

Statewide Framework Document for:

270301 Applied Geometry

Standards may be added to this document prior to submission but may not be removed from the framework to meet state credit equivalency requirements. Performance assessments may be developed at the local level. In order to earn state approval, performance assessments must be submitted within this framework. **This course is eligible for one credit of Geometry.** Washington Mathematics Standards (Common Core State Standards) support foundational mathematical knowledge and reasoning. While it is important to develop a conceptual understanding of mathematical topics and fluency in numeracy and procedural skills, teachers should also focus on the application of mathematics to career fields to support the three (3) key shifts of CCSS. The Standards for Mathematical Practice develop mathematical habits of mind and are to be modeled and integrated throughout the course.

School District Name	
Course Title: Applied Math Geometry	Total Framework Hours: 180
CIP Code: 270301 <input checked="" type="checkbox"/> Exploratory <input type="checkbox"/> Preparatory	Date Last Modified: March 12, 2021
Career Cluster: Science, Technology, Engineering and Math	Cluster Pathway: Science and Math
<p>Course Summary: Applied Geometry is designed to formalize and further develop the geometric knowledge students' have attained through their previous educational and life experiences. The course will encompass the study of the basic elements of plane geometry and into the complexities of solid geometry. Applied Geometry utilizes an application based experiential approach to instruction and learning. This course will focus on all the high school geometry standards in the Common Core State Standards for Mathematics (CCSSM) while reinforcing previously learned CCSSM. The course will also introduce standards from CCSSM in functions and statistics where applicable.</p> <p>This course will include comprehensive investigations of stimulating simple and complex geometric situations derived from engaging and challenging actual world circumstances. These inspiring situations will heighten interest levels in order to promote in-depth understanding of the interconnected geometric relationships of the world and universe we live in. Through these explorations, students will recognize and properly identify the geometry throughout the universe. Students will also achieve through discovery an essential well-rounded knowledge of trigonometry and its practical applications. Subsequently, students will achieve the ability to express geometric connections in mathematical terms utilizing proper terminology and equations. The relevant and enticing experiences that students participate in will promote their desires to learn thereby enhancing their problem-solving abilities, challenging them to think analytically, critically and creatively while applying deductive and inductive reasoning skills. Applied Geometry will result in students' achieving excellent abilities to articulate and demonstrate both a theoretical and pragmatic knowledge of Geometry.</p> <p>Industries and careers where geometry skills and competencies are essential will be explored throughout the course.</p>	
Eligible for Equivalent Credit in: Geometry	Total Number of Units: 8

Course Resources:

[Washington Applied Math Council](#)

[Math Open Reference](#)

[Math is Fun](#)

Additional resources to be developed at the local level.

Unit 1: Measuring in US Standard and Metric/Precision Measurement

Total Learning Hours for Unit: 10

Unit Summary: Students will be able to:

- Use the common measurement units for length, area, volume, capacity, and weight in US Standard units.
- Use the common measurement units for length, area, volume, capacity, and weight in Metric units.
- Convert measurement units from one form to another and carry out calculations that involve a variety of units.
- Use appropriate tools to accurately measure objects and to solve problems that involve these measurements.
- Distinguish between counting and measuring; precision and accuracy.
- Read and write measurements to show precision and tolerance. Use significant digits to indicate the accuracy of a measurement.
- Write and solve absolute value inequalities to determine tolerance.
- Use precision tools to take accurate measurements.
- Calculate with measurements and round the results.
- Develop a lab or activity using measuring in US Standard and Metric units with precision to be presented to the class.
- Explore careers where conversion and precision measurement are applicable skills.

Performance Assessments: *These can be locally developed or use the suggested assessments below.*

Students will be able to synthesize information from a variety of instructional and technological experiences. These will include (but are not limited to) labs, experiments, skill-drills, hands-on practice with calculators and other tools of mathematics, diagnostic (written) testing, group projects, problem-solving techniques, unit quizzes, as well as formative and summative assessments.

