Rich Mathematical Task – Grade *6 – Smart Shopper*

Task Overview/Description/Purpose:
- The purpose of this task is to explore the concept of solving multistep practical problems involving addition subtraction, multiplication, and division of decimals.   - In this task, students will apply operations to decimal numbers in order to recommend a company that would be the best for trophy purchases.

Standards Alignment: Strand – *Number and Number Sense*
Primary SOL: 6.5c The student will solve multistep practical problems involving addition, subtraction, multiplication, and division of decimals. **Related SOL (within or across grade levels/courses): 5.5a, 5.5b, 4.6a, 4.6b**
Learning Intention(s):   **Content** - I am learning how to solve multistep practical problems involving operations with decimals.   **Language** - I am learning to use appropriate mathematical vocabulary when explaining my reasoning regarding which company I am recommending for trophy purchases (sum, difference, product, quotient, unit rate).   **Social** - I am learning to actively listen to classmates and communicate my own reasoning effectively so that my small group can evaluate each recommendation presented.
Success Criteria (Evidence of Student Learning):   - I can decode a multistep practical problem and plan a strategy that will lead to an accurate solution.   - I can accurately apply operations to decimal numbers when applying my solution strategy.   - I can use appropriate mathematical vocabulary when justifying my recommendation regarding which company should be used for trophy purchases.   - I can actively listen to classmates as they explain their recommendations.   - I can effectively communicate my thinking to peers as we work to evaluate each recommendation presented.

Mathematics Process Goals

Problem Solving	Students will develop and work through a strategy to solve a multistep practical problem which asks them to recommend a company that should be used to purchase trophies for a dive team.
Communication and Reasoning	- Students will communicate the reasoning behind their recommendations with peers. - Students will apply logical reasoning to determine which company provides the best buy for a given consumer. - Students will communicate their logical reasoning with other classmates.
Connections and Representations	- Students will connect their background knowledge of decimal operations with a multistep practical problem presented. - Students will represent a consumer's total cost for each of three different companies as a dollar value to determine which supplier they would recommend.

Virginia Department of Education

Rich Mathematical Task – Grade 6 – *Smart Shopper*

Task Pre-Planning

Approximate Length/Time Frame: 60 minutes

Grouping of Students: Since operations with decimal numbers are background knowledge for Math 6 students, this task could be used to introduce the concept of solving multistep practical problems. The task begins with a whole class launch. Students then work individually on the first page of the task. After working individually, students are assigned to small groups of 3 or 4 students. The teacher should make these small groups based on classroom observations. Some students may need the opportunity to discuss different strategies to approach the task while others need a small group of students who are approaching the task in a similar manner but need to refine their method. After these small groups have had time to discuss their recommendations/strategies and the teacher has orchestrated whole class discussion of the first page of the task, students return to their groups and are provided the new information revealed on the second page. As small groups, the students will come to a consensus regarding whether they will change their original recommendation. Once again, the teacher will promote productive whole class discourse relating to the new information presented and how it affects the original recommendation.

Materials and Technology:

- [Virtual Implementation Google Slides](#)
- Copies of the task, printed as two separate pages
- Access to the Desmos scientific calculator or a handheld scientific calculator
- Graph paper
- Unifix cubes
- Base 10 blocks (units and tens)
- Copies of the adapted version of the information presented in the table (Possible Graphic Organizer)

Vocabulary:

- Sum
- Difference
- Product
- Quotient
- Unit Rate

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

Rich Mathematical Task – Grade 6 – *Smart Shopper*

Task Implementation (Before)

Task Launch

- Share the learning intentions and success criteria associated with the task.
- Display the image and questions listed below to invoke discussion about delivery fees. Students may not have experience with this piece of the task. They may benefit from considering the difference between a tip and a delivery fee and/or evaluating when a $3.00 delivery fee may discourage a consumer from ordering from a restaurant.

What do you notice?

