DRAFT

Algebra 1
EOC
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 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! (JRF) Office 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.

Item Type Descriptions

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

The various 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).
- **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 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	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.

General Algebra 1 Assessment Limits

All items should be written with the following limits in mind and comply accordingly, unless otherwise stated in the assessment limit(s) for a particular benchmark.

Items will

- Use the real number system only. Imaginary numbers will not be used in given information or solutions.
- Present two-variable linear equations and inequalities using standard form, slope-intercept form, point-slope form, or the form $x = a$ or $y = b$, where a and b are rational numbers.
- Present two-variable linear equations in standard form as $Ax + By = C$, where A, B, and C are rational numbers.
- Use all inequality symbols for benchmarks regarding one- and two-variable linear inequalities.
- Present quadratic equations and expressions using factored form, standard form, or vertex form and may require converting between the forms as necessary.
- Use Algebra 1 appropriate functions when a specific function type(s) is not specified in benchmark language or clarifications.
  - Appropriate functions are limited to linear, quadratic, cubic, exponential, absolute value, and radical.
- Use function notation when working with real-world context for modeling benchmarks or benchmarks in the function strand.
- Use Algebra 1 appropriate notation or forms to state domain and range.
  - Verbal form, e.g., Domain is all real numbers
  - Inequality form, e.g., Domain: $-1 < x \leq 5$
  - Set notation, e.g., Range: $\{y|y \geq 6\}$
- Use Algebra 1 appropriate exponential form for all exponential expressions or functions.
  - $f(x) = ab^x$, where b is a whole number greater than 1 or a unit fraction
  - $f(x) = a(1 \pm r)^x$, where $0 < r < 1$.
- Present data as a set and/or in Algebra 1 appropriate graphical representations.
  - Histograms, stem-and-leaf plots, box plots, line plots, scatter plots, bar charts (single or segmented), circle graphs, line graphs, frequency tables (single or joint), or relative frequency tables (single or joint).

Expressions, Functions, and Data Analysis

MA.912.NSO.1	***Generate equivalent expressions and perform operations with expressions involving exponents, radicals or logarithms.***
MA.912.NSO.1.1	Extend previous understanding of the Laws of Exponents to include rational exponents. Apply the Laws of Exponents to evaluate numerical expressions and generate equivalent numerical expressions involving rational exponents.
Benchmark Clarifications	*Clarification 1:* Instruction includes the use of technology when appropriate. *Clarification 2:* Refer to the K-12 Formulas (Appendix E) for the Laws of Exponents. *Clarification 3:* Instruction includes converting between expressions involving rational exponents and expressions involving radicals. *Clarification 4:* Within the Mathematics for Data and Financial Literacy course, it is not the expectation to generate equivalent numerical expressions.
Context	Mathematical
Calculator	Available
Assessment Limits	Items will require the student to evaluate an expression, generate an equivalent expression, or generate and evaluate an equivalent expression. Items must incorporate at least one fractional exponent in either the given expression or the student-generated expression.

MA.912.NSO.1	***Generate equivalent expressions and perform operations with expressions involving exponents, radicals or logarithms.***
MA.912.NSO.1.2	Generate equivalent algebraic expressions using the properties of exponents. *Example:* The expression 1.5^{3t+2} is equivalent to the expression $2.25(1.5)^{3t}$ which is equivalent to $2.25(3.375)^{t}$.
Context	Mathematical
Calculator	Available
Assessment Limits	Monomials with only one or two variables must include at least one rational, noninteger exponent or the use of more than three Laws of Exponents. Items will not require the student to use the rational/fractional exponent property with variables.

MA.912.NSO.1	***Generate equivalent expressions and perform operations with expressions involving exponents, radicals or logarithms.***
MA.912.NSO.1.4	Apply previous understanding of operations with rational numbers to add, subtract, multiply and divide numerical radicals. *Algebra 1 Example:* The expression $\frac{\sqrt{136}}{\sqrt{2}}$ is equivalent to $\sqrt{\frac{136}{2}}$ which is equivalent to $\sqrt{68}$ which is equivalent to $2\sqrt{17}$.
Benchmark Clarifications	*Clarification 1:* Within the Algebra 1 course, expressions are limited to a single arithmetic operation involving two square roots or two cube roots.
Context	Mathematical
Calculator	Available
Assessment Limits	Expressions containing square roots may require the student to rewrite so that the radicand does not contain any square factors. Expressions containing cube roots may require the student to rewrite so that the radicand does not contain any cubic factors.

MA.912.AR.1	***Interpret and rewrite algebraic expressions and equations in equivalent forms.***
MA.912.AR.1.1	Identify and interpret parts of an equation or expression that represent a quantity in terms of a mathematical or real-world context, including viewing one or more of their parts as a single entity. *Algebra 1 Example:* Derrick is using the formula $P = 1000(1 + .1)^t$ to make a prediction about the camel population in Australia. He identifies the growth factor as (1 + .1), or 1.1, and states that the camel population will grow at an annual rate of 10% per year. *Example:* The expression 1.15^t can be rewritten as $(1.15^{\frac{1}{12}})^{12t}$ which is approximately equivalent to 1.012^{12t}. This latter expression reveals the approximate equivalent monthly interest rate of 1.2% if the annual rate is 15%.
Benchmark Clarifications	*Clarification 1:* Parts of an expression include factors, terms, constants, coefficients and variables. *Clarification 2:* Within the Mathematics for Data and Financial Literacy course, problem types focus on money and business.
Context	Both
Calculator	Available
Assessment Limits	Expressions or equations must be given in items. Items will not require the student to rewrite an expression or equation or generate equivalent expressions or equations.

