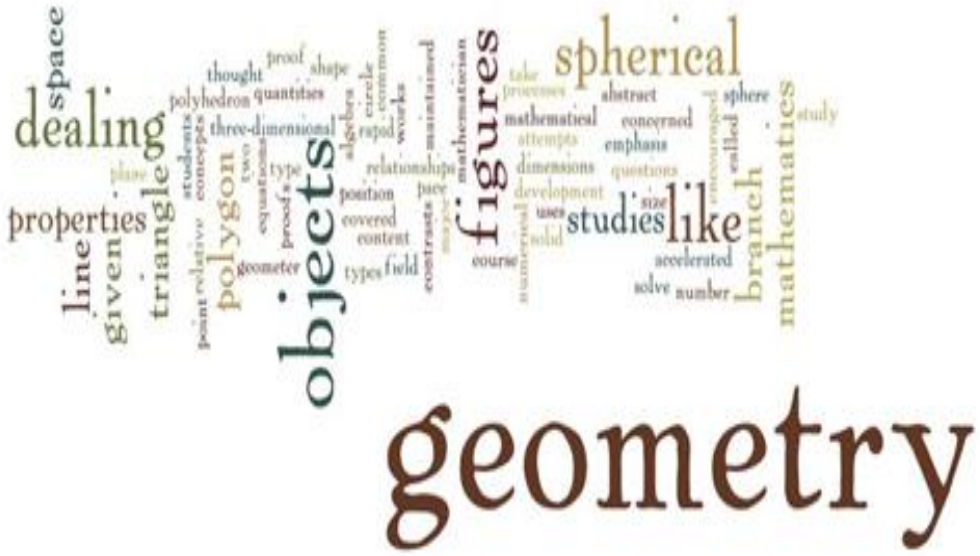
Geometry Toolkit



A. Geometry Course Description, Instructional Resources and Standards

I. Geometry

II. Geometry Honors

B. Course Maps and Sample Course Pacing Guides

I. Geometry Sample Course Pacing Guides

C. Geometry Assessment Assistance

I. Test Item Specifications
(The Specifications are a resource that defines the content and format of the Geometry EOC.)

II. Diagnostic and Assessment Development Tool – Item Bank Test Platform (IBTP)
(Note: Single Sign-On log in information is required.)

III. Accommodations for Florida's Statewide Student Assessments
(FDOE Bureau of Exceptional Education and Student Services)

Suggested Teacher Supplies	Suggested Student Supplies & Materials
Protractors Compasses Scientific calculator Rulers Graph paper Geogebra https://www.geogebra.org/ (free download) and/or other geometry cad software Geometric solids (free website below) https://illuminations.nctm.org/Activity.aspx?id=3521 National Library of Virtual Manipulatives http://nlvm.usu.edu/en/nav/vlibrary.html (use Internet Explorer) Free virtual calculators http://www.meta-calculator.com/online/?panel-201-calculator http://www.calculator.org/jcalc98.aspx http://www.alcula.com/simplecalc.php	Protractor Compass Geogebra https://www.geogebra.org/ (free download) and/or other geometry cad software (classroom & home use) National Library of Virtual Manipulatives http://nlvm.usu.edu/en/nav/vlibrary.html (use Internet Explorer) Pencils/pens/colored pencils Folder with prongs or three-ring binder with dividers Erasers/cap erasers Composition notebooks/notebook paper/spiral notebooks Graph paper/notebook with graph paper Ruler Scientific calculator Free virtual calculators (classroom & home use) Geometric solids (free website below) https://illuminations.nctm.org/Activity.aspx?id=3521

★ Denotes Math Florida Standards for Modeling

Modeling standards are marked with a star/asterisk at the end of the standard. This denotes that it is a modeling standard from the ***Modeling*** conceptual category. Modeling is best interpreted not as a collection of isolated topics but 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 (★). It is important to note that there are 61 specific modeling standards throughout the high school standards. Look for a star/asterisk in the course descriptions to delineate. For more information regarding modeling standards, please click on the star.

Standard: MAFS.912.G-C.1.1
Prove that all circles are similar.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Establish Circle Similarity using Similar Triangles **MAFS.912.G-C.1.1**	In this lesson, students will learn how to show that one circle is similar to another by using similar triangles.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Demonstrate Circle Similarity using Translations and Dilations **MAFS.912.G-C.1.1**	In this lesson, students will learn how to show that one circle is similar to another by using translations and dilations.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
All Circles are Similar **MAFS.912.G-C.1.1**	Using this MFAS task, students are given two circles with different radius lengths and are asked to prove that the circles are similar.	• All Circles are Similar worksheet (included) • Microsoft Word or Adobe Acrobat Reader
Similar Circles **MAFS.912.G-C.1.1**	Using this MFAS task, students are given two circles with different radii and are asked to prove that the circles are similar.	• Similar Circles worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Standard: MAFS.912.G-C.1.2
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.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Circle Up! **MAFS.912.G-C.1.2**	This interactive game will help students learn about angles and segments, lines and arcs in a circle and how they are related. Students will compete against themselves and earn points as they answer questions about radius, diameter, chord, tangent line, central angles, inscribed angles and intercepted arcs.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Two Wheels and a Belt **MAFS.912.G-C.1.2**	This task combines two skills: making use of the relationship between a tangent segment to a circle and the radius touching that tangent segment, and computing lengths of circular	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

	arcs given the radii and central angles.	
Right Triangles Inscribed in Circles I **MAFS.912.G-C.1.2**	This task provides a good opportunity to use isosceles triangles and their properties to show an interesting and important result about triangles inscribed in a circle. The fact that these triangles are always right triangles is often referred to as Thales' theorem.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Right Triangles Inscribed in Circles II **MAFS.912.G-C.1.2**	In this problem solving task, students will explain certain characteristics about a triangle.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Tangent Lines and the Radius of a Circle **MAFS.912.G-C.1.2**	This problem solving task challenges students to find the perpendicular meeting point of a segment from the center of a circle and a tangent.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Neglecting the Curvature of the Earth **MAFS.912.G-C.1.2**	This task applies geometric concepts, namely properties of tangents to circles and of right triangles, in a modeling situation. The key geometric point in this task is to recognize that the line of sight from the mountain top towards the horizon is tangential to the earth. We can then use a right triangle where one leg is tangential to a circle and the other leg is the radius of the circle to investigate this situation.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Central and Inscribed Angles **MAFS.912.G-C.1.2**	Using this MFAS task, students are asked to describe the relationship between a central angle and an inscribed angle that intercept the same arc.	• Central and Inscribed Angles worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Circles with Angles **MAFS.912.G-C.1.2**	Using this MFAS task, students are given a diagram with inscribed, central and circumscribed angles and are asked to identify each type of angle, determine angle measures and describe relationships among them.	• Circles with Angles worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Inscribed Angle on Diameter **MAFS.912.G-C.1.2**	Using this MFAS task, students are asked to find the measures of two inscribed angles of a circle.	• Inscribed Angle on Diameter worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Tangent Line and Radius **MAFS.912.G-C.1.2**	Using this MFAS task, students are asked to draw a circle, a tangent to the circle, and a radius to the point of tangency. Students are then asked to describe the relationship between the radius and the tangent line.	• Tangent Line and Radius worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Standard: MAFS.912.G-C.1.3
Construct the inscribed and circumscribed circles of a triangle and prove properties of angles for a quadrilateral inscribed in a circle.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Circumscribe a Circle About a Triangle **MAFS.912.G-C.1.3**	In this Geogebra interactive worksheet, students can watch the step by step process of circumscribing a circle about a triangle. Using paper and pencil along with this resource will reinforce the concept.	• Internet connection • Computer • Java plugin • Calculator (if necessary)
Placing a Fire Hydrant **MAFS.912.G-C.1.3**	This problem solving task asks students to place a fire hydrant so that it is equal distance from three given points.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Locating Warehouse **MAFS.912.G-C.1.3**	This problem solving task challenges students to place a warehouse (point) an equal distance from three roads (lines).	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Inscribing a Triangle in a Circle **MAFS.912.G-C.1.3**	This problem introduces the circumcenter of a triangle and shows how it can be used to inscribe the triangle in a circle.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Circumcenter of a Triangle **MAFS.912.G-C.1.3**	This task shows that the three perpendicular bisectors of the sides of a triangle all meet in a point, using the characterization of the perpendicular bisector of a line segment as the set of	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

	points equidistant from the two ends of the segment.	
Inscribing a Circle in a Triangle I **MAFS.912.G-C.1.3**	This problem solving task shows how to inscribe a circle in a triangle using angle bisectors.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Inscribing a Circle in a Triangle II **MAFS.912.G-C.1.3**	This problem solving task focuses on a remarkable fact which comes out of the construction of the inscribed circle in a triangle: the angle bisectors of the three angles of triangle ABC all meet in a point.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Inscribed Quadrilaterals **MAFS.912.G-C.1.3**	Using this MFAS task, students are asked to prove that opposite angles of a quadrilateral, inscribed in a circle, are supplementary.	• Internet connection • Computer • Inscribed Quadrilaterals worksheet (included) • Calculator (if necessary)
Properties of the Inscribed Angle **MAFS.912.G-C.1.3**	The link provides properties of inscribed angles	• Internet connection • Computer • Calculator (if necessary)
Circumscribed Circle Construction **MAFS.912.G-C.1.3**	Using this MFAS task, students are asked to use a compass and straightedge to construct a circumscribed circle of an acute scalene triangle.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Circumscribed Circle Construction Worksheet (included) • Compass • Straightedge
Inscribed Circle Construction **MAFS.912.G-C.1.3**	Using this MFAS task, students are asked to use a compass and straightedge to construct an inscribed circle of an acute scalene triangle.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Inscribed Circle Construction Worksheet (included) • Compass • Straightedge

