MCAP Maryland Comprehensive Assessment Program

Algebra II

Performance Level Descriptors

Maryland State Department of Education

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MARYLAND STATE DEPARTMENT OF EDUCATION
EQUITY AND EXCELLENCE

Algebra II Content Performance Level Descriptors

The Big Ideas

Performance Level Descriptors for the Content Subclaim

Big Idea 1: Understand the properties of the real and complex number systems.

Domain: The Real Number System (N.RN)

Cluster: Extend the properties of exponents to rational exponents.

Evidence Statements:

- **N.RN.A.2:** Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Domain: The Complex Number System (N.CN)

Cluster: Perform arithmetic operations with complex numbers.

Evidence Statements:

- **N.CN.A.1:** Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.
- **N.CN.A.2:** Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.

Evidence Statements	Level 4 *A student performing at this level should be able to:*	Level 3 *A student performing at this level should be able to:*	Level 2 *A student performing at this level should be able to:*	Level 1 *A student performing at this level should be able to:*
N.RN.A.2	rewrite expressions involving radicals and rational exponents, which include variables and integers, using the properties of exponents **to analyze and/or compare expressions.**	rewrite expressions involving radicals and **rational exponents**, which include variables and integers, **using the properties of exponents.**	rewrite expressions **involving radicals and positive rational exponents**, which may include variables and integers.	rewrite expressions written as radicals or rational exponents involving **positive integer values**.
N.CN.A.1; N.CN.A.2	perform arithmetic operations with complex numbers **to solve problems that require connecting multiple grade-level concepts.**	add, subtract, **and multiply** complex numbers of the form $a + bi$.	**add and subtract complex numbers** of the form $a + bi$.	recognize complex numbers have the form $a + bi$.

Big Idea 2: Reason with quantities

Domain: Quantities (N.Q)

Cluster: Reason quantitatively and use units to solve problems.

Evidence Statements:

- **N.Q.A.2★:** Define appropriate quantities for the purpose of descriptive modeling.

Evidence Statements	Level 4 *A student performing at this level should be able to:*	Level 3 *A student performing at this level should be able to:*	Level 2 *A student performing at this level should be able to:*	Level 1 *A student performing at this level should be able to:*
N.Q.A.2	determine and use appropriate quantities to solve real world problems **that require connecting multiple grade-level concepts.**	determine **and use** appropriate quantities **to solve real world problems.**	**determine** appropriate quantities in contexts.	identify appropriate quantities in contexts.

Big Idea 3: Interpret representations

Domain: Interpreting Functions (F.IF)

Cluster: Interpret functions that arise in applications in terms of the context.

Evidence Statements:

- **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.
- **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.

Cluster: Analyze functions using different representations.

Evidence Statements:

- **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.
- **F.IF.C.8b:** Use the properties of exponents to interpret expressions for exponential functions.
- **F.IF.C.9:** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum*.

Domain: Linear, Quadratic, and Exponential Functions (F.LE)

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

Evidence Statements:

- **F.LE.B.5★:** Interpret the parameters in a linear or exponential function in terms of a context.

Evidence Statements	Level 4 *A student performing at this level should be able to:*	Level 3 *A student performing at this level should be able to:*	Level 2 *A student performing at this level should be able to:*	Level 1 *A student performing at this level should be able to:*
F.IF.B.4; F.IF.B.6; F.IF.C.8; F.LE.B.5	interpret key features (including average rates of change) of graphic, algebraic, numeric and/or verbal representations for all course appropriate functions **in any form** in terms of a real-world context, **requiring connecting multiple grade-level concepts.**	interpret key features (including average rates of change) of graphic, algebraic, numeric and/or **verbal** representations for **all course appropriate functions** in terms of a real-world context, **when suitable factorizations and structures are available**.	**interpret** key features (including average rates of change) of graphic, **algebraic,** and/or numeric representations for linear, quadratic, **and exponential** relationships in terms of a real-world context, **without needing to rewrite the expression in order to reveal the key features.**	identify key features (including average rates of change) of graphic and/or numeric representations for **linear** and **quadratic** relationships in terms of a real-world context.
F.IF.C.9	relate properties of two functions given algebraically, graphically, numerically, and/or **by verbal descriptions**, applying multiple concepts, to make comparative statements **within real world context.**	relate properties of two functions (quadratic, exponential, trigonometric, logarithmic) given algebraically, graphically, and/or numerically, **applying multiple concepts,** to make comparative statements that **may be within real world context.**	relate properties of two functions (quadratic, exponential) given algebraically, graphically, and/or numerically, where values are explicitly given, to make comparative statements.	

