

Performance Level Descriptors – Algebra II

	Algebra II: 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: Distinguished Command	Level 4: Strong Command	Level 3: Moderate Command	Level 2: Partial Command
<p>Equivalent Expressions</p> <p>N-RN.2 A.Int.1 A-REI.2 A-SSE.2-3 A-SSE.2-6 A-SSE.3c-2</p>	<p>Uses mathematical properties and structure of polynomial, exponential, rational and radical expressions to create equivalent expressions that aid in solving mathematical and contextual problems with three or more steps required.</p> <p>Rewrites exponential expressions to reveal quantities of interest that may be useful.</p>	<p>Uses mathematical properties and structure of polynomial, exponential, rational and radical expressions to create equivalent expressions that aid in solving mathematical and contextual problems with two steps required.</p> <p>Rewrites exponential expressions to reveal quantities of interest that may be useful.</p>	<p>Uses mathematical properties and structure of polynomial, exponential and rational expressions to create equivalent expressions.</p> <p>Rewrites exponential expressions to reveal quantities of interest that may be useful.</p>	<p>Uses provided mathematical properties and structure of polynomial and exponential expressions to create equivalent expressions.</p>
<p>Interpreting Functions</p> <p>A-APR.2 A-REI.11-2 F-IF.4-2</p>	<p>Uses mathematical properties and relationships to reveal key features of polynomial, exponential, rational, trigonometric and logarithmic functions, using them to sketch graphs and identify characteristics of the relationship between two quantities, and applying the remainder theorem where appropriate.</p> <p>Identifies how changing the</p>	<p>Uses mathematical properties and relationships to reveal key features of polynomial, exponential, rational, trigonometric and logarithmic functions, using them to sketch graphs and identify characteristics of the relationship between two quantities, and applying the remainder theorem where appropriate.</p>	<p>Interprets key features of graphs and tables, and uses mathematical properties and relationships to reveal key features of polynomial, exponential and rational functions, using them to sketch graphs.</p>	<p>Uses provided mathematical properties and relationships to reveal key features of polynomial and exponential functions, using them to sketch graphs.</p>

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	parameters of functions impacts key features of graphs.			
Rate of Change F-IF.6-2 F-IF.6-7	Calculates and interprets the average rate of change of polynomial, exponential, logarithmic or trigonometric 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 and interprets the average rate of change of polynomial, exponential, logarithmic or trigonometric functions (presented symbolically or as a table) over a specified interval, and estimates the rate of change from a graph.	Calculates the average rate of change of polynomial and exponential functions (presented symbolically or as a table) over a specified interval, and estimates the rate of change from a graph.	Calculates the average rate of change of polynomial and exponential functions (presented symbolically or as a table) over a specified interval.
Building Functions A-SSE.4-2 F-Int.3 F-BF.1b-1 F-BF.2	Builds functions that model mathematical and contextual situations, including those requiring multiple trigonometric functions, sequences and combinations of these and other functions, and uses the models to solve, interpret and generalize about problems.	Builds functions that model mathematical and contextual situations, including those requiring trigonometric functions, sequences and combinations of these and other functions, and uses the models to solve, interpret and generalize about problems.	Builds functions that model mathematical and contextual situations, including those requiring trigonometric functions, sequences and combinations of these and other functions , and uses the models to solve and interpret problems.	Builds functions that model mathematical and contextual situations, limited to those requiring arithmetic and geometric sequences, and uses the models to solve and interpret problems.

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Statistics & Probability S-IC.3-1	Determines why a sample survey, experiment or observational study is most appropriate. Given an inappropriate choice of a sample survey, experiment or observational study, determines how to change the scenario to make the choice appropriate.	Determines why a sample survey, experiment or observational study is most appropriate. Given an inappropriate choice of a sample survey, experiment or observational study, identifies and supports the appropriate choice.	Determines whether a sample survey, experiment or observational study is most appropriate.	Identifies whether a given scenario represents a sample survey, experiment or observational study.