MA.912.AR.1	***Interpret and rewrite algebraic expressions and equations in equivalent forms.***
MA.912.AR.1.2	Rearrange equations or formulas to isolate a quantity of interest. *Algebra 1 Example:* The Ideal Gas Law $PV = nRT$ can be rearranged as $T = \frac{PV}{nR}$ to isolate temperature as the quantity of interest. *Example:* Given the Compound Interest formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$, solve for P. *Mathematics for Data and Financial Literacy Honors Example:* Given the Compound Interest formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$, solve for t.
Benchmark Clarifications	*Clarification 1:* Instruction includes using formulas for temperature, perimeter, area and volume; using equations for linear (standard, slope-intercept and point-slope forms) and quadratic (standard, factored and vertex forms) functions. *Clarification 2:* Within the Mathematics for Data and Financial Literacy course, problem types focus on money and business.
Context	Both
Calculator	Available
Assessment Limits	N/A

MA.912.F.1	***Understand, compare and analyze properties of functions.***
MA.912.F.1.1	Given an equation or graph that defines a function, classify the function type. Given an input-output table, determine a function type that could represent it.
Benchmark Clarifications	*Clarification 1:* Within the Algebra 1 course, functions represented as tables are limited to linear, quadratic and exponential. *Clarification 2:* Within the Algebra 1 course, functions represented as equations or graphs are limited to vertical or horizontal translations or reflections over the *x*-axis of the following parent functions: $f(x) = x, f(x) = x^2, f(x) = x^3, f(x) = \sqrt{x}, f(x) = \sqrt[3]{x}, f(x) = \lvert x \rvert, f(x) = 2^x$, and $f(x) = \left(\frac{1}{2}\right)^x$.
Context	Mathematical
Calculator	Available
Assessment Limits	Items will not require the student to write a function. Input-output tables must include some successive values. Tables that represent quadratic functions must show some values increasing and some decreasing. Items will not focus only on classifying functions as linear. Functions represented as equations or graphs may include vertical and/or horizontal translations.

MA.912.F.1	***Understand, compare and analyze properties of functions.***
MA.912.F.1.2	Given a function represented in function notation, evaluate the function for an input in its domain. For a real-world context, interpret the output. *Algebra 1 Example:* The function $f(x) = \frac{x}{7} - 8$ models Alicia's position in miles relative to a water stand x minutes into a marathon. Evaluate and interpret for a quarter of an hour into the race.
Benchmark Clarifications	*Clarification 1:* Problems include simple functions in two-variables, such as $f(x, y) = 3x - 2y$. *Clarification 2:* Within the Algebra 1 course, functions are limited to one-variable such as $f(x) = 3x$.
Context	Both
Calculator	Available
Assessment Limits	Functions will not be piecewise functions. Items may not assess composition of functions.

MA.912.F.1	***Understand, compare and analyze properties of functions.***
MA.912.F.1.3	Calculate and interpret the average rate of change of a real-world situation represented graphically, algebraically or in a table over a specified interval.
Benchmark Clarifications	*Clarification 1:* Instruction includes making the connection to determining the slope of a particular line segment.
Context	Real-world
Calculator	Available
Assessment Limits	Real-world situations must be nonlinear. Items that use exponential functions may not start with $x = 0$ with a specified interval of only 1 unit.

MA.912.F.1	***Understand, compare and analyze properties of functions.***
MA.912.F.1.6	Compare key features of linear and nonlinear functions each represented algebraically, graphically, in tables or written descriptions.
Benchmark Clarifications	*Clarification 1*: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior and asymptotes. *Clarification 2:* Within the Algebra 1 course, functions other than linear, quadratic or exponential must be represented graphically. *Clarification 3:* Within the Algebra 1 course, instruction includes verifying that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically.
Context	Both
Calculator	Available
Assessment Limits	Items may require the student to identify which function eventually exceeds the other when comparing a linear function with an exponential function or with both a quadratic function and an exponential function. Items will require the student to compare a linear function to a nonlinear function.

MA.912.F.1	***Understand, compare and analyze properties of functions.***
MA.912.F.1.8	Determine whether a linear, quadratic or exponential function best models a given real-world situation.
Benchmark Clarifications	*Clarification 1:* Instruction includes recognizing that linear functions model situations in which a quantity changes by a constant amount per unit interval; that quadratic functions model situations in which a quantity increases to a maximum, then begins to decrease or a quantity decreases to a minimum, then begins to increase; and that exponential functions model situations in which a quantity grows or decays by a constant percent per unit interval. *Clarification 2:* Within this benchmark, the expectation is to identify the type of function from a written description or table.
Also Assesses	
MA.912.FL.3	***Determine simple and compound interest and demonstrate its relationship to functions. Calculate and use net present and net future values.***
MA.912.FL.3.4	Explain the relationship between simple interest and linear growth. Explain the relationship between compound interest and exponential growth and the relationship between continuously compounded interest and exponential growth.
Benchmark Clarifications	*Clarification 1:* Within the Algebra 1 course, exponential growth is limited to compound interest.
Context	Real-world
Calculator	Available
Assessment Limits	Items should not require the student to create an equation. Items must include a written description or table.

