Rich Mathematical Task – Grade 7 – *Bake Sale Fundraiser*

Task Overview/Description/Purpose:

- In this task, students will determine how many cupcakes were sold and how much money is left over for spending money in order to develop mathematical understanding of operations with rational numbers.
- This task is designed to deepen understanding of operations with fractions, decimals, and percents as it relates to consumer applications.

Standards Alignment: Strand – *Computation and Estimation*

Primary SOL: 7.2 The student will practical problems involving operations with rational numbers.

Related SOL (within or across grade levels/courses): 6.5bc, 8.4

Learning Intention(s):

- **Content –** I am learning about operations with rational numbers and how they can be used to solve practical problems.
- **Language-** I am learning how to communicate about parts of a whole and computational processes like addition, subtraction, multiplication, and division.
- **Social –** I am learning how to explain my strategy and work to others so I can refine my strategies for problem solving.

Success Criteria (Evidence of Student Learning);

- I can use operations with rational numbers to solve a practical problem.
- I can justify my computational process and report my conclusions.
- I can make suggestions and utilize suggestions made by my peers to make revisions to my work and thinking.

Mathematics Process Goals

Problem Solving	• Students will apply the concept of operations with rational numbers to model a practical situation.
Communication and Reasoning	• Students will justify verbally and with mathematical evidence how they know if the pair raised enough money and how much was left for spending money.
Connections and Representations	• Students will use formulas, tiles, or graph paper to model the cupcakes sold and profit. This task builds upon prior knowledge of fraction and decimal computation and number sense.

Task Pre-Planning

Approximate Length/Time Frame: 45-60 minutes

Grouping of Students: This task would be best completed with students working collaboratively first to discuss their problem solving process, and then work independently to determine their solution.

Materials and Technology:	**Vocabulary:**
• graph paper • linking cubes	• fraction • decimal

Copyright ©2019 by the Commonwealth of Virginia, Department of Education, P.O. Box 2120, Richmond, Virginia 23218-2120. All rights reserved. Except as permitted by law, this material may not be reproduced or used in any form or by any means, electronic or mechanical, including photocopying or recording, or by any information storage or retrieval system, without written permission from the copyright owner. Commonwealth of Virginia public school educators may reproduce any portion of these items for non-commercial educational purposes without requesting permission. All others should direct their written requests to the Virginia Department of Education at the above address or by e-mail to vdoe.mathematics@doe.virginia.gov

Task Pre-Planning	
• square tiles	• percent • rational number • operation
Anticipate Responses: See Planning for Mathematical Discourse Chart (Columns 1-3)	

Task Implementation (Before)

Task Launch

- Have a discussion with students about what a bake sale is.
- To help students make sense of the task, it would be beneficial to have students read the task first without showing them the final question and circle any words that are confusing to them. You may choose to read the task to students and have them follow along. Then have a class discussion about any words that students circled. Following this discussion, have the students read the task a second time, again not showing the question and have students underline any important information. Read the problem a third time and ask students what questions could be asked for this information. After taking some suggestions, reveal the question.

Task Implementation (During)

Directions for Supporting Implementation of the Task

- Monitor – Teacher will listen and observe students as they work on task and ask assessing or advancing questions (see chart on next page)
- Select – Teacher will decide which strategies or thinking that will be highlighted (after student task implementation) that will advance mathematical ideas and support student learning
- Sequence – Teacher will decide the order in which student ideas will be highlighted (after student task implementation) during the closure discussion.
- Connect – Teacher will consider ways to facilitate connections between different student responses

Suggestions For Additional Student Support *(possible supports or accommodations for individual student, as needed)*

- Question students, in both assessing and advancing formats, to help students refine their strategies.
- Have all of the manipulatives out on a central table so that students can get what they need, as they need it.
- Some students get stuck at one way of thinking and using one method. Asking questions like "How confident are you?" and "What would convince someone?" will help students get past this point.
- For students with motor processing difficulties, allow them to communicate the reasoning in other ways such as video recording or typing answers.
- For students with attention challenges ask student to restate the problem or important information.
- For students who need academic language support, consider the use of a visual word wall or reference sheet for students to use identifying rational number, fraction, decimal, and percent.
- For students who need more support in justifying their thinking, you may choose to provide them with the sentence frames below.
    - What I know about the problem is…
    - My method for solving the problem was…
    - I know that they sold ___ cupcakes because …..
- For ELs with first language literacy, try to provide prompt, or parts of prompt, in their home language

Task Implementation (After)

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

- Based on the actual student responses, sequence and select particular students to present their mathematical work during class discussion. Some possible big mathematical ideas to highlight could include:
    - Common misconceptions
    - Concrete to representational to abstract

