Rich Mathematical Task – Grade 2– *Coins in Pocket*

Task Overview/Description/Purpose:
In this task, students will explore selecting coins for a given amount in order to develop mathematical understanding of the idea that different combinations of coins can result in the same amount of money.

Standards Alignment: Strand – Measurement and Geometry

Primary SOL: 2.7 The student will
- a) count and compare a collection of pennies, nickels, dimes, and quarters whose total value is $2.00 or less; and
- b) use the cent symbol, dollar symbol, and decimal point to write a value of money.

Related SOL (within or across grade levels/courses): K.7, 1.8, 2.2, 3.6

Learning Intentions:
- **Content -** I am learning to explore selecting coins for a given amount.
- **Language -** I am learning to use math vocabulary to justify my thinking related to coins and different values.
- **Social -** I am learning to collaborate with my classmates to solve problems.

Evidence of Student Learning (based on Essential Knowledge and Skills):
- I can identify coins penny, nickel, dime, and quarter.
- I can recall the value of coins penny, nickel, dime, and quarter.
- I can skip count by fives, tens, and twenty-fives.
- I can apply counting on strategies to count money.
- I can count a collection of mixed coins.
- I can create different combinations of coins to equal the same value.
- I can describe how I created combinations of coins that have the same value.
- I can use problem solving strategies.

Mathematics Process Goals

Problem Solving	• Students will apply mathematical concepts and skills and the relationships among them along with problem-solving strategies to find solutions to the task.
Communication and Reasoning	• Students will work with a partner and use math vocabulary to justify their thinking.
Connections and Representations	• Students will make connections between skip counting and counting money. Students will also represent their thinking using a physical model and record their thinking on paper.

Task Pre-Planning

Approximate Length/Time Frame*:* 60 minutes

Grouping of Students: After the whole group launch, students will be partnered for this task. Partners work through possible answers, and then individually record their chosen solution.

Materials and Technology:	**Vocabulary:**
• play or real money • a visual that has each coin and its value (see VDOE Math Vocabulary Cards resource)	• coin, penny, nickel, dime, quarter, dollar • value • collection

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• hundreds charts • copy of task for each student	• more, fewer • odd

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

Task Implementation (Before)

Task Launch:

- Tell the students that you have 75 cents in your pocket. Ask: "Can you guess what coins I might have in my pocket?" Record a few students' responses.
- Show the students the coins in your pocket (Have two quarters, one dime, two nickels, and five pennies in your pocket.)
- Then ask questions like: "Do I have more nickels than dimes? Fewer quarters than dimes? An even or odd number of pennies?"
- Read over the task with the students and highlight the parameters of the task.
    - She has an odd number of quarters
    - She has more dimes than nickels.
    - She has fewer than 20 pennies.
- Hand out the task and play money to each pair of students.

Teacher Note: This task should be given toward the end of your money unit, once students have been successful at counting various collections of coins.

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 page 4)
- Select – Teacher will decide which strategies or thinking 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)
- Connect – Teacher will consider ways to facilitate connections between different student responses

Suggestions For Additional Student Support

- Students who demonstrate weaknesses with memory and language could benefit from word wall cards to activate prior knowledge of money.
- Remove the restrictions –"She has an odd number of quarters. She has more dimes than nickels. She has fewer than 20 pennies."
- Have students only work on finding combinations to $1.00 with the following restrictions–"She has an odd number of quarters. She has more dimes than nickels. She has fewer than 20 pennies."
- Remove quarters and have students work on finding combinations to $1.00 with the following restrictions- "She has more dimes than nickels. She has fewer than 20 pennies."
- Provide hundreds charts for students to use when counting money.
- Provide sentence frames to support student justifications or explanations (i.e., A (coin) is worth __ cents, I added (coin) so now it is __ cents, etc.).
- Include a graphic organizer for students to record their combinations and values, which may include a visual word bank and sentence frames.
- Possible extension of the task would be to ask students to try and come up with all the possible combinations to make $1.63 or to create their own task with a different amount, add constraints, and solve.

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. Typically you start with strategies you think that all students can connect with and share the most complex strategy last.

• As students share their work, ask questions like:
  ○ That seems important, who can repeat that?
  ○ Who can repeat that back in their own words?
  ○ Who can add to that?
  ○ Do you agree or disagree? Why?
  ○ Is this strategy similar to the one shared before? Why or why not?
  ○ Did anyone think about that in a different way?
• Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion.

