where $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, and so on would be on this number line. As students work through this line up on the board they will be thinking about how they can create a number line that would work for halves, thirds, fourths, fifths, sixths, eighths, tenths, and twelfths that did not include decimals when we divided it. This is when students start thinking about different numbers that would work for these fractional parts. Students will work to find the least common multiples of these fractional parts in order to create a line segment that will allow these fractions to be made. Students should come to a decision of 120 inches. They will then use a piece of adding machine tape to create a 120 inch long piece of paper making sure to label each inch. Students will then place a 0 for the starting point, $\frac{1}{2}$ for the half-way point and a 1 for the end point of the number line. Students will be assigned fractions to place on the number line. One student will be the "gluer" and the rest of the students will place their fractions on the number line.

Share: While students are placing their fraction on the number line they will need to explain how they know their fraction goes there. Is it closer to 0? $\frac{1}{2}$? 1?

Summarize: Students were able to find various patterns throughout the number line. They came to the conclusion that at the halfway marks the denominator increased by 2 each time. They also saw that on the far right side of the number line that the numerator and denominators of the fraction had the same number which meant they were equal to one whole.

Link for Fraction Approximation:

<https://www.teacherspayteachers.com/Product/Fraction-Approximation-Visualizing-fractions-on-a-number-line-390332>

Day 10: Rational Numbers Project- Lesson 5

Launch: Explain to students that they have been solving fraction addition problems using fraction circles. We have discussed how to add fraction with the circles and we have recorded these steps with symbols. Have students imagine they are using fraction circles to add $\frac{2}{6} + \frac{1}{4}$. What color pieces are you putting on the black circle? Do you think the answer will be greater than $\frac{1}{2}$ or less than $\frac{1}{2}$? What would you do to find the exact answer using fraction circles? Put that students responses on the board as they explain them. Ask students what color do they think we can use to show both fractions? What denominator would that be (12ths)? Solve the problem using fraction circles and record each step with symbols. Repeat this with various problems.

Explore: Students will work with a partner or in small groups to complete Students Pages A and B. They will be working through different translations: symbol to fraction circles to symbols; symbols to symbols to fraction circles.

Share: Students will share with the class how they solved their problems on Student Pages A and B. They will bring their work up to the document camera and present it to the class. They will explain how they found the common denominator for each set they were adding. They will also show the class two-addition problems that then needed to create on their own.

Summarize: Students have created their own real world addition problems using common denominators. They have used their “mental math” skills to help them solve basic fraction addition problems. They have solved these problems without using their fractions circles or paper folding strips. Students seem to construct their own ways for finding common denominators.

Link to Lesson 5:

<http://www.cehd.umn.edu/ci/rationalnumberproject/RNP2/Lesson05.pdf>

Rational Number Project

Initial Fraction Ideas	Materials
Lesson 5: Overview	∞ Fraction Circles for students and teacher
Students are introduced to fraction symbols by translating from manipulatives to verbal to symbols.	∞ Student Pages A - E

Teaching Actions

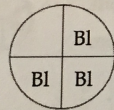
Warm Up

Use paper strips to show these fractions. Which

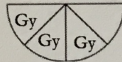
is the largest? $\frac{1}{3}$ $\frac{1}{12}$ $\frac{1}{4}$

Large Group Introduction

1. Ask students to use fraction circles to show 3-fourths. They are to show two models. For example:



3 blues are 3-fourths of 1 black.



3 grays are 3-fourths of 1 yellow.

2. Ask how the two models are alike.
3. Record in words fraction name: 3-fourths. Explain that there is also a symbol name for 3-fourths and it is $\frac{3}{4}$.
4. Discuss the meaning of $\frac{3}{4}$. Ask how many equal parts each unit is divided into? Point to the bottom of the fraction symbol and explain that this 4 tells us that. The 3 tells us that we are interested in 3 of

Comments

It's not important for students to memorize the words: numerator and denominator.

It's very important to help children verbalize the meaning of fraction symbols.

Have them talk through what they are doing with the fraction circles.

The action on the manipulative reinforces the meaning of the symbol.

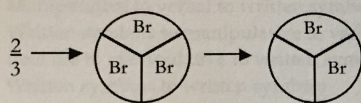
You can also return to previous student pages and have students record answers in symbol form.