- Connect different students' responses and connect the responses to the key mathematical ideas to bring closure to the task. Possible questions and sentence frames to connect student strategies:
    - How are these strategies alike? How are they different?
    - Where do you see _____'s strategy in _____'s strategy?
    - How does _____'s picture relate to _____'s symbols?
    - Why is this important?
- Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion. Some possible ways to do this are to-
    - Assign roles like time keeper, task master, material fetcher, and recorder of strategies to each member of the group.
    - Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion. A possible ways to do this is to use "Snowball" in the middle of the task to have students get new ideas/refine their thinking. In groups of 3-5, have students share their ideas related to the task. What strategies are they using? How are they showing their thinking? Give each group 3-5 minutes to share (roughly 1 minute per student). Then have students form a new group of 3-5. They should not be with any of the same people. Repeat this process of sharing again. "Snowball" is a good way to promote discourse as well as help all students generate and refine strategies for approaching the task.

Teacher Reflection About Student Learning:

- Teacher should use the chart on the next page with the anticipated student solutions to monitor which students are using each strategy as well as record any additional strategies encountered. The sequence of tasks will inform what will come next in instruction to further student ideas and thinking. Form small groups to address misconceptions that are not addressed in the class debrief.
- Information gathered from the task rubric could identify small groups for later instruction, identifying specific students to partner with one another, and/or identifying students who need more teacher modeling and think alouds.

Rich Mathematical Task – Grade 7 – *Bake Sale Fundraiser*

Planning for Mathematical Discourse

Mathematical Task: Bake Sale Fundraiser

Content Standard(s): SOL 7.2

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 what to do?	• What is the question asking you? • What information do you have? • What do you notice? • What do you wonder? • What do you predict the solution might look like?	• What could you use to model the problem? • What do you predict the solution might look like?		
Anticipated Student Response: Student finds 75% of 3.	• What percent is the 3 cupcakes at the end? How can you represent this?	• How can you represent 75%?	**Student C**	
Anticipated Student Response: Student works backward to get 14 at the beginning of the second hour but then for the	• Tell me about your thinking. • What did you do for the first hour?	• How can you represent $\frac{1}{3}+\frac{3}{8}$?		

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*
first hour adds fractions incorrectly: $\frac{1}{3}+\frac{3}{8}=\frac{4}{11}$				
Anticipated Student Response: Student works backward to get 14 at the beginning of the second hour but then adds $14+\frac{1}{3}+\frac{3}{8}$	• Tell me about your thinking. • What does the $\frac{1}{3}$ represent in the context of the problem? What about $\frac{3}{8}$? • Let's go back to the question for a second. Is everything still making sense?	• How can you represent $\frac{1}{3}$ of the original amount of cupcakes and $\frac{3}{8}$ of the original amount of cupcakes?	**Student A** **Student D**	
Anticipated Student Response: Student works backward to get 14 at the beginning of the second hour and added to find that $\frac{17}{24}$ were sold during the first hour but cannot determine how many they had at the beginning of hour 1.	• Tell me about your thinking. • If you sold $\frac{17}{24}$ during the first hour, what fraction of the cupcakes were left to sell the remainder of the bake sale?	• How can you represent the amount of cupcakes at the beginning of the bake sale?		

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: Student answers 48 cupcakes but does not answer the question.	• Let's go back to the question for a second. Is everything still making sense?	• What did the problem want to know?	**Student E**	
Anticipated Student Response: Student arrives at correct answer of $32 left over.	• How confident in your answer are you? • Tell me about your thinking.	• How can you confirm that they started with 48 cupcakes?	**Student B** **Student F**	

Bake Sale Fundraiser

Name_____ Date_____

Brady and Jaquan were selling cupcakes together at a bake sale. They hope to make $100 so they can both go on the band field trip to Washington, DC.

- In the first hour, Brady sold $\frac{1}{3}$ of the cupcakes and Jaquan sold $\frac{3}{8}$ of the cupcakes.
- During the second hour, they sold 2 cupcakes.
- During the third hour, they sold 75% of the remaining cupcakes.
- During the fourth hour, they sold the remaining 3 cupcakes.

If they sold each cupcake for $2.75, will they make enough money to go on the field trip? If so, how much money would be left over for spending money? Explain how you know.

Rich Mathematical Task – Grade 7 – *Bake Sale Fundraiser*

	Advanced	Proficient	Developing	Emerging
Mathematical Understanding	Proficient Plus: • Uses relationships among mathematical concepts	• 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 little or 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 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	• Chooses a problem solving strategy that does not display an 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 or is not complete • Does not produce a solution that is relevant to the problem
Communication and Reasoning	Proficient Plus: • Reasoning is organized and coherent • Consistent use of precise mathematical language and accurate use of symbolic notation	• Communicates thinking process • Demonstrates reasoning and/or justifies solution steps • Supports arguments and claims with evidence • Uses mathematical language to express ideas with precision	• 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 with some imprecision	• Provides little to no correct reasoning or justification • Does not provide evidence to support arguments and claims • Uses little or 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