DRAFT

Geometry EOC
Item Specifications

Florida
Standards Assessments

The draft Florida Standards Assessments (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.

Item types describe the characteristics of the question.

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

Florida Standards Assessments

Modeling Cycle

The basic modeling cycle involves (1) identifying variables in the situation and selecting those that represent essential features, (2) formulating a model by creating and selecting geometric, graphical, tabular, algebraic, or statistical representations that describe relationships between the variables, (3) analyzing and performing operations on these relationships to draw conclusions, (4) interpreting the results of the mathematics in terms of the original situation, (5) validating the conclusions by comparing them with the situation, and then either improving the model or, if it is acceptable, (6) reporting on the conclusions and the reasoning behind them. Choices, assumptions, and approximations are present throughout this cycle.
http://www.cpalms.org/Standards/mafs_modeling_standards.aspx

Mathematical Practices:

The Mathematical Practices are a part of each course description for Grades 3–8, Algebra 1, and Geometry. These practices are an important part of the curriculum. The Mathematical Practices will be assessed throughout.

MAFS.K12.MP.1.1:	**Make sense of problems and persevere in solving them.** Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.
MAFS.K12.MP.2.1:	**Reason abstractly and quantitatively**. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

MAFS.K12.MP.3.1:	**Construct viable arguments and critique the reasoning of others.** Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
MAFS.K12.MP.4.1:	**Model with mathematics.** Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

MAFS.K12.MP.5.1:	**Use appropriate tools strategically.** Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.
MAFS.K12.MP.6.1:	**Attend to precision.** Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

MAFS.K12.MP.7.1:	**Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
MAFS.K12.MP.8.1:	**Look for and express regularity in repeated reasoning.** Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Technology-Enhanced Item Descriptions:

The Florida Standards Assessments (FSA) are composed of test items that include traditional multiple-choice items, items that require the student to type or write a response, and technology-enhanced items (TEI). Technology-enhanced items are computer-delivered items that require the student to interact with test content to select, construct, and/or support their answers.

Currently, there are nine types of TEIs that may appear on computer-based assessments for FSA Mathematics. For students with an IEP or 504 plan that specifies a paper-based accommodation, TEIs will be modified or replaced with test items that can be scanned and scored electronically.

Any of the item types may be combined into a single item with multiple parts called a multi-interaction item. The student will interact with different item types within a single item. Each part could be a different item type. For paper-based assessments, this item type may be replaced with a modified version of the item that can be scanned and scored electronically, or replaced with another item type that assesses the same standard and can be scanned and scored electronically.

For samples of each of the item types described below, see the FSA Practice Tests.

Technology-Enhanced Item Types – Mathematics

1. **Editing Task Choice** – The student clicks a highlighted word, phrase, or blank, which reveals a drop-down menu containing options for correcting an error as well as the highlighted word or phrase as it is shown in the sentence to indicate that no correction is needed. The student then selects the correct word or phrase from the drop-down menu. For paper-based assessments, the item is modified so that it can be scanned and scored electronically. The student fills in a bubble to indicate the correct word or phrase.
2. **Editing Task** – The student clicks on a highlighted word or phrase that may be incorrect, which reveals a text box. The directions in the text box direct the student to replace the highlighted word or phrase with the correct word or phrase. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.
3. **Hot Text** –
    a. **Selectable Hot Text** – Excerpted sentences from the text are presented in this item type. When the student hovers over certain words, phrases, or sentences, the options highlight. This indicates that the text is selectable ("hot"). The student can then click

on an option to select it. For paper-based assessments, a "selectable" hot text item is modified so that it can be scanned and scored electronically. In this version, the student fills in a bubble to indicate a selection.

b. **Drag-and-Drop Hot Text** – Certain numbers, words, phrases, or sentences may be designated "draggable" in this item type. When the student hovers over these areas, the text highlights. The student can then click on the option, hold down the mouse button, and drag it to a graphic or other format. For paper-based assessments, drag-and-drop hot text items will be replaced with another item type that assesses the same standard and can be scanned and scored electronically.

