Constructing Task: Fraction Cookies Bakery

Revisited - Adapted from "Fraction Cookies" Grade 2, Unit 5

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.NF.3 Understand a fraction *a*/*b* with *a* > 1 as a sum of fractions 1/*b*.
   a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
   b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.*
   c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.
   d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.
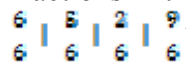
STANDARDS FOR MATHEMATICAL PRACTICE

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.
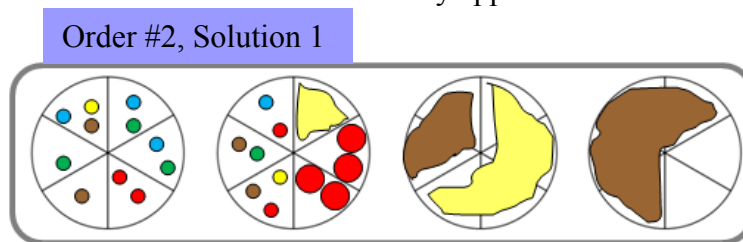8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Students should have an understanding about how to represent a fraction using an area model, such as a circle.

When creating the cookie confirmations, students are able to use the associative property to add different fractions first if that makes more sense. For example, a solution for order # 2 is shown below. In this case a student added the fractions in the order they appear on the order form.
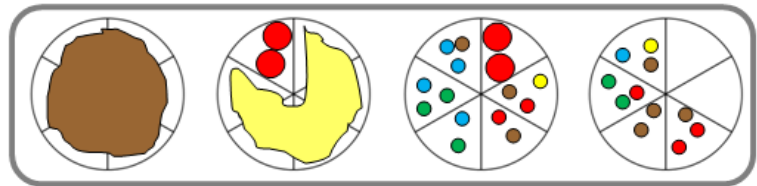
If a student had added the fractions in the following order, $\frac{6}{6} + \frac{5}{6} + \frac{2}{6} + \frac{9}{6}$ the solution could be as shown in the second example.

Be sure students understand that either solution is correct because the correct fraction of each

Order #2, Solution 1

Order #2, Solution 2

type of topping is represented. Numerical solutions and pictorial solutions are shown below. As discussed above, answers may vary.

ESSENTIAL QUESTIONS

- What is a fraction and how can it be represented?
- What is an improper fraction and how can it be represented?
- What is a mixed number and how can it be represented?
- What is the relationship between a mixed number and an improper fraction?
- How can improper fractions and mixed numbers be used interchangeably?
- How do we add fractions?
- How do we apply our understanding of fractions in everyday life?

MATERIALS

- "Fraction Cookie Bakery, Order Form" student recording sheet
- "Fraction Cookie Bakery, Order Confirmation Form" student recording sheet
- colored pencils, crayons, or markers

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

This task provides students with their first opportunity to explore addition with improper and proper fractions. Students will add proper and improper fractions to create cookie order confirmation notices. They will be required to write each sum as an improper fraction and a mixed number.

Comments

This task may be introduced by reading *The Hershey's Milk Chocolate Fractions Book* by Jerry Pallotta, focusing on the addition that is modeled in the book. Continue by explaining the task and modeling the example problem as shown below.
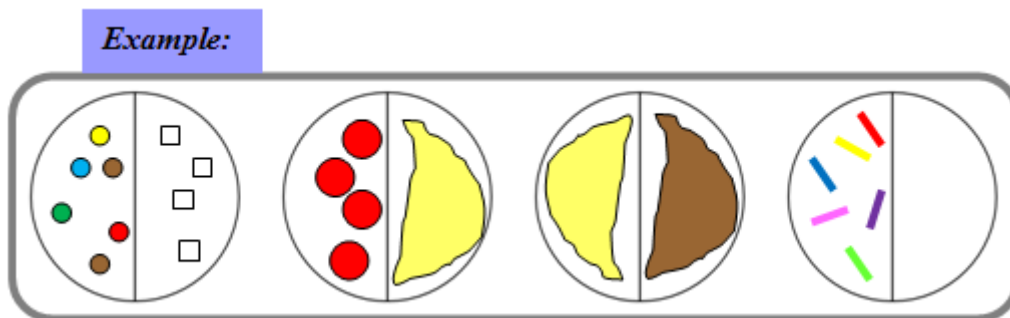
Cookie Orders

Order Number	Toppings								Order Totals		
	M & Ms	Walnuts	Chocolate Chips	Raspberries	Peanut Butter	Vanilla Icing	Chocolate Icing	Sprinkles	Improper fraction	Mixed Number	Number of Whole Cookies
Example	$\frac{1}{2}$	$\frac{1}{2}$		$\frac{1}{2}$		$\frac{2}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{7}{2}$	$3\frac{1}{2}$	4

As students are working, ask them how they created the confirmations for each order. Ask questions that will cause students to think about how many fractional parts make a whole, different ways they can group toppings to create a whole cookie, and how they know what the sum is, written as an improper fraction and as a mixed number. Some sample questions are given in the "FORMATIVE ASSESSMENT QUESTIONS" section below.

