Rich Mathematical Task – Grade *3* – *Pizza Party*

Task Overview/Description/Purpose:

- The purpose of this task is for students to explore the possibility of mixed numbers and improper fractions related to the amount of leftover pizza.
- In this task, students will create a model of a mixed number and improper fraction using certain parameters.

Standards Alignment: Strand – *Number and Number Sense*

Primary SOL 3.2 The student will

a) name and write fractions and mixed numbers represented by a model;
b) represent fractions and mixed numbers with models and symbols; and
c) compare fractions having like and unlike denominators, using words and symbols (>, <, =, or ≠), with models.

Related SOLs: 3.5, 2.4abc, 4.2abc, 4.3abcd

Learning Intention(s):

- **Content** - I am learning how to represent mixed numbers and improper fractions with a model.
- **Language** - I am learning how to use fraction language and mixed number representations to show an amount.
- **Social** - I am learning to explain my thinking as it relates to the fractional amounts of left over pizza. I am learning to listen to and explain my peers' strategies.

Success Criteria (Evidence of Student Learning):

- I can show more than one representation of a mixed number (picture, number line, paper folding, improper fraction, fraction circles, etc.).
- I can show my math thinking about mixed numbers/improper fractions through pictures, numbers, and words.

Mathematics Process Goals

Problem Solving	• With the given parameter of more than $\frac{2}{2}$ pepperoni pizzas but less than $\frac{3}{2}$ pepperoni pizzas, students will create a model and a mixed number/improper fraction representation to show at least one way to show the amount of leftover pepperoni pizza. • With the given parameter of more than 3 cheese pizzas but less than 4 cheese pizzas, students will create a model and a mixed number/improper fraction representation to show at least one way to show the leftover cheese pizza.
Communication and Reasoning	• Students will communicate their thinking process for representing the fractional pizza amounts in multiple ways through words, picture/model representations, and numbers. • Students will use appropriate and accurate written and/or oral mathematical language to express ideas. • Students will demonstrate sound reasoning and justify their solutions in an organized and coherent manner.

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Standards Alignment: Strand – *Number and Number Sense*	
Connections and Representations	• Students will use clear and appropriate representations to model the fractional amount of pizzas in multiple ways. • Students will make connections between their fraction representations and the representations of their peers.

Task Pre-Planning

Approximate Length/Time Frame: 60 minutes

Grouping of Students: Students should begin the task independently (5-7 minutes). After actively monitoring student strategies and responses, the teacher should purposefully pair students together.

Materials and Technology:

- Fraction circles, Virtual Fraction Circles
- Patty paper or tracing paper
- Circle/rectangle paper (Supporting documents)
- Anchor chart
- VDOE – Grade 3 Word Wall Cards
- paper and pencil

Vocabulary:

- fraction
- numerator, denominator
- mixed number, improper fraction
- halves, thirds, fourths, fifths, sixths, eighths, tenths, twelfths
- greater than, less than, equal to (<, >, =)

Anticipate Responses: See the Planning for Mathematical Discourse Chart (columns 1-3).

Task Implementation (Before)

Task Launch:

- **Anticipate prior knowledge:** The teacher will help students access their prior knowledge about mixed numbers and improper fractions by doing one to two of the Fraction Splats. In the Splat, students need to determine a mixed number/improper fraction displayed. Once the whole is determined then students must determine the part that is covered by the Splat. Allow students to Turn and Talk to discuss how they know what amount is shown and what amount is covered. Use the vocabulary listed above in addition to any words or phrases that were generated by students. Consider posting the vocabulary where all students can see it (fraction related anchor chart and/or VDOE - Grade 3 Word Wall Cards).
- **Ensure understanding of task:** The teacher will read the task aloud to all students. Have students *Turn and Talk* to summarize task without getting into potential solutions. Make sure the parameters are addressed. Have 1-2 students paraphrase the task.
- **Establish clear expectations:** Review rubric with students as a tool for monitoring their proficiency. Review classroom expectations for working independently.