4. **Open Response** – The student uses the keyboard to enter a response into a text field. These items can usually be answered in a sentence or two. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.
5. **Multiselect** – The student is directed to select all of the correct answers from among a number of options. These items are different from Multiple Choice items, which allow the student to select only one correct answer. These items appear in the online and paper-based assessments.
6. **Graphic Response Item Display (GRID)** – The student selects numbers, words, phrases, or images and uses the drag-and-drop feature to place them into a graphic. This item type may also require the student to use the point, line, or arrow tools to create a response on a graph. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.
7. **Equation Editor** – The student is presented with a toolbar that includes a variety of mathematical symbols that can be used to create a response. Responses may be in the form of a number, variable, expression, or equation, as appropriate to the test item. For paper-based assessments, this item type may be replaced with a modified version of the item that can be scanned and scored electronically or replaced with another item type that assesses the same standard and can be scanned and scored electronically.
8. **Matching Item** – The student checks a box to indicate if information from a column header matches information from a row. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.
9. **Table Item** – The student types numeric values into a given table. The student may complete the entire table or portions of the table depending on what is being asked. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.

Reference Sheets:

- Reference sheets will be available as online references (in a pop-up window). A paper version will be available for paper-based tests.
- Reference sheets with conversions will be provided for FSA Mathematics assessments in Grades 4–8 and EOC Mathematics assessments.
- There is no reference sheet for Grade 3.
- For Grades 4, 6, 7, and Geometry, some formulas will be provided on the reference sheet.
- For Grade 5 and Algebra 1, some formulas may be included with the test item if needed to meet the intent of the standard being assessed.
- For Grade 8, no formulas will be provided; however, conversions will be available on a reference sheet.

Grade	Conversions	Some Formulas
3	No	No
4	On Reference Sheet	On Reference Sheet
5	On Reference Sheet	With Item
6	On Reference Sheet	On Reference Sheet
7	On Reference Sheet	On Reference Sheet
8	On Reference Sheet	No
Algebra 1	On Reference Sheet	With Item
Geometry	On Reference Sheet	On Reference Sheet

MAFS.912.G-C.1.1	Prove that all circles are similar.
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 the algebraic description $(x, y) \to (x+a, y+b)$ for a translation, and $(x, y) \to (kx, ky)$ for a dilation when given the center of dilation. Items may require the student to be familiar with the algebraic description for a 90-degree rotation about the origin, $(x, y) \to (-y, x)$, for a 180-degree rotation about the origin, $(x, y) \to (-x, -y)$, and for a 270-degree rotation about the origin, $(x, y) \to (y, -x)$. Items that use more than one transformation may ask the student to write a series of algebraic descriptions. Items should not use matrices to describe transformations.
Stimulus Attributes	Circles should not be given in equation form. Items may be set in a real-world or mathematical context.
Response Attribute	Items may require the student to use or choose the correct unit of measure.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this 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.*
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	Items may be set in a real-world or mathematical context.
Response Attribute	Items may require the student to use or choose the correct unit of measure.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this 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.
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 may include problems that use the incenter and circumcenter of a triangle.
Stimulus Attribute	Item may be set in real-world or mathematical context.
Response Attributes	Items may require the student to use or choose the correct unit of measure. Items may require the student to provide steps for a construction. Items may require the student to give statements and/or justifications to complete formal and informal proofs.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this 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.
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	The center of dilation must be given.
Stimulus Attribute	Items may be set in a real-world or mathematical context.
Response Attribute	Items may require the student to use or choose the correct unit of measure.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test items aligned to this 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.
Clarification	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 be set in a real-world or mathematical context Items may require the student to analyze possible definitions to determine mathematical accuracy. Items may require the student to use definitions for justifications when choosing examples or nonexamples. Items may require the student to use properties of rotations, reflections, and translations as steps to a formal definition.
Response Attribute	
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this standard.

