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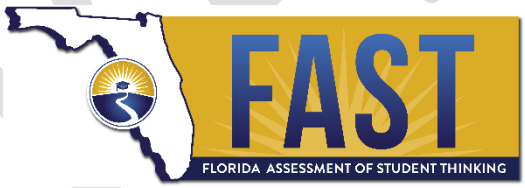
Grade 8 Mathematics Test Item Specifications



INTENDED FOR TEST ITEM WRITERS AND REVIEWERS FOR FLORIDA'S STATEWIDE ASSESSMENTS. NOT FOR INSTRUCTIONAL USE.

The contents of these draft *Test Item Specifications (Specifications)* are based on the benchmarks provided in Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards. The *Specifications* define the content and format of the tests and test items and indicate the alignment of items with the benchmarks for test item writers and reviewers. **The *Specifications* are not intended for instructional use.**

With the adoption of Florida's B.E.S.T. Standards for ELA and Mathematics, the following comprehensive resource has been developed to support educators.

- Within the standards, **benchmark clarifications** provide helpful information for educators to understand and to implement each standard.

Given the availability of B.E.S.T. resources, and to prevent any misuse of the *Specifications* by educators, item specifications for ELA and Mathematics assessments aligned to the B.E.S.T. Standards will be reserved for their intended purpose of guiding item writers and reviewers. B.E.S.T. Standards implementation should be driven by the instructional support provided by the Just Read, Florida! Office (JRF) and the Bureau of Standards and Instructional Support (BSIS) to ensure that the focus remains on the content and skills students will engage with in the classroom.

Origin of the Specifications

The Florida Department of Education convened committees of Florida educators to help develop and approve the specifications documents.

Technology-Enhanced Item Descriptions

The Florida B.E.S.T. Standards Assessments are composed of test items that include traditional multiple-choice items as well as enhanced items that require students to select and/or support their answers.

The various enhanced item types are described below.

- **Technology-Enhanced Item Types—Mathematics**
  - **Editing Task Choice**—The student clicks a drop-down menu containing options to complete an equation or expression, a statement, or other component. The student then selects the correct response from the drop-down menu. For paper-based assessments, this item type is modified; the student fills in a bubble to indicate a selection.
  - **Selectable Hot Text**—The student is directed to click on one or more correct answers from among a number of options. When the student hovers over the options (e.g., phrases, sentences, numbers, or expressions), the text will highlight. This indicates that the text is selectable ("hot"). The options may be presented in various ways (e.g., as a list, embedded within text, or in a table). The student can then click on an option to select it. For paper-based assessments, this item type is modified; the student fills in a bubble to indicate a selection.
  - **Multiselect**—The student is directed to select all 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.
  - **Graphic Response Item Display (GRID)**—The student uses the point, line, or arrow tools to create a response on a graph. The item type may also require the student to select numbers, words, phrases, or images and use the drag-and-drop feature to place them into a graphic. For paper-based assessments, this item type will be replaced with another item type.
  - **Equation Editor**—The student enters a number, variable, expression, or equation, as appropriate to the test item, in a response box. The student is presented with a toolbar that includes a variety of mathematical symbols that can be used to create a response. The response box may be separate from the text of the item, or it may be embedded within text of the item (e.g., in line with a sentence or within a table). For paper-based assessments, this item type is modified; the student writes a response in the response box.
  - **Matching Item**—The student checks a box to indicate whether information from a column header matches information from a row. The number of correct answer options per row or column may vary. These items appear in the online and paper-based assessments.

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, different item types (multiple choice, multiselect, editing task choice, selectable hot text, matching, and equation editor) may be combined into a single item.

Item Specifications Definitions

- **Assessment Limits** define the range of content knowledge and degree of difficulty that should be assessed in the assessment items for the benchmark(s).
- **Meaning of Also Assesses**—Where mastery of overlapping mathematical skills of associated benchmark(s) could be assessed through primary benchmark(s).
- **Calculator Availability**
  The following chart displays the type of calculator that is available for each grade or course B.E.S.T. Assessment. Note: For grades 6, 7, 8, Algebra 1, and Geometry, calculators are available for the entire assessment.

Grade/Course	Calculator
3, 4, 5	None
6	Basic four-function
7, 8	Desmos scientific
Algebra 1, Geometry	Desmos scientific

  - **Calculator Designations**
    - **None**—Items for this benchmark **may not** allow for the availability of a calculator.
    - **Available**—Items for this benchmark **must** allow for the availability of a calculator.

