Grade 8 Mathematics Instructional Toolkit

The Grade 8 Mathematics Instructional Toolkit is intended to assist teachers with planning instruction aligned to the Florida Standards. This toolkit is not intended to replace your district's curriculum, but rather it serves to support the teaching and learning of the grade 8 Mathematics Florida Standards. This toolkit includes a breakdown of information related to the Grade 8 Mathematics Florida Standards Assessment (FSA), CPALMS and Florida Students, the Grade 8 Mathematics Florida Standards, and standards aligned resources.

Grade 8 Mathematics Florida Standards Assessment

This section highlights some key information related to the Grade 8 Mathematics FSA that can be found on the FSA Portal. These items include the Test Design Summary and Blueprint, Test Item Specifications and FSA Practice Tests.

Test Design Summary and Blueprint

The grade 8 mathematics standards can be broken down into four major reporting categories as assessed on the Grade 8 Mathematics FSA with a corresponding weight. This information can also be found on page 6 of the Test Design Summary and Blueprint.

- Expressions and Equations (30%)
- Functions (25%)
- Geometry (27%)
- Statistics and Probability & The Number System (18%)

Test Item Specifications

The grade 8 Test Item Specification Document indicates the alignment of items with the Florida Standards. Assessment limits are included in the specifications, which define the range of content knowledge in the assessment items for the standard. In addition to limits, each item specification identifies whether or not that item could appear in the calculator allowed test session or no calculator allowed test session. Sample items for each standard are also included in the specifications document. Each standard in this toolkit lists the corresponding page number in the specifications document along with any assessment limits and allowable calculator use.

Practice Tests

Practice Tests are available for students to become familiar with the various item types that may be used on the Grade 8 Mathematics FSA. Within the Test Item Specification document, page 43, is a chart aligning standards to each item type and item number on the Computer-Based Practice Test. Each Computer-Based Practice Test is provided with an answer key. It is important to note that students are not permitted to use a calculator of any kind on Session 1 of the Grade 8 Mathematics FSA. Students will be permitted a scientific calculator on all other sessions. For information regarding usage of calculators, please see the Calculator and Reference Sheet Policy page on the FSA portal.

CPALMS: Official Source of Florida Standards

This section features information and tools that are found on CPALMS.

Grade 8 Mathematics Course Description
The Grade 8 Mathematics Course Description provides an overview for the course with standards aligned resources for educators, students, and parents.

Mathematics Formative Assessment System (MFAS)
One resource available on CPALMS that has been designed specifically for mathematics instruction is the Mathematics Formative Assessment System (MFAS). The system includes a task or problem that teachers can implement with their students. It also includes various levels of rubrics that help the teacher interpret students' responses. In addition to using the MFAS tasks as formative assessments for students, these tasks can be used by teachers to plan lessons that are closely aligned to the standards.

Model Eliciting Activity (MEAs)
Model Eliciting Activities (MEAs) are open-ended, interdisciplinary problem-solving activities that are meant to reveal students' thinking about the concepts embedded in these realistic activities. Students will work in teams to apply their knowledge of mathematics and science while considering constraints and tradeoffs. Each MEA is aligned to at least two subject areas, including mathematics, English language arts and/or literacy in the content areas, and science.

Mathematical Practices
The Mathematical Practices are habits of mind that describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. The Mathematical Practices should be infused during the course and will be assessed throughout the Grade 8 Mathematics FSA. More information about each Mathematical Practice can be found by clicking on the links below.

MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.
MAFS.K12.MP.4.1 Model with mathematics.
MAFS.K12.MP.5.1 Use appropriate tools strategically.
MAFS.K12.MP.6.1 Attend to precision.
MAFS.K12.MP.7.1 Look for and make use of structure.
MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

Depth of Knowledge
Florida has adopted Webb's four-level Depth of Knowledge (DOK) model of content complexity as a means of classifying the cognitive demand presented by the Florida standards. It is important to distinguish between the DOK rating for a given standard and the possible DOK ratings for assessment items designed to address the standard. This is particularly important for assessment purposes, since 50% or more of assessment items associated with a given standard should meet or exceed the DOK level of the standard. The DOK Levels are identified for each standard throughout this document. Please visit the CPALMS Content Complexity page for more information about the DOK complexity for standards. For more information about the DOK complexity for mathematics assessments, please visit page 9 of the mathematics Test Design Summary and Blueprint on the FSA Portal.

Florida Students

Resources specifically designed with students in mind are available on Florida Students. Florida Students is an interactive site that provides educational resources and student tutorials aligned to the Florida Standards. This site should not be used as a lesson guide, but rather a tool to help students obtain mastery in various mathematical concepts.

Grade 8 Mathematics Florida Standards

This section includes a breakdown of each standard by domain and cluster. Standards should not be taught in the order below. To do so would strip the coherence of the mathematical ideas and miss opportunity to enhance the major work of the grade with the supporting clusters and/or standards. In addition to the breakdown, each standard has the corresponding DOK Level, and assessment limits with page number in the Grade 8 Mathematics Item Specification.