MA.912.F.2	***Identify and describe the effects of transformations on functions. Create new functions given transformations.***
MA.912.F.2.1	Identify the effect on the graph or table of a given function after replacing $f(x)$ by $f(x)+k$, $kf(x)$, $f(kx)$ and $f(x+k)$, for specific values of k.
Benchmark Clarifications	*Clarification 1:* Within the Algebra 1 course, functions are limited to linear, quadratic and absolute value. *Clarification 2:* Instruction focuses on including positive and negative values for k.
Context	Mathematical
Calculator	Available
Assessment Limits	Items must give the equation, graph, and/or table of the original function $f(x)$ and the function notation for the transformed function. Items may require the student to identify the effect on the graph as reflected, stretched/compressed, or vertically and/or horizontally shifted. The value of k will be any nonzero rational number.

MA.912.DP.1	***Summarize, represent and interpret categorical and numerical data with one and two variables.***
MA.912.DP.1.2	Interpret data distributions represented in various ways. State whether the data is numerical or categorical, whether it is univariate or bivariate and interpret the different components and quantities in the display.
Benchmark Clarifications	*Clarification 1:* Within the Probability and Statistics course, instruction includes the use of spreadsheets and technology.
Also Assesses	
MA.912.DP.1.1	Given a set of data, select an appropriate method to represent the data, depending on whether it is numerical or categorical data and on whether it is univariate or bivariate.
Benchmark Clarifications	*Clarification 1:* Instruction includes discussions regarding the strengths and weaknesses of each data display. *Clarification 2:* Numerical univariate includes histograms, stem-and-leaf plots, box plots and line plots; numerical bivariate includes scatter plots and line graphs; categorical univariate includes bar charts, circle graphs, line plots, frequency tables and relative frequency tables; and categorical bivariate includes segmented bar charts, joint frequency tables and joint relative frequency tables. *Clarification 3:* Instruction includes the use of appropriate units and labels and, where appropriate, using technology to create data displays.
Context	Real-world
Calculator	Available
Assessment Limits	Selecting an appropriate method to represent the data will not be solely based upon choosing between categorical or numerical data. Items requiring the student to interpret distributions must include a graphical representation. Items may require the student to choose and/or interpret different components and quantities that can be shown for different representations. Items may require the student to interpret mean, median, range, minimum, maximum, quartiles, and/or interquartile range, and these quantities must be given or readily available in the data display.

MA.912.DP.1	***Summarize, represent and interpret categorical and numerical data with one and two variables.***
MA.912.DP.1.4	Estimate a population total, mean or percentage using data from a sample survey; develop a margin of error through the use of simulation. *Algebra 1 Example:* Based on a survey of 100 households in Twin Lakes, the newspaper reports that the average number of televisions per household is 3.5 with a margin of error of ±0.6. The actual population mean can be estimated to be between 2.9 and 4.1 televisions per household. Since there are 5,500 households in Twin Lakes the estimated number of televisions is between 15,950 and 22,550.
Benchmark Clarifications	*Clarification 1:* Within the Algebra 1 course, the margin of error will be given.
Context	Real-world
Calculator	Available
Assessment Limits	The survey sample must have a size of at least 100. Items must include both the sample mean and a margin of error to be used in determining estimations.

<table>
<tr><td>MA.912.DP.3</td><td>Solve problems involving categorical data.</td></tr>
<tr><td>MA.912.DP.3.1</td><td>Construct a two-way frequency table summarizing bivariate categorical data. Interpret joint and marginal frequencies and determine possible associations in terms of a real-world context.
Algebra 1 Example: Complete the frequency table below.
<table>
<tr><td></td><td>Has an A in math</td><td>Doesn’t have an A in math</td><td>Total</td></tr>
<tr><td>Plays an Instrument</td><td>20</td><td></td><td>90</td></tr>
<tr><td>Doesn’t play an instrument</td><td>20</td><td></td><td></td></tr>
<tr><td>Total</td><td></td><td></td><td>350</td></tr>
</table>
Using the information in the table, it is possible to determine that the second column contains the numbers 70 and 240. This means that there are 70 students who play an instrument but do not have an A in math and the total number of students who play an instrument is 90. The ratio of the joint frequencies in the first column is 1 to 1 and the ratio in the second column is 7 to 24, indicating a strong positive association between playing an instrument and getting an A in math.</td></tr>
<tr><td>Context</td><td>Real-world</td></tr>
<tr><td>Calculator</td><td>Available</td></tr>
<tr><td>Assessment Limits</td><td>Items may require the student to construct a two-way frequency table given bivariate categorical data.
Categorical data given in an item or presented in a two-way frequency table will not be given as percentages or relative frequencies.
Items may require the student to find and interpret joint frequencies, marginal frequencies, or both.
Items will not require the student to find/interpret relative frequencies.</td></tr>
</table>

Linear Relationships

MA.912.AR.2	***Write, solve and graph linear equations, functions and inequalities in one and two variables.***
MA.912.AR.2.1	Given a real-world context, write and solve one-variable multi-step linear equations.
Context	Real-world
Calculator	Available
Assessment Limits	Items may require the student to solve and/or write a linear equation from a real-world context.