This task provides students with an opportunity to explore sums of improper and proper fractions using models. Therefore, students SHOULD NOT use an algorithm to change improper fractions to mixed numbers. Instead, students will be using their models to determine the sums.

During the lesson summary, be sure students are aware that an improper fraction can be written as a mixed number because $\frac{7}{2} = \frac{2}{2} + \frac{2}{2} + \frac{2}{2} + \frac{1}{2}$ as shown in the cookie model the students

Example:

created (see example above). This way students will develop an understanding of what an improper fraction represents. Students can use this same understanding when writing a mixed number as an improper fraction. They should recognize that:

$$3\frac{1}{2} = \boxed{\frac{2}{2}} + \boxed{\frac{2}{2}} + \boxed{\frac{2}{2}} + \frac{1}{2} = \frac{7}{2}$$
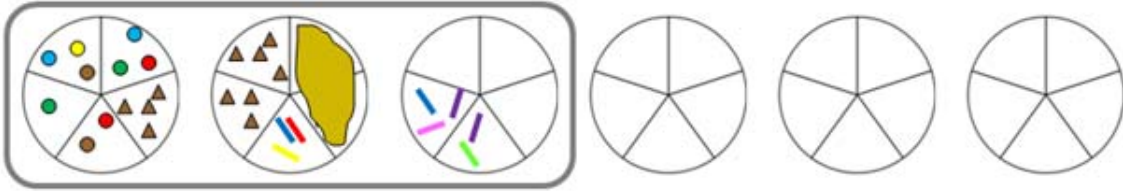
Because each $\frac{2}{2}$ is equal to one whole, there needs to be three $\frac{2}{2}$ to represent the 3 wholes in the mixed number. When the fractions are added the sum is $\frac{7}{2}$.

Order Number	Toppings								Order Totals		
	M & Ms	Walnuts	Chocolate Chips	Raspberries	Peanut Butter	Vanilla Icing	Chocolate Icing	Sprinkles	Improper fraction	Mixed Number	Number of Whole Cookies
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#1	$\frac{4}{5}$		$\frac{3}{5}$		$\frac{2}{5}$			$\frac{3}{5}$	$\frac{12}{5}$	$2\frac{2}{5}$	3
#2	$\frac{9}{6}$			$\frac{2}{6}$		$\frac{5}{6}$	$\frac{6}{6}$		$\frac{22}{6}$	$3\frac{4}{6}$	4
#3	$\frac{3}{4}$	$\frac{2}{4}$	$\frac{4}{4}$				$\frac{1}{4}$		$\frac{10}{4}$	$2\frac{2}{4}$	3
#4	$\frac{7}{3}$			$\frac{4}{3}$		$\frac{7}{3}$			$\frac{18}{3}$	6	6
#5		$\frac{4}{2}$	$\frac{2}{2}$	$\frac{5}{2}$					$\frac{11}{2}$	$5\frac{1}{2}$	6
#6			$\frac{4}{3}$		$\frac{1}{3}$	$\frac{3}{3}$		$\frac{7}{3}$	$\frac{15}{3}$	5	5
#7		$\frac{6}{8}$		$\frac{4}{8}$		$\frac{12}{8}$			$\frac{22}{8}$	$2\frac{6}{8}$	3
#8	$\frac{3}{4}$		$\frac{9}{4}$		$\frac{5}{4}$		$\frac{2}{4}$		$\frac{19}{4}$	$4\frac{3}{4}$	5