Domain: The Number System

Cluster 1 *(Supporting): Know that there are numbers that are not rational, and approximate them by rational numbers.*

Standard Code	Standard	Assessment Limit(s)	Resources
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. Content Complexity: Level 1: Recall	Page 10; All irrational numbers may be used, excluding *e*. Only rational numbers with repeating decimal expansions up to thousandths may be used. Item assessed without calculator.	MFAS: Rational Numbers Lesson: Predicting the decimal equivalent for a fraction
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 √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.* Content Complexity: Level 2: Basic Application of Skills & Concepts	Page 11; All irrational numbers may be used, excluding e. Irrational expressions should only use one operation. Item assessed without calculator.	MFAS: Locating Irrational Numbers Lesson: Pin the Irrational "Tail" on the Number Line

Domain: Expressions and Equations

Cluster 1 *(Major): Work with radicals and integer exponents.*

Standard Code	Standard	Assessment Limit(s)	Resources
MAFS.8.EE.1.1	Know and apply the properties of integer exponents to generate equivalent numerical	Page 12; Exponents must be integers. Bases must be	MFAS: Equivalent

	expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = \frac{1}{3^3} = \frac{1}{27}$. Content Complexity: Level 1: Recall	whole numbers. Variables may not be used. Item assessed without calculator.	Powers Expressions Lesson: Math is Exponentially Fun!
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. Content Complexity: Level 1: Recall	Page 13; Square roots and cube roots may be used to represent solutions to equations. Radicands may not include variables. Item assessed with and/or without calculator.	MFAS: Dimensions Needed Lesson: Generalizing Patterns: The Difference of Two Squares
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 × 10^8 and the population of the world as 7 ×10^9, and determine that the world population is more than 20 times larger.* Content Complexity: Level 1: Recall	Page 14; N/A Item assessed without calculator.	MFAS: How Many Times? Lesson: Estimating Length Using Scientific Notation
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. Content Complexity: Level 2: Basic Application of Skills & Concepts	Page 15; N/A Item assessed without calculator.	MFAS: Mixed Form Operations Tutorial: Calculating Red Blood Cells

Cluster 2 *(Major):* Understand the connections between proportional relationships, lines, and linear equations.

Standard Code	Standard	Assessment Limit(s)	Resources
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*	Page 16; Numbers in items must be rational numbers. Item assessed with calculator.	MFAS: Proportional Paint Lesson: Slope Intercept

	which of two moving objects has greater speed. Content Complexity: Level 2: Basic Application of Skills & Concepts		
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*. Content Complexity: Level 2: Basic Application of Skills & Concepts	Page 17; All triangles must be right triangles and on a coordinate grid. Numbers in items must be rational numbers. Functions must be linear. Item assessed with calculator.	MFAS: Slope Triangles Lesson: Slope Intercept

Cluster 3 *(Major):* Analyze and solve linear equations and pairs of simultaneous linear equations.

Standard Code	Standard	Assessment Limit(s)	Resources
MAFS.8.EE.3.7	Solve linear equations in one variable. *a)* 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). *b)* Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. Content Complexity: Level 2: Basic Application of Skills & Concepts	Pages 18-19; Numbers in items must be rational numbers. Item assessed with calculator.	MFAS: Equation Prototypes Lesson: Company Charges
MAFS.8.EE.3.8	Analyze and solve pairs of simultaneous linear equations. *a)* 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. *b)* 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*	Pages 20-22; 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.	MFAS: Identify the Solution Lesson: Battle on the High Seas

	simultaneously be 5 and 6. *c)* 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.* Content Complexity: Level 2: Basic Application of Skills & Concepts	Item assessed with calculator.	

Domain: Functions

Cluster 1 *(Major):* Define, evaluate, and compare functions.

Standard Code	Standard	Assessment Limit(s)	Resources
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. Content Complexity: Level 2: Basic Application of Skills & Concepts	Pages 23-24; Function notation must not be used. Nonlinear functions may be included for identifying a function Item assessed with and/or without calculator.	MFAS: What is a Function? Lesson: How Much Are Playoff Tickets?
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.* Content Complexity: Level 2: Basic Application of Skills & Concepts	Page 25; Function notation may not be used. Functions must be linear. Item assessed with calculator.	MFAS: Speed Reading Original Tutorial: The Linear Function Connection
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.* Content Complexity: Level 2: Basic Application of Skills & Concepts	Page 26; Function notation may not be used. Item assessed with calculator.	MFAS: Linear or Nonlinear? Lesson: Functions: Are They Linear or Nonlinear?

***Cluster 2** (Major):* Use functions to model relationships between quantities.

Standard Code	Standard	Assessment Limit(s)	Resources
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. Content Complexity: Level 3: Strategic Thinking & Complex Reasoning	Page 27; Function notation may not be used. Functions must be linear. Item assessed with and/or without calculator.	MFAS: Smart TV Original Tutorial: Constructing Functions from Tables
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. Content Complexity: Level 2: Basic Application of Skills & Concepts	Pages 28-30; Linear or nonlinear relationships may use any of the four quadrants. Graph descriptions move from left to right. Functional relationships must be continuous. Item assessed with and/or without calculator.	MFAS: Graph the Ride Original Tutorial: Interpreting Distance-Time Graphs

Domain: Geometry

***Cluster 1** (Major):* Understand congruence and similarity using physical models, transparencies, or geometry software.