Link to OSPI document [Creating Performance Assessments - Framework Development](#) (pdf)

Examples:

- Explain and demonstrate knowledge on how to convert between the US Standard and Metric system.
- Complete a lab on measurement skills using rulers, compass, protractor, tape measure, calipers, and micrometers.
- Use measurement tools to explore measurement skills, precision, and accuracy.
- Develop a lab or activity incorporating the use of both US standard and Metric units of precision measurement including conversions to be presented to the class.

Leadership Alignment: 21st Century Skills (*identify leadership component being utilized within this space; for example, FFA, DECA, TSA, etc.*)

Note: All skills can be applied to CTSO Program and Equivalent Activities at the High School Level.

- 1B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes.
- 2C.5 Reflect critically on learning experiences and processes.
- 2D.2 Identify and ask significant questions that clarify various points of view and lead to better solutions.
- 3B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member.
- 7A.1 Adapt to varied roles, jobs responsibilities, schedules and contexts.

Industry Standards and/or Competencies: This course in Applied Geometry is not industry specific. Geometry is utilized in a vast array of the world's industries. The standards and competencies vary widely throughout these industries. It would be a daunting task to compile an all-encompassing list of their standards and competencies. Therefore, throughout the Unit students will discuss and explore industries and careers where conversion and precision measurement are essential.

Aligned Washington State Academic Standards

Mathematics: Common Core	HS.N.Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. HS.N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. HS.N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Mathematical Practices	MP1 Make sense of problems and persevere in solving them. MP2 Reason abstractly and quantitatively. MP3 Construct viable arguments and critique the reasoning of others. MP4 Model with mathematics. MP5 Use appropriate tools strategically. MP6 Attend to precision. MP7 Look for and make use of structure. MP8 Look for and express regularity in repeated reasoning.

Unit 2: Lines, Angles, and Triangles	Total Learning Hours for Unit: 20
<p>Unit Summary: Students will be able to:</p> <ul style="list-style-type: none"> • Demonstrate knowledge of the undefined terms of geometry. • Name the different parts of lines and angles. • Recognize parallel and perpendicular lines. • Define coordinate plane. • Define coplanar. • Utilize ordered pairs to locate/describe points on a coordinate plane as unions, intersections, or complements of other events ("or," "and," "not"). • Construct lines, angles, and triangles using a variety of tools and techniques. • Explore curved lines to include sine waves, amplitude, period, midline. • Measure line segments and angles. • Construct lines and angles to produce parallel and perpendicular lines. • Prove geometric theorems involving lines, angles, and triangles. • Develop a lab or activity using lines, angles, or triangles to be presented to the class using multiple representations including graphs, etc. • Explore careers where the understanding and application of properties of lines and angles are applicable. 	
<p>Performance Assessments: <i>These can be locally developed or use the suggested assessments below.</i></p> <p>Students will be able to synthesize information from a variety of instructional and technological experiences. These will include (but are not limited to) labs, experiments, skill-drills, hands-on practice with calculators and other tools of mathematics, diagnostic (written) testing, group projects, problem-solving techniques, unit quizzes, as well as formative and summative assessments.</p> <p>Link to OSPI document Creating Performance Assessments - Framework Development (pdf)</p> <p>Examples:</p> <ul style="list-style-type: none"> • Use protractor, ruler, compass to construct lines, angles, parallel lines, bisectors, midpoints, perpendicular lines, etc. • Complete exercises using patty paper to identify different types of lines, angles, and triangles. • Participate in a scavenger hunt to identify different concepts taught. 	
<p>Leadership Alignment: 21st Century Skills (<i>identify leadership component being utilized within this space; for example, FFA, DECA, TSA, etc.</i>)</p> <p>Note: All skills can be applied to CTSO Program and Equivalent Activities at the High School Level.</p> <ul style="list-style-type: none"> 2A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation. 2C.3 Synthesize and make connections between information and arguments. 2D.2 Identify and ask significant questions that clarify various points of view and lead to better solutions. 3A.5 Communicate effectively in diverse environments (including multi-lingual). 7B.1 Incorporate feedback effectively. 8A.3 Utilize time and manage workload efficiently. 	
<p>Industry Standards and/or Competencies: This course in Applied Geometry is not industry specific. Geometry is utilized in a vast array of the world's industries. The standards and competencies vary widely throughout these industries. It would be a daunting task to compile an all-encompassing list of their standards and competencies. Therefore, throughout the Unit students will discuss and explore careers where the understanding and application of properties of lines and angles are applicable.</p>	
<p>Aligned Washington State Academic Standards</p>	