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Interpreting Functions F-IF.7c F-IF.7e-1 F-IF.7e-2 F-IF.8b F-IF.9-2 F-Int.1-2	<p>Given multiple functions in different forms (algebraically, graphically, numerically and by verbal description), writes multiple equivalent versions of the functions, and identifies and compares key features.</p> <p>Graphs polynomial, exponential, trigonometric and logarithmic functions, showing key features.</p> <p>Determines how the changes of a parameter in functions impact their other representations.</p>	<p>Given multiple functions in different forms (algebraically, graphically, numerically and by verbal description), writes multiple equivalent versions of the functions, and identifies and compares key features.</p> <p>Graphs exponential, polynomial and trigonometric functions, showing key features.</p>	<p>Given functions represented algebraically, graphically, numerically and by verbal description, writes multiple equivalent versions of the functions and identifies key features.</p> <p>Graphs exponential and polynomial functions, showing key features.</p>	<p>Given functions represented algebraically, graphically, numerically and by verbal description, writes equivalent versions of the functions, and identifies key features.</p> <p>Graphs polynomial functions, showing key features.</p>
Equivalent Expressions N-CN.1 N-CN.2 A-APR.6	<p>Uses commutative, associative and distributive properties to perform operations with complex numbers.</p> <p>Rewrites simple rational expressions using inspection or long division, and determines how different</p>	<p>Uses commutative, associative and distributive properties to perform operations with complex numbers.</p> <p>Rewrites simple rational expressions using inspection or long division.</p>	<p>Uses commutative, associative and distributive properties to perform operations with complex numbers.</p> <p>Rewrites simple rational expressions using inspection.</p>	<p>Uses commutative and associative properties to perform operations with complex numbers.</p>

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	forms of an expression reveal useful information.			
Function Transformations F-BF.3-2 F-BF.3-3 F-BF.3-5	Given a context that infers particular transformations, identifies the effects on graphs of polynomial, exponential, logarithmic and trigonometric functions, and determines if the resulting function is even or odd.	Identifies the effects of multiple transformations on graphs of polynomial, exponential, logarithmic and trigonometric functions, and determines if the resulting function is even or odd.	Identifies the effects of a single transformation on graphs of polynomial, exponential, logarithmic and trigonometric functions – including $f(x)+k$, $kf(x)$, $f(kx)$, and $f(x+k)$ – and determines if the resulting function is even or odd.	Identifies the effects of a single transformation on graphs of polynomial, exponential, logarithmic and trigonometric functions – limited to $f(x)+k$ and $kf(x)$ – and determines if the resulting function is even or odd.
Trigonometry F-TF.1 F-TF.8-2	Given a trigonometric value and quadrant for an angle, utilizes the structure and relationships of trigonometry, including relationships in the unit circle, to identify other trigonometric values for that angle, and describes the relationship between the radian measure and the subtended arc in the circle in contextual situations.	Given a trigonometric value and quadrant for an angle, utilizes the structure and relationships of trigonometry, including relationships in the unit circle, to identify other trigonometric values for that angle, and describes the relationship between the radian measure and the subtended arc in the circle.	Given a trigonometric value and quadrant for an angle, utilizes the structure and relationships of trigonometry, including relationships in the unit circle, to identify other trigonometric values for that angle.	Given a trigonometric value and quadrant for an angle, utilizes the structure and relationships of trigonometry to identify other trigonometric values for that angle.

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<p>Solving Equations and Systems</p> <p>N-CN.7 A-REI.4b-2 A-REI.6-2 A-REI.7 F-Int.3 F-BF.Int.2 F-LE.2-3 HS-Int.3-3</p>	<p>Solves multi-step contextual word problems to find similarities and differences between solution approaches involving linear, exponential, quadratic (with real or complex solutions) and trigonometric equations and systems of equations, using inverses where appropriate.</p> <p>Constructs linear and exponential function models in multi-step contextual problems.</p>	<p>Solves multi-step contextual word problems involving linear, exponential, quadratic (with real or complex solutions) and trigonometric equations and systems of equations, using inverses where appropriate.</p> <p>Constructs linear and exponential function models in multi-step contextual problems.</p>	<p>Solves problems involving linear, exponential, quadratic (with real or complex solutions) and trigonometric equations and systems of equations, using inverses where appropriate.</p> <p>Constructs linear and exponential function models in multi-step contextual problems with mathematical prompting.</p>	<p>Solves problems involving linear, exponential and quadratic (with real solutions) equations and systems of equations, using inverses where appropriate.</p> <p>Constructs linear and exponential function models in multi-step contextual problems with mathematical prompting.</p>
<p>Data – Univariate and Bivariate</p> <p>S-ID.4 S-ID.6a-1 S-ID.6a-2</p>	<p>Uses the means and standard deviations of data sets to fit them to normal distributions.</p> <p>Fits exponential or trigonometric functions to data in order to solve multi-step contextual problems.</p> <p>Identifies when these procedures are not appropriate.</p>	<p>Uses the means and standard deviations of data sets to fit them to normal distributions.</p> <p>Fits exponential and trigonometric functions to data in order to solve multi-step contextual problems.</p>	<p>Uses the means and standard deviations of data sets to fit them to normal distributions.</p> <p>Fits exponential functions to data in order to solve multi-step contextual problems.</p>	<p>Uses the means and standard deviations of data sets to fit them to normal distributions.</p> <p>Uses fitted exponential functions to solve multi-step contextual problems.</p>

