Rich Mathematical Task – Grade K– *Morning Routine*

Task Overview/Description/Purpose:
● The purpose of this task is to recognize and transfer a repeating pattern into a different representation ● In this task students will deepen their understanding of repeating patterns by exploring and transferring a pattern found in their daily lives using a representation of their choice.

Standards Alignment: Strand – *Number and Number Sense*	
Primary SOL: K.13 The student will identify, describe, extend, create, and transfer repeating patterns. **Related SOLs:** 1.14, 2.16	
Learning Intention(s): ● **Content** - I am learning to transfer and compare patterns. ● **Language** - I am learning to use the language of mathematics to describe and compare patterns. ● **Social** - I am learning to share my thinking and listen to my classmates' mathematical thinking. This will help me understand how my pattern is similar or different from my classmates' patterns.	
Success Criteria (Evidence of Student Learning): ● I can use tools, pictures, numbers, or words to transfer patterns. ● I can compare how my pattern is similar or different to a classmate's pattern. ● I can describe and share my pattern. I can listen to my classmates' mathematical thinking to learn about their pattern(s).	
Mathematics Process Goals	
Problem Solving	● Students will select and use a representation of their choice to transfer a repeating pattern.
Communication and Reasoning	● Students will describe the core of a pattern as the part of the sequence that repeats. This understanding will support students in comparing their pattern to other classmates' patterns.
Connections and Representations	● Students will represent patterns using tools, pictures, numbers, or words. Students will compare a variety of representations to consider how their patterns are similar or different to the original pattern and their classmates' patterns.

Task Pre-Planning	
Approximate Length/Time Frame: 60 minutes	
Grouping of Students: Students begin the task independently. As the task progresses, students share ideas with a partner. Students will communicate findings by sharing their patterns during a whole group reflection.	
Materials and Technology: ● task for each student ● manipulatives (blocks, tiles, counters, and connecting cubes, etc.) ● drawing tools (crayons, pencils, etc.) ● camera or phone (to take pictures of concrete representations) ● stickers	**Vocabulary:** ● repeating pattern ● core ● transfer ● compare

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Task Pre-Planning

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

Task Implementation (Before)

Task Launch:

- In a whole group setting, invite students to connect with the context of the problem by asking questions such as:
  - When you get home from school, what do you do? Turn and talk to a partner.
  - What are some of the activities that you do every day or repeat throughout the week? (i.e. eating dinner, brushing your teeth, reading a book before bed)
  - As you think about the activities that repeat throughout the week, how does that connect to what you know about repeating patterns?
- Today we are going to think about transferring or re-creating a pattern that most of us must experience every day before we go to school!
- Introduce the pictures of the pattern. This is Andrew's routine for getting dressed in the morning. What do you notice about these pictures? What do you wonder?
- Introduce the task by reading the problem aloud to students. Ask a few students to restate the task in their own words to promote understanding and clarify questions.
- Pass out the task to each student to solve. Make manipulatives and drawing tools available, as needed.

**Teachers should listen and take notes as students work and share ideas. For those students unable to record their own thinking, the teacher should record the student explanation or strategy on the student's work. If a student creates a pattern using tools, take pictures of the concrete representations.*

Task Implementation (During)

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 *Question Matrix).*
- Select – The teacher will decide which strategies or thinking will be highlighted (after student task implementation) that will advance mathematical ideas and support student learning.
- Sequence – The teacher will select 2-3 student strategies to share with the whole group. One suggestion is to look for one common misconception and two correct responses to share.
- Connect – The teacher will consider ways to facilitate connections between different student representations.

