DRAFT

Geometry EOC Item Specifications

Florida
Standards Assessments

The draft Florida Standards Assessment (FSA) *Test Item Specifications* (*Specifications)* are based upon the Florida Standards and the Florida Course Descriptions as provided in CPALMs. The *Specifications* are a resource that defines the content and format of the test and test items for item writers and reviewers. Each grade-level and course *Specifications* document indicates the alignment of items with the Florida Standards. It also serves to provide all stakeholders with information about the scope and function of the FSA.

Item Specifications Definitions

Also assesses refers to standard(s) closely related to the primary standard statement.

Clarification statements explain what students are expected to do when responding to the question.

Assessment limits define the range of content knowledge and degree of difficulty that should be assessed in the assessment items for the standard.

Acceptable response mechanisms describe the characteristics from which a student must answer a question.

Context defines types of stimulus materials that can be used in the assessment items.

MAFS.912.G-C.1.1	Prove that all circles are similar.
Item Types	Equation response – May require writing an algebraic description of a transformation or giving a value. Graphic response – May require creating circles. Multiple-choice response – May require selecting a value or an expression from a list. Multi-select response – May require selecting responses. Natural Language response – May require describing relationships. Simulation response – May require generating tables or creating circles with specific features.
Clarifications	Students will use a sequence of transformations to prove that circles are similar. Students will use the measures of different parts of a circle to determine similarity.
Assessment Limits	Items should not require the student to use the distance or midpoint formula. Items should not require the student to write an equation of a circle. Items may require the student to be familiar with using an algebraic description, $x \rightarrow x+3$, for transformations. Items should not use matrices to describe transformations.
Stimulus Attribute	Circles should not be given in equation form.
Response Attribute	Items may require students to use or choose the correct unit of measure.
Calculator	Neutral

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.
Item Types	Equation response – May require creating numeric values or expressions. Graphic response – May require creating circles with specific features. Multiple-choice response – May require selecting a value or an expression from a list. Multi-select response – May require selecting responses. Natural Language response – May require describing relationships. Simulation response – May require creating circles with specific features.
Clarification	Students will solve problems related to circles using the properties of central angles, inscribed angles, circumscribed angles, diameters, radii, chords, and tangents.
Assessment Limit	Items may include finding or describing the length of arcs when given information.
Stimulus Attribute	
Response Attribute	Items may require students to use or choose the correct unit of measure.
Calculator	Neutral

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.
Item Types	Graphic response – May require creating circles. Hot text response – May require dragging text to complete a justification. Movable text response – May require ordering steps or properties. Multiple-choice response – May require selecting a value or an expression from a list. Multi-select response – May require selecting responses. Natural Language response – May require explaining the validity of a proof. Selectable text response – May require highlighting a step in construction or a property within an informal argument. Simulation response – May require creating circles.
Clarifications	Students will construct a circle inscribed inside a triangle. Students will construct a circle circumscribed about a triangle. Students will solve problems using the properties of inscribed and circumscribed circles of a triangle. Students will use or justify properties of angles of a quadrilateral that is inscribed in a circle.
Assessment Limit	Items can include problems that use the incenter and circumcenter of a triangle.
Stimulus Attribute	
Response Attributes	Items may require students to use or choose the correct unit of measure. Items may require the students to provide steps for a construction. Items may require students to give statements and/or justifications to complete formal and informal proofs.
Calculator	Neutral

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.
Item Types	Graphic response – May require creating circles. Hot text response – May require dragging text to complete a proof. Movable text response – May require ordering steps in a derivation. Multiple-choice response – May require selecting a value or an expression from a list. Multi-select response – May require selecting responses. Natural Language response – May require explaining the validity of a proof. Selectable text response – May require highlighting a step in a derivation. Simulation response – May require creating circles.
Clarifications	Students will use similarity to derive the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure as the constant of proportionality. Students will apply similarity to solve problems that involve the length of the arc intercepted by an angle and the radius of a circle. Students will derive the formula for the area of a sector. Students will use the formula for the area of a sector to solve problems.
Assessment Limit	
Stimulus Attribute	
Response Attribute	Items may require students to use or choose the correct unit of measure.
Calculator	Neutral

