

Unit 4 Title	Estimated Time Frame
Geometry and Statistics	Approximately 40 days
Big Idea	
Solve real-world and mathematical problems involving area, surface area, and volume. Develop an understanding of statistical variability. Summarize and describe distributions.	
Essential Question(s)	
What are the meanings of surface area and volume, and how can surface area and volume be found? What is the relationship between a parallelogram's area and a triangle's area? How can you find the areas of trapezoids and kites? How are area and volume related to a mathematical net? How can data be described? How can tables and graphs represent data and answer questions? How can data be described by a single number? How can tables and graphs be used to represent data and answer questions? How can measures of central tendency be used to predict future events? How do sets of data compare? What are statistical questions, and how can data be used to answer them?	
Standards for Mathematical Practice (MP.) - The practice standards in bold describe expertise to be intentionally developed in this unit.	Kentucky Interdisciplinary Literacy Practices (KILP.) - The practice standards in bold describe expertise to be intentionally developed in Mathematics.
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.	KILP.1 Recognize that text is anything that communicates a message. KILP.2 Employ, develop, and refine schema to understand and create text. KILP.3 View literacy experiences as transactional, interdisciplinary and transformational. KILP.4 Utilize receptive & expressive language arts to better understand self, others, and the world. KILP.5 Apply strategic practices, with scaffolding & then independently, to approach new literacy tasks. KILP.6 Collaborate with others to create new meaning. KILP.7 Utilize digital resources to learn and share with others. KILP.8 Engage in specialized, discipline specific literacy practices. KILP.9 Apply high level cognitive processes to think deeply and critically about text. KILP.10. Develop a literacy identity that promotes lifelong learning.

Common Preconceptions/Misconceptions

Students often need help finding the area of composite figures, even after decomposing them. It may be helpful to have students write the areas of the joined shapes directly in the composite figure to help track the parts. Color coding the decomposition could also help students with their understanding.

Use coordinate points in all four quadrants. Activate students' prior knowledge with negative integers to find points such as (-3, -2).

Remind students that the spread (range) is stated as a **single** number (such as 15 when describing the spread of data for 6 - 21) and describes how the values vary across the data set. The purpose of the number is not the value itself but the interpretation it provides for the variation of the data.

Box plots can seem complicated to some students because of the many steps involved in creating them. Students are just beginning to think statistically, and the focus should be on students learning to describe and summarize statistical data sets (not just the *procedure* of creating graphs).

Additional practice with finding the mean can be helpful (students often forget to divide and what to divide by). Explain the difference between center and variation or variability.

Students may confuse histograms and bar graphs (which leads to difficulty interpreting intervals). Consider displaying histograms and bar graphs side by side with related data and ask students to compare and contrast what can be learned from each graph.

Ensure that students understand observation means sample size or n size and how it relates to numerical data sets. (For example, a data set with 10 data points has 10 observations, or we can say $n = 10$. Make sure students know the difference between intervals and observations.

KAS Standards	Prerequisite Skill, Considerations, and Coherence	Samples of Learning Intentions and Success Criteria
Cluster: Solve real-world and mathematical problems involving area, surface area and volume.		
<p>KY.6.G.1 Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing them into rectangles or decomposing them into triangles and quadrilaterals; apply these techniques in the context of solving real-world and mathematical problems.</p> <p><input type="checkbox"/> Conceptual <input type="checkbox"/> Procedural <input type="checkbox"/> Application</p> <p>MP.1, MP.6, KILP.1, KILP.4, KILP.8</p> <p>Supporting Standard: KY.6.G.2</p>	<p>Considerations: Area of the listed shapes may be thought of as a rectangle with larger area, subtracting the area's exterior to the actual shape to obtain the true area, or as a composite area of smaller triangles and rectangles which sum to the true area of the given shape. Students recognize that given shapes can be combined to find area or decomposed to find area, such as surface area, and one method may be more efficient than the other.</p> <p>Coherence KY.5.NF.4→KY.6.G.1→KY.7.G.6</p>	<p>We are learning to find the area of triangles, quadrilaterals, and polygons.</p> <ul style="list-style-type: none"> ● I can decompose other polygons into standard polygons to find the area. ● I can use formulas to find the area of polygons. ● I can solve real world problems involving areas of polygons.