Standard: MAFS.912.G-C.2.5
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.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Two Wheels and a Belt **MAFS.912.G-C.2.5**	This task combines two skills: making use of the relationship between a tangent segment to a	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

	circle and the radius touching that tangent segment, and computing lengths of circular arcs given the radii and central angles.	
Setting up Sprinklers **MAFS.912.G-C.2.5**	This modeling task involves several different types of geometric knowledge and problem solving: finding areas of sectors of circles, using trigonometric ratios to solve right triangles, and decomposing a complicated figure involving multiple circular arcs into parts whose areas can be found.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Definition of a Radian Measure as the Constant of Proportionality **MAFS.912.G-C.2.5**	In this video, students will be introduced to the definition of a radian measure as the constant of proportionality.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Radians as Proportionality Constants **MAFS.912.G-C.2.5**	Using this resource, students will examine how an angle measure in radians can be defined as the constant of proportionality in the relationship between the radius and the intercepted arc.	• Internet connection • Computer • Calculator (if necessary)
How is the Radian Measure of Angles Derived/Defined? **MAFS.912.G-C.2.5**	Using this resource, students will learn how the radian measure of an angle is derived/defined.	• Internet connection • Computer • Calculator (if necessary)
Area of a Circle-Derivation **MAFS.912.G-C.2.5**	Using this resource, students will learn how to derive the formula for the area of a circle.	• Intent connection • Computer • Calculator (if necessary)
Sector Area **MAFS.912.G-C.2.5**	Using this MFAS task, students are asked to find the areas of sectors in two different circles.	• Calculator (if necessary) • Sector Area worksheet (included) • Microsoft Word or Adobe Acrobat Reader
Deriving the Sector Area Formula **MAFS.912.G-C.2.5**	Using this MFAS task, students are asked to write a formula to find the area of a sector of a circle and then explain and justify that formula.	• Calculator (if necessary) • Deriving the Sector Area Formula worksheet (included) • Microsoft Word or Adobe Acrobat Reader
Arc Length and Radians **MAFS.912.G-C.2.5**	Using this MFAS task, students are asked to explain why the length of an arc intercepted by an angle is proportional to the radius and then explain how that	• Arc Length and Radians worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

	proportionality leads to a definition of the radian measure of an angle.	
Arc Length **MAFS.912.G-C.2.5**	Using this MFAS task, students are asked to find the lengths of arcs in two different circles.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Arc Length worksheet (included)

Standard: MAFS.912.G-CO.1.1
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.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
The Language of Geometry **MAFS.912.G-CO.1.1**	Before learning any new concept, it is important students learn and use common language and label concepts consistently. This tutorial introduces students to the point, line, ray, segment and plane.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Identifying Parallel and Perpendicular Lines **MAFS.912.G-CO.1.1**	This tutorial is great practice for assisting students with identifying parallel and perpendicular lines.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Parallel Lines **MAFS.912.G-CO.1.1**	Using this video, students will receive an illustration on how to determine if the graphs of a given set of equations are parallel.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Definition of a Circle **MAFS.912.G-CO.1.1**	Using this MFAS task, students are asked to draw, label and give a precise definition of the term circle.	• Definition of a Circle worksheet (included) • Microsoft Word • Calculator (if necessary)
Definition of an Angle **MAFS.912.G-CO.1.1**	Using this MFAS task, students are asked to draw, label and give a precise definition of an angle.	• Definition of an Angle worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Definition of Line Segment **MAFS.912.G-CO.1.1**	Using this MFAS task, students are asked to draw, label and give a precise definition of a line segment.	• Definition of Line Segment worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Definition of Parallel Lines **MAFS.912.G-CO.1.1**	Using this MFAS task, students are asked to draw, label and give	• Definition of Parallel Lines Worksheet (included)

	a precise definition of parallel lines.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Definition of Perpendicular Lines **MAFS.912.G-CO.1.1**	Using this MFAS task, students are asked to draw, label and give a precise definition of perpendicular lines.	• Definition of Perpendicular Lines Worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Arc Length **MAFS.912.G-CO.1.1**	Using this task, students will be provided with the precise definition of arc length and provided examples of how to find the distance around a circular arc.	• Internet connection • Computer • Calculator (if necessary)

Standard: MAFS.912.G-CO.1.2. Also Assesses MAFS.912.G-CO.1.4

MAFS.912.G-CO.1.2 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 angle to those that do not (e.g., translation versus horizontal stretch).

MAFS.912.G-CO.1.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines and line segments.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Mathematically Exploring the Wakulla Caves **MAFS.912.G-CO.1.2**	The tide is high! How can we statistically prove there is a relationship between the tides on the Gulf Coast and in a fresh-water spring 20 miles away?	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Transformations Using Technology **MAFS.912.G-CO.1.2** **MAFS.912.G-CO.1.4**	This virtual manipulative can be used to demonstrate and explore the effect of translation, rotation, and/or reflection on a variety of plane figures. A series of transformations can be explored to result in a specified final image.	• Internet connection • LCD projector • Computer • Calculator (if necessary)
Comparing Transformations **MAFS.912.G-CO.1.2**	Using this MFAS task, students are asked to determine whether or not dilations and reflections preserve distance and angle measure.	• Comparing Transformations worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Demonstrating Reflections **MAFS.912.G-CO.1.2**	Using this MFAS task, students are asked to reflect a quadrilateral across a given line.	• Tracing paper or blank transparency • Demonstrating Reflections worksheet (included)

		• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Demonstrating Rotations **MAFS.912.G-CO.1.2**	Using this MFAS task, students are asked to rotate a quadrilateral 90 degrees clockwise.	• Tracing paper or blank transparency • Demonstrating Rotations worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Demonstrating Translations **MAFS.912.G-CO.1.2**	Using this MFAS task, students are asked to translate a quadrilateral according to a given vector.	• Tracing paper or blank transparency • Demonstrating Translations worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Transformations And Functions **MAFS.912.G-CO.1.2**	Using this MFAS task, students are given examples of three transformations and are asked if each is a function.	• Transformations and Functions worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Line of Reflection - Reflect Segments over Line **MAFS.912.G-CO.1.4**	Using this tutorial, students are shown with an interactive tool how to reflect a line segment. Students should have an understanding of slope and midpoint before viewing this video.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Line of Reflection - Points on Line of Reflection **MAFS.912.G-CO.1.4**	Using this tutorial, students will use the midpoint of two lines to find the line of reflection.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Define a Reflection **MAFS.912.G-CO.1.4**	Using this MFAS task, students are asked to develop a definition of reflection.	• Define a Reflection worksheet (included) • Compass and straightedge (optional) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Define a Rotation **MAFS.912.G-CO.1.4**	Using this MFAS task, students are asked to develop a definition of rotation.	• Define a Rotation worksheet (included) • Ruler and protractor or straight edge and compass or transparent paper • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Define a Translation **MAFS.912.G-CO.1.4**	Using this MFAS task, students are asked to develop a definition for translation.	• Define a Translation worksheet (included) • Protractor and ruler or straight edge and compass or transparent paper • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Standard: MAFS.912.G-CO.1.5. Also Assesses MAFS.912.G-CO.1.3

MAFS.912.G-CO.1.5 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.