MATHEMATICS • GRADE 4 • UNIT 3: Adding and Subtracting Fractions

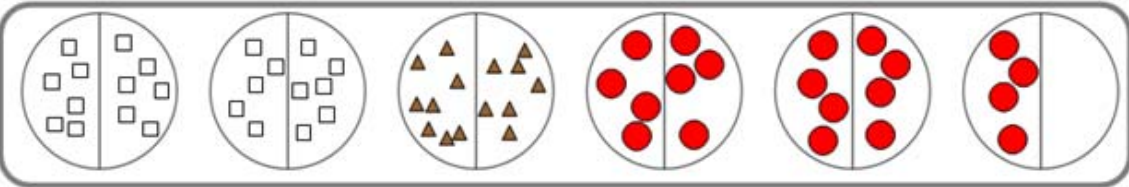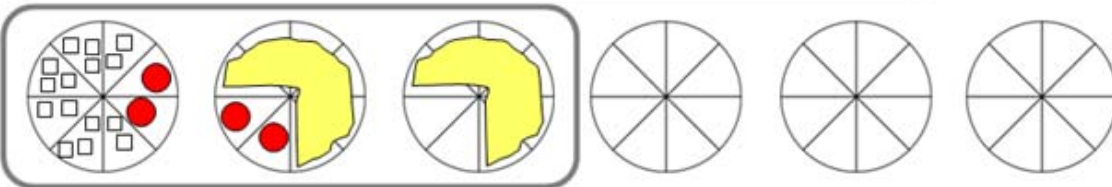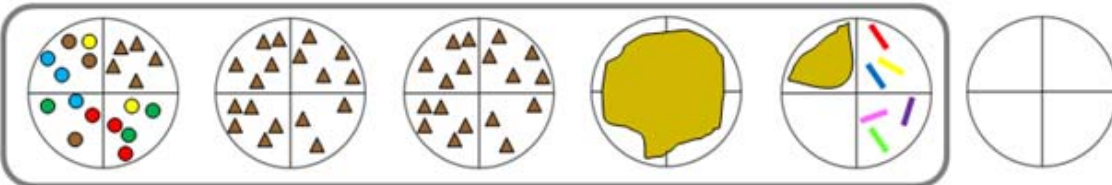**Task Directions**

Students will follow the directions below from the "Fraction Cookies Bakery, Order Form" student recording sheet and "Fraction Cookies Bakery, Order Confirmation Form" student recording sheet below.

"Fraction Cookies Bakery, Order Form" student recording sheet

You own a bakery that specializes in fraction cookies. Customers place orders from all over the country for your unique cookies. You recently received the orders shown below. Before making the cookies to fill the order, you need to confirm each order by sending a confirmation notice to each customer. (If the toppings ordered do not cover an entire cookie, customers want the remaining portion of the cookie to be left plain.) Using the circle templates below, show how you would create each cookie order with the correct fractional amounts of toppings.

"Fraction Cookies Bakery, Order Confirmation Form" student recording sheet

Customers expect you to use the fewest number of cookies possible to complete each order. No part of a cookie should be without a topping except for one. You may split a topping between two cookies as shown below (the vanilla icing was shared between two cookies rather than covering both halves of one cookie with vanilla icing).

FORMATIVE ASSESSMENT QUESTIONS

- How do you know you have recorded the order correctly?
- In what order did you record the fractions? Why?
- How many sections do you need to cover a whole cookie? How do you know?
- How did you determine the improper fraction?
- How did you determine the mixed number?
- How did you determine how much of a cookie would be plain?
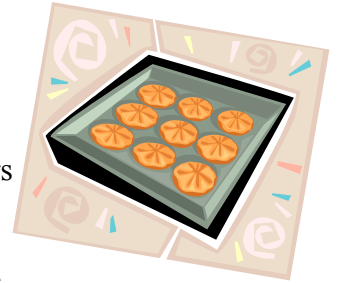
DIFFERENTIATION

Extension
- Challenge students with one or more of the orders on the "Fraction Cookie Bakery, Order Form – Version 2" student recording sheet. Be sure students USE MODELS ONLY to solve these problems.
- Ask students to create orders of their own, then switch with a partner to create the confirmations for those orders. Students can be given a blank confirmation sheet or they can create their own fraction models.

Intervention
- Some students may need more examples modeled before they are able to complete this task on their own. Provide an opportunity for further small group instruction before students are asked to complete this task.
- Allow students to use pre-made circle fraction pieces to create the cookies. It might be necessary to combine several sets of pieces in order to make multiple cookies.