<p>Mathematics: Common Core</p>	<p>HS.F.IF.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.</p> <p>HS.F.IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.</p> <p>HS.F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*</p> <p>HS.F.IF.7a Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> <p>HS.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.</p> <p>HS.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.</p> <p>HS.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.</p> <p>HS.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.</p> <p>HS.S.CP.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").</p>
<p>Mathematical Practices</p>	<p>MP1 Make sense of problems and persevere in solving them.</p> <p>MP2 Reason abstractly and quantitatively.</p> <p>MP3 Construct viable arguments and critique the reasoning of others.</p> <p>MP4 Model with mathematics.</p> <p>MP5 Use appropriate tools strategically.</p> <p>MP6 Attend to precision.</p> <p>MP7 Look for and make use of structure.</p> <p>MP8 Look for and express regularity in repeated reasoning.</p>

Unit 3: Two Dimensional Figures**Total Learning Hours for Unit: 30****Unit Summary:** Students will be able to:

- Identify and define common geometric figures (such as rectangles, squares, triangles, parallelograms, trapezoids, polygons, circles, ellipses, parabolas, and hyperbola).
- recognize geometric figures within real life objects.
- Construct circles, quadrilaterals, and polygons using the tools of geometry.
- Calculate the perimeter and the area of common geometric figures.
- Calculate the circumference and area of circles with use of area of sectors.
- Understand and apply theorems about circles to solve real-world problems.
- Determine the relationship between the measure of a central angle and the measure of its intercepted arc.
- Use properties of chords to solve problems.
- Find the length of an arc given the central angle and the radius.
- Use the sum of the measures of a quadrilateral's interior angles to solve problems.
- Use properties of parallelograms to solve problems.
- Use the properties of trapezoids to solve problems.
- Use the mid-segment theorems for trapezoids and triangles to solve problems.
- Classify polygons by the number of sides and vertices.
- Classify polygons as: regular or irregular; concave, convex, or complex.
- Find the sum of the measures of the interior angles of a convex polygon.
- Find the measure of each interior and exterior angle of a regular polygon.
- Use the sum of the measures of a convex polygon's exterior angles to solve problems.
- Develop a lab or activity using two dimensional figures to be presented to the class
- Explore careers where the understanding and application of properties of two-dimensional figures are relevant.

Performance Assessments: *These can be locally developed or use the suggested assessments below.*

Students will be able to synthesize information from a variety of instructional and technological experiences. These will include (but are not limited to) labs, experiments, skill-drills, hands-on practice with calculators and other tools of mathematics, diagnostic (written) testing, group projects, problem-solving techniques, unit quizzes, as well as formative and summative assessments.

Link to OSPI document [Creating Performance Assessments - Framework Development](#) (pdf)

Examples:

- Explain and use the formulas for perimeter, circumference, and area of two-dimensional figures.
- Sort and classify polygons by their characteristics.
- Create plans for a miniature golf course using specific area and perimeter constraints.
- Calculate the cost to redo flooring and wall treatments in a house.
- Develop a lab or activity using two dimensional figures to be presented to the class.

Leadership Alignment: 21st Century Skills (*identify leadership component being utilized within this space; for example, FFA, DECA, TSA, etc.*)

Note: All skills can be applied to CTSO Program and Equivalent Activities at the High School Level.

2B.1 Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems.

4A.2 Evaluate information critically and competently.

4B.1 Use information accurately and creatively for the issue or problem at hand.