MAFS.912.G-CO.1.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Points after Rotation **MAFS.912.G-CO.1.5**	Students will see what happens when a figure is rotated about the origin -270 degrees. Having a foundation about right triangles is recommended before viewing this video.	• Internet Connection • Speakers/Headphones • Computer • Calculator (if necessary)
Combining Transformations **MAFS.912.G-CO.1.5**	Using this activity, students can first get an idea of what each of the rigid transformations looks like, and then get to experiment with combinations of transformations in order to map a pre-image to its image.	• Internet Connection • Computer • Calculator (if necessary)
Transformations Using Technology **MAFS.912.G-CO.1.5**	This virtual manipulative can be used to demonstrate and explore the effect of translation, rotation, and/or reflection on a variety of plane figures. A series of transformations can be explored to result in a specified final image.	• Internet Connection • LCD Projector • Computer • Calculator (if necessary)
Indicate the Transformations **MAFS.912.G-CO.1.5**	Using this MFAS task, students are asked to describe the transformations that take one triangle onto another.	• Indicate the Transformations worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Reflect a Semicircle **MAFS.912.G-CO.1.5**	Using this MFAS task, students are asked to reflect a semicircle across a given line.	• Reflect a Semicircle worksheet (included)

		• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Rotation of a Quadrilateral **MAFS.912.G-CO.1.5**	Using this MFAS task, students are asked to rotate a quadrilateral around a given point.	• Rotation of a Quadrilateral worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Two Triangles **MAFS.912.G-CO.1.5**	Using this MFAS task, students are asked to describe the transformations that take one triangle onto another.	• Two Triangles worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Rotating Polygons 180 Degrees about their Center **MAFS.912.G-CO.1.3**	Using this tutorial, students will investigate symmetry by rotating polygons 180 degrees about their center.	• Internet Connection • Speakers/Headphones • Computer • Calculator (if necessary)
Points after Rotation **MAFS.912.G-CO.1.3**	Using this tutorial, students will see what happens when a figure is rotated about the origin -270 degrees. Having a foundation about right triangles is recommended before viewing this video.	• Internet Connection • Speakers/Headphones • Computer • Calculator (if necessary)
Transformations of Parallelograms and Rhombi **MAFS.912.G-CO.1.3**	Using this MFAS task, students are asked to describe the rotations and reflections that carry a parallelogram and rhombus onto itself.	• Transformations of Parallelograms and Rhombi worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Transformations of Rectangles and Squares **MAFS.912.G-CO.1.3**	Using this MFAS task, students are asked to describe the rotations and reflections that carry a rectangle and a square onto itself.	• Transformations of Rectangles and Squares worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Transformations of Regular Polygons **MAFS.912.G-CO.1.3**	Using this MFAS task, students are asked to describe the rotations and reflections that carry a regular polygon onto itself.	• Transformations of Regular Polygons worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Transformations of Trapezoids **MAFS.912.G-CO.1.3**	Using this MFAS task, students are asked to describe the rotations and reflections that carry a trapezoid onto itself.	• Transformations of Trapezoids worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Standard: MAFS.912.G-CO.2.6 Also Assesses MAFS.912.G-CO.2.7 and MAFS.912.G-CO.2.8

MAFS.912.G-CO.2.6 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.

MAFS.912.G-CO.2.7 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.

MAFS.912.G-CO.2.8 Explain how the criteria for triangle congruence (ASA, SAS, SSS, and Hypotenuse-Leg) follow from the definition of congruence in terms of rigid motions.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Reflections and Isosceles Triangles **MAFS.912.G-CO.2.6**	This activity uses rigid transformations of the plane to explore symmetries of classes of triangles.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Reflections and Equilateral Triangles **MAFS.912.G-CO.2.6**	This activity is one in a series of tasks using rigid transformations of the plane to explore symmetries of classes of triangles, with this task in particular focusing on the class of equilateral triangles.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Congruent Trapezoids **MAFS.912.G-CO.2.6**	Using this MFAS task, students will determine whether two given trapezoids are congruent.	• Congruent Trapezoids worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Repeated Reflections and Rotations **MAFS.912.G-CO.2.6**	Using this MFAS task, students are asked to describe what happens to a triangle after repeated reflections and rotations.	• Repeated Reflections and Rotations worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Transform This **MAFS.912.G-CO.2.6**	Using this MFAS task, students are asked to translate and rotate a triangle in the coordinate plane and explain why the pre-image and image are congruent.	• Transform This worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Reflections and Equilateral Triangles II **MAFS.912.G-CO.2.7**	This task provides students with an opportunity to see the influence of reflections on an explicit object and to see that the reflections do not always commute.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Congruence Implies Congruent Corresponding Parts **MAFS.912.G-CO.2.7**	Using this MFAS task, students are given two congruent triangles and asked to determine the corresponding side lengths and angle measures and to use the definition of congruence in terms of rigid motion to justify their reasoning.	• Congruence Implies Congruent Corresponding Parts worksheet (included) • Microsoft Word • Calculator (if necessary)
Proving Congruence using Corresponding Parts **MAFS.912.G-CO.2.7**	Using this MFAS task, students are asked to prove two triangles congruent given that all pairs of corresponding sides and angles are congruent.	• Proving Congruence using Corresponding Parts worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Showing Congruence Using Corresponding Parts – 1 **MAFS.912.G-CO.2.7**	Using this MFAS task, students are given two triangles in which all pairs of corresponding parts are congruent and are asked to use the definition of congruence in terms of rigid motion to show the triangles are congruent.	• Showing Congruence Using Corresponding Parts 1 worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Showing Congruence Using Corresponding Parts – 2 **MAFS.912.G-CO.2.7**	Using this MFAS task, students are given two triangles in which all pairs of corresponding parts are congruent and are asked to use the definition of congruence in terms of rigid motion to show the triangles are congruent.	• Showing Congruence Using Corresponding Parts 2 worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Showing Triangles Congruent Using Rigid Motion **MAFS.912.G-CO.2.7**	Using this MFAS task, students are asked to use the definition of congruence in terms of rigid motion to show that two triangles are congruent in the coordinate plane.	• Showing Triangles Congruent Using Rigid Motion worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Finding Congruent Triangles **MAFS.912.G-CO.2.8**	In this tutorial, students will use the SSS, ASA, SAS and AAS postulates to find congruent triangles.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Using SSS in a Proof **MAFS.912.G-CO.2.8**	In this tutorial, students will examine the difference between a theorem and axiom. Additionally, students will examine how to use SSS in a proof.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Triangle Congruence Postulates **MAFS.912.G-CO.2.8**	Using this tutorial, students will examine SSS, SAS, ASA and AAS postulates for congruent	• Internet connection • Speakers/headphones • Computer

	triangles. Additionally, students will examine how AAA is only good for similarity and SSA is good for neither.	• Calculator (if necessary)
Congruent Triangles and SSS **MAFS.912.G-CO.2.8**	In this tutorial, students will learn about congruent triangles and the "Side-Side-Side" postulate.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Why Does ASA Work? **MAFS.912.G-CO.2.8**	In this problem solving task, students will show the reflection of one triangle maps to another triangle.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
When Does SSA Work to Determine Triangle Congruence? **MAFS.912.G-CO.2.8**	In this problem, students will consider SSA. The triangle congruence criteria, SSS, SAS and ASA all require three pieces of information. It is interesting, however, that not all three pieces of information about sides and angles are sufficient to determine a triangle up to congruence.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Why Does SAS Work? **MAFS.912.G-CO.2.8**	This problem solving task challenges students to explain the reason why the given triangles are congruent, and to construct reflections of the points.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Why does SSS work? **MAFS.912.G-CO.2.8**	This problem solving task exhibits congruency between two triangles, demonstrating translation, reflection and rotation.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Are the Triangles Congruent? **MAFS.912.G-CO.2.8**	This problem solving task is primarily assessment-oriented. Students are asked to demonstrate knowledge of how to determine the congruency of triangles.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Justifying ASA Congruence **MAFS.912.G-CO.2.8**	Using this MFAS task, students are asked to use rigid motion to explain why the ASA pattern of congruence ensures triangle congruence.	• Justifying ASA Congruence worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Justifying HL Congruence **MAFS.912.G-CO.2.8**	Using this MFAS task, students are asked to use rigid motion to explain why the HL pattern of congruence ensures right triangle congruence.	• Justifying HL Congruence worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Justifying SAS Congruence **MAFS.912.G-CO.2.8**	Using this MFAS task, students are asked to use rigid motion to explain why the SAS pattern of congruence ensures triangle congruence.	• Justifying SAS Congruence worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Justifying SSS Congruence **MAFS.912.G-CO.2.8**	Using this MFAS task, students are asked to use rigid motion to explain why the SSS pattern of congruence ensures triangle congruence.	• Justifying SSS Congruence worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Standard: MAFS.912.G-CO.3.9
Prove theorems about lines and angles; use theorems about lines and angles to solve problems. *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.*

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Parallel Lines and Transversal Lines **MAFS.912.G-CO.3.9**	In this tutorial, students will examine the eight angles formed when two parallel lines are cut by a transversal line.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Parallel Lines and Transversals Part 2 **MAFS.912.G-CO.3.9**	In this tutorial, students will find the measures of angles formed when a transversal cuts two parallel lines.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Parallel Lines, Transversals and Triangles Part 3 **MAFS.912.G-CO.3.9**	In this tutorial, students will examine the eight angles formed when two parallel lines are cut by a transversal line. Additionally, there is a review of triangles.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Parallel Lines and Transversals: Angles between Transversal & Parallel Lines **MAFS.912.G-CO.3.9**	In this tutorial, students will learn the angle measures when two parallel lines are cut by a transversal line.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Proof: Vertical Angles are Equal **MAFS.912.G-CO.3.9**	In this tutorial, students will be provided with the proof that vertical angles are equal.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)