Big Idea 4: Use equivalent forms of algebraic expressions, equations, and functions

Domain: The Real Number System (N.RN)
Cluster: Extend the properties of exponents to rational exponents.
Evidence Statements:
- **N.RN.A.2:** Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Domain: Seeing Structure in Expressions (A.SSE)
Cluster: Interpret the structure of expressions.
Evidence Statements:
- **A.SSE.A.2:** Use the structure of an expression to identify ways to rewrite it.

Cluster: Write expressions in equivalent forms to solve problems.
Evidence Statements:
- **A.SSE.B.3c★:** Use the properties of exponents to transform expressions for exponential functions.

Domain: Arithmetic with Polynomials and Rational Expressions (A.APR)
Cluster: Write rational expressions.
Evidence Statements:
- **A.APR.D.6:** Rewrite simple rational expressions in different forms; write $^{a(x)}/_{b(x)}$ in the form $q(x) + {}^{r(x)}/_{b(x)}$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.

Domain: Linear, Quadratic, and Exponential Functions (F.LE)
Cluster: Construct and compare linear, quadratic and exponential models and solve problems.
Evidence Statements:
- **F.LE.A.4★:** For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.

Evidence Statements	Level 4 *A student performing at this level should be able to:*	Level 3 *A student performing at this level should be able to:*	Level 2 *A student performing at this level should be able to:*	Level 1 *A student performing at this level should be able to:*
N.RN.A.2; A.SSE.A.2; A.SSE.B.3c; A.APR.D.6; F.LE.A.4	use the structure of expressions and equations to rewrite them in different forms in order to model and/or solve mathematical and real world problems, **make generalizations, and draw conclusions.**	use the structure of **expressions and equations** to rewrite them in different forms when prompted **in order to model and/or solve mathematical and real world problems.**	use the structure of **polynomial expressions and equations containing positive rational exponents** to rewrite them in different forms when prompted in order to solve mathematical problems.	use the structure of **polynomial expressions and equations containing positive integer exponents of degree less than 4** to rewrite them in different forms when prompted.

Big Idea 5: Create expressions, equations and functions to represent the relationship between quantities.

Domain: Creating Equations (A.CED)
Cluster: Create equations that describe the numbers or relationships.
Evidence Statements:

- **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*.

Domain: Interpreting Functions (F.IF)
Cluster: Understand the concept of a function and use function notation.
Evidence Statements:

- **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 ≥ 1*.

Domain: Building Functions (F.BF)
Cluster: Build a function that models a relationship between two quantities.
Evidence Statements:

- **F.BF.A.1★:** Write a function that describes a relationship between two quantities.
- **F.BF.A.1a ★:** Determine an explicit expression, a recursive process, or steps for calculation from a context.
- **F.BF.A.1b★:** Combine standard function types using arithmetic operations.
- **F.BF.A.2★:** Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

Cluster: Build new functions from existing functions.
Evidence Statements:

- **F.BF.B.3:** Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, k $f(x)$, $f(kx)$, 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.
- **F.BF.B.4a:** Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse.

Domain: Linear, Quadratic and Exponential Functions (F.LE)
Cluster: Construct and compare linear quadratic and exponential models and solve problems.
Evidence Statements:

- **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).

Domain: Trigonometric Functions (F.TF)
Cluster: Model periodic phenomena with trigonometric functions.
Evidence Statements:

- **F.TF.B.5★:** Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.

