CONSTRUCTING TASK: I LIKE TO MOVE IT! MOVE IT!!

Suggested Time for Task: 1-2 class periods

Students will count unit fraction on number lines.

STANDARDS FOR MATHEMATICAL CONTENT

MCC3.NF.1 Understand a fraction a/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b.

MCC3.NF.2 Understand a fraction as a number on the number line; represent fractions on a number line diagram.

a. Represent a fraction 1/b on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line.
b. Represent a fraction a/b on a number line diagram by marking off *a* lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line.

MCC3.OA.3 Use multiplication and division within 1000 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

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

Van de Walle stated that in whole-number learning, counting precedes and helps students compare the size of numbers and later to add and subtract. This is also true with fractions. Counting fractional parts, initially unit fractions, to see how multiple parts compare to the whole helps students understand the relationship between the parts (the numerator) and the whole (the

denominator). (A unit fraction is a single fractional part. The fractions 1/3 and 1/8 are unit fractions). Students should come to think of counting fractional parts in much the same way as they; might count apples or other objects. If you know the kind of part you are counting (denominator), you can tell when you get to one whole, when you get to two wholes, and so on. Students should be able to answer the question, "How many fifths are in a whole?" us as they know how many ones are in a ten. However, in the 2008 National Assessment of Education Progress (NAEP) only 44 percent of fourth grade students answered that question correctly (Rampey, Dion, & Donahue, 2009).

The students will continue to be reinforced about their understanding of a unit fraction and the similarities and differences between it and units of 1 (whole numbers). Thus, in this task, the students will:

a. Develop an understanding of how, like units of 1, unit fractions are positioned on a number line in patterns of odd and even.
b. Adding unit fractions together can make wholes with extra "parts" as remainders.
c. "Explore" *b*'s relationship to division with remainders.

Throughout this unit, students have justified their understanding of how unit fractions make a whole. Just like counting whole numbers, the counting of unit fractions is called iterating. Like partitioning, iterating is an important part of being able to understand and use fractions. Understanding that ¾ can be thought of as a count of three parts called fourths is an important idea for students to develop (Van de Walle).

COMMON MISCONCEPTIONS

Many students do not see unit fractions as the basic building block of fractions, in the same sense that the number 1 is the basic building block of the whole numbers. Just as every whole number is obtained by combining sufficient number of 1s, every fraction is obtained by combining a sufficient number of unit fractions (Kentucky DOE FALs document).

ESSENTIAL QUESTIONS

- What is the relationship between a unit fraction and a unit of 1?
- How is the odd and even pattern with unit fractions on a number line similar to units of 1 on a number line?
- Why is the denominator important to the unit fractions?
- How does the numerator impact the denominator on the number line?

MATERIALS

- Sidewalk chalk

GROUPING

Partners/Small Group

NUMBER TALKS

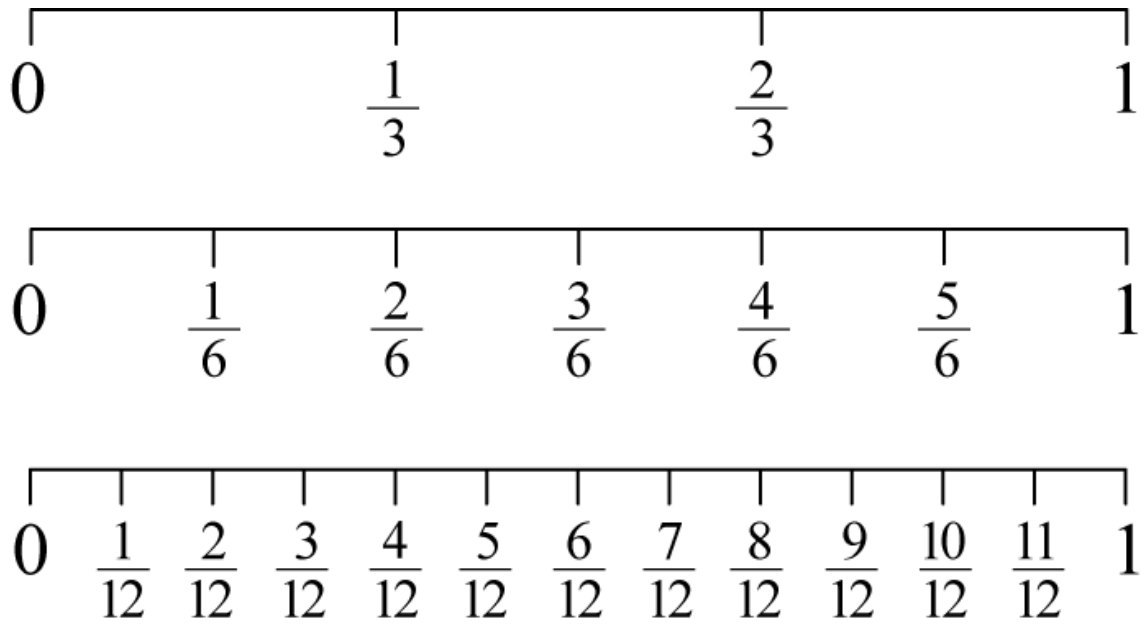
By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students.

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

It is imperative that the teacher conducts the following discussion using the below mentioned questions before the task since they will serve as a bridge for conceptual understanding.

On the board, the teacher will display the following number lines but have it continue to the whole number 5 with ⅓ and ⅔ being labeled between each whole unit and likewise with sixths . This will be done to reinforce how the denominator tells how many equal units it takes to make a whole and size relationship.



NOTE: The picture contains twelfths, BUT they are NOT taught in third grade!

