CCGPS
Frameworks
Student Edition

Mathematics

Fourth Grade Unit Three
Adding and Subtracting Fractions

Dr. John D. Barge, State School Superintendent
"Making Education Work for All Georgians"

Unit 3 Organizer
Adding and Subtracting Fractions
(6 Weeks)

TABLE OF CONTENTS

OVERVIEW

In this unit students will:
- identify visual and written representations of fractions
- understand representations of simple equivalent fractions
- understand the concept of mixed numbers with common denominators to 12
- add and subtract fractions with common denominators
- add and subtract mixed numbers with common denominators
- convert mixed numbers to improper fractions and improper fractions to mixed fractions

Although the units in this instructional framework emphasize key standards and big ideas at specific times of the year, routine topics such as estimation, mental computation, and basic computation facts should be addressed on an ongoing basis. Ideas related to the eight Standards for Mathematical Practice should be continually addressed as well. These "big eight" STANDARDS FOR MATHEMATICAL PRACTICE are: make sense of problems and persevere in solving them, reason abstractly and quantitatively, construct viable arguments and critique the reasoning of others, model with mathematics, use appropriate tools strategically, attend to precision, look for and make use of structure, look for and express regularity in repeated reasoning.

The first unit should establish these routines, allowing students to gradually enhance their understanding of the concept of number and to develop computational proficiency.

To assure that this unit is taught with the appropriate emphasis, depth, and rigor, it is important that the tasks listed under "Evidence of Learning" be reviewed early in the planning process. A variety of resources should be utilized to accomplish this. The tasks in these units illustrate the types of learning activities that should be utilized from a variety of sources.

STANDARDS FOR MATHEMATICAL CONTENT

Mathematical standards are interwoven and should be addressed throughout the year in as many different units and activities as possible in order to emphasize the natural connections that exist among mathematical topics.

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.

ENDURING UNDERSTANDINGS

- Fractions can be represented visually and in written form.
- Fractional amounts can be added and/or subtracted.
- Mixed numbers can be added and/or subtracted.
- Mixed numbers and improper fractions can be used interchangeably.
- Mixed numbers can be ordered by considering the whole number and the fraction.
- Fractional numbers and mixed numbers can be added and/or subtracted.

ESSENTIAL QUESTIONS

- How are fractions used in problem-solving situations?
- How can equivalent fractions be identified?
- How can fraction represent parts of a set?
- How can I add and subtract fractions of a given set?
- How can I find equivalent fractions?
- How can I represent fractions in different ways?
- How can improper fractions and mixed numbers be used interchangeably?
- How can you use fractions to solve addition and subtraction problems?
- How do we add fractions with like denominators?
- How do we apply our understanding of fractions in everyday life?
- What do the parts of a fraction tell about its numerator and denominator?
- What happens to the denominator when I add fractions with like denominators?
- What is a fraction and how can it be represented?
- What is a fraction and what does it represent?
- What is a mixed number and how can it be represented?
- What is an improper fraction and how can it be represented?
- What is the relationship between a mixed number and an improper fraction?
- Why does the denominator remain the same when I add fractions with like denominators?

- Why is it important to identify, label, and compare fractions (halves, thirds, fourths, sixths, eighths, tenths) as representations of equal parts of a whole or of a set?

CONCEPTS/SKILLS TO MAINTAIN

It is expected that students will have prior knowledge/experience related to the concepts and skills identified below. It may be necessary to pre-assess in order to determine if time needs to be spent on conceptual activities that help students develop a deeper understanding of these ideas.

- Identify and give multiple representations for the fractional parts of a whole (area model) or of a set, using halves, thirds, fourths, sixths, eighths, tenths and twelfths.
- Recognize and represent that the denominator determines the number of equally sized pieces that make up a whole.
- Recognize and represent that the numerator determines how many pieces of the whole are being referred to in the fraction.
- Compare fractions with denominators of 2, 3, 4, 6, 10, or 12 using concrete and pictorial models.
- Understand repeated addition is one way to model multiplication, repeated subtraction is one way to model division.
- Recognize that a fraction can be represented in multiple ways by using equivalent fractions (i.e. one half can equal two fourths, three sixths, etc.)

SELECTED TERMS AND SYMBOLS

The following terms and symbols are often misunderstood. These concepts are not an inclusive list and should not be taught in isolation. However, due to evidence of frequent difficulty and misunderstanding associated with these concepts, instructors should pay particular attention to them and how their students are able to explain and apply them.

Teachers should present these concepts to students with models and real life examples. Students should understand the concepts involved and be able to recognize and/or demonstrate them with words, models, pictures, or numbers.

The websites below are interactive and include a math glossary suitable for elementary children. It has activities to help students more fully understand and retain new vocabulary. (i.e. The definition for *dice* actually generates rolls of the dice and gives students an opportunity to add them.) **Note – At the elementary level, different sources use different definitions. Please preview any website for alignment to the definitions given in the frameworks.**
http://www.teachers.ash.org.au/jeather/maths/dictionary.html
http://intermath.coe.uga.edu/dictnary/
The terms below are for teacher reference only and are not to be memorized by the students.

- fraction
- denominator
- equivalent sets
- improper fraction
- increment
- mixed number
- numerator

- proper fraction
- term
- unit fraction
- whole number

STRATEGIES FOR TEACHING AND LEARNING

- Students should be actively engaged by developing their own understanding.
- Mathematics should be represented in as many ways as possible by using graphs, tables, pictures, symbols, and words.
- Interdisciplinary and cross curricular strategies should be used to reinforce and extend the learning activities.
- Appropriate manipulatives and technology should be used to enhance student learning.
- Students should be given opportunities to revise their work based on teacher feedback, peer feedback, and metacognition which includes self-assessment and reflection.
- Students should write about the mathematical ideas and concepts they are learning.
- Books such as *Fractions and Decimals Made Easy* (2005) by Rebecca Wingard-Nelson, illustrated by Tom LaBaff, are useful resources to have available for students to read during the instruction of these concepts.
- Consideration of all students should be made during the planning and instruction of this unit. Teachers need to consider the following:
    - What level of support do my struggling students need in order to be successful with this unit?
    - In what way can I deepen the understanding of those students who are competent in this unit?
    - What real life connections can I make that will help my students utilize the skills practiced in this unit?

EVIDENCE OF LEARNING

By the conclusion of this unit, students should be able to demonstrate the following competencies:
- Represent and read proper fractions, improper fractions, and mixed numbers in multiple ways.
- Represent equivalent common fractions
- Use mixed numbers and improper fractions interchangeably.
- Add and subtract proper fractions, improper fractions, and mixed numbers with like denominators.
- Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. *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.*
- Use visual fraction models and equations to represent their thinking
- 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

TASKS

The following tasks represent the level of depth, rigor, and complexity expected of all fourth grade students. These tasks or tasks of similar depth and rigor should be used to demonstrate evidence of learning. It is important that all elements of a task be addressed throughout the learning process so that students understand what is expected of them. While some tasks are identified as a performance task, they also may be used for teaching and learning.

Scaffolding Task	Constructing Task	Practice Task	Performance Tasks
Tasks that build up to the constructing task.	Constructing understanding through deep/rich contextualized problem solving tasks	Games/activities	Summative assessment for the unit

Task Name	Task Type *Grouping Strategy*	Content Addressed
Pizza Party	Scaffolding Task *Partner/Small Group Task*	Draw fraction representations, add and subtract fractions
Snacks in a Set	Scaffolding Task *Individual/Partner Task*	Find the fractions of a given set
Eggsactly	Scaffolding Task *Individual/Partner Task*	Write number sentences to show addition of fractions.
Tile Task	Practice Task *Partner/Small Group Task*	Subtract and add fractions
Sweet Fraction Bar	Constructing Task *Individual/Partner Task*	Solve story problems with fractions
Fraction Cookies Bakery	Constructing Task *Individual/Partner Task*	Addition with improper and proper fractions
Rolling Fractions	Practice Task *Individual/Partner Task*	Add and subtract fractions, use mixed numbers and improper fractions
The Fraction Story Game	Performance Task *Individual/Partner Task*	Create story problems with fractions
Fraction Field Events	Performance Task *Individual/Partner Task*	Solve story problems with mixed numbers
Culminating Task: Pizza Parlor (Revisited)	Performance Task *Individual/Partner Task*	Add and subtract fractions, improper fractions and mixed numbers

Scaffolding Task: Pizza Party

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.*

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

   The students should have had multiple opportunities with paper-folding fractions. To create eighths, students can fold the pizza in half, then in fourths, and finally into eighths.
   Each student's story problems may be unique. To assess student work, look for an illustration made with the pizza slices that matches the events in the story, an accurate number sentence for the story, and clear explanations. Student explanations should provide evidence that they understood why the denominator is 8. The standard explicitly says students should write their fractions as the sum of 1/b. Guide students toward this goal, having them write number sentences that reflect this. For example, if someone ate ⅜ or a pizza then they actually ate one slice, then another, then a third slice or ⅛ + ⅛ + ⅛. You could simply joke around with kids about how no one really stuffs three slices in their mouth at once!

ESSENTIAL QUESTIONS

- What happens to the denominator when I add fractions with like denominators?
- Why does the denominator remain the same when I add fractions with like denominators?
- How do we add fractions with like denominators?

MATERIALS

- "Pizza Party" student recording sheet

- "Pizza Party, Pizza Dough" student sheet (each sheet has enough circles for two students)
- Colored pencils or crayons
- Glue stick

GROUPING

Individual Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Using fraction models divided into eighths (pizzas), students create addition and subtraction story problems.

Comments

One way to introduce the task is by describing a family tradition of having pizza and a movie every Friday evening. Explain that the family makes two pizzas for dinner and rents a movie for the family to watch. There is always one cheese pizza and one pepperoni pizza. Each pizza is cut into eight equal slices.

Discuss with the students some possible addition problems that could be done with the pieces of pizza. For example, if the mom ate two slices of cheese pizza and one slice of pepperoni pizza, how much pizza did she eat? Discuss the whole is cut into 8 equal pieces, so $\frac{2}{8}$ cheese $+ \frac{1}{8}$ pepperoni $= \frac{3}{8}$ of a pizza. Have a student record the number sentence on the board, reminding students about the correct fraction notation.

As a subtraction problem, one example would be discussing the amount of cheese pizza left after the mom took two pieces. 8/8 – 2/8 = 6/8. Ask students how they might illustrate subtraction with the pizza slices. (Students may suggest crossing out the pieces removed or circling the pieces that are being subtracted.)

Sometimes students find it difficult to understand that the whole can be any shape. Therefore, it may be helpful to provide square pizzas for students to work with in addition to the circle-shaped pizzas used in this task.

Time does not permit all students to share their work with the class. However, students may be afforded the opportunity to share their work in a small group and then one student from each group may share with the whole group. Or students can share their work with a partner and two or three students can be selected to share their work with the class. Teachers need to be thoughtful about who will share during the closing of a lesson. The student(s) whose work is shared needs to add to the class discussion or take the class discussion in a specific direction. A teacher needs to think about what type of conversation will help clarify possible student misconceptions and solidify student understanding of the concepts imbedded in the task.

Task Directions

Students will follow the directions below from the "Pizza Party" student recording sheet.

You will be writing two story problems, modeling with problem using pizzas that you create. Fold this paper in half to create two sections on the back to record your stories.

1. Create two pizzas.
   a. Cut out two circles of paper (pizza dough) and color them to look like your two favorite types of pizza.
   b. Fold the pizzas into eighths.
2. Fold this paper in half to create two sections on the back to record your pizza stories.
3. Write an addition story problem on the back of this paper.
   a. Cut out the correct number of pizza slices for your story.
   b. Glue down the pizza slices to illustrate your story.
   c. Explain how you solved the problem using words and numbers.
4. Write a subtraction story problem on the back of this paper.
   a. Cut out the correct number of pizza slices for your story.
   b. Glue down the pizza slices to illustrate your story.
   c. Explain how you solved the problem using words and numbers.

Be prepared to share your story, illustration, and solution with the class.

FORMATIVE ASSESSMENT QUESTIONS

- In your addition story, how many pieces of pizza do you have in all? How many slices of pizza in one whole? How do you write that as a fraction?
- In your subtraction story, how many pieces of pizza do you have left? How many slices of pizza in one whole? How do you write that as a fraction?
- Why does the denominator stay the same with addition and subtraction?
- Tell me the story that goes with your picture and number sentence.

DIFFERENTIATION

Extension
- Have students consider the whole to be both pizzas, for a total of 16 slices equaling one whole.
- What would happen if the pizza restaurant made a mistake and cut one of the pizzas into fourths? How does it make finding the answer to an addition or subtraction sentence more difficult if the denominators of your fractions are not the same? Have students write problems where one pizza is cut into fourths, the other is cut into eights.

Intervention
- Allow students to tell their story and model it with their pieces in a small group before gluing and labeling it on paper.

.

Name _____ Date _____

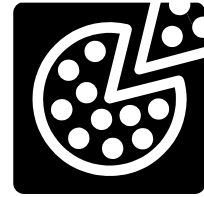# Pizza Party

You will be writing two story problems, modeling with problem using pizzas that you create. Fold this paper in half to create two sections on the back to record your stories.

1. Create two pizzas.
    a. Cut out two circles of pizza dough and color them to look like your two favorite types of pizza.
    b. Fold the pizzas into eighths.

2. Fold this paper in half to create two sections on the back to record your pizza stories.

3. Write an addition story problem on the back of this paper.
    a. Cut out the correct number of pizza slices for your story.
    b. Glue down the pizza slices to illustrate your story.
    c. Explain how you solved the problem using words and numbers.