MA.912.AR.2	***Write, solve and graph linear equations, functions and inequalities in one and two variables.***
MA.912.AR.2.2	Write a linear two-variable equation to represent relationships between quantities from a graph, a written description or a table of values within a mathematical or real-world context.
Benchmark Clarifications	*Clarification 1:* Instruction includes the use of standard form, slope-intercept form and point-slope form, and the conversion between these forms.
Context	Both
Calculator	Available
Assessment Limits	Items that give a written description or table of values should not include the *y*-intercept. Items requiring the student to create an equation should use decimals in at least one coordinate pair and/or have a nonintegral *y*-intercept. Items that give a graph should not mark or label any points on the graph. Lines on graphs should not pass through the *y*-axis at an integer value.

MA.912.AR.2	***Write, solve and graph linear equations, functions and inequalities in one and two variables.***
MA.912.AR.2.3	Write a linear two-variable equation for a line that is parallel or perpendicular to a given line and goes through a given point.
Benchmark Clarifications	*Clarification 1:* Instruction focuses on recognizing that perpendicular lines have slopes that when multiplied result in –1 and that parallel lines have slopes that are the same. *Clarification 2:* Instruction includes representing a line with a pair of points on the coordinate plane or with an equation. *Clarification 3:* Problems include cases where one variable has a coefficient of zero.
Context	Mathematical
Calculator	Available
Assessment Limits	Items will present the given line as an equation, a graph, or passing through two points. Items may include vertical or horizontal lines. Items may require the student to identify the slope of a line that would be parallel or perpendicular to a given line.

MA.912.AR.2	***Write, solve and graph linear equations, functions and inequalities in one and two variables.***
MA.912.AR.2.4	Given a table, equation or written description of a linear function, graph that function, and determine and interpret its key features.
Benchmark Clarifications	*Clarification 1:* Key features are limited to domain, range, intercepts and rate of change. *Clarification 2:* Instruction includes the use of standard form, slope-intercept form and point-slope form. *Clarification 3:* Instruction includes cases where one variable has a coefficient of zero. *Clarification 4:* Instruction includes representing the domain and range with inequality notation, interval notation or set-builder notation. *Clarification 5:* Within the Algebra 1 course, notations for domain and range are limited to inequality and set-builder notations.
Context	Mathematical
Calculator	Available
Assessment Limits	Items will require the student to graph and/or determine/interpret key features. Items that only require the student to graph the function should present the given information in function notation, standard form, or point-slope form.

MA.912.AR.2	***Write, solve and graph linear equations, functions and inequalities in one and two variables.***
MA.912.AR.2.5	Solve and graph mathematical and real-world problems that are modeled with linear functions. Interpret key features and determine constraints in terms of the context. *Algebra 1 Example:* Lizzy's mother uses the function $C(p) = 450 + 7.75p$, where $C(p)$ represents the total cost of a rental space and p is the number of people attending, to help budget Lizzy's 16th birthday party. Lizzy's mom wants to spend no more than $850 for the party. Graph the function in terms of the context.
Benchmark Clarifications	*Clarification 1:* Key features are limited to domain, range, intercepts and rate of change. *Clarification 2:* Instruction includes the use of standard form, slope-intercept form and point-slope form. *Clarification 3:* Instruction includes representing the domain, range, and constraints with inequality notation, interval notation or set-builder notation. *Clarification 4:* Within the Algebra 1 course, notations for domain and range are limited to inequality and set-builder. *Clarification 5:* Within the Mathematics for Data and Financial Literacy course, problem types focus on money and business.
Context	Both
Calculator	Available
Assessment Limits	Equations or graphs of functions must be given in items. Items requiring the student to graph linear functions will also require solving, interpreting key features, and/or determining domain constraints. Items may require the student to solve linear functions, interpret key features, and/or determine domain constraints in terms of the context.

MA.912.AR.2	***Write, solve and graph linear equations, functions and inequalities in one and two variables.***
MA.912.AR.2.6	Given a mathematical or real-world context, write and solve one-variable linear inequalities, including compound inequalities. Represent solutions algebraically or graphically. *Algebra 1 Example:* The compound inequality $2x \leq 5x + 1 < 4$ is equivalent to $-1 \leq 3x$ and $5x < 3$, which is equivalent to $\frac{-1}{3} \leq x < \frac{3}{5}$.
Context	Both
Calculator	Available
Assessment Limits	Items where the inequality is given must include compound inequalities or inequalities requiring more than two procedural steps to solve for *x.* Items may require the student to represent solutions using an inequality, set-builder notation, and/or a graph. Items may require the student to verbally interpret or describe a solution. Items will require the student to write and/or solve an inequality.

