Maryland Comprehensive Assessment Program

Algebra I

EVIDENCE STATEMENTS

Maryland State Department of Education

Overview of the Maryland Comprehensive Assessment Program

The Maryland Comprehensive Assessment Program (MCAP) includes a coherent set of summative mathematics assessments aligned to the Maryland College and Career Ready Standards for Mathematics. Students are required to take a MCAP Mathematics assessment at the end of grades 3-8 and at the end of Algebra I. Students may also take a MCAP Mathematics Assessment at the end of Geometry and Algebra II.

The MCAP Mathematics assessment development process is based on Evidence -Centered Design (ECD). The Evidence-Centered Design process begins by establishing the answer to "What skills and understandings should be assessed?" The MCCRSM describe the skills and understandings that the MCAP Mathematics assessments assess. Assessments are then designed to gather evidence that allows inferences to be made. Assessments can be designed to allow inferences of various grain sizes. The MCAP Mathematics assessments are summative assessments and are therefore designed to provide evidence that allows only general inferences about a student's mathematical skills and understandings. The MCAP Mathematics Claims Structure describes the grain size of the evidence that the MCAP Mathematics assessments will yield. Assessment items are designed to elicit evidence of a student's level of proficiency for each claim.

MCAP Mathematics Claims Structure

Master Claim

The student is college and career ready or is "On-Track" to being college and career ready in

Sub-Claims

Content	• The student solves problems related to all content of the grade/course related to the Standards for Mathematical Practice.
Reasoning	• The student expresses grade/course level appropriate mathematical reasoning.
Modeling	• The student solves real-world problems with a degree of difficulty appropriate to the course.

Overview of MCAP Mathematics Assessment Task Types

Task Type	Description	Sub Claim	Scoring Method	Number of Operational Items per Form
Type I	Type I items will assess conceptual understanding; procedural skills; reasoning and the ability to use mathematics to solve real world problems.	• Content • Reasoning • Modeling	Machine scored	**32**
Type II	Type II items will assess a student's ability to reason mathematically. Items may require students to provide arguments or justifications; critique the reasoning of others and to use precision when explaining their thinking related to mathematics.	Reasoning	Human-Scored but may also include a machine scored component	**2**
Type III	Type III items will assess a student's ability to apply their understanding of mathematics when solving real-world contextual problems.	Modeling	Human-Scored but may also include a machine scored component	**2**
			Total	**36**

Overview

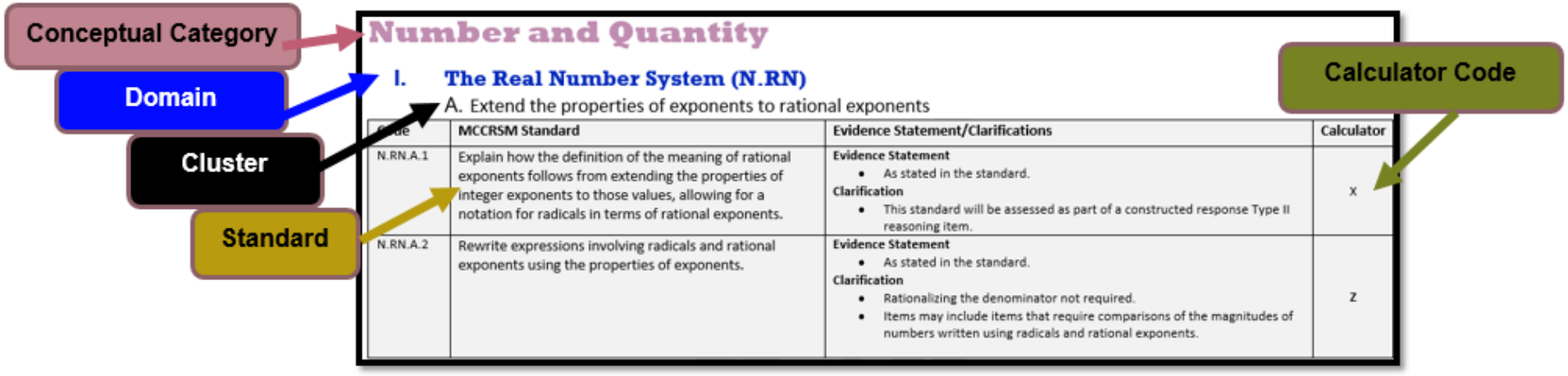
MCAP Mathematics Evidence Statements

MCAP Mathematics Evidence Statements help teachers, curriculum developers, and administrators to understand how the Maryland College and Career Ready Standards for Mathematics will be assessed. Assessment items are designed to elicit the evidence described in the Evidence Statements.

