Rich Mathematical Task – Grade *3 – Money in the Piggy Bank*

Task Overview/Description/Purpose:

- The purpose of this task is to create two collections of bills and coins, given specific parameters, and then determine and compare their values.
- In this task, students will explore creating and counting collections of bills and coins containing values between $2.00 and $3.00.

Standards Alignment: Strand – *Number and Number Sense*

Primary SOL: 3.6 The student will
   a) determine the value of a collection of bills and coins whose total is $5.00 or less;
   b) compare the value of two sets of coins and bills

Related SOLs: 2.7, 4.3

Learning Intention(s):

- **Content** - I am learning to count and compare sets of bills and coins.
- **Language** - I am learning to use mathematical language to compare collections of coins.
- **Social** - I am learning to listen to and explain my peers' strategies.

Success Criteria (Evidence of Student Learning):

- I can create and determine the value of two sets of coins.
- I can compare the values of two sets of coins using appropriate mathematical language.
- I can show my math thinking in an organized way through the use of pictures, numbers, and words.
- I can listen to my peers' strategies and explain how they solved the problem.

Mathematics Process Goals

Problem Solving	• Using the parameters of a given number of coins, students will create two collections using bills and coins that have a total value greater than $2.00 and less than $3.00.
Communication and Reasoning	• Students will communicate their thinking process for representing the two sets of coins in multiple ways including words, picture representations, and numbers. • Students will demonstrate sound reasoning and justify their solutions in an organized and coherent manner. • Students will use appropriate and accurate written and oral mathematical language to express ideas, including accurately identifying coin names and values, and reading money amounts correctly (i.e. "three dollars and twenty-seven cents").
Connections and Representations	• Students will use clear and appropriate representations to model the two collections of bills and coins. • Students will make connections between their representations and the representations of their peers. • Students will accurately use symbolic notation ($, ¢, <, >, =) to write and compare the values of the collections.

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Task Pre-Planning

Approximate Length/Time Frame: 45 minutes

Grouping of Students: Students should begin the task independently. After actively monitoring student strategies and responses, the teacher should purposefully pair students together.

Materials and Technology:	Vocabulary:
- Anchor chart paper - Paper and pencils - Manipulative money - Hundreds charts - Dry erase/laminated circles - Open number lines	- dollar, half dollar, quarter, dime, nickel, penny - bills, coins - collections, sets - compare, more, less - greater than, less than, equal to - comparing symbols: <, >, =

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

Task Implementation (Before) 10 minutes

Task Launch:
- Activate prior knowledge: The teacher will help students access their prior knowledge about money by asking "What do you already know about money?" A KWL (Know-Want to Know-What I Learned) graphic organizer could be used for students to organize their ideas. Then, the teacher should allow students time to share with a partner. The teacher will facilitate a whole group discussion and record student ideas on the board or an anchor chart. Next, the teacher should review relevant vocabulary prior to beginning the task. Use the vocabulary listed above in addition to any words or phrases that were generated by students in their KWL charts. Post the vocabulary where all students can see and access (anchor chart, math notebooks, board).
- Ensure understanding of task: The teacher will read the task aloud to all students. Next, the teacher will review the names and values of each coin. Finally, the teacher will ask a student to restate the parameters of the task (each student has one dollar bill, Carmen has 9 coins, Rafael has 7 coins, Rafael has the most money).
- Ensure understanding of the components required for a sufficient response: numbers, symbols, and words. Include sentence starters for students to use to support their written communication (see *Suggestions for Additional Student Support)*.
- Establish clear expectations: The teacher will share and review the rubric with students as a tool for monitoring their level of proficiency. Then, the teacher will review classroom expectations for working independently and with a partner. Finally, the teacher will review expectations for utilizing various manipulatives or tools.

Task Implementation (During) 20 minutes

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 attached *Planning for Mathematical Discourse Chart).*
- Select – The teacher will select students to pair up based on the strategies used to solve the task. 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 attached *Planning for Mathematical Discourse Chart).*
- Sequence – The teacher will select 3-4 student strategies to share with the whole group. One suggestion is to look for one common misconception and two correct responses to share or to choose several strategies that connect well and show a progression of sophistication.

- Connect – The teacher will facilitate connections between different student representations.

