DRAFT

Grade 8 Mathematics 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.

- **Context – Allowable** refers to items that may but are not required to have context.
- **Context – No Context** refers to items that should not have context.
- **Context – Required** refers to items that must have context.

Technology-Enhanced Item Descriptions:

The Florida Standards Assessments (FSA) are composed of test items that include traditional multiple-choice items, items that require students to type or write a response, and technology-enhanced items (TEI). Technology-enhanced items are computer-delivered items that require students 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.

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

Technology-Enhanced Item Types – Mathematics

1. **Editing Task Choice –** The student clicks a highlighted word or phrase, 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 circle 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 circle 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.

Mathematical Practices:

The Mathematical Practices are a part of each course description for Grades 3-8, Algebra 1, Geometry, and Algebra 2. 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 × 5 + 7 × 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.

Reference Sheets:

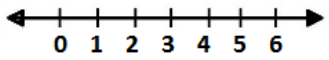
• Reference sheets and z-tables will be available as online references (in a pop-up window). A paper version will be available for paper-based tests.
• Reference sheets with conversions will be provided for FSA Mathematics assessments in Grades 4–8 and EOC Mathematics assessments.
• There is no reference sheet for Grade 3.
• For Grades 4, 6, and 7, Geometry, and Algebra 2, 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.
• For Algebra 2, a z-table will be available.

Grade	Conversions	Some Formulas	z-table
3	No	No	No
4	On Reference Sheet	On Reference Sheet	No
5	On Reference Sheet	With Item	No
6	On Reference Sheet	On Reference Sheet	No
7	On Reference Sheet	On Reference Sheet	No
8	On Reference Sheet	No	No
Algebra 1	On Reference Sheet	With Item	No
Algebra 2	On Reference Sheet	On Reference Sheet	Yes
Geometry	On Reference Sheet	On Reference Sheet	No

Content Standard	***MAFS.8.NS*** *The Number System* ***MAFS.8.NS.1*** *Know that there are numbers that are not rational, and approximate them by rational numbers.* ***MAFS.8.NS.1.1*** Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.
Assessment Limits	All irrational numbers may be used, excluding *e*. Only rational numbers with repeating decimal expansions up to thousandths may be used.
Calculator	No
Item Types	Editing Task Choice Equation Editor Hot Text Matching Item Multiple Choice Multiselect Open Response
Context	No Context

Sample Item	Item Type
Select all numbers that are irrational. ☐ $\frac{1}{3}$ ☐ $\sqrt{2}$ ☐ π ☐ $\frac{2}{9}$ ☐ $\sqrt{3}$	Multiselect
Which number is irrational? A. $\sqrt{64}$ B. $\frac{1}{2}$ C. $\frac{\sqrt{16}}{4}$ D. $\frac{\sqrt{20}}{5}$	Multiple Choice
What is $0.\overline{36}$ written as a fraction?	Equation Editor
See Appendix for the practice test item aligned to this standard.	

Content Standard	***MAFS.8.NS*** *The Number Systems* ***MAFS.8.NS.1*** *Know that there are numbers that are not rational, and approximate them by rational numbers.* ***MAFS.8.NS.1.2*** Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). *For example, by truncating the decimal expansion of* $\sqrt{2}$*, show that* $\sqrt{2}$ *is between* 1 *and* 2*, then between* 1.4 *and* 1.5*, and explain how to continue on to get better approximations*.
Assessment Limits	All irrational numbers may be used, excluding *e*. Irrational expressions should only use one operation.
Calculator	No
Item Types	Equation Editor GRID Multiple Choice Multiselect Open Response
Context	No context

Sample Item	Item Type
What is the approximate value of $\sqrt{3}$, to the nearest whole number?	Equation Editor
What is the approximate value of $\sqrt{12}$? A. 2 B. 3.5 C. 4.5 D. 6	Multiple Choice
A number line is shown. Place the following numbers in the proper location on the number line.  • $\sqrt{3}$ • $\sqrt{8}$ • $\sqrt{23}$	GRID
See Appendix for the practice test item aligned to this standard.	

Content Standard	***MAFS.8.EE*** *Expressions and Equations* ***MAFS.8.EE.1*** *Work with radicals and integer exponents.* ***MAFS.8.EE.1.1*** Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example,* $3^2 \cdot 3^{-5} = 3^{-3} = \frac{1}{3^3} = \frac{1}{27}$.
Assessment Limits	Exponents must be integers. Bases must be whole numbers. Variables may not be used.
Calculator	No
Item Types	Equation Editor GRID Matching Item Multiple Choice Multiselect
Context	No context

Sample Item	Item Type
Which expression is equivalent to $\frac{1}{27}$? A. $3^1 \cdot 3^{-10}$ B. $3^{-1} \cdot 3^{10}$ C. $3^{-4} \cdot 3^7$ D. $3^4 \cdot 3^{-7}$	Multiple Choice
Select all the expressions equivalent to $(4^3)^2 \cdot 4^2$. ☐ 2^{14} ☐ 2^{16} ☐ 4^8 ☐ 4^{12} ☐ 16^4 ☐ 16^8	Multiselect
Which expression is equivalent to $5^4 \cdot (5^{-3})^2$? A. 5^1 B. 5^2 C. $\left(\frac{1}{5}\right)^1$ D. $\left(\frac{1}{5}\right)^2$	Multiple Choice
See Appendix for the practice test item aligned to this standard.	

Content Standard	***MAFS.8.EE*** *Expressions and Equations* ***MAFS.8.EE.1*** *Work with radicals and integer exponents.* ***MAFS.8.EE.1.2*** Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.
Assessment Limits	Square roots and cube roots may be used to represent solutions to equations. Radicands may not include variables.
Calculator	Neutral
Item Types	Equation Editor Multiple Choice Open Response
Context	Allowable

Sample Item	Item Type
What is the value of p in the equation shown? $p^3 = 0.064$	Equation Editor
A cube with an edge of length s has a volume of 64 units. What is the length of s?	Equation Editor
See Appendix for the practice test item aligned to this standard.	

