Geometry Unit 1: Relationships

Stage 1 Desired Results

ESTABLISHED GOALS:

Competencies:

- ***Students will demonstrate the ability to apply and extend mathematical properties in order to solve problems.***
- ***Students will demonstrate the ability to communicate and justify reasoning in order to support mathematical arguments.***

Content Standards:

- A.CED.1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
- A.CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- A.CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
- A.REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- G.CO.1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
- G.CO.2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and

Transfer

*Students will be able to independently use their learning to **model the world and solve problems.***

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- two dimensional and three dimensional objects are related to each other
- the relationships between parts of a geometric figure determine characteristics and classifications of those figures.

ESSENTIAL QUESTIONS

- How do we prove a statement is true?
- How do we prove relationships?

Acquisition

Students will know…

- that two dimensional and three dimensional objects are related to each other.
- that relationships exist between the sides of similar right triangles.
- that relationships between angles determine whether lines are parallel.
- that angle relationships determine properties about triangles.
- that a quadrilateral can be classified based on the relationship between its diagonals.
- that circles define relationships among segments, angles, and arcs.
- that segment, angle, and triangle congruence are reflexive, symmetric, and transitive.
- the Laws of Sines and Cosines
- that the radius of a circle is perpendicular to the tangent where the radius intersects the circle.
- that the length of the arc intercepted by an angle is proportional to the radius, and define

Students will be skilled at…

- creating equations and inequalities in one variable and using them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
- creating equations in two or more variables to represent relationships between quantities.
- graphing equations on coordinate axes with labels and scales.
- rearranging formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
- solving linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- verifying experimentally the properties of dilations given by a center and a scale factor:.
- using the definition of similarity in terms of similarity transformations to decide if they are similar.
- explaining using similarity transformations the meaning of similarity for triangles as the

angle to those that do not (e.g., translation versus horizontal stretch).
- G.CO.3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
- G.CO.4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
- G.CO.5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
- G.CO.6. 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.
- G.CO.7. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
- G.CO.8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
- G.CO.9. Prove theorems about lines and angles. Theorems 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.
- G.CO.10. Prove theorems about triangles. Theorems 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.
- G.CO.11. Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.

the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.
- the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.

Theorems, Corollaries, and properties: Right Angle Congruence Theorem, Congruent Supplements Theorem, Congruent Complements Theorem, Vertical Angle Congruence Theorem, Corresponding Angles Theorem, Alternate Interior Angles Theorem, Alternate Exterior Angles Theorem, Consecutive Interior Angles Theorem, Corresponding Angles Converse, Alternate Interior Angles Converse, Alternate Exterior Angles Converse, Consecutive Interior Angles Converse, Transitive Property of Parallel Lines, Linear Pair Perpendicular Theorem, Perpendicular Transversal Theorem, Lines Perpendicular to a Transversal Theorem, Slopes of Parallel Lines, Slopes of Perpendicular Lines, Triangle Sum Theorem, Exterior Angle Theorem, Corollary to the Triangle Sum Theorem, Third Angles Theorem, SAS Congruence Theorem, SSS Congruence Theorem, HL Congruence Theorem, ASA Congruence Theorem, AAS Congruence Theorem, Third Angles Theorem, Base Angles theorem, Converse of the Base Angles Theorem, Corollary to the Base Angles Theorem, Corollary to the Converse of the Base Angles theorem, Circumcenter Theorem, Incenter Theorem, Centroid Theorem, Triangle Midsegment Theorem, Triangle Longer Side Theorem, Triangle Larger Angle Theorem, Triangle Inequality Theorem, Hinge Theorem, Converse of the Hinge Theorem, AA Similarity Theorem, SSS similarity theorem, SAS Similarity Theorem, Triangle Proportionality Theorem, Converse of the Triangle Proportionality Theorem, Triangle Angle Bisector Theorem, Pythagorean Theorem, Converse of the Pythagorean Theorem, Pythagorean Inequalities Theorem, 45-45-90 Triangle Theorem, 30-60-90 Triangle Theorem, Right Triangle Similarity Theorem, Geometric Mean (Altitude) Theorem, Geometric Mean (Leg) Theorem, Law of Sines, Law of Cosines,

equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
- using the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
- proving theorems about triangles.
- using congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
- recognizing that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
- explaining and using the relationship between the sine and cosine of complementary angles.
- using trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
- proving the Laws of Sines and Cosines and use them to solve problems.
- applying the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).
- proving that all circles are similar.
- identifying and describing relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.
- deriving using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.
- using coordinates to prove simple geometric theorems algebraically.
- finding the point on a directed line segment between two given points that partitions the segment in a given ratio.

● G.SRT.1. Verify experimentally the properties of dilations given by a center and a scale factor: ○ G.SRT.1a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. ○ G.SRT.1b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor. ● G.SRT.2. Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides. ● G.SRT.3. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. ● G.SRT.4. Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity. ● G.SRT.5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. ● G.SRT.6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. ● G.SRT.7. Explain and use the relationship between the sine and cosine of complementary angles. ● G.SRT.8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. ● G.SRT.10. (+) Prove the Laws of Sines and Cosines and use them to solve problems. ● G.SRT.11. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces). ● G.C.1. Prove that all circles are similar. ● G.C.2. Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and	Polygon Interior Angle Theorem, Corollary to Polygon Interior Angles Theorem, Polygon Exterior Angles Theorem, Parallelogram Opposite Sides, Parallelogram Opposite Angles Theorem, Parallelogram Consecutive Angles Theorem, Parallelogram Diagonals theorem, Parallelogram Opposite Sides Converse, Parallelogram Opposite Angles Converse, Opposite Sides Parallel and Congruent Theorem, Parallelogram Diagonals Converse, Rhombus Corollary, Rectangle Corollary, Square Corollary, Rhombus Diagonals theorem, Rhombus Opposite Angles Theorem, Rectangle Diagonals Theorem, Isosceles Trapezoid Base Angles Theorem, Isosceles Trapezoid Base Angles Converse, Isosceles Trapezoid Diagonals Theorem, Trapezoid Midsegment Theorem, Kite Diagonals Theorem, Kite Opposite Angles Theorem. *vocabulary:* point, line segment, line, endpoint, distance, ray, plane, congruent, intersection, collinear, construction, coplanar, midpoint, bisector, angle, acute angle, obtuse angle, right angle, straight angle, linear pair, complementary angles, supplementary angles, adjacent angles, vertex, vertical angles, inscribed angles, radii, and chords. central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. kite, midsegment of a trapezoid, parallelogram, rhombus, square, trapezoid, isosceles trapezoid, diagonal	● using coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. ● giving an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. ● using volume formulas for cylinders, pyramids, cones, and spheres to solve problems. ● using geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). ● applying concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ● applying 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). ● knowing precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. ● Representing transformations in the plane using, e.g., paper; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). ● describing congruence transformations given a rectangle, parallelogram, trapezoid, or regular polygon ● developing definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. ● specifying a sequence of transformations that will carry a given figure onto another. Given a geometric figure and a rotation, reflection, or

circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle. ● G.C.5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector. ● G.GPE.4. Use coordinates to prove simple geometric theorems algebraically. ● G.GPE.6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio. ● G.GPE.7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. ● G.GMD.1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. ● G.GMD.3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. ● G.MD.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.MD.2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ● G.MD.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).		translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. ● Using 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. ● Using the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. ● explaining how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. ● Proving theorems about lines and angles. Theorems 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. ● Proving theorems about triangles. Theorems 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. ● Proving theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.
Content Area Literacy Standards		***21st Century Skills***
● RH 9-10.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. ● RST 9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context		● ***Solve Problems*** ● ***Communicate clearly*** ● ***Collaborate with others***

● RST. 9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. ● WHST.9-10.1 Write arguments focused on *discipline-specific content*. ● WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	● ***Be self-directed learners*** ● ***Reason effectively***

Geometry Unit 2: Logic

Stage 1 Desired Results

ESTABLISHED GOALS:

