Practice Task: Fraction Pie Game

STANDARDS OF 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.)*

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

When asked what is larger, ½ or ¼, many students will say that ¼ is larger. When asked why, they will say, "Because four is a larger number than two." Students need a lot of exposure to fractions to discover various essential fractional concepts. One important concept involves students discovering the relationship between the size of a fractional piece and the size of the denominator. The greater the denominator, the smaller the fraction. This game is intentionally broken up into two parts so students can see that as the denominator gets higher. it in fact becomes much more difficult and requires many more roles of the dice, to produce 15 wholes. Young students also typically enjoy games of chance. and probability is a skill that also builds fractional understanding. Having students play with both 6-sided and 10-sided dice will also build this skill and they will begin to gain some understanding of both fractions and their odds when playing games of chance.

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

- Use repeated addition to add fractions with the same denominator.
- decompose fractions, for example ¾ = ½ + ½ or ¼ + ¾
- understand that the whole came be any number and the fractions always depend on taking a portion of this whole

ESSENTIAL QUESTIONS

- What does it mean to take a fractional portion of a whole number?
- How is multiplication of fractions similar to division of whole numbers?
- How is multiplication of fractions similar to repeated addition of fraction?
- What is the relationship between the size of the denominator and the size of each fractional piece (i.e. the numerator)?

MATERIALS

- Fraction circles
- Colored pencils or crayons
- 6 or 10 sided dice
- Fraction Pie Game student recording sheet.

GROUPING

Group/Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

In this task students will play a simple game of chance to see who can fill up 15 wholes on their score card and game board first. Children at this age enjoy games of chance, however this game also gives students a chance to practice using their fractional understandings and also requires them to use logical thinking and problem solving strategies.

Comments

Colored fraction circles should be made available to the students as much as possible. However, if these manipulatives are not available, then student's score cards must also be colored in. Fraction bars can be used as an alternative manipulative for this task. Students may even utilize the fraction bars as a strategy for keeping track of their score.

This task could be introduced by playing similar commercially bought dice games, such as Yahtzee, which are great, but often reinforce whole number operations and not fractions. Some students might be familiar with these games. To teach the students how to play the game, the teacher could model with a student and play one round. To play the game, a player rolls the dice. The value of the roll indicates the number of fraction pieces you can shade in.

The game is designed to build some fractional thinking alongside some strategy. For example, if a player rolled a 6, they could shade in a fraction with a larger denominator such as tenths or twelfths. Students will quickly realize that the greater the denominator, the harder it is to cover up that fraction.

Task Directions

Students will follow directions below from the Fraction Pie Game recording sheet.
The object of the game is to be the first person to 15 wholes. You have to complete a whole for it count toward the 15. You need to be able to prove your answer.

2-4 person game

1. Each person takes turns rolling the dice
2. After you have rolled, you must pick what type of pie you choose to color in and then you may color in fractional pie for the value of the role (for example, if you rolled a 6 and chose halves then you may shade in 6 halves)
3. You are also responsible for filling in your score card as you play.
4. Play several rounds, but be sure to share your strategy when you are done.
5. Be sure you can prove your answer.

FORMATIVE ASSESSMENT QUESTIONS

- What fraction circles are you trying to fill up first? Why?
- What strategies do you have for this game?
- If you roll a high number, what fraction circle might you try to fill in?
- If you roll a low number, what fraction circle might you try to fill in?

DIFFERENTIATION

Extension

- Once students have completed the task above, this lesson could be extended to use a larger value then 15, although more score cards will need to be reproduced. For example, if two score cards were made available, students could play to 20 or 30.
- Students could also play with additional dice.
- Students could be introduced to much larger fractions such as $\frac{1}{25}$, $\frac{1}{50}$, $\frac{1}{100}$.

Intervention

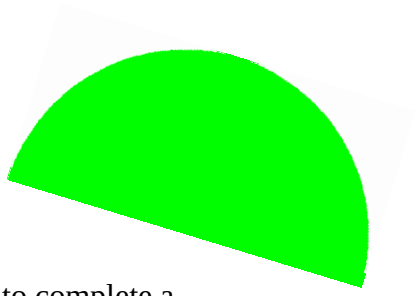
- Students may need to play to a smaller whole than 15.
- Students could benefit from a number line such as the one included below.