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.
Item Types	Graphic response – May require drawing a figure. Hot text response – May require dragging text to complete a justification. Multiple-choice response – May require selecting a definition. Multi-select response – May require selecting responses. Natural Language response – May require explaining the validity of a definition. Selectable text response – May require highlighting a definition from an informal argument.
Clarifications	Students will use the precise definitions of angles, circles, perpendicular lines, parallel lines, and line segments, basing the definitions on the undefined notions of point, line, distance along a line, and distance around a circular arc.
Assessment Limit	
Stimulus Attributes	Items may ask students to analyze possible definitions to determine mathematical accuracy. Items may ask students to use definitions for justifications when choosing examples or nonexamples. Items may ask students to use properties of rotations, reflections, and translations as steps to a formal definition.
Response Attribute	
Calculator	Neutral

MAFS.912.G-CO.1.2 Also assesses MAFS.912.G-CO.1.4	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). Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
Item Types	Drag and drop response – May require completing a table. Graphic response – May require constructing transformations, mapping vertices to each other, or graphing a figure or a line of reflection. Multiple-choice response – May require selecting a value or an expression from a list. Multi-select response – May require selecting responses. Natural Language response – May require explaining the differences and similarities between different transformations or describing rotations, reflections, and/or translations. Selectable text response – May require highlighting a definition of rotation, reflection, or translation from an informal or formal geometric argument. Simulation response – May require generating tables and constructing transformations.
Clarifications	Students will represent transformations in the plane. Students will describe transformations as functions that take points in the plane as inputs and give other points as outputs. Students will compare transformations that preserve distance and angle to those that do not. Students will use definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
Assessment Limits	Items may require the student to be familiar with using an algebraic description, $x \rightarrow x+3$, for transformations. Items should not use matrices to describe transformations.

	Items should not require the student to use the distance formula. Items may require the student to find the distance between two points or the slope of a line. In items that require the student to represent transformations, at least two transformations should be applied.
Stimulus Attributes	Items may ask students to determine if a transformation is rigid. Items may ask students to determine if steps that are given can be used to develop a definition of an angle, a circle, perpendicular lines, parallel lines, or line segments by using rotations, reflections, and translations.
Response Attributes	Students may be asked for a coordinate of a transformed figure. Students may be asked to use a function to describe a transformation. Items may ask students to determine if verbal description of a definition is valid. Items may ask students to determine any flaws in verbal description of a definition. Students may be asked to use a function to describe a transformation. Students may be asked to give a line of reflection and/or degree of rotation that carry a figure onto itself. Students may be required to draw a figure using a description of a translation.
Calculator	Neutral

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.
Also assesses MAFS.912.G-CO.1.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
Item Types	Graphic response – May require constructing a transformed figure or graphing a figure or a line of reflection. Hot text response – May require reordering steps of a transformation. Multiple-choice response – May require selecting a value or an expression from a list. Multi-select response – May require selecting responses. Natural Language response – May require describing rotations and reflections. Simulation response – May require generating a table and constructing a transformed figure.
Clarifications	Students will apply two or more transformations to a given figure to draw a transformed figure. Students will specify a sequence of transformations that will carry a figure onto another. Students will describe rotations and reflections that carry a geometric figure onto itself.
Assessment Limits	Items should not require the student to use the distance formula. Items may require the student to be familiar with using an algebraic description, $x \rightarrow x+3$, for transformations. Items should not use matrices to describe transformations. In items in which the line of reflection is given, it should be in slope-intercept form. In items in which the student has to write the line of reflection, any form of a line can be used. If the line is not a vertical line or a horizontal line, then the line of reflection should be graphed as a dotted line so that the slope and the *y*-intercept can be determined.