Teaching Actions

these 4 equal parts. The fraction means $\frac{1}{4}$ and $\frac{1}{4}$ and $\frac{1}{4}$.

5. Write $\frac{2}{3}$ on the board and ask students to show that fraction with the fraction circles. Have them verbalize why their model does indeed represent $\frac{2}{3}$.

First divide the whole circle into 3 equal parts ... then explain



"I divided the circle into 3 equal parts to find what color is thirds. Then I only want two of them so



shows 2 of 3 equal parts. It is $\frac{1}{3}$ and $\frac{1}{3}$ more."

6. Repeat for $\frac{3}{5}$, $\frac{2}{6}$, $\frac{4}{8}$, $\frac{3}{3}$.

Embed examples in context:

A spinner for a game was divided into 5 equal parts. $\frac{3}{5}$ of the spinner was blue. Show that amount with the fraction circles.

A pizza was cut into 6 equal parts. You ate $\frac{2}{6}$ of the pizza. Show that amount with the fraction circles.

Small Group/Partner Work

7. Student pages that follow reinforce the meaning of the symbol. Select the most appropriate (and amount of) practice that your students need.

Comments

Teaching Actions**Comments****Wrap Up**

8. Ask students to describe 2-3 instances that fractions are used in everyday life or in science class.
9. Record situations from these examples that lead to recording a fraction with symbols. For example, to make chocolate chip cookies, you need to use $\frac{3}{4}$ of a cup of brown sugar. Draw a picture of a measuring cup, partition it into 4 equal parts and show $\frac{3}{4}$.

Translations

- ∞ Manipulative to verbal to written symbols
- ∞ Written symbols to manipulative to verbal
- ∞ Real life to manipulative to written symbols
- ∞ Written symbols to written symbols
- ∞ Written symbols to pictures
- ∞ Pictures to written symbols

Use paper strips to show these fractions. Which is the largest?

A $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{12}$ $\frac{1}{4}$

2. Write the word name and the number name for each fraction division.

- a. 3 of 5 equal-size parts are shaded. _____
- b. 5 of 7 equal-size parts are shaded. _____
- c. 3 of 15 equal-size parts are shaded. _____
- d. 12 of 17 equal-size parts are shaded. _____
- e. 6 of 3 equal-size parts are shaded. _____

3. Write the fraction symbol for each fraction word.

- a. 6 tenths _____ b. One-hundredths _____
- c. 7 eighths _____ d. 1 eighth _____
- e. 4 sixths _____ e. 6 tenths _____
- f. 10 hundredths _____

1. Write each fraction in words.

a. $\frac{2}{4}$ _____ e. $\frac{7}{10}$ _____

b. $\frac{3}{7}$ _____ f. $\frac{7}{15}$ _____

c. $\frac{6}{8}$ _____ g. $\frac{3}{12}$ _____

d. $\frac{3}{11}$ _____ h. $\frac{7}{9}$ _____

2. Write the word name and the symbol name for each fraction described.

a. 3 of 5 equal-size parts are shaded. _____

b. 5 of 7 equal-size parts are shaded. _____

c. 3 of 13 equal-size parts are shaded. _____

d. 12 of 17 equal-size parts are shaded. _____

e. 0 of 3 equal-size parts are shaded. _____

3. Write the fraction symbol for each fraction word.

a. 9-tenths _____ e. 13-twenty-firsts _____

b. 7-eighths _____ f. 17-eighteenths _____

c. 6-sixths _____ g. 0-fourths _____

d. 15-nineteenths _____

Day 11: Fractions Around the Room- TeachersPayTeachers.com

Launch: We will start out today with a review of what we have covered so far. Ask students the following questions:

- 1.) What is a fraction?
- 2.) What does the numerator represent?
- 3.) What does the denominator represent?
- 4.) Are all fractions the same size?

Once students feel comfortable with these questions move on to the activity. Tell students they are going to be doing an activity today that involves moving around the room. Around the room there are questions posted that have students writing fractions using symbols and words. Students are arranged around the room at various starting spots.

Explore: Students work on the problems that are posted around the room. They can work individually or with a partner to check over their answers. They need to discuss and solve the problems and record their answer on their recording sheets. Once they have recorded their answer they can move on to the next problem.

Share: Students will share with their tabletop groups how they solved their problems. They will then choose the most creative method that was used and present that to the class. This will allow students to see the various methods that have been used.