Standard Code	Standard	Assessment Limit(s)	Resources
MAFS.8.G.1.1	Verify experimentally the properties of rotations, reflections, and translations: *a)* Lines are taken to lines, and line segments to line segments of the same length. *b)* Angles are taken to angles of the same measure. *c)* Parallel lines are taken to parallel lines. Content Complexity: Level 2: Basic Application of Skills & Concepts	Pages 31-32; 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).	MFAS: Angle Transformations Lesson: A Transformation's Adventure with Patty Paper

		Item assessed with and/or without calculator.	
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. Content Complexity: Level 2: Basic Application of Skills & Concepts	Pages 31; 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). Item assessed with and/or without calculator.	MFAS: Multistep Congruence Lesson: Polygon Transformers
MAFS.8.G.1.3	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. Content Complexity: Level 2: Basic Application of Skills & Concepts	Page 32; 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. Item assessed with and/or without calculator.	MFAS: Rotation Coordinates Virtual Manipulative: Transformations
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. Content Complexity: Level 2: Basic Application of Skills & Concepts	Page 33; 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	MFAS: Proving Similarity Original Tutorial: Home Transformations

		symbols relating to the definition should be used (HS Geometry). Item assessed with and/or without calculator.	
MAFS.8.G.1.5	Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles 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.* Content Complexity: Level 2: Basic Application of Skills & Concepts	Page 34; Items must not include shapes beyond triangles. Item assessed with and/or without calculator.	MFAS: Justifying the Triangle Sum Theorem Lesson: Identifying Similar Triangles

Cluster 2 *(Major):* MAFS.8.G.2 Understand and apply the Pythagorean Theorem.

Standard Code	Standard	Assessment Limit(s)	Resources
MAFS.8.G.2.6	Explain a proof of the Pythagorean Theorem and its converse. Content Complexity: Level 2: Basic Application of Skills & Concepts	Page 35; For the converse, only perfect roots should be used. Item assessed with calculator.	MFAS: Pythagorean Squares Lesson: Discovering and Using the Pythagorean Theorem
MAFS.8.G.2.7	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-word and mathematical problems in two and three dimensions. Content Complexity: Level 2: Basic Application of Skills & Concepts	Page 36; 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. Item assessed with calculator.	MFAS: How Far to School Lesson: Alas, Poor Pythagoras, I Knew You Well!
MAFS.8.G.2.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. Content Complexity: Level 1: Recall	Page 36; 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.	MFAS: Distance Between Two Points STEM Lesson: Bike Club Trip

		Item assessed with calculator.	

Cluster 3 *(Additional): Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.*

Standard Code	Standard	Assessment Limit(s)	Resources
MAFS.8.G.3.9	Know the formulas for the volume of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. Content Complexity: Level 2: Basic Application of Skills & Concepts	Page 37; Graphics of three-dimensional figures can be included. Dimensions must be given as rational numbers. Figures must not be composite. Item assessed with calculator.	MFAS: Platinum Cylinder Original Tutorial: Volume of Spherical Bubble Tea

Domain: Statistics & Probability

Cluster 1 *(Supporting): Investigate patterns of association in bivariate data.*

Standard Code	Standard	Assessment Limit(s)	Resources
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. Content Complexity: Level 2: Basic Application of Skills & Concepts	Page 38; Numbers in items must be rational numbers. Item assessed with and/or without calculator.	Original Tutorial: Scatterplots Part 1: Graphing MFAS: Sleepy Statistics
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. Content Complexity: Level 2: Basic Application of Skills & Concepts	Page 39; 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 Item assessed with and/or without calculator.	Lesson: If the line fits, where's it? MFAS: Line of Good Fit
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*	Page 40; Numbers in items must be simple rational numbers (e.g., 1/2, 1/4, to the 10th). Data are required for all items. In all items requiring a line of best	Lesson: Scattering Plots MFAS: Foot Length

	sunlight each day is associated with an additional 1.5 cm in mature plant height. Content Complexity: Level 2: Basic Application of Skills & Concepts	fit, the equation of that line should be given. Item assessed with and/or without calculator.	
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?* Content Complexity: Level 3: Strategic Thinking & Complex Reasoning	Page 41; 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). Item assessed with calculator.	Lesson: Tackling 2 Way Tables MFAS: Music and Sports

Grade 8 Mathematics Resources

Course Descriptions, Standards, and Resources

- Grade 8 Mathematics Course Description
- Grade 8 Math Student Resources
- Text Complexity Resources
- Florida Assessments for Instruction in Mathematics (FAIM)
- Student Support Resources
- Parent Support Resources

Florida Standards Assessment Assistance

- Test Item Specifications
- Test Design Summary and Blueprint
- FSA Fact Sheet
- Calculator and Reference Sheet Policy
- Reference Sheet
- Understanding FSA Reports