MA.912.AR.2	***Write, solve and graph linear equations, functions and inequalities in one and two variables.***
MA.912.AR.2.7	Write two-variable linear inequalities to represent relationships between quantities from a graph or a written description within a mathematical or real-world context.
Benchmark Clarifications	*Clarification 1:* Instruction includes the use of standard form, slope-intercept form and point-slope form and any inequality symbol can be represented. *Clarification 2:* Instruction includes cases where one variable has a coefficient of zero.
Context	Both
Calculator	Available
Assessment Limits	N/A

MA.912.AR.2	***Write, solve and graph linear equations, functions and inequalities in one and two variables.***
MA.912.AR.2.8	Given a mathematical or real-world context, graph the solution set to a two-variable linear inequality.
Benchmark Clarifications	*Clarification 1:* Instruction includes the use of standard form, slope-intercept form and point-slope form and any inequality symbol can be represented. *Clarification 2:* Instruction includes cases where one variable has a coefficient of zero.
Context	Both
Calculator	Available
Assessment Limits	Items must include the linear inequality.

MA.912.AR.9	***Write and solve a system of two- and three-variable equations and inequalities that describe quantities or relationships.***
MA.912.AR.9.1	Given a mathematical or real-world context, write and solve a system of two-variable linear equations algebraically or graphically.
Benchmark Clarifications	*Clarification 1:* Within this benchmark, the expectation is to solve systems using elimination, substitution and graphing. *Clarification 2:* Within the Algebra 1 course, the system is limited to two equations.
Context	Both
Calculator	Available
Assessment Limits	Items will require the student to write and/or solve a system of equations. Systems of equations will have one solution, no solution, or infinitely many solutions.

MA.912.AR.9	***Write and solve a system of two- and three-variable equations and inequalities that describe quantities or relationships.***
MA.912.AR.9.4	Graph the solution set of a system of two-variable linear inequalities.
Benchmark Clarifications	*Clarification 1:* Instruction includes cases where one variable has a coefficient of zero. *Clarification 2:* Within the Algebra 1 course, the system is limited to two inequalities.
Context	Mathematical
Calculator	Available
Assessment Limits	A system of inequalities must be given.

MA.912.AR.9	***Write and solve a system of two- and three-variable equations and inequalities that describe quantities or relationships.***
MA.912.AR.9.6	Given a real-world context, represent constraints as systems of linear equations or inequalities. Interpret solutions to problems as viable or non-viable options.
Benchmark Clarifications	*Clarification 1:* Instruction focuses on analyzing a given function that models a real-world situation and writing constraints that are represented as linear equations or linear inequalities.
Context	Real-world
Calculator	Available
Assessment Limits	Items will require the student to represent constraints and/or interpret solutions as viable or nonviable.

MA.912.F.1	***Understand, compare and analyze properties of functions.***
MA.912.F.1.5	Compare key features of linear functions each represented algebraically, graphically, in tables or written descriptions.
Benchmark Clarifications	*Clarification 1*: Key features are limited to domain; range; intercepts; slope and end behavior.
Context	Both
Calculator	Available
Assessment Limits	N/A

MA.912.DP.2	***Solve problems involving univariate and bivariate numerical data.***
MA.912.DP.2.4	Fit a linear function to bivariate numerical data that suggests a linear association and interpret the slope and *y*-intercept of the model. Use the model to solve real-world problems in terms of the context of the data.
Benchmark Clarifications	*Clarification 1:* Instruction includes fitting a linear function both informally and formally with the use of technology. *Clarification 2:* Problems include making a prediction or extrapolation, inside and outside the range of the data, based on the equation of the line of fit.
Context	Real-world
Calculator	Available
Assessment Limits	Items requiring the student to interpret slope and y-intercept must also require the student to either fit a linear function or use the model to solve real-world problems.

MA.912.DP.2	***Solve problems involving univariate and bivariate numerical data.***
MA.912.DP.2.6	Given a scatter plot with a line of fit and residuals, determine the strength and direction of the correlation. Interpret strength and direction within a real-world context.
Benchmark Clarifications	*Clarification 1:* Instruction focuses on determining the direction by analyzing the slope and informally determining the strength by analyzing the residuals.
Also Assesses:	
MA.912.DP.1.3	Explain the difference between correlation and causation in the contexts of both numerical and categorical data. *Algebra 1 Example:* There is a strong positive correlation between the number of Nobel prizes won by country and the per capita chocolate consumption by country. Does this mean that increased chocolate consumption in America will increase the United States of America's chances of a Nobel prize winner?
Context	Real-world
Calculator	Available
Assessment Limits	Items assessing MA.912.DP.1.3 will focus on the fact that correlation does not imply causation because there could be other factors that are affecting the correlation as well. Items will not assess how to determine causation as the level of knowledge needed extends beyond Algebra 1. Items will not require the student to find or calculate the equation for a line of fit, the slope or y-intercept of a line of fit, or the residuals of a scatter plot. Residual values must be represented graphically on the scatter plot or on a residual plot. Items requiring the student to determine or interpret strength must be easily recognizable. Items will require the student to interpret direction of a line of fit in connection with the slope of the line of fit within the real-world context. Items will not reference/use the correlation coefficient.