Summarize: This is a self-directed activity where students are able to move around the room answering questions at their own pace. They will be able to represent fractions in words, symbols, and verbally so it is a nice review of what we have covered so far throughout the beginning lessons.

Link for Fractions Around the Room:

<https://www.teacherspayteachers.com/Product/Fractions-Around-the-Room-259936>

Day 12: Rational Numbers Project- Lesson 6

Launch: Start out this lesson by presenting the following word problems found in the Rational Number Project Lesson 6 large group instruction:

- 1.) Jackson spent $\frac{1}{2}$ of his total allowance on a movie and $\frac{1}{4}$ of his total allowance on a candy. What fraction of her allowance did he spend in all?
- 2.) Ty had a bag of peanuts weighing about $\frac{3}{4}$ of a pound. He ate about $\frac{1}{3}$ of a pound. How much did he have left?
- 3.) India ran $\frac{1}{2}$ mile and stopped for a few minutes to catch her breath. Then she ran another $\frac{1}{8}$ of a mile. How far did she run in all?

Tell students they solved these problems using common denominators and ask them why they chose to solve using common denominators?

Verbally state their solutions, show them with symbols, and then have them prove their work using the fraction circles.

Explore: Give directions for Student pages A and B before students begin working on them. They will work with a partner to finish Student Page A. They will use the fraction circles while using a symbolic method for finding the common denominators. Have students read the directions for Student Page B to a partner and solve the problems without using the fraction circles. They can check their work using the fraction circles.

Share: Students will come up to the document camera and show how they solved their problems with the fraction circles as well as without their circles. This will give them all a chance to see various ways that the problems were solved.

Summarize: Students will be able to add and subtract fractions using common denominators. They were also able to represent these fractions using symbols, words, and fraction circles. Students often times get a little confused with the denominators of fractions thinking that $\frac{1}{4} > \frac{1}{3}$ because 4 is greater than 3. They have a hard time relating to the fact that the bigger the denominator the smaller the pieces. They need to remember that we are looking at the size of the piece and not the number of pieces.

Link to Lesson 6:

<http://www.cehd.umn.edu/ci/rationalnumberproject/RNP2/Lesson06.pdf>

Rational Number Project

Initial Fraction Ideas Lesson 6: Overview	Materials
Students observe with circles that as the unit is divided into more and more equal parts, the unit parts become smaller.	<ul style="list-style-type: none"> ∞ Fraction Circles for students and teacher ∞ Student Pages A, B, C

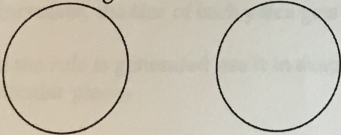
Teaching Actions

Warm Up

Show these fractions with your fraction circles using two different units. Then draw pictures for each display: $\frac{3}{4}$ $\frac{5}{6}$ $\frac{2}{3}$

Large Group Introduction

1. Start the lesson by reviewing ordering of whole numbers. For example, ask a student to select the larger of these 2 numbers, 720 or 702, and to explain his/her strategy for doing so.
2. Give another example using a context. José earns \$42,175 a year. Mara earns \$51,275 a year. Who earns more?
3. Introduce the idea of ordering fractions with this example. Kara entered the Pizza Factory. She saw 2 friends in 1 booth and 3 friends in another booth. Both groups have just been served a large pizza. Which group should she sit with so that she gets the most to eat?
4. Draw this diagram:


5. Ask students to show Kara's share in booth 1 (with 2 friends) and in booth 2 (with 3 friends).

Comments

To think quantitatively about fractions, students should know something about the relative size of fractions. Lesson 6 is the first of several lessons to help students construct informal strategies for ordering fractions. At Level 1, we want to provide the concrete experiences that students need if they are ever to reason intuitively about fraction symbols.

Activities in this lesson will lead students to reason, for example, that $1/4 > 1/8$ because if you divide a circle into 8 equal parts, the parts will be smaller than if you divide the same unit into 4 equal parts.

This notion of more and greater can lead to misunderstandings. Some students may want to say that $1/8 > 1/4$ because $8 > 4$ or because with eighths, you have more pieces than you do with fourths. Whole-number reasoning has a strong influence on how children think about fractions.

Children need to be reminded that to compare fractions, we look at the "size of piece," not the "number of pieces".