Organization of Evidence Statements

Content Sub-Claim

The MCAP Mathematics Evidence Statements for the Content Sub-Claim are organized using the same structure as the Maryland College and Career Ready Standards for Mathematics. The Algebra I, Geometry and Algebra II Content Evidence Statements are organized by Conceptual Category; Domains; Clusters and then Standards.



Calculator Codes

The last column of each table found in the Content Sub-Claim Evidence Statement tables identifies whether items that assess a given standard will allow the use of a calculator. The codes are identified in the Calculator Key below.

***Calculator Key:**

- Y – Yes; a calculator will be available on the tool bar when this standard is assessed.
- N – No; a calculator will NOT be available on the tool bar when this standard is assessed.
- X – The calculator designation will be dependent on the task and will be determined as a Yes or No during content review.
- Z – A calculator would not be useful when assessing such standards, therefore items aligned to the designated standards could be placed on either the calculator or non-calculator section of a fixed form paper assessment.

Evidence Statements

Evidence statements are provided for each standard to describe the type of evidence that a task addressing the standard should elicit. In some cases the standard clearly describes the type of evidence that an aligned task should elicit. The Evidence Statement for such standards will read "As stated in the standard". In cases where the wording of a standard does not adequately describe the type of evidence that should be elicited, the Evidence Statement will attempt to better describe the type of evidence items should elicit. In cases where a standard is taught in both Algebra I and Algebra II, the Evidence and/or Clarification will seek to describe how the items might differ between the two courses.

Clarifications

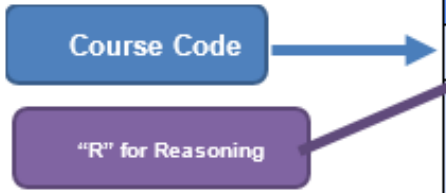
Clarifications provide additional information to help the reader better understand how a standard might be assessed.

Modeling Standards ★

Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (★).

Reasoning Sub-Claim

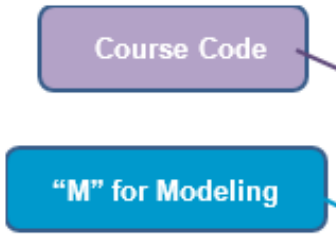
The MCAP Mathematics Evidence Statements for the Reasoning Sub-Claim have a different structure than the Content Evidence Statements. The codes for the Reasoning Evidence Statements begin with either A1, G or A2 that correspond to Algebra I, Geometry or Algebra II. The letter "R" appears after the course designation in the code to indicate that the statement is a Reasoning Evidence Statement. The Reasoning Evidence Statements may apply to both machine-scored and constructed response items, unless otherwise noted. Reasoning items may align to any of the content standards from a given course.



Code	Reasoning Evidence Statement	Clarifications
A1.R.1	Given an equation reason about the number or nature of the solutions	• Focus on quadratic equations
A1.R.2	Given a system of equations reason about the number or nature of the solutions	• Systems may be comprised of various combinations of linear, quadratic and exponential functions • Items may require understanding of the basic shape of the graph of the parent function of linear, quadratic and exponential functions • Items should not require determine the solution to the system
A1.R.3	Reasoning based on the principle that the graph of an equation and inequalities in two variables is the set of all its solutions plotted in the coordinate plane	•
A1.R.4	Identify an option that would refute a conjecture/claim.	•
A1.R.5	Identify a correct method and justification given two or more chains of reasoning.	•
A1.R.6	Given a proposition determine cases where the proposition is true or false.	•
A1.R.9	Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures about functions	• Content scope: F-IF.8a
A1.R.10	Express reasoning about transformations of functions	•

Modeling Sub-Claim

The MCAP Mathematics Evidence Statements for the Modeling Sub-Claim have a different structure than the Content Evidence Statements. The codes for the Modeling Evidence Statements begin with either A1, G or A2 that correspond to Algebra I, Geometry or Algebra II. The letter "M" appears after the course designation in the code to indicate that the statement is a Modeling Evidence Statement. The Modeling Evidence Statements may apply to both machine-scored and constructed response items, unless otherwise noted. Modeling items may align to any of the content standards from a given course.