4. Write a subtraction story problem on the back of this paper.
    a. Cut out the correct number of pizza slices for your story.
    b. Glue down the pizza slices to illustrate your story.
    c. Explain how you solved the problem using words and numbers.

Be prepared to share your story, illustration, and solution with the class.

Pizza Party
Pizza Dough
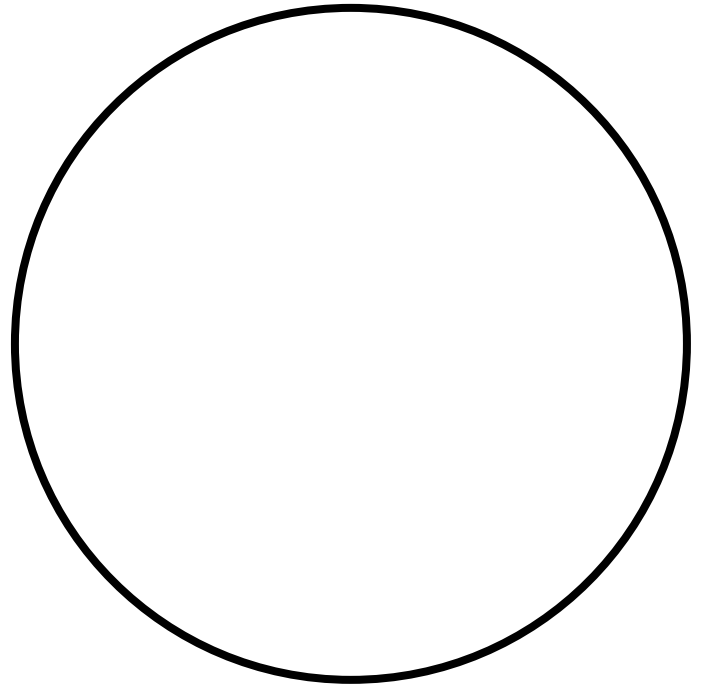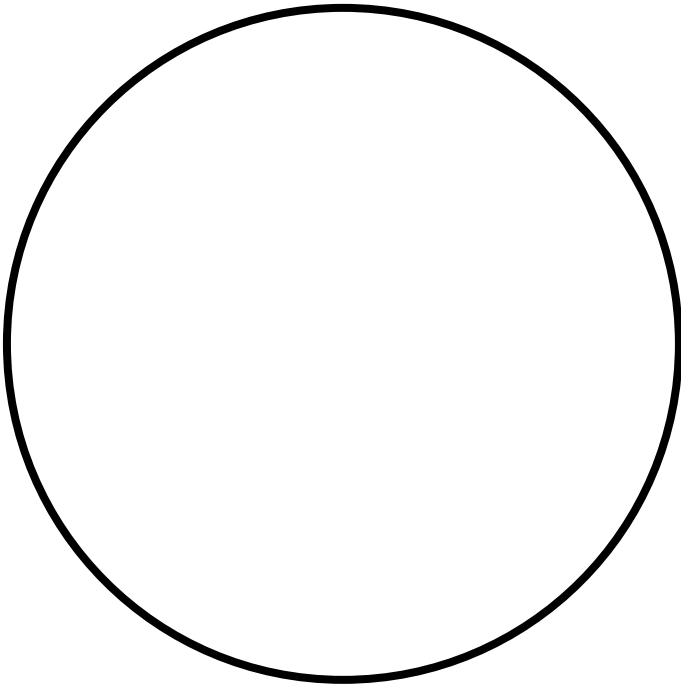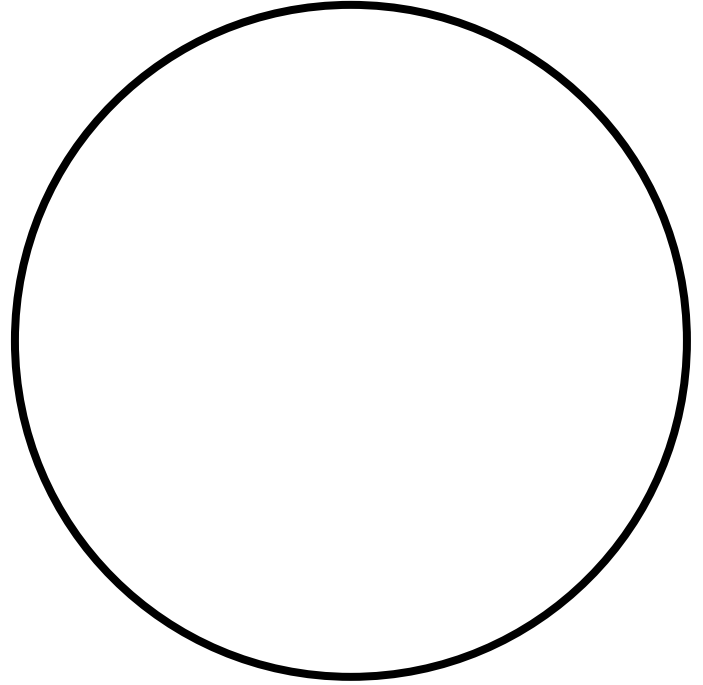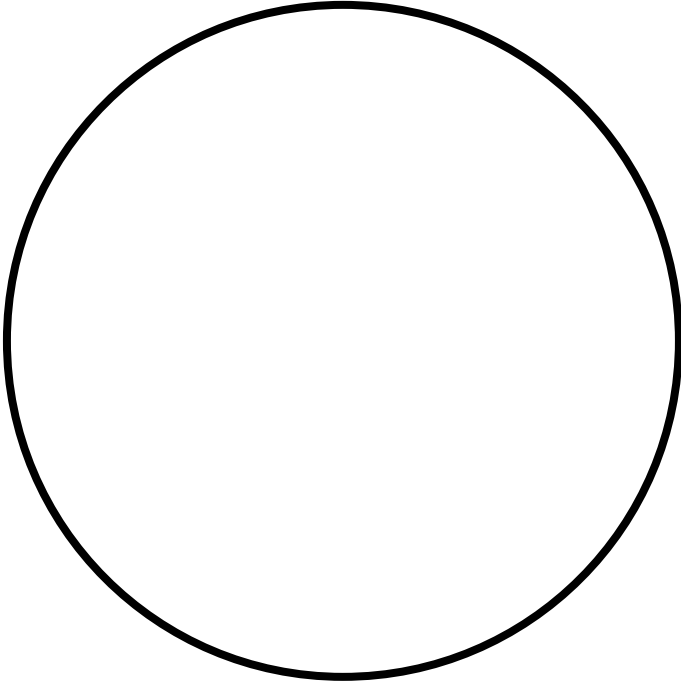
SCAFFOLDING TASK: Eggsactly

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.

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 understand how to name fractions and that the denominator represents the number of equal-sized pieces while the numerator represents the number of pieces being considered. Students should also have some understanding of how to divide twelve into subsets of 1, 2, 3, 4, and 6.

Using a dozen, and later eighteen, eggs as a whole allows students to add and subtract values from the dozen eggs and then search for equivalent fractions. Students should be encourage to see that twelve eggs or eighteen eggs can be group in other ways than 12 or 18, for example they could be grouped in two sets of 6 or three sets of 6 respectively.
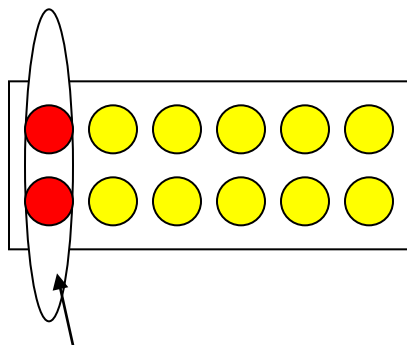
For example, these red circles could represent two eggs used in a recipe. The student should be able to do several mathematical steps with this one representation. Students should be able to see the subset as both $\frac{2}{12}$ and $\frac{1}{6}$. Also students are required to write a number sentence to represent that two eggs are removed from the carton: $\frac{12}{12} - \frac{1}{12} - \frac{1}{12} = \frac{10}{12}$ or $\frac{12}{12} - \frac{2}{12} = \frac{10}{12}$. Students may also be able to see equivalent number sentences: $\frac{6}{6} - \frac{1}{6} = \frac{5}{6}$.

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 yellow and red circles)
- write an equation which shows the equivalent fractions

ESSENTIAL QUESTIONS

- What is a fraction and how can it be represented?
- How can equivalent fractions be identified?
- How can fraction represent parts of a set?
- How can I add and subtract fractions of a given set?

MATERIALS

- 18 Two sided counters
- Eggstactly recording sheet
- Crayons or colored pencils

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

It is crucial that students understand that fractions represent part of a whole as well as part of a set. In sets, the whole is the total number of objects or the denominator and subsets of the whole make up the fraction parts or the numerator. As students work through this activity, they are first asked to see the "whole" as a twelve eggs and then to see the "whole" as eighteen eggs. They can explore the sets with two sided counters, but ultimately they will need to represent them with drawings.

Comments

Sets of Two-sided counters should be available to the students. The students can use these to represent the "eggs" in the assignment. Students will need sets of 12 and 18 eggs and they can then flip them over to show some as red and some as yellow to represent fractional parts of a dozen.

If available, students can glue die-cut yellow and red circles. Alternately, students can manipulate the fraction sets online and easily print and then label their work. One site is: http://illuminations.nctm.org/ActivityDetail.aspx?ID=11. Make sure students use "sets" to represent their fractions.

This task could be introduced by bringing in a dozen eggs, either real or plastic. Students have some prior knowledge of this and will be comfortable with seeing the box as now representative of a whole.

Task Directions

Students will follow directions below from the "Twelve Eggsactly" and the "Eighteen Eggsactly" student recording sheet.

- Obtain a set of two sided counters.
- Use the two sided counters to act out each recipe in the lesson.
- Identify each fraction of eggs being used.
- Write a number sentence for each recipe
- Identify any equivalent fractions and write number sentences using these equivalent fractions.

Example: If a recipe calls for 8 eggs a student would have to represent his using two sided counters, red for those eggs being used and yellow for those that still remain
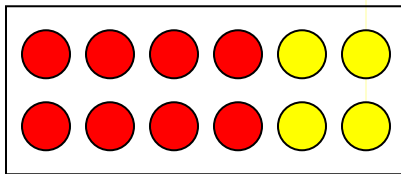
1. What fraction of the entire set is 8 eggs? *⁸⁄₁₂*

2. Can you represent this fraction another way? *⁴⁄₆ or ⅔*

3. How many eggs still remain? *4 eggs*

4. What fraction of the set still remains? *⁴⁄₁₂*

5. Can you represent this fraction another way? *²⁄₆ or ⅓*

6. Write a fraction sentence to show how many eggs were removed and how many still remain:
¹²⁄₁₂ - ⁸⁄₁₂ = ⁴⁄₁₂ or ¹²⁄₁₂ - ⁴⁄₁₂ = ⁸⁄₁₂ or ⁶⁄₆ - ⁴⁄₆ = ²⁄₆ etc.

FORMATIVE ASSESSMENT QUESTIONS

- How are you keeping your work organized?
- Have you found all of the possible equivalent fractions? How do you know?
- How do you know these two fractions are equivalent?
- How many different illustrations can be created to show equivalent fractions**?** How do you know?
- Is there any other way you could write your number sentence?

DIFFERENTIATION

Extension
- Once students have completed the task above, this lesson can be extended to other sets, such as the "Eighteen Eggsactly" lesson which uses a set of 18 eggs to represent one whole.
- Students will need to model the "Eighteen Eggsactly" lesson using two sided counters again and this will provide meaningful practice adding and subtracting fraction with the same denominator. It will also challenge them to find more equivalent fractions than the "Twelve Eggsactly" lesson can provide.
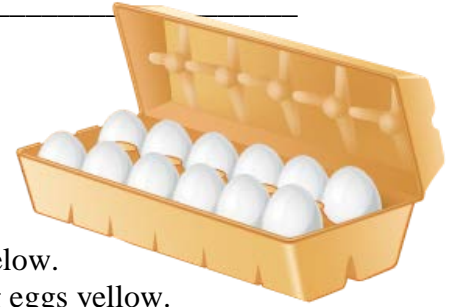
Intervention
- Allow students to first gain a lot of experience with smaller sets of "eggs". Using the two sided counters create sets of 6 or 8 "eggs" to explore adding, subtracting and finding equivalent fractions.
- Some students could benefit from more concrete manipulatives such as egg cartons and plastic eggs.
- Students can manipulate the fractions online and represent them as a set and easily print and then label their work. One site for fraction sets is: http://www.illuminations.nctm.org
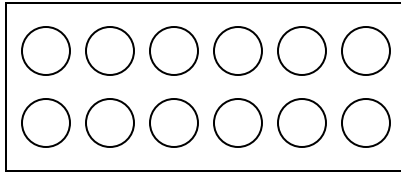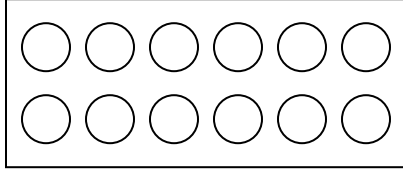
Name _____ Date _____

Twelve Eggsactly

Your brother needs help baking cookies for the school bake sale.
One recipe he has calls for six eggs. Remove six eggs from the carton below.
To show you have removed eggs color them red. Shade in the remaining eggs yellow.