6A.1 Use technology as a tool to research, organize, evaluate and communicate information.

8B.1 Monitor, define, prioritize and complete tasks without direct oversight.

8C.4 Reflect critically on past experiences in order to inform future progress.

Industry Standards and/or Competencies: This course in Applied Geometry is not industry specific. Geometry is utilized in a vast array of the world's industries. The standards and competencies vary widely throughout these industries. It would be a daunting task to compile an all-encompassing list of their standards and competencies. Therefore, throughout the Unit students will discuss and explore careers where the understanding and application of properties of two-dimensional figures are applicable.

Aligned Washington State Academic Standards

Mathematics: Common Core

HS.F.TF.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.*

HS.F.TF.8 Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.

HS.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.

HS.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.

HS.G.CO.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

HS.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.

HS.G.C.1 Prove that all circles are similar.

HS.G.C.2 Identify and describe 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.

HS.G.C.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.

HS.G.C.4 (+) Construct a tangent line from a point outside a given circle to the circle.

Find arc lengths and areas of sectors of circles

HS.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.

HS.G.MG.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).*

Mathematical Practices	<p>MP1 Make sense of problems and persevere in solving them.</p> <p>MP2 Reason abstractly and quantitatively.</p> <p>MP3 Construct viable arguments and critique the reasoning of others.</p> <p>MP4 Model with mathematics.</p> <p>MP5 Use appropriate tools strategically.</p> <p>MP6 Attend to precision.</p> <p>MP7 Look for and make use of structure.</p> <p>MP8 Look for and express regularity in repeated reasoning.</p>
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Unit 4: Three Dimensional Figures	Total Learning Hours for Unit: 20
<p>Unit Summary: Students will be able to:</p> <ul style="list-style-type: none"> • Identify Polyhedrons (Platonic Solids), Prisms, Pyramids • Identify cylinders, cones, spheres, and tori. • Understand and apply theorems about cylinders, rectangular solids, cones, and spheres to solve real-world problems. • Calculate surface area and volume for cylinders, rectangular solids, cones and spheres. • Explain volume formulas and use them to solve problems. • Articulate the relationship between two-dimensional and three-dimensional objects. • Apply Cavalier's Principle for volume to solid figures. • Develop a lab or activity using three dimensional figures to be presented to the class • Explore careers where the understanding and application of properties of three-dimensional figures are applicable. 	
<p>Performance Assessments: <i>These can be locally developed or use the suggested assessments below.</i></p> <p>Students will be able to synthesize information from a variety of instructional and technological experiences. These will include (but are not limited to) labs, experiments, skill-drills, hands-on practice with calculators and other tools of mathematics, diagnostic (written) testing, group projects, problem-solving techniques, unit quizzes, as well as formative and summative assessments.</p> <p>Link to OSPI document Creating Performance Assessments - Framework Development (pdf)</p> <p>Examples:</p> <ul style="list-style-type: none"> • Explain and use the different formulas for surface area and volume of polyhedrons. • Explore the concepts of vertices, edges, and faces using a toothpick and modeling clay (or marshmallows). • Construct three-dimensional figures using paper, cardboard, or Styrofoam. • Compare and contrast the similarities and differences between similar polyhedrons. • Develop a lab or activity using three dimensional figures to be presented to the class. 	
<p>Leadership Alignment: 21st Century Skills (<i>identify leadership component being utilized within this space; for example, FFA, DECA, TSA, etc.</i>)</p> <p>Note: All skills can be applied to CTSO Program and Equivalent Activities at the High School Level.</p> <p>2A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation.</p> <p>2C.3 Synthesize and make connections between information and arguments.</p> <p>3A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts.</p> <p>7A.1 Adapt to varied roles, jobs responsibilities, schedules and contexts.</p> <p>9A.1 Know when it is appropriate to listen and when to speak.</p> <p>9B.2 Respond open-mindedly to different ideas and values.</p>	
<p>Industry Standards and/or Competencies: This course in Applied Geometry is not industry specific. Geometry is utilized in a vast array of the world's industries. The standards and competencies vary widely throughout these industries. It would be a daunting task to compile an all-encompassing list of their standards and competencies. Therefore, throughout the Unit students will discuss and explore careers where the understanding and application of properties of three-dimensional figures are applicable.</p>	
<p>Aligned Washington State Academic Standards</p>	
<p>Mathematics: Common Core</p>	

