

Unit 1 Title		Estimated Time Frame
Foundations of Geometry, Parallel and Perpendicular Lines, and Transformations		40 days or 20 blocks
Big Idea (s)		
Geometric figures are named precisely, based on their properties. Algebra and the coordinate plane can be used to solve problems involving geometric concepts.		
Essential Question(s)		
How can properties of polygons, lines, and angles be used to solve problems? How can algebraic ideas be used when expressing geometric properties?		
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, & 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		
<ul style="list-style-type: none">Students may have intuitive but limited ideas of basic geometric terms. For example, they may consider a point a “dot.” Teachers should challenge these notions. Students should recognize that the dot is just a representation of a point, and the point is an exact location.Make sure students understand the definition of parallel lines as “two coplanar lines that never intersect.”Emphasize that opposite reciprocals multiply to $= -1$. (also the definition of perpendicular slope)Remind students that rotations are always counterclockwise, the way of the quadrants.Students connect prior knowledge of the Pythagorean Theorem (Gr 8) to develop the distance and midpoint formulas.Students often view transformations as a “motion.” Encourage students to think of a transformation as <i>a function</i>. That is, it is a rule that		

could be applied to any point in the plane, not just a given figure.

KAS Standards	Considerations	Samples of Learning Intentions and Success Criteria
<p>KY.HS.G.1 Know and apply precise definitions of the language of Geometry:</p> <p>a. Understand properties of line segments, angles, and circles.</p> <p>b. Understand the properties of and differences between perpendicular and parallel lines. MP.3, MP.6</p>	<p>Students in high school start to formalize the intuitive geometric notions they developed in grades 6–8 and give specificity to geometric concepts that can serve as a good basis for developing precise definitions and arguments.</p> <p>a. Students understand a more formal knowledge of postulates, theorems and various properties relating to line segments, angles and circles. This knowledge is based on the undefined notions of point, line, distance along a line and distance around a circular arc.</p> <p>b. Students understand important properties of both parallel and perpendicular lines, prior to making the connections between these types of lines and how they relate to their calculated or given slope.</p>	<p>I am learning to apply definitions in the language of Geometry. (Lesson 1-1)</p> <ul style="list-style-type: none"> • I can define point, line, and plane definitions. • I can apply the Ruler and Segment Addition Postulate • I can apply the Protractor and Angle Addition Postulate • I can identify and apply properties of line segments, angles, and circles. • I can demonstrate understanding by applying properties of points, lines, and planes to segments, angles, and circles to solve problems. <p>I am learning to describe the properties of perpendicular and parallel lines. (Lessons: 2-1, 2-2, 2-3, & 2-4)</p> <ul style="list-style-type: none"> • I can define parallel and perpendicular lines. • I can describe slope and how it relates to linear equations. • I can understand and model the relationship between the properties of slope in parallel and perpendicular lines. • I can demonstrate understanding by applying properties of parallel and perpendicular lines to solve problems.
<p>KY.HS.G.2 Representing transformations in the plane.</p> <p>a. Describe transformations as functions that take points in the plane as inputs and give other points as outputs.</p>	<p>Software, transparencies, etc. may be used to accurately represent congruence transformations in the plane.</p> <p>a. Students understand any point (a,b) can be thought of as an input and any image of point (a,b) can be thought of as the output of a specific transformation function.</p>	<p>I am learning to represent transformations in the plane and describe transformations as functions. (Lesson 3-1, 3-2, 3-3, & 7-1)</p> <ul style="list-style-type: none"> • I can describe transformations as functions that take points in the plane as inputs and give other points as outputs, using appropriate mathematical language and notation.

<p>b. Compare transformations that preserve distance and angle measures to those that do not.</p> <p>c. Given a rectangle, parallelogram, trapezoid, or regular polygon, formally describe the rotations and reflections that carry it onto itself, using properties of these figures. MP.5, MP.7</p>	<p>b. Students make connections between which transformations are a rigid motion (isometry) and which transformations do not have that characteristic. c. Students practice and understand the procedures needed to carry out multiple transformations that carry the figure onto itself, recognizing the important properties of these figures.</p>	<p>I am learning to compare transformations that preserve distance and angle measures to those that do not. (Lesson 3-1, 3-2, 3-3, & 7-1)</p> <ul style="list-style-type: none"> • I can define a rigid transformation. • I can compare and contrast transformations that preserve distance and angle measures to those that do not, using appropriate mathematical language and notation. (i.e., rigid vs. non-rigid) • I can model transformations as functions and describe points in the plane as inputs and outputs. <p>I am learning to use properties of geometric figures to describe rotations and reflections. (Lesson 3-1, 3-2, 3-3, & 3-5)</p> <ul style="list-style-type: none"> • I can define rotation, reflection, translation, and parts of polygons such as vertices, angles, and line segments. • I can describe the rotations and reflections that carry a regular polygon onto itself using appropriate mathematical language and notation. • I can demonstrate my knowledge of congruence and symmetry through transformations.
<p>KY.HS.G.6 Apply theorems for lines, angles, triangles, parallelograms. MP.2, MP.3</p>	<p>Students use previously learned definitions, theorems, postulates and properties of lines, angles, triangles and parallelograms to draw conclusions and to make inferences. Theorems for lines and angles include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.</p>	<p>I am learning to identify and state the theorems related to lines, angles, and triangles. (Lesson 1-4, 1-5 1-6, & 1-7)</p> <ul style="list-style-type: none"> • I can identify the theorems related to lines, angles, and triangles. • I can with accuracy, use appropriate mathematical language and notation when stating theorems related to lines, angles, and triangles.