Code	Modeling Evidence Statement	Clarifications
A1.M.1	Choose between competing mathematical models to solve real-world problems	• Limit to linear, quadratic and exponential functions
A1.M.2	Construct a mathematical model to solve a problem	• Limit to linear, quadratic and exponential functions
A1.M.3	Validate a given model and make improvement	• Limit to linear, quadratic and exponential functions
A1.M.4	Interpret the solution to a real-world problem in terms of context	• Limit to linear, quadratic and exponential functions
A1.M.5	Compare the result from a model with real world data	• Limit to linear, quadratic and exponential functions
A1.M.6	Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge	• Limit to linear, quadratic and exponential functions

Modeling Standards ★

Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (★).

Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look and make use of structure
8. Look for and express regularity in repeated reasoning

Content Evidence Statements

Number and Quantity

I. The Real Number System (N.RN)

B. Use properties of rational and irrational numbers

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
N.RN.B.3	Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.	**Evidence Statement** • Apply properties of rational and irrational numbers to identify rational and irrational numbers. **Clarification** • Assess at the cluster level.(for example, items may include addition, subtraction and multiplication of irrational numbers) • Simplification of radicals not required. • Division of radicals not assessed. • Items do not have context. • Items should go beyond asking students to only identify rational and irrational numbers.	N

II. Quantities (N.Q)

A. Reason quantitatively and use units to solve problems.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
N.Q.A.1★	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	**Evidence Statement** • Determine an appropriate scale for a graph. • Use dimensional analysis to convert units. **Clarification** • Items must have real-world context.	**Y**
N.Q.A.2★	Define appropriate quantities for the purpose of descriptive modeling.	**Evidence Statement** • Select an appropriate quantity for a real-world context. **Clarification** • Items must have real-world context. • Items should include units with every numerical entry. • Items should focus on students choosing appropriate units based on the real world context	**Y**
N.Q.A.3★	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	**Evidence Statement** • Not assessed	NA

Algebra

I. Seeing Structure in Expressions (A.SSE)

A. Interpret the structure of expressions.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
A.SSE.A.1★	Interpret expressions that represent a quantity in terms of its real-world context.	**Evidence Statement** • This standard is not assessed as a stand-alone standard **Clarification** • This statement serves as the stem for A.SSE.A.1a and A.SSE.A.1b	NA
A.SSE.A.1a	Interpret parts of an expression, such as terms, factors, and coefficients.	**Evidence Statement** • Interpret parts of linear, quadratic or exponential expressions that represent a quantity in terms of real-world context. **Clarification** • Items must have real-world context. • Items that contain exponential expressions should be limited to single variable exponents (i.e. $y = 3(2)^x$) • The item prompt may contain either an equation or an expression.	Z

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
A.SSE.A.1b	Interpret complicated expressions by viewing one or more of their parts as a single entity.	**Evidence Statement** • As stated in the standard. **Clarification** • Items must have real-world context. • Items use linear, quadratic or exponential expressions.	Z
A.SSE.A.2★	Use the structure of expressions to identify ways to rewrite it.	**Evidence Statement** • Rewrite linear, quadratic and exponential expressions. **Clarification** • Unlike standard A.SSE.1, items that address A.SSE.2 do not need to have real-world context. • In Algebra I, expressions are limited to one variable expressions. • Items could ask a student to identify expressions equivalent to a given expression. • Items could ask a student to rewrite an expression in one variable.	Z

B. Write expressions in equivalent forms to solve problems.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
A.SSE.B.3★	Choose and produce an equivalent form of an expression **to reveal and explain** properties of the **quantity** represented by the expression.	**Evidence Statement** • This standard is not assessed as a stand-alone standard. **Clarification** • This statement serves as the stem for A.SSE.B.3a, A.SSE.B.3b and A.SSE.3c.	NA
A.SSE.B.3a	Factor a quadratic expression to reveal the zeros of the function it defines.	**Evidence Statement** • As stated in the standard. **Clarification** • Items must have real-world context. • The equivalent form must reveal something about the real-world context.	Z
A.SSE.B.3b	Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.	**Evidence Statement** • As stated in the standard. **Clarification** • Items may have real-world context. • The equivalent form must reveal something about the real-world context or the graph of the associated function. • Limit completing the square in a quadratic expression to quadratics that have a leading coefficient of one and an even number as the coefficient of the linear term. • Items with real world context may give the completed vertex form and ask analysis based questions.	Z

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
A.SSE.B.3c	Use the properties of exponents to transform expressions for exponential functions.	**Evidence Statement** • As stated in the standard. **Clarification** • Items must have real-world context. • The equivalent form must reveal something about the real-world context. • The domain of exponential functions limited to integers.	X

