CMAS Algebra I Performance Level Descriptors

(Based on PARCC)

In 2018, Colorado will continue to use the performance level descriptors (PLDs) that were developed in collaboration with the Partnership for Assessment of Readiness for College and Careers (PARCC) consortium to describe performance on the CMAS assessments.

	Algebra I: Sub-Claim A The student solves problems involving the Major Content for the grade/course with connections to the Standards for Mathematical Practice.			
	Level 5: Exceeded Expectations	**Level 4: Met Expectations**	**Level 3: Approached Expectations**	**Level 2: Partially Met Expectations**
Expressions A-SSE.1-1 A-SSE.1-2 A-SSE.2-1 A-SSE.2-4 A.APR.1-1	Writes and **analyzes** equivalent numerical and polynomial expressions in one variable, using addition, subtraction, multiplication and factoring, **including multi-step problems.** Interprets parts of **complicated** exponential and quadratic expressions that represent a quantity in terms of its context.	Writes equivalent numerical and polynomial expressions in one variable, using addition, subtraction, multiplication **and factoring**. **Interprets parts of exponential and quadratic expressions that represent a quantity in terms of its context.**	Writes equivalent numerical and polynomial expressions in one variable, using addition, subtraction and multiplication. Identifies components of exponential **and quadratic** expressions.	Writes equivalent numerical and polynomial expressions in one variable, using addition, subtraction and multiplication. Identifies components of exponential expressions.
Interpreting Functions F-IF.1 F-IF.2 F-IF.A.Int.1 F-IF.4-1 F-IF.5-1 F-IF.5-2	Determines if a given relation is a function. Evaluates with, uses and **interprets** with function notation within a context. Given a context, writes **and analyzes** a linear **or quadratic** function. For linear and quadratic functions that model contextual relationships, determines **and**	Determines if a given relation is a function. Evaluates with and uses function notation **within a context.** Given a context, writes a linear function. For linear and quadratic functions that model contextual relationships, determines key features **and graphs the function.**	Determines if a given relation is a function. Evaluates with and uses function notation. Given a context, writes a linear function. For linear **and quadratic** functions that model contextual relationships, determines key	Determines if a given relation is a function. Evaluates with and uses function notation. Given a context, writes a linear function. Given the graph of linear functions that model contextual relationships, determines key features.

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	interprets key features, graphs the function **and solves problems.** Determines the domain and relates it to the quantitative relationship it describes for a linear, quadratic, exponential (limited to domains in the integers), **square root, cube root, piece-wise, step** and absolute value functions.	Determines the domain **and relates it to the quantitative relationship it describes for** linear, quadratic **and exponential (limited to domains in the integers)** functions.	features. **Determines the domain of linear and quadratic functions.**	
Rate of Change F-IF.6-1a F-IF.6-1b F-IF.6-6a F-IF.6-6b	Calculates and interprets the average rate of change of linear, exponential, quadratic, **square root, cube root and piecewise-defined functions (presented symbolically or as a table)** over a specified interval, and estimates the rate of change from a graph. **Compares rates of change associated with different intervals.**	Calculates the average rate of change of linear, exponential and quadratic functions (presented symbolically or as a table) over a specified interval **and estimate the rate of change from a graph.**	Calculates the average rate of change of linear, exponential and quadratic functions (presented **symbolically** or as a table) over a specified interval.	Calculates the average rate of change of linear, exponential and quadratic functions (presented symbolically or as a table) over a specified interval.
Solving Algebraically A-REI.3 A-REI.4a-1 A-REI.4b-1 A.REI.4b-2 A-CED.4-1 A-CED.4-2 HS-Int.1 HS-Int.2 HS-Int.3-2	Algebraically solves linear equations, linear inequalities and quadratics in one variable (at complexity appropriate to the course), including those with coefficients represented by letters. **Utilizes structure and rewriting as strategies for solving.**	Algebraically solves linear equations, linear inequalities and quadratics in one variable (at complexity appropriate to the course), **including those with coefficients represented by letters.**	Algebraically solves linear equations, linear inequalities and **quadratics** in one variable (at complexity appropriate to the course).	Algebraically solves linear equations and linear inequalities in one variable (at complexity appropriate to the course).

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Solving Graphically A-CED.3-1 A-REI.10 A-REI.11-1a A-REI.11-1b A-REI.12	Graphs **and analyzes** the solution sets of equations, linear inequalities and systems of linear inequalities. Finds the solutions to two polynomial functions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. **Writes a system of linear inequalities given a context.**	Graphs the solution sets of equations, linear inequalities **and systems of linear equations and linear inequalities.** Finds the solutions to two polynomial functions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations.	Graphs the solution sets of equations and linear inequalities. **Finds the solutions to two polynomial functions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations.**	Graphs the solution sets of equations and linear inequalities. Given the graph, identify the solutions of a system of two polynomial functions.