1. What fraction of the entire set is 6 eggs? _____

2. Can you represent this fraction another way?
_____

3. How many eggs still remain?   _____

4. What fraction of the set still remains?   _____

5. Can you represent this fraction another way? _____

6. Write a fraction sentence to show how many eggs were removed and how many still remain:

_____

Your brother needs help baking brownies for the school bake sale.
One recipe he has calls for eight eggs. Remove eight eggs from the carton below.
To show you have removed eggs color them red. Shade in the remaining eggs yellow.
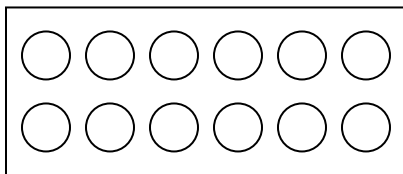
1. What fraction of the entire set is 8 eggs? _____

2. Can you represent this fraction another way?
_____

3. How many eggs still remain? _____

4. What fraction of the set still remains? _____

5. Can you represent this fraction another way? _____

6. Write a fraction sentence to show how many eggs were removed and how many still remain:

_____

Your sister also needs help baking cupcakes for the school bake sale.
One recipe she has calls for ¼ of a dozen. Remove ¼ of the eggs from the carton below.
To show you have removed eggs color them red. Shade in the remaining eggs yellow.

1. What fraction of the entire set is ¼ of the eggs? _____

2. Can you represent this fraction another way? _____

3. How many eggs still remain? _____

4. What fraction of the set still remains?   _____

5. Can you represent this fraction another way? _____

6. Write a fraction sentence to show how many eggs were removed and how many still remain:

_____

Use the cartons below to show all the different ways to represent ⅓ of a dozen eggs. Then write a number sentence for each model to show how many eggs were removed and how many still remain.

Number Sentences

_____

_____

_____

_____

_____

_____
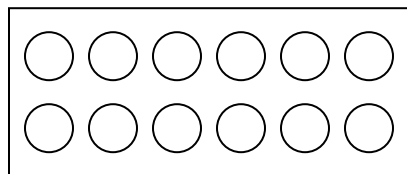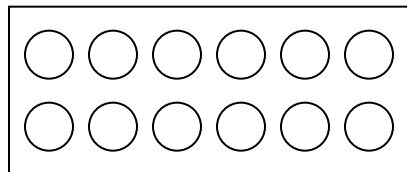
    How many cartons of eggs did your mother have to buy in order for your brother to make cookies and brownies and for your sister to make cupcakes? Use pictures, numbers and words to show your answer.

Name _____ Date _____

Eighteen Eggsactly

Your brother needs help baking cookies for the school bake sale.
One recipe he has calls for six eggs. Remove six eggs from the carton below.
To show you have removed eggs color them red. Shade in the remaining eggs yellow.

1. What fraction of the entire set is 6 eggs?   _____

2. Can you represent this fraction another way?
_____

3. How many eggs still remain?   _____

4. What fraction of the set still remains?   _____

5. Can you represent this fraction another way? _____

6. Write a fraction sentence to show how many eggs were removed and how many still remain:

_____

Your brother needs help baking brownies for the school bake sale.
One recipe he has calls for eight eggs. Remove eight eggs from the carton below.
To show you have removed eggs color them red. Shade in the remaining eggs yellow.

1. What fraction of the entire set is 6 eggs? _____

2. Can you represent this fraction another way? _____

3. How many eggs still remain? _____

4. What fraction of the set still remains? _____

5. Can you represent this fraction another way? _____

6. Write a fraction sentence to show how many eggs were removed and how many still remain:

_____

Your sister also needs help baking cupcakes for the school bake sale.
One recipe she has calls for ⅚ of a dozen. Remove ⅚ of the eggs from the carton below.
To show you have removed eggs color them red. Shade in the remaining eggs yellow.

1. What fraction of the entire set is ⅚ of the eggs? _____

2. Can you represent this fraction another way? _____

3. How many eggs still remain? _____

4. What fraction of the set still remains? _____

5. Can you represent this fraction another way? _____

6. Write a fraction sentence to show how many eggs were removed and how many still remain:

_____

Use the cartons below to show all the different ways to represent ⅓ of a carton of eggs. Then write a number sentence for each model to show how many eggs were removed and how many still remain.
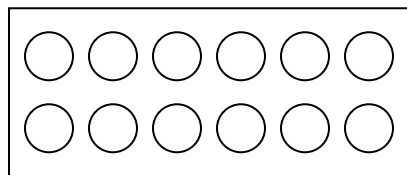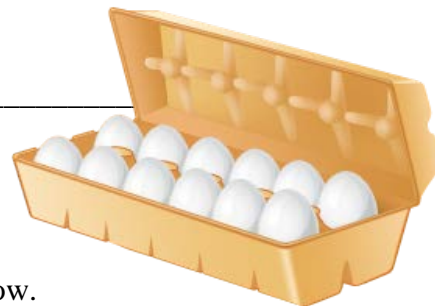
Number Sentences
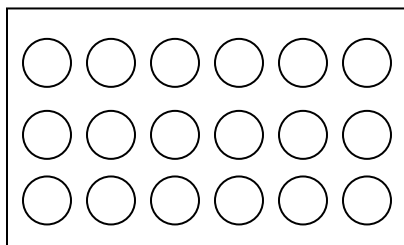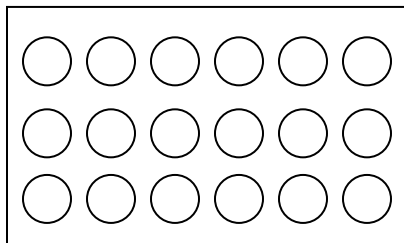

_____

_____

_____

_____

_____

_____
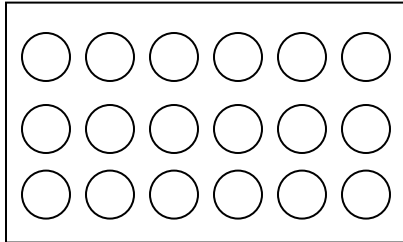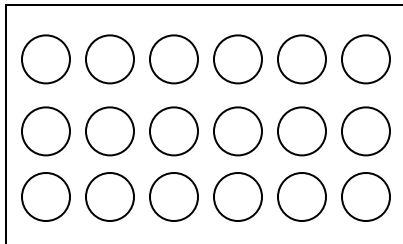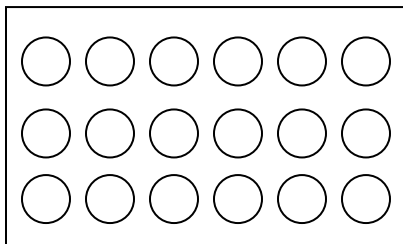
How many cartons of eggs did your mother have to buy in order for your brother to make cookies and brownies and for your sister to make cupcakes? Use pictures, numbers and words to show your answer.

Constructing Task: Tile Task

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.*
   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 will have experienced seeing fractions as both a bar and as a set. This activity will have students see fractions as portions of an area. By having students create multiple designs with the same criteria they will be forced to verify their results repeatedly, as well as show the cost of each design.
   Students will also be able to copy their colored tile designs on to grid paper, however they may need their colored tiles to rearrange and help them determine their fractional worth.   For example a student could make the design below but be having a difficult time determining what fraction of each color he or she used. With the tiles it can easily be rearranged to aid the students' fractional understanding.
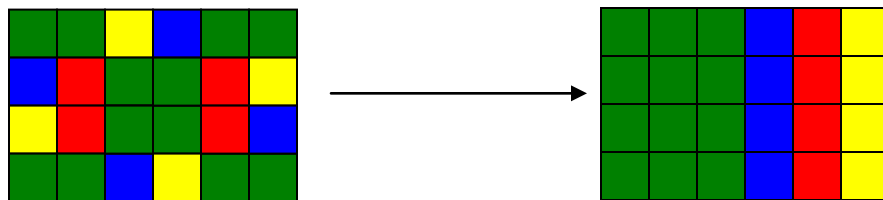
By allowing students to make several designs they will be forced into verifying their answers as well as thinking critically about what looks artistically pleasing while keeping the cost of each tile in mind.

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, be comfortable with different size "wholes" such as 12 in a dozen, show equivalent fractions with an area model, record on the student sheet equivalent fractions or fraction sets (either by coloring or gluing die cut yellow and red circles), write an equation which shows the equivalent fractions, and write an equation that shows addition of fractions with like denominators.

ESSENTIAL QUESTIONS

- What is a fraction and how can it be represented?
- 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 add and subtract fractions of a given set?

MATERIALS

- Colored tiles
- Tile Task recording sheet
- Crayons or colored pencils

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

In this task students are asked to design tiled coffee tables for a local furniture store. It allows for a lot of creativity, but the tiles cost different amounts so some designs are not profitable. Students will need to design several colorful coffee tables. However, some tiles cost more than others.

Comments

A great way to introduce this activity is to bring in some small ceramic tiles and discuss their uniform size. Colored tiles should be available to the students. The students can use these to represent the ceramic tiles. Students will be asked to make arrays and model an area model for fractions.

If available, students can glue die-cut squares of blue, yellow, red and green. Alternately, students can manipulate the color tiles online and easily print and then label their work. One site for fraction bars is:
http://nlvm.usu.edu/en/nav/frames_asid_203_g_2_t_1.html?from=grade_g_2.html

Task Directions

Students will follow directions below from the Fraction Clues task sheet. .

- Obtain a set of colored tiles.
- Work with a partner to make several designs and record it on their activity sheet.
- Keep record of fractional values as well as cost.
- Determine which of their designs is the most cost effective and artistic.

FORMATIVE ASSESSMENT QUESTIONS

- Tell me about your design.
- What tiles are you using most frequently?
- What fraction of the total are your blue tiles? Red tiles? Etc.
- Could you make this design a different way? If so, would it be cheaper or more expensive?

DIFFERENTIATION

Extension

- Once students have completed the task above, this lesson can be extended to have students make a slightly larger coffee table that is perhaps four by eight or even four by nine tiles in area.
- Students could be asked to determine the perimeter of their coffee tables if they were to use standard four inch square ceramic tiles.
- Students could be asked to determine the cost of putting molding around the tiles given a certain cost per foot.

Intervention

- If necessary students could begin this activity with a smaller set
- Also if students are struggling they could attempt with activity with only three colors instead of using all four colored tiles.

Name _____ Date _____

Tile Task
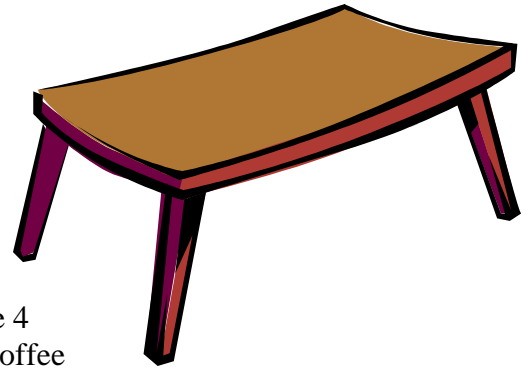
Part 1.

Sammy's Small Furniture Store is selling tiled coffee tables.
The tables have four inch tiles on them in an assortment of colors;
yellow, red, green and blue. The store is selling coffee tables that are 4
tiles wide and 6 tiles long. Sammy needs your help to design some coffee
tables. He wants each table top to have some of each color, and of course he wants it to look
great. However, some tiles cost more than others, and yellow tiles are very expensive.   Help
Sammy out by designing 3 table tops of your own. Make sure to include ALL the colors, and
pay attention to the price!

Your job has several parts:

1. Use colored tiles and the grid paper below to design at least three coffee tables.

2. Tally the number of each colored tile,

3. Find what fraction that number is out of a total of 24 tiles.

4. Find the cost of each set of colored tile

5. And finally, determine the total cost of your design.

Design 1.

Color/Price	How many?	How many out of the total of 24 Tiles	$ Subtotal Cost
Yellow/$3			
Red/$1			
Blue/$2			
Green/$1			
TOTAL			

Design 2.

Color/Price	How many?	How many out of the total of 24 Tiles	$ Subtotal Cost
Yellow/$3			
Red/$1			
Blue/$2			
Green/$1			
TOTAL			

Design 3.

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Color/Price	How many?	How many out of the total of 24 Tiles	$ Subtotal Cost
Yellow/$3			
Red/$1			
Blue/$2			
Green/$1			
TOTAL			

Of the three designs you created, which design do you think is the best? Which design do you think will be the most cost effective to manufacture?

_____

_____

_____

_____

_____

_____

_____

Constructing Task: Sweet Fraction Bars

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.*
  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 experience working with adding and subtracting fractions and using a number line, an area model, and a set model. Also, students should be able to record the operation using fractional notation. Eggsactly and Tile Task should have provided students a chance to decompose fractions using a set model and an area model. With this task students will only use the denominator of 10.

ESSENTIAL QUESTIONS

- How can you use fractions to solve addition and subtraction problems?
- What happens to the denominator when I add fractions with like denominators?

MATERIALS

- "Sweet Fraction Bars, Story Problems" student recording sheet
- "Sweet Fraction Bars, Ten-Frames" student recording sheet

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

In this task, students will be given problems to solve involving a candy bar divided into ten equal sections.

Comments

Students may use a ten-frame or a number line to solve these problems. Alternatively, students may choose to use math pictures to solve the problems. Allow students to choose a model that makes sense to them. As students work, look for strategies that students use that may be beneficial to other students. Allow students who used these helpful strategies to share their thinking during the summary part of the lesson.

Task Directions

Students will follow the directions below from the "Sweet Fraction Bars" student recording sheet below.

A Sweet Fraction Bar is a chocolate candy bar that is divided into ten equal sections. Solve the following problems.