II. Arithmetic with Polynomials and Rational Expressions (A.APR)

A. Perform arithmetic operations on polynomials.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
A.APR.A.1	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	**Evidence Statement** • Add, subtract, and multiply polynomials. **Clarification** • The understand part of this standard is not assessed. • Polynomials must be of degree one, two or three.	Z

B. Understand the relationship between zeros and factors of polynomials.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
A.APR.B.3★	Identify zeros of polynomials when suitable factorizations are available and/or use the zeros to construct a rough graph of the function defined by the polynomial.	**Evidence Statement** • As stated in the standard. **Clarification** • Cubic polynomials may be used if one linear factor and an easily factorable quadratic factor are provided. (e.g. $(x-1)(x^2-9)$). • Zeros of cubic polynomials must be integers. • Construction of a rough graph is limited to the graph of a quadratic polynomial.	N

III. Creating Equations (A.CED)

A. Create equations that describe the numbers or relationships.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
A.CED.A.1★	Create equations and inequalities in **one** variable and use them to solve problems. Include equations arising from **linear and quadratic** functions, and simple rational and **exponential** functions.	**Evidence Statement** • As stated in the standard. **Clarification** • Items must have real-world context. • Limit equations to those arising from linear, quadratic functions and exponential functions with domain limited to integers. • Limit inequalities to those arising from linear functions. • Rational functions are addressed in Algebra II.	X
A.CED.A.2★	Create equations in **two** or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	**Evidence Statement** • As stated in the standard. **Clarification** • Items must have real-world context • Limit equations to two variables.	X

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
A.CED.A.3★	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.	**Evidence Statement** • Provide constraints based on real-world context for equations, inequalities, systems of equations and systems of inequalities. • Determine if a solution is viable based on real-world context. **Clarification** • Items must have real-world context. • Systems are limited to systems of equations with two equations and two unknowns.	Z
A.CED.A.4★	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	**Evidence Statement** • As stated in the standard. **Clarification** • Items must have real-world context. • Limit quadratic formulas to those that do not contain a linear term. (e.g. DO NOT ask students to solve for "*t*" in an expression such as $r=\frac{1}{2}at^2+v_0t+r_0$).	Z

IV. Reasoning with Equations and Inequalities (A.REI)

A. Understand solving equations as a process of reasoning and explain the reasoning.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
A.REI.A.1★	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	**Evidence Statement** • Identify or justify a solution method. **Clarification** • Items that require solving linear equations will require the student to explain the properties used in the solution process. • Items may include solving quadratic equations.	Z

B. Solve equations and inequalities in one variable.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
A.REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	**Evidence Statement** • As stated in the standard. **Clarification** • Items do not include compound inequalities. • Linear equations should be more complex than those assessed in 8th grade.	Z
A.REI.B.4	Solve quadratic equations in one variable	See A.REI.B.4a and A.REI.B.4b	NA

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
A.REI.B.4a	Use the method of completing the square to transform any quadratic equation in *x* into an equation of the form $(x-p)^2=q$ that has the same solutions. Derive the quadratic formula from this form.	**Evidence Statement** • As stated in the standard. **Clarification** • Items do not require finding solutions • The "derive the quadratic formula from this form" part of the standard is not assessed.	X
A.REI.B.4b★	Solve quadratic equations with rational number coefficients by inspection (e.g., for $x^2=49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions.	**Evidence Statement** • As stated in the standard. **Clarification** • Items may require student to identify cases where the equation has "no real solutions" • Items that require the use of factoring to solve **multiple** quadratic equations should limit the quadratics to those that have a leading coefficient of 1.	X

C. Solve Systems of Equations.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
A.REI.C.5	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.	**Evidence Statement** • Not assessed.	Z
A.REI.C.6	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.	**Evidence Statement** • As stated in the standard. **Clarification** • Items may have real-world context. • Items do not require student to use a particular method. • Systems are to be provided for students when assessing this standard	X