Competencies:

- ***Students will demonstrate the ability to apply and extend mathematical properties in order to solve problems.***
- ***Students will demonstrate the ability to communicate and justify reasoning in order to support mathematical arguments.***

Content Standards:

- A.REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution.
- G.CO.1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
- G.CO.7. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
- G.CO.8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
- G.CO.9. Prove theorems about lines and angles. Theorems 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.
- G.CO.10. Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to

Transfer

Students will be able to independently use their learning to ***analyze patterns, determine reasonable conclusions and justify with viable arguments .***

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- there are multiple types of reasoning
- arguments must be viable
- triangle congruence

ESSENTIAL QUESTIONS

- What is reason?
- How do we reason?
- What is truth?

Acquisition

Students will know…

- the properties of equality include;
  - addition, subtraction, multiplication, division, reflexive, symmetric, transitive, and substitution
- that proofs can be written in a variety of ways including: two-column, paragraph, and flow-chart.
- that triangles can be proven to be congruent or similar depending on given information.
- that all circles can be proven to be similar.
- that some circles can be proven to be congruent.

Students will continue to know...

Theorems, Corollaries, and properties: Right Angle Congruence Theorem, Congruent Supplements Theorem, Congruent Complements Theorem, Vertical Angle Congruence Theorem, Corresponding Angles Theorem, Alternate Interior Angles Theorem, Alternate Exterior Angles Theorem, Consecutive Interior Angles Theorem, Corresponding Angles Converse, Alternate Interior Angles Converse, Alternate Exterior Angles Converse, Consecutive Interior Angles Converse, Transitive Property of Parallel Lines, Linear Pair

Students will be skilled at…

- explaining each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution.
- knowing precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
- using the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
- explaining how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
- proving theorems about lines and angles.
- proving theorems about triangles.
- proving theorems about parallelograms.
- proving theorems about triangles.

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. ● G.CO.11. Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals. ● G.SRT.4. Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity. ● G.SRT.5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. ● G.C.3. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.	Perpendicular Theorem, Perpendicular Transversal Theorem, Lines Perpendicular to a Transversal Theorem, Slopes of Parallel Lines, Slopes of Perpendicular Lines, Triangle Sum Theorem, Exterior Angle Theorem, Corollary to the Triangle Sum Theorem, Third Angles Theorem, SAS Congruence Theorem, SSS Congruence Theorem, HL Congruence Theorem, ASA Congruence Theorem, AAS Congruence Theorem, Third Angles Theorem, Base Angles theorem, Converse of the Base Angles Theorem, Corollary to the Base Angles Theorem, Corollary to the Converse of the Base Angles theorem, Circumcenter Theorem, Incenter Theorem, Centroid Theorem, Triangle Midsegment Theorem, Triangle Longer Side Theorem, Triangle Larger Angle Theorem, Triangle Inequality Theorem, Hinge Theorem, Converse of the Hinge Theorem, AA Similarity Theorem, SSS similarity theorem, SAS Similarity Theorem, Triangle Proportionality Theorem, Converse of the Triangle Proportionality Theorem, Triangle Angle Bisector Theorem, Pythagorean Theorem, Converse of the Pythagorean Theorem, Pythagorean Inequalities Theorem, 45-45-90 Triangle Theorem, 30-60-90 Triangle Theorem, Right Triangle Similarity Theorem, Geometric Mean (Altitude) Theorem, Geometric Mean (Leg) Theorem, Law of Sines, Law of Cosines, Polygon Interior Angle Theorem, Corollary to Polygon Interior Angles Theorem, Polygon Exterior Angles Theorem, Parallelogram Opposite Sides, Parallelogram Opposite Angles Theorem, Parallelogram Consecutive Angles Theorem, Parallelogram Diagonals theorem, Parallelogram Opposite Sides Converse, Parallelogram Opposite Angles Converse, Opposite Sides Parallel and Congruent Theorem, Parallelogram Diagonals Converse, Rhombus Corollary, Rectangle Corollary, Square Corollary, Rhombus Diagonals theorem, Rhombus Opposite Angles Theorem, Rectangle Diagonals Theorem, Isosceles Trapezoid Base Angles Theorem, Isosceles Trapezoid Base Angles Converse, Isosceles Trapezoid Diagonals Theorem, Trapezoid Midsegment Theorem, Kite Diagonals Theorem, Kite Opposite Angles Theorem, Measure of an Inscribed Angle Theorem, Inscribed Angles of a Circle Theorem,	● using congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. ● proving properties of angles for a quadrilateral inscribed in a circle