	<p>HS.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. Use dissection arguments, Cavalieri's principle, and informal limit arguments.</p> <p>HS.G.GMD.2 (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.</p> <p>HS.G.GMD.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.*</p> <p>HS.G.GMD.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.</p> <p>HS.G.MG.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).*</p>
Mathematical Practices	<p>MP1 Make sense of problems and persevere in solving them.</p> <p>MP2 Reason abstractly and quantitatively.</p> <p>MP3 Construct viable arguments and critique the reasoning of others.</p> <p>MP4 Model with mathematics.</p> <p>MP5 Use appropriate tools strategically.</p> <p>MP6 Attend to precision.</p> <p>MP7 Look for and make use of structure.</p> <p>MP8 Look for and express regularity in repeated reasoning.</p>

Unit 5: Transformations, Similarity, and Congruence		Total Learning Hours for Unit: 35
<p>Unit Summary: Students will be able to:</p> <ul style="list-style-type: none"> Explore and experiment with transformations, similarity, congruence, and rigid motion in the plane utilizing geometric software. Explore and experiment with rotations, reflections, and dilations in the plane utilizing geometric software. Explore and articulate the differences between rigid motions, transformation, rotations and other movement in a plane. Explore a variety of two-dimensional figures including triangles, quadrilaterals of different types, other polygons and circles. Understand congruence in terms of rigid motions. Develop definitions for similarity and congruence using transformation, similarity, and rigid motions. Develop a lab or activity using Transformations, Similarity, and Congruence to be presented to the class Explore careers where the understanding and application of transformations, similarity, and congruence are applicable. 		
<p>Performance Assessments: <i>These can be locally developed or use the suggested assessments below.</i></p> <p>Students will be able to synthesize information from a variety of instructional and technological experiences. These will include (but are not limited to) labs, experiments, skill-drills, hands-on practice with calculators and other tools of mathematics, diagnostic (written) testing, group projects, problem-solving techniques, unit quizzes, as well as formative and summative assessments.</p> <p>Link to OSPI document Creating Performance Assessments - Framework Development (pdf)</p> <p>Examples:</p> <ul style="list-style-type: none"> Create a tessellation of polygons using different transformations. Identify the different types of transformations and how they affect the original shape. Use GeoGebra or similar software to see the effect of different transformations in real time. Develop a lab or activity requiring the use of Transformations, Similarity, and Congruence to be presented to the class. 		
<p>Leadership Alignment: 21st Century Skills (<i>identify leadership component being utilized within this space; for example, FFA, DECA, TSA, etc.</i>)</p> <p>Note: All skills can be applied to CTSO Program and Equivalent Activities at the High School Level.</p> <p>1A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts.</p> <p>1B.1 Develop, implement and communicate new ideas to others effectively.</p> <p>2C.5 Reflect critically on learning experiences and processes.</p> <p>3B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member.</p> <p>8A.3 Utilize time and manage workload efficiently.</p> <p>9A.2 Conduct themselves in a respectable, professional manner.</p> <p>10A.2 Prioritize, plan and manage work to achieve the intended result.</p> <p>11B.1 Act responsibly with the interests of the larger community in mind.</p>		
<p>Industry Standards and/or Competencies: This course in Applied Geometry is not industry specific. Geometry is utilized in a vast array of the world's industries. The standards and competencies vary widely throughout these industries. It would be a daunting task to compile an all-encompassing list of their standards and competencies. Therefore, throughout the Unit students will discuss and explore careers where the understanding and application of transformations, similarity, and congruence are applicable.</p>		
Aligned Washington State Academic Standards		
Mathematics: Common Core	HS.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	