1. Hannah had $\frac{7}{10}$ of a Sweet Fraction Bar. She gave $\frac{3}{10}$ of the candy bar to Carlos. How much of the candy bar does she have left?
2. Sarah has $\frac{5}{10}$ of a candy bar. Brianna has $\frac{3}{10}$ of the same candy bar. Also, Mika has $\frac{2}{10}$ of the same candy bar. Together do the girls have enough to equal a whole candy bar?
3. Marissa gave Paulo $\frac{4}{10}$ of a Sweet Fraction Bar. Michael gave Paulo $\frac{3}{10}$ of a Sweet Decimal Fraction bar. How much candy does Paulo have now?
4. Caleb had $\frac{9}{10}$ of a Sweet Fraction Bar. He gave Mika $\frac{6}{10}$ of the candy bar. How much of the candy bar does he have left?

FORMATIVE ASSESSMENT QUESTIONS

- Does the story involve combining or taking away? How do you know?
- How many tenths of a candy bar do you have in all? How many tenths of a candy bar do you have left? How do you know?
- Can you show what happened in the story on a number line? Using the ten-frames? Using a set of counters? In a math picture?
- How many tenths would you need to equal a whole candy bar? How many tenths do you have?

DIFFERENTIATION

Extension
- Ask students to create an addition and a subtraction problem. Have students solve the problems on the back of the paper.
- Give students four numbers and a target number (e.g. $\frac{4}{10}, \frac{6}{10}, \frac{4}{6}, \frac{3}{10}$; target number $\frac{5}{10}$). Ask students to use the number line below to show an addition/subtraction sequence that would result in the target number.
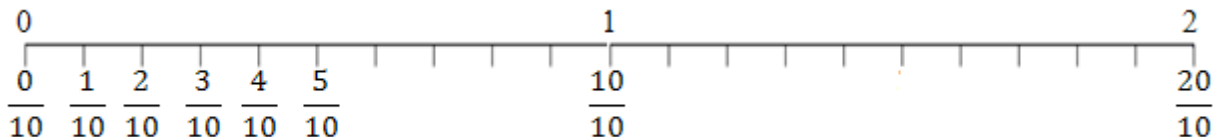
For this example, students could show the following.
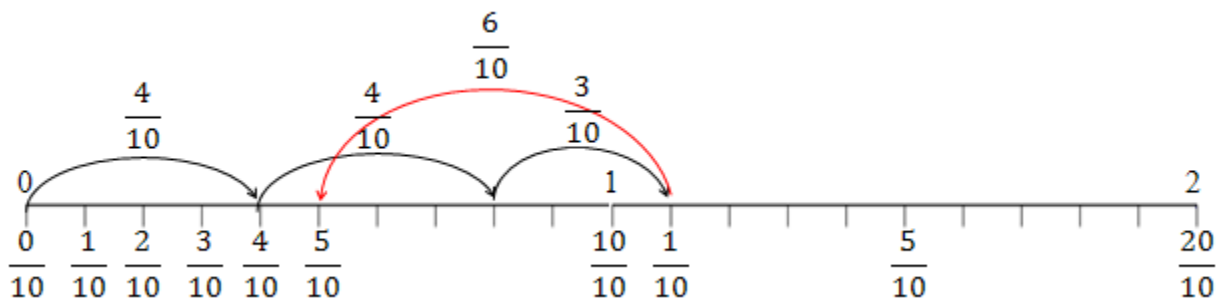
$$\frac{4}{10} + \frac{4}{10} + \frac{3}{10} - \frac{6}{10} = \frac{5}{10}$$

This problem was adapted from the following website.
http://nlvm.usu.edu/en/nav/frames_asid_107_g_2_t_1.html?from=category_g_2_t_1.html

Intervention
- Allow students to act out the problems with a partner or in a small group. Students may cut the ten-frames and use the fractional pieces when acting out the stories.

Name _____ Date _____

Sweet Fraction Bars
Story Problems

A Sweet Fraction Bar is a chocolate candy bar that is divided into ten equal sections. Solve the following problems.

|	
1. Hannah had $\frac{7}{10}$ of a Sweet Fraction Bar. She gave $\frac{3}{10}$ of the candy bar to Carlos. How much of the candy bar does she have left?	2. Sarah has $\frac{5}{10}$ of a candy bar. Brianna has $\frac{3}{10}$ of the same candy bar. Also, Mika has $\frac{2}{10}$ of the same candy bar. Together do the girls have enough to equal a whole candy bar?
3. Marissa gave Paulo $\frac{4}{10}$ of a Sweet Fraction Bar. Michael gave Paulo $\frac{3}{10}$ of a Sweet Fraction bar. How much candy does Paulo have now?	4. Caleb had $\frac{9}{10}$ of a Sweet Fraction Bar. He gave Mika $\frac{6}{10}$ of the candy bar. How much of the candy bar does he have left?

Name _____ **Date** _____

Sweet Fraction Bars
Ten-Frames

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
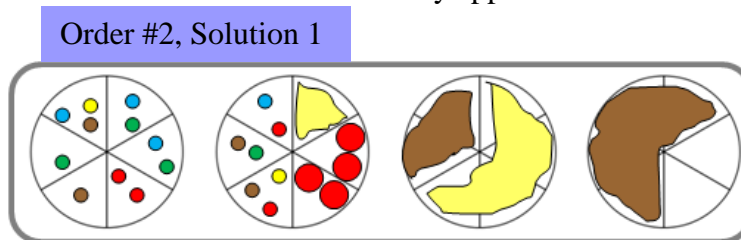
Order #2, Solution 1

Order #2, Solution 2

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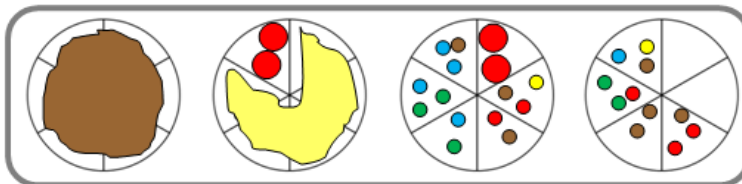
ESSENTIAL QUESTIONS

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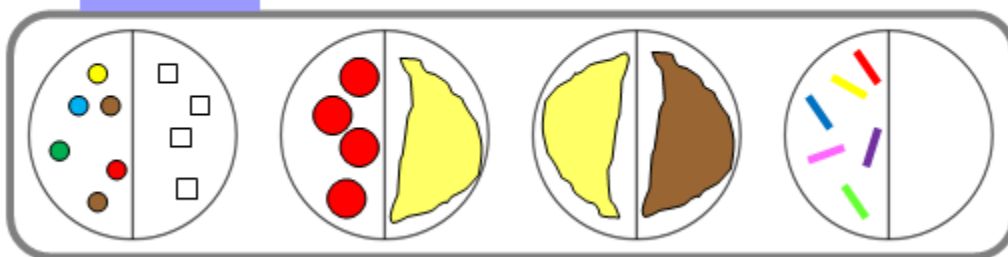
created (see example above). This way students will develop an understanding of what an improper fraction represents. Students can use this same understanding when writing a mixed number as an improper fraction. They should recognize that:

$$3\frac{1}{2} = \boxed{\frac{2}{2}} + \boxed{\frac{2}{2}} + \boxed{\frac{2}{2}} + \frac{1}{2} = \frac{7}{2}$$
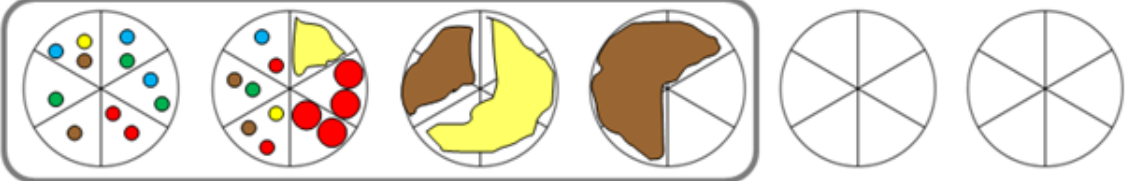
Because each $\frac{2}{2}$ is equal to one whole, there needs to be three $\frac{2}{2}$ to represent the 3 wholes in the mixed number. When the fractions are added the sum is $\frac{7}{2}$.
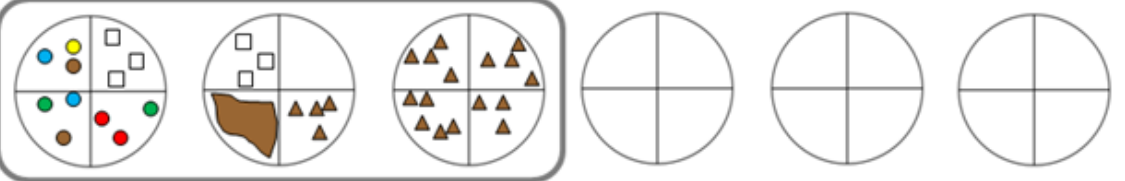
| Order Number	M & Ms	Walnuts	Chocolate Chips	Raspberries	Peanut Butter	Vanilla Icing	Chocolate Icing	Sprinkles	Improper fraction	Mixed Number	Number of Whole Cookies
Example	$\frac{1}{2}$	$\frac{1}{2}$		$\frac{1}{2}$		$\frac{1}{2}$	$\frac{2}{2}$	$\frac{1}{2}$	$\frac{7}{2}$	$3\frac{1}{2}$	4
#1	$\frac{4}{5}$		$\frac{3}{5}$		$\frac{2}{5}$			$\frac{3}{5}$	$\frac{12}{5}$	$2\frac{2}{5}$	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
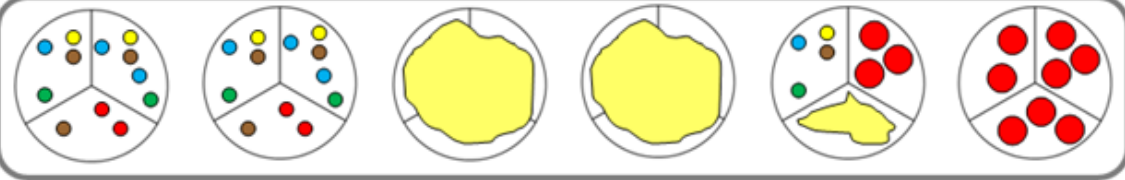
MATHEMATICS • GRADE 4 • UNIT 3: Adding and Subtracting Fractions
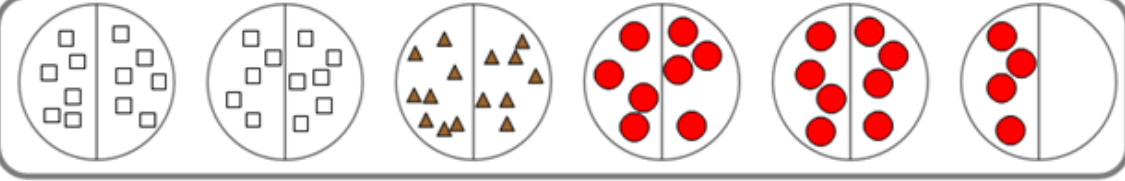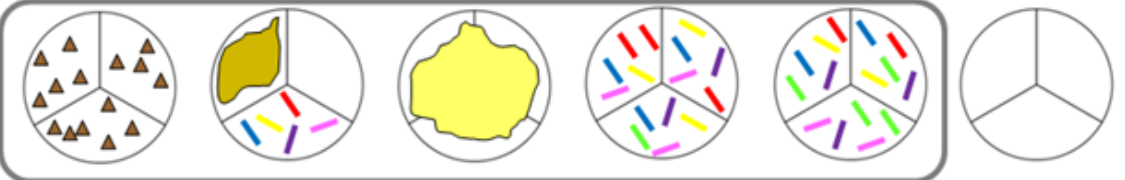
1.
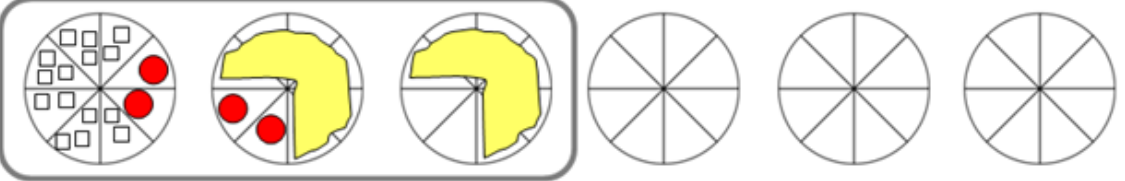
2.

3.

4.

5.

6.

7.

8.

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

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. Using the circle templates below, show how you would create each cookie order with the correct fractional amounts of toppings.

Cookie Orders

Order Number	Toppings								Order Totals		
	M & M's	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
#1	$\frac{4}{5}$		$\frac{3}{5}$		$\frac{2}{5}$			$\frac{3}{5}$			
#2	$\frac{9}{6}$			$\frac{2}{6}$		$\frac{5}{6}$	$\frac{6}{6}$				
#3	$\frac{3}{4}$	$\frac{2}{4}$	$\frac{4}{4}$			$\frac{1}{4}$					
#4	$\frac{7}{3}$			$\frac{4}{3}$		$\frac{7}{3}$					
#5		$\frac{4}{2}$	$\frac{2}{2}$	$\frac{5}{2}$							
#6			$\frac{4}{3}$		$\frac{1}{3}$	$\frac{3}{3}$		$\frac{7}{3}$			
#7		$\frac{6}{8}$		$\frac{4}{8}$		$\frac{12}{8}$					
#8	$\frac{3}{4}$		$\frac{9}{4}$		$\frac{5}{4}$			$\frac{2}{4}$			

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).