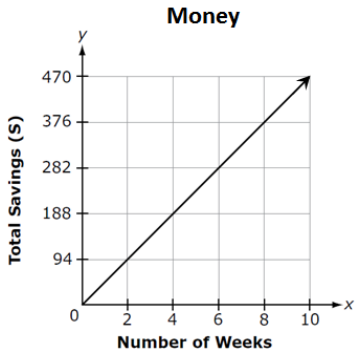
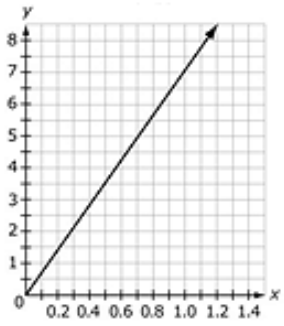
Content Standard	***MAFS.8.EE*** *Expressions and Equations* ***MAFS.8.EE.1*** *Work with radicals and integer exponents.* ***MAFS.8.EE.1.3*** Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as* 3 *times* 10^8 *and the population of the world as* 7 *times* 10^9*, and determine that the world population is more than* 20 *times larger.*
Assessment Limits	N/A
Calculator	No
Item Types	Editing Task Choice Equation Editor Hot Text Multiple Choice Open Response
Context	Allowable

Sample Item	Item Type
The average mass of a giraffe is approximately 1×10^3 kilograms. The average mass of a blue whale is approximately 2×10^6 kilograms. About how many times more mass does a blue whale have than a giraffe?	Equation Editor

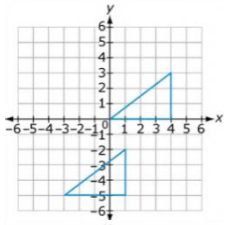
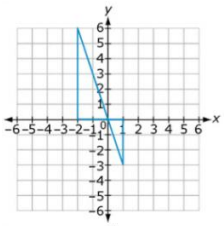
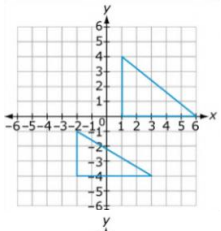
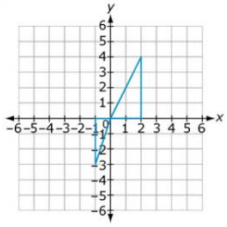
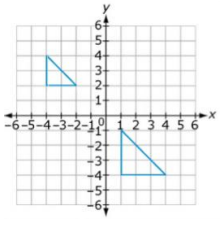
See Appendix for the practice test item aligned to this standard.

Content Standard	***MAFS.8.EE*** *Expressions and Equations* ***MAFS.8.EE.1*** *Work with radicals and integer exponents.* ***MAFS.8.EE.1.4*** Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.	
Assessment Limits	N/A	
Calculator	No	
Item Types	Editing Task Choice Equation Editor Hot Text Matching Item Multiple Choice Open Response	
Context	Allowable	
Sample Item		Item Type
What is the sum of 4×10^{-5} and 3×10^{-5} written in standard form?		Equation Editor
See Appendix for the practice test item aligned to this standard.		

Content Standard	***MAFS.8.EE*** *Expressions and Equations* ***MAFS.8.EE.2*** *Understand the connections between proportional relationships, lines, and linear equations.* ***MAFS.8.EE.2.5*** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*
Assessment Limit	Numbers in items must be rational numbers.
Calculator	Yes
Item Types	Equation Editor GRID Matching Item Multiple Choice Multiselect Open Response
Context	Allowable

Sample Item	Item Type
The graph of a proportional relationship is shown.  What is the amount of savings per week?	Equation Editor
The graph of a proportional relationship and an equation are shown.  $y = \frac{11}{2}x + 3$ What is the greater unit rate?	Equation Editor
See Appendix for the practice test item aligned to this standard.	

Content Standard	***MAFS.8.EE*** *Expressions and Equations* ***MAFS.8.EE.2*** *Understand the connections between proportional relationships, lines, and linear equations.* ***MAFS.8.EE.2.6*** Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.
Assessment Limits	All triangles must be right triangles and on a coordinate grid. Numbers in items must be rational numbers. Functions must be linear.
Calculator	Yes
Item Types	Editing Task Choice Equation Editor GRID Hot Text Matching Item Multiple Choice Multiselect Open Response Table Item
Context	Allowable

Sample Item	Item Type
Select all pairs of triangles that can be used to show the slope of a line is the same anywhere along the line. ☐  ☐  ☐  ☐  ☐ 	Multiselect

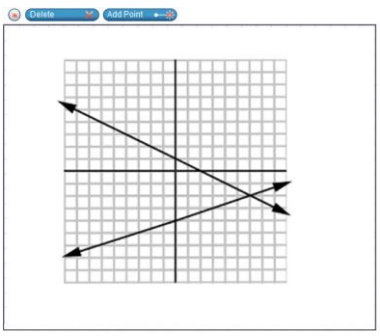
See Appendix for the practice test item aligned to this standard.