- **Context Designations**
  Any item could include justifying and error analysis through reasoning.
  - **Real-world**—authentic application of mathematics to real-world situations
  - **Mathematical**—using models, equations, or evaluation of mathematical reasoning in the absence of a real-world context
  - **Both**—items could either use a real-world context or be strictly mathematical

Number Sense and Operations

MA.8.NSO.1	***Solve problems involving rational numbers, including numbers in scientific notation, and extend the understanding of rational numbers to irrational numbers.***
MA.8.NSO.1.1	Extend previous understanding of rational numbers to define irrational numbers within the real number system. Locate an approximate value of a numerical expression involving irrational numbers on a number line. *Example:* Within the expression $1 + \sqrt{30}$, the irrational number $\sqrt{30}$ can be estimated to be between 5 and 6 because 30 is between 25 and 36. By considering $(5.4)^2$ and $(5.5)^2$, a closer approximation for $\sqrt{30}$ is 5.5. So, the expression $1 + \sqrt{30}$ is equivalent to about 6.5.
Benchmark Clarifications	*Clarification 1:* Instruction includes the use of number line and rational number approximations, and recognizing pi (π) as an irrational number. *Clarification 2:* Within this benchmark, the expectation is to approximate numerical expressions involving one arithmetic operation and estimating square roots or pi (π).
Context	Mathematical
Calculator	Available
Assessment Limits	Irrational numbers are limited to pi (π) and square roots. Approximate values of square roots must be based on the value of the square roots of neighboring perfect squares.

MA.8.NSO.1	***Solve problems involving rational numbers, including numbers in scientific notation, and extend the understanding of rational numbers to irrational numbers.***
MA.8.NSO.1.2	Plot, order and compare rational and irrational numbers, represented in various forms.
Benchmark Clarifications	*Clarification 1:* Within this benchmark, it is not the expectation to work with the number e. *Clarification 2:* Within this benchmark, the expectation is to plot, order and compare square roots and cube roots. *Clarification 3:* Within this benchmark, the expectation is to use symbols (<, > or =).
Context	Mathematical
Calculator	Available
Assessment Limits	Items must include at least one irrational number or radical. Irrational numbers are limited to pi (π), square roots, and cube roots. Items requiring the student to compare fractions with irrational numbers or decimals are limited to fractions that result in a terminating decimal. Items may use the words "is less than," "is greater than," or "is equal to." Approximate values of square roots must be based on the value of the square roots of neighboring perfect squares.

MA.8.NSO.1	***Solve problems involving rational numbers, including numbers in scientific notation, and extend the understanding of rational numbers to irrational numbers.***
MA.8.NSO.1.3	Extend previous understanding of the Laws of Exponents to include integer exponents. Apply the Laws of Exponents to evaluate numerical expressions and generate equivalent numerical expressions, limited to integer exponents and rational number bases, with procedural fluency. *Example:* The expression $\frac{2^4}{2^7}$ is equivalent to 2^{-3} which is equivalent to $\frac{1}{8}$.
Benchmark Clarifications	*Clarification 1:* Refer to the K-12 Formulas (Appendix E) for the Laws of Exponents.
Context	Mathematical
Calculator	Available
Assessment Limits	Items must incorporate a negative exponent in either the given expression or the student-generated expression. Items requiring the student to evaluate numerical expressions must incorporate at least one Law of Exponents or a negative exponent. Items will require the student to evaluate a numerical expression with negative exponents, generate an equivalent expression, or generate and evaluate an expression.

MA.8.NSO.1	***Solve problems involving rational numbers, including numbers in scientific notation, and extend the understanding of rational numbers to irrational numbers.***
MA.8.NSO.1.4	Express numbers in scientific notation to represent and approximate very large or very small quantities. Determine how many times larger or smaller one number is compared to a second number. *Example:* Roderick is comparing two numbers shown in scientific notation on his calculator. The first number was displayed as 2.3147E27 and the second number was displayed as 3.5982E − 5. Roderick determines that the first number is about 10^{32} times bigger than the second number.
Benchmark Clarifications	
Context	Both
Calculator	Available
Assessment Limits	Items may require the student to rewrite numbers in scientific notation or in standard form.

MA.8.NSO.1	***Solve problems involving rational numbers, including numbers in scientific notation, and extend the understanding of rational numbers to irrational numbers.***
MA.8.NSO.1.5	Add, subtract, multiply and divide numbers expressed in scientific notation with procedural fluency. *Example:* The sum of 2.31×10^{15} and 9.1×10^{13} is 2.401×10^{15}.
Benchmark Clarifications	*Clarification 1:* Within this benchmark, for addition and subtraction with numbers expressed in scientific notation, exponents are limited to within 2 of each other.
Context	Mathematical
Calculator	Available
Assessment Limits	Items may require the student to rewrite numbers in scientific notation or in standard form. Numbers are limited to the thousandths place or less when expressed in scientific notation.