1											
$\frac{1}{2}$											$\frac{2}{2}$
$\frac{1}{3}$										$\frac{2}{3}$	$\frac{3}{3}$
$\frac{1}{4}$				$\frac{2}{4}$				$\frac{3}{4}$			$\frac{4}{4}$
$\frac{1}{5}$			$\frac{2}{5}$			$\frac{3}{5}$			$\frac{4}{5}$		$\frac{5}{5}$
$\frac{1}{6}$		$\frac{2}{6}$			$\frac{3}{6}$			$\frac{4}{6}$		$\frac{5}{6}$	$\frac{6}{6}$
$\frac{1}{7}$	$\frac{2}{7}$			$\frac{3}{7}$			$\frac{4}{7}$			$\frac{5}{7}$	$\frac{6}{7}$	$\frac{7}{7}$
$\frac{1}{8}$	$\frac{2}{8}$		$\frac{3}{8}$			$\frac{4}{8}$			$\frac{5}{8}$	$\frac{6}{8}$	$\frac{7}{8}$	$\frac{8}{8}$
$\frac{1}{9}$	$\frac{2}{9}$	$\frac{3}{9}$			$\frac{4}{9}$			$\frac{5}{9}$	$\frac{6}{9}$	$\frac{7}{9}$	$\frac{8}{9}$	$\frac{9}{9}$
$\frac{1}{10}$	$\frac{2}{10}$	$\frac{3}{10}$	$\frac{4}{10}$	$\frac{5}{10}$	$\frac{6}{10}$	$\frac{7}{10}$	$\frac{8}{10}$	$\frac{9}{10}$	$\frac{10}{10}$			
$\frac{1}{11}$	$\frac{2}{11}$	$\frac{3}{11}$	$\frac{4}{11}$	$\frac{5}{11}$	$\frac{6}{11}$	$\frac{7}{11}$	$\frac{8}{11}$	$\frac{9}{11}$	$\frac{10}{11}$	$\frac{11}{11}$		
$\frac{1}{12}$	$\frac{2}{12}$	$\frac{3}{12}$	$\frac{4}{12}$	$\frac{5}{12}$	$\frac{6}{12}$	$\frac{7}{12}$	$\frac{8}{12}$	$\frac{9}{12}$	$\frac{10}{12}$	$\frac{11}{12}$	$\frac{12}{12}$	

1											
$\frac{1}{2}$											$\frac{2}{2}$
$\frac{1}{3}$										$\frac{2}{3}$	$\frac{3}{3}$
$\frac{1}{4}$				$\frac{2}{4}$				$\frac{3}{4}$			$\frac{4}{4}$
$\frac{1}{5}$			$\frac{2}{5}$			$\frac{3}{5}$			$\frac{4}{5}$		$\frac{5}{5}$
$\frac{1}{6}$		$\frac{2}{6}$			$\frac{3}{6}$			$\frac{4}{6}$		$\frac{5}{6}$	$\frac{6}{6}$
$\frac{1}{7}$	$\frac{2}{7}$			$\frac{3}{7}$			$\frac{4}{7}$			$\frac{5}{7}$	$\frac{6}{7}$	$\frac{7}{7}$
$\frac{1}{8}$	$\frac{2}{8}$		$\frac{3}{8}$			$\frac{4}{8}$			$\frac{5}{8}$	$\frac{6}{8}$	$\frac{7}{8}$	$\frac{8}{8}$
$\frac{1}{9}$	$\frac{2}{9}$	$\frac{3}{9}$			$\frac{4}{9}$			$\frac{5}{9}$	$\frac{6}{9}$	$\frac{7}{9}$	$\frac{8}{9}$	$\frac{9}{9}$
$\frac{1}{10}$	$\frac{2}{10}$	$\frac{3}{10}$	$\frac{4}{10}$	$\frac{5}{10}$	$\frac{6}{10}$	$\frac{7}{10}$	$\frac{8}{10}$	$\frac{9}{10}$	$\frac{10}{10}$			
$\frac{1}{11}$	$\frac{2}{11}$	$\frac{3}{11}$	$\frac{4}{11}$	$\frac{5}{11}$	$\frac{6}{11}$	$\frac{7}{11}$	$\frac{8}{11}$	$\frac{9}{11}$	$\frac{10}{11}$	$\frac{11}{11}$		
$\frac{1}{12}$	$\frac{2}{12}$	$\frac{3}{12}$	$\frac{4}{12}$	$\frac{5}{12}$	$\frac{6}{12}$	$\frac{7}{12}$	$\frac{8}{12}$	$\frac{9}{12}$	$\frac{10}{12}$	$\frac{11}{12}$	$\frac{12}{12}$	

Name: _____ Date: _____

Fraction Pie Game
Part 1



The object of the game is to be the first person to make 15 wholes. You have to complete a whole for it count toward the 15. You need to be able to prove your answer.

2-4 person game

1. Each person takes turns rolling the dice
2. After you have rolled, you must pick what type of pie you choose to color in and then you may color in fractional pie for the value of the roll (for example, if you rolled a 6 and chose halves then you may shade in 6 halves)
3. You are also responsible for filling in your score card as you play.
4. Play several rounds, but be sure to share your strategy when you are done.
5. Be sure you can prove your answer.