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.
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 the algebraic description $(x, y) \rightarrow (x+a, y+b)$ for a translation, and $(x, y) \rightarrow (kx, ky)$ for a dilation when given the center of dilation. Items may require the student to be familiar with the algebraic description for a 90-degree rotation about the origin, $(x, y) \rightarrow (-y, x)$, for a 180-degree rotation about the origin, $(x, y) \rightarrow (-x, -y)$, and for a 270-degree rotation about the origin, $(x, y) \rightarrow (y, -x)$. Items that use more than one transformation may ask the student to write a series of algebraic descriptions. Items must not use matrices to describe transformations. Items must 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 be set in real-world or mathematical context. Items may ask the student to determine if a transformation is rigid. Items may ask the student 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	Items may require the student to give a coordinate of a transformed figure. Items may require the student to use a function, e.g., $y = k(f(x+a))+b$, to describe a transformation. Items may require the student to determine if a verbal description of a definition is valid. Items may require the student to determine any flaws in a verbal description of a definition. Items may require the student to be familiar with slope-intercept form of a line, standard form of a line, and point-slope form of a line. Items may require the student to give a line of reflection and/or a degree of rotation that carries a figure onto itself. Items may require the student to draw a figure using a description of a translation.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test items aligned to these standards.

MAFS.912.G-CO.1.5 Also assesses MAFS.912.G-CO.1.3	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. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
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 find the distance between points. Items may require the student to be familiar with using the algebraic description $(x, y) \to (x + a, y + b)$ for a translation, and $(x, y) \to (kx, ky)$ for a dilation when given the center of dilation. Items may require the student to be familiar with the algebraic description for a 90-degree rotation about the origin, $(x, y) \to (-y, x)$, for a 180-degree rotation about the origin, $(x, y) \to (-x, -y)$, and for a 270-degree rotation about the origin, $(x, y) \to (y, -x)$. Items that use more than one transformation may ask the student to write a series of algebraic descriptions. Items must not use matrices to describe transformations. In items in which the line of reflection is given, it must be in slope-intercept form. In items in which the line of reflection is given, any form of a line may be used. If the line is not a vertical line or a horizontal line, then the line of reflection must be graphed as a dotted line.
Stimulus Attributes	Items may be set in a real-world or mathematical context. Items may require the student to provide a sequence of transformations. Items may require the student to determine if an attribute of a figure is the same after a sequence of transformations has been applied.

Response Attributes	Items may require the student to use a function, e.g., $y = k(f(x+a)) + b$, to describe a transformation. Items may require the student to give a line of reflection and/or a degree of rotation that carries a figure onto itself. Items may require the student to draw a figure using a description of a transformation. Items may require the student 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 may be used. Items may require the student to be familiar with slope-intercept form of a line, standard form of a line, and point-slope form of a line. Items may require the student to write a line of reflection that will carry a figure onto itself. Items may require the student to give a degree of rotation that will carry a figure onto itself.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to a standard in this group.

MAFS.912.G-CO.2.6 Also assesses MAFS.912.G-CO.2.7 Also assesses MAFS.912.G-CO.2.8	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. 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. Explain how the criteria for triangle congruence (ASA, SAS, SSS, and Hypotenuse-Leg) follow from the definition of congruence in terms of rigid motions.
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. In items in which the line of reflection is given, any form of the line may 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. Items should not require the student to use the distance formula. Items may require the student to be familiar with using the algebraic description $(x, y) \rightarrow (x+a, y+b)$ for a translation, and $(x, y) \rightarrow (kx, ky)$ for a dilation when given the center of dilation. Items may require the student to be familiar with the algebraic description for a 90-degree rotation about the origin, $(x, y) \rightarrow (-y, x)$, for a 180-degree rotation about the origin, $(x, y) \rightarrow (-x, -y)$, and for a 270-degree rotation about the origin, $(x, y) \rightarrow (y, -x)$. Items that use more than one transformation may ask the student to write a series of algebraic descriptions. Items should not use matrices to describe transformations.

Stimulus Attributes	Items may be set in a real-world or mathematcal context. Items may require the student to determine the rigid motions that show that two triangles are congruent.
Response Attributes	Items may ask the student to name corresponding angles and/or sides. Items may require the student to use a function, e.g., $y = k(f(x+a)) + b$, to describe a transformation. In items in which the student must write the line of reflection, any line may be used. Items may require the student to be familiar with slope-intercept form of a line, standard form of a line, and point-slope form of a line. 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 the student to list sufficient conditions to prove triangles are congruent. Items may require the student to determine if given information is sufficient for congruence. Items may require the student to give statements to complete formal and informal proofs.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test items aligned to a standard in this group.