Points Equidistant from Two Points in the Plane **MAFS.912.G-CO.3.9**	Using this task, students will show how certain points on a plane are equidistant to points on a segment when placed on a perpendicular bisector.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Equidistant Points **MAFS.912.G-CO.3.9**	Using this MFAS task, students are asked to prove that a point on the perpendicular bisector of a line segment is equidistant from the endpoints of the segment.	• Equidistant Points worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Name that Triangle **MAFS.912.G-CO.3.9**	Using this MFAS task, students are asked to describe a triangle whose vertices are the endpoints of a segment and a point on the perpendicular bisector of a segment.	• Name that Triangle worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Finding Angle Measures – 1 **MAFS.912.G-CO.3.9**	Using this MFAS task, students are asked to find the measures of angles formed by three concurrent lines and to justify their answers.	• Finding Angle Measures – 1 worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Finding Angle Measures – 2 **MAFS.912.G-CO.3.9**	Using this MFAS task, students are asked to find the measures of angles formed by two parallel lines and a transversal.	• Finding Angle Measures – 2 worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Finding Angle Measures – 3 **MAFS.912.G-CO.3.9**	Using this MFAS task, students are asked to find the measures of angles formed by two parallel lines and two transversals.	• Finding Angle Measures – 3 worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Proving the Alternate Interior Angles Theorem **MAFS.912.G-CO.3.9**	In a diagram involving two parallel lines and a transversal, students are asked to use rigid motion to prove that alternate interior angles are congruent.	• Proving the Alternate Interior Angles Theorem worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Proving the Vertical Angles Theorem **MAFS.912.G-CO.3.9**	Using this MFAS task, students are asked to identify a pair of vertical angles in a diagram and then prove that they are congruent.	• Proving the Vertical Angles Theorem worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Standard: MAFS.912.G-CO.3.10
Prove theorems about triangles; use theorems about triangles to solve problems. *Theorems include: measures of interior angles of a triangle sum to 180°; triangle inequality theorem; 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.*

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Proof: Sum of Measures of Angles in a Triangle are 180 MAFS.912.G-CO.3.10	In this tutorial, students will prove that the sum of interior angles of a triangle is equal to 180 degrees.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Use Triangle Congruence to Prove Triangle Relationships MAFS.912.G-CO.3.10	In this lesson, students will learn how to prove the angle relationships that exist within a triangle by using SAS congruence and parallel lines.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Use Triangle Similarity to Prove the Triangle Midsegment Theorem MAFS.912.G-CO.3.10	In this lesson, students will learn how to prove the Triangle Midsegment Theorem by using the properties of triangle similarity.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Use Properties of Similar Triangles to Prove the Concurrency of Medians Theorem MAFS.912.G-CO.3.10	In this lesson, students will learn how to prove the Concurrency of Medians Theorem by using parallel lines and properties of similar triangles.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Isosceles Triangle Proof MAFS.912.G-CO.3.10	Using tis MFAS task, students are asked to prove that the base angles of an isosceles triangle are congruent.	• Isosceles Triangle Proof worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Median Concurrence Proof MAFS.912.G-CO.3.10	Using this MFAS task, students are asked to prove that the medians of a triangle are concurrent.	• Median Concurrency Proof worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Proving the Triangle Inequality Theorem MAFS.912.G-CO.3.10	Using this MFAS task, students are asked to prove the Triangle Inequality Theorem.	• Proving the Triangle Inequality Theorem worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
The Measure of an Angle of a Triangle MAFS.912.G-CO.3.10	Using this MFAS task, students are given the measure of one interior angle of an isosceles triangle and are asked to find the	• The Measure of an Angle of a Triangle worksheet (included) • Microsoft Word or Adobe Acrobat Reader

	measure of another interior angle.	• Calculator (if necessary)
The Third Side of a Triangle **MAFS.912.G-CO.3.10**	Using this MFAS task, students are given the lengths of two sides of a triangle and asked to describe all possible lengths of the remaining side.	• The Third Side of a Triangle worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Triangle Midsegment Proof **MAFS.912.G-CO.3.10**	Using this MFAS task, students are asked to prove that the segment joining the midpoints of two sides of a triangle is parallel to the third side of the triangle and half of its length.	• Triangle Midsegment Proof worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Triangle Sum Proof **MAFS.912.G-CO.3.10**	Using this MFAS task, students are asked prove that the measures of the interior angles of a triangle sum to 180°.	• Triangle Sum Proof worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Triangles and Midpoints **MAFS.912.G-CO.3.10**	Using this MFAS task, students are asked to explain why a quadrilateral formed by drawing the midsegments of a triangle is a parallelogram and to find the perimeter of the triangle formed by the midsegments.	• Triangles and Midpoints worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Standard: MAFS.912.G-CO.3.11
Prove theorems about parallelograms; use theorems about parallelograms to solve problems. *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.*

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Use Parallel Lines and Triangle Congruence Theorems to Prove Properties of Parallelograms **MAFS.912.G-CO.3.11**	In this lesson, students will learn how to prove the angle and side length properties of parallelograms by using parallel lines and triangle congruence theorems.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Use Parallel Lines and Triangle Congruence Theorems to Prove Properties of Diagonals within Parallelograms **MAFS.912.G-CO.3.11**	In this lesson, students will learn how to prove the properties of diagonals within parallelograms by using parallel lines and triangle congruence theorems.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Use Triangle and Parallelogram Theorems to Solve a Real-World Problem	In this lesson, students will learn how to solve a real-world	• Internet connection • Speakers/headphones • Computer

MAFS.912.G-CO.3.11	problem by using properties of parallelograms and triangles.	• Calculator (if necessary)
Angles of a Parallelogram **MAFS.912.G-CO.3.11**	Using this MFAS task, students are given expressions that represent the measures of two angles of a parallelogram and are asked to find the measures of all four angles describing any theorems used.	• Angles of a Parallelogram worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Proving a Rectangle Is a Parallelogram **MAFS.912.G-CO.3.11**	Using this MFAS task, students are asked to prove that a rectangle is a parallelogram.	• Proving a Rectangle Is a Parallelogram worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Proving Parallelogram Angle Congruence **MAFS.912.G-CO.3.11**	Using this MFAS task, students are asked to prove that opposite angles of a parallelogram are congruent.	• Proving Parallelogram Angle Congruence worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Proving Congruent Diagonals **MAFS.912.G-CO.3.11**	Using this MFAS task, students are asked to prove that the diagonals of a rectangle are congruent.	• Proving Congruent Diagonals worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Proving Parallelogram Diagonals Bisect **MAFS.912.G-CO.3.11**	Using this MFAS task, students are asked to prove that the diagonals of a parallelogram bisect each other.	• Proving Parallelogram Diagonals Bisect worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Proving Parallelogram Side Congruence **MAFS.912.G-CO.3.11**	Using this MFAS task, students are asked to prove that opposite sides of a parallelogram are congruent.	• Proving Parallelogram Side Congruence worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Two Congruent Triangles **MAFS.912.G-CO.3.11**	Using this MFAS task, students are asked to explain why a pair of triangles formed by the sides and diagonals of a parallelogram are congruent.	• Two Congruent Triangles worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Standard: MAFS.912.G-CO.4.12. Also Assesses MAFS.912.G-CO.4.13

MAFS.912.G-CO.4.12 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.

MAFS.912.G-CO.4.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
The Blueprints of Construction MAFS.912.G-CO.4.12	Using this tutorial, students should be able to construct the perpendicular bisector of a line segment using a straightedge and compass.	• Internet connection • Speakers/headphones • Computer • Adobe Acrobat Reader (optional) • Calculator (if necessary)
Bisecting a Segment and an Angle MAFS.912.G-CO.4.12	Using this MFAS task, students are asked to construct the bisectors of a given segment and a given angle and to justify one of the steps in each construction.	• Bisecting A Segment and Angle worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Construction of a Perpendicular Bisector MAFS.912.G-CO.4.12	This problem solving task challenges students to construct a perpendicular bisector of a given segment.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Constructing a Congruent Angle MAFS.912.G-CO.4.12	Using this MFAS task, students are asked to construct an angle congruent to a given angle.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Bisecting an Angle MAFS.912.G-CO.4.12	This problem solving task challenges students to bisect a given angle.	• Compass and straightedge • Translucent paper, reflective devices or dynamic geometry software • Constructing a Congruent Angle worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Angle Bisection and Midpoints of Line Segments MAFS.912.G-CO.4.12	This task provides a construction of the angle bisector of an angle by reducing it to the bisection of an angle to finding the midpoint of a line segment. It is worth observing the symmetry -- for both finding midpoints and bisecting angles, the goal is to cut an object into two equal parts.	• Compass and straightedge • Translucent paper, reflective devices or dynamic geometry software • Constructing a Congruent Segment worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Constructing a Congruent Segment MAFS.912.G-CO.4.12	Using this MFAS task, students are asked to construct a line	• Microsoft Word or Adobe Acrobat Reader