	<p>outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).</p> <p>HS.G.CO.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.</p> <p>HS.G.CO.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.</p> <p>HS.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.</p> <p>HS.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.</p> <p>HS.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.</p> <p>HS.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.</p> <p>HS.G.SRT.1 Verify experimentally the properties of dilations given by a center and a scale factor:</p> <p>HS.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.</p> <p>HS.G.SRT.1b The dilation of a line segment is longer or shorter in the ratio given by the scale factor.</p> <p>HS.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.</p> <p>HS.G.SRT.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.</p> <p>HS.S.CP.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.</p>
Mathematical Practices	<p>MP1 Make sense of problems and persevere in solving them.</p> <p>MP2 Reason abstractly and quantitatively.</p> <p>MP3 Construct viable arguments and critique the reasoning of others.</p> <p>MP4 Model with mathematics.</p> <p>MP5 Use appropriate tools strategically.</p> <p>MP6 Attend to precision.</p> <p>MP7 Look for and make use of structure.</p> <p>MP8 Look for and express regularity in repeated reasoning.</p>

Unit 6: Right Triangle Relationships/Trigonometry/General Triangles	Total Learning Hours for Unit: 30
<p>Unit Summary: Students will be able to:</p> <ul style="list-style-type: none"> • Use the Cartesian coordinate plane to demonstrate and explain dilations. • Use properties of sine, cosine, and tangents to solve real-world problems. • Use the Pythagorean Theorem of solve applied problems involving right triangles. • Define trigonometric ratios and solve problems involving right triangles. • Apply trigonometry to general triangles • Develop a lab or activity using right and general triangles and trigonometry to be presented to the class • Explore careers where the understanding and application of right triangle relationships and trigonometry are applicable 	
<p>Performance Assessments: <i>These can be locally developed or use the suggested assessments below.</i></p> <p>Students will be able to synthesize information from a variety of instructional and technological experiences. These will include (but are not limited to) labs, experiments, skill-drills, hands-on practice with calculators and other tools of mathematics, diagnostic (written) testing, group projects, problem-solving techniques, unit quizzes, as well as formative and summative assessments.</p> <p>Link to OSPI document Creating Performance Assessments - Framework Development (pdf)</p> <p>Examples:</p> <ul style="list-style-type: none"> • Calculate the height of objects using similar right triangles. • Explain and demonstrate understanding of each of the trigonometric ratios. • Create construction plans using different types of right triangles and trigonometric ratios. • Build a stair riser using ratios and trigonometric ratios. • Develop a lab or activity that uses Right Triangle Relationships, General Triangles and Trigonometry to be presented to the class. 	
<p>Leadership Alignment: 21st Century Skills (<i>identify leadership component being utilized within this space; for example, FFA, DECA, TSA, etc.</i>)</p> <p>Note: All skills can be applied to CTSO Program and Equivalent Activities at the High School Level.</p> <p>1B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes.</p> <p>2A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation.</p> <p>2D.2 Identify and ask significant questions that clarify various points of view and lead to better solutions.</p> <p>3B.1 Demonstrate ability to work effectively and respectfully with diverse teams.</p> <p>4A.2 Evaluate information critically and competently.</p> <p>10A.1 Set and meet goals, even in the face of obstacles and competing pressures.</p> <p>11A.1 Use interpersonal and problem-solving skills to influence and guide others toward a goal.</p>	
<p>Industry Standards and/or Competencies: This course in Applied Geometry is not industry specific. Geometry is utilized in a vast array of the world's industries. The standards and competencies vary widely throughout these industries. It would be a daunting task to compile an all-encompassing list of their standards and competencies. Therefore, throughout the Unit students will discuss and explore careers where the understanding and application of right triangle relationships and trigonometry are applicable.</p>	
<p>Aligned Washington State Academic Standards</p>	
<p>Mathematics: Common Core</p>	<p>HS.G.SRT.1 Verify experimentally the properties of dilations given by a center and a scale factor:</p>

