Fraction Strips: Comparing and Ordering Fractions

Strand: Number and Number Sense

Topic: Using the symbols <, >, =, and ≠ to compare fractions.

Primary SOL: 4.2 The student will
  a) Compare and order fractions and mixed numbers, with and without models; * and
  b) Represent equivalent fractions.*

*On the state assessment, items measuring this objective are assessed without the use of a calculator

Related SOL:

Materials

- Rectangular strips of paper for folding and creating fraction strips (ideal size is 11" x 1½")
- Chart paper or large sheets of paper
- Equal or Not Equal: Task activity sheet (attached)

Vocabulary

denominator, equal to (=), equivalent fractions, greater than (>), less than (<), not equal to, (≠), numerator, one-half, unit fraction

Student/Teacher Actions: What should students be doing? What should teachers be doing?

1. Provide the students with identical strips of paper, representing the length/measurement model for fractions, to use during the activity. The length of one strip of paper is equal to one whole. It is important to define the whole so that the students will be able to identify other fractional parts within the length model. Have the student take one strip of paper and fold it in half. Ask the students to compare the two parts to the whole and name the fraction represented by the length of each part. Students can draw lines at the fold and label the parts with their fraction names. Using additional strips of paper, ask, *"Can you use the folding process to find two fractions that are equivalent to one half?"* Give the students time to explore using the fraction strips to find equivalent fractions for one-half.

2. As a class, discuss all fractions equivalent to one-half. Remind students that these fractions are different ways of naming the same fractional amount of the same whole. Use the students' work to write some of the equivalencies on the board, such as $\frac{1}{2} = \frac{2}{4}$, $\frac{1}{2} = \frac{4}{8}$, and $\frac{1}{2} = \frac{3}{6}$. Ask students to compare the numerator to the denominator of the fractions that are equivalent to half and describe anything that they notice. Class discussions should lead to the generalization that when the denominator is twice as

large as the numerator, the fraction will be equal to one-half. Ask students to use this generalization to create several other fractions that they think are equal to one-half.

3. Tell students that they are now going to use the paper strips to compare fractions. Write the fraction $\frac{2}{3}$ and $\frac{4}{6}$ on the board. Have the students take one fraction strip and fold into thirds. You may have to guide the students on how to fold the paper into thirds. Have the students draw lines at the fold and label the fractions. Next have the student take a second fraction strip and ask whether they know what they can do to make sixths. Listen for ideas such as: Fold the strip in thirds and then fold the stack of thirds in half. Have students unfold the sixths and ask them what they notice when they compare the strip showing thirds to the strip showing sixths. Listen for ideas such as: The denominator doubled, and each third is now in two parts.

   • Ask students to use their fraction strips, by laying the strips down on their desk, to compare the length of $\frac{2}{3}$ to the length of $\frac{4}{6}$ and share what they find out with a shoulder partner. Ask a volunteer to explain how they know these fractions are equivalent to each other.

   • Have the students discuss what they notice about any other relationships they see when the two strips are side by side. Pose questions that bring out the ideas that two sixths make one-third and that six sixths and three thirds both make a whole. The students should also recognize that half of a third is one sixth.

   • Ask, *"What symbol can be used in a number sentence to correctly compare the fractions?"* Write the sentence on the board.

4. Next, have students compare the fractions $\frac{7}{8}$ and $\frac{2}{3}$. Because students already have a fraction strip folded to represent the fraction $\frac{2}{3}$, the students only need to fold a paper strip to represent the fraction $\frac{7}{8}$ if they did not make eighths earlier. Ask for a volunteer to describe how to fold and make eighths. Listen for some students to say, "Fold in half to make halves, then fold in half to make fourths, and finally fold in half to make eighths."

   • Have students use the strips and describe any relationships they notice when comparing $\frac{7}{8}$ and $\frac{2}{3}$. Students should notice that the fractions are both greater than one-half, that $\frac{7}{8}$ is greater than $\frac{2}{3}$, and they are both one unit fraction less than a whole.

   • If students do not notice that each fraction is one unit fraction less than a whole pose a question: *"How much less than the whole is $\frac{7}{8}$?"* *"How much less than the whole is $\frac{2}{3}$?"* Have the students justify their reasoning and explain their thinking about the distance each fraction is to one whole. Highlight the idea that each fraction is really close to one whole, but because $\frac{1}{8}$ is smaller than $\frac{1}{3}$, it takes less to make up the gap between $\frac{7}{8}$ and one whole.