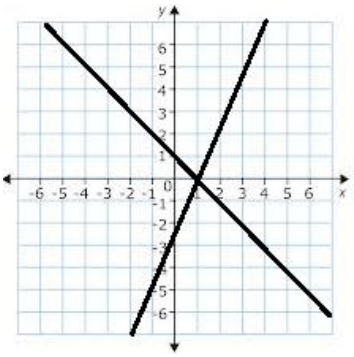
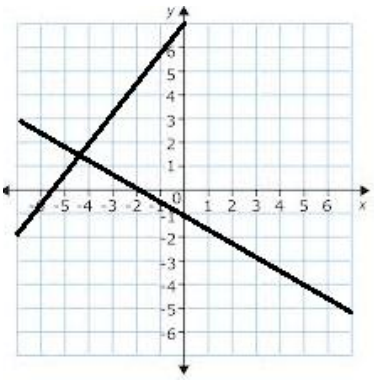
Content Standard	***MAFS.8.EE*** *Expressions and Equations* ***MAFS.8.EE.3*** *Analyze and solve linear equations and pairs of simultaneous linear equations.* ***MAFS.8.EE.3.7*** Solve linear equations in one variable. ***MAFS.8.EE.3.7a*** Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers). ***MAFS.8.EE.3.7b*** Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
Assessment Limit	Numbers in items must be rational numbers.
Calculator	Yes
Item Types	Equation Editor GRID Matching Item Multiple Choice Multiselect Open Response
Context	Allowable

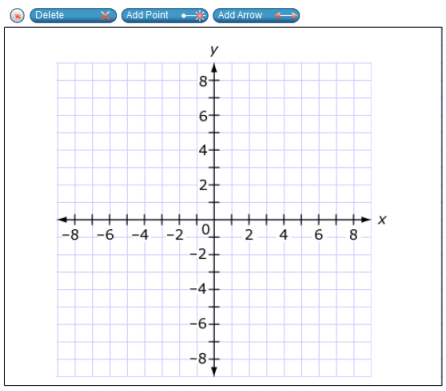
Sample Item	Item Type
How many solutions does the equation shown have? $\frac{1}{4}(x-3) = 3x - \frac{11}{4}x - 3$	Open Response
What values of a and b would make the equation shown have infinitely many solutions? $3x = ax + b$	Equation Editor
Solve the equation shown for x. $2(x-4) = 4x + 3x + 6$	Equation Editor
Explain why $3(x+4) = 3(x-5)$ has no solution. Choose the best response below. A. The x-terms are the same, but the constant terms are different. B. The x-terms are different, but the constant terms are the same. C. The x-terms are the same, and the constant terms are same. D. The x-terms are different, and the constant terms are different.	Multiple Choice

Sample Item	Item Type
Enter values of a and b for which $x = 4$ is a solution of the equation shown. $ax + 4 = 5x + b$ $a =$ ☐ $b =$ ☐	Equation Editor
See Appendix for the practice test item aligned to this standard.	

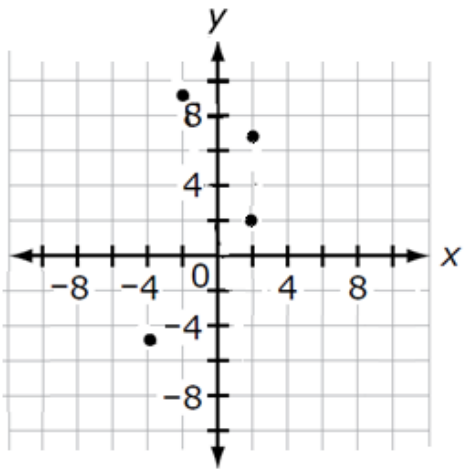
Content Standard	***MAFS.8.EE*** *Expressions and Equations* ***MAFS.8.EE.3*** *Analyze and solve linear equations and pairs of simultaneous linear equations.* ***MAFS.8.EE.3.8*** Analyze and solve pairs of simultaneous linear equations. ***MAFS.8.EE.3.8a*** Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. ***MAFS.8.EE.3.8b*** Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.* ***MAFS.8.EE.3.8c*** Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*
Assessment Limits	Numbers in items must be rational numbers. Coefficients of equations in standard form must be integers. Items written for *MAFS.8.EE.3.8a* must include the graph or the equations. Equations in items written for *MAFS.8.EE.3.8a* must be given in slope-intercept form.
Calculator	Yes
Item Types	Editing Task Choice Equation Editor GRID Hot Text Matching Item Multiple Choice Open Response
Context	Allowable

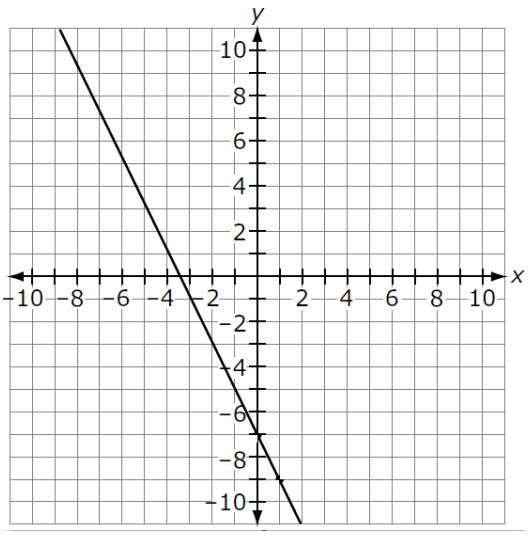
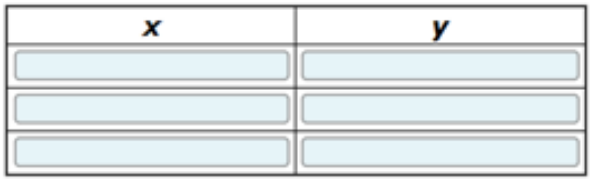
Sample Item	Item Type
A graph of a system of two equations is shown. Use the Add Point tool to plot the solution of the system. 	GRID

Sample Item	Item Type
Analyze the system of two equations shown. $y = 3(x + 4)$ $y = 3(x - 4)$ How many solutions does the system of equations have? • No Solution • One Solution • Infinitely many solutions	Hot Text
A graph of a system of two equations is shown.  What is the solution of the system? $x =$ ☐ $y =$ ☐	Equation Editor
A graph of a system of two equations is shown.  What is the approximate solution of the system? (☐ , ☐)	Equation Editor

