

## Unit C - Exponents and Roots

### Overview

Students will explore the meaning of exponents and the rules for multiplying and dividing numbers in exponential form. Operations are extended to include negative exponents. A review of scientific notation with both negative and positive powers of 10 is included, with references to content in Integrated Science. Students solve expressions involving several steps with numbers in exponent form. Students investigate the square roots and explore their connection to rational exponents. Students apply square roots to solve missing lengths of right triangle using the pythagorean theorem. Students are challenged to apply principles of exponents and square roots to approximate the volume of a lean-to shelter.

**21st Century Capacities:** Analyzing

### Stage 1 - Desired Results

<p>ESTABLISHED GOALS/ STANDARDS</p> <p><b>MP 1</b> Make sense of problems and persevere in solving them</p> <p><b>MP4</b> Model with Mathematics</p> <p><b>MP5</b> Use appropriate tools strategically</p> <p>CCSS.MATH.CONTENT.HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.</p> <p>CCSS.MATH.CONTENT.HSA.SSE.A.2 Use the structure of an expression to identify ways to rewrite it.</p> <p>CCSS.MATH.CONTENT.HSA.SSE.B.3 Choose and produce an equivalent form of an</p>	<p><b>Transfer:</b></p> <p><i>Students will be able to independently use their learning in new situations to...</i></p> <ol style="list-style-type: none"> <li>1. Apply familiar mathematical concepts to a new problem or apply a new concept to rework a familiar problem. (Analyzing)</li> <li>2. Justify reasoning using clear and appropriate mathematical language. (Analyzing)</li> </ol>		
	<p><b>Meaning:</b></p>		
	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p><b>UNDERSTANDINGS:</b> <i>Students will understand that:</i></p> <ol style="list-style-type: none"> <li>1. Mathematicians understand numbers, ways of representing numbers, relationships among numbers, and number systems</li> <li>2. Mathematicians use visualization, spatial reasoning, and geometric modeling to solve problems</li> </ol> </td> <td style="width: 50%; vertical-align: top;"> <p><b>ESSENTIAL QUESTIONS:</b> <i>Students will explore &amp; address these recurring questions:</i></p> <ol style="list-style-type: none"> <li>A. How do operations relate to one another?</li> <li>B. How can I simplify my problem?</li> <li>C. How does my knowledge of geometry apply to mathematical operations?</li> </ol> </td> </tr> </table>	<p><b>UNDERSTANDINGS:</b> <i>Students will understand that:</i></p> <ol style="list-style-type: none"> <li>1. Mathematicians understand numbers, ways of representing numbers, relationships among numbers, and number systems</li> <li>2. Mathematicians use visualization, spatial reasoning, and geometric modeling to solve problems</li> </ol>	<p><b>ESSENTIAL QUESTIONS:</b> <i>Students will explore &amp; address these recurring questions:</i></p> <ol style="list-style-type: none"> <li>A. How do operations relate to one another?</li> <li>B. How can I simplify my problem?</li> <li>C. How does my knowledge of geometry apply to mathematical operations?</li> </ol>
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## Integrated Algebra & Geometry Curriculum

	<b>Acquisition:</b>	
	<i>Students will know...</i>	<i>Students will be skilled at...</i>
<p>expression to reveal and explain properties of the quantity represented by the expression.*</p> <p>CCSS.MATH.CONTENT.HSA.SSE.B.3.C Use the properties of exponents to transform expressions for exponential functions</p> <p>CCSS.MATH.CONTENT.HSG.SRT.B.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.</p> <p>CCSS.MATH.CONTENT.HSG.GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.</p> <p>CCSS.MATH.CONTENT.HSG.MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).</p>	<ol style="list-style-type: none"> <li>1. That exponents represent repeated multiplication</li> <li>2. The rules of exponents, including multiplying and dividing powers with the same base, zero and negative exponents, how rational exponents relate to square roots</li> <li>3. How to simplify expressions including exponents</li> <li>4. That positive numbers have two real roots and one principal square root</li> <li>5. That radicals are precise values and rounded approximations lose precision</li> <li>6. The pythagorean theorem and its converse</li> <li>7. Vocabulary: exponent, base, index, radical, pythagorean theorem, approximate</li> </ol>	<ol style="list-style-type: none"> <li>1. Simplifying expressions with exponents</li> <li>2. Writing numbers in exponential form</li> <li>3. Approximating square roots</li> <li>4. Solving for missing sides in right triangles</li> <li>5. Identifying whether a triangle is a right triangle given the lengths of its sides.</li> </ol>