	Algebra I: Sub-Claim B The student solves problems involving the Additional and Supporting Content for the grade/course with connections to the Standards for Mathematical Practice.			
	Level 5: Exceeded Expectations	**Level 4: Met Expectations**	**Level 3: Approached Expectations**	**Level 2: Partially Met Expectations**
Number Systems N-RN.B-1	Identifies rational and irrational numbers. Calculates sums and products of two rational and/or irrational numbers **and determines whether and generalizes when the sums and products are rational or irrational.**	Identifies rational and irrational numbers. **Calculates sums and products of two rational and/or irrational numbers.**	Identifies rational and irrational numbers.	Identifies rational and irrational numbers.
Equivalent Expressions	Determines equivalent forms of quadratic **and exponential (with**	**Determines** equivalent forms of quadratic expressions and	Identifies equivalent forms of quadratic expressions and	Identifies equivalent forms of quadratic expressions and

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and Functions A-SSE.3a A-SSE.3b A-SSE.3c-1 F.IF.8a	**integer domain)** expressions and functions to reveal and explain **their properties.**	functions. Uses equivalent forms **to reveal and explain** zeros, **extreme values** and symmetry.	functions. **Identifies zeros and symmetry**.	functions **in cases where suitable factorizations are provided.**
Interpreting Graphs of Functions A-APR.3-1 F-IF.7a-1 F-IF.7a-2 F-IF.7b	Graphs linear, quadratic, cubic (in which linear and quadratic factors are available), **square root, cube root and piecewise-defined functions, showing key features.** **Determines a function, given a graph with key features identified.**	Graphs linear, quadratic **and cubic (in which linear and quadratic factors are available)** functions, showing key features.	Graphs linear **and quadratic functions**, showing key features.	Graphs linear functions, showing key features.
Function Transformations F-BF.3-1 F-BF.3-4	Identifies the effects of **multiple** transformations on graphs of linear and quadratic functions and finds the value of *k* given a transformed graph. **Experiments with cases using technology.** **Given the equation of a transformed linear or quadratic function, creates an appropriate graph.**	Identifies the effects of a single transformation on graphs of linear and quadratic functions, including $f(x)+k$, $kf(x)$, $\boldsymbol{f(kx)}$ **and** $\boldsymbol{f(x+k)}$**, and finds the value of** $\boldsymbol{k}$ **given a transformed graph.**	Identifies the effects of a single transformation on graphs of linear and quadratic functions, limited to $f(x)+k$ **and** $\boldsymbol{kf(x)}$**.**	Identifies the effects of a single transformation on graphs of linear and quadratic functions, limited to $f(x)+k$.
Multiple Representations of Functions	Writes **and analyzes** systems of linear equations in multi-step contextual problems.	Writes systems of linear equations in multi-step contextual problems.	Writes systems of linear equations in **multi-step** contextual problems.	Writes systems of linear equations in simple contextual problems.

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A-REI.6-1 F-LE.2-1 F-LE.2-2 F-IF.9-1 F-Int.1-1 S-ID.Int.1 S-ID.Int.2 HS-Int.1 HS-Int.2 HS-Int.3-1 HS-Int.3-2	Represents linear and exponential (with domain in the integers) functions symbolically, in real-life scenarios, graphically, with a verbal description, as a sequence and with input- output pairs to solve mathematical and contextual problems. Compares the properties of two functions represented in multiple ways, limited to linear, exponential (with domains in the integers), quadratic, square root and, absolute value cube root, piecewise and step.	**Represents** linear and exponential (with domain in the integers) functions symbolically, graphically and with input-output pairs to solve mathematical problems. Compares the properties of two functions represented in different ways, limited to linear quadratic, and, **exponential (with domains in the integers).**	Given a symbolic representation, real-life scenario, graph, verbal description, sequence or input-output pairs for linear **and exponential** functions **(with domains in the integers)**, solves mathematical problems. Compares the properties of two functions represented in different ways, limited to linear **and quadratic**.	Given a symbolic representation, real-life scenario, graph, verbal description, sequence or input-output pairs for linear functions, solves mathematical problems. Compares the properties of two linear functions represented in different ways.
Summarizing Representing and Interpreting Data S-ID.5 S-ID.Int.1 S-ID.Int.2	Determines appropriate representations of categorical and quantitative data, summarizing and interpreting the data and characteristics of the representations. **Describes and interprets possible associations and trends in the data.**	**Determines appropriate** representations of categorical and quantitative data, summarizing the data and characteristics of the representations.	Given representations of categorical and quantitative data, **summarizes the data** and characteristics of the representations.	Given representations of categorical and quantitative data, describes the characteristics of the representations.