D. Represent and solve equations and inequalities graphically.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
A.REI.D.10	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	**Evidence Statement** • As stated in the standard. **Clarification** • Limit to linear and quadratic functions	X
A.REI.D.11★	Explain why the x-coordinates of the points where the graphs of the equations $y=f(x)$ and $y=g(x)$ intersect are the solutions of the equation $f(x)=g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.	**Evidence Statement** • Approximate the solutions to an equation of the form $f(x)=g(x)$ using the point(s) of intersection of the graphs of the equations $y=f(x)$ and $y=g(x)$ intersect. **Clarification** • If the graphs of the two equations are provided with clearly identified points of intersection, then combinations of linear, quadratic, absolute value and exponential functions may be used for items that involve approximation of the solutions.	Y
A.REI.D.12	Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	**Evidence Statement** • As stated in the standard. **Clarification** • Items may ask students to graph solutions or require that the student select a graph that displays the solutions to a linear inequality or a system of linear inequalities.	N

Functions

I. Interpreting Functions (F.IF)

A. Understand the concept of a function and use function notation.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
F.IF.A.1	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then $f(x)$ denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation $y = f(x)$.	**Evidence Statement** • As stated in the standard. **Clarification** • Items may require students to identify the domain and/or range of a function.	Z
F.IF.A.2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a real-world context.	**Evidence Statement** • As stated in the standard.	X
F.IF.A.3★	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.	**Evidence Statement** • Identify a given sequence as arithmetic or geometric • Match a given sequence to a given algebraic representation for the sequence. • Given a recursive or explicit rule, evaluate the expression to find the value for a specified term in the sequence • Create an explicit function rule for a sequence. **Clarification** • Limit sequences to simple arithmetic or geometric sequences.	X

B. Interpret functions that arise in applications in terms of the real-world context

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
F.IF.B.4★	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.	**Evidence Statement** • As stated in the standard. **Clarification** • Items must have real-world context. • Limit key features to: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior. • Items may include determining the equation of the axis of symmetry of the graph of a given quadratic function. • End behavior would be assessed informally. (e.g. Describe what happens to the graph $f(x)=5(.9^x)$ as the values of x increase.) • Limit items to linear, quadratic, square root functions, piecewise-defined (including step functions, and absolute-value functions), and exponential functions. Exponential functions are limited to those with domains in the integers. • Items may include determining and/or interpreting the slope/rate of change of a linear function from a table or graph	X

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
F.IF.B.5★	Relate the domain of a function to a graph and, where applicable, to the quantitative relationship it describes.	**Evidence Statement** • As stated in the standard. **Clarification** • Items must have real-world context. • Limit items to linear, quadratic, square root, piecewise-defined (including step functions, and absolute-value functions), and exponential functions. Exponential functions are limited to those with domains in the integers. • An item containing a graph, equation or verbal description is acceptable to assess this standard	Z
F.IF.B.6★	Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	**Evidence Statement** • As stated in the standard. **Clarification** • Items must have real-world context. • Limit functions to linear, quadratic and exponential functions. • Exponential functions are limited to those with domains in the integers.	X

C. Analyze functions using different representations.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
F.IF.C.7★	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.	**Evidence Statement** • This standard is not assessed as a stand-alone standard. **Clarification** • This statement serves as the stem for F.IF.C.7a and F.IF.C.7b	NA
F.IF.C.7a	Graph linear and quadratic functions and show intercepts, maxima and minima.	**Evidence Statement** • As stated in the standard. **Clarification**	X
F.IF.C.7b	Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.	**Evidence Statement** • As stated in the standard. **Clarification**	X
F.IF.C.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.	**Evidence Statement** • This standard is not assessed as a stand-alone standard. **Clarification** • This statement serves as the stem for F.IF.C.8a	NA

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
F.IF.C.8a	Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a real-world context.	**Evidence Statement** • As stated in the standard. **Clarification** • Items must have real-world context. • Items will not require students to use completing the square to manipulate a quadratic expression with a leading coefficient not equal to 1. • Items may include interpretation of quadratics given in vertex form.	Y
F.IF.C.9★	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	**Evidence Statement** • As stated in the standard. **Clarification** • Function types should be limited to linear, quadratic , square root, cube root, piecewise-defined (including step functions and absolute value functions), and exponential functions. Exponential functions are limited to those with domains in the integers. • Items may or may not have real world context.	X

II. Building Functions (F.BF)

A. Build a function that models a relationship between two quantities.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
F.BF.A.1★	Write a function that describes a relationship between two quantities.	**Evidence Statement** • This standard is not assessed as a stand-alone standard. **Clarification** • This statement serves as the stem for F.BF.A.1a.	NA
F.BF.A.1a★	Determine an explicit expression, a recursive process, or steps for calculation from a real-world context.	**Evidence Statement** • Write a function based on an observed pattern in a real-world scenario. **Clarification** • Items must have real-world context. • Limit to linear, quadratic and exponential functions with domains in the integers. • Similar to creating a function from a scatterplot but for this standard the relationship between the two quantities is clear from the context.	Z

