



Unit 6 Exponents, Scientific Notation, and Volume Math 8 Reg

Last Update: August 1, 2025

Archdiocesan Curriculum > Grade > Math 8 > Length of unit 20 to 25 days

Stage 1: Desired Results						
<div>General Information</div> <div>In this unit, students will develop and apply the properties of integer exponents and learn to express and compute with numbers in scientific notation. They will also derive and use formulas for the volume of cylinders, cones, and spheres, applying these formulas to solve real-world problems involving three-dimensional shapes.</div> <div>Mathematical Practices:</div> <div><ul style="list-style-type: none">MP1 – Make sense of problems and persevere in solving themMP2 – Reason abstractly and quantitativelyMP4 – Model with mathematicsMP5 – Use appropriate tools strategically</div>	<div>Essential Question(s)</div> <div><ul style="list-style-type: none">What are the key properties of integer exponents, and how can they be applied to simplify expressions?How do we convert very large or very small numbers into scientific notation and why is this useful?What strategies can we use to perform calculations with numbers expressed in scientific notation?How can we derive and apply the formulas for the volumes of cylinders, cones, and spheres?In what real-world situations can volume formulas for cylinders, cones, and spheres be used to solve problems?</div>					
	<div>Enduring Understanding/Knowledge</div> <div>Students will:</div> <div><ul style="list-style-type: none">Develop and use the properties of integer exponents.Express numbers using scientific notation.Compute with numbers written in scientific notation.</div> <div>Review/Assess</div> <div><ul style="list-style-type: none">Develop and use the formula for the volume of a cylinder.Develop and use the formula for the volume of a cone.Develop and use the formula for the volume of a sphere.Use volume formulas to solve problems involving cylinders, cones, and spheres.</div> <div>Review/Assess</div>	<div>Vocabulary</div> <table><tr><th>New</th><th>Review</th></tr><tr><td><ul style="list-style-type: none">properties of exponentsscientific notationstandard (or decimal) formslant heightsphere</td><td><ul style="list-style-type: none">cylinder</td></tr></table>		New	Review	<ul style="list-style-type: none">properties of exponentsscientific notationstandard (or decimal) formslant heightsphere
New	Review					
<ul style="list-style-type: none">properties of exponentsscientific notationstandard (or decimal) formslant heightsphere	<ul style="list-style-type: none">cylinder					
<div>Connections to Catholic Identity / Other Subjects</div> <div>Religion/Catholic Identity:</div> <div><ul style="list-style-type: none">Mathematical rules reflect the order in God's creation, while the concept of exponents amplifying values parallels how our actions, however small, can have a big impact, resonating with Catholic teachings on stewardship.The concept of volume reflects the idea of being filled, symbolizing how we are called to be filled with God's love and grace. Each shape has a unique formula, showing the diversity and intention in creation, much like the uniqueness of every individual's role in God's plan. This lesson encourages students to appreciate the order,</div>	<div>Differentiation</div> <div>Enrichment</div> <div><ul style="list-style-type: none">Explore Exponent Laws in Depth – Challenge students to prove and extend exponent properties, including negative and zero exponents, and explore patterns with fractional exponents.Scientific Notation in Real-World Contexts – Have students research and present on applications of scientific notation in fields like astronomy, microbiology, or physics, analyzing very large or very small quantities.Derive Volume Formulas – Guide students through the derivation of the volume formulas for</div>					

<p>purpose, and beauty in both math and their faith.</p> <p>Other Subject Here:</p> <ul style="list-style-type: none"> • Integer exponents represent growth, change, and scaling, which connect to themes of expansion in art, science, and social systems. • ELA: Metaphorical "volume" of themes, conflicts, or character development in a story. • Art: The physical volume of objects and the 3D space occupied in sculptures or designs. • Science: Volume is used to measure space and matter in experiments, chemical reactions, and biological functions. • Social Studies: Volume helps us understand how physical space, resources, and populations are distributed and managed within societies. 	<p>cones and spheres using calculus concepts or geometric reasoning, depending on grade level.</p> <ul style="list-style-type: none"> • Compare Volumes Across Shapes – Have students investigate relationships between volumes of cones, cylinders, and spheres with the same dimensions, and explain the mathematical reasons. • Create and Solve Multi-Step Problems – Encourage students to design real-world problems involving volume and scientific notation that require multiple steps and conversions. <p>Support</p> <ul style="list-style-type: none"> • Use Visual Models and Manipulatives – Provide physical or virtual models of cylinders, cones, and spheres to help students visualize volume concepts and formulas. • Step-by-Step Scientific Notation Practice – Scaffold practice with converting between standard form and scientific notation and performing operations with detailed examples. • Formula Practice Templates – Provide guided worksheets that break down the steps for applying volume formulas with prompts for substituting values and solving. • Relate Volume to Units – Emphasize the importance of units and unit conversion when calculating volume (e.g., cm^3 vs. m^3), with examples and checklists. • Sentence Frames and Key Vocabulary – Offer sentence starters and key terms to support students explaining their process (e.g., "I used the formula $V = \pi r^2 h$ because...")
---	--

Standards & Benchmarks

Exponents and Scientific Notation:

8.NS.3

Given a numeric expression with common rational number bases and integer exponents, apply the properties of exponents to generate equivalent expressions. (E)

8.EE.A.3

Use numbers expressed in the form of a single digit times an integer power of 10 to estimate exceptionally large or small quantities and to express how many times as much one is than another. For example, estimate the population of the United States as 3 times 10^8 and the population of the world as 7 times 10^9 , and determine that the world population is more than 20 times larger.

8.EE.A.4

Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of convenient size for quantities. For example, use millimeters per year for seafloor spreading. Interpret scientific notation that has been generated by technology.

CCSS.Math.Content.8.EE.A.3

Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.

8.EE.3

Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.

8.3.5.4

Express approximations of very large and very small numbers using scientific notation. Understand how technology displays numbers in scientific notation. Compare numbers expressed in scientific notation using the symbols $<$, $>$, $=$, \leq and \geq . (MP4, MP5) ☼

8.EE.A.1

Apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.

Volume:**8.G.C.9**

Apply the formulas for the volume of cones, cylinders, and spheres to solve real-world and mathematical problems.

CCSS.Math.Content.8.G.C.9

Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

8.G.9

Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

7.GM.3

Solve real-world and other mathematical problems involving volume of cylinders and three-dimensional objects composed of right rectangular prisms. (E)

Teaching Ideas/Resources**Websites/Resources:****Exponents and Scientific Notation**

- Exponents Card Game
- Square Roots with Cheez-Its and a Graphic Organizer | I Speak Math

Volume

- Volume of sphere cone cylinder | TPT
- Geometry Worksheets
- Volume_of_Cylinders_Cones_and_Spheres.pdf
- PRACTICE USING THE VOLUME OF A CYLINDER FORMULA!
- Free Worksheets for Grades 6, 7, 8 — Mashup Math
- Delta Math Resource
- Volume of Cylinders, Cones, and Spheres - Self-Checking • Activity Builder by Desmos Classroom