	Algebra I: Sub-Claim C In connection with content, the student expresses course-level appropriate mathematical reasoning by constructing viable arguments, critiquing the reasoning of others and/or attending to precision when making mathematical statements.			
	Level 5: Exceeded Expectations	**Level 4: Met Expectations**	**Level 3: Approached Expectations**	**Level 2: Partially Met Expectations**
Reasoning	In connection with the content	In connection with the content	In connection with the content	In connection with the content

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	Level 5: Exceeded Expectations	**Level 4: Met Expectations**	**Level 3: Approached Expectations**	**Level 2: Partially Met Expectations**
HS.C.2.1 HS.C.5.5 HS.C.5.6 HS.C.5.10.1 HS.C.6.1 HS.C.8.1 HS.C.9.1 HS.C.10.1 HS.C.12.1 HS.C.16.2 HS.C.18.1	knowledge, skills, and abilities described in Sub-claims A and B, the student clearly constructs and communicates a **complete response** based on: • the principle that a graph of an equation in two variables is the set of all its solutions • reasoning about linear and exponential growth • properties of rational numbers or irrational numbers • transformations of functions • a chain of reasoning to justify or refute algebraic, function, or linear-equation propositions or conjectures • a given equation or system of equations • the number or nature of solutions by:	knowledge, skills, and abilities described in Sub-claims A and B, the student clearly constructs and communicates a response based on: • the principle that a graph of an equation in two variables is the set of all its solutions • reasoning about linear and exponential growth • properties of rational numbers of rational numbers or irrational numbers • transformations of functions • a chain of reasoning to justify or refute algebraic, function, or linear-equation propositions or conjectures • a given equation or system of equations • the number or nature of solutions by:	knowledge, skills, and abilities described in Sub-claims A and B, the student constructs and communicates a **partial response** based on: • the principle that a graph of an equation in two variables is the set of all its solutions • reasoning about linear and exponential growth • properties of rational numbers or irrational numbers • transformations of functions • a chain of reasoning to justify or refute algebraic, function, or linear-equation propositions or conjectures • a given equation or system of equations • the number or nature of solutions by:	knowledge, skills, and abilities described in Sub-claims A and B, the student constructs and communicates an incomplete response based on: • the principle that a graph of an equation in two variables is the set of all its solutions • reasoning about linear and exponential growth • properties of rational numbers or irrational numbers • transformations of functions • a chain of reasoning to justify or refute algebraic, function or linear-equation propositions or conjectures • a given equation or system of equations • the number or nature of solutions by:
	• using a logical approach based on a conjecture and/or stated assumptions, utilizing mathematical connections (when appropriate)providing an **efficient and** logical progression of steps or chain of reasoning with appropriate justification • performing precise calculations • using correct grade-level	• using a logical approach based on a conjecture and/or stated assumptions, **utilizing mathematical connections (when appropriate)** • providing a **logical** progression of steps or chain of reasoning **with appropriate justification** • **performing precise calculations** • using **correct** grade-level	• using a **logical** approach based on a conjecture and/or stated assumptions • providing a **logical, but incomplete,** progression of steps or chain of reasoning • **performing minor** calculation errors • using **some** grade-level vocabulary, symbols and labels	• using an approach based on a conjecture and/or stated or faulty assumptions • providing an incomplete or illogical progression of steps or chain of reasoning • making an intrusive calculation error • using limited grade-level vocabulary, symbols and labels

	Algebra I: Sub-Claim C In connection with content, the student expresses course-level appropriate mathematical reasoning by constructing viable arguments, critiquing the reasoning of others and/or attending to precision when making mathematical statements.			
	Level 5: Exceeded Expectations	**Level 4: Met Expectations**	**Level 3: Approached Expectations**	**Level 2: Partially Met Expectations**
	vocabulary, symbols and labels • providing a justification of a conclusion • **determining whether an argument or conclusion is generalizable** • evaluating, interpreting and critiquing the validity of others' responses, approaches and reasoning – utilizing mathematical connections (when appropriate) – and **providing a counter-example where applicable**	vocabulary, symbols and labels • providing a **justification** of a conclusion • **evaluating, interpreting and critiquing the validity of others' responses, approaches and reasoning - utilizing mathematical connections (when appropriate)**	• providing a partial justification of a conclusion based on own calculations • **evaluating the validity of others' approaches and conclusions**	• providing a partial justification of a conclusion based on own calculations

