CMAS Grade 8 Mathematics 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.

	Grade 8 Math : Sub-Claim A The student solves problems involving the Major Content for 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 8 EE.1 8 EE.2	Evaluates and generates equivalent numerical expressions using and applying properties of integer exponents. Solves equations of the form $x^2 = p$ and $x^3 = p$, representing solutions **using √ or $\sqrt[3]{}$ symbols.**	Evaluates and **generates equivalent** numerical expressions using and **applying** properties of integer exponents. **Solves** equations of the form $x^2 = p$, where p is a perfect square, **and solves equations of the form $x^3 = p$, where p is a a perfect cube.**	Evaluates numerical expressions using properties of integer exponents. **Partially solves equations of the form $x^2 = p$, where p is a positive rational number and a perfect square less than or equal to 100, by representing only the positive solution of the equation.**	Evaluates numerical expressions using properties of integer exponents.
Scientific Notation 8.EE.3 8.EE.4-1 8.EE.4-2	Using scientific notation, estimates very large and very small quantities and determines how many times as large one number is in relation to another. Performs operations with numbers expressed in scientific notation. Interprets scientific notation that has been generated by technology. Chooses appropriate units for measuring very large or very small quantities. **Interprets scientific notation in**	Using scientific notation, estimates very large and **very small quantities.** Performs operations with numbers expressed in scientific notation.	Using scientific notation, estimates very large quantities. **Performs operations with numbers expressed in scientific notation.**	Using scientific notation, estimates very large quantities.

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	context.			
Proportional Relationships and Linear Equations 8.EE.5-1 8.EE.5-2 8.EE.6-1 8.F.3-1	Graphs linear relationships in the form *y=mx+b*, including proportional relationships. Interprets the unit rate as the slope of the graph of a proportional relationship and applies these concepts to solve real-world problems. Compares two different proportional relationships represented in different ways. Interprets *y=mx+b* as defining a linear function. Uses similar triangles to show that the slope is the same between any two distinct points on a non-vertical line in the coordinate plane.	Graphs linear relationships, in the form *y=mx+b*, including proportional relationships. Interprets the unit rate as the slope of the graph of a proportional relationship and **applies these concepts to solve real-world problems**. **Compares** two different proportional relationships represented in different ways.	Graphs linear relationships, in the form *y=mx+b*, **including proportional relationships.** **Interprets the unit rate as the slope of the graph of a proportional relationship.** **Makes some comparisons between two different proportional relationships represented in different ways**.	Graphs linear relationships, in the form *y=mx+b*.
Solving Linear Equations 8.EE.7b 8.EE.C.Int. 1	Solves **mathematical and real-world problems** linear equations in one variable, with rational number coefficients, including those that require use of the distributive property and combining like terms.	Solves linear equations in one variable, with rational number coefficients, including those that require use of the distributive property **and** combining like terms.	Solves linear equations in one variable, with rational number coefficients, **including those that require use of the distributive property or combining like terms.**	Solves linear equations in one variable, with rational number coefficients.
Simultaneous Linear Equations	Analyzes and solves mathematical and **real-world** problems leading to pairs of simultaneous linear	**Analyzes** and solves mathematical problems leading to pairs of simultaneous linear equations	Solves mathematical problems leading to pairs of simultaneous linear equations graphically and by	Solves mathematical problems leading to pairs of simultaneous linear equations graphically, where

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8.EE.8a 8.EE.8b-1 8.EE.8b-2 8.EE.8b-3 8.EE.8c	equations graphically, algebraically and by **inspection.** **Understands the relationship between the graphic representation and the algebraic solution to the system.** **Verifies a solution utilizing multiple methods to prove accuracy.**	graphically and **algebraically.**	**inspection**.	the graph is provided.
Functions 8.F.1-1 8.F.1-2 8.F.2 8.F.3-2	Understands that a function is a rule assigning to each input exactly one output, which can be graphed as a set of ordered pairs. Compares properties of two functions represented in different ways. Identifies **and proves** functions that are non-linear**.**	Understands that a function is a rule that assigns to each input exactly one output and can be graphed as a set of ordered pairs. **Compares properties of two functions represented in different ways.**	Understands that a function is a rule that assigns to each input exactly one output **and can be graphed as a set of ordered pairs.**	Understands that a function is a rule that assigns to each input exactly one output.
Congruence and Similarity 8.G.1a 8.G.1b 8.G.1c 8.G.2 8.G.3 8.G.4	Describes the effect of dilations, translations, rotations and reflections on two-dimensional figures with and without coordinates, determines whether two given figures are congruent or similar through one or more transformations and **describes the sequence of transformations to justify congruence or similarity of**	Describes the effect of **dilations**, translations, rotations and reflections on two-dimensional figures **with** coordinates, and determines whether two given figures are congruent **or similar through one or more transformations.**	Describes the effect of translations, rotations **and** reflections on two-dimensional figures without coordinates and determines whether two given figures are congruent.	Describes the effect of translations, rotations or reflections on two-dimensional figures without coordinates and determines whether two given figures are congruent.