What do you wonder?

- After this brainstorm session, the teacher should distribute the first page of the task and follow a three read protocol.
    - The first read is for context. Insure that students understand the data presented in the table as well as the purchase that Ms. Lewis needs to make.
    - The second read is for mathematics. Students should highlight or circle any math vocabulary that they might need assistance with prior to beginning the task.
    - The third read allows students a chance to ask any other questions about the scenario itself.

Task Implementation (During)

Directions for Supporting Implementation of the Task

- Monitor – The teacher will observe students as they work collaboratively with peers after a short individual think period. 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 share recommendations from each page of the task with classmates. Students should be given the opportunity to argue each of the three companies if all three arise in student work.

- Sequence – The teacher will select 2-3 student strategies for each page of the task to share with the whole group. One suggestion is to look for one common misconception and two correct responses.

Rich Mathematical Task – Grade 6 – *Smart Shopper*

Task Implementation (Before)

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

Suggestions For Additional Student Support
- Some students with visual-motor weaknesses may benefit from graph paper to help them organize their work and/or create sketches of boxes filled with trophies.
- This same group of students could also benefit from an adapted version of the information presented in the table (provided as a Possible Graphic Organizer).
- Kinesthetic learners may benefit from the use of unifix cubes or base 10 blocks to help them simulate the packaging of trophies.
- Students with weaknesses in memory and language could benefit from word walls or graphic organizers to activate prior knowledge about vocabulary related to operations and decimal numbers.
- Post visual cues such as copies of the data table for students who need support with memory.
- For students who need 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 determining the best choice was…
  - The first thing I did was …
  - I recommend Trophy Time because …
  - I recommend Awards 4 All because …
  - I recommend Trophies and Things because …

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.
- 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. For instance, provide the students whose work was not selected as part of the sequence of student work that will be shown the opportunity to validate and/or question what they see.

Teacher Reflection About Student Learning:

- Student understanding of the content through the use of the process goals will be assessed with the Rich Mathematical Task Rubric.
- Students have a variety of ways to enter this task. Teachers will need to anticipate these different entry points but also be prepared for others. The key here is allowing the students to communicate their reasoning as they are working through the task.
- This task can be used to introduce the concept of solving practical problems. Students have prior knowledge of decimal operations. This task allows them to begin developing strategies to solve a multistep practical problem while applying a more familiar mathematical concept. The strategies developed while exploring this task can be expanded upon as students continue solving other multistep practical problems that involve operations with fractions.
- The task also provides formative assessment data regarding mastery of elementary standards relating to operations with decimal numbers. Similarly, it provides data that can help identify the strengths and weaknesses of students as they begin solving multistep practical problems. Consider how these data sets might assist with differentiation and grouping as exploration of the standard continues.

Rich Mathematical Task – Grade 6 – *Smart Shopper*

Planning for Mathematical Discourse

Mathematical Task: Smart Shopper   Content Standard(s): 6.5c

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 A (First Page): **Non-starter**	• Is there anything that you need me to clarify about the task? • Can you describe how the three different trophy companies package trophies?	• How many boxes of trophies do you think Ms. Lewis would need to buy if she were to make her purchase from Trophy Time?		
Anticipated Student Response B (First Page): **Student finds the unit rate for each trophy in one box but does not consider how many boxes are needed and does not factor in delivery fees.**	• Can you explain your work? • According to your work, which company would you recommend that Ms. Lewis use for her trophy purchase? • How many trophies does Ms. Lewis need to purchase?	• How many boxes would Ms. Lewis need to buy? • How could you determine the total cost for 50 trophies from each of these companies?		
Anticipated Student Response C (First Page): **Student adds the cost of 1 box and the delivery fee and determines a price per trophy**	• Can you explain your thinking? • How many trophies does Ms. Lewis need to purchase?	• How many boxes would Ms. Lewis need to buy? • Since you only pay a delivery fee once for each order, would that change any of your calculations?		