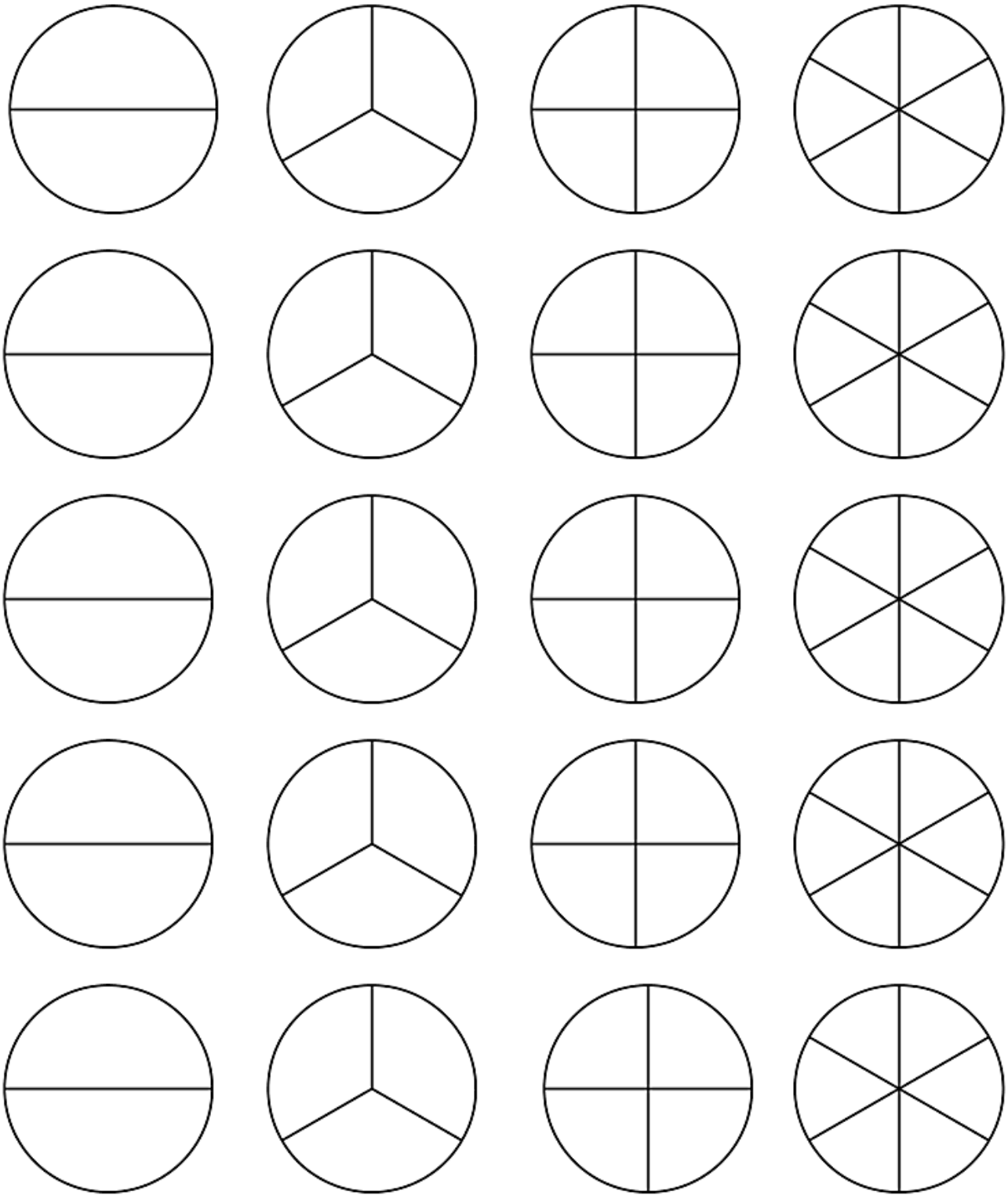
Fraction	Tally	Fraction x Tally	Product
½			
⅓			
¼			
⅙			

TOTAL: _____

_____

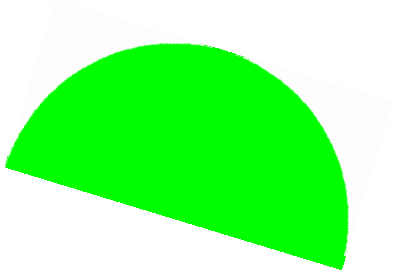
_____

_____



Name: _____ Date: _____

Fraction Pie Game
Part 2



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Fraction	Tally	Fraction x Tally	Product
1/5			
1/8			
1/10			
1/12			

TOTAL: _____

_____

_____

_____

Was it easier to get to 15 in Part 1 or Part 2? Why do you suppose this is? _____

_____