	<p>HS.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.</p> <p>HS.G.SRT.1b The dilation of a line segment is longer or shorter in the ratio given by the scale factor.</p> <p>HS.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.</p> <p>HS.G.SRT.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.</p> <p>HS.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.</p> <p>HS.G.SRT.7 Explain and use the relationship between the sine and cosine of complementary angles.</p> <p>HS.G.SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.*</p> <p>HS.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.</p> <p>HS.G.SRT.10 (+) Prove the Laws of Sines and Cosines and use them to solve problems.</p> <p>HS.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).</p>
Mathematical Practices	<p>MP1 Make sense of problems and persevere in solving them.</p> <p>MP2 Reason abstractly and quantitatively.</p> <p>MP3 Construct viable arguments and critique the reasoning of others.</p> <p>MP4 Model with mathematics.</p> <p>MP5 Use appropriate tools strategically.</p> <p>MP6 Attend to precision.</p> <p>MP7 Look for and make use of structure.</p> <p>MP8 Look for and express regularity in repeated reasoning.</p>

Unit 7: Coordinate Geometry/Proof	Total Learning Hours for Unit: 20
<p>Unit Summary: Students will be able to:</p> <ul style="list-style-type: none"> • Use coordinates to prove geometric theorems algebraically. • Prove properties of circles, quadrilaterals, and polygons. • Use the Pythagorean Theorem to derive the equation of a circle. • Explore and define the slope relationships for a variety of lines (parallel, perpendicular, and intersecting) in terms of no, one, and many simultaneous solutions. • Find the point of a directed line segment that partitions the segment in a given ratio. • Find the midpoint of a line segment using coordinates then generalize the process to find the formula • Develop a lab or activity using coordinate geometry and proofs to be presented to the class • Explore careers where the understanding and application of coordinate geometry and proof are applicable. 	
<p>Performance Assessments: <i>These can be locally developed or use the suggested assessments below.</i></p> <p>Students will be able to synthesize information from a variety of instructional and technological experiences. These will include (but are not limited to) labs, experiments, skill-drills, hands-on practice with calculators and other tools of mathematics, diagnostic (written) testing, group projects, problem-solving techniques, unit quizzes, as well as formative and summative assessments.</p> <p>Link to OSPI document Creating Performance Assessments - Framework Development (pdf)</p> <p>Examples:</p> <ul style="list-style-type: none"> • Use variable coordinates to demonstrate how different geometric properties can be proven using a coordinate proof • Compare and contrast different ways to show geometric properties on a coordinate plane. • Develop a lab or activity using coordinate geometry that requires the use of algebraic proofs and theorems and equations derived in this unit to be presented to the class. 	
<p>Leadership Alignment: 21st Century Skills (<i>identify leadership component being utilized within this space; for example, FFA, DECA, TSA, etc.</i>)</p> <p>Note: All skills can be applied to CTSO Program and Equivalent Activities at the High School Level.</p> <ul style="list-style-type: none"> 1A.1 Use a wide range of idea creation techniques (such as brainstorming). 1B.3 Demonstrate originality and inventiveness in work and understand the real-world limits to adopting new ideas. 2B.1 Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems. 3A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts. 3B.1 Demonstrate ability to work effectively and respectfully with diverse teams. 9A.1 Know when it is appropriate to listen and when to speak. 10B.1 Demonstrate additional attributes associated with producing high quality products. 	
<p>Industry Standards and/or Competencies: This course in Applied Geometry is not industry specific. Geometry is utilized in a vast array of the world's industries. The standards and competencies vary widely throughout these industries. It would be a daunting task to compile an all-encompassing list of their standards and competencies. Therefore, throughout the Unit students will discuss and explore careers where the understanding and application of coordinate geometry and proof are applicable.</p>	
<p>Aligned Washington State Academic Standards</p>	
<p>Mathematics: Common Core</p>	<p>HS.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.</p>