	segment congruent to a given line segment.	• Calculator (if necessary)
Constructions for Parallel Lines **MAFS.912.G-CO.4.12**	Using this MFAS task, students are asked to construct a line parallel to a given line through a given point.	• Compass and straightedge • Translucent paper, reflective devices or dynamic geometry software • Constructions for Parallel Lines worksheet (included) • Microsoft Word or Adobe Acrobat Reader Calculator (if necessary)
Constructions for Perpendicular Lines **MAFS.912.G-CO.4.12**	Using this MFAS task, students are asked to construct a line perpendicular to given line (1) through a point not on the line and (2) through a point on the line.	• Compass and straightedge • Translucent paper, reflective devices or dynamic geometry software • Constructions for Perpendicular Lines worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Inscribe a Regular Hexagon in a Circle **MAFS.912.G-CO.4.13**	This geogebra interactive worksheet shows the step-by-step process for inscribing a regular hexagon in a circle.	• Internet connection • Computer • Java plugin • Calculator (if necessary)
Inscribing a Hexagon in a Circle **MAFS.912.G-CO.4.13**	This problem solving task challenges students to inscribe equilateral triangles and regular hexagons on a circle with a compass and straightedge.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Geometric Constructions: Circle-Inscribed Regular Hexagon **MAFS.912.G-CO.4.13**	In this tutorial, students will learn how to construct a regular hexagon that is inscribed inside a given circle using compass and straightedge.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Geometric Constructions: Circle-Inscribed Equilateral Triangle **MAFS.912.G-CO.4.13**	In this tutorial, students will learn how to construct an equilateral triangle that is inscribed inside a given circle using compass and straightedge.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Geometric Constructions: Circle-Inscribed Square **MAFS.912.G-CO.4.13**	In this tutorial, students will learn how to construct a square that is inscribed inside a given circle using compass and straightedge.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Construct the Center of a Circle **MAFS.912.G-CO.4.13**	Using this MFAS task, students are asked to construct the center of a circle.	• Compass and straightedge • Translucent paper, reflective devices or

		dynamic geometry software • Construct the Center of a Circle worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Equilateral Triangle in a Circle **MAFS.912.G-CO.4.13**	Using this MFAS task, students are asked to construct an equilateral triangle inscribed in a circle.	• Compass and straightedge • Translucent paper, reflective devices or dynamic geometry software • Equilateral Triangle in a Circle worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Regular Hexagon in a Circle **MAFS.912.G-CO.4.13**	Using this MFAS task, students are asked to construct a regular hexagon inscribed in a circle.	• Compass and straightedge • Translucent paper, reflective devices or dynamic geometry software • Regular Hexagon in a Circle worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Square in a Circle **MAFS.912.G-CO.4.13**	Using this MFAS task, students are asked to construct a square inscribed in a circle.	• Compass and straightedge • Translucent paper, reflective devices or dynamic geometry software • Square in a Circle worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Standard: MAFS.912.G-GMD.1.1
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.*

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Relate Diameter and Circumference **MAFS.912.G-GMD.1.1**	In this lesson, students will investigate the relationship between diameter and circumference by dissecting a circle and making comparisons.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Informally Prove the Area of a Circle	In this lesson, students will learn how to prove the area of a circle	• Internet connection • Speakers/headphones

MAFS.912.G-GMD.1.1	by dissecting and rearranging a circle.	• Computer • Calculator (if necessary)
Relate the Volume of Prisms/Cylinders to Pyramids/Cones **MAFS.912.G-GMD.1.1**	In this lesson, students will learn how to prove the relationship between prisms/pyramids and cylinders/cones by applying the Cavalieri Principle.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Area and Circumference – 1 **MAFS.912.G-GMD.1.1**	This task is the first in a series of three tasks that assess the students' understanding of informal derivations of the formulas for the area and circumference of a circle. In this task, students are shown a regular *n*-gon inscribed in a circle. They are asked to use the formula for the area of the *n*-gon to derive an equation that describes the relationship between the area and circumference of the circle.	• Area and Circumference – 1 worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Area and Circumference – 2 **MAFS.912.G-GMD.1.1**	This task is the second in a series of three tasks that assesses the students' understanding of informal derivations of the formulas for the area and circumference of a circle. In this task, students show that the area of the circle of radius r, $A(r)$, can be found in terms of the area of the unit circle, $A(1)$ [i.e., $A(r) = r^2 \cdot A(1)$].	• Area and Circumference – 2 worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Area and Circumference – 3 **MAFS.912.G-GMD.1.1**	This task is the third in a series of three tasks that assess the students' understanding of informal derivations of the formulas for the area and circumference of a circle. In this task, students are given the definition of pi as the area of the unit circle, $A(1)$, and are asked to use this representation of pi along with the results from the two previous tasks to generate formulas for the area and circumference of a circle.	• Area and Circumference – 3 worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Volume of a Cone **MAFS.912.G-GMD.1.1**	Using this MFAS task, students are asked to derive and explain a formula for the volume of a cone given a pyramid with the	• Volume of a Cone worksheet (included) • Microsoft Word or Adobe Acrobat Reader

	same height and the same cross-sectional area at every height.	• Calculator (if necessary)
Volume of a Cylinder **MAFS.912.G-GMD.1.1**	Using this MFAS task, students are asked to derive and explain a formula for the volume of a cylinder given a prism with the same height and the same cross-sectional area at every height.	• Volume of a Cylinder worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Volume of a Pyramid **MAFS.912.G-GMD.1.1**	Using this MFAS task, students are guided through the process of writing an informal argument for the volume of a pyramid formula using Cavalieri's Principle.	• Volume of a Pyramid worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Standard: ★ MAFS.912.G-GMD.1.3
Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
I Scream! You Scream! We All Scream for... Volume! **MAFS.912.G-GMD.1.3**	In this tutorial, students should be able to answer this question and solve other real-world problems by using the formula for the volume of a cone.	• Internet connection • Speakers/headphones • Computer • Adobe Acrobat Reader (optional) • Calculator (if necessary)
Estimating Oil Seep Production by Bubble Volume **MAFS.912.G-GMD.1.3★**	Perspectives Video: Professional/Enthusiast When viewing this short video, students will need to bring their computer skills and math knowledge to estimate oil volume and rate as it seeps from the ocean floor.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Doctor's Appointment **MAFS.912.G-GMD.1.3★**	The purpose of the task is to analyze a plausible real-life scenario using a geometric model. The task requires knowledge of volume formulas for cylinders and cones, some geometric reasoning involving similar triangles. Students must give attention to reasonable approximations and maintaining reasonable levels of accuracy throughout.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Do Not Spill the Water! **MAFS.912.G-GMD.1.3★**	Using this MFAS task, students are asked to solve a problem	• Do Not Spill the Water! Worksheet (included)

	that requires calculating the volumes of a sphere and a cylinder.	• Volume formula reference sheet or textbook • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Snow Cones **MAFS.912.G-GMD.1.3★**	Using this MFAS task, students are asked to solve a problem that requires calculating the volumes of a cone and a cylinder.	• Snow Cones worksheet (included) • Volume formula reference sheet or textbook • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Sports Drinks **MAFS.912.G-GMD.1.3★**	Using this MFAS task, students are asked to solve a problem that requires calculating the volume of a large cylindrical sports drink container and comparing it to the combined volumes of 24 individual containers.	• Sports Drinks worksheet (included) • Volume formula reference sheet or textbook • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
The Great Pyramid **MAFS.912.G-GMD.1.3★**	Using this MFAS task, students are asked to find the height of the Great Pyramid of Giza given its volume and the length of the edge of its square base.	• The Great Pyramid worksheet (included) • Volume formula reference sheet or textbook • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Standard: MAFS.912.G-GMD.2.4
Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Ninja Nancy Slices **MAFS.912.G-GMD.2.4**	Using this tutorial, students should be able to determine the shape of a cross section created by the intersection of a slicing plane with a pyramid or prism.	• Internet connection • Speakers/headphones • Computer • Adobe Acrobat Reader (optional) • Calculator (if necessary)
3-D Conic Section Explorer **MAFS.912.G-GMD.2.4**	Using this resource, students can manipulate the measurements of a 3-D hourglass figure (double-napped cone) and its intersecting plane to see how the graph of a conic section changes. Students will see the	• Internet connection • Computer • Calculator (if necessary)