Stimulus Attributes	Students may be given a sequence of transformations to determine if a figure will carry one figure on top of another. Students may be asked to determine if an attribute of a figure is the same after a sequence of transformations has been applied.
Response Attributes	Students may be asked to use a function to describe a transformation. Students may be asked to give a line of reflection and/or degree of rotation that carry a figure onto itself. Students may be required to draw a figure using a description of a transformation. Students may be required to graph a figure using a description of a rotation and/or reflection. In items in which the student has to write the line of reflection, any line can be used. If the line is not a vertical line or a horizontal line, then the line of reflection should be graphed as a dotted line so that the slope and the *y*-intercept can be determined. Students may be asked to write a line of reflection that will carry a figure onto itself. Students may be asked degree of rotation that will carry a figure onto itself.
Calculator	Neutral

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.
Item Types	Graphic response – May require constructing a transformed figure. Hot text response – May require reordering steps of a transformation or selecting text that proves congruence between triangles. Movable text response – May require dragging and dropping text to complete a viable geometric argument. Multiple-choice response – May require selecting a value, an expression from a list, or from choices of transformations. Multi-select response – May require identifying transformed figures. Natural Language response – May require justifying why two figures are congruent. Simulation response – May require generating a table and constructing a transformed figure.
Clarifications	Students will use rigid motions to transform figures. Students will predict the effect of a given rigid motion on a given figure. Students will use the definition of congruence in terms of rigid motions to determine if two figures are congruent. Students will explain triangle congruence using the definition of congruence in terms of rigid motions. Students will apply congruence to solve problems. Students will use congruence to justify steps within the context of a proof.
Assessment Limits	Items may require the student to justify congruence using the properties

	of rigid motion. Items should not require the student to use the distance formula. Items may require the student to be familiar with using an algebraic description, $x \rightarrow x+3$, for transformations. Items should not use matrices to describe transformations.
Stimulus Attribute	Items may require the student to determine the rigid motions that show that two triangles are congruent.
Response Attributes	Items may ask students to name corresponding angles and/or sides. Students may be asked to use a function to describe a transformation. In items in which the student has to write the line of reflection, any line can be used. If the line is not a vertical line or a horizontal line, then the line of reflection should be graphed as a dotted line so that the slope and the *y*-intercept can be determined. Items may require the student to name corresponding angles or sides. Items may require the student to determine the transformations required to show a given congruence. Items may require students to list sufficient conditions to prove triangles are congruent. Items may require students to determine if given information is sufficient for congruence. Items may require students to give statements to complete formal and informal proofs.
Calculator	Neutral

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.
Item Types	Drag and drop response – May require completing a proof as a diagram, such as a flowchart. Hot text response – May require completing a proof by selecting statements. Movable text response – May require dragging and dropping text to complete a viable geometric argument. Multi-select response – May require identifying statements or values. Multiple-choice response – May require selecting from choices. Natural Language response – May require explaining a proof in a narrative paragraph or providing a justification. Selectable text – May require choosing a statement in a narrative proof.
Clarifications	Students will prove theorems about lines. Students will prove theorems about angles. Students will use theorems about lines to solve problems. Students will use theorems about angles to solve problems.
Assessment Limits	Theorems are restricted to: 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. Items may have multiple sets of lines and angles. Items can include narrative proofs, flow-chart proofs, two-column proofs, or informal proofs. In items that require the student to justify, the student should not be required to recall from memory the formal name of a theorem.
Stimulus Attribute	

Response Attributes	Items may require students to give statements and/or justifications to complete formal and informal proofs. Items may require students to justify a conclusion from a construction.
Calculator	Neutral

