

Rich Mathematical Task – Grade 4 – *Lunch at Leonardo’s*

Task Overview/Description/Purpose:	
<ul style="list-style-type: none"> In this task, students will use estimation and operations with decimal numbers to plan a lunch purchase, calculate the actual cost of the lunch purchase, and determine the amount of change received after the purchase. The purpose of this task is for students to develop mathematical reasoning and communication skills as they estimate and then solve a multistep practical problem involving addition and subtraction with decimals. 	
Standards Alignment: Strand – <i>Computation and Estimation</i>	
<p>Primary SOL: 4.6b The student will solve single-step and multistep practical problems involving addition and subtraction with decimals.</p> <p>Related SOL: 5.1, 5.5b, 4.3ab, 4.4bd, 4.6a, 3.3b, 2.6c</p>	
Learning Intentions:	
<ul style="list-style-type: none"> Content - I am learning to estimate and apply strategies to solve multistep practical problems. Language - I am learning to use language that explains my reasoning and justifies my thinking. Social - I am learning to listen and respond to my peers’ explanations in appropriate ways and make connections between different strategies for solving a problem. 	
Success Criteria (Evidence of Student Learning):	
<ul style="list-style-type: none"> I can identify the multiple steps needed to solve the problem and use estimation to make sure my solution is reasonable. I can explain my reasoning and communicate my thinking for solving the problem clearly, using appropriate vocabulary. I can plan a purchase using a menu, calculate the cost of the purchase, and determine the amount of change received after the purchase I can justify my solutions using pictures, numbers, and words. I can give specific feedback to my peers and use suggestions to clarify my thinking. 	
Mathematics Process Goals	
Problem Solving	<ul style="list-style-type: none"> Students will identify the steps needed to solve the problem and determine strategies for solving. Students will accurately apply operations with decimal numbers to plan a lunch purchase, calculate the cost of the purchase, and determine amount of change left over.
Communication and Reasoning	<ul style="list-style-type: none"> Students will clearly communicate their thinking process for solving a multi-step problem to their peers. Students will justify their solutions using pictures, numbers, and words. Students will use appropriate mathematical language to express ideas with accuracy and precision.
Connections and Representations	<ul style="list-style-type: none"> Students will use an appropriate representation to explore the problem and justify their solution. Students will describe connections between their representations and the representations of their peers.

Rich Mathematical Task – Grade 4 – *Lunch at Leonardo's*

Standards Alignment: Strand – *Computation and Estimation*

- Students will connect and/or extend thinking to other mathematical ideas (ex: rounding decimals).

Task Pre-Planning

Approximate Length/Time Frame: 60 minutes

Grouping of Students: Students will begin working independently, then will be purposefully partnered based on teacher monitoring of strategies.

Materials and Technology:

- copy of task for each student
- pencil
- grid paper
- dry erase boards/markers
- chart paper

Vocabulary:

- estimate
- quantity
- addition: sum
- subtraction: difference

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

Task Implementation (Before) 10 – 15 minutes

Task Launch:

- **Engage students in making sense of the problem:** Display the sample restaurant check for students (see attached handout):

Quantity	Item	Price
2	SOUP	1.99
4	Sandwich	3.99
2	Cola	0.99

- Ask students what they notice about the check and what they wonder. Listen for students to discuss quantity and clarify meaning if needed.
- Discuss estimating total cost of check, about how much money would be needed to pay, etc. Discuss possibilities for each person's lunch order and estimated cost per person.
- Ask students what steps would be necessary to find the total cost of the check. Model setting up the problem to calculate the total cost of the check. Ask students what you would need to do in order to find out how much change was received.
- Reveal the Lunch at Leonardo's task to students, reading it aloud. Discuss sections of the menu.
- **Ensure understanding of task:** The teacher will ask questions to make sure the task is understood: "What are we trying to figure out?" "What do you already know that can help you get started?" Allow students to turn and talk to a partner.
- **Establish clear expectations:** The teacher will read and discuss the Learning Intentions and Success Criteria. Review rubric with students as a tool for monitoring their proficiency. Review classroom expectations for working independently and in groups. Support materials and manipulatives should be accessible for student use.