Example:
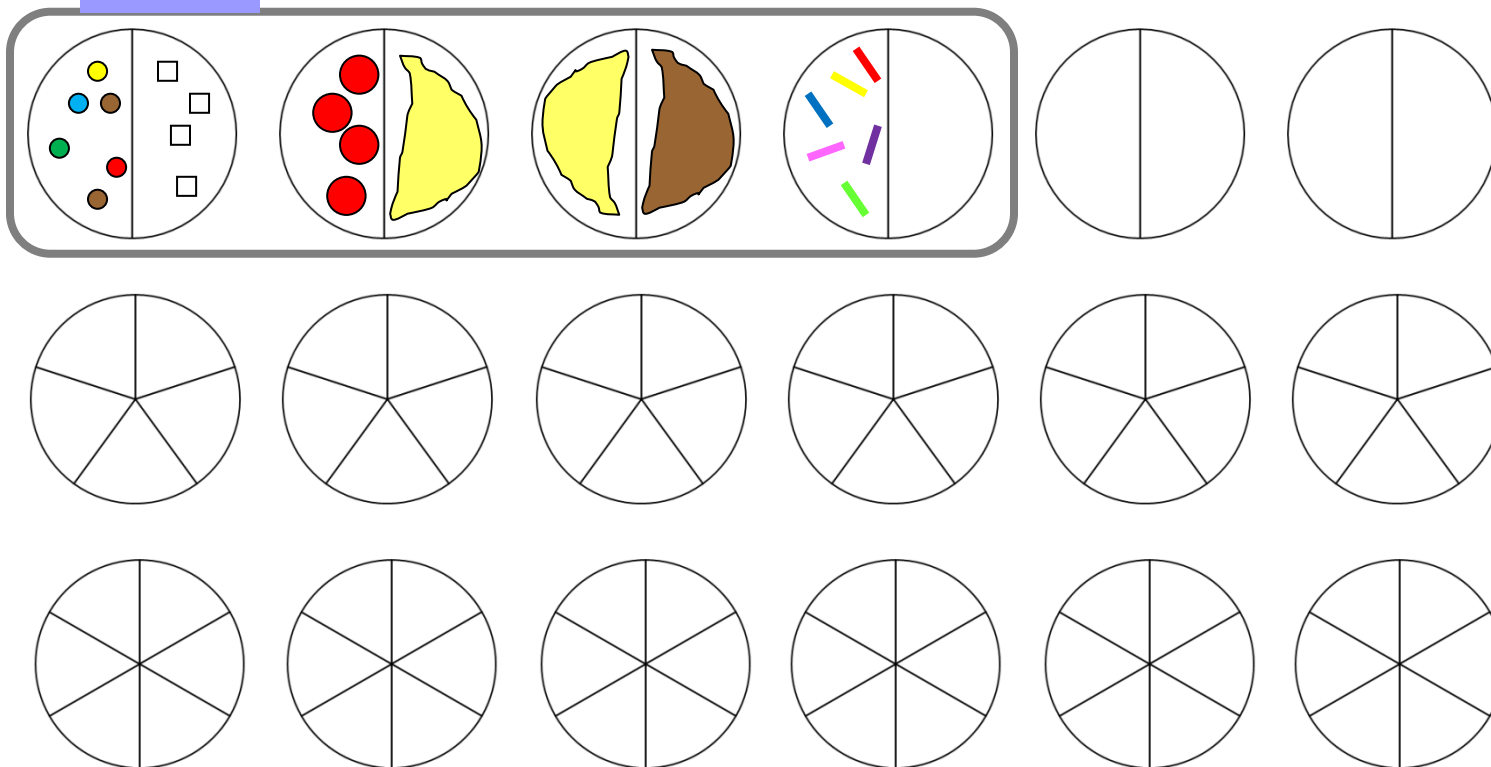
Cookie Order Codes

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
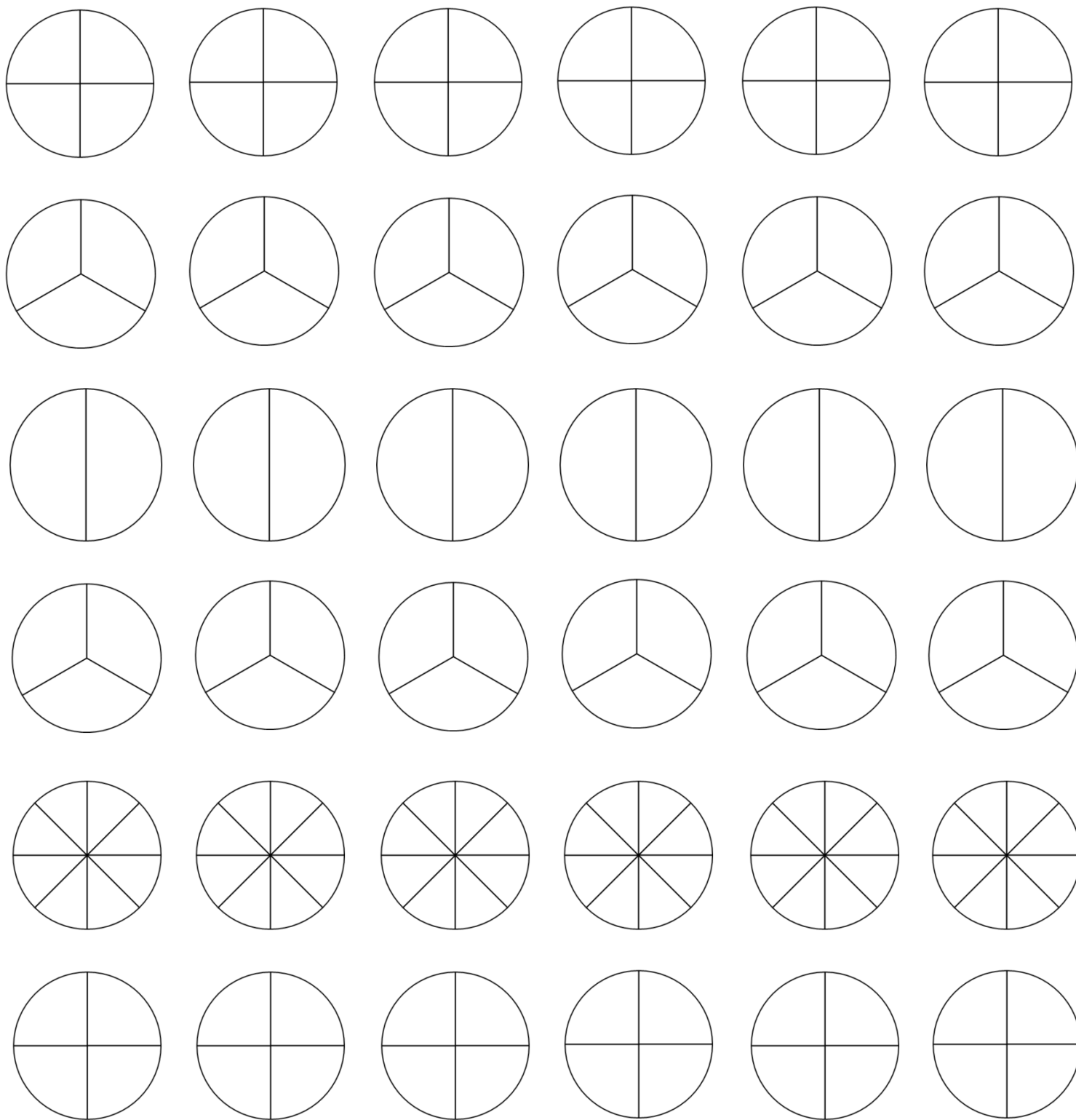
Name _____ Date _____
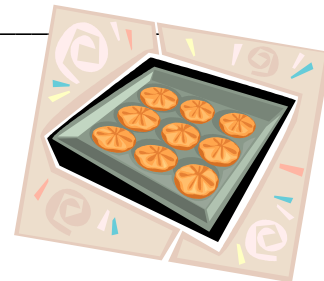
Fraction Cookies Bakery
Order Form – Version 2

    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).

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
#1	$\frac{1}{4}$		$\frac{1}{2}$		$\frac{1}{4}$			$\frac{3}{4}$			
#2	$\frac{9}{6}$			$\frac{1}{3}$		$\frac{1}{6}$	$\frac{2}{3}$				
#3	$\frac{3}{8}$	$\frac{1}{4}$	$\frac{4}{4}$					$\frac{5}{8}$			
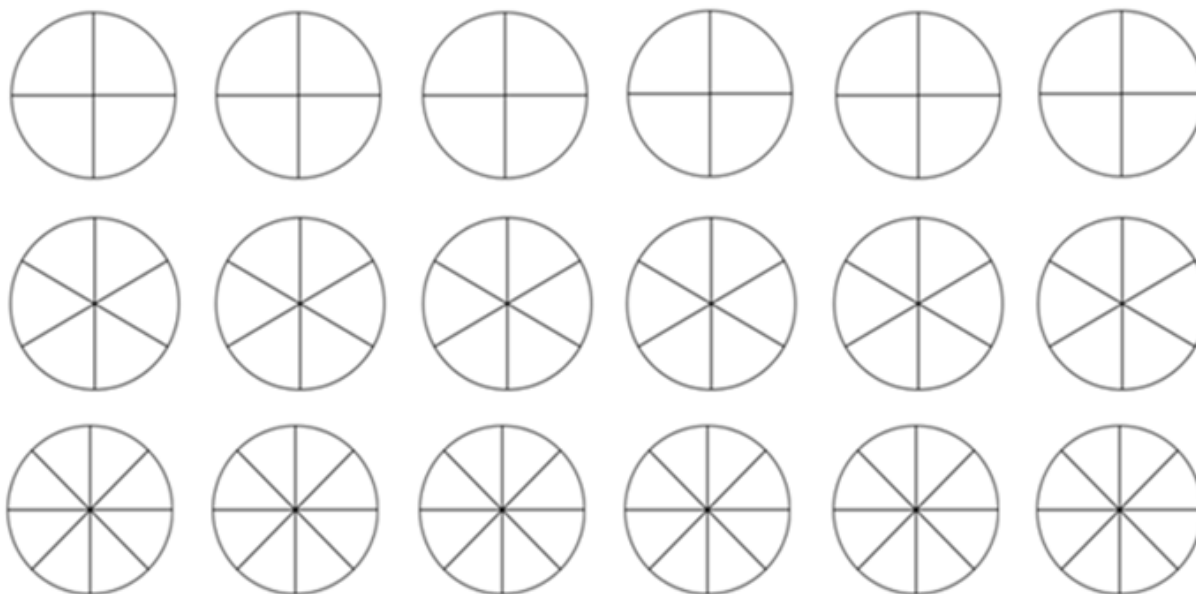
Practice Task: Rolling Fractions

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 had prior experiences and/or instruction with subtracting fractions with like denominators. In this task students will discover how to convert improper fractions to mixed numbers. Students should have prior experience representing one whole as a fraction with the same numerator and denominator.

Based on students' understanding of subtraction and of fractions, students may develop several strategies for subtracting mixed numbers. Some examples are shown below. Remember, these are strategies that students may use; students do not need to know how to subtract mixed numbers using all of these strategies, they are provided for teacher information only.

How might students solve the problem $3\frac{2}{4} - 2\frac{3}{4}$?

- Some students may subtract the whole numbers first, $3 - 2 = 1$ and then think about the fractions $\frac{2}{4} - \frac{3}{4}$. To subtract they may think of $\frac{3}{4}$ as $\frac{2}{4} + \frac{1}{4}$. If they subtract $\frac{2}{4}$ first, they will be left with $\frac{1}{4}$ to subtract from the 1 remaining after subtracting the whole numbers. Knowing $1 = \frac{4}{4}$, students can subtract $\frac{4}{4} - \frac{1}{4} = \frac{3}{4}$.

- Other students may choose to count up from $2\frac{3}{4}$ to $3\frac{2}{4}$. Adding $\frac{1}{4}$ to $2\frac{3}{4}$ makes 3. Adding $\frac{2}{4}$ to 3 makes $3\frac{2}{4}$. Because $\frac{1}{4}$ and $\frac{2}{4}$ were added to count up to $3\frac{2}{4}$ the different is $\frac{1}{4} + \frac{2}{4}$ or $\frac{3}{4}$. This method is shown on the open number line below.
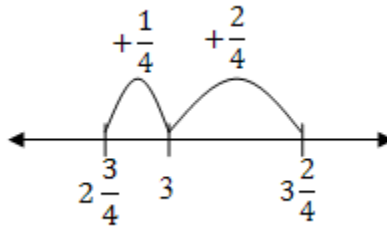
- Finally, some students may start by regrouping. The mixed number $3\frac{2}{4}$ can be rewritten as $2 + \frac{4}{4} + \frac{2}{4}$.

  - Some students may take that one step further and regroup as shown $2 + \frac{4}{4} + \frac{2}{4} = 2 + \frac{6}{4}$. Then students can subtract $2\frac{6}{4} - 2\frac{3}{4} = \frac{3}{4}$ by subtracting $2 - 2 = 0$ and $\frac{6}{4} - \frac{3}{4} = \frac{3}{4}$.

  - Some students may subtract $2\frac{2}{4} + \frac{4}{4} - 2\frac{3}{4} = \frac{3}{4}$ by first subtracting $2 - 2 = 0$ and then subtracting $\frac{4}{4} - \frac{3}{4} = \frac{1}{4}$. The difference $\frac{1}{4}$ is added to the other fraction $\frac{2}{4}$ giving $\frac{3}{4}$.

These examples demonstrate several ways students could apply their understanding of subtraction and fractions to subtraction and mixed numbers. It is important to remember that all students do not need to know how to subtract using all of the procedures above. Students need to understand subtraction of mixed numbers and be able to subtract and add mixed numbers. They may use the same strategy each time or they may become proficient in more than one strategy that allows them to choose the best strategy for the problem they are trying to solve.