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.*
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	Items may assess relationships between vertical angles, special angles formed by parallel lines and transversals, angle bisectors, congruent supplements, congruent complements, and a perpendicular bisector of a line segment. Items may have multiple sets of lines and angles. Items may 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	Items may be set in a real-world or mathematical context.
Response Attributes	Items may require the student to give statements and/or justifications to complete formal and informal proofs. Items may require the student to justify a conclusion from a construction.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test items aligned to this 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°; 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.*
Clarifications	Students will prove theorems about triangles. Students will use theorems about triangles to solve problems.
Assessment Limits	Items may assess theorems and their converses for interior triangle sum, base angles of isosceles triangles, mid-segment of a triangle, concurrency of medians, concurrency of angle bisectors, concurrency of perpendicular bisectors, triangle inequality, and the Hinge Theorem. Items may 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	Items may be set in a real-world or mathematical context.
Response Attributes	Items may require the student to give statements and/or justifications to complete formal and informal proofs. Items may require the student to justify a conclusion from a construction.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this 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.*
Clarifications	Students will prove theorems about parallelograms. Students will use properties of parallelograms to solve problems.
Assessment Limits	Items may require the student to be familiar with similarities and differences between types of parallelograms (eg., squares and rectangles). Items may require the student to identify a specific parallelogram. Items may assess theorems and their converses for opposite sides of a parallelogram, opposite angles of a parallelogram, diagonals of a parallelogram, and consecutive angles of a parallelogram. Items may assess theorems and their converses for rectangles and rhombuses. Items may 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	Items may be set in real-world or mathematical context.
Response Attributes	Items may require the student to classify a quadrilateral as a parallelogram based on given properties or measures. Items may require the student to prove that a quadrilateral is a parallelogram.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this standard.

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.
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. Constructions are limited to the use of a formal compass and a straightedge. Items should not ask student to find values or use properties of the geometric figure that is constructed.
Stimulus Attribute	Items may be set in a real-world or mathematical context.
Response Attributes	Items may require the student to justify why a construction results in the geometric figure. Items may require the student to use or choose the correct unit of measure. Items may require the student to provide steps for a construction.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to a standard in this group.

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.*
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 the student to recall the formula for the circumference and area of a circle.
Stimulus Attributes	Items may be set in a real-world or mathematical context. Items may ask the student to analyze an informal argument to determine mathematical accuracy.
Response Attribute	Items may require the student to use or choose the correct unit of measure.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this standard.