Rich Mathematical Task – Grade 4 – *Lunch at Leonardo's*

Task Implementation (During) 20 – 30 minutes

- Monitor – Teacher will listen and observe students as they work on task and ask assessing or advancing questions (see the Planning for Mathematical Discourse chart on next page).
- Select – Teacher will decide which strategies 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.
 - Students work in purposefully planned groups for 20-25 minutes to explore strategies, share ideas and transfer their ideas to paper using pictures, words, and symbols.
 - As the teacher is monitoring, teacher will look for strategies used by students and record on Planning Chart.
 - The teacher should use questions to assess or advance student thinking.
 - Students should be encouraged to explore different strategies for solving and evaluate effectiveness.

Suggestions for Additional Student Support

May include, among others:

- Sentence frames to support student thinking and discourse:
 - I agree/disagree with _____'s strategy because _____.
 - The strategy I used to solve is _____.
 - If Creek purchased _____ and _____, it would cost about _____. He would have about _____ left.
- Table or chart to organize each lunch purchase.
- Adjust task to have students only plan one purchase.
- Variety of manipulatives available for students to choose to use:
 - Base 10 blocks
 - Place Value Chart or Mat
 - Money

Task Implementation (After) 20 minutes

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:
 - a common misconception;
 - trajectory of sophistication in student ideas (i.e. concrete to abstract)
 - different solutions with reasoning
 - different representation of same solution
- Connect student responses and connect the responses to the key mathematical ideas to bring closure to the task. Possible questions to connect student strategies:
 - How are these strategies alike? How are they different?
 - How do these connect to our Learning Intentions?
 - Why is this important?
- Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion, such as a gallery walk to allow feedback on all strategies.
- Close the lesson by returning to success criteria. Have students reflect on their progress related to the criteria.

Rich Mathematical Task – Grade 4 – *Lunch at Leonardo's*

Teacher Reflection About Student Learning:

- Teacher will use the *Planning for Mathematical Discourse Chart* (anticipated student solutions) to monitor which students are using specific strategies. This will include: possible misconceptions, learning trajectories and sophistication of student ideas, and multiple solution pathways. Next steps based on this information could include:
 - Informing sequence of tasks. What will come next in instruction to further student thinking in determining equivalent measures of liquid volume?
 - Informing small groups based on misconceptions that are not addressed in sharing.
- After task implementation, the teacher will use the Rich Mathematical Task Rubric criteria to assess where students are in their mathematical understanding and use of the process goals. This could be a focus on one category. Next steps based on this information could include:
 - Informing small groups based on where students are in engagement in the process goal(s).

Rich Mathematical Task – Grade 4 – *Lunch at Leonardo's*

Planning for Mathematical Discourse

Mathematical Task: *Lunch at Leonardo's*

Content Standard(s): SOL 4.6b

Teacher Completes Prior to Task Implementation			Teacher Completes Prior to Task Implementation	
Anticipated Student Response/Strategy <i>Provide examples of possible correct student responses along with examples of student errors/misconceptions</i>	Assessing Questions <i>Teacher questioning that allows student to explain and clarify thinking</i>	Advancing Questions <i>Teacher questioning that moves thinking forward</i>	List of Students Providing Response <i>Who? Which students used this strategy?</i>	Discussion Order - sequencing student responses <ul style="list-style-type: none"> ○ <i>Based on the actual student responses, sequence and select particular students to present their mathematical work during class discussion</i> ○ <i>Connect different students' responses and connect the responses to the key mathematical ideas</i> ○ <i>Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion</i>
Anticipated Student Response: Student is unable to start the problem.	<ul style="list-style-type: none"> • Tell me what you are thinking. • What do you know? • What are you trying to figure out? 	<ul style="list-style-type: none"> • What if we only planned to purchase one lunch? • What if Creek only had \$10.00 to spend? 		
Anticipated Student Response: Student does not align decimal places when adding and/or subtracting decimals.	<ul style="list-style-type: none"> • What do you know? • What are you trying to figure out? • Does the total cost of the lunch purchase make sense? 	<ul style="list-style-type: none"> • What does your solution tell you? How can you model your thinking? 		
Anticipated Student Response: Student quickly solves the problem but does not estimate first.	<ul style="list-style-type: none"> • Tell me about your thinking. • Explain how you solved the problem. • How did you decide what to purchase? • How did you know Creek would have enough money for your choices? 	<ul style="list-style-type: none"> • Can you use the same strategy to determine a different lunch purchase? • How can you organize your thinking on paper? • How do you know this solution works? 		