Domain: Interpreting Categorical and Quantitative Data (S.ID)
Cluster: Summarize, represent, and interpret data on two categorical and quantitative variables.
Evidence Statements:

- **S.ID.B.6a:** Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

Evidence Statements	Level 4 *A student performing at this level should be able to:*	Level 3 *A student performing at this level should be able to:*	Level 2 *A student performing at this level should be able to:*	Level 1 *A student performing at this level should be able to:*
A.CED.A.1; F.IF.A.3; F.BF.A.1; F.BF.A.1a; F.BF.A.1b; F.BF.A.2; F.BF.B.3; F.BF.B.4a; F.LE.A.2; F.TF.B.5; S.ID.B.6a	**compare and analyze differing mathematical representations** in order to solve mathematical and real world problems.	**create a mathematical representation** to model a relationship between quantities **in order to solve mathematical and real world problems.**	**create** a linear, exponential, or quadratic representation to model a relationship between quantities in problems, with prompting embedded.	choose a linear, exponential, or quadratic representation to model a relationship between quantities in problems, with prompting embedded.

Big Idea 6: Solve equations and systems of equations

Domain: The Complex Number System (N.CN)
Cluster: Use complex numbers in polynomial identities and equations.
Evidence Statements:
- **N.CN.C.7:** Solve quadratic equations with real coefficients that have complex solutions.

Domain: Seeing Structure in Expressions (A.SSE)
Cluster: Write expressions in equivalent forms to solve problems.
Evidence Statements:
- **A.SSE.B.4★:** Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.

Domain: Reasoning with Equations and Inequalities (A.REI)
Cluster: Understand solving equations as a process of reasoning and explain the reasoning.
Evidence Statements:
- **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.
- **A.REI.A.2:** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Cluster: Solve equations and inequalities on one variable.
Evidence Statements:
- **A.REI.B.4b:** Solve quadratic equations with rational number coefficients by inspection, 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.

Cluster: Solve systems of equations.
Evidence Statements:
- **A.REI.C.7:** Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.

Cluster: Represent and solve equations and inequalities graphically
Evidence Statements:
- **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.

Domain: Linear, Quadratic, and Exponential Functions (F.LE)
Cluster: Construct and compare linear, quadratic, and exponential models and solve problems.
Evidence Statements:
- **F.LE.A.4★:** For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.

Evidence Statements	Level 4 *A student performing at this level should be able to:*	Level 3 *A student performing at this level should be able to:*	Level 2 *A student performing at this level should be able to:*	Level 1 *A student performing at this level should be able to:*
N.CN.C.7; A.SSE.B.4; A.REI.A.1; A.REI.A.2; A.REI.B.4b; A.REI.C.7; A.REI.D.11; F.LE.A.4	**find** the solution(s) of an equation or system of equations **which require connecting multiple grade-level concepts**; **justify** the reasoning used in the solution process and explain the meaning of the solution(s).	**find** the solution(s) of a given equation or system of equations; **communicate** the reasoning used in the solution process and **explain the meaning of the solution(s).**	**find** the solution(s) of a given equation or system of equations needing little manipulation; **identify the reasoning used in the solution process** and **explain the type of solution(s) to an equation (i.e., real, complex, extraneous).**	identify the solution(s) of a given equation or system of equations needing little or no manipulation; recognize when an equation has a real, complex or extraneous solution.

Big Idea 7: Build, interpret, and analyze expressions and functions

Domain: Arithmetic with Polynomials and Rational Expressions (A.APR)
Cluster: Understand the relationship between zeros and the factors of polynomials.
Evidence Statements:

- **A.APR.B.2:** Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.
- **A.APR.B.3:** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

Domain: Interpreting Functions (F.IF)
Cluster: Interpret functions that arise in applications in terms of real-world context.
Evidence Statements:

- **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.
- **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.

Cluster: Analyze functions using different representations.
Evidence Statements:

- **F.IF.C.7c★:** Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- **F.IF.C.7e★:** Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

Domain: Building Functions (F.BF)
Cluster: Build new functions from existing functions.
Evidence Statements:

- **F.BF.B.3:** Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, 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 Statements	Level 4 *A student performing at this level should be able to:*	Level 3 *A student performing at this level should be able to:*	Level 2 *A student performing at this level should be able to:*	Level 1 *A student performing at this level should be able to:*
A.APR.B.2	apply and interpret the remainder theorem **in problems that require connecting multiple grade-level concepts.**	apply **and interpret** the remainder theorem **given a polynomial and a divisor.**	**apply the remainder theorem given a polynomial in standard form with non-zero integer coefficients and a divisor.**	
A.APR.B.3; F.IF.B.4; F.IF.C.7c; F.IF.C.7e	use key features of a function and **connect multiple grade-level concepts** to create the graph of a function and/or to select the equation that models the function.	use key features of a function to create the graph of a function and/or to select the equation that models the function.	identify key features of a function given the graph or the equation of the function.	identify the zeros of a function when suitable factorizations are available or given a graph of the function.
F.IF.B.6	analyze the effect on the rate of change when a function is transformed.	compare average rates of change within a function and across functions.	identify parts of a graph that match stated rates of change	calculate the average rate of change for functions given a table or set of ordered pairs.
F.BF.B.3	**explain why a given** function is even, odd, or neither **based on** a graph or an equation of the function.	identify a function as even, odd, **or neither** given a graph or an equation of the function.	identify a function as even **or odd** given a graph **or an equation** of the function**.**	identify if a function is even given a graph of the function.
F.BF.B.3	produce the graph and/or analyze the effects on the graph of a function **in problems that require connecting multiple grade-level concepts.**	**produce the graph and/or analyze the effects on the graph** of a function under two transformations.	choose the graph of a function under **two** transformations.	choose the graph of a function under **one vertical** transformation.

Big Idea 8: Make connections between the unit circle and trigonometric relationships

Domain: Trigonometric Functions (F.TF)

Cluster: Extend the domain of trigonometric functions using the unit circle.

Evidence Statements:

- **F.TF.A.1:** Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
- **F.TF.A.2:** Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

Cluster: Prove* and apply trigonometric identities.

Evidence Statements:

- **F.TF.C.8:** Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$* and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.

Evidence Statements	Level 4 *A student performing at this level should be able to:*	Level 3 *A student performing at this level should be able to:*	Level 2 *A student performing at this level should be able to:*	Level 1 *A student performing at this level should be able to:*
F.TF.A.1; F.TF.A.2; F.TF.A.8	Use properties of the unit circle, right triangles, Pythagorean identities, and trigonometric relationships to solve mathematical problems **that require connecting multiple grade-level concepts.**	Use properties of the unit circle, right triangles, **Pythagorean identities**, and trigonometric relationships **to solve mathematical problems.**	**Use properties of the unit circle, right triangles, and trigonometric relationships to solve mathematical problems only within the first quadrant.**	Convert between radians and degree measurements and state trigonometric ratios from given right triangles.

*Note: The “prove” part of F.TF.C.8 is not assessed.

MCAP Mathematics Content PLDs – Algebra II

Evidence Statements and Performance Level Descriptors Crosswalk

Evidence Statement Code	PLD Big Idea Number
N.RN.A.2	1, 4
N.Q.A.2	2
N.CN.A.1	1
N.CN.A.2	1
N.CN.C.7	6
A.SSE.A.2.a	4
A.SSE.A.2.b	4
A.SSE.A.2.c	4
A.SSE.B.3.c	4
A.SSE.B.4	6
A.APR.B.2	7
A.APR.B.3	7
A.APR.D.6	4
A.CED.A.1	5
A.REI.A.1	6
A.REI.A.2-1	6
A.REI.A.2-2	6
A.REI.B.4.b	6
A.REI.C.7	6
A.REI.D.11	6
F.IF.A.3	5
F.IF.B.4	3, 7
F.IF.B.6-1	3, 7

Evidence Statement Code	PLD Big Idea Number
F.IF.B.6-2	3, 7
F.IF.B.6-3	3, 7
F.IF.C.7c	7
F.IF.C.7e	7
F.IF.C.8b	3
F.IF.C.9	3
F.BF.A.1.a	5
F.BF.A.1.b	5
F.BF.A.2	5
F.BF.B.3-1	5, 7
F.BF.B.3-2	5, 7
F.BF.B.4.a	5
F.LE.A.2-1	5
F.LE.A.2-2	5
F.LE.A.4	4, 6
F.LE.B.5-1	3
F.LE.B.5-2	3
F.TF.A.1	8
F.TF.A.2	8
F.TF.B.5	5
F.TF.C.8	8
S.ID.B.6.a	5

Performance Level Descriptors for the Reasoning Subclaim

Performance Level Descriptors (PLDs)

All Reasoning Assessment Items connect to the content knowledge, skills, and abilities described in the Algebra II Content Evidence Statements.

Students must provide evidence of their ability to reason mathematically by responding to:

- one-point items that require the application of reasoning skills aligned to the Content PLDS.
- four-point items that require communicating their reasoning via a written response.