Questions:

a. How many units are represented between 0 and 1 on the first number line? second number line?

b. What's the major difference between the two number lines?

c. What do you think would happen if I had 5 thirds? Could it be placed on the number line?
d. Are there fractions that are at the same point on the number line?
e. Why do you think that happened?

The teacher can then ask questions and have the students position the fractions on the number line. The Progressions document states that the words "proper" and "improper" fractions should NOT be introduced initially; instead 5/3 is the "quantity" you get by combining 5 parts together when the whole is divided into 3 equal parts. The **Progressions third grade** document also states that the goal is for students to see unit fractions as the basic building blocks of fractions, in the same sense that the number 1 is the basic building block of the whole numbers; just as every whole number is obtained by combining a sufficient number of 1s, every fraction is obtained by combining a sufficient number of unit fractions.

The progressions' document states that students need to see that unit fractions, the one with the larger denominator is smaller, by reasoning, for example, that in order for more (identical) pieces to make the same whole, the pieces must be smaller. From this they reason that for fractions that have the same numerator, the fraction with the smaller denominator is greater. For example, *¼ > 2/7 because 1/7 < ¼, so 2 lengths of 1/7 is shorter than 2 lengths of ¼*

Part II (SMP 1, 2, 3, 4, 5, 6, 7, 8)

The teacher will then take the students outside to the parking lot or sidewalk. She will have the students broken into groups of three. Each group will have been assigned a color which will match the sidewalk chalk number lines on the ground. Each group will have four number lines on the ground. The teacher will have this prepared with the number lines beginning at 0 and extending to 5. Their first task will be to partition each number line into halves, thirds, fourths, and sixths. Between each whole number should be 1/3, 2/3, or ¼, 2/4, ¾, etc. You never want the student to lose sight of whatever the denominator is, that's how many parts it takes to make a whole. As for the number lines, be clear to say that each number line has its own fractions. Halves are on a line by themselves, thirds are on their own line and sixths are on their own line. They are NOT combined. ***Note for teacher: Creating unit fractions on a number line is actually more challenging than it sounds. The students will be developing their conceptual understanding of how halves should be drawn larger than thirds and so forth. Having a student serve as a "resident expert" once the fractions lines are completed will also reinforce the idea that the smaller the denominator the bigger the part and vice versa. The "expert" could also have a sheet with a sample to serve as a visual if need be.***

Also, the students could partition the wholes into units without writing the fraction underneath. However, the students must know that between each whole number, the partitioning of units MUST remain the same. ***3rd grade progressions document, fractions, page 3***

The teacher should position the students in the parking lot or sidewalk side by side but with enough space so that the each group can work independently. This is important too so that when

they begin the game, each team will have the same distance to run. The following gives an example of the way it could look.

_____No. Line Halves_____	**_____No. Line Halves_____**	**_____No. Line Halves____**
_____No. Line Thirds_____	**_____No. Line Thirds_____**	**_____No. Line Thirds____**
_____No. Line Fourths_____	**_____No. Line Fourths_____**	**_____No. Line Fourths____**
_____No. Line Sixths_____	**_____No. Line Sixths_____**	**_____No. Line Sixths____**

Once the number lines are partitioned into their correct fractional parts, the teams then go and stand at their starting line which should be about 8 to 10 feet directly behind their number lines and side by side with the other teams for fairness. The teacher will then call out a fraction. The first team member to run and stand on the correct position wins the point. They also must orally count aloud 1/3, 2/3, 3/3, 4/3, 5/3 so that ALL students gain an understanding of how unit fractions are counting numbers.

FORMATIVE ASSESSMENT

- What did you notice happening when the numerator was larger than the denominator?
- How is counting the number of parts related to creating whole numbers?
- How is that related to division?

DIFFERENTIATION

- **Extension #1-** Van de Walle Activity 12. 5, "How Far Did She Go?", *Teaching Student Centered Mathematics, Second Edition*
  Give students number lines partitioned such that only some of the partitions are showing. Meaning, between 0 and 1, give two partition fraction lines near zero, but leave the rest off to see if they can determine that there were six equal groupings. The other number line directly underneath could be eighths, but the partitioning lines could be near the number one. The scenario could be use a context such as walking to school. For each number line, ask, "How far has Nicole gone? How do you know? The teacher must have one of the partitioning lines circled on each graph and require the student to justify their responses to check for conceptual understanding. As an activity, the teacher can have the students create their own number lines with just a few partitioning lines displayed either near zero or one and have a classmate determine the location. Instead of it being just 0 to 1, it could be extended to whole numbers 5 or 10 depending on their readiness.

- **Extension #2-** This task could continue by doing similar activities from the previous day but the students must tell you the location in wholes and part. For example, if they are standing on 7/3 on the number line, then that's 2 and 1/3. Note: This is NOT a third grade standard. However, it is an excellent opportunity to "expose" and justify how the

parts of the denominator makes a whole and how the numerator factors in because the numerator partners with the denominator to possibly make wholes with parts left over. In fourth grade they call this a mixed number. This also shows a connection between division and fractions due to the divisor and denominator sharing the same role and the numerator is the dividend. This IS NOT meant for them to know, but to show relationships on the progression.

Intervention

- The students pull out their fractional self-created sets from the previous lesson or teacher provided fractional strips. The students will practice counting the fractional parts and drawing out different amounts. For example, they could count and display ½, 2/2, 3/2, 4/2, and 5/2. They would then draw the representation to look like a number line and label each part as typed above to show how you can count unit fractions like unit whole numbers.

Just For Fun: The task is entitled "I like to move it! Move it!" When the students are using the sidewalk chalk to partition each number line into unit fractions, play the Madagascar song

to get them moving since they will be running and moving throughout the game!