MA.8.NSO.1	***Solve problems involving rational numbers, including numbers in scientific notation, and extend the understanding of rational numbers to irrational numbers.***
MA.8.NSO.1.6	Solve real-world problems involving operations with numbers expressed in scientific notation.
Benchmark Clarifications	*Clarification 1:* Instruction includes recognizing the importance of significant digits when physical measurements are involved. *Clarification 2:* Within this benchmark, for addition and subtraction with numbers expressed in scientific notation, exponents are limited to within 2 of each other.
Context	Real-world
Calculator	Available
Assessment Limits	Items may require the student to rewrite numbers in scientific notation or in standard form. Numbers are limited to the thousandths place or less when expressed in scientific notation.

MA.8.NSO.1	***Solve problems involving rational numbers, including numbers in scientific notation, and extend the understanding of rational numbers to irrational numbers.***
MA.8.NSO.1.7	Solve multi-step mathematical and real-world problems involving the order of operations with rational numbers including exponents and radicals. *Example:* The expression $\left(-\frac{1}{2}\right)^2 + \sqrt{(2^3 + 8)}$ is equivalent to $\frac{1}{4} + \sqrt{16}$ which is equivalent to $\frac{1}{4} + 4$ which is equivalent to $\frac{17}{4}$.
Benchmark Clarifications	*Clarification 1:* Multi-step expressions are limited to 6 or fewer steps. *Clarification 2:* Within this benchmark, the expectation is to simplify radicals by factoring square roots of perfect squares up to 225 and cube roots of perfect cubes from -125 to 125.
Context	Both
Calculator	Available
Assessment Limits	Decimals are limited to the thousandths place or less. Expressions must be given and must incorporate a negative exponent and/or a radical. The value of the radicand must be a perfect square or perfect cube. Integer exponents are limited to values between –3 and 3, inclusive. Expressions that include the use of both fractions and decimals must use fractions that only result in a terminating decimal.

Algebraic Reasoning

MA.8.AR.1	***Generate equivalent algebraic expressions.***
MA.8.AR.1.1	Apply the Laws of Exponents to generate equivalent algebraic expressions, limited to integer exponents and monomial bases. *Example:* The expression $(3x^3y^{-2})^3$ is equivalent to $27x^9y^{-6}$.
Benchmark Clarifications	*Clarification 1:* Refer to the K-12 Formulas (Appendix E) for the Laws of Exponents.
Context	Mathematical
Calculator	Available
Assessment Limits	Items are limited to the use of monomials and one-term algebraic expressions involving multiplication and/or division. Items are limited to the use of no more than two variables. Items including one variable are limited to no more than three laws. Items including two different variables are limited to the application of no more than two Laws of Exponents.

MA.8.AR.1	***Generate equivalent algebraic expressions.***
MA.8.AR.1.2	Apply properties of operations to multiply two linear expressions with rational coefficients. *Example:* The product of $(1.1 + x)$ and $(-2.3x)$ can be expressed as $-2.53x - 2.3x^2$ or $-2.3x^2 - 2.53x$.
Benchmark Clarifications	*Clarification 1:* Problems are limited to products where at least one of the factors is a monomial. *Clarification 2:* Refer to Properties of Operations, Equality and Inequality (Appendix D).
Context	Mathematical
Calculator	Available
Assessment Limits	N/A

MA.8.AR.1	***Generate equivalent algebraic expressions.***
MA.8.AR.1.3	Rewrite the sum of two algebraic expressions having a common monomial factor as a common factor multiplied by the sum of two algebraic expressions. *Example:* The expression $99x - 11x^3$ can be rewritten as $11x(9 - x^2)$ or as $-11x(-9 + x^2)$.
Benchmark Clarifications	
Context	Mathematical
Calculator	Available
Assessment Limits	Algebraic expressions must be given. Items are limited to the use of no more than two different variables.

MA.8.AR.2	***Solve multi-step one-variable equations and inequalities.***
MA.8.AR.2.1	Solve multi-step linear equations in one variable, with rational number coefficients. Include equations with variables on both sides.
Benchmark Clarifications	*Clarification 1:* Problem types include examples of one-variable linear equations that generate one solution, infinitely many solutions or no solution.
Context	Mathematical
Calculator	Available
Assessment Limits	Items including one equation must give the equation and include more than two procedural steps to solve. Items including multiple equations must give the equations and at least one of the given equations will include more than two procedural steps to solve. Items may require the student to state whether there is one solution, no solution, or infinite solutions.

MA.8.AR.2	***Solve multi-step one-variable equations and inequalities.***
MA.8.AR.2.2	Solve two-step linear inequalities in one variable and represent solutions algebraically and graphically.
Benchmark Clarifications	*Clarification 1:* Instruction includes inequalities in the forms $px \pm q > r$ and $p(x \pm q) > r$, where p, q and r are specific rational numbers and where any inequality symbol can be represented. *Clarification 2:* Problems include inequalities where the variable may be on either side of the inequality.
Context	Mathematical
Calculator	Available
Assessment Limits	Inequalities must be given, will be presented in the forms $px \pm q > r$ or $p(x \pm q) > r$, and will use the relational symbols >, ≥, <, or ≤.