MAFS.912.G-CO.3.10	Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.
Item Types	Drag and drop response – May require completing a proof as a diagram, such as a flowchart. Hot text response – May require completing a proof by selecting statements. Movable text response – May require dragging and dropping text to complete a viable geometric argument. Multi-select response – May require identifying statements. Multiple-choice response – May require selecting from choices. Natural Language response – May require explaining a proof in a narrative paragraph or providing a justification. Selectable text – May require choosing a statement in a narrative proof.
Clarification	Students will prove theorems about triangles.
Assessment Limits	Theorems are restricted to: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point. Items can include narrative proofs, flow-chart proofs, two-column proofs, or informal proofs. In items that require the student to justify, the student should not be required to recall from memory the formal name of a theorem.
Stimulus Attribute	
Response Attributes	Items may require students to give statements and/or justifications to complete formal and informal proofs. Items may require students to justify a conclusion from a construction.
Calculator	Neutral

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.
Item Types	Drag and drop response – May require completing a proof as a diagram, such as a flowchart. Hot text response – May require completing a proof by selecting statements. Movable text response – May require dragging and dropping text to complete a viable geometric argument. Multi-select response – May require identifying statements or values. Multiple-choice response – May require selecting from choices. Natural Language response – May require explaining a proof in a narrative paragraph or providing a justification. Selectable text – May require choosing a statement in a narrative proof.
Clarifications	Students will prove theorems about parallelograms. Students will use properties of parallelograms to solve problems.
Assessment Limits	Theorems are restricted to: opposite sides are congruent; opposite angles are congruent; the diagonals of a parallelogram bisect each other; and conversely, rectangles are parallelograms with congruent diagonals. Items can include narrative proofs, flow-chart proofs, two-column proofs, or informal proofs. In items that require the student to justify, the student should not be required to recall from memory the formal name of a theorem.
Stimulus Attribute	
Response Attributes	Students may be asked to classify a quadrilateral as a parallelogram based on given properties or measures. Students may be asked to prove that a quadrilateral is a parallelogram.
Calculator	Neutral

MAFS.912.G-CO.4.12 Also assesses MAFS.912.G-CO.4.13	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.* Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
Item Types	Drag and drop response – May require sequencing the steps of a construction. Hot spot response – May require identifying steps in the construction. Movable text response – May require dragging and dropping text to complete a viable geometric argument. Multi-select response – May require identifying the steps of a construction from a stem animation. Natural Language response – May require explaining the steps of a construction. Selectable text – May require choosing a statement in a description of a construction.
Clarifications	Students will identify the result of a formal geometric construction. Students will determine the steps of a formal geometric construction.
Assessment Limits	Constructions are limited to copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; constructing a line parallel to a given line through a point not on the line; constructing an equilateral triangle inscribed in a circle; constructing a square inscribed in a circle; and a regular hexagon inscribed in a circle. Items should not ask student to find values or use properties of the geometric figure that is constructed.
Stimulus Attribute	
Response Attributes	Items may require students to justify why a construction results in the geometric figure.

	Items may require students to use or choose the correct unit of measure. Items may require the student to provide steps for a construction.
Calculator	Neutral

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.*
Item Types	Drag and drop response – May require sequencing an informal argument. Hot text response – May require selecting text. Multi-select response – May require identifying the steps of an informal argument from a stem animation. Natural Language response – May require writing an informal argument or explaining how to derive a formula. Selectable text – May require choosing a statement in an informal argument.
Clarification	Students will give an informal argument for the formulas for the circumference of a circle; the area of a circle; or the volume of a cylinder, a pyramid, and a cone.
Assessment Limits	Informal arguments are limited to dissection arguments, Cavalieri's principle, and informal limit arguments. Items may require students to recall the formula for the circumference of a circle; the area of a circle; or the volume of a cylinder, a pyramid, and a cone.
Stimulus Attribute	Items may ask students to analyze an informal argument to determine mathematical accuracy.
Response Attribute	Items may require students to use or choose the correct unit of measure.
Calculator	Neutral

