

Geometry Topic 11: 3-D Models		Estimate Time Frame: 4 Block Days
<p>Essential Standards: G.25, G.27</p> <p>Assessment Resource: enVision <a href="#">Topic #11 Performance Task</a> (use as a mini-test grade).</p>		
FCPS Supporting Links	Additional Supporting Links	
<p><a href="#">Pacing Guide</a></p> <p><a href="#">enVision Geometry Standards Crosswalk Resource</a></p> <p><a href="#">FCPS P-12 Mathematics Guidance Document</a></p> <p><a href="#">FCPS Achievement &amp; Trauma-Informed Strategies in the Classroom</a></p>	<p><a href="#">Kentucky Academic Standards</a></p> <p><a href="#">KSA Blueprint</a></p> <p><a href="#">Target of the Standards</a> - conceptual, procedural &amp; application</p> <p><a href="#">Three-Reads Routine</a></p> <p><a href="#">Notice and Wonder Routine</a></p> <p><b><a href="#">MILC Resources Topic 11</a></b></p> <p><i>enVision Geometry Teacher Guide: page 466A to 466D for specific Topic 11 Focus-Coherence-Rigor</i></p>	
Big Idea		
<p>3D geometry offers the tools and principles necessary to navigate and shape the world around us.</p>		
Essential Questions	Common Preconceptions/Misconceptions	
<p>•How are three-dimensional figures and polygons related?</p> <p>•How can I use volume to model and solve real-world problems?</p> <p>•How are the prism/cylinder and cone/pyramid formulas alike?</p> <p>•How is the volume of a sphere related to the volumes of other solids?</p> <p><b>Theorems/Postulates:</b></p>	<ul style="list-style-type: none"> <li>• Students use previously learned definitions, theorems, postulates, and properties of lines, angles, and triangles to draw conclusions and to make inferences.</li> <li>• Remind students that a cylinder has two circular faces, or sides, connected by a curved surface, while a prism has two faces that are congruent polygons, and the other faces are rectangles.</li> <li>• Prisms are named according to the shape of the two congruent polygons.</li> <li>• Note - No Cavalieri's Principle for General Geometry (right solids only, no oblique)</li> </ul>	

<ul style="list-style-type: none"> <li>•Euler's Formula</li> <li>•Volume of a prism, cylinder, pyramid, cone, and sphere</li> </ul>	<ul style="list-style-type: none"> <li>• Cavalieri's Principle is only in Advanced Geometry- see Standard G.26 (+) standard.</li> </ul>	
<p><b>Standards for Mathematical Practices</b></p>	<p><b>Kentucky Interdisciplinary Literacy Practices (KILP)</b></p>	
<p><a href="#">MP.1. Make sense of problems and persevere in solving them.</a>  <a href="#">MP.2. Reason abstractly and quantitatively.</a>  <a href="#">MP.3. Construct viable arguments and critique the reasoning of others.</a>  <a href="#">MP.4. Model with mathematics.</a>  <a href="#">MP.5. Use appropriate tools strategically.</a>  <a href="#">MP.6. Attend to precision.</a>  <a href="#">MP.7. Look for and make use of structure.</a>  <a href="#">MP.8. Look for and express regularity in repeated reasoning.</a></p> <p><i>enVision Teacher Guide: page 466D for specific Math Practice suggestions</i></p>	<ol style="list-style-type: none"> <li>1. Recognize that text is anything that communicates a message.</li> <li>2. Employ, develop, and refine schemas to understand and create text.</li> <li>3. View literacy experiences as transactional, interdisciplinary, and transformational.</li> <li>4. Utilize receptive and expressive language arts to better understand self, others, and the world.</li> <li><b>5. Apply strategic practices, with scaffolding and then independently, to approach new literacy tasks.</b></li> <li><b>6. Collaborate with others to create new meaning.</b></li> <li><b>7. Utilize digital resources to learn and share with others.</b></li> <li><b>8. Engage in specialized, discipline-specific literacy practices.</b></li> <li><b>9. Apply high-level cognitive processes to think deeply and critically about text.</b></li> <li>10. Develop a literacy identity that promotes lifelong learning.</li> </ol> <p><i>Incorporating texts into math instruction fosters interdisciplinary learning for a more engaging educational experience.</i></p>	
<p><b>Essential Standards</b></p>	<p><b>Sample Learning Intentions &amp; Success Criteria</b></p>	<p><b>HQIR/Resource Considerations</b></p>
<p><b>Cluster: Explain volume formulas and use them to solve problems.</b></p>		
<p><b>KY.HS.G.25</b> Analyze and determine the validity of arguments for the formulas for the various figures and shapes.</p> <p>b. Find the volume of a sphere, prism, cylinder, pyramid, and cone.  <b>MP.3, MP.7, KILP.1, KILP.6, KILP.8</b></p> <p><i>Supporting Standard: KY.HS.G.26 (+), KY.HS.G.30</i></p>	<p>We are learning to analyze and determine the validity of arguments for the formulas used to calculate measurements of various figures and shapes.</p> <ul style="list-style-type: none"> <li>• I can identify the volume formulas of a sphere, prism, cylinder, pyramid, and cone.</li> <li>• I can analyze and critique the rationale behind the formula for finding the volume of</li> </ul>	<ul style="list-style-type: none"> <li>• Topic 11-2</li> <li>• Topic 11-3</li> <li>• Topic 11-4</li> </ul> <p>Students may use dissection arguments, Cavalieri's principle, and informal limit</p>