Rich Mathematical Task – Grade 4 – *Lunch at Leonardo's*

Teacher Completes Prior to Task Implementation			Teacher Completes Prior to Task Implementation	
Anticipated Student Response/Strategy <i>Provide examples of possible correct student responses along with examples of student errors/misconceptions</i>	Assessing Questions <i>Teacher questioning that allows student to explain and clarify thinking</i>	Advancing Questions <i>Teacher questioning that moves thinking forward</i>	List of Students Providing Response <i>Who? Which students used this strategy?</i>	Discussion Order - sequencing student responses <ul style="list-style-type: none"> ○ <i>Based on the actual student responses, sequence and select particular students to present their mathematical work during class discussion</i> ○ <i>Connect different students' responses and connect the responses to the key mathematical ideas</i> ○ <i>Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion</i>
Anticipated Student Response: Student solves part of the problem but does not answer all of the questions.	<ul style="list-style-type: none"> ● Tell me about your thinking. ● Explain how you solved the problem. ● What are you trying to figure out? ● What information does the problem tell you? 	<ul style="list-style-type: none"> ● What questions are you trying to answer? ● Do you have enough information in your solution to answer all of the questions? 		

Rich Mathematical Task – Grade 4 – *Lunch at Leonardo's*

Rich Mathematical Task Rubric

	Advanced	Proficient	Developing	Emerging
Mathematical Understanding	<p>Proficient Plus:</p> <ul style="list-style-type: none"> Uses relationships among mathematical concepts or makes mathematical generalizations 	<ul style="list-style-type: none"> Demonstrates an understanding of concepts and skills associated with task Applies mathematical concepts and skills which lead to a valid and correct solution 	<ul style="list-style-type: none"> Demonstrates a partial understanding of concepts and skills associated with task Applies mathematical concepts and skills which lead to an incomplete or incorrect solution 	<ul style="list-style-type: none"> 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	<p>Proficient Plus:</p> <ul style="list-style-type: none"> Problem solving strategy is well developed or efficient 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> A problem solving strategy is not evident Does not produce a solution that is relevant to the problem
Communication and Reasoning	<p>Proficient Plus:</p> <ul style="list-style-type: none"> Reasoning or justification is comprehensive Consistently uses precise mathematical language to communicate thinking 	<ul style="list-style-type: none"> Demonstrates reasoning and/or justifies solution steps Supports arguments and claims with evidence Uses mathematical language to communicate thinking 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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	<p>Proficient Plus:</p> <ul style="list-style-type: none"> Uses representations to analyze relationships and extend thinking Uses mathematical connections to extend the solution to other mathematics or to deepen understanding 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Uses no representation or uses a representation that does not model the problem Makes no mathematical connections

Rich Mathematical Task – Grade 4 – *Lunch at Leonardo's*

Name _____

Date _____

Lunch at Leonardo's

Creek has \$25 to spend on lunch at Leonardo's Pizza and Subs Restaurant. He wants to buy lunch for himself and his friend Nolan.

Leonardo's Lunch Menu			
Pizza		Salads & Sides	
Cheese Pizza	\$10.25	Chef Salad	\$4.70
Pepperoni Pizza	\$10.95	Greek Salad	\$5.30
Pizza Roll	\$7.45	Breadsticks	\$2.45
Stromboli	\$8.75	French Fries	\$1.75
Subs & Wraps		Drinks	
Cheese Steak Sub	\$7.80	Iced Tea	\$0.75
Italian Sub	\$6.60	Lemonade	\$0.95
Turkey Bacon Wrap	\$6.25	Fountain Drinks	\$1.95
Grilled Chicken Wrap	\$6.25		

Use the menu above to plan Creek's lunch purchase at Leonardo's.

- About how much do you think lunch for Creek and Nolan will cost? About how much money do you think Creek will have left over after he buys lunch?
- Create a lunch order for both Creek and Nolan. Determine the cost of each lunch and the amount of money Creek will have left.

Rich Mathematical Task – Grade 4 – *Lunch at Leonardo's*

Task Launch

Quantity	Item	Price
2	SOUP	1.99
4	Sandwich	3.99
2	Cola	0.99