MAFS.912.G-GMD.1.3	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
Item Types	Equation response – May require expressing a numeric value or creating an expression. Multiple-choice response – May require selecting from choices. Multi-select response – May require identifying a value or a statement. Natural Language response – May require drawing a conclusion about a given situation.
Clarification	Students will use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
Assessment Limits	Items may require students to recall the formula for the volume of a cylinder, a pyramid, a cone, or a sphere. Items may require students to find a dimension. Items may include composite figures, including three-dimensional figures previously learned. Items may not include oblique figures. Items may require the student to find the volume when one or more dimensions are changed. Items may require the student to find a dimension when the volume is changed.
Stimulus Attribute	
Response Attribute	Items may require students to use or choose the correct unit of measure.
Calculator	Neutral

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.
Item Types	Drag and drop response – May require sorting three-dimensional figures with their two-dimensional cross-sections and vice versa. Graphic response – May require creating a line to show the location of the cross-section of three-dimensional figures or drawing two-dimensional shapes. Hot spot response – May require selecting the word or figure that describes the three-dimensional figure made from the two-dimensional figure. Multiple-choice response – May require selecting from choices. Multi-select response – May require identifying statements. Simulation response – May require showing the rotation of a two-dimensional figure.
Clarifications	Students will identify the shape of a two-dimensional cross-section of a three-dimensional object. Students will identify a three-dimensional object generated by a rotation of a two-dimensional object.
Assessment Limits	Items may include vertical, horizontal, or other cross-sections. Items may include more than one three-dimensional shape.
Stimulus Attribute	A verbal description of a cross-section or a three-dimensional shape may be used.
Response Attribute	Items may require students to draw a line that shows the location of a cross-section.
Calculator	Neutral

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.
Item Types	Equation response – May require constructing an equation of a circle. Graphic response – May require creating circles. Hot text response – May require reordering steps of a derivation. Movable text response – May require dragging and dropping steps in completing the square of the standard form of a circle expression or in the derivation of an equation of a circle using the Pythagorean theorem. Multiple-choice response – May require selecting from choices. Multi-select response – May require identifying statements.
Clarifications	Students will use the Pythagorean theorem, the coordinates of a circle's center, and the circle's radius to derive the equation of a circle. Students will determine the center and radius of a circle given its equation in general form.
Assessment Limit	In items where students have to complete the square to find the center and radius of the circle, coefficients of quadratic terms should equal one and all other terms should have integral coefficients.
Stimulus Attribute	
Response Attribute	Items may require the student to draw a circle that matches an equation in general form.
Calculator	Neutral

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).*
Item Types	Equation response – May require showing steps of an algebraic proof. Graphic response – May require graphically showing that a set of points does or does not create a specified polygon. Multiple-choice response – May require selecting from choices. Natural Language response – May require writing an informal argument or explanation. Selectable text response – May require choosing a statement in an informal argument.
Clarification	Students will use coordinate geometry to prove simple geometric theorems algebraically.
Assessment Limits	Items may require the student to use slope or the distance formula. Items may require the student to prove properties of triangles, properties of regular quadrilaterals, properties of circles, and properties of polygons. Items may require the student to use coordinate geometry to provide steps to a proof of a geometric theorem.
Stimulus Attribute	
Response Attribute	Items may require the student to determine if the algebraic proof is correct.
Calculator	Neutral

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).
Item Types	Equation response – May require constructing an equation. Multiple-choice response – May require selecting from choices. Natural language response – May require explaining the slope criteria.
Clarifications	Students will prove the slope criteria for parallel lines. Students will prove the slope criteria for perpendicular lines. Students will find equations of lines using the slope criteria for parallel and perpendicular lines.
Assessment Limit	Lines can include horizontal and vertical lines.
Stimulus Attribute	
Response Attribute	Equations of lines may be given in point-slope, slope-intercept, or standard form.
Calculator	Neutral