Teaching Actions

6. Which group has the most people? In which group does a person have the smallest share of pizza?
7. Conclude that $\frac{1}{3}$ of the pizza is more than $\frac{1}{4}$ of the pizza. [Repeat with 6 people at a table; 5 people at a table.]
8. Develop this idea of more implying less, by using Student Page A.
9. Ask students to use their fraction circles as you work together; name the black circle as the unit.
10. Ask: How many brown pieces cover the whole circle? How many orange? Which color takes more pieces to cover the whole unit? Which color has the smaller pieces?

11. Record that information in a chart.

Color	How many cover 1 circle	Which color takes more...	Which color has smaller...
1. Brown	3		
Orange	5	√	√
2.			

12. When completed, ask students if they see any patterns between the number of pieces to fill the whole unit and the size of the pieces.
13. As a group, write a rule similar to either of these:
 - ∞ As the number of pieces needed to fill the whole decreases, the size of each piece gets larger.
 - ∞ As the number of pieces needed to fill the whole increases, the size of each piece gets smaller.
14. Once the rule is generated use it in examples without the circular pieces.

Examples:

20 purples = 1 whole

80 greens = 1 whole

Which is larger, 1 purple or 1 green?

Comments

Teaching Actions

18 goos = 1 whole
12 boos = 1 whole
Which is smaller, 3 boos or 3 goos?

15. Conclude by asking: Does more always mean less with fractions? Give this example: Imagine that it takes 10 maroon pieces to cover the whole circle. Which is smaller, 2 maroon pieces or 3 maroon pieces? How do you know?
16. Ask: How is this example different from all the rest we've talked about today?

Small Group/Partner Work

17. Assign Practice Pages B and C to reinforce the day's lesson.

Wrap Up

18. Ask students to explain their reasoning for the 2 pairs of fractions on Student Page B they were asked to order without using manipulatives. Ask several students to explain their thinking. Ask students to describe the picture they have in their mind that helps them order these two fraction pairs.

Comments

Students tend to over generalize. This lesson leads children to order fractions with the same numerator, but different denominators ($\frac{1}{3}$ vs. $\frac{1}{2}$, $\frac{2}{5}$ vs. $\frac{2}{10}$, $\frac{40}{100}$ vs. $\frac{40}{90}$). The same reasoning will not work for comparing fractions with the same denominator but different numerators ($\frac{3}{4}$ vs. $\frac{2}{4}$).

If a circle is divided into the same size pieces (4ths) the ordering decision is made by looking at the numerator - "2 of same-sized pieces is greater than 2 of same-sized pieces." Now more does mean more. No wonder students have trouble with fractions!

Translations

- ∞ Real life to picture to verbal
- ∞ Manipulative to written symbols to verbal
- ∞ Written symbols to manipulative
- ∞ Real life to manipulative to pictures

Show these fractions with your fraction circles using two different units. Then draw pictures for each display:

3. Purple			
White	$\frac{3}{4}$	$\frac{5}{6}$	$\frac{2}{3}$
4. Gray			
Green			
5. White			
Green			
6. Orange			
Purple			
7. Gray			
Brown			
8. Brown			
Green			

Name _____

Directions: Use fraction circles to fill in the table.

Color	How many cover 1 whole circle?	Which color takes MORE pieces to cover 1 whole?	Which color has SMALLER pieces?
1. Brown	3		
Orange	5	√	√
2. Orange			
White			
3. Purple			
White			
4. Gray			
Green			
5. White			
Green			
6. Orange			
Purple			
7. Gray			
Brown			
8. Brown			
Green			

Name _____

Directions:

Use fraction circles to compare the two fractions. Circle the larger fraction.

$$\frac{1}{3}$$

$$\frac{2}{3}$$

$$\frac{1}{4}$$

$$\frac{3}{4}$$

$$\frac{4}{5}$$

$$\frac{3}{5}$$

$$\frac{2}{7}$$

$$\frac{2}{6}$$

$$\frac{6}{7}$$

$$\frac{2}{7}$$

$$\frac{4}{12}$$

$$\frac{4}{15}$$

$$\frac{8}{12}$$

$$\frac{11}{12}$$

$$\frac{6}{7}$$

$$\frac{3}{7}$$

$$\frac{2}{7}$$

$$\frac{2}{9}$$

$$\frac{9}{10}$$

$$\frac{3}{10}$$

$$\frac{4}{8}$$

$$\frac{4}{6}$$

Try these without
manipulatives.

$$\frac{2}{3}$$

$$\frac{2}{8}$$

$$\frac{13}{100}$$

$$\frac{27}{100}$$

$$\frac{7}{10}$$

$$\frac{7}{9}$$

$$\frac{9}{10}$$

$$\frac{9}{100}$$

Rational Number Project

Use fraction circles to solve problems.