	<p>HS.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.</p> <p>HS.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.</p> <p>HS.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.</p> <p>HS.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.</p> <p>HS.G.GPE.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.</p> <p>HS.G.GPE.2 Derive the equation of a parabola given a focus and directrix.</p> <p>HS.G.GPE.4 Use coordinates to prove simple geometric theorems algebraically</p> <p>HS.G.GPE.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).</p> <p>HS.G.GPE.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.</p> <p>HS.G.GPE.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.*</p>
Mathematical Practices	<p>MP1 Make sense of problems and persevere in solving them.</p> <p>MP2 Reason abstractly and quantitatively.</p> <p>MP3 Construct viable arguments and critique the reasoning of others.</p> <p>MP4 Model with mathematics.</p> <p>MP5 Use appropriate tools strategically.</p> <p>MP6 Attend to precision.</p> <p>MP7 Look for and make use of structure.</p> <p>MP8 Look for and express regularity in repeated reasoning.</p>

Unit 8: Geometry Applications		Total Learning Hours for Unit: 15
<p>Unit Summary: Students will be able to:</p> <ul style="list-style-type: none"> • Apply geometric standards and concepts in modeling situations. • Demonstrate their knowledge of geometric standards through designing, planning, and construction of models. • Document the process with detailed notes and multiple representations to include all calculations and reasoning and to demonstrate the depth of understanding developed throughout the course. • Explore careers where the understanding and application of the principals of geometry are applicable 		
<p>Performance Assessments: <i>These can be locally developed or use the suggested assessments below.</i></p> <p>Students will be able to synthesize information from a variety of instructional and technological experiences. These will include (but are not limited to) labs, experiments, skill-drills, hands-on practice with calculators and other tools of mathematics, diagnostic (written) testing, group projects, problem-solving techniques, unit quizzes, as well as formative and summative assessments.</p> <p>Link to OSPI document Creating Performance Assessments - Framework Development (pdf)</p> <p>Examples:</p> <ul style="list-style-type: none"> • Use properties of figures and the concept of area to determine density (ex: how many people per sq. mile, how many fish per pond, etc. • Create a dream house floor plan with specific constraints on square footage, number of rooms, number of doors, etc. • Create a fictional zoo with different needs for different animals. Calculate the cost of building the zoo. 		
<p>Leadership Alignment: 21st Century Skills (<i>identify leadership component being utilized within this space; for example, FFA, DECA, TSA, etc.</i>)</p> <p>Note: All skills can be applied to CTSO Program and Equivalent Activities at the High School Level.</p> <p>1A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts.</p> <p>1B.3 Demonstrate originality and inventiveness in work and understand the real-world limits to adopting new ideas.</p> <p>2C.3 Synthesize and make connections between information and arguments.</p> <p>3B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal.</p> <p>5A.1 Understand both how and why media messages are constructed, and for what purposes.</p> <p>5B.1 Understand and utilize the most appropriate media creation tools, characteristics and conventions.</p> <p>7B.1 Incorporate feedback effectively</p> <p>8C.1 Go beyond basic mastery of skills and/or curriculum to explore and expand one's own learning and opportunities to gain expertise</p>		
<p>Industry Standards and/or Competencies: This course in Applied Geometry is not industry specific. Geometry is utilized in a vast array of the world's industries. The standards and competencies vary widely throughout these industries. It would be a daunting task to compile an all-encompassing list of their standards and competencies. Therefore, throughout the Unit students will discuss and explore careers where the understanding and application of the principals of geometry are applicable.</p>		
Aligned Washington State Academic Standards		
Mathematics: Common Core	<p>Additional Common Core State Standards demonstrated will vary according to models being developed and explored.</p> <p>HS.G.MG.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).*</p> <p>HS.G.MG.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).*</p>	

	HS.G.MG.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).*
Mathematical Practices	MP1 Make sense of problems and persevere in solving them. MP2 Reason abstractly and quantitatively. MP3 Construct viable arguments and critique the reasoning of others. MP4 Model with mathematics. MP5 Use appropriate tools strategically. MP6 Attend to precision. MP7 Look for and make use of structure. MP8 Look for and express regularity in repeated reasoning.