Code	Reasoning Evidence Statement
A2.R.1	Given an equation, reason about the number and nature of the solutions.
A2.R.2	Given a system of equations, reason about the number of solutions.
A2.R.3	Reasoning based on the principle that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.
A2.R.4	Identify an option that would refute a conjecture/claim.
A2.R.5	Identify a correct method and justification given two or more chains of reasoning.
A2.R.6	Given a proposition, determine cases where the proposition is true or false.
A2.R.7	Identify an unstated assumption that would make a problem well posed or make a particular method viable.
A2.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).
A2.R.9	Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures about trigonometric functions.
A2.R.10	Express reasoning about the relationship between zeros and factors of polynomials.
A2.R.11	Express reasoning about properties of exponents.

Level 4 *A student performing at this level should be able to provide evidence of mathematical reasoning by communicating:*	**Level 3** *A student performing at this level should be able to provide evidence of mathematical reasoning by communicating:*	**Level 2** *A student performing at this level should be able to provide evidence of mathematical reasoning by communicating:*	**Level 1** *A student performing at this level should be able to provide evidence of mathematical reasoning by communicating:*
a sophisticated chain of reasoning.	a well-developed chain of reasoning.	a partially developed, valid chain of reasoning.	the beginning of a chain of reasoning.
a precise, logical solution pathway.	a logical solution pathway that may contain minor flaws.	a solution pathway that contains some correct processes yielding an incorrect solution.	an attempted solution pathway.
an extensive command of mathematical representations and vocabulary.	a proficient command of mathematical representations and vocabulary.	an understanding of some mathematical representations and vocabulary.	a developing understanding of some mathematical representations and vocabulary.

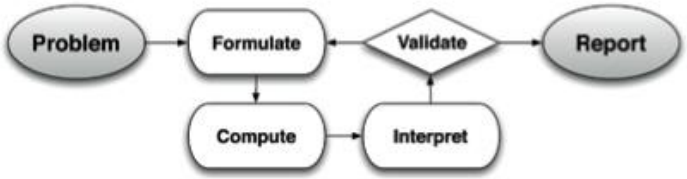
Domain: Modeling (A2.M)

Performance Level Descriptors (PLDs)

All Modeling Assessment Items require a student to employ one or more steps of the modeling cycle when determining a response and are connected to the content knowledge, skills, and abilities described in the Algebra II Content Evidence Statements.

Students must provide evidence of their ability to use the modeling cycle by responding to one-point machine scored items and four-point items that require communicating a written response.

Modeling Cycle



Code	Modeling Evidence Statement
A2.M.1	Choose between competing mathematical models to solve real-world problems
A2.M.2	Construct a mathematical model to solve a problem
A2.M.3	Validate a given model and make improvement
A2.M.4	Interpret the solution to a real-world problem in terms of context
A2.M.5	Compare the result from a model with real world data
A2.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.
A2.M.7	Make a reasonable assumption about a given scenario and use the assumption to solve a problem
A2.M.8	Provide a reasoned estimate of a quantity needed to solve a problem

Level 4 *A student performing at this level should be able to provide evidence of the ability to use the modeling cycle by:*	**Level 3** *A student performing at this level should be able to provide evidence of the ability to use the modeling cycle by:*	**Level 2** *A student performing at this level should be able to provide evidence of the ability to use the modeling cycle by:*	**Level 1** *A student performing at this level should be able to provide evidence of the ability to use the modeling cycle by:*
determining the information or mathematics needed to solve a problem that requires connecting multiple grade-level concepts.	determining needed information or mathematics.	identifying needed information or mathematics.	identifying some needed information or mathematics.
communicating an accurate, organized solution path aligned to the problem using appropriate, effective, and precise representations.	communicating an accurate, organized solution path aligned to the problem using appropriate, effective, and precise representations that may contain minor flaws.	communicating a partial solution path that may contain mathematical errors.	communicating the beginning of a solution path, containing mathematical errors.
evaluating or validating a solution path or showing how to improve a model or correct a given solution.	evaluating or validating a solution path or showing how to improve a model, but work may include minor flaws.	partially validating a solution path or incorrectly improving the model.	attempting to validate a solution path.