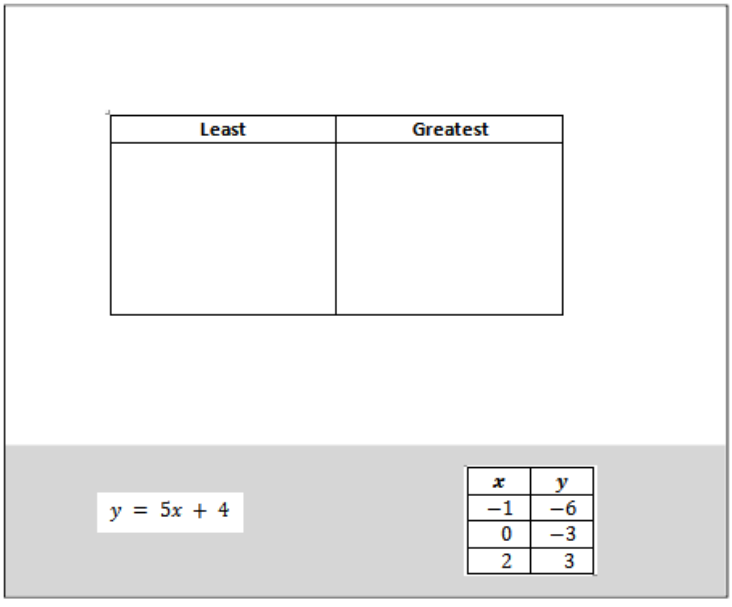
Sample Item	Item Type
A system of two equations is shown. $y = 5x + 3$ $y = 3x - 1$ A. Use the Add Arrow tool to graph the two lines. B. Drag the palette image to show the solution of the system. X  	GRID
Radha is trying to choose between two bike rental companies, Company A and Company B. Company A charges a $\$25$ initial fee and an additional $\$5$ for each hour rented. Company B charges an initial $\$18$ fee and an additional $\$6$ for each hour rented. The total cost to rent a bike from Company A can be represented by the equation $y = 5h + 25$, where h represents the number of hours rented and y represents the cost, in dollars. The total cost to rent a bike from Company B can be represented by the equation $y = 6h + 18$, where h represents the number of hours rented and y represents the cost, in dollars. For how many hours of rental is the amount charged by the two companies the same? What is the cost, in dollars, of renting the bike for this many hours? Hours = ☐ Cost = ☐	Equation Editor
Enter values for a and b, so that the system of equations shown has one solution. $y = 3x + 4$ $y = ax + b$ $a =$ ☐ $b =$ ☐	Equation Editor
See Appendix for the practice test item aligned to this standard.	

Content Standard	***MAFS.8.F*** *Functions* ***MAFS.8.F.1*** *Define, evaluate, and compare functions.* ***MAFS.8.F.1.1*** Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
Assessment Limits	Function notation may not be used. Nonlinear functions may be included for identifying a function.
Calculator	Neutral
Item Types	Editing Task Choice Equation Editor GRID Hot Text Multiple Choice Multiselect Open Response Table Item
Context	Allowable

Sample Item	Item Type
A graph is shown.  How do you determine if this is a function or not?	Open Response

Sample Item	Item Type
A graph of a function is shown.  Create a table to show the relationship of the values of x to the values of y.  	Table Item
See Appendix for the practice test item aligned to this standard.	

Content Standard	***MAFS.8.F*** *Functions* ***MAFS.8.F.1*** *Define, evaluate, and compare functions.* ***MAFS.8.F.1.2*** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change*.
Assessment Limits	Function notation is not used. Functions must be linear.
Calculator	Yes
Item Types	Editing Task Choice Equation Editor GRID Hot Text Matching Item Multiple Choice Multiselect Open Response Table Item
Context	Allowable

Sample Item	Item Type
Drag each function to the box to show the least rate and the greatest rate.  	GRID

See Appendix for the practice test item aligned to this standard.

Content Standard	***MAFS.8.F*** *Functions* ***MAFS.8.F.1*** *Define, evaluate, and compare functions.* ***MAFS.8.F.1.3*** Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function* $A = s^2$ *giving the area of a square as a function of its side length is not linear because its graph contains the points* $(1, 1)$, $(2, 4)$ *and* $(3, 9)$*, which are not on a straight line*.
Assessment Limit	Function notation may not be used.
Calculator	Yes
Item Types	Editing Task Choice Equation Editor GRID Hot Text Matching Item Multiple Choice Multiselect Open Response Table Item
Context	Allowable

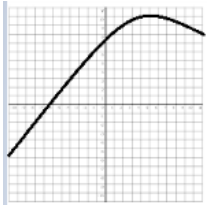
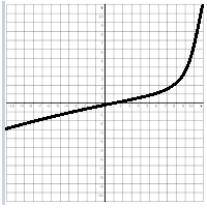
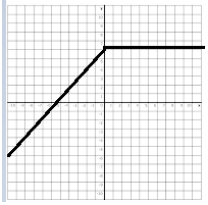
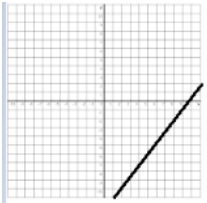
Sample Item	Item Type
Several functions represent different savings account plans. Which functions are nonlinear? □ $y = 5.50x + 7$ □ $y = 5.50(1.02)^x$ □ $y = 0.5(x)^2$ □ $y = 7.25x$ □ $y = 7.25 + x^2$	Multiselect
Jared puts 20 cents in a jar. The following week, he puts two times that original amount in the jar. For each of the following six weeks, Jared continues to double the amount of money he places in his savings jar each week. Determine if the relationship is linear or nonlinear. Explain your choice using examples with ordered pairs.	Open Response
See Appendix for the practice test item aligned to this standard.	

