Unit 5
Extending Two Dimensions to Three Dimensions

Geometry

Building upon content studied in prior grade levels, students will not only derive area and perimeter formulas of polygons, but also derive circumference and area formulas of circles. Additionally, students will explore the effects of changing dimensions and investigate spherical geometry including arcs and sectors of circles. Students will also describe properties of prisms, pyramids, cones, cylinders, and spheres as well as develop and apply formulas for surface area and volume.

Standards for Mathematical Practice

MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Louisiana Student Standards for Mathematics (LSSM)

G-GMD: Geometric Measurement and Dimension	
A. Explain volume formulas and use them to solve problems.	
G-GMD.A.1	Give an informal argument, e.g., dissection arguments, Cavalieri's principle, and informal limit arguments, for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.
G-GMD.A.3	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. ★
G-GMD.A.4	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
G-MG: Modeling with Geometry	
A. Apply geometric concepts in modeling situations.	
G-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). ★

G-MG.A.2	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★
G-MG.A.3	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). ★
Additional Standards for Honors Classes **G-GMD.A.2 (+)** Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures. **G-SRT.9 (+)** Derive the formula $A = \frac{1}{2}ab\sin C$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.	

★**As defined by LSSM, the basic modeling cycle involves:**

1. identifying variables in the situation and selecting those that represent essential features,
2. formulating a model by creating and selecting geometric, graphical, tabular, algebraic, or statistical representations that describe relationships between the variables,
3. analyzing and performing operations on these relationships to draw conclusions,
4. interpreting the results of the mathematics in terms of the original situation,
5. validating the conclusions by comparing them with the situation, and then either improving the model or, if it is acceptable,
6. reporting on the conclusions and the reasoning behind them.

Choices, assumptions, and approximations are present throughout this cycle.

Enduring Understandings:	**Essential Questions:**
*Three-dimensional figures have relationships to specific tow-dimensional figures. *Geometric objects may be used to model various physical phenomena. *Representation of geometric ideas and relationships allows multiple approaches to geometric problems and connects geometric interpretations to other contexts. *Reasonable estimates and sensible judgment about the precision and accuracy of measurement values is important.	*How are two-dimensional and three-dimensional space related? *How can geometric properties and relationships be applied to solve problems that are modeled by geometric objects? *How can you find the volume of solids for which no formula is available? *How can you make sound decisions about how quantities should be measured and represented?