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.
Item Types	Equation response – May require identifying a ratio. Graphic response – May require constructing a graph. Multiple-choice response – May require selecting from choices. Multi-select response – May require identifying points on a line segment.
Clarification	Students will find a point on a directed line segment between two given points when given the partition as a ratio.
Assessment Limit	
Stimulus Attribute	
Response Attribute	Students may be asked to find a ratio when given the endpoints of a directed line segment and a point on the line segment. Students may be asked to find an endpoint when given a ratio, one endpoint, and a point on the directed line segment.
Calculator	Neutral

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.
Item Types	Equation response – May require identifying the perimeter of a polygon or the area of a triangle or a rectangle. Multiple-choice response – May require selecting from choices.
Clarifications	Students will use coordinate geometry to find a perimeter of a polygon. Students will use coordinate geometry to find the area of triangles and rectangles.
Assessment Limits	Items may require the use of the Pythagorean theorem. Items may include convex, concave, regular, and/or irregular polygons. In items that require the student to find the area, the polygon must be able to be divided into triangles and rectangles.
Stimulus Attribute	
Response Attributes	Items may require students to use or choose the correct unit of measure. Items may require students to find a dimension given the perimeter or area of a polygon.
Calculator	Neutral

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).
Item Types	Equation response – May require expressing a numerical value or creating an equation that models a given situation. Graphic response – May require constructing a figure. Natural Language response – May require explaining properties of objects. Selectable text response – May require choosing a statement in a description.
Clarifications	Students will use geometric shapes to describe objects found in the real world. Students will use measures of geometric shapes to find the area, volume, surface area, perimeter, or circumference of a shape found in the real world. Students will apply properties of geometric shapes to solve real-world problems.
Assessment Limit	Items may require the student to use knowledge of other Geometry standards.
Stimulus Attribute	
Response Attribute	Items may require students to use or choose the correct unit of measure.
Calculator	Neutral

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).
Item Types	Equation response – May require identifying a value. Movable text response – May require choosing a statement. Multiple-choice response – May require selecting from choices. Natural Language response – May require explaining a model.
Clarifications	Students will apply concepts of density based on area in modeling situations. Students will apply concepts of density based on volume in modeling situations.
Assessment Limit	Items may require the student to use knowledge of other Geometry standards.
Stimulus Attribute	
Response Attribute	Items may require students to use or choose the correct unit of measure.
Calculator	Neutral

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).
Item Types	Equation response – May require expressing a numerical value or creating an equation that models a given situation. Graphic response – May require constructing a figure. Movable text response – May require rearranging statements. Natural Language response – May require explaining a model. Selectable text response- May require choosing a statement in a description.
Clarification	Students will apply geometric methods to solve design problems.
Assessment Limit	Items may require the student to use knowledge of other Geometry standards.
Stimulus Attribute	
Response Attribute	Items may require students to interpret the results of a solution within the context of the modeling situation. Items may require students to use or choose the correct unit of measure.
Calculator	Neutral

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.
Item Types	Equation response – May require determining the scale factor of a given dilation. Graphic response – May require constructing lines and/or line segments to show the effects of a given dilation. Multi-select response – May require selecting figures that show a correct dilation. Natural Language response – May require explaining whether or not a dilation is accurate or explaining how the scale factor is determined for a given dilation. Selectable text response – May require choosing a statement in a narrative description. Simulation response – May require generating tables and creating dilations based on scale factor input values.
Clarifications	When dilating a line that does not pass through the center of dilation, students will verify that the dilated line is parallel. When dilating a line that passes through the center of dilation, students will verify that the line is unchanged. When dilating a line segment, students will verify that the dilated line segment is longer or shorter with respect to the scale factor.
Assessment Limits	Items may use line segments of a geometric figure. The center of dilation and scale factor must be given. Scale factors may be written as a rule.
Stimulus Attribute	Items may give the student a figure or its dilation, center, and scale and ask the student to verify the properties of dilation.
Response Attribute	

