



Bridging for Math Strength Resources

[Standards of Learning Curriculum Framework \(SOL\)](#)

Standard of Learning (SOL) 4.15 Identify, describe, create, and extend patterns found in objects, pictures, numbers, and tables



Student Strengths	Bridging Concepts	Standard of Learning
Students can identify, describe, create, and extend patterns found in objects, pictures, numbers, and tables.	<p>Students can recognize growing patterns.</p> <p>Students, when given the rule, can determine the missing values in a list or table.</p>	Students can identify, describe, create, and extend patterns found in objects, pictures, numbers, and tables.

Understanding the Learning Trajectory

Big Ideas:

- Skip counting on the number line generates number patterns.
- The structure of the base ten numeration system produces many numerical patterns.
- Known elements in a pattern can be used to predict other elements (Charles, 2005).
- Patterns and functions can be represented in many ways and described using words, tables, graphs, and symbols (VDOE Curriculum Framework).

Formative Assessment:

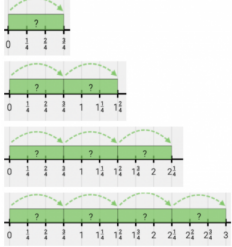
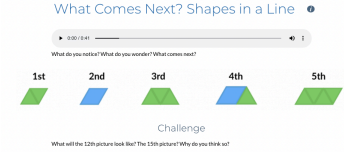
- [Just in Time Mathematics Quick Check 4.15 PDF](#)
- [Just in Time Mathematics Quick Check 4.15 Desmos](#)

Important Assessment Look Fors:

- The student recognizes increasing patterns and decreasing patterns, and makes connections to addition and subtraction.
- The student can justify how and why a rule works.
- The student applies a rule throughout an entire pattern and utilizes a rule to extend patterns..
- The student represents the same pattern in multiple ways (picture, table, numbers, words, etc.).

Purposeful Questions:

- What is a rule? Do all patterns have one?
- How did you identify the rule? How did you know what operation to use?
- How do you know the rule will always work for that pattern?
- When you solved this problem, what did you notice about the relationship between addition and subtraction?
- How could you represent this pattern another way?
- Can you create another pattern that follows the same rule?
- What is the difference between a growing pattern and a repeating pattern?

Bridging Activity to Support Standard	Instructional Tips
<p>Routines: What Comes Next? Number line jumps</p>  <p>What Comes Next? Shapes in a line</p> 	<p>Show students the image and ask, “What do you notice? What do you wonder?” Give students time to make sense of the image and explore before asking specific questions.</p> <p>After students share, pose the following questions:</p> <ul style="list-style-type: none"> • What do you think comes next? Why? • Will we ever land on the number ___? (specific to the number line image) • Can you create your own pattern? (For this question, encourage students to use this online application: Number Line) • For an additional challenge ask “What will the 12th picture look like? The 15th picture? Why do you think so?” (specific to Shapes in a line image) <p>The Shapes in a line routine is good preparation for the Growing Worms rich task.</p>
<p>Rich Tasks: Sidewalk Patterns Illustrative Mathematics</p> <p>Growing Worms Adapted from NCTM “Catching Growing Night Crawlers” task</p>	<p>The Sidewalk Patterns task supports students in identifying and extending two increasing patterns. Students are also asked to find relationships between the patterns. This task also supports the concept of multiples.</p> <p>Encourage students to explore this task in groups. Let them use any strategy that works for them. Note: The numbers extend to 153. This is a perfect opportunity to let students explore with a calculator.</p> <p>The Growing Worms task supports students with identifying and extending patterns that include fractions and mixed numbers. Before beginning this task, it is helpful for students to explore the fractional relationships between the pattern block pieces. Encourage students to use pattern blocks or interactive pattern blocks to represent their thinking.</p>
<p>Games/Tech: Desmos 4.15 Diving Into Growing Patterns</p>	<p>Select which activities and slides you want students to access.</p> <p>Students can complete the matching activity on Slide 14 as a partner activity.</p>

<p>Guess my Rule</p> <p>VDOE</p>	<p>To prepare to play Guess my Rule, show students the function machine. Point out the input slot and the output slot. Discuss the terms input and output. Explain to participants that this machine takes numbers in, performs operations on the number (applies a rule) and then spits them out.</p> <p>Have students play Guess My Rule with a partner. Partner 1 suggests a number and writes it in the input column. Partner 2 applies a rule and writes the output in the output column. Play continues back and forth until Partner 1 guesses the rule. Then, players will switch roles.</p>
<p>Other Resources:</p> <ul style="list-style-type: none"> • How many chairs around the table? • Growing Patterns: Illuminations, NCTM • VDOE Mathematics Instructional Plans (MIPS) <ul style="list-style-type: none"> ◦ How Does the Pattern Grow? (Word) / (PDF Version) • VDOE Word Wall Cards: Grade 4 (Word) / (PDF) <ul style="list-style-type: none"> ◦ Growing Patterns ◦ In/Out Table • VDOE Algebra Readiness Remediation Plans <ul style="list-style-type: none"> ◦ Determine the Rule (Word) / (PDF) ◦ Number Patterns and Rules (Word) / (PDF) • VDOE Algebra Readiness Formative Assessments <ul style="list-style-type: none"> ◦ 4.15 (Word) / (PDF) • Desmos Activity <ul style="list-style-type: none"> ◦ Diving into Growing Patterns <p>Learning Trajectory Resources:</p> <p>Charles, R. (2005). Big ideas and understandings as the foundation for elementary and middle school mathematics. <i>Journal of Mathematics Education Leadership</i>, 7(3), NCSM.</p> <p>Common Core Standards Writing Team. (2019). Progressions for the Common Core State Standards for Mathematics. Tucson, AZ: Institute for Mathematics and Education, University of Arizona.</p> <p>Van De Walle, J., Karp, K. S., & Bay-Williams, J. M. (2018). <i>Elementary and Middle School Mathematics: Teaching Developmentally</i>. (10th edition) New York: Pearson (2019:9780134802084)</p> <p>VDOE Curriculum Framework for All Grades - Standard of Learning Curriculum Framework (SOL)</p>	