Nonlinear Relationships

MA.912.AR.1	***Interpret and rewrite algebraic expressions and equations in equivalent forms.***
MA.912.AR.1.3	Add, subtract and multiply polynomial expressions with rational number coefficients.
Benchmark Clarifications	*Clarification 1:* Instruction includes an understanding that when any of these operations are performed with polynomials the result is also a polynomial. *Clarification 2:* Within the Algebra 1 course, polynomial expressions are limited to 3 or fewer terms.
Context	Mathematical
Calculator	Available
Assessment Limits	Limit on number of terms as stated in *Clarification 2* is restricted to the polynomials being added, subtracted, or multiplied. Items requiring the addition or subtraction of polynomial expressions must include at least one expression with a degree of two or more. Items requiring the multiplication of a monomial and a polynomial must include at least one expression with a degree of two or more.

MA.912.AR.1	***Interpret and rewrite algebraic expressions and equations in equivalent forms.***
MA.912.AR.1.4	Divide a polynomial expression by a monomial expression with rational number coefficients.
Benchmark Clarifications	*Clarification 1:* Within the Algebra 1 course, polynomial expressions are limited to 3 or fewer terms.
Context	Mathematical
Calculator	Available
Assessment Limits	Polynomial expression given as the dividend is limited to two or three terms.

MA.912.AR.1	***Interpret and rewrite algebraic expressions and equations in equivalent forms.***
MA.912.AR.1.7	Rewrite a polynomial expression as a product of polynomials over the real number system. *Example:* The expression $4x^3y - 3x^2y^4$ is equivalent to the factored form $x^2y(4x - 3y^3)$. *Example:* The expression $16x^2 - 9y^2$ is equivalent to the factored form $(4x - 3y)(4x + 3y)$.
Benchmark Clarifications	*Clarification 1:* Within the Algebra 1 course, polynomial expressions are limited to 4 or fewer terms with integer coefficients.
Context	Mathematical
Calculator	Available
Assessment Limits	Limit on number of terms as stated in *Clarification 1* is restricted to the polynomial being rewritten. If a polynomial expression can be rewritten using a common monomial factor only, the polynomial expression must have three or four terms or terms with at least two variables. Items may include factoring a quadratic trinomial, a perfect square trinomial, a difference of two squares trinomial, quartic polynomials in quadratic form, or polynomials with four terms. Items cannot assess factoring sum or difference of perfect cube binomials.

MA.912.AR.3	***Write, solve and graph quadratic equations, functions and inequalities in one and two variables.***
MA.912.AR.3.1	Given a mathematical or real-world context, write and solve one-variable quadratic equations over the real number system.
Benchmark Clarifications	*Clarification 1:* Within the Algebra 1 course, instruction includes the concept of non-real answers, without determining non-real solutions. *Clarification 2:* Within this benchmark, the expectation is to solve by factoring techniques, taking square roots, the quadratic formula and completing the square.
Context	Both
Calculator	Available
Assessment Limits	Given quadratic equations should not be in the form $x^2 = c$. Items will require the student to write and/or solve a quadratic equation.

MA.912.AR.3	***Write, solve and graph quadratic equations, functions and inequalities in one and two variables.***
MA.912.AR.3.4	Write a quadratic function to represent the relationship between two quantities from a graph, a written description or a table of values within a mathematical or real-world context. *Algebra 1 Example:* Given the table of values below from a quadratic function, write an equation of that function. x: -2, -1, 0, 1, 2 $f(x)$: 2, -1, -2, -1, 2
Benchmark Clarifications	*Clarification 1:* Within the Algebra 1 course, a graph, written description or table of values must include the vertex and two points that are equidistant from the vertex. *Clarification 2:* Instruction includes the use of standard form, factored form and vertex form. *Clarification 3:* Within the Algebra 2 course, one of the given points must be the vertex or an *x*-intercept.
Context	Both
Calculator	Available
Assessment Limits	Vertex and coordinates are limited to integers. Items that give a graph with two points equidistant from the vertex must be marked and not be *x*-intercepts.

MA.912.AR.3	***Write, solve and graph quadratic equations, functions and inequalities in one and two variables.***
MA.912.AR.3.5	Given the *x*-intercepts and another point on the graph of a quadratic function, write the equation for the function.
Context	Both
Calculator	Available
Assessment Limits	The given *x*-intercepts and other point must be integral values.

MA.912.AR.3	***Write, solve and graph quadratic equations, functions and inequalities in one and two variables.***
MA.912.AR.3.6	Given an expression or equation representing a quadratic function, determine the vertex and zeros and interpret them in terms of a real-world context.
Context	Real-world
Calculator	Available
Assessment Limits	Items will require the student to determine and/or interpret the vertex and/or zeros in a real-world context.

MA.912.AR.3	***Write, solve and graph quadratic equations, functions and inequalities in one and two variables.***
MA.912.AR.3.7	Given a table, equation or written description of a quadratic function, graph that function, and determine and interpret its key features.
Benchmark Clarifications	*Clarification 1:* Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior; vertex; and symmetry. *Clarification 2:* Instruction includes the use of standard form, factored form and vertex form, and sketching a graph using the zeros and vertex. *Clarification 3:* Instruction includes representing the domain and range with inequality notation, interval notation or set-builder notation. *Clarification 4:* Within the Algebra 1 course, notations for domain and range are limited to inequality and set-builder.
Context	Mathematical
Calculator	Available
Assessment Limits	Items may require the student to graph a quadratic function and/or determine/interpret key features.