Suggestions For Additional Student Support

- Students who have difficulties with decoding/reading math text may benefit from pairing vocabulary with visuals. For example, have a picture of the core circled around a different pattern.
- Students who have difficulty getting started with the task, planning, and/or self-monitoring can be supported through questioning. See the planning for mathematical discourse chart for possible questions to ask these students.
- Students who have trouble expressing themselves may benefit from sentence frames such as
  - I notice ___ repeats.
  - The core of ____'s pattern is ….
  - I created the pattern using ….
  - I transferred this pattern by….
  - I know this pattern is the same/different because….
- Students who have difficulties with fine motor skills might benefit from using stickers or tools to build

Task Implementation (During)
concrete representations. Capture this representation using pictures to understand student thinking. ● After students have shared solutions, create an anchor chart including picture representations to summarize student findings. ● Students who are ready for an extension can be asked: What would come next? How could you extend this pattern? How could you transfer this pattern using a different representation?

Task Implementation (After)
Connecting Student Responses (From Anticipating Student Response Chart) and Closure of the Task: ● Reflect on student solution strategies during a whole group discussion. Use this time to connect different students' responses and connect the responses to the key mathematical ideas of repeating patterns. ● Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during the task discussion. ● Questions to promote student engagement and discourse: – What is one way that Maria could make Andrew's pattern? – How do you know the pattern you created is the same type of pattern as the one Andrew created? – Where do you see the core in ___'s representation or pattern? How do you know it's the core? – How is ___'s pattern similar or different to ___' s pattern? – Who can add on to that? – Do you agree or disagree? Why? – Did anyone think about that in a different way? ● Close the lesson by creating an anchor chart including picture representations to summarize student findings.

Teacher Reflection About Student Learning:
● Use the rich mathematical task rubric to evaluate students' progress toward the goals. ● Look at the students' work. How did students transfer the pattern? – Who recognized and described the core? – Who was able to describe how the core repeats? – Who was unable to complete the task even with support? Why? – Who needed the manipulatives to create the pattern? Who recorded their representation? – Who recreated the pattern with the exact same pictures? – Who was able to compare their pattern to a classmate's pattern? – Who was able to connect multiple representations of the same pattern? – Who was able to extend the pattern?

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Name__________________________________ Date_________________

Morning Routine

Andrew drew pictures to show his routine for getting dressed in the morning.

Maria is making a pattern. She wants to create the same type of pattern as Andrew's pattern using tools, pictures, numbers, or words. What could her pattern look like? Explain your thinking and show your work.

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Planning for Mathematical Discourse

Mathematical Task: Morning Routine

Content Standard(s): K.13

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: Student does not know how to begin or approach the problem.	• What do you notice about the way Andrew gets dressed? • How many different types of pictures does Andrew have? • What type of pattern is this? • What is the core? • Is this a repeating pattern? How do you know?	• How could you show the same type of pattern? • What tool could you use to show the same pattern?		
Anticipated Student Response: Student recreates the pattern using the same pictures.	• What does the same type of pattern mean for this problem? • What is the problem asking you to do? • How might you know how many__ (blocks, colors, etc.) you will need?	• Maria wants to create a different pattern. What could that look like? • Can you make this pattern with different tools? • How can you make a pattern that looks different?		

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Anticipated Student Response: Student creates a pattern that is not an ABCC pattern. Difficulty recognizing core. (Just used two instead of 3 Example: ABABAB)	● Tell me about your pattern. ● What does it mean to find the core of the pattern? ● What is the core of Andrew's pattern? ● What is the core of your pattern? ● How might you know how many___ (blocks, colors, etc.) you will need?	● How do you know your pattern in the same as Andrew's pattern?		
Anticipated Student Response: Student can represent the problem with concrete manipulatives	● What type of pattern is this? ● What is the core? ● Is this a repeating pattern? How do you know?	● What would it look like to show this on paper? ● How could you record what you created?		
Anticipated Student Response: Student can represent the pattern on paper using pictures, letters, or	● How do you know you created the same pattern as Andrew?	● How would you extend this pattern? ● What would come next if you continued the pattern? ● Can you make this pattern		

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numbers.		using another tool or representation?		

Possible sentence frames for supporting learners:

I notice ____ repeats.

The core of ____’s pattern is …

I created the pattern using …

I transferred this pattern by…

I know this pattern is the same/different because…

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