Name _____ Date _____

Fraction Cookies Bakery
Order Form

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Cookie Orders

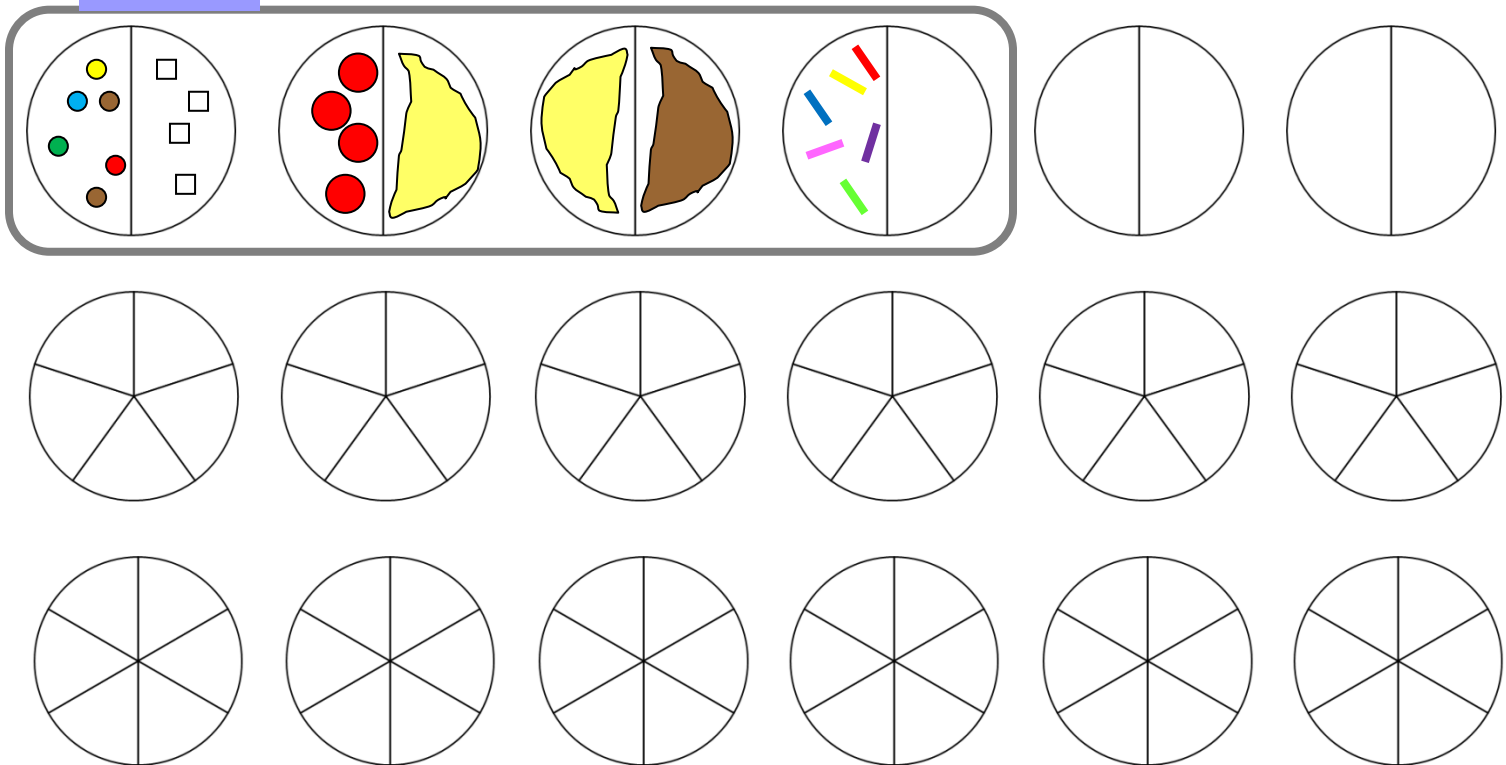| Order Number	Toppings								Order Totals		
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#4	$\frac{7}{3}$			$\frac{4}{3}$		$\frac{7}{3}$					
#5		$\frac{4}{2}$	$\frac{2}{2}$	$\frac{5}{2}$							
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#7		$\frac{6}{8}$		$\frac{4}{8}$		$\frac{12}{8}$					
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Name _____ Date _____

