CMAS Integrated Math 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.

	Math 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 and Equations A.SSE.1-1 A.Int.1 A.CED.4-1 A.REI.3 A.SSE.3c-1 A.SSE.3c-2	Manipulates linear formulas and equations **to highlight a quantity of interest in context.** **Interprets** components of contextual exponential expressions and solves equations that require seeing structure.	Manipulates linear formulas and equations for a specified variable. Identifies components of contextual exponential expressions **and solves equations that require seeing structure.**	Manipulates linear formulas and equations to solve for a specified variable requiring one step. **Identifies components of contextual exponential expressions.**	Manipulates linear formulas and equations to solve for a specified variable requiring one step.
Rate of Change F.IF.6-3a F.IF.6-3b F.IF.6-8	Calculates and interprets the average rate of change of linear, exponential, **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 and exponential 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 and exponential functions (presented **symbolically** or as a table) over a specified interval.	Calculates the average rate of change of linear and exponential functions (presented as a table) over a specified interval.
Interpreting Functions F.BF.2	Determines if a given relation is a function.	Determines if a given relation is a function.	Determines if a given relation is a function.	Determines if a given relation is a function. Evaluates with and uses function

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F.Int.1-3 F.IF.1 F.IF.2 F.IF.A.Int.1 F.IF.4-3 F.IF.5-1 S.ID.Int.1 HS.Int.3-1	Evaluates with, uses and **interprets** with function notation within a context. Writes and uses arithmetic and geometric sequences **to model situations.** For linear functions that model contextual relationships, determines **and interprets** key features, graphs the function **and solves problems.** Determines the domain and relates it to the quantitative relationship it describes for a linear, exponential (limited to domains in the integers), **square root, cube root, piecewise, step and absolute value** functions.	Evaluates with and uses function notation **within a context.** Writes arithmetic and geometric sequences. For linear functions that model contextual relationships, determines key features **and graphs the function.** Determines the domain **and relates it to the quantitative relationship it describes for** linear **and exponential (limited to domains in the integers)** functions.	Evaluates with and uses function notation. **Writes** arithmetic sequences. **For linear functions** that model contextual relationships, determines key features. **Determines the domain of linear functions.**	notation. Identifies arithmetic sequences. Given the graph of linear functions that model contextual relationships, determines key features.
Solving Graphically A.REI.10 A.REI.11-1a A.REI.11-1b A.REI.12 A.CED.3-1	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	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,	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 inequalities. Given the graph, finds the solutions to a system of two polynomial functions.

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	successive approximations. **Writes a system of linear inequalities given a context.**	or find successive approximations.		
Congruence Transformations G.CO.C G.CO.6	**Determines and** uses **appropriate** geometric theorems and properties of rigid motions, lines, angles, triangles and parallelograms to solve problems and prove statements about angle measurement, triangles, distance, line properties and congruence.	Uses given geometric theorems and properties of rigid motions, lines, angles, triangles and parallelograms to solve routine problems and **prove statements** about angle measurement, triangles, distance, line properties and congruence.	Uses given geometric theorems and properties of rigid motions, lines, angles, triangles and parallelograms to solve routine problems **and reason about angle measurement, triangles, distance, line properties and congruence.**	Uses given geometric theorems and properties of rigid motions, lines, angles, triangles and parallelograms to solve routine problems.

	Math 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**
Summarizing, Representing and Interpreting Data S.ID.5	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** characteristics of the data representations.
Transformations G.CO.1 G.CO.3	Given a figure and a transformation **(or a sequence of transformations),** draws the	Given a figure and transformation, draws the transformed figure. **Specifies a sequence of**	Given a figure and a transformation, **draws** the transformed figure.	Given a figure and a transformation, **identifies** the transformed figure.

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	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**
G.CO.5	transformed figure. **Uses precise geometric terminology to** specify a **sequence of** transformations that will carry a figure onto **itself or** another.	**transformations that will carry a figure onto another.**		
Solving Systems A.REI.6-1 A.REI.6-2	**Solves multi-step contextual problems that require writing,** solving **and analyzing** systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables with **real** coefficients and solutions. **Solves a given system of three linear equations and three unknowns with rational coefficients.**	Given a system of linear equations, solves contextual problems exactly and approximately, focusing on pairs of linear equations in two variables with **rational** coefficients and solutions.	Given a system of linear equations, **solves** contextual problems exactly and approximately, focusing on pairs of linear equations in two variables with integer coefficients and solutions.	Given the graph of a system of linear equations, identifies the solution to contextual problems exactly and approximately, focusing on pairs of linear equations in two variables with integer coefficients and solutions.
Contextual Problems Functions F.IF.7a-1 F.IF.9-3 F.LE.2-1 F.LE.2-2 F.LE.2-3	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	**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 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 linear functions represented in different ways.	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.

	Math 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**
	integers), **square root, cube root, piece-wise, step and absolute value**.			

	Math I: Sub-Claim C			
	In connection with content, the student expresses grade/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 HS.C.5.6 HS.C.5.10-2 HS.C.6.1 HS.C.10.1 HS.C.14.1 HS.C.14.2 HS.C.18.1	In connection with the content 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:	In connection with the content 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 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:	In connection with the content 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:	In connection with the content 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:

	Math I: Sub-Claim C In connection with content, the student expresses grade/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**
	• 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 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.**	• 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 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).**	• 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 • providing a partial justification of a conclusion based on own calculations • **evaluating the validity of others' approaches and conclusions.**	• 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 • providing a partial justification of a conclusion based on own calculations.

<table>
<tr><td colspan="5">Math 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.</td></tr>
<tr><td></td><td>Level 5: Exceeded Expectations</td><td>Level 4: Met Expectations</td><td>Level 3: Approached Expectations</td><td>Level 2: Partially Met Expectations</td></tr>
<tr>
<td>Modeling
HS.D.1-1
HS.D.2-5
HS.D.2-8
HS.D.3-1b
HS.D.3-3b</td>
<td>In connection with the content knowledge, skills, and abilities described in Sub-claims A and B, 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 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
</td>
<td>In connection with the content knowledge, skills, and abilities described in Sub-claims A and B, devises and enacts a plan to apply mathematics in solving problems arising I everyday life, society and the workplace by:

using stated assumptions and making assumptions and 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 conclusions
interpreting mathematical results in the context of the situation
reflecting on whether the results make sense
</td>
<td>In connection with the content knowledge, skills, and abilities described in Sub-claims A and B, devises and enacts 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
illustrating relationships between important quantities
using provided tools to create models
analyzing relationships mathematically between important quantities to draw conclusions
interpreting mathematical results in a simplified context
reflecting on whether the results make sense
</td>
<td>In connection with the content knowledge, skills, and abilities described in Sub-claims A and B, 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
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
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reflecting on whether the results make sense
improving the model if it has
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improving the model if it has not served its purpose
writing a complete, clear and
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<td>
modifying the model if it has not served its purpose
writing an algebraic expression
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<td>
applying common geometric principles and theorems
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	Math 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**
	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** • applying geometric principals and theorems • 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	**correct** algebraic expression or equation to describe a situation • applying proportional reasoning and percentages • applying geometric principles and theorems • 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	or equation to describe a situation • applying proportional reasoning and percentages • applying geometric principles and theorems • **writing and** using functions 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 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