MA.8.AR.2	***Solve multi-step one-variable equations and inequalities.***
MA.8.AR.2.3	Given an equation in the form of $x^2 = p$ and $x^3 = q$, where p is a whole number and q is an integer, determine the real solutions.
Benchmark Clarifications	*Clarification 1:* Instruction focuses on understanding that when solving $x^2 = p$, there is both a positive and negative solution. *Clarification 2:* Within this benchmark, the expectation is to calculate square roots of perfect squares up to 225 and cube roots of perfect cubes from -125 to 125.
Context	Mathematical
Calculator	Available
Assessment Limits	Items will not require the student to simplify square roots of non-perfect squares, simplify cube roots of non-perfect cubes, or approximate roots. Items are limited to one procedural step to isolate the variable. Items may require the student to give both the positive and negative solutions for the form $x^2 = p$.

MA.8.AR.3	***Extend understanding of proportional relationships to two-variable linear equations.***
MA.8.AR.3.2	Given a table, graph or written description of a linear relationship, determine the slope.
Benchmark Clarifications	*Clarification 1:* Problem types include cases where two points are given to determine the slope. *Clarification 2:* Instruction includes making connections of slope to the constant of proportionality and to similar triangles represented on the coordinate plane.
Context	Mathematical
Calculator	Available
Assessment Limits	All values for *x*- and *y*-coordinates used to determine slope must be integers.

MA.8.AR.3	***Extend understanding of proportional relationships to two-variable linear equations.***
MA.8.AR.3.3	Given a table, graph or written description of a linear relationship, write an equation in slope-intercept form.
Benchmark Clarifications	
Context	Mathematical
Calculator	Available
Assessment Limits	Items must state that the given table, graph, or written description represents a linear relationship. Tables must include at least two points. Graphs may include at least two exact points marked on the line and may be labeled with coordinates. Graphs must have integral *y*-intercepts. All values for *x*- and *y*-coordinates used to determine slope must be integers.

MA.8.AR.3	***Extend understanding of proportional relationships to two-variable linear equations.***
MA.8.AR.3.4	Given a mathematical or real-world context, graph a two-variable linear equation from a written description, a table or an equation in slope-intercept form.
Benchmark Clarifications	
Context	Both
Calculator	Available
Assessment Limits	Items must use integral values for *y*-intercepts. Coordinate points within tables and written descriptions must be integers.

MA.8.AR.3	***Extend understanding of proportional relationships to two-variable linear equations.***
MA.8.AR.3.5	Given a real-world context, determine and interpret the slope and y-intercept of a two-variable linear equation from a written description, a table, a graph or an equation in slope-intercept form. *Example:* Raul bought a palm tree to plant at his house. He records the growth over many months and creates the equation $h = 0.21m + 4.9$, where h is the height of the palm tree in feet and m is the number of months. Interpret the slope and y-intercept from his equation.
Benchmark Clarifications	*Clarification 1:* Problems include conversions with temperature and equations of lines of fit in scatter plots.
Context	Real-world
Calculator	Available
Assessment Limits	Items will require the student to find and interpret the slope, the *y*-intercept, or both. Items will not require the student to write an equation or graph a line on a given coordinate plane. Variables must be defined in context.

MA.8.AR.4	***Develop an understanding of two-variable systems of equations.***
MA.8.AR.4.1	Given a system of two linear equations and a specified set of possible solutions, determine which ordered pairs satisfy the system of linear equations.
Benchmark Clarifications	*Clarification 1:* Instruction focuses on the understanding that a solution to a system of equations satisfies both linear equations simultaneously.
Context	Mathematical
Calculator	Available
Assessment Limits	Items must present the system of equations, and equations must be in slope-intercept form. Items must present possible solutions as integral ordered pairs.

MA.8.AR.4	***Develop an understanding of two-variable systems of equations.***
MA.8.AR.4.2	Given a system of two linear equations represented graphically on the same coordinate plane, determine whether there is one solution, no solution or infinitely many solutions.
Benchmark Clarifications	
Context	Mathematical
Calculator	Available
Assessment Limits	Items may present the system of equations using slope-intercept form.

MA.8.AR.4	***Develop an understanding of two-variable systems of equations.***
MA.8.AR.4.3	Given a mathematical or real-world context, solve systems of two linear equations by graphing.
Benchmark Clarifications	*Clarification 1:* Instruction includes approximating non-integer solutions. *Clarification 2:* Within this benchmark, it is the expectation to represent systems of linear equations in slope-intercept form only. *Clarification 3:* Instruction includes recognizing that parallel lines have the same slope.
Context	Both
Calculator	Available
Assessment Limits	When equations are given, the equations must be in slope-intercept form with integral *y*-intercepts. Items that require the student to graph and find the point of intersection will have the coordinates of the solution as integers. Given a system of equations, items may require the student to approximate the non-integer solution.