Rich Mathematical Task – Grade 6 – *Smart Shopper*

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*
without factoring in the delivery fee				
Anticipated Student Response D (Part 1): **Student completes all calculations accurately (using total cost or cost per trophy) and recommends Awards for All**	• Will you explain how you decided to recommend Awards for All? • What do these final values you determined represent?	• Can you think of any reason why another student might recommend a different company?		
Anticipated Student Response E (Part 1): **Student completes all calculations accurately (using total cost) and recommends Medals and More**	• Will you explain how you decided to recommend Medals and More? • What do these final values you determined represent?	• Can you think of any reason why another student might recommend a different company?		
Anticipated Student Response A (Part 2): **Student applies the three coupons and recommends Trophy Time based on total cost**	• Will you explain why the coupon for Trophy Time changed your recommendation? • What do these final values you determined represent?	• Can you think of any reason why another student might recommend a different company?		

Rich Mathematical Task – Grade 6 – *Smart Shopper*

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 B (Part 2): **Student applies the three coupons and recommends Trophy Time based on price per trophy**	• Will you explain why the coupon for Awards 4 All changed your recommendation? • What do these final values you determined represent?	• Can you think of any reason why another student might recommend a different company?		

Name_____   Date_____

Smart Shopper

Ms. Lewis is a smart shopper, and she has been selected to purchase trophies for the end of the season dive awards at her pool. She has a limited budget and needs to spend the least amount of money possible. Ms. Lewis has found three different on-line companies that offer the exact trophy she wants to purchase, and each company will personalize the awards for the individual divers. All three companies require that shoppers purchase entire boxes of trophies. Two of the three charge for delivery, and Ms. Lewis will need them delivered since none of these on-line companies offer local pick-up.

Company	Price per box	Trophies per box	Delivery Charge
Trophy Time	$26.46	14	$14.99
Awards 4 All	$39.80	20	$0.00
Medals and More	$15.70	8	$9.50

If there are 50 divers on the team, from which company would you recommend that Ms. Lewis buy the trophies? Explain your reasoning.

Being the smart shopper that she is, Ms. Lewis found coupons for each of the three companies.

Trophy Time

One time offer . . .

FREE DELIVERY on any trophy order of $100 or more.

Awards 4 All

Buy 3 boxes of any of our trophies, get a fourth box for free.

Medals and More

Take $1.50 off the cost of each box of trophies purchased.

Would any of these offers change your recommendation to Ms. Lewis? Explain your reasoning.
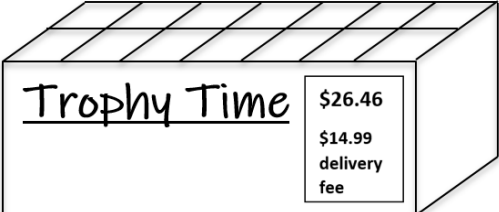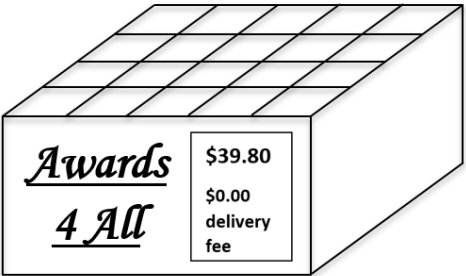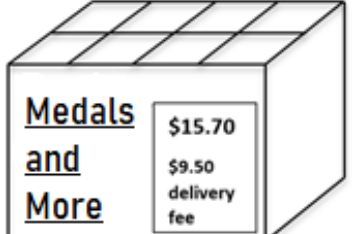
Rich Mathematical Task – Grade 6 – *Smart Shopper*

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 Organizers

Trophy Time $26.46 / $14.99 delivery fee	**Awards 4 All** $39.80 / $0.00 delivery fee	**Medals and More** $15.70 / $9.50 delivery fee