   • Pose questions for students to think about and recognize that $\frac{2}{3}$ is equal to $\frac{6}{8}$. Ask the students questions such as how much greater is $\frac{7}{8}$ than $\frac{2}{3}$.

- Next, have the students use the correct symbol for comparing these two fractions. Most students will use the greater than symbol or less than symbol to compare the fraction, but ask whether there is an additional symbol that could be used to correctly compare these two fractions. The not equal symbol, $\neq$, can also be used to compare these fractions. Ask students which symbol provides the most specific information about the relationship between the two fractions.

5. Have students work with a partner or in small groups to complete the Equal or Not Equal: Task. Have the students use fraction strips and a large piece of paper to display their information. They should glue the fraction strips to their paper, write the number sentence to show the relationship, and write any additional true statements that reflect the comparison of the fractions. Some of these statements could include which fraction is greater or less, how much greater a fraction is than another, distance from half or whole, or which fractions are equivalent.
   - After the students complete the activity, have a class discussion on the fractions sets. Have the students share the correct symbol used to compare and share two true statements that describe the comparison of the fractions.
   - To close the lesson, have student groups display their posters in the room and ask students to look across the posters and discuss some of the things they notice that may be different. Encourage a class discussion as to what they were thinking about as they worked on their posters, and ask students whether there is anything written on another poster that they want to hear more about. This is time for the teacher to notice any misconceptions and decide whether to address them now or in the next lesson.

6. Use the fractions in each task on the Equal or Not Equal activity sheet and put the set of fractions in each task in order from least to greatest. Use the fraction strips to check your answers.

Assessment

- **Questions**
  - Use pictures, models, and words to explain why the fraction $\frac{2}{6}$ is equivalent to $\frac{1}{3}$.
  - Explain why every fraction is equal to an infinite number of other fractions.
  - Explain how to fold a paper strip to make twelfths.

- **Journal/writing prompts**
  - Carli and Maria were comparing the fractions $\frac{11}{12}$ and $\frac{2}{3}$. Maria said $\frac{11}{12}$ was larger because it was closer to the whole. Carli said $\frac{11}{12}$ and $\frac{2}{3}$ were equivalent fractions because they were both one unit fraction away from the whole. Which student is correct? Use pictures or words to explain your answer.

  - Identify at least two factions that are equivalent, greater than, and less than the fraction $\frac{3}{4}$. Write a number sentence to show your thinking. Use pictures and models to justify your answer.

Other Assessments

- ○ Present students with a pair of fractions to compare. Use two different models to compare your fractions. Explain your answer.
- ○ Explain why $\frac{2}{5}$ is not equal to $\frac{3}{10}$. Use pictures and words to explain your answer.

Extensions and Connections

- Have students to create a human number line from 0 to 2 so that the distances between the numbers are proportional. That is, $\frac{1}{2}$ is twice as far from 0 as $\frac{1}{4}$. Create a set of number cards by writing 0, 1, and 2 and then fractions with denominators of 12 or less on enough index cards or sheets of paper so that each person in class has one. Include some equivalent fractions and fractions greater than one. Give each student a number card and ask the 0 and 2 to take their place with enough distance between them so that eventually every student in class will find their fractions correct placement on in the line. Ask the students with 1 and $\frac{1}{2}$ to take their places on the number line, ask another student to explain whether the fractions are in the correct place on the number line and how they know. Then ask for volunteers to come up, one at a time, and take their fraction's place on the number line. Each time a volunteer comes up, ask someone to justify the position and how they know it is correct or not. Have a class discussion on the location of each fraction and how equivalent fractions can be located at the same position on the number line. Ask questions such as: *"How far from zero?" "How much further to?" "How close to one?" "How much more than one?"* to highlight the idea of distance on the number line and to have students think about the relationships between fractions.

Strategies for Differentiation

- Use an area model, such as fraction circles.
- Have some ready-made strips with dotted lines so they can fold on the dotted line.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

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Equal or Not Equal: Task

Directions: Use the paper strips to create fraction models to compare the following fractions. The symbols >, <, = or ≠ should be used to write as many different number sentences as possible to correctly compare the fractions. Glue the fraction strips on the paper provided, and write the true number sentences to describe the relationship when the fractions are compared, as well as any other relationships they notice.

Set A: $\frac{1}{3}$ and $\frac{4}{9}$

Set B: $\frac{3}{4}$ and $\frac{6}{8}$

Set C: $\frac{8}{12}$ and $\frac{4}{6}$