Bridging for Math Strength Resources

Standards of Learning Curriculum Framework

Standard of Learning (SOL) 6.4 Recognize and represent patterns with whole number exponents and perfect squares.

Student Strengths	Bridging Concepts	Standard of Learning
Students use an array model for multiplication. Students can determine numerical patterns in a table using addition/subtraction.	Students can determine numerical patterns in a table using multiplication/division. Students have whole number multiplication fact fluency.	Students can recognize and represent patterns with whole number exponents and perfect squares.

Understanding the Learning Trajectory

Big Ideas:

- A perfect square is a whole number whose square root is an integer.
- Perfect squares can be represented by the area of a square, and the square root of a number can be represented geometrically as the length of a side of the square.
- Exponents are a way to express repeated products of the same number (Van de Walle).

Formative Assessment:

- VDOE Just in time Quick Check SOL 6.4 (Word) / PDF / Desmos

Important Assessment Look Fors:

- The student continues a pattern of exponents.
- The student recognizes the relationship between perfect squares and square roots.
- The student uses multiplication facts to find square roots.
- The student demonstrates an understanding of place value when working with powers of 10
- The student uses repeated multiplication to determine the value of an exponent.

Purposeful Questions:

- How can you represent a perfect square pictorially?
- How can you describe the relationship between a perfect square and a square root?
- What is the relationship between the base and the exponent?

Bridging Activity to Support Standard	Instructional Tips
Routine Exponent Number Sense Routines (6.4) Henrico County	These slides provide a variety of number sense routines to support students in exploring and thinking about perfect squares and exponents. The slide 7 supports students in recognizing patterns in a table format.
Rich Tasks Exponential Experimentation 1 Illustrative Mathematics The Square of My Age NRICH	In the Exponential Experimentation task, students explore whether statements involving exponents are true or false. It gives them an opportunity to work with equations. Students will need to use repeated multiplication to simplify the exponential expressions in order to determine if the statements are true or false. Students should be encouraged to create a table showing the repeated multiplication process. In the Square of my Age task, students must determine the ages of two children based upon the total when one age is squared and added to the other age. Students should create a table of possible ages and squares to determine the actual ages of the children. Students can then use this as an example and create their own versions for classmates to solve.
Games/Tech Desmos 6.4 Patterns of tables and graphs	Learners will explore patterns in tables and graphs and predict patterns of powers of 10 and perfect squares.

Other Resources:

- VDOE Mathematics Instructional Plans (MIPS)
  - 6.4 - Whole Number Exponents and Perfect Squares (Word) / PDF Version
- VDOE Algebra Readiness Formative Assessments
  - SOL 6.4 (Word) / PDF
- VDOE Algebra Readiness Remediation Plans
  - Powers of Ten (Word) / PDF
- VDOE Word Wall Cards: Grade 6 (Word) | (PDF)
  - Perfect Squares
  - Exponential Form
  - Powers of Ten
- Desmos Activity
  - Looking for Patterns in Tables and Graphs

Learning Trajectory Resources:

Charles, R. (2005). Big ideas and understandings as the foundation for elementary and middle school mathematics. *Journal of Mathematics Education Leadership*, *7*(3), NCSM.

Clements, D. H., & Sarama, J. (2019). Learning and teaching with learning trajectories [LT]2. Marsico Institute, Morgridge College of Education, University of Denver. https://www.learningtrajectories.org/

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.

Richardson, K. (2012). How Children Learn Number Concepts: A Guide to Critical Learning Phases. Bellingham: Math Perspectives Teacher Development Center.

Van De Walle, J., Karp, K. S., & Bay-Williams, J. M. (2018). *Elementary and Middle School Mathematics: Teaching Developmentally.* (10th edition) New York: Pearson (2019:9780134802084)

VDOE Curriculum Framework for All Grades - Standard of Learning Curriculum Framework (SOL)