1. Mr. Hickman made a large apple pie. His daughter ate $\frac{1}{2}$ of the pie. His son ate $\frac{1}{3}$ of the pie. Who ate less? Draw a picture to show your thinking.
2. Spinner A was divided into 6 equal parts shaded green. Spinner B was divided into 10 equal parts with 4 parts shaded green. Which spinner had the larger amount of green? Explain "in your own words" your reasoning.
3. Jessica and Kim shared a large pizza. Jessica ate $\frac{2}{6}$ of a pizza. Kim ate $\frac{3}{6}$ of the pizza. Who ate more? Draw a picture to show your thinking?
4. Mathew and Cassandra shared a bag of candy. Mathew ate $\frac{2}{3}$. Cassandra ate $\frac{2}{5}$. Who ate more? Explain your thinking.
5. Andrew spent $\frac{1}{2}$ of his allowance on candy. Ellen spent $\frac{1}{3}$ of her allowance on a movie. Is it possible that Ellen spent more than Andrew? Explain. [Use the back of the page].

Day 13: Pattern Block Fractions- Illuminations

Launch: Students will be using pattern blocks for this lesson. Give them a set of blocks and allow them a few minutes to get their “wiggles” out and play with the blocks. This will allow them to focus better during the lesson. They will need yellow hexagons, red trapezoids, blue rhombi, and green triangles. Students will be working to figure out the relationships that these shapes have with one another.

Ask the following questions:

- 1.) Is there a way to represent the red trapezoid using blue and green pattern blocks?
- 2.) Can you cover the red trapezoid using only one color?
- 3.) What does this tell us about the relationship between the blue rhombus and the green triangle?
- 4.) Are there other ways to represent various pattern blocks using more than one color pattern block?

Explore: Have students work with a partner to complete the Region Relationships sheet. Students should work on this sheet and explain to their partners how they are finding their solutions.

Share: Students will come up to the document camera and show how they came up with their answers to the Region Relationships. They will explain how many of each color covers a certain shape. They will show them with their shapes along with writing the symbols for the fraction along side of them.

Summarize: Students will be able to identify fraction when they are given a part of a whole along with the whole. They will also be able to show fractional relationships between pattern blocks, fraction circles, fraction symbols and verbal use of fractions. They will also be able to tell what the numerator and denominator represent in a fraction.

Link for Pattern Block Fractions:

<http://illuminations.nctm.org/Lesson.aspx?id=1315>

Day 14: Rational Numbers Project- Lesson 7

Launch: Explain to students that today we are going to keep working with adding and subtracting fractions using the common denominator approach. Students will be reading a story problem and determining if they need to add or subtract in order to solve the problems. Ask students to read through the problems and decide if they will be adding or subtracting in each one. Then ask them how they knew that they needed to subtract in problem one (compare) and problem 4 (how many more needed). Compare the problems to one another and find how they are similar and how they are different. Students should then solve each problem using the common denominator strategy.

Explore: Students will be working on Student Page A on their own. They can check their work with a neighbor if they get stuck on a problem.

Share: Students will share how they completed each of their problems with the people at their groups. This will give them the chance to see how problems were solved in different ways.

Summarize: Students should be able to successfully add and subtract fractions using the common denominator strategy. Students will be able to read through word problems and know what operations need to be completed in order to come up with the correct answer.