	vocabulary: point, line segment, line, endpoint, distance, ray, plane, congruent, intersection, collinear, construction, coplanar, midpoint, bisector, angle, acute angle, obtuse angle, right angle, straight angle, linear pair, complementary angles, supplementary angles, adjacent angles, vertex, vertical angles, inscribed angles, radii, and chords. central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. kite, midsegment of a trapezoid, parallelogram, rhombus, square, trapezoid, isosceles trapezoid, diagonal (...previous from Unit 1) angle, vertical angle, bisector, circle, perpendicular line, parallel line, line segment, point, line, distance along a line, distance around a circular arc, rigid motion, triangle, corresponding parts, corresponding angles, congruent angles, congruent segments, diagonal, interior, exterior, base angles, sum, midpoint, transversal, parallel, equidistant, medians, quadrilateral, inscribed, congruent, similar, parallelogram,	
Content Area Literacy Standards		***21st Century Skills***
● RH 9-10.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. ● RST 9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context ● RST. 9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. ● WHST.9-10.1 Write arguments focused on *discipline-specific content*. ● WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.		● ***Solve Problems*** ● ***Communicate clearly*** ● ***Collaborate with others*** ● ***Be self-directed learners*** ● ***Reason effectively***

Geometry Unit 3: Constructions

Stage 1 Desired Results

ESTABLISHED GOALS:

Competencies:

- ***Students will demonstrate the ability to apply and extend mathematical properties in order to solve problems.***
- ***Students will demonstrate the ability to communicate and justify reasoning in order to support mathematical arguments.***

Content Standards:

- G.CO.12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.
- G.CO.13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
- G.C.3. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
- G.C.4. (+) Construct a tangent line from a point outside a given circle to the circle.

Transfer

Students will be able to independently use their learning to ***justify the congruent relationships of sides, angles, and polygons by using a variety of tools.***

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- geometric figures can be congruent.
- congruent segments and angles have equal measures.

ESSENTIAL QUESTIONS

- How are constructions and transformations used to measure or assess precision?

Acquisition

Students will know…

- that a geometric construction is a method to show congruence without the use of numbers.
- that there are a variety of tools and methods for making geometric constructions including but not limited to compass and straightedge, string, reflective devices, paper folding, dynamic geometric software
- that geometric figures can be congruent.
- that congruent segments have equal measures.
- that congruent angles have equal angle measure.
- that congruent parts of a polygon map to its congruent parts under a rotation or reflection.
- that corresponding parts of congruent polygons are congruent.

Students will be skilled at…

- making formal geometric constructions with a variety of tools and methods.
- copying a segment.
- copying an angle.
- bisecting a segment.
- bisecting an angle.
- constructing perpendicular lines, including the perpendicular bisector of a line segment.
- constructing a line parallel to a given line through a point not on the line.
- constructing an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
- constructing the inscribed and circumscribed circles of a triangle.
- constructing a tangent line from a point outside a given circle to the circle.

	vocabulary: constructions, segment, bisect, perpendicular, parallel, inscribed, circumscribed, tangent, angle, line, triangle, square, hexagon, circle, equilateral,	
Content Area Literacy Standards		***21st Century Skills***
• RH 9-10.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. • RST 9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context • RST. 9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. • WHST.9-10.1 Write arguments focused on *discipline-specific content*. • WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.		• ***Solve Problems*** • ***Communicate clearly*** • ***Collaborate with others*** • ***Be self-directed learners*** • ***Reason effectively***