MAFS.912.G-GMD.1.3	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
Clarification	Students will use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
Assessment Limits	Items may require the student to recall the formula for the volume of a sphere. Items may require the student to find a dimension. Items that involve cones, cylinders, and spheres should require the student to do more than just find the volume. 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 Attributes	Items must be set in a real-world context. Items may require the student to apply the basic modeling cycle.
Response Attributes	Items may require the student to use or choose the correct unit of measure. Items may require the student to apply the basic modeling cycle.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this 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.
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 Attributes	Items may be set in a real-world or mathematical context. A verbal description of a cross-section or a three-dimensional shape may be used.
Response Attribute	Items may require the student to draw a line that shows the location of a cross-section.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this 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.
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 the student has to complete the square to find the center and radius of the circle, coefficients of quadratic terms should equal 1 and all other terms should have integral coefficients.
Stimulus Attribute	Items may be set in a real-world or mathematical context.
Response Attribute	Items may require the student to draw a circle that matches an equation in general form.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this 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).*
Clarification	Students will use coordinate geometry to prove simple geometric theorems algebraically.
Assessment Limits	Items may require the student to use slope or to find the distance between points. Items may require the student to prove properties of triangles, properties of quadrilaterals, properties of circles, and properties of regular polygons. Items may require the student to use coordinate geometry to provide steps to a proof of a geometric theorem.
Stimulus Attribute	Items may be set in a real-world or mathematical context.
Response Attribute	Items may require the student to determine if the algebraic proof is correct.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this 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).
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 Limits	Lines may include horizontal and vertical lines. Items may not ask the student to provide only the slope of a parallel or perpendicular line.
Stimulus Attribute	Items may be set in a real-world or mathematical context.
Response Attribute	Items may require the student to be familiar with slope-intercept form of a line, standard form of a line, and point-slope form of a line.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this 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.
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	Items may be set in a real-world or mathematical context.
Response Attributes	Items may require the student to find a ratio when given the endpoints of a directed line segment and a point on the line segment. Items may require the student to find an endpoint when given a ratio, one endpoint, and a point on the directed line segment.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this 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.
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	Items must be set in a real-world context.
Response Attributes	Items may require the student to apply the basic modeling cycle. Items may require the student to use or choose the correct unit of measure. Items may require the student to find a dimension given the perimeter or area of a polygon.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this 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).
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 Limits	Items may require the student to use knowledge of other Geometry standards. Items may include composite figures. Items must not also assess G-GMD.1.3 or G-MG.1.3.
Stimulus Attribute	Items must be set in a real-world context.
Response Attributes	Items may require the student to use or choose the correct unit of measure. Items may require the student to apply the basic modeling cycle.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this 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).
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	Items must be set in a real-world context.
Response Attributes	Items may require the student to apply the basic modeling cycle. Items may require the student to use or choose the correct unit of measure.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this 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).
Clarification	Students will apply geometric methods to solve design problems.
Assessment Limits	Items may require the student to use knowledge of other Geometry standards. Items that use volume should not also assess G-GMD.1.3 or G-MG.1.1.
Stimulus Attribute	Items must be set in a real-world context.
Response Attributes	Items may require the student to interpret the results of a solution within the context of the modeling situation. Items may require the student to apply the basic modeling cycle. Items may require the student to use or choose the correct unit of measure.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this 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.
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.
Stimulus Attributes	Items may give the student a figure or its dilation, center, and scale and ask the student to verify the properties of dilation. Items may be set in a real-world or mathematical context.
Response Attribute	
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this 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.
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 transformations that corresponding angles of two figures are congruent and that corresponding sides of two figures are proportional.
Assessment Limit	Items may require the student to be familiar with using the algebraic description $(x, y) \to (x+a, y+b)$ for a translation, and $(x, y) \to (kx, ky)$ for a dilation when given the center of dilation. Items may require the student to be familiar with the algebraic description for a 90-degree rotation about the origin, $(x, y) \to (-y, x)$, for a 180-degree rotation about the origin, $(x, y) \to (-x, -y)$, and for a 270-degree rotation about the origin, $(x, y) \to (y, -x)$. Items that use more than one transformation may ask the student to write a series of algebraic descriptions.
Stimulus Attribute	Items may be set in a real-world or mathematical context.
Response Attribute	Items may ask the student to determine if given information is sufficient to determine similarity.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this standard.

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*.
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 Limit	Items may require the student to be familiar with using the algebraic description $(x, y) \rightarrow (x+a, y+b)$ for a translation, and $(x, y) \rightarrow (kx, ky)$ for a dilation when given the center of dilation. Items may require the student to be familiar with the algebraic description for a 90-degree rotation about the origin, $(x, y) \rightarrow (-y, x)$, for a 180-degree rotation about the origin, $(x, y) \rightarrow (-x, -y)$, and for a 270-degree rotation about the origin, $(x, y) \rightarrow (y, -x)$. Items that use more than one transformation may ask the student to write a series of algebraic descriptions.
Stimulus Attribute	Items may be set in a real-world or mathematical context.
Response Attribute	
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test items aligned to a standard in this group.

MAFS.912.G-SRT.2.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
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	Items may use geometric figures of any shape if the figure can be deconstructed to form a triangle.
Stimulus Attribute	Items may be set in a real-world or mathematical context.
Response Attribute	Items may require the student to use or choose the correct unit of measure.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to this standard.

MAFS.912.G-SRT.3.8 Also assesses MAFS.912.G-SRT.3.6 Also assesses MAFS.912.G-SRT.3.7	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. 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. Explain and use the relationship between the sine and cosine of complementary angles.
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 Attributes	For G-SRT.3.8, items must be set in a real-world context. For G-SRT.3.6 and G-SRT.3.7, items must be set in a mathematical context. For G-SRT.3.8, items may require the student to apply the basic modeling cycle.
Response Attributes	Items may require the student to find equivalent ratios. Items may require the student to use or choose the correct unit of measure. Multiple-choice options may be written as a trigonometric equation. Equation Editor items may require the student to use the inverse trigonometric function to write an expression.
Calculator	Neutral
Sample Item	See Appendix A for the Practice Test item aligned to a standard in this group.