B. Build new functions from existing functions.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
F.BF.B.3★	Identify the effect on the graph of replacing $f(x)$ by $f(x)+k$, $kf(x)$, $f(kx)$, and $f(x+k)$ for specific values of *k* (both positive and negative); find the value of *k* given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.	**Evidence Statement** • As stated in the standard. **Clarification** • Limit to linear and quadratic functions. • Even and odd functions are not assessed In Algebra I. • The experiment part of the standard is instructional only. This aspect of the standard is not assessed.	X

III. Linear, Quadratic, and Exponential Functions (F.LE)

A. Construct and compare linear, quadratic, and exponential models and solve problems.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
F.LE.A.1★	Distinguish between situations that can be modeled with linear functions and with exponential functions.	**Evidence Statement** • This standard is not assessed as a stand-alone standard. **Clarification** • This statement serves as the stem for F.LE.A.1a, F.LE.A.1b and F.LE.A.1c.	NA
F.LE.A.1a★	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.	**Evidence Statement** • The prove part of this standard is not assessed. **Clarification** • Given real-world situations identify those that can be modeled with a linear function versus an exponential function.	X
F.LE.A.1b★	Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.	**Evidence Statement** • Identify the relationship between two quantities in a given contextual situation where the rate of change over equal intervals is the same**.** **Clarification** • Items must have real-world context.	X

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
F.LE.A.1c★	Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	**Evidence Statement** • Identify the relationship between two quantities in a given contextual situation where one quantity changes by a constant percent per unit interval relative to another. **Clarification** • Items must have real-world context.	X
F.LE.A.2★	Construct linear, and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).	**Evidence Statement** • Solve multi-step contextual problems with degree of difficulty appropriate to the course by constructing linear, or exponential function models, where exponentials are limited to integer exponents. **Clarification** • Items must have real-world context. • Items do not reveal the type of function that should be constructed.	X
F.LE.A.3★	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	**Evidence Statement** • This standard is not assessed.	NA

B. Interpret expressions for functions in terms of the situation they model.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
F.LE.B.5★	Interpret the parameters in a linear or exponential function in terms of a context.	**Evidence Statement** • As stated in the standard. **Clarification** • Items must have real-world context. • Explain the meaning of the slope and *y*-intercept in terms of real-world context given a linear model. • Explain the meaning of the base, the exponent and the coefficient in terms of real-world context, given an exponential model with a domain in the integers.	Z

Statistics

I. Interpreting Categorical and Quantitative Data (S.ID)

B. Summarize, represent, and interpret data on two categorical and quantitative variables.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
S.ID.B.6	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related	**Evidence Statement** • This standard is not assessed as a stand-alone standard. **Clarification** • This statement serves as the stem for S.ID.B.6a, S.ID.B.6b and S.ID.6c.	NA
S.ID.B.6a★	Fit a function to the data; use functions fitted to data to solve problems in the real-world context of the data. Use given functions or choose a function suggested by the real-world context. Emphasize linear, quadratic, and exponential models.	**Evidence Statement** • As stated in the standard. **Clarification** • Items must have real-world context. • Predictions should not extrapolate far beyond the set of data provided. • Items may involve linear, quadratic or exponential functions.	Y

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
S.ID.B.6b	Informally assess the fit of a function by plotting and analyzing residuals	**Evidence Statement** • As stated in the standard. **Clarification** • Items must have real-world context • Analysis of residuals may include the identification of a pattern in a residual plot as an indication of a poor fit.	Y
S.ID.B.6c	Fit a linear function for a scatter plot that suggests a linear association.	**Evidence Statement** • Items must have real-world context. **Clarification**	Y

C. Interpret Linear Models.

Code	MCCRSM Standard	Evidence Statement/Clarifications	Calculator
S.ID.C.7	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the real-world context of the data.	**Evidence Statement** • As stated in the standard. **Clarification** • Items must have real-world context.	Y
S.ID.C.8	Compute (using technology) and interpret the correlation coefficient of a linear fit	**Evidence Statement** • As stated in the standard. **Clarification** • Focus on the interpretation of the correlation coefficient.	Y
S.ID.C.9	Distinguish between correlation and causation.	**Evidence Statement** • As stated in the standard. **Clarification** • Items must have real-world context	Y

Reasoning Sub Claim

Type I

- Machine Scored.
- 1–point per item.
- Can be applied to any of the content standards
- Reasoning items must be calculator active.
- Four items from this grouping will appear on each assessment.

