Packet 3: Patterns and Linear Functions 1

Dear Parents/Guardians,

Packet 3 introduces the domain of functions through geometric patterns and number sequences. Students will describe these patterns using tables, graphs and verbal descriptions. Students will generate rules for the patterns to describe the sequences. Finally, students will apply their patterning to real-world situations, using numbers, graphs, equations and words to solve problems.

Geometric Patterns

Students will explore toothpick patterns, predicting how they will grow in order to describe the sequence.

Step # ⟶	Step 1	Step 2	Step 3	Step 4 (build, then sketch below)
Number of toothpicks ⟶	6	9	12	15

Students note the pattern from step to step. *"Step 1 has 6 toothpicks and we add 3 more for each step."*
Students may discover that it is helpful to think about the pattern as having a triangle (3 toothpicks) plus 3 more for each step. This leads right into the rule, *"3 times the step number plus 3, or 3n + 3."*
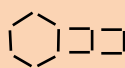
Number Patterns

Students explore number patterns by creating a table. From the table, students describe the patterns and develop rules, looking at the relationship between the step # (input) and the quantity (output).

Step 1	Step 2	Step 3	Step 4	Step 5
$1 \bullet 3 - 3$	$2 \bullet 3 - 3$	$3 \bullet 3 - 3$	$4 \bullet 3 - 3$	$5 \bullet 3 - 3$
= 0	= 3	= 6	= 9	= 12

Explicit Rule:	The step # multiplied by 3 minus 3 $n(3) - 3$

"Fourfold Way"
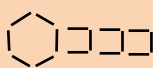
Step 1   Step 2   Step 3

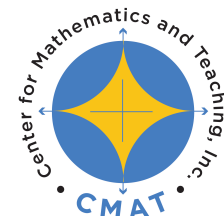| Step #	0	1	2	3	4	n
# of toothpicks	6	9	12	15	18	$6+n(3)$ Or $3n+6$
Pattern	6	6+3	6+3+3 6+2(3)	6+3+3+3 6+3(3)	6+3+3+3+3 6+4(3)	$6+step\#(3)$
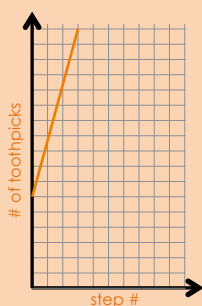
Recursive Rule:
Start with __6__ toothpicks, and then
__add three__ each step.

Explicit Rule: Explain what operations to perform on the input value to arrive at the corresponding output.
The number of toothpicks is 3 times the step number plus 6.

(graph: # of toothpicks vs step #)

By the end of the packet, your student should know…

How to describe geometric and number patterns using tables, graphs and verbal descriptions Lessons 3.1 and 3.2

Use the "fourfold way" to solve problems Lesson 3.3

Additional Resources

Resource Guide (RG)
Part 1, pages 45-46

The "fourfold way" helps prepare students to develop algebra skills through multiple representations.

They will use pictures, numbers, symbols and words (four representations) to solve problems.