Teacher Reflection About Student Learning:

• Use the rich mathematical task rubric to evaluate students' progress toward the process goals.
• Look at the students' work. Who employed what strategies?
  ○ Students who did not follow the constraints-Pull them into a group and introduce the guess and check strategy with constraints. Work on the relationships between the coins to include trading two nickels for one dime, two dimes and a nickel for a quarter, etc.
  ○ Students who used the guess and check strategy-Pull them into a group and work on the relationships between the coins to include trading two nickels for one dime, two dimes and a nickel for a quarter, etc.
  ○ Students who come up with one solution and then trade coins from there-Pull them into a group and introduce the idea of an organized list.
  ○ Students who create a table to organize-Pull them into a group and ask them if there is a way they can structure their list to ensure they have all possible combinations.

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Planning for Mathematical Discourse

Mathematical Task: ____Coins in Madison's Pocket____________________ Content Standard(s): ____SOL 2.7ab___

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 Stays to Hear Response** *Teacher questioning that allows student to explain and clarify thinking*	**Advancing Questions – Teacher Poses Question and Walks Away** *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: Students do not follow the constraints.	• What is this coin? What is it worth? • Can you show me how you counted the money? • Do you have more dimes than nickels? • Do you have an odd or even number of quarters? • Tell me about your representation.	• Is it possible for Madison to have five quarters? Why or why not? • How many dimes are possible? Why? • Is there another way to ensure your total is $1.63?	Student A	
Anticipated Student Response: Students guess and check.	• Why did you choose to start with pennies/nickels/dimes/ quarters? • Can you show me how you counted the money? • Tell me about your representation. • Do you have more dimes than	• How many dimes are possible? Why? • Is there another way to ensure your total is $1.63? • Can you find another way to make $1.63? • Could you find a way with fewer	Student C Student E	

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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 Stays to Hear Response** *Teacher questioning that allows student to explain and clarify thinking*	**Advancing Questions – Teacher Poses Question and Walks Away** *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*
	nickels? • Do you have an odd or even number of quarters? • Can we exchange one of the dimes for two nickels? • Can we exchange pennies for nickels/dimes? • What is the relationship between the nickels and dimes? What is the relationship between pennies, nickels, dimes, and quarters?	pennies/dimes/nickels/quarters? • Could you find a way with more pennies/dimes/ nickels/quarters?		
Anticipated Student Response: Students may think of the quarters and realize there could be only one, three, or five quarters and then begin to guess and check.	• Do you have more dimes than nickels? • Do you have an odd or even number of quarters? • Can we exchange one of the dimes for two nickels? • Can we exchange pennies for nickels/dimes? • What is the relationship	• Can you find another way to make $1.63? • Could you find a way with fewer pennies/dimes/nickels/ quarters? • Could you find a way with more pennies/dimes/nickels/ quarters?	Student D	

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 Stays to Hear Response** *Teacher questioning that allows student to explain and clarify thinking*	**Advancing Questions – Teacher Poses Question and Walks Away** *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*
	between the nickels and dimes? What is the relationship between pennies, nickels, dimes, and quarters?			
Anticipated Student Response: Students may come up with one solution and then trade coins from there. For example, they used one quarter for their solution and then they trade it out for two dimes and a nickel.	• Can you show me how you counted the money? • Tell me about your representation. • Do you have more dimes than nickels? • Do you have an odd or even number of quarters?	• Can you find another way to make $1.63? • Could you find a way with fewer pennies/dimes/nickels/ quarters? • Could you find a way with more pennies/dimes/nickels/ quarters?	Student B	
Anticipated Student Response: Students will make a dollar first and then the 63 cents and combine to make $1.63.	• Can you show me how you counted the money? • Tell me about your representation. • Do you have more dimes than nickels? • Do you have an odd or even number of quarters?	• Can you find another way to make $1.63? • Could you find a way with fewer pennies/dimes/nickels/ quarters? • Could you find a way with more pennies/dimes/nickels/ quarters?	Student F	

Name ___________________________ Date ________________

Coins in Madison's Pocket

Madison has some pennies, nickels, dimes, and quarters in her pocket. She counts the coins and she has a total of $1.63. Use the following clues to determine how many of each coin Madison could have in her pocket:

- She has an odd number of quarters.
- She has more dimes than nickels.
- She has fewer than 20 pennies.

Explain your thinking using pictures, words, and/or symbols.

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Rich Mathematical Task Rubric

	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

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Possible Combinations

Quarters	Dimes	Nickels	Pennies
5	3	1	3
5	2	1	13
3	8	1	3
3	8	0	8
3	7	3	3
3	7	1	13
3	7	0	18
3	6	5	3
3	6	4	8
3	6	3	13
3	6	2	18
1	13	1	3
1	13	0	8
1	12	3	3
1	12	1	13
1	12	0	18

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1	**11**	**5**	**3**
1	**11**	**4**	**8**
1	**11**	**3**	**13**
1	**11**	**2**	**18**
1	**10**	**7**	**3**
1	**10**	**6**	**8**
1	**10**	**5**	**13**
1	**10**	**4**	**18**
1	**9**	**7**	**13**
1	**9**	**6**	**18**