ESSENTIAL QUESTIONS

- How do we subtract fractions?
- What is an improper fraction and how can it be represented?
- What is a mixed number and how can it be represented?

MATERIALS

- "Rolling Fractions, Directions" student sheet
- "Rolling Fractions, Game Sheet" student recording sheet (2 pages; copy page 2 on the back of page 1)
- Four six-sided dice – two in one color, two in a different color (If available, 4 ten-sided dice (0-9) could be used per team)

GROUPING

Partner/Small Group Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

In this task, students play a game that requires them to subtract and compare mixed numbers with like denominators. This task gives students lots of opportunities for practice with subtraction of fractions with like denominators. It also gives students the opportunity to investigate mixed numbers and improper fractions.

Comments
There are several situations that add depth to this game. But when students are first learning this game, those situations should be avoided. If the dice show numbers that don't allow students to create a mixed number where the fraction part is a proper fraction, then tell students to roll that pair of dice again. For example, if the denominator chosen is 4, and the two dice show a 5 and a 6, allow students to roll again rather than creating a mixed number such as $5\frac{6}{4}$ or $6\frac{5}{4}$. After students have played the game several times, remove the limitation of mixed numbers with proper fractions. This will allow rich conversations regarding the meaning of improper fractions as part of a mixed number.

If students are given the opportunity to create any mixed number, the following discussion gives some examples of the rich conversations that could develop. Present the following problem to the students to determine their understanding of subtraction with mixed numbers and of fractions in general.

> *It's your turn. You roll the dice shown below. You and your partner have agreed the denominator for this round is 4. What subtraction problem with two mixed numbers can you write to create the largest possible difference?*

In this situation, students may create the following straightforward subtraction problem. But that doesn't give the largest difference.

$$5\frac{3}{4} - 4\frac{1}{4} = 1\frac{2}{4}$$

Some students may write the following mixed numbers.

$$5\frac{3}{4} - 1\frac{4}{4}$$

- Students, who recognize that $\frac{4}{4}$ is equivalent to 1, may rewrite the problem as $5\frac{3}{4} - 2 = 3\frac{3}{4}$ and solve the problem by subtracting the whole numbers.

- Others may rewrite $5\frac{3}{4}$ as $\left(4 + \frac{4}{4}\right) + \frac{3}{4}$ and then subtract $1\frac{4}{4}$ by subtracting the whole numbers, $4 - 1 = 3$ and then subtracting the fractions $\frac{4}{4} - \frac{4}{4} = \frac{0}{4}$, leaving $\frac{3}{4}$. Therefore their answer is $3 + \frac{3}{4}$ or $3\frac{3}{4}$.

- Some students may rewrite $5\frac{3}{4}$ as $\left(4 + \frac{4}{4}\right) + \frac{3}{4}$ and then add $\frac{4}{4} + \frac{3}{4} = \frac{7}{4}$. The problem would then be $4\frac{7}{4} - 1\frac{4}{4} = 3\frac{3}{4}$.

Some students may write the following mixed numbers.

$$4\frac{1}{4} - 3\frac{5}{4}$$

To solve this, students may struggle with subtracting $\frac{5}{4}$ from $\frac{1}{4}$. Help them to make sense of what this means, but allow them to determine how best to solve the problem.

- Students may recognize that $3\frac{5}{4}$ is the same as $3 + \boxed{1} + \frac{1}{4}$ and because $\frac{4}{4} = 1$, students may rewrite $3\frac{5}{4}$ as $4\frac{1}{4}$. However, when the problem is rewritten, it is $4\frac{1}{4} - 4\frac{1}{4} = 0$ which does not give the greatest difference!

- Some students may solve this problem by subtracting $\frac{1}{4}$ from $4\frac{1}{4}$ leaving $3\frac{4}{4}$ to subtract from 4 $\left(\text{i.e. } 4\frac{1}{4} - \left(3\frac{4}{4} + \frac{1}{4}\right) = 4\frac{1}{4} - \left(\frac{1}{4} + 3\frac{4}{4}\right) = \left(4\frac{1}{4} - \frac{1}{4}\right) - 3\frac{4}{4} = 4 - 3\frac{4}{4}\right)$. Students

may then subtract the whole numbers (4-3 = 1) and be left with $1 - \frac{4}{4}$. If they recognize

that $\frac{4}{4}$ is equivalent to 1 then they can subtract $1 - 1 = 0$.

All of the examples above highlight the idea that students will make sense of subtraction of mixed numbers based on their understanding of subtraction and numbers. It is important to allow students to solve mixed-number problems in a way that makes sense to them. Rather than teaching addition and subtraction of mixed numbers separately from fractions, allow students to solve mixed-number problems by building on their understanding of fractions. (See Van de Walle & Lovin, 2006, p. 166)

While playing the game, be sure students are aware that they need to subtract the smaller mixed number from the larger mixed number. Therefore, one pair of dice (one color) **does not** always have to be the minuend, and the other always the subtrahend. Instead, either pair of dice can be used for the minuend. (While students should understand the term "difference" in the context of subtraction, they are not expected to know the terms minuend and subtrahend. These terms are related as follows: *minuend – subtrahend = difference*. This information is for teachers only, students are not expected to use the terms minuend and subtrahend.)

Some variations for this game are listed below.

- Keep the same denominator throughout the game and declare the winner to be the person who wins the most rounds after a given amount of time.
- This game can be played as an addition game. Instead of subtracting the two mixed numbers, students could add them and then compare their answers in the same way as the subtraction version.
- Allow students to make a rule for what will happen if it is not possible to create a mixed number without an improper fraction. What if the yellow dice showed 5 and 6 and the denominator was 4? Would the player have to forfeit their turn; would the player need to roll those two dice again; or would the students have to agree to allow improper fractions as part of a mixed number? Determining this rule provides for some rich conversations regarding the make-up of mixed numbers and what each part means.
- Rather than having the player with the higher fraction win, students could use a spinner that shows two sections, high and low. This way, it is unknown if the higher or lower fraction wins until it is determined by the spinner at the end of each round.
- Once students are familiar with the game, they do not need the record sheet. They can easily record the game and keep score on a blank sheet of paper.

Task Directions

Students will follow the directions below from the "Rolling Fractions" student recording sheet.

Players: 2 or more
Materials: "Rolling Fractions, Directions" student sheet
"Rolling Fractions, Game Sheet" student recording sheet
4 dice (2 dice one color, 2 dice different color)
Pencil

Directions:
1. With your partner, choose a denominator of 2, 3 or 4. You and your partner <u>must</u> have the same denominator.
2. Roll a set of four dice. Use the chosen denominator and the dice of one color to write the first mixed number; use the dice of the other color to write the second mixed number. Find the difference of the two fractions created.
3. If possible, write your difference as an improper fraction.

> *Example:*
> *If you roll the dice as shown below, you could create the following subtraction problem:*

> The 5 and the 3 can be placed as the whole number or the numerator of the fraction for one mixed number, the 4 and 1 can be placed as the whole number or the numerator of the fraction for the other mixed number.

$$5\frac{3}{4} - 4\frac{1}{4} = 1\frac{2}{4} = \boxed{1\frac{4}{4}} + \frac{2}{4} = \frac{6}{4}$$

> *You would fill in the table as shown below. Each player should have their own recording sheet.*

Rolling Fractions

Round	1st Mixed Number	2nd Mixed Number	Difference	Improper Fraction	Score
Example	$5\frac{3}{4}$	$4\frac{1}{4}$	$1\frac{2}{4}$	$1\frac{4}{4} + \frac{2}{4} = \frac{6}{4}$	1

4. Your partner should do the same (see steps 2 &3). Now compare your fractions.
5. The partner with the largest fraction receives 1 point. Continue the game until one player has 10 points.
6. The player that earns 10 points first is the winner.

FORMATIVE ASSESSMENT QUESTIONS

- Can your difference be written as an improper fraction? How do you know?
- How do you subtract the two fractions?
- Can you model with fraction pieces (or make a sketch to model) the subtraction problem?
- How does the denominator affect the value of your fractions?
- Can you model with fraction pieces (or make a sketch to model) the relationship between the mixed number and the equivalent improper fraction?

DIFFERENTIATION

Extension
- Ask students to create a real life context for one of the subtraction problems from the game. Using the context created, students will model the problem and solution and then explain their model and solution.

Intervention
- If it proves beneficial, allow students to use fraction pieces to model the subtraction and to find the answer.

Name _____ Date _____

Rolling Fractions
Directions

Players: 2 or more
Materials: "Rolling Fractions, Directions" student sheet
"Rolling Fractions, Game Sheet" student recording sheet (one per student)
4 dice (2 dice one color, 2 dice different color)
Pencil
Directions:
1. With your partner, choose a denominator of 2, 3 or 4. You and your partner <u>must</u> have the same denominator.
2. Roll a set of dice. Use the chosen denominator and the dice of one color to write the first mixed number; use the dice of the other color to write the second mixed number. Find the difference of the two fractions created. Record.

    Example:
    If you roll the dice as shown below, you could create the following subtraction problem:

    The 5 and the 3 can be placed as the whole number or the numerator of the fraction for one mixed number, the 4 and 1 can be placed as the whole number or the numerator of the fraction for the other mixed number.

    $$5\frac{3}{4} - 4\frac{1}{4} = 1\frac{2}{4} = \boxed{1\frac{4}{4}} + \frac{2}{4} = \frac{6}{4}$$

    You would fill in the table as shown below. Each player should have their own recording sheet

Rolling Fractions

Round	1ˢᵗ Mixed Number	2ⁿᵈ Mixed Number	Difference	Improper Fraction	Score
Example	$5\frac{3}{4}$	$4\frac{1}{4}$	$1\frac{2}{4}$	$\boxed{1\frac{4}{4}} + \frac{2}{4} = \frac{6}{4}$	1

3. If possible, write your difference as an improper fraction. Your partner should do the same.
4. Compare your improper fraction to your partner's.
5. The player with the largest fraction receives 1 point.
6. Continue the game until one player has 10 points.
7. The player that reaches 10 first is the winner.

Name _____ Date _____

Rolling Fractions
Game Sheet

Round	1st Mixed Number	2nd Mixed Number	Difference	Improper Fraction	Score
Example	$5\frac{3}{4}$	$4\frac{1}{4}$	$1\frac{2}{4}$	$1\boxed{\frac{4}{4}} + \frac{2}{4} = \frac{6}{4}$	1
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Rolling Fractions
Game Sheet (Back)

Round	First Fraction	Second Fraction	Difference	Mixed Number	Score
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

Page 2
Copy on Back of Page 1

Constructing Task: The Fraction Story Game

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

    While this task may serve as a summative assessment, it also may be used for teaching and learning. It is important that all elements of the task be addressed throughout the unit so that students understand what is expected of them.

ESSENTIAL QUESTION

- How are fractions used in problem-solving situations?

MATERIALS

Materials Required Per Group
- "The Fraction Story Game, Directions" student sheet
- "The Fraction Story Game, Game board" student sheet

- Colored pencils or crayons
- Index cards (about 60)
- Common classroom materials - recycled items for game pieces (about 6)

GROUPING

Small Group Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Students create a game while reviewing all the different aspects of fractions they have studied.

Comments

Students may not understand what you mean by "common classroom materials." While many classrooms have standard dice that can be used, give alternative examples such as, a penny can be flipped to determine how many spaces the players get to move (heads = 2 spaces, tails =1 space). For game pieces, extra marker caps, manipulatives, or coins can be used.

Begin by having students review lessons or activities that have been done during the fraction unit that they think were important. Record their thoughts on chart paper or the board. You may want to post a list of the elements of the standard covered during the unit and brainstorm tasks and activities you did that addressed each element.

Since a good game should have at least 20-30 questions, you may want the children to work with a partner or in small groups to create enough questions.

This task represents the level of depth, rigor, and complexity expected of all fourth grade students to demonstrate evidence of learning.

Additional Comments:
- Students should have had multiple opportunities to write story problems by this time in the school year.
- Questions should match a standard/element.
- Creating questions to match elements of the standard taught is a wonderful way to review. It is a strategy that can be used from elementary school through college and is very effective.
- Index cards may be used for the problem cards. Insist that the students write legibly. All problem cards should have the solutions on the back
- Solutions should be accompanied by an explanation/illustration.
- Game boards, playing pieces, and cards can be stored in large Ziploc bags or manila folders.

The cards students create for their games can be used in a variety of ways. The problem cards can be used to create a Jeopardy type game which can be played as a review of the unit. Also the problem cards can be reproduced and used as a set of review questions before the unit assessment.

Task Directions

Students will follow the directions below from "The Fraction Story Game, Directions" student sheet.

Your task is to create a fraction story game using what you learned about common fractions and decimal fractions. Use the fraction game board on "The Fraction Story Game, Game Board" student sheet to create a game that other students will want to play.