<p>KY.6.G.4 Classify three-dimensional figures, including cubes, prisms, pyramids, cones, and spheres.</p> <p><input type="checkbox"/> Conceptual <input type="checkbox"/> Procedural <input type="checkbox"/> Application</p> <p>MP.2, MP.3, KILP.1, KILP.2</p>	<p>Considerations: Emphasis is on classifying three-dimensional shapes and specifically the attributes of each shape that make it unique to its classification.</p> <p>Coherence KY.6.G.4→KY.7.G.6</p>	<p>We are learning to classify three-dimensional figures.</p> <ul style="list-style-type: none"> I can identify cubes, prisms, pyramids, cones, and spheres. I can group shapes by their characteristics.
<p>KY.6.G.2 Find the volume of a right rectangular prism with rational number edge lengths. Apply the formulas $V = lwh$ and $V = Bh$ to find volumes of right rectangular prisms with rational number edge lengths in the context of solving real-world and mathematical problems.</p> <p><input type="checkbox"/> Conceptual <input type="checkbox"/> Procedural <input type="checkbox"/> Application</p> <p>MP.2, MP.5, MP.6, KILP.1, KILP.4, KILP.8</p> <p>Coherence KY.5.MD.5→KY.6.G.2→KY.7.G.6</p>		<p>We are learning to apply volume formulas to solve real-world and mathematical problems involving right rectangular prisms.</p> <ul style="list-style-type: none"> I can use formula $V = lwh$ to find volume when the length, width, or height are rational numbers. I can use formula $V = Bh$ to find volume when the area of the base or height are rational numbers.
<p>Cluster: Develop understanding of statistical variability.</p>		
<p>KY.6.SP.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.</p> <p><input type="checkbox"/> Conceptual <input type="checkbox"/> Procedural <input type="checkbox"/> Application</p> <p>MP.1, MP.3, MP.6, KILP.1, KILP.3</p> <p><i>Supporting Standard: KY.6.SP.0</i></p>	<p>Considerations: For example, “How old am I?” is not a statistical question, but “How old are the students in my school?” is a statistical question because one anticipates a variety of values with associated variability in students’ ages.</p> <p>Coherence KY.5.MD.2→KY.6.SP.1→KY.7.SP.1</p>	<p>We are learning to recognize and understand statistical questions.</p> <ul style="list-style-type: none"> I can explain what makes a question statistical. I can determine if a question is statistical or non-statistical.
<p>KY.6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number to describe a typical value. In contrast, a measure of variation describes how the values in the distribution vary.</p> <p><input type="checkbox"/> Conceptual <input type="checkbox"/> Procedural <input type="checkbox"/> Application</p> <p>MP.2, MP.5, MP.6, KILP.1, KILP.7</p> <p><i>Supporting Standard: KY.6.SP.0</i></p>	<p>Considerations: Emphasis is on the sensitivity of measures of center to changes in the data, such as mean is generally much more likely to be pulled towards an extreme value than the median. Additionally, measures of variation (range, interquartile range) describe the data by giving a sense of the spread of data points.</p> <p>Coherence KY.6.SP.3→KY.7.SP.4</p>	<p>We are learning to summarize all values of a set of data with a single number.</p> <ul style="list-style-type: none"> I can determine the mean or average, mode and median of a set of data. I can explain how extreme values can affect measures of center. I can determine measures of variation. I can use measures of variation to describe data, such as range, IQR, and mean absolute deviation.