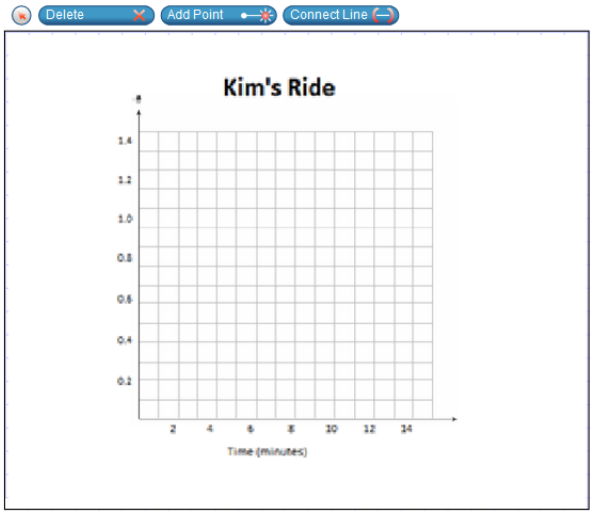
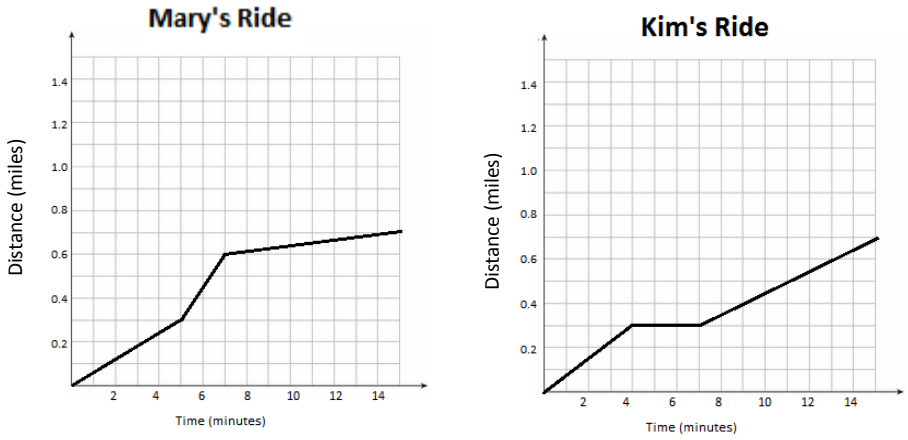
Content Standard	***MAFS.8.F*** *Functions* ***MAFS.8.F.2*** *Use functions to model relationships between quantities*. ***MAFS.8.F.2.4*** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (*x*, *y*) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
Assessment Limits	Function notation may not be used. Functions must be linear.
Calculator	Neutral
Item Types	Equation Editor GRID Matching Item Multiple Choice Multiselect Open Response Table Item
Context	Allowable

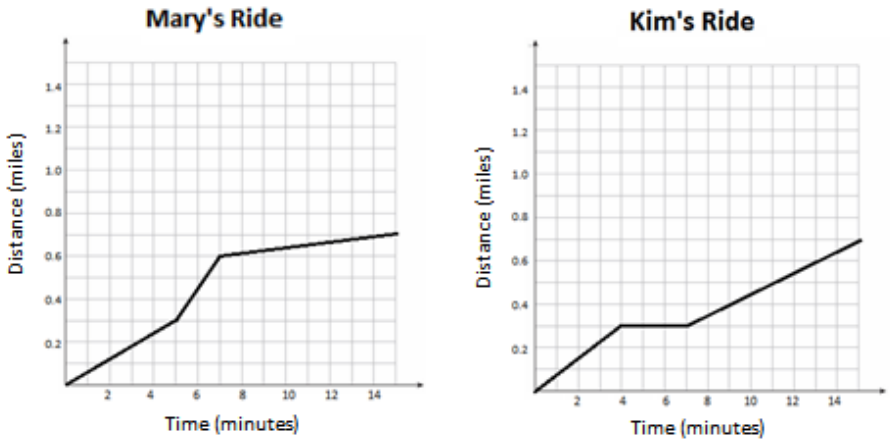
Sample Item	Item Type
The cost, *C*, to rent a car for *d* days is shown in the table. **Days (*d*)** / **Cost (*C*)** 2 / $105 4 / $195 5 / $240 6 / $285 Write an equation that represents this function.	Equation Editor

See Appendix for the practice test item aligned to this standard.

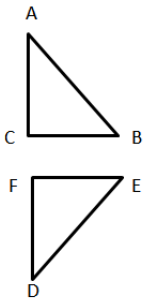
Content Standard	***MAFS.8.F*** *Functions* ***MAFS.8.F.2*** *Use functions to model relationships between quantities.* ***MAFS.8.F.2.5*** Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.
Assessment Limits	Linear or nonlinear relationships may use any of the four quadrants. Graph descriptions move from left to right. Functional relationships must be continuous.
Calculator	Neutral
Item Types	Editing Task Choice Equation Editor GRID Hot Text Matching Item Multiple Choice Multiselect Open Response Table Item
Context	Allowable

Sample Item	Item Type
Which graph represents a linear function increasing at a constant rate? A.  C.  B.  D. 	Multiple Choice