Directions:

- Look at the list of elements of the standard that you studied in class. The problem cards you create must match those elements.
- You will need to make approximately 30 problem cards for your game. Most of the cards should be written in story problem form.
- Be sure you have some problem cards for each of the elements of the standard addressed in this unit. Make sure you use both decimal fractions and common fractions in your problem cards.
- Each problem card must have the correct answer on the back. Cover each problem card with a blank index card so players cannot see the problems before their turn. See sample below.
- Write the rules for your game.
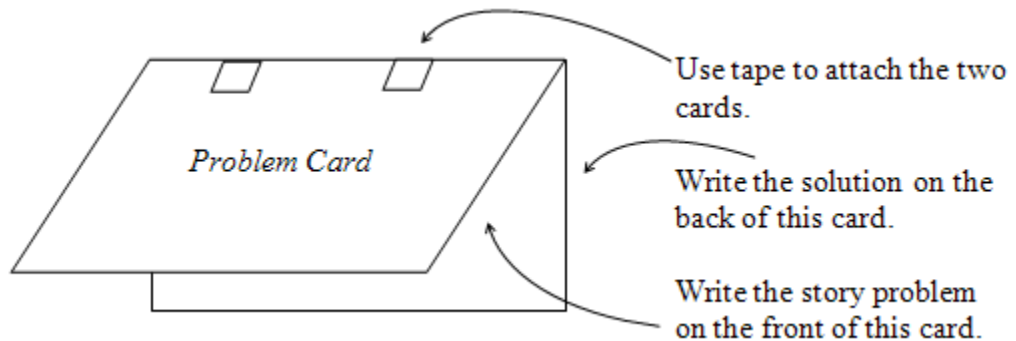
Things to remember:

- You can only use common classroom materials.
- You may decorate your game board in a way that makes the game interesting and fun to play.
- Be sure to play your game with a partner to be sure it works.

FORMATIVE ASSESSMENT QUESTIONS

- What are the skills you learned during this unit?
- What kind of problem can you create for _____ (one of the elements of the standard)?
- How do you know this is the correct solution for your problem?

DIFFERENTIATION

Extension
- Students can create their own game board format with penalties, rewards, and more complex rules.

Intervention
- Allow students to work in a small group so each student will need to make only one card per element of the standard.
- For some of the elements of the standard, give the students the problem and require them to create the solution to the problem.
- Students with a significant problem with manual dexterity may need to type their problems, then cut and paste then onto the index cards.

Name _____ **Date** _____

The Fraction Story Game
Directions
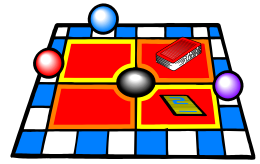
   Your task is to create a fraction story game using what you learned about common fractions and decimal fractions. Use the fraction game board on "The Fraction Story Game, Game Board" student sheet to create a game that other students will want to play.

Directions:
  • Look at the list of elements for the standard that you studied in class. The problem cards you create must match the elements of the standard.
  • You will need to make approximately 30 problem cards for your game. Most of the cards should be written in story problem form.
  • Be sure you have some problem cards for each of the elements of the standard addressed in this unit. Make sure you use both decimal fractions and common fractions in your problem cards.
  • Each problem card must have the correct answer on the back. Cover each problem card with a blank index card so players cannot see the problems before their turn. See sample below.

Use tape to attach the two cards.

Write the solution on the back of this card.

Write the story problem on the front of this card.

Problem Card

  • Write the rules for your game.

Things to remember:
  • You can only use common classroom materials.
  • You may decorate your game board in a way that makes the game interesting and fun to play.
  • Be sure to play your game with a partner to be sure it works.

Name _____ Date _____

The Fraction Story Game
Game Board

Finish

Start

Problem Cards

MATHE

Constructing Task: Fraction Field Event

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

The boys' and girls' long jump event total scores are shown below. Mary was the winner for the girls with a total score of $24\frac{3}{12}$, Bob was the winner for the boys with a total score of $26\frac{10}{12}$.

1.

Name	1st Jump	2nd Jump	3rd Jump	Total Score
Kim	$7\frac{3}{12}$ feet	$6\frac{11}{12}$ feet	$6\frac{5}{12}$ feet	$20\frac{7}{12}$ feet
Amanda	$5\frac{9}{12}$ feet	$6\frac{1}{12}$ feet	$6\frac{4}{12}$ feet	$18\frac{2}{12}$ feet
Malaika	$7\frac{9}{12}$ feet	$6\frac{2}{12}$ feet	$7\frac{11}{12}$ feet	$21\frac{10}{12}$ feet
Mary	$8\frac{1}{12}$ feet	$7\frac{11}{12}$ feet	$8\frac{3}{12}$ feet	$24\frac{3}{12}$ feet
Freida	$7\frac{10}{12}$ feet	$7\frac{10}{12}$ feet	$8\frac{2}{12}$ feet	$23\frac{10}{12}$ feet

3.

Name	1st Jump	2nd Jump	3rd Jump	Total Score
Carlos	$8\frac{1}{12}$ feet	$7\frac{11}{12}$ feet	$8\frac{6}{12}$ feet	$24\frac{6}{12}$ feet
Emmett	$7\frac{7}{12}$ feet	$6\frac{10}{12}$ feet	$8\frac{4}{12}$ feet	$22\frac{9}{12}$ feet
Bob	$8\frac{9}{12}$ feet	$9\frac{2}{12}$ feet	$8\frac{11}{12}$ feet	$26\frac{10}{12}$ feet
Thomas	$6\frac{7}{12}$ feet	$8\frac{11}{12}$ feet	$8\frac{3}{12}$ feet	$23\frac{9}{12}$ feet
Gene	$7\frac{10}{12}$ feet	$7\frac{3}{12}$ feet	$8\frac{5}{12}$ feet	$23\frac{6}{12}$ feet

To find the distance Carlos would need to jump on his second jump to win the event, students would first need to determine how far he was from first place. To compare Carlos' and Bob's scores, subtract $26\frac{10}{12} - 24\frac{6}{12} = 2\frac{4}{12}$.

- This can be done easily by subtracting the whole numbers, $26 - 24 = 2$ and subtracting the fractions $\frac{10}{12} - \frac{6}{12} = \frac{4}{12}$.

- To use a counting up strategy, students may add $\frac{6}{12}$ to $24\frac{6}{12}$ to get $24\frac{6}{12} + \frac{6}{12} = 24\frac{12}{12} = 25$. To get to $26\frac{10}{12}$ students would need to add $1\frac{10}{12}$ to the 25 giving $25 + 1\frac{10}{12} = 26\frac{10}{12}$. Since students added $\frac{6}{12}$ and $1\frac{10}{12}$ to count up to $26\frac{10}{12}$ the difference of $26\frac{10}{12} - 24\frac{6}{12}$ is the sum of $\frac{6}{12}$ and $1\frac{10}{12}$ which is $2\frac{4}{12}$ $\left(\text{i. e.} \frac{6}{12} + 1\frac{10}{12} = 1\frac{16}{12} = 1 + \frac{12}{12} + \frac{4}{12} = 2\frac{4}{12}\right)$.

The difference of the two scores needs to be added to Carlos' second score of $7\frac{11}{12}$. Therefore,

students should add $7\frac{11}{12} + 2\frac{4}{12} = 9\frac{15}{12} = 9 + \frac{12}{12} + \frac{3}{12} = 10\frac{3}{12}$. Carlos needed a second jump of

$10\frac{3}{12}$ to tie with Bob. To win, he needed to jump a distance greater than $10\frac{3}{12}$.

To find the distance Frieda would need to jump on her second jump to win the event, students would first need to determine how far she was from first place. To compare Mary's and Frieda's scores, subtract $24\frac{3}{12} - 23\frac{10}{12} = \frac{5}{12}$.

- To use a counting up strategy, students may add $\frac{2}{12}$ to $23\frac{10}{12}$ to get $23\frac{10}{12} + \frac{2}{12} = 23\frac{12}{12} =$

  24. To get to $24\frac{3}{12}$ students would need to add $\frac{3}{12}$ to the 24 giving $24 + \frac{3}{12} = 24\frac{3}{12}$. Since

  students added $\frac{2}{12}$ and $\frac{3}{12}$ to count up to $24\frac{3}{12}$ the difference of $24\frac{3}{12} - 23\frac{10}{12}$ is the sum of

  $\frac{2}{12}$ and $\frac{3}{12}$ which is $\frac{5}{12}$.

- To use a regrouping strategy, students may rewrite $24\frac{3}{12}$ as follows:

  $24\frac{3}{12} = 23 + \frac{12}{12} + \frac{3}{12} = 23\frac{15}{12}$. Then students can subtract $23\frac{10}{12}$ from $23\frac{15}{12}$ leaving $\frac{5}{12}$.
  $23\frac{15}{12} - 23\frac{10}{12} = \frac{5}{12}$.

The difference of the two scores needs to be added to Frieda's second score of $7\frac{10}{12}$. Therefore,

students should add $7\frac{10}{12} + \frac{5}{12} = 7\frac{15}{12} = 7 + \frac{12}{12} + \frac{3}{12} = 8\frac{3}{12}$. Frieda needed a second jump of $8\frac{3}{12}$

to tie with Mary. To win, she needed to jump a distance greater than $8\frac{3}{12}$.

ESSENTIAL QUESTIONS

- How do we add/subtract fractions?
- What is an improper fraction and how can it be represented?
- What is a mixed number and how can it be represented?

MATERIALS

"Fraction Field Event" student recording sheet

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Comments

Students can be encouraged to participate in field events and add their scores to find the total score as required in this task.

Task Directions

Students will follow the directions below from the "Fraction Field Event" student recording sheet.

Carter Elementary School is having a field day! One of the events is the long jump. Participants of this event take a running start and then jump as far as they can. The winner is determined by adding the distances jumped in three trials. The highest total wins. Using the jump measures below, determine the winner of this year's girls' and boys' long jump. Show all of your work on a separate sheet of paper.

1.

Name	1st Jump	2nd Jump	3rd Jump	Total Score
Kim	$7\frac{3}{12}$ feet	$6\frac{11}{12}$ feet	$6\frac{5}{12}$ feet	
Amanda	$5\frac{9}{12}$ feet	$6\frac{1}{12}$ feet	$6\frac{4}{12}$ feet	
Malaika	$7\frac{9}{12}$ feet	$6\frac{2}{12}$ feet	$7\frac{11}{12}$ feet	
Mary	$8\frac{1}{12}$ feet	$7\frac{11}{12}$ feet	$8\frac{3}{12}$ feet	
Freida	$7\frac{10}{12}$ feet	$7\frac{10}{12}$ feet	$8\frac{2}{12}$ feet	

2. Who had the highest total score for the girls' long jump?

3.

Name	1st Jump	2nd Jump	3rd Jump	Total Score
Carlos	$8\frac{1}{12}$ feet	$7\frac{11}{12}$ feet	$8\frac{6}{12}$ feet	
Emmett	$7\frac{7}{12}$ feet	$6\frac{10}{12}$ feet	$8\frac{4}{12}$ feet	
Bob	$8\frac{9}{12}$ feet	$9\frac{2}{12}$ feet	$8\frac{11}{12}$ feet	
Thomas	$6\frac{7}{12}$ feet	$8\frac{11}{12}$ feet	$8\frac{3}{12}$ feet	
Gene	$7\frac{10}{12}$ feet	$7\frac{3}{12}$ feet	$8\frac{5}{12}$ feet	

4. Who had the highest total score for the boys' long jump?

5. Carlos wants to find how long his 2nd jump needed to be in order to win the event. In order to score higher than the winner, how far did Carlos need to jump? Explain your thinking using words, numbers, and math pictures as needed.

6. Frieda wants to find how long her 2nd jump needed to be in order to win the event. In order to score higher than the winner, how far would Frieda need to jump? Explain your thinking using words, numbers, and math pictures as needed.

FORMATIVE ASSESSMENT QUESTIONS

- How did you find the sum of these mixed numbers?
- Is the fraction a proper or improper fraction? How do you know?
- If the fraction part of the mixed number is improper, what should you do?
- What do you know about the fraction $\frac{12}{12}$?
- How can you rewrite that mixed number?
- Did you add the whole numbers? Did you add the fractions?

DIFFERENTIATION

Extension
- Challenge students to write and solve a problem based on the jumping distances provided. Then ask students to give the problem to a partner to solve.

Intervention
- Allow students to use two or three rulers or a yardstick to work with the fractions in this task. Students can count the number of inches $\left(\frac{1}{12}\right)$ along the ruler to find the sum of the fractional part of the mixed number. This also allows students to recognize that 1 whole (the length of one ruler) is equivalent to $\frac{12}{12}$.

Name_____ Date_____

Fraction Field Event

Carter Elementary School is having a field day! One of the events is the long jump. Participants of this event take a running start and then jump as far as they can. The winner is determined by adding the distances jumped in three trials. The highest total wins. Using the jump measures below, determine the winner of this year's girls' and boys' long jump. Show all of your work on a separate sheet of paper.

1.

Name	1st Jump	2nd Jump	3rd Jump	Total Score
Kim	$7\frac{3}{12}$ feet	$6\frac{11}{12}$ feet	$6\frac{5}{12}$ feet	
Amanda	$5\frac{9}{12}$ feet	$6\frac{1}{12}$ feet	$6\frac{4}{12}$ feet	
Malaika	$7\frac{9}{12}$ feet	$6\frac{2}{12}$ feet	$7\frac{11}{12}$ feet	
Mary	$8\frac{1}{12}$ feet	$7\frac{11}{12}$ feet	$8\frac{3}{12}$ feet	
Freida	$7\frac{10}{12}$ feet	$7\frac{10}{12}$ feet	$8\frac{2}{12}$ feet	

2. Who had the highest total score for the girls' long jump? _____

3.

Name	1st Jump	2nd Jump	3rd Jump	Total Score
Carlos	$8\frac{1}{12}$ feet	$7\frac{11}{12}$ feet	$8\frac{6}{12}$ feet	
Emmett	$7\frac{7}{12}$ feet	$6\frac{10}{12}$ feet	$8\frac{4}{12}$ feet	
Bob	$8\frac{9}{12}$ feet	$9\frac{2}{12}$ feet	$8\frac{11}{12}$ feet	
Thomas	$6\frac{7}{12}$ feet	$8\frac{11}{12}$ feet	$8\frac{3}{12}$ feet	
Gene	$7\frac{10}{12}$ feet	$7\frac{3}{12}$ feet	$8\frac{5}{12}$ feet	

4. Who had the highest total score for the boys' long jump? _____

Fraction Field Event
Continued

5. Carlos wants to find how long his 2nd jump needed to be in order to win the event. In order to score higher than the winner, how far did Carlos need to jump? Explain your thinking using words, numbers, and math pictures as needed.