Fraction Cookie Bakery
Order Confirmation Form

Customers expect you to use the fewest number of cookies possible to complete each order. No part of a cookie should be without a topping except for one. You may split a topping between two cookies as shown below (the vanilla icing was shared between two cookies rather than covering both halves of one cookie with vanilla icing).
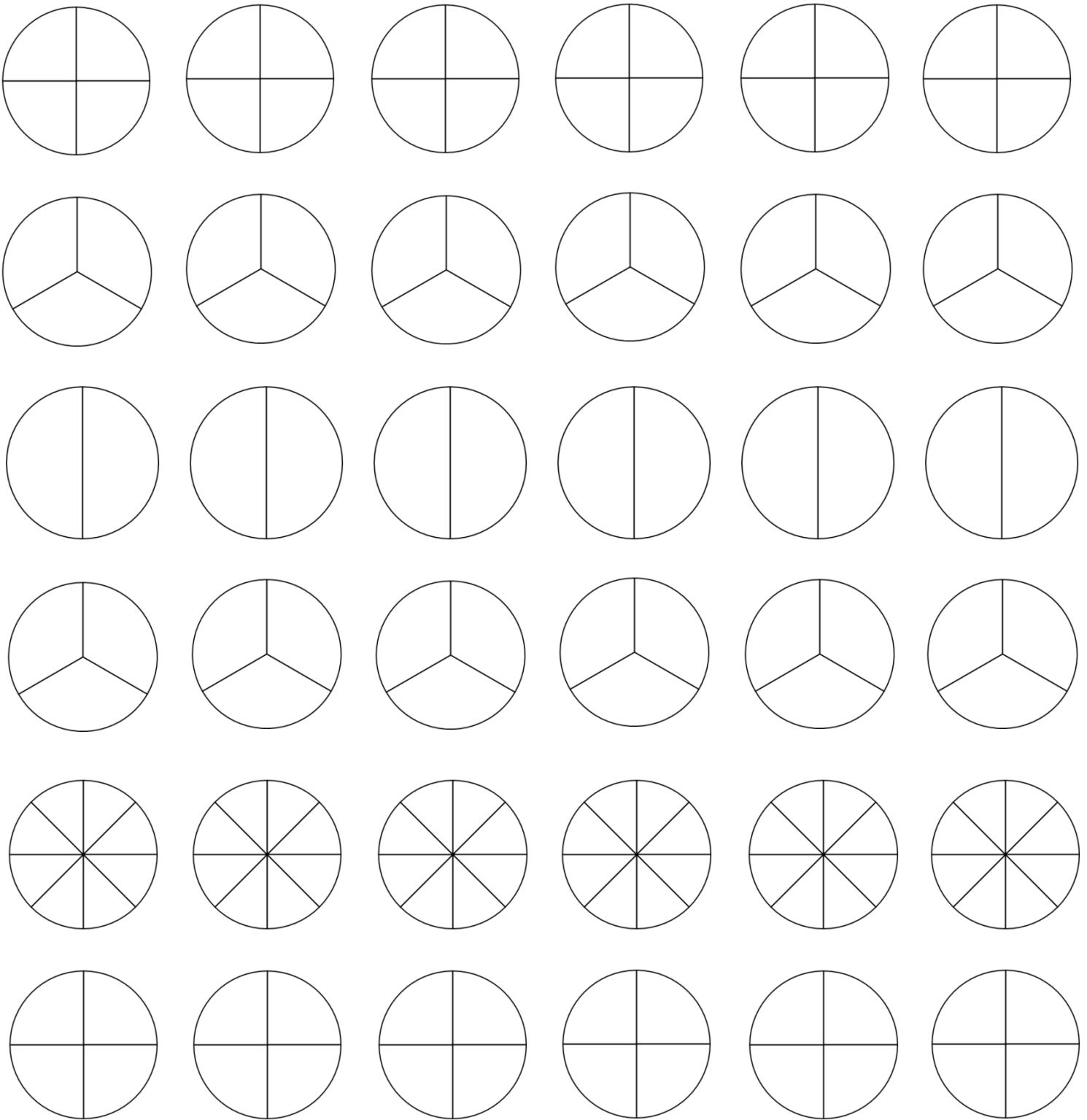

Cookie Order Codes

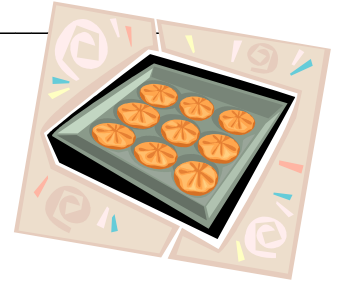|	
M & M's	Colorful Circles
Walnuts	Squares
Chocolate Chips	Brown Triangles
Raspberries	Red Circles
Peanut Butter	Light Brown
Mint Icing	Light Green
Vanilla Icing	Yellow
Chocolate Icing	Dark Brown
Sprinkles	Colorful Specs

Fraction Cookie Bakery
Order Confirmations, Page 2

Name _____ Date _____

Fraction Cookies Bakery
Order Form – Version 2

You recently received the orders shown below. Confirm each order below. Using the circle templates below, show how you would create each cookie order with the correct fractional amounts of toppings.

Customers expect you to use the fewest number of cookies possible to complete each order. No part of a cookie should be without a topping except for one. You may split a topping between two cookies as shown below (the vanilla icing was shared between two cookies rather than covering both halves of one cookie with vanilla icing).

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