Rich Mathematical Task – Kindergarten – *Building Towers*

Task Overview/Description/Purpose:

- Given a set of cubes, students will build three towers, where one tower represents fewer and another represents more.
- In this task, students will explore how a given number can be decomposed into parts that represent sets having more, fewer, or the same.
- This task gives students the opportunity to explore comparing numbers and deepen understanding of the relationships that exist among numbers.

Standards Alignment: Strand – *Number Sense*

Primary SOL: K.2 The student will

a) describe one set as having more, fewer, or the same number of objects as the other set(s).
b) compare and order sets from least to greatest and greatest to least.

Related SOLs: K.1a; K.4b; 1.2 b,c; 2.1c

Learning Intentions:

- **Content –** I am learning to compare and order sets, knowing which set has more, fewer, or the same.
- **Language –** I am learning to explain my thinking when ordering sets using the words of more, fewer, or the same.
- **Social –** I am learning to share ideas about ordering numbers with my classmates.

Evidence of Student Learning (based on Essential Knowledge and Skills):

- I can compare and describe three or fewer sets, of ten or fewer objects, using more, fewer, and the same.
- I can order three or fewer sets, of ten or fewer objects, from least to greatest and greatest to least.

Mathematics Process Goals

Problem Solving	• Students will be mathematical problem solvers as they adjust cube towers to fit the parameters of more and fewer or greatest to least and least to greatest.
Communication and Reasoning	• Students will represent and justify their mathematical thinking through the presentation and labeling of models that show more, fewer, greatest to least and least to greatest.
Connections and Representations	• Students will make connections between the height of towers and the number of cubes as they explore various representations that show same, more, fewer, greatest to least, and least to greatest.

Task Pre-Planning

Approximate Length/Time Frame*:* 45 minutes

Grouping of Students: Students begin the task independently. As the task progresses, students will share ideas with a partner. Students will communicate findings, by sharing models and representations during a whole group reflection.

Materials and Technology:

- stacking or connecting cubes
- paper
- writing tools (marker, crayon, pencil)

Vocabulary:

- more, fewer, same
- greatest, least
- set

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Task Pre-Planning

• document camera, if available, for sharing	• taller, shorter

Anticipate Responses*:* See Planning for Mathematical Discourse Chart (Columns 1-3)

Task Implementation (Before)

Task Launch:
During a whole group launch, ensure students understand task vocabulary by sharing a picture of towers or buildings where one has more floors, fewer floors, or the same number of floors. Ask students to notice other attributes that can be compared (e.g., number of windows, number of bricks, etc.).

- Explain to students that their task is to build three towers, using stacking or connecting cubes, where one tower is more and one is less (each tower having a different number of cubes). Ask students to build several different models. Encourage students to order their towers greatest to least or least to greatest. Tell students they will draw a picture of their model to share with the class.
- Give each student a baggie of 13 stacking or connecting cubes.
- Tell them they will work independently for 10 minutes, and then they will share with a partner.

*Teacher should listen and take notes as students work and share ideas. For those unable to record their own thinking, the teacher should feel free to record student explanation or strategy on the student's work.

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 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)
- 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)*

- Create an anchor chart to display task vocabulary, include visuals to represent concepts such as more, fewer, same value, etc.
  - Use VDOE Word Wall Cards for *more than* and *fewer than*.
- Model motions to associate with the new vocabulary.
- Provide sentence frames for students to justify their thinking (i.e., This tower has (fewer/more) blocks than that tower. I put this tower first because (it has the least #).
  - Have students repeat these sentences for different examples as practice. Scaffold by modeling a few, then leaving a verbal blank for students to fill in (fewer/more than).
- Suggest students use letters to label pictorial representations, such as **M** for more.
- Change number of cubes.
- Provide grid paper and/or stickers for a child who may struggle to create a pictorial representation on his/her own.

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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.

- Connect different students' responses and connect the responses to the key mathematical ideas to bring closure to the task. As students share, ask other students if they had a tower that had fewer or more cubes than the one being discussed.
- Having students share their work with a partner before sharing with the group may promote a deeper understanding of the math.
- 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 goals.
- Based on student responses, the teacher may repeat the task using different parameters.
    - Grab a handful of cubes instead of using a set number.
    - Students build four towers—two with the same number of cubes, one with more cubes and one with fewer cubes.
    - Students create two towers that are the same, where the third has more or fewer.
    - Repeat the task using a different context (e.g. eggs in baskets, apples on trees, beads on bracelets, windows on houses, ducks in ponds, etc.).

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Planning for Mathematical Discourse

Mathematical Task: Building Towers Content Standard(s): K.2ab

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: Student builds just one tower.	• Tell me about your tower. What will you compare it to? • Can you build more than one tower?	• How many towers did the task say you should have? • How can you compare your towers if you have just one? • How can you use these same blocks to build another tower that has more or fewer blocks?		
Anticipated Student Response: Student tries to make all three towers equal	• Do you have a tower that shows more or fewer cubes?	• Which one of your towers has more or fewer cubes? • How can you tell if a tower has more/fewer cubes?		
Anticipated Student Response: Student builds three towers, but he/she doesn't order them correctly.	• Tell me about how you ordered your towers.	• Are your towers ordered greatest to least or least to greatest?	Student F	
Anticipated Student Response: Student thinks he/she doesn't have enough cubes.	• How many cubes are you supposed to have?	• Is there a way to rearrange your cubes so you do have enough?		

