Unit 4 Title	**Estimated Time Frame**
Geometry and **Statistics**	**35 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 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. KLIP.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
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. **MP.1, MP.6**	**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. Coherence KY.5.NF.4→KY.6.G.1→KY.7.G.6	We are learning to find the area of parallelograms and rhombuses. **(Lesson 7-1)** ● I can derive the formula for a parallelogram by composing it into a rectangle. ● I can use the formula A = base x height (A=bh) to find the area of parallelograms and rhombuses. ● I can find the height or base of a parallelogram or rhombus when given the area and the base or height. We are learning to find the area of triangles to solve problems. **(Lesson 7-2)** ● I can find the area of triangles using the formula Area = ½ base x height (A=½ bh).

		• I can find the base or height of a triangle given the area and the base or height. We are learning to find the area of trapezoids and kites. **(Lesson 7-3)** • I can break trapezoids and kites into rectangles, parallelograms, and triangles (decompose) to find the area. We are learning to find the area of other polygons. **(Lesson 7-4)** • I can decompose other polygons into standard polygons to find the area. • I can find the area of polygons to solve real-world problems. • I can find the area of polygons on a coordinate plane.
KY.6.G.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems. **MP.4, MP.5, MP.6**	**Considerations:** For example, a gardener draws a map of his garden on a coordinate plane with vertices (-2, 7), (-2, -1), (4, 7). What is the base and height of this triangle? What is the area of his garden, assuming each unit on the coordinate plane is 1 meter? Coherence KY.5.G.2→KY.6.G.3	We are learning to draw polygons on the coordinate plane to solve real-world problems. **(Lesson 2-6)** • I can plot ordered pairs to draw a polygon on a coordinate grid. • I can find the side lengths of a polygon on a coordinate grid by finding the distance between two vertices.
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. **MP.1, MP.3, MP.6**	**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. Coherence KY.5.MD.2→KY.6.SP.1→KY.7.SP.1	We are learning to analyze questions to determine if they are statistical. **(Lesson 8-1)** • I can determine if a question is statistical by evaluating whether it will result in more than one option for a response.
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**	**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	We are learning to describe a set of numerical data that answers a statistical question. **(Lesson 8-7)** • I can describe the center, spread, and overall shape of a set of data. • I can use a measure of center to describe a data set.

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. **MP.2, MP.5, MP.6**	**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. Coherence KY.6.SP.3→KY.7.SP.4	We are learning to summarize all values of a set of data with a single number. **(Lesson 8-2)** ● I can determine the mean or average of a set of data. ● I can determine a set of data's mode, median, and range.
KY.6.SP.4 Display the distribution of numerical data in plots on a number line, including dot plots, histograms, and box plots. **MP.6, MP.7**	**Considerations:** Students create the listed graphical representations in the appropriate context and describe the attributes of each. Coherence KY.5.MD.2→KY.6.SP.4→KY.7.SP.1	We are learning to display numerical data using graphical representations. **(Lessons 8-3, 8-4)** ● I can extend my knowledge of how to find the median to find the first and third quartiles. ● I can display data in a box plot. ● I can analyze and interpret data in a box plot. ● I can organize data into equal intervals and display data in a frequency table or histogram. ● I can interpret and analyze a histogram.
KY.6.SP.5 Summarize numerical data sets with their context, such as: a. Reporting the number of observations. b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. c. Determining quantitative measures of center (median and/or mean) to describe the distribution of numerical data. d. Describing distributions of numerical data qualitatively relating toshape (using terms such as cluster, mode(s), gap, symmetric,uniform,	**Considerations:** Students understand larger numbers of observations create a more accurate statistical representation than smaller numbers of observations. b. Students describe how the data measured relates to answering a statistical question. 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. 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.	We are learning to summarize numerical sets of data. **(Lessons 8-2, 8-4, 8-5, 8-6, and 8-7)** ● I can identify the number of observations for a set of data. ● I can determine a set of data's mean, median, mode, and range. ● I can describe data distribution in a display by relating it to its shape. ● I can describe the spread and clustering of data. ● I can determine outliers of a set of data. ● I can summarize data using measures of variability.

skewed-left, skewed-right and the presence of outliers) and quantitatively relating to spread/variability (using terms such as range and interquartile range). e. Relating the choice of measures of center and variability to the shape of the data distribution. **MP.3, MP.7**	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. Coherence KY.6.SP.5→KY.7.SP.1	

Supporting Standards

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. **(enVision Lesson 7-8) MP.2, MP.5, MP.6, Coherence KY.5.MD.5→KY.6.G.2→KY.7.G.6**

KY.6.G.4 Classify three-dimensional figures, including cubes, prisms, pyramids, cones, and spheres. **(enVision Lessons 7-5 and 7-6) MP.2, MP.3, Coherence KY.6.G.4→KY.7.G.6**
Emphasis is on classifying three-dimensional shapes and specifically the attributes of each shape that make it unique to its classification.

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**
a. Formulate Questions: Formulate a statistical question as one that anticipates variability and can be answered with data.
b. Collect Data: Design and use a plan to collect appropriate data to answer a statistical question.
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. **(enVision Lesson 8-1)**
Emphasis on understanding and answering a statistical question is completed by an investigative process encompassing questioning, collecting, analyzing, and interpreting the data gathered.

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.

Common Assessment

Common Assessment Unit 4 Grade 6 Math

Anchor Resources

***enVision* Topic 7**	***enVision* Topic 8**
MILC - MILC Area, Surface Area, and Volume resources **3-ACT Math Task: That's a Wrap** cubes (link cubes and cm cubes), Variety of Shapes (pattern blocks, shape sets), and rulers. Teaching Tools: Grid Paper TT8,9,&10 Various nets TT17,18,19,20,21,&22	**MILC - MILC Statistics and Data resources** **3-ACT Math Task: Vocal Range** link cubes to conceptualize mean, median, mode; rulers Frequency Tables TT24, Histograms TT25 ****OMIT Lesson 7-7:** Find Surface Area of Pyramids **(Not a grade 6 standard)**

*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.