	impact of changing the *height* and *slant* of the cone and the *m* and *b* values of the plane on the shape of the graph. Students can also rotate and re-size the cone and graph to view from different angles.	
Cross Section Flyer – Shodor **MAFS.912.G-GMD.2.4**	Using this online Java applet, students use slider bars to move a cross section of a cone, cylinder, prism or pyramid. This activity allows students to explore conic sections and the 3-dimensional shapes from which they are derived.	• Internet connection • Computer • Java plugin • LCD projector • Calculator (if necessary)
2D Rotations of Rectangles **MAFS.912.G-GMD.2.4**	Using this MFAS task, students are given the coordinates of the vertices of a rectangle and asked to describe the solid formed by rotating the rectangle about a given axis.	• 2D Rotations of Rectangles worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
2D Rotations of Triangles **MAFS.912.G-GMD.2.4**	Using this MFAS task, students are given the coordinates of the vertices of a right triangle and asked to describe the solid formed by rotating the triangle about a given axis.	• 2D Rotations of Triangles worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Inside the Box **MAFS.912.G-GMD.2.4**	Using this MFAS task, students are asked to identify and draw cross sections of a rectangular prism and to describe their dimensions.	• Inside the Box worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Slice It **MAFS.912.G-GMD.2.4**	Using this MFAS task, students are asked to identify and describe two-dimensional cross sections of three-dimensional solids.	• Slice It worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Slice of a Cone **MAFS.912.G-GMD.2.4**	Using this MFAS task, students are asked to sketch, describe, and compare three horizontal cross sections of a cone.	• Slice of a Cone worksheet (included) • Microsoft Word • Calculator (if necessary)
Working Backwards – 2D Rotations **MAFS.912.G-GMD.2.4**	Using this MFAS task, students are given a solid and asked to determine the two-dimensional shape that will create the solid when rotated about the *y*-axis.	• Working Backwards – 2D Rotations worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Standard: MAFS.912.G-GPE.1.1
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.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Find the Center and Radius of a Circle by Completing the Square MAFS.912.G-GPE.1.1	In this lesson, students will learn how to find the center and radius of a circle by completing the square.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Derive the Equation of a Circle Centered at the Origin MAFS.912.G-GPE.1.1	In this lesson, students will derive the equation of a circle centered at the origin using the Pythagorean Theorem.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Write the Equation of a Circle Centered at (h, k) MAFS.912.G-GPE.1.1	In this lesson, students will learn to write an equation of a circle centered at (h,k) by using the Pythagorean Theorem.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Translate the Equation of a Circle from General Form to Standard Form MAFS.912.G-GPE.1.1	In this lesson, students will learn to translate the equation of a circle in general form to standard form by completing the square.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Performance task for Deriving the Equation of a Circle using the Pythagorean Theorem MAFS.912.G-GPE.1.1	Using this performance task, students will derive the equation of a circle of given center and radius using the Pythagorean Theorem. Additionally, students will complete the square to find the center and radius of a circle given by an equation.	• Internet connection • Computer • Calculator (if necessary)
Complete the Square for Center – Radius MAFS.912.G-GPE.1.1	Using this MFAS task, students are asked to find the center and radius of a circle given its equation in general form.	• Complete the Square for Center – Radius worksheet (included) • Microsoft Word • Calculator (if necessary)
Complete the Square for Center – Radius 2 MAFS.912.G-GPE.1.1	Using this MFAS task, students are asked to find the center and radius of a circle given its equation in general form	• Complete the Square for Center – Radius 2 worksheet (included) • Microsoft Word • Calculator (if necessary)
Derive the Circle – General Points MAFS.912.G-GPE.1.1	Using this MFAS task, students are given the coordinates of the center, (h, k), and the radius, r, of a circle and are asked to derive the equation of the circle using the Pythagorean Theorem.	• Derive the Circle – General Points worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Derive the Circle – Specific Points **MAFS.912.G-GPE.1.1**	Using this MFAS task, students are given the coordinates of the center and the radius of a circle and are asked to derive the equation of the circle using the Pythagorean Theorem.	• Derive the Circle – Specific Points worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Standard: MAFS.912.G-GPE.2.4
Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).*

Lesson/Activity	Lesson/Activity Description	Suggested Technology
A Midpoint Miracle **MAFS.912.G-GPE.2.4**	This problem solving task gives students the opportunity to prove a fact about quadrilaterals: that if we join the midpoints of an arbitrary quadrilateral to form a new quadrilateral, then the new quadrilateral is a parallelogram, even if the original quadrilateral was not.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Describe the Quadrilateral **MAFS.912.G-GPE.2.4**	Using this MFAS task, students are given the coordinates of the vertices of a quadrilateral and are asked to determine whether the quadrilateral could also be a parallelogram, rhombus, rectangle, square or trapezoid.	• Describe the Quadrilateral worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Type of Triangle **MAFS.912.G-GPE.2.4**	Using this MFAS task, students are given the coordinates of three vertices of a triangle and are asked to use algebra to determine whether the triangle is scalene, isosceles or equilateral.	• Type of Triangle worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Diagonals of a Rectangle **MAFS.912.G-GPE.2.4**	Using this MFAS task, students are given the coordinates of three of the four vertices of a rectangle and are asked to determine the coordinates of the fourth vertex and show the diagonals of the rectangle are congruent.	• Describe the Quadrilateral worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Midpoints of Sides of a Quadrilateral **MAFS.912.G-GPE.2.4**	Using this MFAS task, students are asked to prove that the quadrilateral formed by	• Midpoints of Sides of a Quadrilateral worksheet (included)

	connecting the midpoints of the sides of a given quadrilateral is a parallelogram.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Standard: MAFS.912.G-GPE.2.5
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).

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Proving Slope Criterion for Parallel Lines - One MAFS.912.G-GPE.2.5	Using this MFAS task, students are asked to prove that two parallel lines have equal slopes.	• Proving Slope Criterion for Parallel Lines - One worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Proving Slope Criterion for Parallel Lines – Two MAFS.912.G-GPE.2.5	Using this MFAS task, students are asked to prove that two lines with equal slopes are parallel.	• Proving Slope Criterion for Parallel Lines - Two worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Proving Slope Criterion for Perpendicular Lines – 1 MAFS.912.G-GPE.2.5	Using this MFAS task, students are asked to prove that the slopes of two perpendicular lines are both opposite and reciprocal.	• Proving Slope Criterion for Perpendicular Lines - 1 worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Proving Slope Criterion for Perpendicular Lines – 2 MAFS.912.G-GPE.2.5	Using this MFAS task, students are asked to prove that if the slopes of two lines are both opposite and reciprocal, then the lines are perpendicular.	• Proving Slope Criterion for Perpendicular Lines - 2 worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Writing Equations for Parallel Lines MAFS.912.G-GPE.2.5	Using this MFAS task, students are asked to identify the slope of a line parallel to a given line and write an equation for the line given a point.	• Writing Equations for Parallel Lines worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Writing Equations for Perpendicular Lines MAFS.912.G-GPE.2.5	Using this MFAS task, students are asked to identify the slope of a line perpendicular to a given line and write an equation for the line given a point.	• Writing Equations for Perpendicular Lines worksheet • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Writing Equations of Perpendicular Lines **MAFS.912.G-GPE.2.5**	In this tutorial, students are presented with a linear equation and a point on a line perpendicular to it. Students will be shown how to find the equation of the perpendicular line.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Writing Equations of Perpendicular Lines (Example 2) **MAFS.912.G-GPE.2.5**	In this tutorial, students are shown how to find the equation of a line perpendicular to a line given in slope-intercept form that passes through a specific point.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)

Standard: MAFS.912.G-GPE.2.6
Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Dividing Line Segments: Graphical **MAFS.912.G-GPE.2.6**	In this tutorial, students will learn how to find the coordinates of a point between two other points that give a certain ratio. A graph is given to make it easier to visualize the problem.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Divide Line Segments **MAFS.912.G-GPE.2.6**	In this tutorial, students will figure out the coordinates of a point between two other points that give a certain ratio.	• Internet connection • Computer • Calculator (if necessary)
Centroid Coordinates **MAFS.912.G-GPE.2.6**	Using this MFAS task, students are asked to find the coordinates of the centroid when given the ratio of a directed segment.	• Centroid Coordinates worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Partitioning a Segment **MAFS.912.G-GPE.2.6**	Using this MFAS task, students are asked to find the coordinates of a point which partitions a segment in a given ratio.	• Partitioning a Segment worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Standard: ★ MAFS.912.G-GPE.2.7
Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Area & Perimeter on the Coordinate Plane **MAFS.912.G-GPE.2.7★**	In this tutorial, students will find the area or perimeter of shapes like triangles, rectangles, parallelograms and hexagons on the coordinate plane.	• Internet connection • Computer • Calculator (if necessary)
Coordinate Plane Word Problems: Polygons **MAFS.912.G-GPE.2.7★**	In this tutorial, students will solve various types of word problems using polygons on the coordinate plane.	• Internet connection • Computer • Calculator (if necessary)
Coordinate Plane Word Problem **MAFS.912.G-GPE.2.7★**	In this tutorial, students will learn how to determine which of the Minions a wizard can reach using the coordinate plane.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Pentagon's Perimeter **MAFS.912.G-GPE.2.7★**	Using this MFAS task, students are asked to find the perimeter of a pentagon given in the coordinate plane.	• Pentagon's Perimeter worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Perimeter and Area of a Rectangle **MAFS.912.G-GPE.2.7★**	Using this MFAS task, students are asked to find the perimeter and the area of a rectangle given in the coordinate plane.	• Perimeter and Area of a Rectangle worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Perimeter and Area of a Right Triangle **MAFS.912.G-GPE.2.7★**	Using this MFAS task, students are asked to find the perimeter and the area of a right triangle given in the coordinate plane.	• Perimeter and Area of a Right Triangle worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Perimeter and Area of an Obtuse Triangle **MAFS.912.G-GPE.2.7★**	Using this MFAS task, students are asked to find the perimeter and area of an obtuse triangle given in the coordinate plane.	• Perimeter and Area of an Obtuse Triangle worksheet (included) • Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