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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*
Anticipated Student Response: Student doesn't understand the word *fewer*. Student doesn't use vocabulary, such as fewer and fewest, accurately.	• What does the word fewer mean? • How can you tell which tower has the fewest or least number of cubes?	• Show student two towers where one has fewer. Say, "This tower has fewer cubes than this one." Can you create a tower with fewer cubes?	Student C	
Anticipated Student Response: Student completes the task with accuracy.	• If you had to build one more tower with fewer/more cubes than your smallest/largest one, how many cubes could it have?	• Could you complete the task with more or fewer cubes? • How could you move one cube and still keep the cubes ordered correctly?	Student B Student E	
Anticipated Student Response: Student creates more or fewer than three towers.	• How many towers did you build? • How many towers did the task ask you to build?	• How many cubes are in each tower? • How do you know this tower is the one with more cubes? • Do you have three towers where one is more and one is less?	Student D	

Name _____ Date _____

Building Towers

Using a set of 13 cubes, create three towers where one tower has more cubes and one has fewer cubes.

Order the towers, based on the number of cubes in each, from greatest to least or least to greatest.

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

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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

Task Supporting Documents

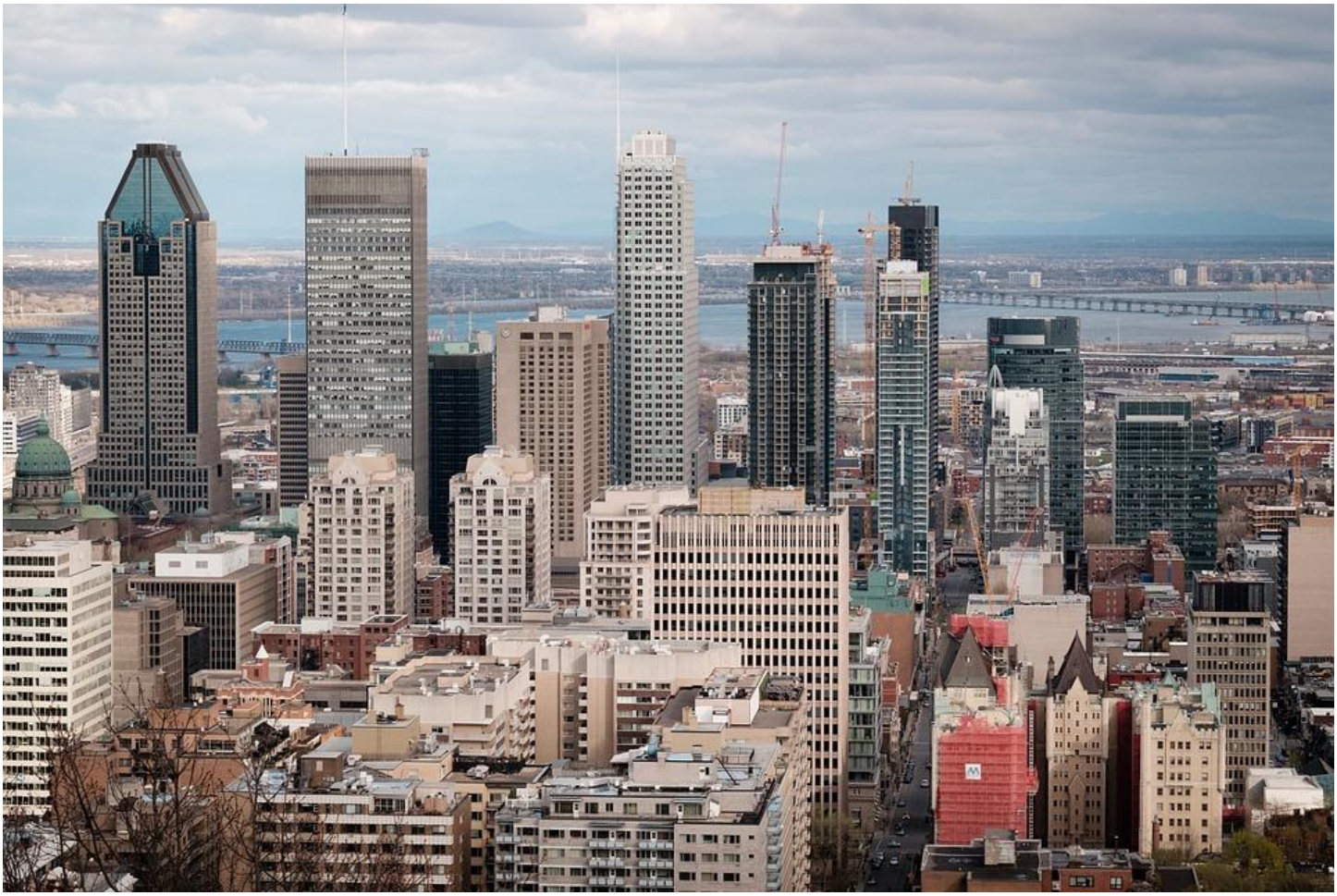

Photo Source

Possible Graphic Organizers

This one-inch grid paper may be used to help with pictorial representations of the towers.