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Inference S-IC.2 S-IC.Int.1	Uses sample data to make, justify and critique inferences and conclusions about the corresponding population. Decides if specified models are consistent with results from given data-generating processes.	Uses sample data to make inferences and justify conclusions about the corresponding population. Decides if specified models are consistent with results from given data-generating processes.	Uses sample data to make inferences about the corresponding population.	Identifies when sample data can be used to make inferences about the corresponding population.
Probability S-CP.Int.1	Recognizes, determines and uses conditional probability and independence in multi-step contextual problems, using appropriate set language and appropriate representations, including two-way frequency tables. Applies the Addition Rule of probability and interprets answers in context.	Recognizes, determines and uses conditional probability and independence in multi-step contextual problems, using appropriate set language and appropriate representations, including two-way frequency tables. Applies the Addition Rule of probability.	Recognizes, determines and uses conditional probability and independence in contextual problems, using appropriate set language and appropriate representations, including two-way frequency tables.	Recognizes and determines conditional probability and independence in contextual problems.

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	Algebra II: Sub-Claim C			
	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.			
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Reasoning HS.C.3.1 HS.C.3.2 HS.C.4.1 HS.C.5.4 HS.C.5.11 HS.C.6.2 HS.C.6.4 HS.C.7.1 HS.C.8.2 HS.C.8.3 HS.C.9.2 HS.C.11.1 HS.C.12.2 HS.C.16.3 HS.C.17.2 HS.C.17.3 HS.C.17.4 HS.C.17.5 HS.C.18.4 HS.C.CCR	Clearly constructs and communicates a complete response based on: <ul style="list-style-type: none"> • a response to a given equation or system of equations • a chain of reasoning to justify or refute algebraic, function or number system propositions or conjectures • a response based on data • a response based on the graph of an equation in two variables, the principle that a graph is a solution set or the relationship between zeros and factors of polynomials • a response based on trigonometric functions and the unit circle • a response based on 	Clearly constructs and communicates a complete response based on: <ul style="list-style-type: none"> • a response to a given equation or system of equations • a chain of reasoning to justify or refute algebraic, function or number system propositions or conjectures, • a response based on data • a response based on the graph of an equation in two variables, the principle that a graph is a solution set or the relationship between zeros and factors of polynomials • a response based on trigonometric functions and the unit circle • a response based on 	Constructs and communicates a response based on: <ul style="list-style-type: none"> • a response to a given equation or system of equations • a chain of reasoning to justify or refute algebraic, function or number system propositions or conjectures • a response based on data • a response based on the graph of an equation in two variables, the principle that a graph is a solution set or the relationship between zeros and factors of polynomials • a response based on trigonometric functions and the unit circle • a response based on 	Constructs and communicates an incomplete response based on: <ul style="list-style-type: none"> • a response to a given equation or system of equations • a chain of reasoning to justify or refute algebraic, function or number system propositions or conjectures • a response based on data • a response based on the graph of an equation in two variables, the principle that a graph is a solution set or the relationship between zeros and factors of polynomials • a response based on trigonometric functions and the unit circle • a response based on

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Algebra II: Sub-Claim C				
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.				
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<p>transformations of functions OR</p> <ul style="list-style-type: none"> a response based on properties of exponents <p>by:</p> <ul style="list-style-type: none"> 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 	<p>transformations of functions OR</p> <ul style="list-style-type: none"> a response based on properties of exponents <p>by:</p> <ul style="list-style-type: none"> 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 	<p>transformations of functions OR</p> <ul style="list-style-type: none"> a response based on properties of exponents <p>by:</p> <ul style="list-style-type: none"> 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 	<p>transformations of functions OR</p> <ul style="list-style-type: none"> a response based on properties of exponents <p>by :</p> <ul style="list-style-type: none"> 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 	

