Constructing Task: Fraction Clues

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

a. Understand a fraction *a/b* as a multiple of 1/*b*. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).*

b. Understand a multiple of *a/b* as a multiple of 1/*b*, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)*

c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Students need practice with open-ended activities that allow them to design their own problems and then assess one another. This activity also makes students use mathematical language, verify answers, and work collaboratively with another student. This activity offers students a concrete way to see equivalent fractions.   This activity also helps build the "guess and check" strategy as each student tries to build the fraction bar based on the set of clues.

This activity is also valuable because students start to realize that a different number of tiles in a different fraction bar can still be represented by the same fraction. For example

3 tiles   4 tiles
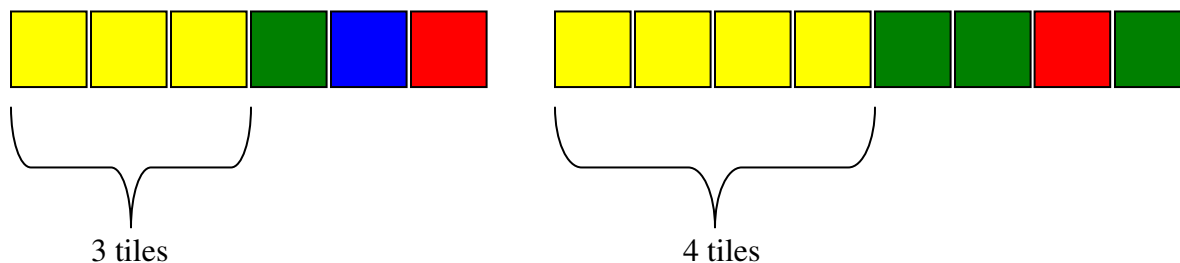
In the first bar three yellow tiles represent ½ and in the second bar four tiles represent ½. Students will gain further understanding that the number of tiles being used (numerator) is always dependent on its relationship to the total number of tiles (denominator)

Before asking students to work on this task, be sure students are able to:

- identify the number of equal pieces needed to cover one whole as the denominator
- show equivalent fractions with an area model
- record on the student sheet equivalent fractions or fraction sets (either by coloring or gluing die cut squares)
- write an equation which shows the clues and verify their answer.

ESSENTIAL QUESTIONS

- How can fraction represent parts of a set?
- How can I represent fractions in different ways?
- How can I find equivalent fractions?
- How can I multiply a set by a fraction?

MATERIALS

- Colored tiles
- Fraction Clues recording sheet
- Crayons or colored pencils

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

In this task students will use what they have learned about adding and subtracting fractions, using equivalent fractions and multiplying a fraction by a whole number to give another student

clues about the fraction strip they created. There is a lot of emphasis on communicating mathematically in this task.

Comments

To introduce this activity display these two fraction bars made from Color Tiles.

Ask students to find out what portion of the whole a tile in the first bar represents and what portion of the whole a tile in the second bar represents. Students should be able to determine that each tile in the first bar represents ¼ of the whole and each tile in the second bar represents ⅙ of the whole.

Ask students to explain what fractional part each color represents in each fraction bar. Give the following set of fraction clues that describe one of the fraction bars. Stop after each clue and ask children which fraction bar is the solution and how they know.

- The fraction bar is one-half green
- The fraction bar is one-third red
- The fraction is one-sixth blue

Many children will not need all three clues to determine the solution however they should be comfortable arguing and verifying their answers and they may need all three clues to conclude that the solution is the second bar.

Part 2 is a much more challenging version where students create fractions bar with any number of tiles, requiring students to use different denominators, such as 6, 8, 10, and 12. This allows students to develop other strategies for determining the denominator, for example a student may be forced to find a common denominator or they may figure out on their own that the largest denominator must refer to the total number of tiles.

If available, students can glue die-cut red, yellow, blue and green squares.

Task Directions
Students will follow directions below from the Fraction Clues activity sheet. .
- Obtain a set of colored tiles.
- Work with a partner to make a fraction bar and record it on their activity sheet.
- Write at least 3 clues that describe your fraction bar
- Exchange only your clues with another group
- Represent your answer with a number sentences (for example: if you have 10 tiles and ½ are red then write the number sentence $^{10}\!/_2$ = 10 x ½ which is 5 tiles)
- Attempt to build another group's fraction bar as they attempt to build yours.
- Discuss results with each other.

FORMATIVE ASSESSMENT QUESTIONS

- What clues did you write to describe your fraction bar?
- Have you found all of the possible equivalent fractions? How do you know?
- Were you able to build the fraction bar based on the clues? If not, why?
- Could you change any of your clues?
- What number sentence can describe the tiles in your bar?

DIFFERENTIATION

Extension
- Once students have completed the task above, this lesson can be extended to have two pairs of students combine their fraction bars to make a larger fraction bar, then continue the activity writing clues for another group to solve.
- Students could also be encourage to work with larger fraction bars as well as write more clues for determining those fraction bars. Most color tiles only have red, blue, green and yellow tiles, so the activity will never have more than four fractions to represent.