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	two figures.			
Pythagorean Theorem 8.G.7-1 8.G.7-2 8.G.8	Applies the Pythagorean Theorem in real world and mathematical problems in two and three dimensions and to find the distance between two points in a coordinate system. **Recognizes situations to apply the Pythagorean Theorem in multi-step problems.**	Applies the Pythagorean Theorem in a simple planar case and **to find the distance between two points in a coordinate system.**	Applies the Pythagorean Theorem in solving **for any side** of the right triangle in a simple planar case without coordinates.	Applies the Pythagorean Theorem in solving for the hypotenuse of a right triangle in a simple planar case without coordinates.

	Grade 8 Math: 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**
Rational Numbers 8.NS.1 8.NS.2	Distinguishes between rational and irrational numbers, understands that these numbers have decimal expansions and approximates their locations on a number line, and converts between terminating decimals or **decimals that repeat eventually** and fractional representations of rational numbers.	Distinguishes between rational and irrational numbers, understands that these numbers have decimal expansions and approximates their locations on a number line, and **converts between terminating decimals or repeating decimals of the form (0.aaa…) and fractional representations of rational numbers.**	Distinguishes between rational and irrational numbers and **understands that these numbers have decimal expansions** and approximates their locations on a number line.	Distinguishes between rational and irrational numbers and approximates their locations on a number line.
Modeling with Functions 8.F.4 8.F.5-1	Constructs a function to model a linear relationship between two quantities described with or without a context.	Constructs a function to model a linear relationship between two quantities described **with or without a context.**	**Constructs** a function to model a linear relationship between two quantities in a table or a graph. Determines the rate of change **and**	Identifies a function to model a linear relationship between two quantities in a table or a graph. Determines the rate of change or

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	Level 5: Exceeded Expectations	**Level 4: Met Expectations**	**Level 3: Approached Expectations**	**Level 2: Partially Met Expectations**
8.F.5-2	Given a description of a relationship or two (*x,y*) values in a table of values or a graph, determines the rate of change and initial value of the function. Analyzes **and** describes the functional relationship between two quantities. Sketches a graph of a function when given a written description.	**Given two (*x,y*) values in a table of values or a graph,** determines the rate of change and initial value of the function. Analyzes the graph of a linear function to describe the functional relationship between two quantities. **Sketches the graph of a function when given a written description.**	initial value of the function from a table or graph that contains the initial value. **Analyzes the graph of a linear function to describe the functional relationship between two quantities.**	initial value of the function from a table or graph that contains the initial value.
Volume 8.G.9	Identifies the formulas for the volume of cones, cylinders and spheres, and uses them to find the volume **or dimensions** of solids in mathematical and real-world problems. **Applies these formulas to multiple composite mathematical solids.**	Identifies the formulas for the volume of cones, cylinders and spheres, and uses them to find the volume of solids in mathematical and **real-world** problems.	Identifies the formulas for the volume of cones, cylinders and spheres, and **uses them to find the volume of solids in mathematical problems.**	Identifies the formulas for the volume of cones, cylinders and spheres.
Bivariate Data 8.SP.1 8.SP.2 8.SP.3 8.SP.4	Analyzes and describes the patterns of association that can be seen in bivariate data by constructing, displaying and interpreting scatter plots and two-way tables. Uses the equation of a linear model to solve problems in context. Informally fits a straight line to a	**Analyzes** and describes the patterns of association that can be seen in bivariate data by **constructing, displaying and** interpreting scatter plots and two-way tables. Uses the equation of a linear model to solve problems in context. **Informally fits a straight line to** a	Describes the patterns of association that can be seen in bivariate data by interpreting scatter plots and two-way tables. **Uses a given equation of a linear model to solve problems in context.** **Identifies a line of best fit for a**	Describes the patterns of association that can be seen in bivariate data by interpreting scatter plots and two-way tables.