Calculator	Neutral

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.
Item Types	Multiple-choice response – May require selecting from choices. Multi-select response – May require identifying similar figures. Natural Language response – May require explaining how figures are similar. Selectable text response – May require choosing a statement in an informal argument.
Clarifications	Students will use the definition of similarity in terms of similarity transformations to decide if two figures are similar. Students will explain using the definition of similarity in terms of similarity of transformations that corresponding angles of two figures are congruent and that corresponding sides of two figures are proportional.
Assessment Limit	
Stimulus Attribute	
Response Attribute	Items may ask the student to determine if given information is sufficient to determine similarity.
Calculator	Neutral

MAFS.912.G-SRT.1.3 Also assesses MAFS.912.G-SRT.2.4	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. 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*.
Item Types	Drag and drop response – May require completing a proof as a diagram, such as a flowchart. Hot text response – May require completing a two-column proof. Graphic response – May require constructing a similar triangle. Multiple-choice response – May require selecting from choices. Multi-select response – May require identifying similar triangles. Natural Language response – May require explaining properties of similar triangles or explaining a proof in a narrative paragraph.
Clarifications	Students will explain using properties of similarity transformations why the AA criterion is sufficient to show that two triangles are similar. Students will use triangle similarity to prove theorems about triangles. Students will prove the Pythagorean theorem using similarity.
Assessment Limits	Theorems about triangles are restricted to the following: • Prove that a line parallel to one side of a triangle intersecting the other two sides of the triangle divides the intersected side proportionally. • Prove that a line that divides two sides of a triangle proportionally is parallel to the third side. • Prove that if three sides of one triangle are proportional to the corresponding sides of another triangle, the triangles are similar. • Prove that if two pairs of corresponding angles are congruent, then the triangles are similar.
Stimulus Attribute	
Response Attribute	

Calculator	Neutral

MAFS.912.G-SRT.2.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
Item Types	Drag and drop response – May require constructing a proof from a list of given postulates. Equation response – May require expressing a value or an expression. Movable text response – May require dragging and dropping steps to prove a relationship in a geometric figure. Multiple-choice response – May require selecting from choices. Natural Language response – May require writing an informal argument or explanation. Selectable text response – May require choosing a statement in an informal argument or narrative proof.
Clarifications	Students will use congruence criteria for triangles to solve problems. Students will use congruence criteria for triangles to prove relationships in geometric figures. Students will use similarity criteria for triangles to solve problems. Students will use similarity criteria for triangles to prove relationships in geometric figures.
Assessment Limit	Geometric figures can be any shape that can be deconstructed to form a triangle.
Stimulus Attribute	
Response Attribute	Items may require students to use or choose the correct unit of measure.
Calculator	Neutral

MAFS.912.G-SRT.3.8	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
Also assesses 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.
Also assesses MAFS.912.G-SRT.3.7	Explain and use the relationship between the sine and cosine of complementary angles.
Item Types	Equation response – May require expressing a value or an expression. Matching response – May require matching expressions to the appropriate trigonometric ratio. Movable text response – May require dragging and dropping steps to explain the definition of trigonometric ratios. Multiple-choice response – May require selecting from choices. Natural Language response – May require writing an informal argument or explanation.
Clarifications	Students will use trigonometric ratios and the Pythagorean theorem to solve right triangles in applied problems. Students will use similarity to explain the definition of trigonometric ratios for acute angles. Students will explain the relationship between sine and cosine of complementary angles. Students will use the relationship between sine and cosine of complementary angles.
Assessment Limit	Items will assess only sine, cosine, and tangent to determine the length of a side or an angle measure.
Stimulus Attribute	
Response Attributes	Students may be required to find equivalent ratios. Items may require students to use or choose the correct unit of measure. Multiple-choice options may be written as a trigonometric equation.

	Equation response may require the student to use the inverse trigonometric function to write an expression.
Calculator	Neutral