	Algebra I: Sub-Claim D In connection with content, the student solves real-world problems with a degree of difficulty appropriate to the grade/course by applying knowledge and skills articulated in the standards for the current grade/course (or for more complex problems, knowledge and skills articulated in the standards for previous grades/courses), engaging particularly in the Modeling practice, and where helpful making sense of problems and persevering to solve them, reasoning abstractly, and quantitatively, using appropriate tools strategically, looking for the making use of structure and/or looking for and expressing regularity in repeated reasoning.			
	Level 5: Exceeded Expectations	**Level 4: Met Expectations**	**Level 3: Approached Expectations**	**Level 2: Partially Met Expectations**
Modeling HS.D.1-1 HS.D.2-5 HS.D.2-6 HS.D.2-8 HS.D.2-9 HS.D.3-1a HS.D.3-3a	In connection with the content knowledge, skills, and abilities described in Sub-claims A and B, the student devises and enacts a plan to apply mathematics in solving problems arising in everyday life, society and the workplace by: • using state assumptions and making assumption and	In connection with the content knowledge, skills, and abilities described in Sub-claims A and B, the student devises and enacts a plan to apply mathematics in solving problems arising in everyday life, society and the workplace by: • using stated assumptions **and making assumptions** and	In connection with the content knowledge, skills, and abilities described in Sub-claims A and B, the student devises and enacts a plan to apply mathematics in solving problems arising in everyday life, society and the workplace by: • using state assumptions and approximations to simplify a real-	In connection with the content knowledge, skills, and abilities described in Sub-claims A and B, the student devises a plan to apply mathematics in solving problems arising in everyday life, society and the workplace by: • using stated assumptions and approximations to simplify a real-world situation

	Algebra I: Sub-Claim D In connection with content, the student solves real-world problems with a degree of difficulty appropriate to the grade/course by applying knowledge and skills articulated in the standards for the current grade/course (or for more complex problems, knowledge and skills articulated in the standards for previous grades/courses), engaging particularly in the Modeling practice, and where helpful making sense of problems and persevering to solve them, reasoning abstractly, and quantitatively, using appropriate tools strategically, looking for the making use of structure and/or looking for and expressing regularity in repeated reasoning.			
	Level 5: Exceeded Expectations	**Level 4: Met Expectations**	**Level 3: Approached Expectations**	**Level 2: Partially Met Expectations**
	approximations to simplify a real-world situation (includes micro-models) • mapping relationships between important quantities • selecting appropriate tools to create models • analyzing relationships mathematically between important quantities to draw conclusion • **analyzing and/or creating constraints, relationships and goals** • **interpreting mathematical results in the context of the situation** • reflecting on whether the results make sense	approximations to simplify a real-world situation**(include micro-models)** • **mapping relationships between important quantities** • **selecting appropriate tools to create models** • **analyzing relationships mathematically between important quantities to draw conclusions**	world situation • **illustrating relationships between important quantities** • using provided tools to create models • analyzing relationship mathematically **between important quantities** to draw conclusions • interpreting mathematical results in a simplified context	• identifying important quantities • using provided tools to create models • analyzing relationships mathematically to draw conclusions • writing an algebraic expression or equation to describe a situation • applying proportional reasoning and percentages
	• improving the model if it has not served its purpose • writing a complete, clear and correct algebraic expression or equation to describe a situation • applying proportional reasoning and percentages **justifying and defending models which lead to a conclusion** • using functions **in any form** to describe how one quantity of	• interpreting mathematical results **in the context of the situation** • reflecting on whether the results make sense • **improving** the model if it has not served its purpose • writing **a complete, clear and correct** algebraic expression or equation to describe a situation • applying proportional reasoning and percentages	• **reflecting on whether the results make sense** • **modifying the model if it has not served its purpose** • writing an algebraic expression or equation to describe a situation • applying proportional reasoning and percentages • **writing and** using functions to describe how one quantity of interest depends on another	• using functions to describe how one quantity of interest depends on another • using statistics • using estimates of known quantities in a chain of reasoning that yields an estimate of an unknown quantity

	Algebra I: Sub-Claim D In connection with content, the student solves real-world problems with a degree of difficulty appropriate to the grade/course by applying knowledge and skills articulated in the standards for the current grade/course (or for more complex problems, knowledge and skills articulated in the standards for previous grades/courses), engaging particularly in the Modeling practice, and where helpful making sense of problems and persevering to solve them, reasoning abstractly, and quantitatively, using appropriate tools strategically, looking for the making use of structure and/or looking for and expressing regularity in repeated reasoning.			
	Level 5: Exceeded Expectations	**Level 4: Met Expectations**	**Level 3: Approached Expectations**	**Level 2: Partially Met Expectations**
	interest depends on another • using statistics • using reasonable estimates of known quantities in a chain of reasoning that yields an estimate of an unknown quantity	• writing and using functions **in any form** to describe how one quantity of interest depends on another • using statistics • using reasonable estimates of known quantities in a chain of reasoning that yields an estimate of an unknown quantity	• using statistics • using **reasonable** estimates of known quantities in a chain of reasoning that yields an estimate of an unknown quantity	