Intervention
- If necessary students could begin this activity with a smaller set, such as using only four tiles.
- If students are struggling, they could attempt with activity with only three colors instead of using all four colored tiles.
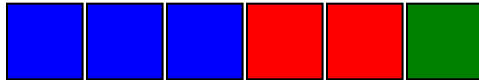
Name _____ Date _____

Fraction Clues
(Part 1)
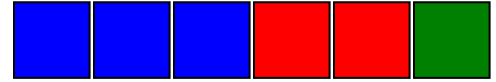
Make a Color Tile fraction bar and then write a set of clues so that someone else could build it.

• Work with a partner. Choose 6 Color Tiles and arrange them in any way to form a fraction bar.

• Decide what fractional part of the whole bar is represented by each color you used. For example:

Blue: ³⁄₆ or ½
Red: ²⁄₆ or ⅓
Green: ⅙

• Record your fraction bar on grid paper. Beneath the grid paper, write a several clues that describe the fractional parts of your bar. For example: *My bar is _____ blue.*

• Exchange lists with another pair. Be careful not to peek at the back of the list!
Follow the clues to try to build the other pair's fraction bar.

• Represent your answer with a number sentences (for example: if you have 10 tiles and ½ are red, then students might write the following: Half of 10 = ¹⁰⁄₂ = 10 ÷ ½ = 5 tiles)

• When you have finished making the fraction bar, turn the list of clues over and compare what you built to the recording.

• Discuss your results with the other pair.

Clue 1: _____

_____

_____

_____

Clue 2: _____

_____

_____

_____

Clue 3: _____

_____

_____

_____

Clue 4: _____

_____

_____

_____

• Work with a partner. Choose 8 color tiles and arrange them in any way to form a fraction bar.

• Decide what fractional part of the whole bar is represented by each color you used. For example:

Blue: ⅜
Red: ⅛ or 1/4
Green: ⅜

• Record your fraction bar on grid paper. Beneath the grid paper, write a several clues that describe the fractional parts of your bar. For example: *My bar is _____ blue.*

• Exchange lists with another pair. Be careful not to peek at the back of the list!
Follow the clues to try to build the other pair's fraction bar.

• Represent your answer with a number sentences (for example: if you have 10 tiles and ½ are red then write the number sentence ¹⁰½ = 10 ÷2 = 5 tiles)

• When you have finished making the fraction bar, turn the list of clues over and compare what you built to the recording.

• Discuss your results with the other pair.

Clue 1: _____

_____

_____

_____

Clue 2: _____

_____

_____

_____

Clue 3: _____

_____

_____

_____

Clue 4: _____

_____

_____

_____

• Work with a partner. Choose 12 Color Tiles and arrange them in any way to form a fraction bar.

• Decide what fractional part of the whole bar is represented by each color you used. For example:

Blue: $\frac{4}{12}$ or $\frac{1}{3}$
Red: $\frac{2}{12}$ or $\frac{1}{6}$
Green: $\frac{6}{12}$ or $\frac{1}{2}$

• Record your fraction bar on grid paper. Beneath the grid paper, write a several clues that describe the fractional parts of your bar. For example: *My bar is _____ blue.*

• Exchange lists with another pair. Be careful not to peek at the back of the list!
Follow the clues to try to build the other pair's fraction bar.

• Represent your answer with a number sentences (for example: if you have 10
tiles and ½ are red then write the number sentence $\frac{1}{2}$ = 10 ÷2 = 5 tiles)

• When you have finished making the fraction bar, turn the list of clues over and compare what you built to the recording.

• Discuss your results with the other pair.

Clue 1: _____

_____

_____

_____

Clue 2: _____

_____

_____

_____

Clue 3: _____

_____

_____

_____

Clue 4: _____

_____

_____

_____

Name _____ Date _____

Fraction Clues
(Part 2)

Make a Color Tile fraction bar and then write a set of clues so that someone else could build it

• Work with a partner. Choose any number of Color Tiles and arrange them in any way to form a fraction bar.

• Decide what fractional part of the whole bar is represented by each color you used. For example:

Blue: ³⁄₆ or ½
Red: ²⁄₆ or ⅓
Green: ⅙

• Record your fraction bar on grid paper. Beneath the grid paper, write a several clues that describe the fractional parts of your bar. For example: *My bar is _____ blue.*

• Exchange lists with another pair. Be careful not to peek at the back of the list!
Follow the clues to try to build the other pair's fraction bar.

• Represent your answer with a number sentences (for example: if you have 10 tiles and ½ are red then write the number sentence ¹⁰½ = 10 ÷2 = 5 tiles)

• When you have finished making the fraction bar, turn the list of clues over and compare what you built to the recording.

• Discuss your results with the other pair.

Clue 1: _____

_____

_____

_____

Clue 2: _____

_____

_____

_____

Clue 3: _____

_____

_____

_____

Clue 4: _____

_____

_____

_____