Link to Lesson 7:

<http://www.cehd.umn.edu/ci/rationalnumberproject/RNP2/Lesson07.pdf>

Rational Number Project

Initial Fraction Ideas Lesson 7: Overview	Materials
This lesson reinforces the idea that as the number of parts the unit is divided into increases, the size of the parts decreases.	<ul style="list-style-type: none"> • 8.5" X 1" strips of paper for each student and teacher • Student Pages A, B, C

<p>Teaching Actions</p> <p>Warm Up</p> <p>Order these fraction pairs. Write an explanation for each pair (use pictures in your explanation).</p> $\frac{3}{4} \frac{3}{10} \quad \frac{5}{7} \frac{3}{7} \quad \frac{1}{9} \frac{1}{4}$ <p>Large Group Introduction</p> <ol style="list-style-type: none"> 1. Ask children to fold a strip of paper into 4 equal parts. Using the same strip of paper ask them how they can <u>increase</u> the number of equal parts to 8. Have them do so, but before they open up the strip of paper to show eighths ask: Before you open up the strip, can you tell me if the size of the equal parts will be larger or smaller than fourths? Why? 2. Repeat for: <ul style="list-style-type: none"> • 3rds changed to 6ths • Then to 12ths • 4ths changed to 12ths 3. Now ask students to fold, shade, and label these fractions with paper folding: $\frac{1}{3} \quad \frac{1}{4}$ $\frac{2}{3} \quad \frac{2}{4}$ $\frac{3}{3} \quad \frac{6}{6}$ $\frac{3}{4} \quad \frac{1}{4}$ $\frac{4}{4}$ <p>[Do more if needed]</p> 	<p>Comments</p> <p>Children need opportunities to use new ideas in order to ensure they internalize them.</p> <p>Many experiences with physical models are needed to overcome the influence of children's whole number thinking.</p> <p>In this lesson students use paper folding to reexamine the relationship between size of piece and number of pieces the whole is divided into.</p> <p>Encourage children to explain their ordering. Don't let them refer to only one part of the fraction, as for example: 1/3 vs. 1/4 "thirds are bigger". Thirds may be bigger, but that information is enough to order 2 fractions only if the numerators are the same. "Thirds are bigger so 1 of a larger piece is greater than 1 of a smaller pieces." By talking like this children are coordinating numerator and denominator to approximate the size of the fraction. You want to build the notion of a fraction as a single entity!</p> <p>Students may over generalize and think bigger is always more. Check for this.</p>
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Teaching Actions

- You may want to refer back to the pizza problem from lesson 6. Model with paper folding or pictures the answer to the question in that story.

Small Group/Partner Work

- Put students in pairs and assign Student Page A. Student 1 will make fraction 1 with paper folding; student 2 will make fraction 2. They will then compare and circle the larger fraction.
- Student Pages B and C offer extra practice.

Wrap Up

- Conclude the lesson by first asking children to create their own context for comparing 2 fractions.

Examples:

Mary had $\frac{2}{4}$ of large pizza;
Jan had $\frac{2}{4}$ of large pizza.
Who ate more?

Lianna ate $\frac{4}{8}$ parts of a candy bar
Rodrigo ate $\frac{4}{7}$ of same-sized candy bar.
Who ate more?

- Now ask students this question: Jose and Mara both ate $\frac{1}{2}$ of a pizza. Jose said he ate more than Mara. Mara said they ate the same amount. Could Jose be correct?

Comments

Some children may be able to compare without manipulatives

$$\frac{1}{3} \text{ vs. } \frac{1}{5}; \frac{2}{10} \text{ vs. } \frac{2}{20}$$

but there is no need to push abstraction at this level.

Some students may try to compare fractions without the manipulatives and make errors. Encourage them to use paper folding at least to verify their guesses.

Challenge Student Page B: The problem here is that the two units are not the same. $\frac{1}{5} < \frac{1}{2}$ only if the two units are the same. Comparing fractions assumes equal units.

This problem is similar to a NAEP item given to 4th graders. Only 24% were able to explain that if Jose's pizza was larger than Mara's then his $\frac{1}{2}$ would be more.

Translations

- Written symbols to manipulative to verbal

Order these fraction pairs. Write an explanation for each pair (use pictures in your explanation).

$$\frac{3}{4} \quad \frac{3}{10}$$

$$\frac{5}{7} \quad \frac{3}{7}$$

$$\frac{1}{9} \quad \frac{1}{4}$$

Name _____

Directions:

Circle the larger fraction. Use your paper strips to determine the answers.