<p><input type="checkbox"/> Conceptual    <input type="checkbox"/> Procedural    <input type="checkbox"/> Application</p>	<p>a sphere, demonstrating an understanding of its connection to the formula for the volume of a cylinder.</p>	<p>arguments to find the values for these figures.</p> <p><b>*Cavalieri's Principle is only in Adv. Geom - see Standard G.26 (+)</b></p>
<p><b>KY.HS.G.27</b> Use volume formulas to solve problems for cylinders, pyramids, cones, spheres, prisms ★  <b>MP.4, MP.6, KILP.2, KILP.6, KILP.9</b></p> <p><i>Supporting Standard: KY.HS.G.28, KY.HS.G.29, KY.HS.G.30</i></p> <p><input type="checkbox"/> Conceptual    <input type="checkbox"/> Procedural    <input type="checkbox"/> Application</p>	<p>We are learning to use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.</p> <ul style="list-style-type: none"> <li>• I can use the appropriate formula for volume based on the figure.</li> <li>• I can use volume formulas for cylinders, pyramids, cones, and spheres to solve contextual problems.</li> </ul>	<ul style="list-style-type: none"> <li>• Topic 11-1</li> <li>• <a href="#">Exploration: Euler's Formula</a> (MILC)</li> <li>• Topic 11-2</li> <li>• Topic 11-3</li> <li>• Topic 11-4</li> <li>• 3 ACT Math Task: "Box 'em Up"</li> </ul> <p>General Prism: <math>V = Bh</math></p> <p>Right Circular Cylinder: <math>V = \pi r^2 h</math></p> <p>Pyramid: <math>V = \frac{1}{3} Bh</math></p> <p>Right Circular Cone: <math>V = \frac{1}{3} \pi r^2 h</math></p> <p>Sphere: <math>V = \frac{4}{3} \pi r^3</math></p>

**Attending to the Standards for Mathematical Practice**

- As students analyze volume formulas, they look for relationships between the shapes and the related formulas (MP.7).
- Students critique different explanations or justifications for the formulas (MP.3).
- Students recognize various situations for which these formulas would apply and use them to solve real-world problems, posing their own real-world problems when possible (MP.4).

**Supporting Standards**

**KY.HS.G.26 (+)** Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures. **MP.2, MP.5**

**KY.HS.G.28** Identify the shapes of two-dimensional cross-sections of three-dimensional objects and identify three-dimensional objects generated by rotations of two-dimensional objects. **MP.5, MP.7**

**KY.HS.G.29** Use geometric shapes, their measures, and their properties to describe objects in real-world settings. **MP.1, MP.4**

**KY.HS.G.30** Apply concepts of density based on area and volume in modeling situations, using appropriate units of measurement. **MP.4, MP.6**

**Vocabulary**

cylinder, prism, pyramid, cone, sphere, hemisphere, area, volume, slant height, edge, vertex, side, altitude, cross section

- Euler's Formula

- Volume of the prism, cylinder, pyramid, cone, and sphere

\*Disclaimer: Success Criteria is the evidence students must produce to demonstrate learning. This example is not comprehensive.

\*\* Mathematical Practices (A.MP. 1- 8) should be evidenced at some point throughout each unit, depending on the explored tasks. It is important to note that MP. 2 should support learning in every lesson.

\*\*\* Modeling Standards: Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol sometimes appears on the heading for a group of standards; in that case, it should be understood to apply to *all* standards in that group.