Type II

- Human Scored Constructed Response.
- 4–points per item.
- Can be applied to any of the content standards.
- Reasoning items must be calculator active.
- Two items from this grouping will appear on each assessment.

Note: Type I and/or Type II items may be written for each Evidence Statement.

Reasoning Evidence Statements

Code	Reasoning Evidence Statement	Clarifications
A1.R.1	Given an equation reason about the number and/or nature of the solutions	• Focus on quadratic equations
A1.R.2	Given a system of equations reason about the number or nature of the solutions	• Systems may be comprised of various combinations of linear, quadratic and exponential functions. • Items may require understanding of the basic shape of the graph of the parent function of linear, quadratic and exponential functions. • Items do not require determining the solution to a system.
A1.R.3	Reasoning based on the principle that the graph of an equation and inequality in two variables is the set of all its solutions plotted in the coordinate plane	• Content scope: A.REI.D Represent and solve equations and inequalities graphically.
A1.R.4	Identify an option that would refute a conjecture/claim.	•
A1.R.5	Identify a correct method and justification given two or more chains of reasoning.	• Items may involve two or more steps in a single reasoning chain.
A1.R.6	Given a proposition determine cases where the proposition is true or false.	•
A1.R.7	Identify an unstated assumption that would make a problem well-posed or make a particular method viable.	•
A1.R.8	Given an equation or system of equations, present the solution steps as a logical argument that concludes with the set of solutions (if any).	• Items are limited to those that require solving quadratic equations. • Content scope: A-REI.1, A-REI.4a, A-REI.4b, limited to real solutions only. • Limit systems of equations to two linear equations.
A1.R.9	Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures about functions	• Content scope: F-IF.8a. • Items may have a mathematical or real-world context.
A1.R.10	Express reasoning about transformations of functions	• Items limited to linear and quadratic functions. • Content scope: F-BF.3 excluding even and odd functions.
A1.R.11	Express reasoning about linear and exponential growth.	• Content scope: F-LE.1a, F-IF.B.4.

Modeling Sub Claim

Type I

- Machine Scored.
- 1–point per item.
- Can be applied to any of the content standards
- Modeling items must be calculator active.
- Four items from this grouping will appear on each assessment.

Type III

- Human Scored Constructed Response.
- 4–points per item.
- Can be applied to any of the content standards.
- Modeling items must be calculator active.
- Two items from this grouping will appear on each assessment.

Note: Type I and/or Type III items may be written for each Evidence Statement unless otherwise noted.

Modeling Evidence Statements

Code	Modeling Evidence Statement	Clarifications
A1.M.1	Choose between competing mathematical models to solve real-world problems.	• Limit to linear functions, linear inequalities, systems of linear equations or inequalities, quadratic functions and exponential functions.
A1.M.2	Construct a mathematical model to solve a problem.	• Limit to linear functions, linear inequalities, systems of linear equations or inequalities, quadratic functions and exponential functions.
A1.M.3	Validate a given model and make improvement.	• Limit to linear functions, linear inequalities, systems of linear equations or inequalities, quadratic functions and exponential functions.
A1.M.4	Interpret the solution to a real-world problem in terms of context.	• Limit to linear functions, linear inequalities, systems of linear equations or inequalities, quadratic functions and exponential functions.
A1.M.5	Compare the result from a model with real world data.	• Limit to linear functions, linear inequalities, systems of linear equations or inequalities, quadratic functions and exponential functions.
A1.M.6	Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in the standards.	• Limit to linear functions, linear inequalities, systems of linear equations or inequalities, quadratic functions and exponential functions.
A1.M.7	Identify information or assumptions needed to solve a problem.	• Type I items only.
A1.M.8	Provide a reasoned estimate of a quantity needed to solve a problem.	• Type I items only.