	<p>Theorems for triangles include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.</p> <p>* Parallelograms in Topic 6</p>	<p>I am learning to apply the theorems related to lines, angles, and triangles to solve problems. (Lesson 1-4, 1-5 1-6, & 1-7)</p> <ul style="list-style-type: none"> I can explain and apply the theorems related to lines, angles, and triangles with examples to illustrate their meaning. I can create problems that involve the theorems related to lines, angles, triangles, and parallelograms.
<p>KY. HS.G.23 Find measurements among points within the coordinate plane.</p> <p>a. Use points from the coordinate plane to find the coordinates of a midpoint of a line segment and the distance between the endpoints of a line segment.</p> <p>b. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.</p> <p>MP.2, MP.8</p>	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$	<p>I am learning to find measurements among points in the coordinate plane by using specific techniques such as the midpoint and distance formula within a coordinate plane.</p> <ul style="list-style-type: none"> I can locate points on the coordinate plane and understand the concept of a line segment. I can calculate the midpoint of a line segment using the formula. I can calculate the distance between the endpoints of a line segment using the distance formula. <p>I am learning to find the point on a directed line segment between two given points that partition the segment in a given ratio. (Lesson 1-3)</p> <ul style="list-style-type: none"> I can use the distance formula and ratios to partition a segment. I can apply these techniques to solve real-world problems related to measurements among points in the coordinate plane.

Supporting Standards

Emphasis is on congruence transformations that preserve corresponding congruent lines, segments, and angles.

KY.HS.G.3 (+) Develop formal definitions of rotations, reflections and translations in terms of angles, circles, perpendicular lines, parallel lines and line segments. **MP.6, MP.7**

KY.HS.G.4 Understand the effects of transformations of geometric figures.

- Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure.
- Specify a sequence of transformations that will carry a given figure onto another.
- Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure. Given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.

MP.2, MP.8

KY.HS.G.7 Prove theorems about geometric figures.

- Construct formal proofs to justify theorems for lines, angles and triangles.
- (+) Construct formal proofs to justify theorems for parallelograms. **MP.6, MP.7**

KY.HS.G.22 Justify and apply the slope criteria for parallel and perpendicular lines and use them to solve geometric problems. **MP.3, MP.7**

Essential Vocabulary, Theorems, and Postulates

Essential Vocabulary by Topic	Essential Theorems/Postulates by Topic
Foundational: congruent, collinear points, coplanar points, line, segment, angle, ray, point, Postulate, Theorem, midpoint, perpendicular, bisect, angle bisector, perpendicular bisector, conditional statement, hypothesis, conclusion, vertical angles, linear pair, complementary, supplementary,	Segment Addition Postulate Angle Addition Postulate Vertical Angle Theorem Linear Pair Theorem

right angle, acute angle, obtuse angle	
Lines: parallel, coplanar, transversal, corresponding angles, alternate exterior angles, alternate interior angles, same-side interior angles	Same-Side Interior Angles Postulate Alternate Interior Angles Theorem Corresponding Angles Theorem Alternate Exterior Angles Theorem Parallel lines have equal slopes Perpendicular lines have opposite reciprocal slopes (in other words, the product of slopes equals -1)
Transformation: rigid motion, preimage, image, reflection, rotation, translation, vector, component form, composition of transformations, glide reflection, dilation, scale factor, line of symmetry, rotational symmetry, point symmetry	Reflection in x-axis Reflection in y-axis Reflection in $y = x$ Rotation 90° counterclockwise about origin Rotation 270° counterclockwise about origin Rotation 180° about origin Translations (left/right/up/down) Compositions of transformations (including glide reflection) Dilations (enlarge/reduce)

Common Assessment

Common Assessment Unit 1 Geometry

Anchor Resources

enVision Topic 1 - Foundations of Geometry	enVision Topic 2 - Parallel and Perpendicular Lines	enVision Topic 3 - Transformations
MILC Resources - MILC - Foundations of Geometry Topic Resources 3 ACT Math Task (one per unit) The Mystery Spokes (use with review or as “anytime” activity after 1-3)	MILC Resources - MILC - Parallel and Perpendicular Topic Resources 3 ACT Math Task (one per unit) - Parallel Paving Company (after 2-4)	MILC Resources - MILC - Transformation Topic Resources 3 ACT Math Task (one per unit) The Perplexing Polygon (use with review or as “anytime” activity)

<p>Note:</p> <ul style="list-style-type: none"> • Include noncollinear and noncoplanar points • Review supplements and complements with properties of vertical angles (1-7) • Include angle bisector problems with midpoint and distance problems (section 1-3) (used briefly in 1–2 but will need to supplement) 	<p>STEM (one per semester) “Build a Roof” (construction/pitch...) recommended (include 2 minute NBC video)</p> <p>Note:</p> <ul style="list-style-type: none"> • Given a diagram students will justify their reasoning as to whether or not the lines are parallel • Supplement classifying triangles by sides and angles • Make sure to emphasize that opposite reciprocals multiply to $= -1$ 	<p>Note:</p> <ul style="list-style-type: none"> • Remember rotations are always counterclockwise. • Remember to complete the transformations in reverse order from the notation. • *If pressed for time, 7-1 can be taught 2nd semester with Topic 7. • Only use dilations from the origin. • Software, transparencies, etc., may be used to accurately represent congruence transformations in the plane. <p>Formative Assessment Lesson (FAL) - (one per semester as a minimum) FAL - FAL: Representing and Combining Transformations</p>
--	--	---

*For teachers wanting to use a cumulative review throughout the year for Algebra I skills - the following Formative Assessment Lessons (FALs) are recommended:

Formative Assessment Lesson (FAL) - (one per semester as a minimum) examples to include:

FAL - [Interpreting Algebraic Expressions](#)

FAL - [Solving Linear Equations in One Variable](#) — [Solving Linear Equations in One Variable](#)

FAL - [Solving Linear Equations in Two Variables](#)

*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.