6. Frieda wants to find how long her 2nd jump needed to be in order to win the event. In order to score higher than the winner, how far would Frieda need to jump? Explain your thinking using words, numbers, and math pictures as needed.

Culminating Task: Pizza Parlor (Revisited)

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

   The solutions for the different order cards are shown below.

	Toppings													Order Totals			
	Extra Cheese	Beef	Buffalo Chicken	Ham	Pepperoni	Sausage	Anchovies	Green Peppers	Jalapeño Peppers	Mushrooms	Onions	Pineapple	Sliced Tomatoes	Improper Fraction	Mixed Number	Fraction of Plain Cheese	Total Pizzas Ordered
Order #1 Customer Name Mrs. Sanchez	$\frac{1}{2}$				$\frac{3}{4}$	$\frac{1}{4}$					$\frac{1}{2}$			$\frac{8}{4}$	2	$\frac{0}{4}$	2
Order #2 Customer Name Mr. Adams								$\frac{3}{2}$	$\frac{1}{4}$				$\frac{3}{4}$	$\frac{10}{4}$	$2\frac{2}{4}$	$\frac{2}{4}$	3
Order #3 Customer Name Sammie			$\frac{3}{8}$			$\frac{1}{8}$					$\frac{3}{4}$			$\frac{10}{8}$	$1\frac{2}{8}$	$\frac{6}{8}$	2
Order #4 Customer Name Ally				$\frac{11}{8}$			$\frac{7}{4}$	$\frac{7}{4}$						$\frac{39}{8}$	$4\frac{7}{8}$	$\frac{1}{8}$	5
Order #5 Customer Name Reggie		$\frac{5}{3}$					$\frac{3}{6}$	$\frac{4}{3}$						$\frac{21}{6}$	$3\frac{3}{6}$	$\frac{3}{6}$	4

	Toppings													Order Totals			
	Extra Cheese	Beef	Buffalo Chicken	Ham	Pepperoni	Sausage	Anchovies	Green Peppers	Jalapeño Peppers	Mushrooms	Onions	Pineapple	Sliced Tomatoes	Improper Fraction	Mixed Number	Fraction of Plain Cheese	Total Pizzas Ordered
Order #1 Customer Name Hilda	$\frac{3}{2}$			$\frac{5}{4}$								$\frac{1}{4}$		$\frac{12}{4}$	3	$\frac{0}{4}$	3
Order #2 Customer Name Nimesh						$\frac{1}{2}$					$\frac{15}{10}$	$\frac{6}{10}$		$\frac{26}{10}$	$2\frac{6}{10}$	$\frac{4}{10}$	3
Order #3 Customer Name Norah	$\frac{5}{4}$		$\frac{3}{4}$			$\frac{3}{4}$								$\frac{11}{4}$	$2\frac{3}{4}$	$\frac{1}{4}$	3
Order #4 Customer Name Ms. Thomas	$\frac{7}{8}$				$\frac{3}{4}$		$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$					$\frac{31}{4}$	$7\frac{3}{4}$	$\frac{1}{4}$	8
Order #5 Customer Name Laticia		$\frac{3}{10}$	$\frac{15}{10}$								$\frac{8}{10}$		$\frac{8}{10}$	$\frac{34}{10}$	$3\frac{4}{10}$	$\frac{6}{10}$	4

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

- "Pizza Parlor, Order Form" student recording sheet
- "Pizza Parlor, Order Cards" students sheet
- "Pizza Parlor, Pizzas" student recording sheet
- Colored pencils or crayons
- Scissors and glue
- Plain paper (students will glue their work on a sheet of paper for display)

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Students use improper fractions and mixed numbers interchangeably and add fractions to complete pizza orders.

Comments

This task is designed to be used after students have done the Fraction Cookies Bakery (see page 30 of this unit). Therefore students should have worked with improper fractions, mixed numbers, and addition of common fractions. In this task, students will use rectangular models for the pizzas because rectangles are much easier for students to divide equally into fifths, sixths, and tenths.

Introduce this task by telling students that they have been hired at a Pizza Parlor and they will be in charge of creating the pizzas with the correct toppings. Explain to students that the customers are very picky and quite specific when ordering pizzas. Only one topping goes on each part of the pizza and if there aren't enough toppings for a whole pizza, the remaining part will be left plain.

Before students work on this task with a partner or independently, they should solve one problem as a class, providing a model of what is expected.

Kaden called to order pizza for his family. Most of the people in his family like sausage on their pizzas so, he ordered $\frac{7}{4}$ sausage. Kaden is the only one who likes pepperoni, so he ordered $\frac{3}{8}$ pepperoni. His sisters, Hannah and Tamara, like vegetables on their pizza; so he also ordered $\frac{3}{4}$ mushroom, and $\frac{5}{8}$ onion.

Ask students the following questions:

- How many pizzas did he order in all?
- Will any part of the pizzas be only cheese?
- How could he write his order as an improper fraction?
- How could he write his order as a mixed number?

	Extra Cheese	Beef	Buffalo Chicken	Ham	Pepperoni	Sausage	Anchovies	Green Peppers	Jalapeño Peppers	Mushrooms	Onions	Pineapple	Sliced Tomatoes	Improper Fraction	Mixed Number	Fraction of Plain Cheese	Total Pizzas Ordered
					Toppings									**Order Totals**			
Order #1 Customer Name Kaden					$\frac{3}{8}$	$\frac{7}{4}$				$\frac{3}{4}$	$\frac{5}{8}$			$\frac{28}{8}$	$3\frac{4}{8}$	$\frac{4}{8}$	4
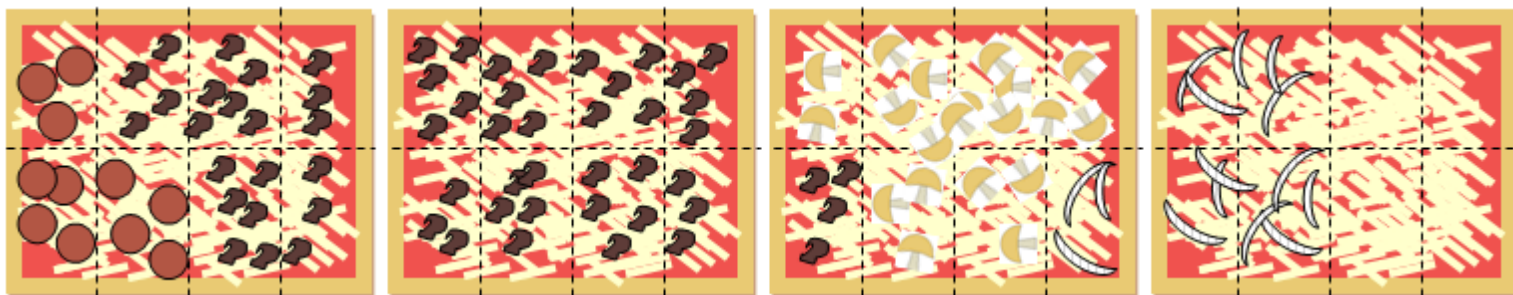
Put four blank, rectangular pizzas on the board. Discuss with the students how Kaden could show the correct toppings on each of the pizzas. First, ask students how the pizzas should be divided. Should they be divided into fourths? Eighths? (It is okay to divide the pizzas into fourths, but students would need to recognize that some of the fourths would need to be divided in half to create eighths as required.) Next, ask students how to cover $\frac{7}{4}$ pizzas with sausage if each pizza is divided into eighths. Looking at the picture, students should recognize that to cover $\frac{7}{4}$, a total of 14 eighths would need sausage. With the onions, a total of 10 eighths would need to be covered with onion. When finished placing the toppings, students should see that $\frac{4}{8}$ or $\frac{2}{4}$ of a pizza is left plain. Discuss how this could also be represented as $\frac{1}{2}$ of the pizza has no additional topping.

Using the example above as a model, allow students to work with a partner or on their own to complete the task. After students have created their pizzas, have a few students share their solution for one pizza order with the class. Allow other students to ask questions and make comments about the pizza models and their work.

Task Directions
Students will follow the directions below from the "Pizza Parlor, Pizzas" student task sheet.

Use the pizzas below to make the customer orders. Use colored pencils or crayons to create the pizzas ordered. Once you have completed an order, cut out the pizzas and the order card and glue them to a piece of paper to display your work. Add words and numbers as needed to understand your work. Remember, customers expect you to use the fewest number of pizzas possible to complete each order. No part of a pizza should be without a topping except for one.

Also, students will follow the directions below from the "Pizza Parlor, Order Form" student recording sheet.

Choose five of the pizza orders from the "Pizza Parlor, Order Cards" student sheet and complete the order form below.

FORMATIVE ASSESSMENT QUESTIONS

- What task have you done that will help you with this "Pizza Parlor" task?
- What order are you working on? How can you make sure you make the fewest pizzas and still fill the order?
- Into how many equal parts did you divide your pizzas? Why?
- How will you represent this improper fraction on your pizzas?
- How many pieces will have that topping? How do you know?
- How do you know this fraction of a pizza will be left plain?
- How do you know there were this many pizzas ordered?

DIFFERENTIATION

Extension
- 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 fraction pieces to create the pizzas. It might be necessary to combine several sets of pieces in order to make multiple pizzas.
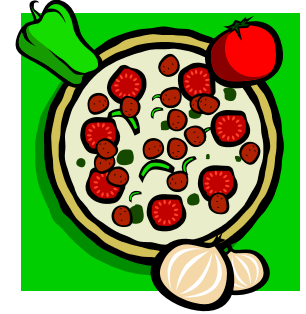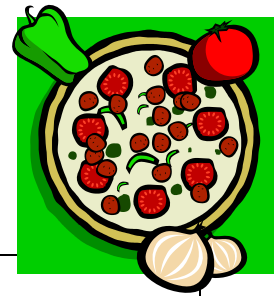
Name _____ Date_____

Pizza Parlor
Order Form

Choose five of the pizza orders from the "Pizza Parlor, Order Cards" student sheet and complete the order form below.

	Toppings													Order Totals			
	Extra Cheese	Beef	Buffalo Chicken	Ham	Pepperoni	Sausage	Anchovies	Green Peppers	Jalapeño Peppers	Mushrooms	Onions	Pineapple	Sliced Tomatoes	Improper Fraction	Mixed Number	Fraction of Plain Cheese	Total Pizzas Ordered
Order #1 Customer Name _____																	
Order #2 Customer Name _____																	
Order #3 Customer Name _____																	
Order #4 Customer Name _____																	
Order #5 Customer Name _____																	

Pizza Parlor

Order Cards

Mrs. Sanchez called to order pizza with $\frac{3}{4}$ pepperoni, $\frac{1}{2}$ extra cheese, $\frac{1}{2}$ onions, and $\frac{1}{4}$ sausage.	Mr. Adams came to pick up his pizza order. He wanted pizza with $\frac{3}{2}$ mushrooms, $\frac{1}{4}$ onions, and $\frac{3}{4}$ sliced tomatoes.
Sammie ordered pizza over the phone. He ordered $\frac{3}{4}$ pineapple and $\frac{3}{8}$ ham, and $\frac{1}{8}$ anchovies.	Ally ordered pizza for a party with her friends. She ordered $\frac{7}{4}$ green peppers, $\frac{11}{8}$ pepperoni, and $\frac{7}{4}$ mushrooms.
Reggie ordered some pizza to share with his friends. He ordered $\frac{4}{3}$ jalapeño peppers, $\frac{3}{6}$ green peppers, and $\frac{5}{3}$ beef.	Hilda called to order pizza. She wanted $\frac{3}{2}$ extra cheese, $\frac{1}{4}$ pineapple, and $\frac{5}{4}$ ham.
Mr. Nimesh ordered pizza. He ordered $\frac{15}{10}$ onions, $\frac{1}{2}$ sausage, and $\frac{6}{10}$ pineapples.	Norah ordered pizza to share with her family. She ordered $\frac{5}{4}$ extra cheese, $\frac{3}{4}$ buffalo chicken and $\frac{3}{4}$ sausage.
Ms. Thomas ordered pizza for her students. She ordered $\frac{3}{4}$ jalapeño peppers, $\frac{3}{4}$ green peppers, $\frac{3}{4}$ pepperoni, $\frac{7}{8}$ extra cheese, and $\frac{3}{4}$ anchovies.	Laticia called to order pizza. She wanted $\frac{3}{10}$ beef, $\frac{8}{10}$ onions, $\frac{15}{10}$ buffalo chicken, and $\frac{8}{10}$ sliced tomatoes.
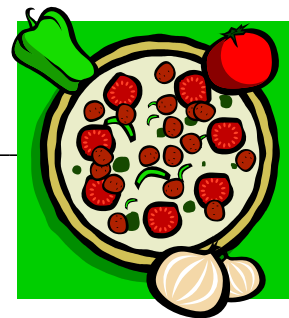
Name _____ Date _____

Pizza Parlor
Pizzas

Use the pizzas below to make the customer orders. Use colored pencils or crayons to create the pizzas ordered. Once you have completed an order, cut out the pizzas and the order card and glue them to a piece of paper to display your work. Add words and numbers as needed to understand your work. Remember, customers expect you to use the fewest number of pizzas possible to complete each order. No part of a pizza should be without a topping except for one.