$\frac{1}{2}$

$\frac{1}{3}$

$\frac{2}{6}$

$\frac{2}{12}$

$\frac{2}{4}$

$\frac{2}{6}$

$\frac{1}{3}$

$\frac{2}{3}$

$\frac{3}{4}$

$\frac{1}{4}$

$\frac{3}{9}$

$\frac{3}{3}$

$\frac{3}{8}$

$\frac{3}{4}$

$\frac{5}{6}$

$\frac{4}{6}$

$\frac{1}{3}$

$\frac{1}{12}$

$\frac{5}{12}$

$\frac{5}{8}$

$\frac{1}{2}$

$\frac{1}{12}$

Without your paper strips,
circle the larger fractions.

$\frac{1}{100}$

$\frac{1}{99}$

$\frac{5}{12}$

$\frac{8}{12}$

$\frac{3}{40}$

$\frac{3}{50}$

$\frac{2}{10}$

$\frac{4}{10}$

Name _____

Directions:

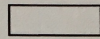
Shade each picture to show the fraction. Circle the SMALLER fraction.



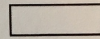
$\frac{1}{2}$



$\frac{1}{4}$



$\frac{1}{4}$



$\frac{1}{3}$



$\frac{2}{3}$



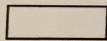
$\frac{2}{6}$



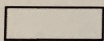
$\frac{2}{3}$



$\frac{2}{4}$



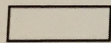
$\frac{1}{8}$



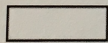
$\frac{1}{4}$

!

Challenge



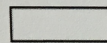
$\frac{1}{8}$



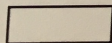
$\frac{1}{4}$



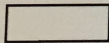
$\frac{1}{5}$



$\frac{1}{2}$



$\frac{2}{4}$



$\frac{2}{3}$

What's wrong with this picture?

Name _____

Directions

A friend has been out of school for two days and missed the math lessons dealing with comparing fractions. Write your friend a letter explaining how to compare fractions like the ones you have been working with. [You may want to draw pictures.]

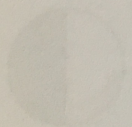
Teaching Activity

Materials:

Use paper folding strips to show how two fractions, $\frac{1}{2}$ and $\frac{2}{4}$, compare the strips. Which fraction is larger? Why?

Large-group Introduction:

1. After a student covers the whole circle with 4 yellow strips, ask students to find different ways to cover the remaining half of the circle. Record answers by color.



2. Repeat this activity, but this time, require that they have to use one color to cover half the circle. Record number of strips and fraction name.

Connections:

The paper folding strips in a previous lesson for fraction equivalence. That is, $\frac{1}{2}$ you will explain that $\frac{1}{2}$ can be changed to $\frac{2}{4}$ because $\frac{1}{2} = \frac{2}{4}$.

Students should find by dividing that $\frac{1}{2}$ is equivalent to $\frac{2}{4}$ because $\frac{1}{2} = \frac{2}{4}$.

Use an additional equivalent fraction by showing that $\frac{1}{2}$ can be changed to $\frac{3}{6}$ because $\frac{1}{2} = \frac{3}{6}$. Ask students to explain why $\frac{1}{2}$ is equivalent to $\frac{3}{6}$.

Day 15: Posttest from Rational Number Project (quizzes 1 and 2)

Name _____

Quiz 1 Naming Fractions

1. The yellow piece is the unit. What fraction name can you give each of these pieces:

1 blue _____

2 grays _____

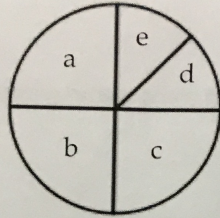
4 reds _____

2. Draw a circle divided into 6 equal parts. Shade 5 of those parts. What fraction of the circle is shaded?

Name _____

Quiz 1 Naming Fractions

3.



What fraction circle color would a, b, or c be? _____

What fraction of the circle is a? _____

What fraction of the circle is a, b and c combined? _____

What fraction of the circle is e? _____

4. Draw a rectangle divided into 8 equal parts. Shade in 5 parts. Write the fraction amount shaded in word.

5. You want to share your pan of brownies equally among yourself and your 8 friends. Draw a picture of your pan of brownies showing how you would divide it up to share. What fraction of the pan will each get?

Name _____

Quiz 2 Ordering fractions

4. Circle the larger fraction. Explain your thinking for each example.

$$\frac{2}{4} \quad \frac{2}{3}$$

$$\frac{1}{10} \quad \frac{1}{20}$$

$$\frac{4}{5} \quad \frac{2}{5}$$

$$\frac{3}{9} \quad \frac{6}{9}$$