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	Level 5: Distinguished Command	Level 4: Strong Command	Level 3: Moderate Command	Level 2: Partial Command
	<ul style="list-style-type: none"> determining whether an argument or conclusion is generalizable evaluating, interpreting and critiquing the validity and efficiency of others' responses, approaches and reasoning – utilizing mathematical connections (when appropriate) – and providing a counter-example where applicable 	<ul style="list-style-type: none"> evaluating, interpreting and critiquing the validity of others' responses, approaches and reasoning – utilizing mathematical connections (when appropriate) 	<ul style="list-style-type: none"> evaluating the validity of others' approaches and conclusions 	

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<p style="text-align: center;">Algebra II: Sub-Claim D</p> <p>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.</p>				
	Level 5: Distinguished Command	Level 4: Strong Command	Level 3: Moderate Command	Level 2: Partial Command
<p>Modeling</p> <p>HS.D.2-3 HS.D.2-4 HS.D.2-7 HS.D.2-10 HS.D.2-12 HS.D.2-13 HS.D.3-5 HS.D.3-6 HS.D.CCR</p>	<p>Devises a plan to apply mathematics in solving problems arising in everyday life, society and the workplace by:</p> <ul style="list-style-type: none"> • using stated assumptions and approximations to simplify a real-world situation • mapping relationships between important quantities • selecting appropriate tools to create the appropriate model • analyzing relationships mathematically between important quantities (either given or created) to draw conclusions 	<p>Devises a plan to apply mathematics in solving problems arising in everyday life, society and the workplace by:</p> <ul style="list-style-type: none"> • using stated assumptions and approximations to simplify a real-world situation • mapping relationships between important quantities • selecting appropriate tools to create the appropriate model • analyzing relationships mathematically between important quantities (either given or created) to draw conclusions • interpreting 	<p>Devises a plan to apply mathematics in solving problems arising in everyday life, society and the workplace by:</p> <ul style="list-style-type: none"> • using stated assumptions and approximations to simplify a real-world situation • illustrating relationships between important quantities • using provided tools to create appropriate but inaccurate model • analyzing relationships mathematically between important given quantities to draw conclusions • interpreting mathematical results in 	<p>Devises a plan to apply mathematics in solving problems arising in everyday life, society and the workplace by:</p> <ul style="list-style-type: none"> • using stated assumptions and approximations to simplify a real-world situation • identifying important given quantities • using provided tools to create inaccurate model • analyzing relationships mathematically to draw conclusions • writing an expression, equation or function to describe a situation • using securely held content incompletely reporting a conclusion,

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Algebra II: Sub-Claim D 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: Distinguished Command	Level 4: Strong Command	Level 3: Moderate Command	Level 2: Partial Command
	<ul style="list-style-type: none"> • 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 expression, equation or function to describe a situation • analyzing and/or creating constraints, relationships and goals • justifying and defending models which lead to a conclusion • using geometry to solve design problems • using securely held 	<p style="text-align: center;">mathematical results in the context of the situation</p> <ul style="list-style-type: none"> • reflecting on whether the results make sense • improving the model if it has not served its purpose • writing a complete, clear and correct expression, equation or function to describe a situation • using geometry to solve design problems • using securely held content, briefly, but accurately reporting the conclusion • identifying and using relevant data from a data source 	<p style="text-align: center;">a simplified context</p> <ul style="list-style-type: none"> • reflecting on whether the results make sense • modifying the model if it has not served its purpose • writing an expression, equation or function to describe a situation • using geometry to solve design problems • using securely held content, incompletely reporting a conclusion • selecting and using some relevant data from a data source • making an evaluation or recommendation 	<p style="text-align: center;">with some inaccuracy within the reporting</p> <ul style="list-style-type: none"> • indiscriminately using data from a data source

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	Level 5: Distinguished Command	Level 4: Strong Command	Level 3: Moderate Command	Level 2: Partial Command
	content, accurately reporting and justifying the conclusion <ul style="list-style-type: none"> • identifying and using relevant data from a data source • making an appropriate evaluation or recommendation 	<ul style="list-style-type: none"> • making an appropriate evaluation or recommendation 		