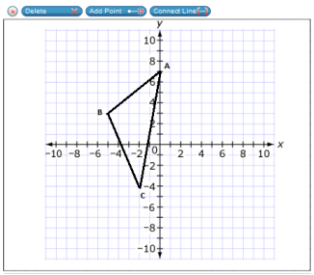
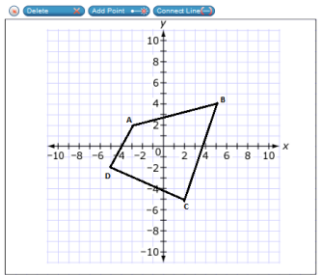
Sample Item	Item Type
Kim rides a stationary bike for fifteen minutes of exercise. Kim starts her ride slowly, stops for 2 minutes, and then continues her ride faster than she started. Use the Connect Line tool to create a possible graph of Kim's ride. 	GRID
Mary and Kim go bike riding on some trails. Graphs of the functions representing one of their rides are shown, where x is the time, in minutes, and y is the distance, in miles. Select all statements that are true based on the graphs shown.  ☐ Kim stops for 3 minutes. ☐ Mary stops for 2 minutes. ☐ Mary slows down after minute 8. ☐ Kim and Mary both ride the same distance after 14 minutes. ☐ Mary and Kim both begin the bike ride at the same speed between minutes 0 and 4.	Multiselect

Sample Item	Item Type
Mary and Kim ride their bikes to school each day. Graphs of the functions representing one of their rides are shown, where x is the time, in minutes, and y is the distance, in miles.  Write a short story about Mary's bike ride describing the relationship between time and distance. Include information about changes in the behavior of the function and rate of speed using terms such as increasing, constant, and decreasing.	Open Response
See Appendix for the practice test item aligned to this standard.	

Content Standard	***MAFS.8.G*** *Geometry* ***MAFS.8.G.1*** *Understand congruence and similarity using physical models, transparencies, or geometry software.* ***MAFS.8.G.1.2*** Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. Also Assessed: ***MAFS.8.G.1.1*** Verify experimentally the properties of rotations, reflections, and translations: ***MAFS.8.G.1.1a*** Lines are taken to lines, and line segments to line segments of the same length. ***MAFS.8.G.1.1b*** Angles are taken to angles of the same measure. ***MAFS.8.G.1.1c*** Parallel lines are taken to parallel lines.
Assessment Limits	The coordinate plane should not be used until *MAFS.8.G.1.3*. Limit sequences to no more than two transformations. A pre-image and image should not include apostrophe notation as this would give away the identification of similarity and congruence. No reference to the definition of congruence or symbols relating to the definition should be used (HS Geometry).
Calculator	Neutral
Item Types	Editing Task Choice Equation Editor GRID Hot Text Matching Item Multiple Choice Multiselect Open Response Table Item
Context	Allowable

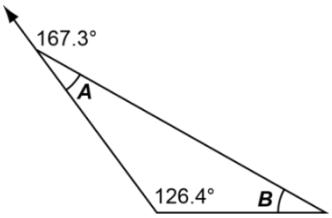
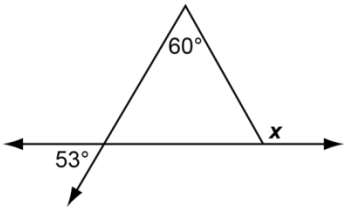
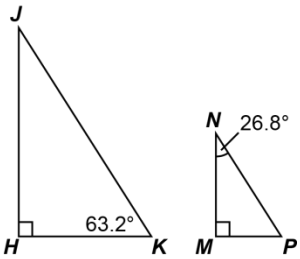
Sample Item	Item Type
Triangle ABC and its transformation DEF are shown.  What transformation of triangle ABC produced triangle DEF? A. vertical translation B. dilation about point C C. rotation about point A D. reflection across a horizontal line	Multiple Choice
See Appendix for the practice test item aligned to a standard in this group.	

Content Standard	***MAFS.8.G*** *Geometry* ***MAFS.8.G.1*** *Understand congruence and similarity using physical models, transparencies, or geometry software.* ***MAFS.8.G.1.3*** Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
Assessment Limits	Coordinate values of x and y must be integers. The number of transformations should be no more than two. In items that require the student to draw a transformed figure using a dilation or a rotation, the center of the transformation must be given.
Calculator	Neutral
Item Types	Editing Task Choice Equation Editor GRID Hot Text Multiple Choice Multiselect Open Response Table Item
Context	Allowable

Sample Item	Item Type
Triangle *ABC* is translated 5 units to the right to create triangle *A'B'C'*.  Use the Connect Line tool to draw triangle *A'B'C'*.	GRID
Quadrilateral $ABCD$ is rotated $90°$ clockwise about the origin to create quadrilateral *A'B'C'D'*.  Use the Connect Line tool to draw quadrilateral *A'B'C'D'*.	GRID
See Appendix for the practice test item aligned to this standard.	

Content Standard	***MAFS.8.G*** *Geometry* ***MAFS.8.G.1*** *Understand congruence and similarity using physical models, transparencies, and geometry software.* ***MAFS.8.G.1.4*** Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. Also Assessed: ***MAFS.8.G.1.1*** Verify experimentally the properties of rotations, reflections, and translations: ***MAFS.8.G.1.1a*** Lines are taken to lines, and line segments to line segments of the same length. ***MAFS.8.G.1.1b*** Angles are taken to angles of the same measure. ***MAFS.8.G.1.1c*** Parallel lines are taken to parallel lines.
Assessment Limits	Items should not include the coordinate plane as the coordinate plane is needed in *MAFS.8.G.1.3.* Limit the sequence to no more than two transformations. Two-dimensional figures are limited to no more than seven sides. A pre-image and image should not include apostrophe notation as this would give away the identification of similarity and congruence. No reference to the definition of congruence or symbols relating to the definition should be used (HS Geometry).
Calculator	Neutral
Item Types	Editing Task Choice Equation Editor GRID Hot Text Matching Item Multiple Choice Multiselect Open Response Table Item
Context	Allowable
Sample Item	Item Type
See Appendix for the practice test items aligned to a standard in this group.	