Functions

MA.8.F.1	***Define, evaluate and compare functions.***
MA.8.F.1.1	Given a set of ordered pairs, a table, a graph or mapping diagram, determine whether the relationship is a function. Identify the domain and range of the relation.
Benchmark Clarifications	*Clarification 1:* Instruction includes referring to the input as the independent variable and the output as the dependent variable. *Clarification 2:* Within this benchmark, it is the expectation to represent domain and range as a list of numbers or as an inequality.
Context	Mathematical
Calculator	Available
Assessment Limits	Items will present domain and range as a list of values in braces or as an inequality. Items may refer to input as the independent variable or domain, and to output as the dependent variable or range.

MA.8.F.1	***Define, evaluate and compare functions.***
MA.8.F.1.2	Given a function defined by a graph or an equation, determine whether the function is a linear function. Given an input-output table, determine whether it could represent a linear function.
Benchmark Clarifications	*Clarification 1:* Instruction includes recognizing that a table may not determine a function.
Also Assesses	
MA.8.AR.3	***Extend understanding of proportional relationships to two-variable linear equations.***
MA.8.AR.3.1	Determine if a linear relationship is also a proportional relationship.
Benchmark Clarifications	*Clarification 1:* Instruction focuses on the understanding that proportional relationships are linear relationships whose graph passes through the origin. *Clarification 2:* Instruction includes the representation of relationships using tables, graphs, equations and written descriptions.
Context	Both
Calculator	Available
Assessment Limits	Items will present a relationship as a table, a graph, an equation, or a written description. For MA.8.AR.3.1, items presented as a written description must state that the relationship is linear and will require the student to identify whether it is proportional.

MA.8.F.1	***Define, evaluate and compare functions.***
MA.8.F.1.3	Analyze a real-world written description or graphical representation of a functional relationship between two quantities and identify where the function is increasing, decreasing or constant.
Benchmark Clarifications	*Clarification 1:* Problem types are limited to continuous functions. *Clarification 2:* Analysis includes writing a description of a graphical representation or sketching a graph from a written description.
Context	Real-world
Calculator	Available
Assessment Limits	Items may require the student to identify increasing, decreasing, or constant intervals from a graph. Intervals will not be expressed in inequality or interval notation.

Geometric Reasoning

MA.8.GR.1	***Develop an understanding of the Pythagorean Theorem and angle relationships involving triangles.***
MA.8.GR.1.1	Apply the Pythagorean Theorem to solve mathematical and real-world problems involving unknown side lengths in right triangles.
Benchmark Clarifications	*Clarification 1:* Instruction includes exploring right triangles with natural-number side lengths to illustrate the Pythagorean Theorem. *Clarification 2:* Within this benchmark, the expectation is to memorize the Pythagorean Theorem. *Clarification 3:* Radicands are limited to whole numbers up to 225.
Context	Both
Calculator	Available
Assessment Limits	Items will not present triangles on a coordinate plane. Items will not require the student to simplify square roots of non-perfect squares. Non-perfect square roots may be represented in radical form or as an approximation.

MA.8.GR.1	***Develop an understanding of the Pythagorean Theorem and angle relationships involving triangles.***
MA.8.GR.1.2	Apply the Pythagorean Theorem to solve mathematical and real-world problems involving the distance between two points in a coordinate plane. *Example:* The distance between $(-2, 7)$ and $(0, 6)$ can be found by creating a right triangle with the vertex of the right angle at the point $(-2, 6)$. This gives a height of the right triangle as 1 unit and a base of 2 units. Then using the Pythagorean Theorem, the distance can be determined from the equation $1^2 + 2^2 = c^2$, which is equivalent to $5 = c^2$. So, the distance is $\sqrt{5}$ units.
Benchmark Clarifications	*Clarification 1*: Instruction includes making connections between distance on the coordinate plane and right triangles. *Clarification 2:* Within this benchmark, the expectation is to memorize the Pythagorean Theorem. It is not the expectation to use the distance formula. *Clarification 3:* Radicands are limited to whole numbers up to 225.
Context	Both
Calculator	Available
Assessment Limits	Items will not require the student to simplify square roots of non-perfect squares. Non-perfect square roots may be represented in radical form or as an approximation.

MA.8.GR.1	***Develop an understanding of the Pythagorean Theorem and angle relationships involving triangles.***
MA.8.GR.1.3	Use the Triangle Inequality Theorem to determine if a triangle can be formed from a given set of sides. Use the converse of the Pythagorean Theorem to determine if a right triangle can be formed from a given set of sides.
Benchmark Clarifications	
Context	Both
Calculator	Available
Assessment Limits	Limit real-world context to simple situations for using the converse of the Pythagorean Theorem.