Standard: ★ MAFS.912.G-MG.1.1
Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Toilet Roll **MAFS.912.G-MG.1.1★**	The purpose of this task is to engage students in geometric modeling, and in particular, to	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

	deduce algebraic relationships between variables stemming from geometric constraints.	
The Lighthouse Problem **MAFS.912.G-MG.1.1★**	In this problem solving task, students will model phenomena on the surface of the earth by examining the visibility of the lamp in a lighthouse from a boat.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
How many Cells are in the Human Body? **MAFS.912.G-MG.1.1★**	This problem solving task challenges students to apply the concepts of mass, volume and density in the real-world context to find how many cells are in the human body.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Use Cavalieri's Principle to Compare Aquarium Volumes **MAFS.912.G-MG.1.1★**	This task presents a context that leads students toward discovery of the formula for calculating the volume of a sphere.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Camping Calculations **MAFS.912.G-MG.1.1★**	Using this MFAS task, students are asked to find the measure of an angle formed by the support poles of a tent using the properties of geometric shapes.	• Microsoft Word • Calculator (if necessary) • Camping Calculations worksheet (included)
Estimating Area **MAFS.912.G-MG.1.1★**	Using this MFAS task, students are asked to select appropriate geometric shapes to model a lake and then use the model to estimate the surface area of the lake.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Estimating Area worksheet (included)
Estimating Volume **MAFS.912.G-MG.1.1★**	Using this MFAS task, students are asked to model a tree trunk with geometric solids and to use the model to estimate the volume of the tree trunk.	• Microsoft Word • Calculator (if necessary) • Estimating Volume worksheet (included)
Size It Up **MAFS.912.G-MG.1.1★**	Using this MFAS task, students are asked to name geometric solids that could be used to model several objects.	• Microsoft Word • Calculator (if necessary) • Size It Up worksheet (included)

Standard: ★ MAFS.912.G-MG.1.2
Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Archimedes and the King's Crown **MAFS.912.G-MG.1.2★**	This problem solving task uses the tale of Archimedes and the	• Microsoft Word or Adobe Acrobat Reader

	King of Syracuse's crown to determine the volume and mass of gold and silver.	• Calculator (if necessary)
How many Cells are in the Human Body? **MAFS.912.G-MG.1.2★**	This problem solving task challenges students to apply the concepts of mass, volume and density in the real-world context to find how many cells are in the human body.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
How Many Trees? **MAFS.912.G-MG.1.2★**	Using this MFAS task, students are asked to determine an estimate of the density of trees and the total number of trees in a forest.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • How Many Trees? Worksheet (included)
Mudslide **MAFS.912.G-MG.1.2★**	Using this MFAS task, students are asked to create a model to estimate volume and mass.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Mudslide worksheet (included)
Population of Utah **MAFS.912.G-MG.1.2★**	Using this MFAS task, students are asked to determine the population of the state of Utah given the state's population density and a diagram of the state's perimeter with boundary distances labeled in miles.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Population of Utah worksheet (included)

Standard: ★ MAFS.912.G-MG.1.3
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).

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Using Geometry and Computers to make Art with CNC Machining **MAFS.912.G-MG.1.3★**	See far into the future of arts and manufacturing as a technician explains computer numerically controlled (CNC) machining bit by bit.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Paper Clip **MAFS.912.G-MG.1.3★**	In this task, a typographic grid system serves as the background for a standard paper clip. A metric measurement scale is drawn across the bottom of the grid and the paper clip extends in both directions slightly beyond the grid. Students are given the approximate length of the paper clip and determine the	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

	number of like paper clips made from a given length of wire.	
Ice Cream Cone **MAFS.912.G-MG.1.3★**	In this task, students will provide a sketch of a paper ice cream cone wrapper, use the sketch to develop a formula for the surface area of the wrapper and estimate the maximum number of wrappers that could be cut from a rectangular piece of paper.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Land for the Twins **MAFS.912.G-MG.1.3★**	Using this MFAS task, students are asked to solve a design problem in which a triangular tract of land is to be partitioned into two regions of equal area.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Land for the Twins worksheet (included)
Softball Complex **MAFS.912.G-MG.1.3★**	Using this MFAS task, students are asked to solve a design problem in which a softball complex is to be located on a given tract of land subject to a set of specifications.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Softball Complex worksheet (included) • Straight edge and compass
The Duplex **MAFS.912.G-MG.1.3★**	Using this MFAS task, students are asked to solve a design problem in which the length of wall used in a rectangular floor plan is minimized.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • The Duplex worksheet (included) • Graphing technology
The Sprinters' Race **MAFS.912.G-MG.1.3★**	Using this MFAS task, student are given a grid with three points (vertices of a right triangle) representing the starting locations of three sprinters in a race and are asked to determine the center of the finish circle, which is equidistant from each sprinter.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • The Sprinters' Race worksheet (included) • Compass and straightedge

Standard: MAFS.912.G-SRT.1.1
Verify experimentally the properties of dilations given by a center and a scale factor:

a. 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.

b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Dilation and Scale Factor **MAFS.912.G-SRT.1.1**	In this tutorial, students will use a scale factor to dilate one line onto another.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Dilating a Line **MAFS.912.G-SRT.1.1**	This task asks students to make deductions about a line after it has been dilated by a factor of 2.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Performing Dilations **MAFS.912.G-SRT.1.1**	In this tutorial, students will learn how to perform a dilation on a hexagon.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Perform Dilations **MAFS.912.G-SRT.1.1**	In this tutorial, students will use an interactive transformation tool to perform dilations.	• Internet connection • Computer • Calculator (if necessary)
Dilation of a Line Segment **MAFS.912.G-SRT.1.1**	Using this MFAS task, students are asked to dilate a line segment and describe the relationship between the original segment and its image.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Dilation of a Line Segment worksheet (included)
Dilation of a Line: Center on the Line **MAFS.912.G-SRT.1.1**	Using this MFAS task, students are asked to graph the image of two points on a line after a dilation using a center on the line and to generalize about dilations of lines when the line contains the center.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Dilation of a Line: Center on the Line worksheet (included)
Dilation of a Line: Factor of One Half **MAFS.912.G-SRT.1.1**	Using this MFAS task, students are asked to graph the image of three points on a line after a dilation using a center not on the line and to generalize about dilations of lines when the line does not contain the center.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Dilation of a Line: Factor of One Half worksheet (included)
Dilation of a Line: Factor of Two **MAFS.912.G-SRT.1.1**	Using this MFAS task, students are asked to graph the image of three points on a line after a dilation using a center not on the line and to generalize about dilations of lines when the line does not contain the center.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Dilation of a Line: Factor of Two worksheet (included)

Standard: MAFS.912.G-SRT.1.2
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.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Are They Similar? **MAFS.912.G-SRT.1.2**	In this problem, students are given a picture of two triangles that appear to be similar, but whose similarity cannot be proven without further information. Asking students to provide a sequence of similarity transformations that maps one triangle to the other, using the definition of similarity in terms of similarity transformations.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)
Determine Triangle Similarity using the Properties of Similarity Transformations **MAFS.912.G-SRT.1.2**	In this lesson, students will learn how to determine if triangles are similar by verifying the properties of similarity transformations.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Showing Similarity **MAFS.912.G-SRT.1.2**	Using this MFAS task, students are to use the definition of similarity in terms of similarity transformations to determine whether or not two quadrilaterals are similar.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Showing Similarity worksheet (included)
The Consequences of Similarity **MAFS.912.G-SRT.1.2**	Using this MFAS task, students are given the definition of similarity in terms of similarity transformations and are asked to explain how this definition ensures the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • The Consequences of Similarity worksheet (included)
To Be or Not To Be Similar **MAFS.912.G-SRT.1.2**	Using this MFAS task, students are asked to use the definition of similarity in terms of similarity transformations to determine whether or not two triangles are similar.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • To Be or Not To Be Similar worksheet (included)

Standard: MAFS.912.G-SRT.1.3. Also Assesses MAFS.912.G-SRT.2.4

MAFS.912.G-SRT.1.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

MAFS.912.G-SRT.2.4 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.*

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Prove AA Similarity by Overlapping Angles **MAFS.912.G-SRT.1.3**	In this lesson, students will learn how to prove AA similarity by overlapping the angles of triangles to form a line.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Show Triangle Similarity using Translation **MAFS.912.G-SRT.1.3**	In this lesson, students will learn why two corresponding congruent angles establish triangle similarity by using a translation.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Describe the AA Similarity Theorem **MAFS.912.G-SRT.1.3**	Using this MFAS task, students are asked to describe the AA Similarity Theorem.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Describe the AA Similarity Theorem worksheet (included)
Justifying a Proof of the AA Similarity Theorem **MAFS.912.G-SRT.1.3**	Using this MFAS task, students are asked to justify statements of a proof of the AA Similarity Theorem.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Justifying a Proof of the AA Similarity Theorem worksheet (included)
Prove the AA Similarity Theorem **MAFS.912.G-SRT.1.3**	Using this MFAS task, students will indicate a complete proof of the AA Theorem for triangle similarity.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Prove the AA Similarity Theorem worksheet (included) • Similarity with Given Sides worksheet (included-optional) • Similarity with Angle and Side worksheet (included-optional)
Proving Theorems about Triangles **MAFS.912.G-SRT.2.4**	This tutorial is designed to help students use properties, postulates and theorems to prove a theorem about a triangle. At the conclusion of this tutorial, students should be able to prove that a line parallel to one side of a triangle divides the other two proportionally.	• Internet connection • Speakers/headphones • Computer • Adobe Acrobat Reader (optional) • Calculator (if necessary)
Pythagorean Theorem Proof Using Similar Triangles **MAFS.912.G-SRT.2.4**	In this tutorial, students will be shown a proof of the Pythagorean Theorem using similar triangles.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)