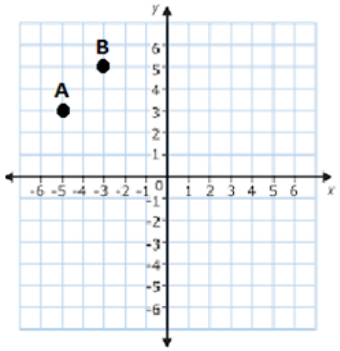
Content Standard	***MAFS.8.G*** *Geometry* ***MAFS.8.G.1*** *Understand congruence and similarity using physical models, transparencies, and geometry software.* ***MAFS.8.G.1.5*** Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angle created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*
Assessment Limit	Do not include shapes beyond triangles.
Calculator	Neutral
Item Types	Equation Editor GRID Multiple Choice Multiselect Open Response
Context	No Context

Sample Item	Item Type
What is the measure of $\angle A$, in degrees, in the figure shown? 	Equation Editor
What is the measure of $\angle x$, in degrees, in the figure shown? 	Equation Editor
Two similar triangles are shown.  What is the measure of $\angle P$, in degrees?	Equation Editor
See Appendix for the practice test item aligned to this standard.	

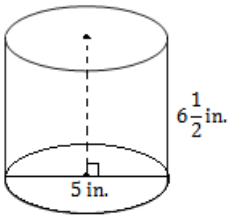
Content Standard	***MAFS.8.G*** *Geometry* ***MAFS.8.G.2*** *Understand and apply the Pythagorean Theorem.* ***MAFS.8.G.2.6*** Explain a proof of the Pythagorean Theorem and its converse.
Assessment Limit	For the converse, use only perfect roots.
Calculator	Yes
Item Types	Editing Task Choice Equation Editor GRID Hot Text Multiple Choice Multiselect Open Response
Context	Allowable

Sample Item	Item Type
Which set of numbers forms a right triangle? A. $1, 2, 3$ B. $3.2, 7, 8$ C. $3.6, 4.7, 5.2$ D. $6, 8, 10$	Multiple Choice
The side lengths of a triangle are given. $3, 4, 5$ Explain how you know which side will be opposite the right angle.	Open Response
See Appendix for the practice test item aligned to this standard.	

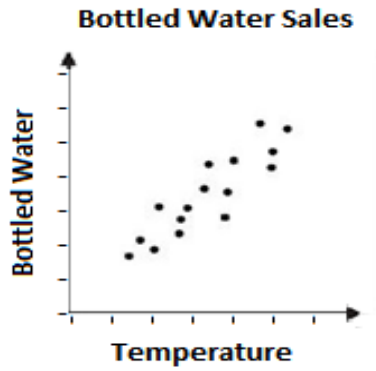
Content Standard	***MAFS.8.G*** *Geometry* ***MAFS.8.G.2*** *Understand and apply the Pythagorean Theorem.* ***MAFS.8.G.2.7*** Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. Also Assessed: ***MAFS.8.G.2.8*** Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
Assessment Limits	If the triangle is part of a three-dimensional figure, a graphic of the three-dimensional figure must be included. Points on the coordinate grid must be where grid lines intersect.
Calculator	Yes
Item Types	Editing Task Choice Equation Editor GRID Hot Text Matching Item Multiple Choice Multiselect
Context	Allowable

Sample Item	Item Type
Triangle ABC is a right triangle. The lengths of the legs are 60 centimeters and 80 centimeters. What is the length, in centimeters, of the hypotenuse?	Equation Editor
Triangle ABC is a right triangle. The length of one leg is 80 centimeters, and the hypotenuse is 120 centimeters. What is the length, in centimeters, of the other leg?	Equation Editor
Two points are on the coordinate plane shown.  What is the distance between A (-5, 3) and B (-3, 5)?	Equation Editor
See Appendix for the practice test items aligned to these standards.	

Content Standard	***MAFS.8.G*** *Geometry* ***MAFS.8.G.3*** *Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.* ***MAFS.8.G.3.9*** Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.
Assessment Limits	Graphics of three-dimensional figures can be included. Dimensions must be given as rational numbers. Figures must not be composite.
Calculator	Yes
Item Types	Equation Editor Multiple Choice Multiselect
Context	Allowable

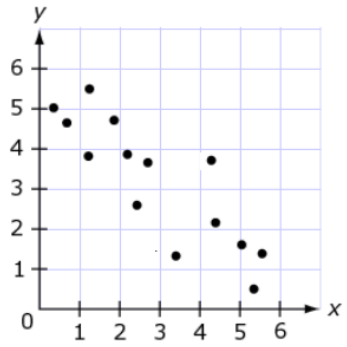
Sample Item	Item Type
A cylinder with a height of $6\frac{1}{2}$ inches (in.) and a diameter of 5 inches is shown.  What is the volume of the cylinder, in cubic inches? (Use 3.14 for π.)	Equation Editor
The diameter of a sphere is 4 inches. What is the volume of the sphere, in cubic inches? (Use 3.14 for π.)	Equation Editor
See Appendix for the practice test item aligned to this standard.	

Content Standard	***MAFS.8.SP*** *Statistics and Probability* ***MAFS.8.SP.1*** *Investigate patterns of association in bivariate data.* ***MAFS.8.SP.1.1*** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
Assessment Limit	Numbers in items must be rational numbers.
Calculator	Neutral
Item Types	GRID Multiple Choice Multiselect
Context	Allowable

Sample Item	Item Type
A scatter plot is shown for bottled water sales and temperature.  Select all statements that correctly interpret the graph. ☐ There are no outliers for the data. ☐ The data show a linear association. ☐ The data show a positive correlation. ☐ The data show a negative correlation. ☐ The data show no relation between bottled water sales and temperature.	Multiselect

See Appendix for the practice test item aligned to this standard.

Content Standard	***MAFS.8.SP*** *Statistics and Probability* ***MAFS.8.SP.1*** *Investigate patterns of association in bivariate data.* ***MAFS.8.SP.1.2*** Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
Assessment Limits	Numbers in items must be rational numbers. Trend/association is based on visual inspection. Line of best fit must be informally assessed. Trend/association must be linear.
Calculator	Neutral
Item Types	GRID Multiple Choice Multiselect Open Response
Context	Allowable

Sample Item	Item Type
A scatter plot is shown.  Use the Add Arrow tool to draw a line of best fit for the scatter plot.	GRID

See Appendix for the practice test item aligned to this standard.