MA.8.GR.1	***Develop an understanding of the Pythagorean Theorem and angle relationships involving triangles.***
MA.8.GR.1.4	Solve mathematical problems involving the relationships between supplementary, complementary, vertical or adjacent angles.
Benchmark Clarifications	
Context	Mathematical
Calculator	Available
Assessment Limits	Angle measures may be expressed as numerical values or algebraic expressions. Items including an algebraic expression for representing an unknown angle must determine the unknown angle measure.

MA.8.GR.1	***Develop an understanding of the Pythagorean Theorem and angle relationships involving triangles.***
MA.8.GR.1.5	Solve problems involving the relationships of interior and exterior angles of a triangle.
Benchmark Clarifications	*Clarification 1:* Problems include using the Triangle Sum Theorem and representing angle measures as algebraic expressions.
Context	Mathematical
Calculator	Available
Assessment Limits	Angle measures may be expressed as numerical values or algebraic expressions. Items including an algebraic expression for representing an unknown angle must determine the unknown angle measure.

MA.8.GR.1	***Develop an understanding of the Pythagorean Theorem and angle relationships involving triangles.***
MA.8.GR.1.6	Develop and use formulas for the sums of the interior angles of regular polygons by decomposing them into triangles.
Benchmark Clarifications	*Clarification 1:* Problems include representing angle measures as algebraic expressions.
Context	Mathematical
Calculator	Available
Assessment Limits	Angle measures may be expressed as numerical values or algebraic expressions. Items including an algebraic expression for representing an unknown angle must determine the unknown angle measure.

MA.8.GR.2	***Understand similarity and congruence using models and transformations.***
MA.8.GR.2.1	Given a preimage and image generated by a single transformation, identify the transformation that describes the relationship.
Benchmark Clarifications	*Clarification 1:* Within this benchmark, transformations are limited to reflections, translations or rotations of images. *Clarification 2:* Instruction focuses on the preservation of congruence so that a figure maps onto a copy of itself.
Context	Mathematical
Calculator	Available
Assessment Limits	Items will not use the coordinate plane.

MA.8.GR.2	***Understand similarity and congruence using models and transformations.***
MA.8.GR.2.2	Given a preimage and image generated by a single dilation, identify the scale factor that describes the relationship.
Benchmark Clarifications	*Clarification 1:* Instruction includes the connection to scale drawings and proportions. *Clarification 2:* Instruction focuses on the preservation of similarity and the lack of preservation of congruence when a figure maps onto a scaled copy of itself, unless the scaling factor is 1.
Context	Mathematical
Calculator	Available
Assessment Limits	Items will not ask the student to find the lengths of missing sides using a scale factor. Items will not use the coordinate plane.

MA.8.GR.2	***Understand similarity and congruence using models and transformations.***
MA.8.GR.2.3	Describe and apply the effect of a single transformation on two-dimensional figures using coordinates and the coordinate plane.
Benchmark Clarifications	*Clarification 1:* Within this benchmark, transformations are limited to reflections, translations, rotations or dilations of images. *Clarification 2:* Lines of reflection are limited to the x-axis, y-axis or lines parallel to the axes. *Clarification 3:* Rotations must be about the origin and are limited to 90°, 180°, 270° or 360°. *Clarification 4*: Dilations must be centered at the origin.
Context	Mathematical
Calculator	Available
Assessment Limits	Rotations must include the direction of rotation with the angle of rotation. Transformations will not be given as ordered pair rules.

MA.8.GR.2	***Understand similarity and congruence using models and transformations.***
MA.8.GR.2.4	Solve mathematical and real-world problems involving proportional relationships between similar triangles. *Example:* During a Tampa Bay Lightning game one player, Johnson, passes the puck to his teammate, Stamkos, by bouncing the puck off the wall of the rink. The path of the puck creates two line segments that form hypotenuses for each of two similar right triangles, with the height of each triangle the distance from one of the players to the wall of the rink. If Johnson is 12 feet from the wall and Stamkos is 3 feet from the wall. How far did the puck travel from the wall of the rink to Stamkos if the distance traveled from Johnson to the wall was 16 feet?
Benchmark Clarifications	
Context	Both
Calculator	Available
Assessment Limits	Given dimensions of figures in items must be the same unit.