Task Implementation (During)

Directions for Supporting Implementation of the Task

- Monitor – The teacher will observe students as they work independently on the task. The teacher will engage with students by asking assessing or advancing questions as necessary (see *Planning for Mathematics Discourse Chart).*
- Select – The teacher will select students to pair up based on the strategies used. The teacher may decide to pair students who used similar strategies or students who used different strategies. Allow students time to work together in pairs on the task. The teacher will engage with pairs by asking assessing or advancing questions as necessary (see page 4*)*.
- Sequence – The teacher will select 2-3 student strategies to share with the whole group. One suggestion is to look for one common misconception and two correct responses to share.
- Connect – The teacher will consider ways to facilitate connections between different student representations.

Suggestions For Additional Student Support

- Sentences frames:
  - _____ is the amount of cheese pizza/pepperoni pizza that is leftover because _____.
  - My strategy for determining the leftover pizza was_____.

- My solution makes sense because _____.
- Vocabulary development:
  - Use Frayer models to deepen understanding of vocabulary terms (mixed number/improper fraction).
  - Keep fraction vocabulary on an anchor chart and/or display related word wall cards. Reference the visual as needed to reinforce verbal, written, and graphic representations of new vocabulary words.
- Organization:
  - Use of circles or rectangles to ease drawing demands
  - Prepare student work space with materials required for task
- Possible problem solving strategies:
  - Pictures, numbers, words, concrete fraction models, number lines etc.
  - Encourage students to begin with the representation of $\frac{1}{2}$. Then ask for $\frac{2}{2}$. Ask I there is another way to name $\frac{2}{2}$.
- Extension:
  - How many possible amounts of cheese pizza could be leftover? Pepperoni pizza?
  - How much cheese *and* pepperoni pizza were left over?

Task Implementation (After) *20 minutes*

Connecting Student Responses (From Anticipating Student Response Chart) and Closure of the Task:

- Allow students time to walk around and see the strategies of other students (Gallery Walk).
- Based on the actual student responses, select and sequence particular students to present their mathematical work during class discussion. Consider sharing one strategy that shows a common misconception, and two other strategies that can connect to each other. Facilitate a discussion about similarities and differences between the strategies.
- Connect different students' responses and connect the responses to the key mathematical ideas to bring closure to the task.
- Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion (opportunity for Gallery Walk or think/pair/share with a partner or small group).

Teacher Reflection About Student Learning:

- How will student understanding of the content through the use of the process goals be assessed?
  - Problem solving
  - Communication & Reasoning
  - Connections & Representations
- How will the evidence provided through student work inform further instruction?
  - Creating small groups to address misconceptions
  - Individualized learning goals related to the standard (based off of proficiency of the task)

Planning for Mathematical Discourse

Mathematical Task: Pizza Party

Content Standard(s): SOL 3.2abc

Anticipated Student Response/Strategy *Provide examples of possible correct student responses along with examples of student errors/misconceptions*	**Assessing Questions** *Teacher questioning that allows student to explain and clarify thinking*	**Advancing Questions** *Teacher questioning that moves thinking forward*	**List of Students Providing Response** *Who? Which students used this strategy?*	**Discussion Order - sequencing student responses** • *Based on the actual student responses, sequence and select particular students to present their mathematical work during class discussion* • *Connect different students' responses and connect the responses to the key mathematical ideas* • *Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion*
Anticipated Student Response: *"I* don't know how to do this."	• What do you know about the pepperoni pizza? Cheese pizza? • How could you represent $\frac{1}{2}$? $\frac{2}{2}$? Is there another way to name $\frac{2}{2}$? • Could you draw a picture or show with fraction circles a little more than one pepperoni pizza?	• Using the fraction pieces (if necessary) can you make another amount equal to 1 whole? How do you know that is one whole? • Can you make more than three cheese pizzas but less than four cheese pizzas with the fraction pieces?		
Anticipated Student Response: Student thinks $\frac{2}{2}$ means two pizzas not two halves.	• Can you show me a picture of $\frac{2}{2}$ or use fraction circles? • What does $\frac{2}{2}$ represent?	• What can you tell me about the cheese pizza now? • How could you organize your work?		
Anticipated Student Response: Student is able to represent the cheese pizza as $3\frac{1}{2}$ but can't determine a model beyond halves.	• Can you show me a fraction that would be a little more than $3\frac{1}{2}$? A little less than $3\frac{1}{2}$?	• Can you use another fraction to show the same amount as $\frac{1}{2}$? How would you write this? Could this other way to make one		