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	Level 5: Exceeded Expectations	**Level 4: Met Expectations**	**Level 3: Approached Expectations**	**Level 2: Partially Met Expectations**
	scatter plot that suggests a linear association and **assesses the model fit.** **Compares linear models used to fit the same set of data to determine which is a better fit.**	scatter plot that suggests a linear association.	**scatter plot that suggests a linear association.**	

	Grade 8: 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**
Graphs and Equations 8.C.1.1 8.C.1.2 8.C.2	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 and a given equation or system of equations including: • a logical approach based on a conjecture and/or stated assumptions • a logical and **complete** progression of steps • precision of calculation • correct use of grade-level vocabulary, symbols and labels • complete justification of a	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 and a given equation or system of equations including: • a logical approach based on a conjecture and/or stated assumptions • a logical and **complete** progression of steps • **precision** of calculation • **correct** use of grade-level vocabulary, symbols and labels • **complete** justification of a	In connection with the content knowledge, skills, and abilities described in Sub-claims A and B, the student 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 and a given equation or system of equations including: • a **logical** approach based on a conjecture and/or stated assumptions • a **logical,** but incomplete, progression of steps • **minor** calculation errors • **some** use of grade-level vocabulary, symbols and labels • partial justification of a	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 and a given equation or system of equations including: • a faulty approach based on a conjecture and/or stated assumptions • an illogical or incomplete progression of steps • major calculation errors • limited use of grade-level vocabulary, symbols and labels • partial justification of a

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	Level 5: Exceeded Expectations	**Level 4: Met Expectations**	**Level 3: Approached Expectations**	**Level 2: Partially Met Expectations**
	conclusion • **generalization of an argument or conclusion** • evaluating, interpreting, and critiquing the validity and efficiency of other's responses, approaches and reasoning, conclusions and **reasoning correcting and providing a counterexample where applicable.**	conclusion • evaluating, **interpreting and critiquing** the validity of other's responses, approaches, conclusions and **reasoning**	conclusion • **evaluating the validity of other's approaches and conclusions**	conclusion
Reasoning 8.C.3.1 8.C.3.2 8.C.3.3 8.C.4.1 8.C.6	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 a chain of reasoning to justify or refute algebraic, function or linear-equation propositions or conjectures including: • a logical approach based on a conjecture and/or stated assumptions • a logical and complete progression of steps • precision of calculation • correct use of grade-level vocabulary, symbols and labels • complete justification of a conclusion • **generalization of an argument**	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 a chain of reasoning to justify or refute algebraic, function or linear-equation propositions or conjectures including: • a logical approach based on a conjecture and/or stated assumptions • a logical and **complete** progression of steps • **precision** of calculation • **correct** use of grade-level vocabulary, symbols and labels • **complete** justification of a conclusion • evaluating, **interpreting and**	In connection with the content knowledge, skills, and abilities described in Sub-claims A and B, the student constructs and communicates a **complete** response based on a chain of reasoning to justify or refute algebraic, function or linear-equation propositions or conjectures including: • a **logical** approach based on a conjecture and/or stated assumptions • a **logical**, but incomplete, progression of steps • **minor** calculation errors • **some** use of grade-level vocabulary, symbols and labels • partial justification of a conclusion • **evaluating the validity of**	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 a chain of reasoning to justify or refute algebraic, function or linear-equation propositions or conjectures including: • a faulty approach based on a conjecture and/or stated assumptions • an illogical and incomplete progression of steps • major calculation errors • limited use of grade-level vocabulary, symbols and labels • partial justification of a conclusion.