Data Analysis and Probability

MA.8.DP.1	***Represent and investigate numerical bivariate data.***
MA.8.DP.1.1	Given a set of real-world bivariate numerical data, construct a scatter plot or a line graph as appropriate for the context. *Example:* Jaylyn is collecting data about the relationship between grades in English and grades in mathematics. He represents the data using a scatter plot because he is interested if there is an association between the two variables without thinking of either one as an independent or dependent variable. *Example:* Samantha is collecting data on her weekly quiz grade in her social studies class. She represents the data using a line graph with time as the independent variable.
Benchmark Clarifications	*Clarification 1:* Instruction includes recognizing similarities and differences between scatter plots and line graphs, and on determining which is more appropriate as a representation of the data based on the context. *Clarification 2:* Sets of data are limited to 20 points.
Context	Real-world
Calculator	Available
Assessment Limits	Data sets will include between 5 and 20 points, inclusive. Items will state whether a scatter plot or line graph is to be constructed based on the intent of the given context.

MA.8.DP.1	***Represent and investigate numerical bivariate data.***
MA.8.DP.1.2	Given a scatter plot within a real-world context, describe patterns of association.
Benchmark Clarifications	*Clarification 1:* Descriptions include outliers; positive or negative association; linear or nonlinear association; strong or weak association.
Context	Real-world
Calculator	Available
Assessment Limits	Items will not require the student to determine strong vs. weak association. Items will use wording of association exclusively when describing as linear, nonlinear, positive, or negative.

MA.8.DP.1	***Represent and investigate numerical bivariate data.***
MA.8.DP.1.3	Given a scatter plot with a linear association, informally fit a straight line.
Benchmark Clarifications	*Clarification 1:* Instruction focuses on the connection to linear functions. *Clarification 2:* Instruction includes using a variety of tools, including a ruler, to draw a line with approximately the same number of points above and below the line.
Context	Both
Calculator	Available
Assessment Limits	Items will not require the student to write or determine the equation of a line of fit.

MA.8.DP.2	***Represent and find probabilities of repeated experiments.***
MA.8.DP.2.1	Determine the sample space for a repeated experiment.
Benchmark Clarifications	*Clarification 1:* Instruction includes recording sample spaces for repeated experiments using organized lists, tables or tree diagrams. *Clarification 2:* Experiments to be repeated are limited to tossing a fair coin, rolling a fair die, picking a card randomly from a deck with replacement, picking marbles randomly from a bag with replacement and spinning a fair spinner. *Clarification 3:* Repetition of experiments is limited to two times except for tossing a coin.
Context	Real-world
Calculator	Available
Assessment Limits	Items may present sample spaces as an organized list, a table, or a tree diagram. Items including a deck of cards are not limited to a standard 52-card deck, and can include, but are not limited to, cards containing names, letters of the alphabet, a variety of colors, or the like. Items including a fair die are not limited to a standard 6-sided die and can include a variety of sides. Items including a fair die are not limited to including consecutive sequential numbers and can include repeated or not repeated, colors, shapes, words, numbers, or the like.

MA.8.DP.2	***Represent and find probabilities of repeated experiments.***
MA.8.DP.2.3	Solve real-world problems involving probabilities related to single or repeated experiments, including making predictions based on theoretical probability. *Example:* If Gabriella rolls a fair die 300 times, she can predict that she will roll a 3 approximately 50 times since the theoretical probability is $\frac{1}{6}$. *Example:* Sandra performs an experiment where she flips a coin three times. She finds the theoretical probability of landing on exactly one head as $\frac{3}{8}$. If she performs this experiment 50 times (for a total of 150 flips), predict the number of repetitions of the experiment that will result in exactly one of the three flips landing on heads.
Benchmark Clarifications	*Clarification 1:* Instruction includes making connections to proportional relationships and representing probability as a fraction, percentage or decimal. *Clarification 2:* Experiments to be repeated are limited to tossing a fair coin, rolling a fair die, picking a card randomly from a deck with replacement, picking marbles randomly from a bag with replacement and spinning a fair spinner. *Clarification 3:* Repetition of experiments is limited to two times except for tossing a coin.
Also Assessess	
MA.8.DP.2.2	Find the theoretical probability of an event related to a repeated experiment.
Benchmark Clarifications	*Clarification 1:* Instruction includes representing probability as a fraction, percentage or decimal. *Clarification 2:* Experiments to be repeated are limited to tossing a fair coin, rolling a fair die, picking a card randomly from a deck with replacement, picking marbles randomly from a bag with replacement and spinning a fair spinner. *Clarification 3:* Repetition of experiments is limited to two times except for tossing a coin.
Context	Real-world
Calculator	Available

Assessment Limits	Probability will be represented using a fraction, percent, or decimal. Items including a deck of cards are not limited to a standard 52-card deck, and can include, but are not limited to, cards containing names, letters of the alphabet, a variety of colors, or the like. Items including a fair die are not limited to a standard 6-sided die and can include a variety of sides. Items including a fair die are not limited to including consecutive sequential numbers and can include repeated or not repeated, colors, shapes, words, numbers, or the like. Descriptions representing an experiment are not limited to the repetition of two trials.