Suggestions For Additional Student Support
- *Sentences frames:*
    - I started solving the problem by _____.
    - The strategy I used to solve the problem is _____.
    - Because Rafael only has 7 coins and Carmen only has 9 coins, I will need to _____.
    - I know my solution is correct because _____.
- *Vocabulary development:*
    - Use Frayer models to deepen understanding of vocabulary terms.
    - Pair vocabulary with visuals.
    - Keep vocabulary on an anchor chart or word wall. (Use VDOE Word Wall Cards, pages 33-35.)
- *Organization:*
    - Use a graphic organizer or graph paper or lined paper to organize work.
    - Use paper circles or dry erase circles to represent coins.
    - Prepare student work space with materials required for task.
- *Possible problem solving strategies*:
    - Pictures, numbers, words, tables, equations, place value chart, etc.
    - Encourage students to start by using a "guess and check" method. Draw the two collections of coins, then check to see if they meet the stated parameters.
- *Extension*:
    - Can you come up with another solution to the problem?
    - What is the greatest/least amount of money Rafael/Carmen could have?
    - What could Rafael's collection look like if we knew he had _____ (two quarters/three dimes/etc.)?
    - What could Carmen's collection look like if we knew she had _____ (one penny/two nickels/etc.)?

Task Implementation (After) 15 minutes

Connecting Student Responses (From Anticipating Student Response Chart) and Closure of the Task:
- Allow students time to walk around and view the strategies of other students (gallery walk).
- Based on 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 or to choose several strategies that connect well and show a progression of sophistication. 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).
- Close the lesson by returning to the success criteria. Have students reflect on their progress toward the criteria.

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: Money in the Piggy Bank   Content Standard(s):   SOL 3.6ab

Teacher Completes Prior to Task Implementation			Teacher Completes During Task Implementation	
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 problem? - How can you show that? - How does this problem remind you of a problem you have done in the past?	- Could you draw a picture to show what's happening in the problem? - How can you use the graphic organizer to help?		
Anticipated Student Response: Student creates two collections of coins but they do not follow the parameters.	Does your collection of bills and coins match what the problem says? Can you show me?	How can you make this match what the problem says?	Students A, G	
Anticipated Student Response: Student creates two collections of coins that meet the parameters, but they counted one or both collections incorrectly.	Can you show me how you counted the money?	How could you keep track of the total value?		
Anticipated Student Response:	Can you tell me verbally how you solved this problem?	How could you use words, numbers, or symbols to show that?	Students D, E, F, G	

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Student is able to find one correct solution, but has difficulty communicating their reasoning.		• Use a sentence frame (see "Additional Suggestions for Student Supports")		
Anticipated Student Response: Student was able to find one accurate solution to the problem.	• What strategy did you use to come up with your solution? • Is there more than one correct solution? • How is your strategy similar to/different than your partner's strategy?	• Could you show your solution using another strategy or method? • Could you use your first solution to help you find another solution?	Students B, C, H	
Anticipated Student Response: Student was able to find more than one accurate solution to the problem.	• Did you use your first solution to help you determine a second solution? Explain. • How is your strategy similar to/different than your partner's strategy?	• What is the greatest amount of money Rafael could have? • What is the least amount of money Carmen could have? • What could Rafael's collection look like if we knew he had _____ (two quarters/three dimes/etc.)? • What could Carmen's collection look like if we knew she had _____ (one penny/two nickels/etc.)?		

Name _____   Date _____

Money in the Piggy Bank

Carmen and Rafael each have some money in their piggy banks. The value in each of their banks is greater than $2.00 but less than $3.00.

- Carmen has one dollar bill and nine coins.
- Rafael has one dollar bill and seven coins.
- Rafael has more money than Carmen.

What coins could each child have in their piggy bank? How much money could each child have in their piggy bank?
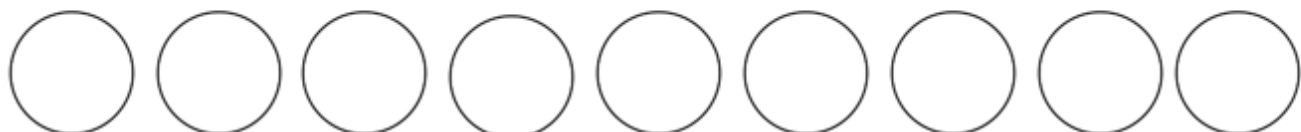
Explain your thinking using numbers, symbols, and words.

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

Possible Graphic Organizer

Carmen's Money

Rafael's Money