Appendix A

The chart below contains information about the standard alignment for the items in the Geometry Computer-Based Practice Test at http://fsassessments.org/students-and-families/practice-tests/ .

Content Standard	Item Type	Computer-Based Practice Test Item Number
MAFS.912.G-C.1.1	Equation Editor	14
MAFS.912.G-C.1.2	Equation Editor	3
MAFS.912.G-C.1.3	GRID	12
MAFS.912.G-C.2.5	Equation Editor	23
MAFS.912.G-C.2.5	Multiple Choice, Equation Editor, and Equation Editor	33
MAFS.912.G-CO.1.1	Open Response	7
MAFS.912.G-CO.1.2	Table Item	18
MAFS.912.G-CO.1.4	Editing Task Choice	4
MAFS.912.G-CO.1.3	Multiselect	8
MAFS.912.G-CO.2.6	Multiple Choice	10
MAFS.912.G-CO.2.8	Multiple Choice, GRID, and Editing Task Choice	32
MAFS.912.G-CO.3.9	Equation Editor	1
MAFS.912.G-CO.3.9	Drag and Drop Hot Text	11
MAFS.912.G-CO.3.10	Drag and Drop Hot Text	21
MAFS.912.G-CO.3.11	Drag and Drop Hot Text	5
MAFS.912.G-CO.4.12	Multiple Choice	27
MAFS.912.G-GMD.1.1	Multiselect	9
MAFS.912.G-GMD.1.3	Equation Editor	28
MAFS.912.G-GMD.2.4	Multiple Choice	16
MAFS.912.G-GPE.1.1	Editing Task Choice	6
MAFS.912.G-GPE.2.4	Editing Task Choice	25
MAFS.912.G-GPE.2.5	Equation Editor	15
MAFS.912.G-GPE.2.6	Equation Editor	20
MAFS.912.G-GPE.2.7	Equation Editor	26
MAFS.912.G-MG.1.1	Matching Item	2
MAFS.912.G-MG.1.2	Equation Editor	30
MAFS.912.G-MG.1.3	Equation Editor	24
MAFS.912.G-SRT.1.1a	Multiselect	22
MAFS.912.G-SRT.1.2	Multiselect	17
MAFS.912.G-SRT.2.4	Multiple Choice	13

Content Standard	Item Type	Computer-Based Practice Test Item Number
MAFS.912.G-SRT.2.4	Drag and Drop Hot Text	19
MAFS.912.G-SRT.2.5	Editing Task Choice	29
MAFS.912.G-SRT.3.8	Equation Editor	31

Appendix B: Revisions

Page(s)	Revision	Date
42–43	Appendix A updated to show Fall 2018 Practice Test information	September 2018

Geometry EOC FSA Mathematics Reference Sheet

Customary Conversions

1 foot = 12 inches
1 yard = 3 feet
1 mile = 5,280 feet
1 mile = 1,760 yards

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts

1 pound = 16 ounces
1 ton = 2,000 pounds

Metric Conversions

1 meter = 100 centimeters
1 meter = 1000 millimeters
1 kilometer = 1000 meters

1 liter = 1000 milliliters

1 gram = 1000 milligrams
1 kilogram = 1000 grams

Time Conversions

1 minute = 60 seconds
1 hour = 60 minutes
1 day = 24 hours
1 year = 365 days
1 year = 52 weeks

Geometry EOC FSA Mathematics Reference Sheet

Formulas

$$\sin A° = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos A° = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan A° = \frac{\text{opposite}}{\text{adjacent}}$$

$$V = Bh$$

$$V = \frac{1}{3}Bh$$

$$V = \frac{4}{3}\pi r^3$$

$y = mx + b$, where m = slope and b = y-intercept

$y - y_1 = m(x - x_1)$, where m = slope and (x_1, y_1) is a point on the line