MA.912.AR.3	***Write, solve and graph quadratic equations, functions and inequalities in one and two variables.***
MA.912.AR.3.8	Solve and graph mathematical and real-world problems that are modeled with quadratic functions. Interpret key features and determine constraints in terms of the context. *Algebra 1 Example:* The value of a classic car produced in 1972 can be modeled by the function $V(t) = 19.25t^2 - 440t + 3500$, where t is the number of years since 1972. In what year does the car's value start to increase?
Benchmark Clarifications	*Clarification 1:* Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior; vertex; and symmetry. *Clarification 2:* Instruction includes the use of standard form, factored form and vertex form. *Clarification 3:* Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation. *Clarification 4:* Within the Algebra 1 course, notations for domain and range are limited to inequality and set-builder.
Context	Both
Calculator	Available
Assessment Limits	Equations or graphs of functions must be given in items. Items that require the student only to graph and/or interpret key features must use real-world context. Items may require the student to graph quadratic functions, solve quadratic functions, interpret key features, and/or determine domain constraints in terms of the context.

MA.912.AR.4	***Write, solve and graph absolute value equations, functions and inequalities in one and two variables.***
MA.912.AR.4.1	Given a mathematical or real-world context, write and solve one-variable absolute value equations.
Context	Both
Calculator	Available
Assessment Limits	Items will require the student to solve and/or write an absolute value equation. Absolute value equations must be in the form $d = \|ax + b\| + c$ or $d = a\|x + b\| + c$, where $a \neq 0$ and b, c, and d are rational numbers.

MA.912.AR.4	***Write, solve and graph absolute value equations, functions and inequalities in one and two variables.***
MA.912.AR.4.3	Given a table, equation or written description of an absolute value function, graph that function and determine its key features.
Benchmark Clarifications	*Clarification 1:* Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; vertex; end behavior and symmetry. *Clarification 2:* Instruction includes representing the domain and range with inequality notation, interval notation or set-builder notation. *Clarification 3:* Within the Algebra 1 course, notations for domain and range are limited to inequality and set-builder.
Context	Mathematical
Calculator	Available
Assessment Limits	Items may require the student to graph an absolute value function and/or determine key features. Absolute value equations must be of the form $y = a\|x - h\| + k$, where $a \neq 0$ and h and k are rational numbers. Items will not require the student to write or solve absolute value functions.

MA.912.AR.5	***Write, solve and graph exponential and logarithmic equations and functions in one and two variables.***
MA.912.AR.5.3	Given a mathematical or real-world context, classify an exponential function as representing growth or decay.
Benchmark Clarifications	*Clarification 1:* Within the Algebra 1 course, exponential functions are limited to the forms $f(x) = ab^x$, where b is a whole number greater than 1 or a unit fraction, or $f(x) = a(1 \pm r)^x$, where $0 < r < 1$.
Context	Both
Calculator	Available
Assessment Limits	Items may present the given information as a table, equation, or written description. The base of the exponent in a given equation must be written in the forms shown in *Clarification 1*.

MA.912.AR.5	***Write, solve and graph exponential and logarithmic equations and functions in one and two variables.***
MA.912.AR.5.4	Write an exponential function to represent a relationship between two quantities from a graph, a written description or a table of values within a mathematical or real-world context.
Benchmark Clarifications	*Clarification 1:* Within the Algebra 1 course, exponential functions are limited to the forms $f(x) = ab^x$, where b is a whole number greater than 1 or a unit fraction, or $f(x) = a(1 \pm r)^x$, where $0 < r < 1$. *Clarification 2:* Within the Algebra 1 course, tables are limited to having successive nonnegative integer inputs so that the function may be determined by finding ratios between successive outputs.
Context	Both
Calculator	Available
Assessment Limits	The base of the exponent in equations listed as options must be written in the forms shown in *Clarification 1*.

MA.912.AR.5	***Write, solve and graph exponential and logarithmic equations and functions in one and two variables.***
MA.912.AR.5.6	Given a table, equation or written description of an exponential function, graph that function and determine its key features.
Benchmark Clarifications	*Clarification 1:* Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; constant percent rate of change; end behavior and asymptotes. *Clarification 2:* Instruction includes representing the domain and range with inequality notation, interval notation or set-builder notation. *Clarification 3:* Within the Algebra 1 course, notations for domain and range are limited to inequality and set-builder. *Clarification 4:* Within the Algebra 1 course, exponential functions are limited to the forms $f(x) = ab^x$, where b is a whole number greater than 1 or a unit fraction, or $f(x) = a(1 \pm r)^x$, where $0 < r < 1$.
Context	Mathematical
Calculator	Available
Assessment Limits	Items may require the student to graph an exponential function and/or determine key features. Items will not require the student to write or solve exponential functions. The base of the exponent in a given equation must be written in the forms shown in *Clarification 4*.