Content Standard	***MAFS.8.SP*** *Statistics and Probability* ***MAFS.8.SP.1*** *Investigate patterns of association in bivariate data.* ***MAFS.8.SP.1.3*** Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height*.
Assessment Limits	Numbers in items must be simple rational numbers (e.g., $\frac{1}{2}$, $\frac{1}{4}$, to the 10^{th}). Data are required for all items. In all items requiring a line of best fit, the equation of that line should be given.
Calculator	Neutral
Item Types	Equation Editor Multiple Choice Multiselect Open Response
Context	Required

Sample Item	Item Type
The slope of the line of best fit for the data shown is approximately $\frac{3}{2}$. **Hours** / **Total Snow Accumulated (inches)** 1 — 1.7 2 — 2.9 3 — 4.4 4 — 6.2 5 — 7.5 6 — 8.9 7 — 10.3 8 — 11.9 What is the meaning of $\frac{3}{2}$ in terms of the context? ☐ After $\frac{3}{2}$ hours the snow begins. ☐ It snows exactly $\frac{3}{2}$ inches each hour. ☐ The snow is accumulating at about $\frac{3}{2}$ inches per hour. ☐ The snow height increases by about $\frac{3}{2}$ inches each hour. ☐ The ground has $\frac{3}{2}$ inches of snow before the data starts.	Multiselect

See Appendix for the practice test item aligned to this standard.

<table>
<tr><td>Content Standard</td><td>MAFS.8.SP Statistics and Probability

MAFS.8.SP.1 Investigate patterns of association in bivariate data.

MAFS.8.SP.1.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?</td></tr>
<tr><td>Assessment Limits</td><td>Numbers in items must be rational numbers.
Data given should include the grand total of the survey.
Tables must not include more than two columns (plus category and total) and two rows (plus category and total).</td></tr>
<tr><td>Calculator</td><td>Yes</td></tr>
<tr><td>Item Types</td><td>Equation Editor
GRID
Multiple Choice
Multiselect
Table Item</td></tr>
<tr><td>Context</td><td>Required</td></tr>
<tr><td colspan="2">Sample Item</td><td>Item Type</td></tr>
<tr><td colspan="2">Two hundred sixty students were surveyed on whether they prefer apple juice or orange juice. A table of relative frequencies is shown.

<table><tr><td></td><td>Apple juice</td><td>Orange juice</td><td>Total</td></tr><tr><td>Boys</td><td></td><td>0.20</td><td></td></tr><tr><td>Girls</td><td></td><td></td><td>0.75</td></tr><tr><td>Total</td><td>0.45</td><td>0.55</td><td>1.00</td></tr></table>
How many more girls prefer apple juice than boys?</td><td>Equation Editor</td></tr>
<tr><td colspan="3">See Appendix for the practice test item aligned to this standard.</td></tr>
</table>

Appendix A

The chart below contains information about the standard alignment for the items in the Grade 8 Mathematics FSA Computer-Based Practice Test at http://fsassessments.org/students-and-families/practice-tests/.

Content Standard	Item Type	Computer-Based Practice Test Item Number
MAFS.8.NS.1.1	Matching Item	6
MAFS.8.NS.1.2	GRID	8
MAFS.8.EE.1.1	Equation Editor	3
MAFS.8.EE.1.2	Equation Editor	27
MAFS.8.EE.1.3	Equation Editor	7
MAFS.8.EE.1.4	Multiple Choice	1
MAFS.8.EE.2.5	GRID	24
MAFS.8.EE.2.6	Table Item	14
MAFS.8.EE.3.7a	Matching Item	19
MAFS.8.EE.3.8b	Matching Item	11
MAFS.8.F.1.1	Table Item	5
MAFS.8.F.1.2	Equation Editor	12
MAFS.8.F.1.3	Multiple Choice	17
MAFS.8.F.2.4	Equation Editor	9
MAFS.8.F.2.5	Matching Item	22
MAFS.8.G.1.2	Multiselect	2
MAFS.8.G.1.3	GRID	4
MAFS.8.G.1.4	Multiple Choice	13
MAFS.8.G.1.5	Equation Editor	23
MAFS.8.G.2.6	Multiselect	20
MAFS.8.G.2.7	Equation Editor	16
MAFS.8.G.2.8	Equation Editor	25
MAFS.8.G.3.9	Equation Editor	18
MAFS.8.SP.1.1	Multiple Choice	10
MAFS.8.SP.1.2	Multiple Choice	26
MAFS.8.SP.1.3	Open Response	15
MAFS.8.SP.1.4	Equation Editor	21

Appendix B: Revisions

Page(s)	Revision	Date
10	Sample items revised.	May 2016
11	Sample items revised.	May 2016
12	Content standard and sample items revised.	May 2016
13	Assessment limits and sample items revised.	May 2016
15	Item types revised.	May 2016
16	Sample items revised.	May 2016
18-19	Item types and sample items revised.	May 2016
20-22	Assessment limits and sample items revised.	May 2016
23-24	Sample items revised.	May 2016
27	Assessment limits revised.	May 2016
28-30	Sample items revised.	May 2016
33	Assessment limits and sample items revised.	May 2016
34	Item types revised.	May 2016
36	Content standard and item types revised.	May 2016
37	Assessment limits and item types revised.	May 2016
38	Sample items revised.	May 2016
40	Sample item added.	May 2016
41	Sample item revised.	May 2016
42	Item types revised.	May 2016
43	Appendix A added to show Practice Test information.	May 2016

Grade 8 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