Appendix A

Grade 8 FAST Mathematics Reference Sheet

Conversions within a System of Measure

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 week = 7 days
1 year = 365 days
1 year = 52 weeks

Conversions between Systems of Measure

Customary to Metric Conversion Approximations

1 inch = 2.54 centimeters
1 foot = 0.305 meters
1 mile = 1.61 kilometers

1 cup = 0.24 liters
1 gallon = 3.785 liters
1 ounce = 28.35 grams
1 pound = 0.454 kilograms

Metric to Customary Conversion Approximations

1 centimeter = 0.39 inches
1 meter = 3.28 feet
1 kilometer = 0.62 miles

1 liter = 4.23 cups
1 liter = 0.264 gallons
1 gram = 0.0352 ounces
1 kilogram = 2.204 pounds

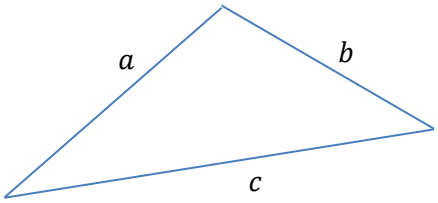
Formula

Slope Formula
$m = \frac{y_2 - y_1}{x_2 - x_1}$ where m = slope

Grade 8 FAST Mathematics Reference Sheet

Theorems

Triangle Inequality Theorem

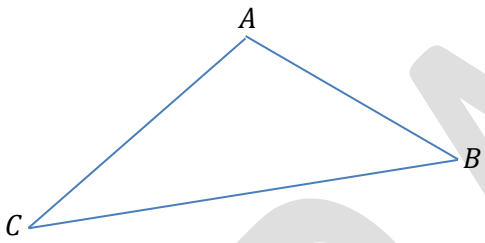


$a + b > c$

$a + c > b$

$b + c > a$

Triangle Sum Theorem



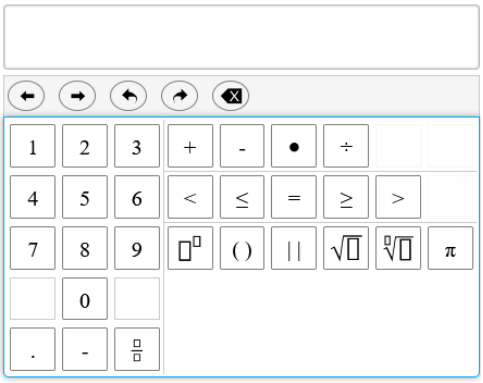
$m\angle A + m\angle B + m\angle C = 180°$

Appendix B

Keypads for Grade 8 Computer-Based Tests

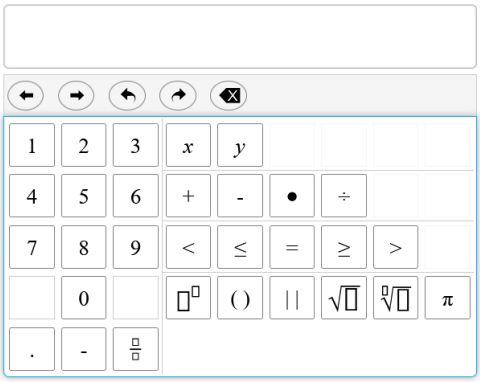
Numeric Only

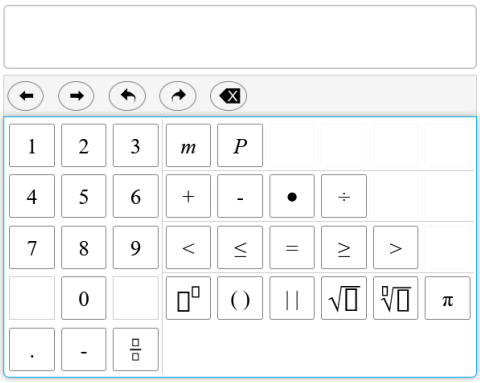
Full Keypad



Full Keypad with Variables:

Variables may change but the rest of the keys are always the same as the full keypad above.





Appendix C: Revisions

Page(s)	Change	Date
5	Updated calculator information	November 2022
6	Updated Calculator Designation	November 2022
7	Updated Calculator Designation	November 2022
8	Updated Calculator Designation for MA.8.NSO.1.3	November 2022
9	Updated Calculator Designation for MA.8.NSO.1.5	November 2022
10	Updated Calculator Designation	November 2022
17	Updated Calculator Designation for MA.8.F.1.1	November 2022
24	Updated Calculator Designations	November 2022
25	Updated Calculator Designation for MA.8.DP.1.3	November 2022
1	Added “AND REVIEWERS” after “ITEM WRITERS”	June 2023
3	Removed “of” after “select all” in the multi-select section.	June 2023
30	Added “the” after “same as” in Full Keypad With Variables section. Added period to end of statement.	June 2023
3-4	Updated language to remove “scanned and scored electronically.”	August 2023