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	Level 5: Exceeded Expectations	**Level 4: Met Expectations**	**Level 3: Approached Expectations**	**Level 2: Partially Met Expectations**
	or conclusion • evaluating, interpreting and critiquing the validity of other's responses, approaches, conclusions and reasoning, **correcting and providing a counterexample where applicable**	**critiquing** the validity of other's responses, approaches, conclusions and **reasoning**	**other's approaches and conclusions**	
Geometric Reasoning 8.C.5.1 8.C.5.2 8.C.5.3	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 applying geometric reasoning in a coordinate setting and/or use coordinates to draw geometric conclusions including: • a logical approach based on a conjecture and/or stated assumptions • a logical and complete progression of steps • precision of calculation • correct use of grade-level vocabulary, symbols and labels • complete justification of a conclusion • **generalization of an argument or conclusion** • evaluating, interpreting and critiquing the validity and	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 applying geometric reasoning in a coordinate setting and/or use coordinates to draw geometric conclusions including: • a logical approach based on a conjecture and/or stated assumptions • a logical and **complete** progression of steps • **precision** of calculation • **correct** use of grade-level vocabulary, symbols and labels • **complete** justification of a conclusion • evaluating, **interpreting and critiquing** the validity of other's responses, approaches, conclusions and **reasoning**	In connection with the content knowledge, skills, and abilities described in Sub-claims A and B, the student constructs and communicates a **complete** response based on applying geometric reasoning in a coordinate setting and/or use coordinates to draw geometric conclusions including: • a **logical** approach based on a conjecture and/or stated assumptions • a **logical**, but incomplete, progression of steps • **minor** calculation errors • **some** use of grade-level vocabulary, symbols and labels • partial justification of a conclusion • **evaluating the validity of other's approaches and conclusions** • **identifying and describing errors in solutions**	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 applying geometric reasoning in a coordinate setting and/or use coordinates to draw geometric conclusions including: • a faulty approach based on a conjecture and/or stated assumptions • an illogical and incomplete progression of steps • major calculation errors • limited use of grade-level vocabulary, symbols and labels • partial justification of a conclusion

	Grade 8: 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**
	efficiency of other's responses, approaches and reasoning, **correcting and providing a counterexample where applicable** • identifying and describing errors in solutions and presenting correct solutions • **distinguishing correct explanation/reasoning from that which is flawed. If there is a flaw, presents correct reasoning.**	• identifying and describing errors in solutions and **presenting correct solutions**		

	Grade 8: 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 and 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 8.D.1 8.D.2 8.D.3 8.D.4	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 making assumptions and approximations to simplify a real-world situation	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 **making assumptions** and **approximations** to simplify a real-world situation	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 • **illustrating relationships**	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 • identifying important quantities

	Grade 8: 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 and 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**
	• mapping relationships between important quantities by selecting appropriate tools to create models • analyzing relationships mathematically between important quantities to draw conclusions • writing a complete, clear and correct algebraic expression or equation to describe a situation • applying proportional reasoning • writing/using functions to describe how one quantity of interest depends on another	• **mapping** relationships between important quantities by **selecting appropriate** tools to create models • analyzing relationships mathematically between important quantities to draw conclusions • writing a **complete, clear and correct** algebraic expression or equation to describe a situation • applying proportional reasoning • writing/using functions to describe how one quantity of interest depends on another	**between important quantities by using provided tools to create models** • analyzing relationships mathematically **between important quantities** to draw conclusions • writing an incomplete algebraic expression or equation to describe a situation • applying proportional reasoning • **writing**/using functions to describe how one quantity of interest depends on another	using provided tools to create models • analyzing relationships mathematically to draw conclusions • writing an incomplete algebraic expression or equation to describe a situation
	• using reasonable estimates of known quantities in a chain of reasoning that yields an estimate of an unknown quantity • reflecting on whether the results make sense • improving the model if it has not served its purpose • interpreting mathematical results in the context of the situation analyzing and/or creating constraints, relationships and goals analyzing, justifying and defending models which lead to a conclusion	• using reasonable estimates of known quantities in a chain of reasoning that yields an estimate of an unknown quantity • reflecting on whether the results make sense • **improving** the model if it has not served its purpose interpreting mathematical results in the **context of the situation**	• using **reasonable** estimates of known quantities in a chain of reasoning that yields an estimate of an unknown quantity • **reflecting on whether the results make sense** • **modifying the model if it has not served its purpose** **interpreting mathematical results in a simplified context**	• applying proportional reasoning • using functions to describe how one quantity of interest depends on another using unreasonable estimates of known quantities in a chain of reasoning that yields an estimate of an unknown quantity