Cluster: Summarize and describe distributions.		
<p>KY.6.SP.4 Display the distribution of numerical data in plots on a number line, including dot plots, histograms, and box plots.</p> <p><input type="checkbox"/> Conceptual <input checked="" type="checkbox"/> Procedural <input type="checkbox"/> Application</p> <p>MP.6, MP.7, KILP.2, KILP.4, KILP.7</p> <p><i>Supporting Standard: KY.6.SP.0</i></p>	<p>Considerations: Students create the listed graphical representations in the appropriate context and describe the attributes of each.</p> <p>Coherence KY.5.MD.2→KY.6.SP.4→KY.7.SP.1</p>	<p>We are learning to display numerical data using graphical representations.</p> <ul style="list-style-type: none"> ● I can create a box plot to display data. ● I can create a histogram to display data. ● I can create dot plots to display data. ● I can describe attributes of each data display.
<p>KY.6.SP.5 Summarize numerical data sets with their context, such as:</p> <p><input type="checkbox"/> Conceptual <input checked="" type="checkbox"/> Procedural <input type="checkbox"/> Application</p> <p>a. Reporting the number of observations.</p> <p><input type="checkbox"/> Conceptual <input type="checkbox"/> Procedural <input type="checkbox"/> Application</p> <p>b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.</p> <p><input type="checkbox"/> Conceptual <input type="checkbox"/> Procedural <input type="checkbox"/> Application</p> <p>c. Determining quantitative measures of center (median and/or mean) to describe the distribution of numerical data.</p> <p><input type="checkbox"/> Conceptual <input checked="" type="checkbox"/> Procedural <input type="checkbox"/> Application</p> <p>d. Describing distributions of numerical data qualitatively relating to shape (using terms such as cluster, mode(s), gap, symmetric, uniform, skewed-left, skewed-right and the presence of outliers) and quantitatively relating to spread/variability (using terms such as range and interquartile range).</p> <p><input type="checkbox"/> Conceptual <input checked="" type="checkbox"/> Procedural <input type="checkbox"/> Application</p> <p>e. Relating the choice of measures of center and variability to the shape of the data distribution.</p> <p><input type="checkbox"/> Conceptual <input type="checkbox"/> Procedural <input type="checkbox"/> Application</p> <p>MP.3, MP.7, KILP.1, KILP.2, KILP.9</p> <p><i>Supporting Standard: KY.6.SP.2</i></p>	<p>Considerations: Students understand larger numbers of observations create a more accurate statistical representation than smaller numbers of observations.</p> <p>b. Students describe how the data measured relates to answering a statistical question.</p> <p>c. Students know methods of finding measures of center, including finding median in non-ordered sets of data and a mean is a mathematical average.</p> <p>d. Students describe the shape of data by inspection using the terms listed and calculate the range and interquartile range of a set of data.</p> <p>e. Students recognize mean and range are appropriate measures for symmetrical data while the median and interquartile range may be better measures for skewed data.</p> <p>Coherence KY.6.SP.5→KY.7.SP.1</p>	<p>We are learning to summarize numerical sets of data.</p> <ul style="list-style-type: none"> ● I can identify the number of observations for a set of data. ● I can describe how the data measured is related to answering a statistical question. ● I can find a set of data's mean, median, mode, and range. ● I can describe distribution in a data display, using terms such as cluster, gap, symmetric, uniform, skewed-left, skewed-right, and outliers. ● I can describe the spread/variability of the data using terms such as range, IQR, and mean absolute deviation. ● I can explain why choosing certain measures of center or variability are related to the shape of the data.

Supporting Standards

KY.6.SP.0 Apply the four-step investigative process for statistical reasoning. **MP.1, MP.4, Coherence KY.5.MD.2→KY.6.SP.0→KY.7.SP.1**

Conceptual **Procedural** **Application**

a. Formulate Questions: Formulate a statistical question as one that anticipates variability and can be answered with data.

Conceptual **Procedural** Application

b. Collect Data: Design and use a plan to collect appropriate data to answer a statistical question. **Conceptual** **Procedural** Application

c. Analyze Data: Select appropriate graphical methods and numerical measures to analyze data by displaying variability within a group, comparing an individual to an individual, and comparing an individual to a group. Emphasis on understanding and answering a statistical question is completed by an investigative process encompassing questioning, collecting, analyzing, and interpreting the data gathered.

Conceptual **Procedural** **Application**

KY.6.SP.2 Understand that a set of numerical data collected to answer a statistical question has a distribution that can be described by its center, spread, and overall shape. **MP.2, MP.6, MP.7, KILP.1, KILP.7**

Considerations: Students distinguish between graphical representations which are skewed or approximately symmetric; use a measure of center to describe a set of data.

Coherence KY.5.MD.2→KY.6.SP.2→KY.7.SP.3

Conceptual Procedural Application

Essential Vocabulary

vertex/vertices - The point(s) at which two line segments or rays meet to form an angle.

coordinate - One or more numbers that uniquely determine the position of a point or other geometric element on a line, graph, or map.

net - A 2-dimensional figure that can be folded into a polyhedron.

spread - A difference between two figures or totals.

center - the middle. Ex: The center of a circle.

measure of center - A calculation resulting in a central value for a set of data; a mean, median, or mode.

dot plots - The set of all inputs a function accepts.

histograms - A bar graph in which the labels for the bars are numerical intervals, so the bars touch each other.

box plot - A visual displaying data values distribution using the data set's median, quartiles, and extremes. A box shows the middle 50% of the data.

mean - A measure of center in a set of numerical data, computed by adding the values in a list and then dividing by the number of values in the list.

EX: For the data set {1, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the mean is 21.

median - The middle value in a set of data when the data is ordered from the greatest to least EX: The median of 13,7,6,4,2,2,1 is 4.

statistics - The collection, organization, and analysis of data.

variability - Measure of spread. A measure of spread tells us how much a data sample is spread out or scattered.

Benchmark Assessment**Resources****Standard Resource Pages Hyperlinked to Each Standard**[enVision Crosswalk Unit 4](#)[enVision Language Support Handbook](#)[Three Reads Routine](#)[Notice and Wonder Routine](#)[MILC Resources](#)

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

** Mathematical Practices (MP.1- 8) should be evidenced at some point throughout.