MA.912.FL.3	***Determine simple and compound interest and demonstrate its relationship to functions. Calculate and use net present and net future values.***
MA.912.FL.3.2	Solve real-world problems involving simple, compound and continuously compounded interest. *Example:* Find the amount of money on deposit at the end of 5 years if you started with $500 and it was compounded quarterly at 6% interest per year. *Example:* Joe won $25,000 on a lottery scratch-off ticket. How many years will it take at 6% interest compounded yearly for his money to double?
Benchmark Clarifications	*Clarification 1:* Within the Algebra 1 course, interest is limited to simple and compound.
Context	Real-world
Calculator	Available
Assessment Limits	Items involving compound interest must provide the interest rate, time, and number of times compounded. Items involving compound interest may not require the student to solve for time or the number of times compounded.

Appendix A

B.E.S.T. Algebra 1 EOC 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

Formulas

Forms of Linear Equations	Forms of Quadratic Functions	Forms of Exponential Functions
$y = mx + b$ $Ax + By = C$ $y - y_1 = m(x - x_1)$	$f(x) = ax^2 + bx + c$ $f(x) = a(x - h)^2 + k$ $f(x) = a(x - p)(x - q)$	$f(x) = ab^x$ $f(x) = a(1 \pm r)^x$

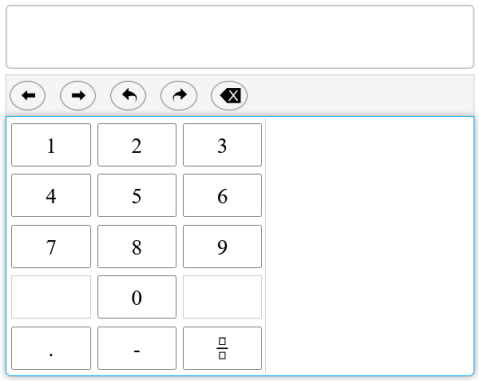
Quadratic Formula
$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ where $ax^2 + bx + c = 0$ and $a \neq 0$

Final Amounts under Simple Interest	Final Amounts under Compound Interest
$A = P(1 + rt)$ where P = principal, r = rate, and t = time	$A = P\left(1 + \frac{r}{n}\right)^{nt}$ where P = principal, r = rate, n = number of times compounded, and t = time

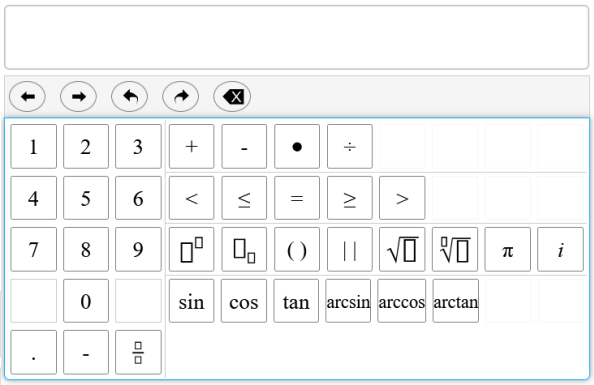
Appendix B

Keypads for Algebra 1 Computer-Based Tests

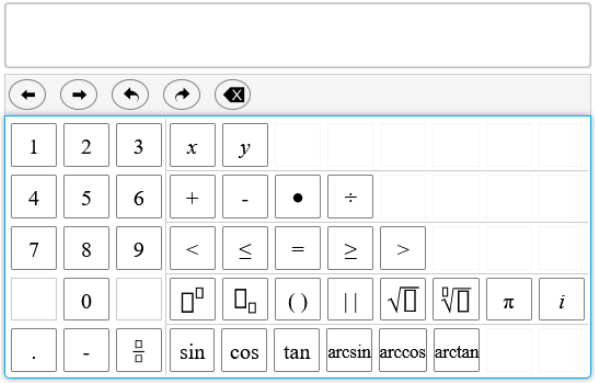
Numeric Only



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: Change Log

Page(s)	Change	Date
Global	Reordered benchmarks according to reporting categories	November 2022
Global	Updated reporting categories	November 2022
Global	Updated calculator designations to "Available"	November 2022
5	Updated calculator information	November 2022
1	Added "AND REVIEWERS" after "ITEM WRITERS"	June 2023
3	Removed "of" after "select all" in the multi-select section.	June 2023
8	Updated assessment limit #1 of 912.NSO.1.2: Update wording to "rational, noninteger."	June 2023
8	Updated assessment limit #2 of 912.NSO.1.2: Items will not require the student to use the rational/fractional exponent property with variables.	June 2023
11	Added assessment limit to 912.F.1.2: Items may not assess composition of functions.	June 2023
12	Inserted 912.F.1.3 assessment limit: Items that use exponential functions may not start with x = 0 with a specified interval of only 1 unit.	June 2023
27	Removed hyphen and lowercased "l" in Nonlinear.	June 2023
30	Updated current assessment limit of 912.AR.3.5: The given x-intercepts and other point must be integral values.	June 2023
33	Updated assessment limit #2 of 912.AR.4.1: Absolute value equations must be in the form $d = \|ax + b\|$ or $d = a\|x + b\| + c$, where $a \neq 0$ and b, c, and d are rational numbers.	June 2023
37	Corrected formatting so that the "s" of millimeters is not cut off.	June 2023
38	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