Converse of the Triangle Proportionality Theorem **MAFS.912.G-SRT.2.4**	Using this MFAS task, students are asked to prove that if a line intersecting two sides of a triangle divides those two sides proportionally, then that line is parallel to the third side.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Converse of the Triangle Proportionality Theorem worksheet (included)
Geometric Mean Proof **MAFS.912.G-SRT.2.4**	Using this MFAS task, students are asked to prove that the length of the altitude to the hypotenuse of a right triangle is the geometric mean of the lengths of the two segments of the hypotenuse.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Geometric Mean Proof worksheet (included)
Pythagorean Theorem Proof **MAFS.912.G-SRT.2.4**	Using this MFAS task, students are asked to prove the Pythagorean Theorem using similar triangles.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Pythagorean Theorem Proof worksheet (included)
Triangle Proportionality Theorem **MAFS.912.G-SRT.2.4**	Using this MFAS task, students are asked to prove that a line parallel to one side of a triangle divides the other two sides of the triangle proportionally.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Triangle Proportionality Theorem worksheet (included)

Standard: MAFS.912.G-SRT.2.5
Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Basketball Goal **MAFS.912.G-SRT.2.5**	Using this MFAS task, students are asked to decide if a basketball goal is regulation height and are given enough information to determine this using similar triangles.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Basketball Goal worksheet (included)
County Fair **MAFS.912.G-SRT.2.5**	Using this MFAS task, students are given a diagram of a county fair and are asked to use similar triangles to determine distances from one location of the fair to another.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • County Fair worksheet (included)
Prove Rhombus Diagonals Bisect Angles **MAFS.912.G-SRT.2.5**	Using this MFAS task, students are asked to prove a specific diagonal of a rhombus bisects a pair of angles.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary)

		• Prove Rhombus Diagonals Bisect Angles worksheet (included)
Similar Triangles - 1 **MAFS.912.G-SRT.2.5**	Using this MFAS task, students are asked locate a pair of similar triangles in a diagram, explain why they are similar, and use the similarity to find two unknown lengths in the diagram.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Similar Triangles – 1 worksheet (included)
Similar Triangles - 2 **MAFS.912.G-SRT.2.5**	Using this MFAS task, students are asked to locate a pair of similar triangles in a diagram, explain why they are similar, and use the similarity to find an unknown length in the diagram.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Similar Triangles – 2 worksheet (included)

Standard: ★MAFS.912.G-SRT.3.8. Also Assesses MAFS.912.G-SRT.3.6 and MAFS.912.G-SRT.3.7

★MAFS.912.G-SRT.3.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

MAFS.912.G-SRT.3.6 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.

MAFS.912.G-SRT.3.7 Explain and use the relationship between the sine and cosine of complementary angles.

Lesson/Activity	Lesson/Activity Description	Suggested Technology
Around the World with Right Triangles **MAFS.912.G-SRT.3.8 ★**	In this tutorial, students will use trigonometric ratios to solve a real-world application.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Using Trigonometry to Solve for Missing Information **MAFS.912.G-SRT.3.8 ★**	In this tutorial, students will use trigonometry to solve for missing information in right triangles.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Holiday Lights **MAFS.912.G-SRT.3.8 ★**	Using this MFAS task, students are asked to solve a problem in a real world context requiring the use of the Pythagorean Theorem.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Holiday Lights worksheet (included)
Lighthouse Keeper **MAFS.912.G-SRT.3.8 ★**	Using this MFAS task, students are asked to find the difference between two lengths in a real world context requiring right triangle trigonometry.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Lighthouse Keeper worksheet (included)

Perilous Plunge **MAFS.912.G-SRT.3.8** ★	Using this MFAS task, students are asked to find an unknown length in a real world context requiring right triangle trigonometry.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Perilous Plunge worksheet (included)
River Width **MAFS.912.G-SRT.3.8** ★	Using this MFAS task, students are asked to find an unknown length in a real world context requiring right triangle trigonometry.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • River Width worksheet (included) • Technology with trigonometric functions or • Table of trigonometric values
Step Up **MAFS.912.G-SRT.3.8** ★	Using this MFAS task, students are asked to explain the relationship among angles in a diagram involving a right triangle and to find one angle of the right triangle.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Step Up worksheet (included)
TV Size **MAFS.912.G-SRT.3.8** ★	Using this MFAS task, students are asked to solve a problem in a real world context requiring the use of the Pythagorean Theorem.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • TV Size worksheet (included)
Washington Monument **MAFS.912.G-SRT.3.8** ★	Using this MFAS task, students are asked to find the angle of elevation in a real world situation modeled by a right triangle.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Washington Monument worksheet (included) • Technology with trigonometric functions or • Table of trigonometric values
Will It Fit? **MAFS.912.G-SRT.3.8** ★	Using this MFAS task, students are asked to solve a problem in a real world context using the Pythagorean Theorem.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Will It Fit? Worksheet (included)
Find the Sine of an Angle in a Right Triangle **MAFS.912.G-SRT.3.6**	In this lesson, students will learn the sine ratio by comparing the ratios of the length of the side opposite an acute angle to the length of the hypotenuse in right triangles.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Find the Cosine of an Angle in a Right Triangle **MAFS.912.G-SRT.3.6**	In this lesson, students will learn the cosine ratio by comparing the ratios of the length of the	• Internet connection • Speakers/headphones • Computer

	side adjacent an acute angle to the length of the hypotenuse in right triangles.	• Calculator (if necessary)
Find the Tangent of an Acute Angle in a Right Triangle **MAFS.912.G-SRT.3.6**	In this lesson, students will learn the tangent ratio by comparing the ratio of the length of the side opposite an acute angle to the length of the side adjacent an acute angle in right triangles.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Find the Secant of an Acute Angle in a Right Triangle **MAFS.912.G-SRT.3.6**	In this lesson, students will learn the secant ratio by comparing the ratio of the length of the hypotenuse to the length of the leg adjacent an acute angle in a right triangle.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Find the Cosecant of an Acute Angle in a Right Triangle **MAFS.912.G-SRT.3.6**	In this lesson, students will learn the cosecant ratio by comparing the ratio of the length of the hypotenuse to the length of the leg opposite an acute angle in right triangles.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Find the Cotangent of an Acute Angle in a Right Triangle **MAFS.912.G-SRT.3.6**	In this lesson, students will learn the cotangent ratio by comparing the ratio of the length of the leg adjacent an acute angle to the length of the leg opposite an acute angle in right triangles.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
The Cosine Ratio **MAFS.912.G-SRT.3.6**	Using this MFAS task, students are asked to compare the ratio of corresponding sides of two triangles and to explain how this ratio is related to the cosine of a given angle.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • The Cosine Ratio worksheet (included)
The Sine of 57 **MAFS.912.G-SRT.3.6**	Using this MFAS task, students are asked to explain what a given sine ratio indicates about a right triangle and if the sine of a specific value varies depending on the right triangle.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • The Sine of 57 worksheet (included)
Sine & Cosine of Complementary Angles **MAFS.912.G-SRT.3.7**	In this tutorial, students will learn that the sine of any angle is equal to the cosine of its complementary angle.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Using Complementary Angles **MAFS.912.G-SRT.3.7**	In this tutorial, students will learn how to solve the following problem: Given that $\cos(58°)=0.53$, find $\sin(32°)$.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)

Trig Word Problem: Complementary Angles **MAFS.912.G-SRT.3.7**	In this tutorial, students will learn how to solve a problem about a submerged pyramid using the fact that the sine of an angle is equal to the cosine of its complementary angle.	• Internet connection • Speakers/headphones • Computer • Calculator (if necessary)
Finding Sine **MAFS.912.G-SRT.3.7**	Using this MFAS task, students are asked to explain the relationship between sine and cosine of complementary angles.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Finding Sine worksheet (included)
Patterns in the 30-60-90 Table **MAFS.912.G-SRT.3.7**	Using this MFAS task, students are asked to use 30-60-90 triangle relationships to observe and explain the relationship between sin 30 and cos 60 (or sin 60 and cos 30).	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Patterns in the 30-60-90 Table worksheet (included)
Right Triangle Relationships **MAFS.912.G-SRT.3.7**	Using this MFAS task, students are given the sine and cosine of angle measures and asked to identify the sine and cosine of their complements.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Right Triangle Relationships worksheet (included)
Sine and Cosine **MAFS.912.G-SRT.3.7**	Using this MFAS task, students are asked to explain the relationship between sine and cosine of the acute angles of a right triangle.	• Microsoft Word or Adobe Acrobat Reader • Calculator (if necessary) • Sine and Cosine worksheet (included)

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