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		half help you to represent the cheese pizza in a different way? Why or why not?		
Anticipated Student Response: The student comes up with an amount of cheese pizza but can't come up with an amount of pepperoni pizza greater than one whole ($\frac{2}{2}$) but less than one and one half ($\frac{3}{2}$).	• Can you draw a picture or use fraction pieces to represent $\frac{1}{2}$? What fraction pieces did you use? What fractions are less than $\frac{1}{2}$?	• What mixed number could be less than $1\frac{1}{2}$ but more than one whole?		
Anticipated Student Response: The student comes up with only one solution for the cheese pizza and pepperoni pizza.	• Is ($3\frac{1}{2}$, $3\frac{1}{4}$, etc.) the only amount of cheese pizza there could be? • Is ($1\frac{1}{4}$, $1\frac{1}{12}$, etc.) the only amount of pepperoni pizza there could be?	• Challenge yourself to find one more possible amount of cheese and pepperoni pizza.		

NAME _____ DATE _____

Pizza Party

The third grade class won a pizza party. All pizzas are the same size and are cut into equal size pieces. The class has eaten some of the pizza.

- There is more than $\frac{2}{2}$ pepperoni pizza, but less than $\frac{3}{2}$ pepperoni pizzas left.
- There are more than 3 cheese pizzas, but less than 4 cheese pizzas left.

How many cheese pizzas could be left over? How many pepperoni pizzas could be left over?

Explain your thinking using pictures, numbers, and words.

Rich Mathematical Task Rubric

	Advanced	Proficient	Developing	Emerging
Mathematical Understanding	Proficient Plus: • Uses relationships among mathematical concepts or makes mathematical generalizations	• Demonstrates an understanding of concepts and skills associated with task • Applies mathematical concepts and skills which lead to a valid and correct solution	• Demonstrates a partial understanding of concepts and skills associated with task • Applies mathematical concepts and skills which lead to an incomplete or incorrect solution	• Demonstrates no understanding of concepts and skills associated with task • Applies limited mathematical concepts and skills in an attempt to find a solution or provides no solution
Problem Solving	Proficient Plus: • Problem solving strategy is well developed or efficient	• Problem solving strategy displays an understanding of the underlying mathematical concept • Produces a solution relevant to the problem and confirms the reasonableness of the solution	• Problem solving strategy displays a limited understanding of the underlying mathematical concept • Produces a solution relevant to the problem but does not confirm the reasonableness of the solution	• A problem solving strategy is not evident • Does not produce a solution that is relevant to the problem
Communication and Reasoning	Proficient Plus: • Reasoning or justification is comprehensive • Consistently uses precise mathematical language to communicate thinking	• Demonstrates reasoning and/or justifies solution steps • Supports arguments and claims with evidence • Uses mathematical language to communicate thinking	• Reasoning or justification of solution steps is limited or contains misconceptions • Provides limited or inconsistent evidence to support arguments and claims • Uses limited mathematical language to partially communicate thinking	• Provides no correct reasoning or justification • Does not provide evidence to support arguments and claims • Uses no mathematical language to communicate thinking
Representations and Connections	Proficient Plus: • Uses representations to analyze relationships and extend thinking • Uses mathematical connections to extend the solution to other mathematics or to deepen understanding	• Uses a representation or multiple representations, with accurate labels, to explore and model the problem • Makes a mathematical connection that is relevant to the context of the problem	• Uses an incomplete or limited representation to model the problem • Makes a partial mathematical connection or the connection is not relevant to the context of the problem	• Uses no representation or uses a representation that does not model the problem • Makes no mathematical connections