Maryland Comprehensive Assessment Program

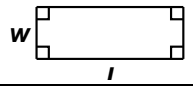
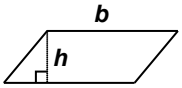
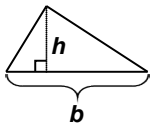
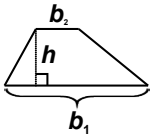
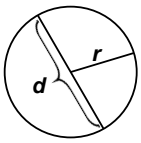
MCAP

Mathematics Assessment

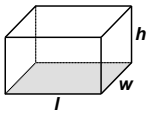
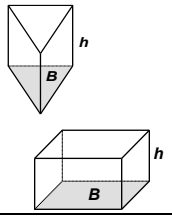
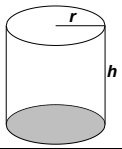
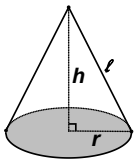
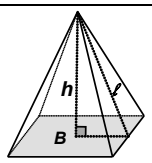
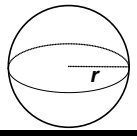
High School Reference Sheet

Formulas

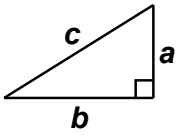
Area (*A*) and Circumference (*C*)

Name	Shape	Formula
Rectangle		$A = lw$
Parallelogram		$A = bh$
Triangle		$A = \frac{1}{2}bh$
Trapezoid		$A = \frac{1}{2}(b_1+b_2)h$
Circle		$A = \pi r^2$ $C = 2\pi r$ $C = \pi d$

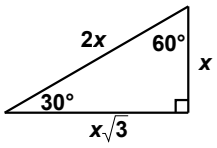
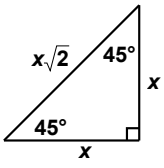
Volume (*V*) and Surface Area (*SA*)

Name	Shape	Formula
Right Rectangular Prism		$V = lwh$ $SA = 2lw + 2hw + 2lh$
General Prism		$V = Bh$ SA = Sum of the areas of the faces
Right Circular Cylinder		$V = \pi r^2 h$ $SA = 2\pi r^2 + 2\pi rh$
Right Circular Cone		$V = \frac{1}{3}\pi r^2 h$ $SA = \pi r^2 + \pi r\ell$
Right Pyramid		$V = \frac{1}{3}Bh$ $SA = B + \frac{1}{2}P\ell$
Sphere		$V = \frac{4}{3}\pi r^3$ $SA = 4\pi r^2$

Formulas for Right Triangles

Shape	Formula
	**Pythagorean Theorem** $a^2 + b^2 = c^2$ **Trigonometric Ratios** $\sin\theta = \frac{a}{c}$ $\cos\theta = \frac{b}{c}$ $\tan\theta = \frac{a}{b}$

Special Right Triangles

30°–60°–90°	45°–45°–90°
	

Polygon Angle Formulas

Interior Angle Formulas
Sum of the Interior Angles of a polygon with n sides = $180°(n-2)$
Measure of an interior angle of an n-sided regular polygon = $\frac{180°(n-2)}{n}$

Formulas

Equations of a Line
Standard Form: $Ax + By = C$ where A and B are not both zero Slope-Intercept Form: $y = mx + b$ where m = slope and b = y-intercept Point-Slope Form: $y - y_1 = m(x - x_1)$ where m = slope and (x_1, y_1) is a point on the line

Coordinate Geometry Formulas
Let (x_1, y_1) and (x_2, y_2) be two coordinate pairs slope = $\frac{y_2 - y_1}{x_2 - x_1}$ where $x_2 \neq x_1$ midpoint = $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ distance = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Arithmetic Sequence	Geometric Sequence	Geometric Series
$a_n = a_1 + (n-1)d$	$a_n = a_1 r^{n-1}$	$S_n = \frac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$
Quadratic Formula	**Distance Traveled**	**Arc Length**
$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	$d = rt$	$S = r\theta$ (where θ is in radians)
Simple Interest	**Compound Interest**	**Continuously Compounded Interest**
$I = prt$	$A = P\left(1 + \frac{r}{n}\right)^{nt}$	$A = Pe^{rt}$

Conversions

Angle Measurements	Weights
1 Radian = $\frac{180}{\pi}$ Degrees 1 Degree = $\frac{\pi}{180}$ Radians	1 pound = 16 ounces 1 pound = 0.454 kilograms 1 ton = 2000 pounds 1 kilogram = 2.2 pounds
Distances	**Volumes**
1 mile = 5280 feet 1 mile = 1760 yards 1 mile = 1.609 kilometers 1 kilometer = 0.62 mile 1 meter = 39.37 inches 1 inch = 2.54 centimeters	1 cup = 8 fluid ounces 1 gallon = 4 quarts 1 pint = 2 cups 1 gallon = 3.785 liters 1 quart = 2 pints 1 liter = 0.264 gallons 1 liter = 1000 cubic centimeters