Algebra 2 Course-Level Expanded Expectations

NUMBER AND QUANTITY: NQ

A2.NQ.A	**Extend and use the relationship between rational exponents and radicals.**	
A2.NQ.A.1	Extend the system of powers and roots to include rational exponents.	The expectation of the student is to extend the system of powers and roots to include rational exponents, particularly rational exponents with integer numerators other than 1.
A2.NQ.A.2	Create and recognize equivalent expressions involving radical and exponential forms of expressions.	The expectation of the student is to create and recognize equivalent expressions involving radical and exponential forms of expressions containing exponents, including rational exponents.
A2.NQ.A.3	Add, subtract, multiply and divide radical expressions.	The expectation of the student is to add, subtract, multiply and divide radical expressions. When necessary, rationalize denominators using conjugates.
A2.NQ.A.4	Solve equations involving rational exponents and/or radicals and identify situations where extraneous solutions may result.	The expectation of the student is to solve equations involving rational exponents and/or radicals and manage appropriately the situations where extraneous solutions may result.
A2.NQ.B	**Use complex numbers.**	
A2.NQ.B.5	Represent complex numbers.	The expectation of the student is to represent complex numbers in the form $a + bi$, where a and b are real numbers. The symbol i is defined to be the square root of -1.
A2.NQ.B.6	Add, subtract, multiply and divide complex numbers.	The expectation of the student is to add, subtract, multiply and divide complex numbers. Leave all answers in the form $a + bi$.
A2.NQ.B.7	Know and apply the Fundamental Theorem of Algebra.	The expectation of the student is to know and apply the Fundamental Theorem of Algebra.

SEEING STRUCTURE IN EXPRESSIONS: SSE

A2.SSE.A	**Define and use logarithms.**	
A2.SSE.A.1	Develop the definition of logarithms based on properties of exponents.	The expectation of the student is to define a logarithm of a given base b of a quantity to be the exponent to which you raise the base to get that quantity *(e.g., $\log_b(x) = y$ if and only if $b^y = x$)*.
A2.SSE.A.2	Use the inverse relationship between exponents and logarithms to solve exponential and logarithmic equations.	The expectation of the student is to use the inverse relationship between exponents and logarithms to solve simple exponential and logarithmic equations. (e.g., *Solve $2^x = 5$ and $\log_2(x) = 3$.)*
A2.SSE.A.3	Use properties of logarithms to solve equations or find equivalent expressions.	The expectation of the student is to use properties of logarithms to do the following: a. Convert an exponent into a multiplier (factor). b. Convert between a logarithm of factors and the sum of the logarithms of the individual factors. c. Convert between a logarithm of a quotient and the difference of the logarithms of the dividend and divisor.
A2.SSE.A.4	Understand why logarithmic scales are used, and use them to solve problems.	The expectation of the student is to understand why logarithmic scales are used, and use them to solve problems. Use logarithmic scales to compare quantities and solve problems involving logarithms*. (e.g., pH scale, earthquake intensity, light intensity and sound intensity)*
REASONING WITH EQUATIONS AND INEQUALITIES: REI		
A2.REI.A	**Solve equations and inequalities.**	
A2.REI.A.1	Create and solve equations and inequalities, including those that involve absolute value.	The expectation of the student is to create and solve equations and inequalities, including those that involve absolute value. These equations and inequalities would include, but wound not be limited to: linear, quadratic, cubic, exponential, step functions and absolute value. The student may use graphical and/or algebraic methods to solve these problems.
A2.REI.A.2	Solve rational equations where numerators and denominators are polynomials and where extraneous solutions may result.	The expectation of the student is to solve rational equations, where numerators and denominators are polynomials and where extraneous solutions may result.
A2.REI.B	**Solve general systems of equations and inequalities.**	

A2.REI.B.3	Create and solve systems of equations that may include non-linear equations and inequalities.	The expectation of the student is to create and solve systems of equations that may include non-linear equations and inequalities. Extend solving systems of equations to finding solutions of systems with two unknowns that include non-linear equations or inequalities. The student may use graphical and/or algebraic methods.
ARITHMETIC WITH POLYNOMIALS AND RATIONALS: APR		
A2.APR.A	**Perform operations on polynomials and rational expressions.**	
A2.APR.A.1	Extend the knowledge of factoring to include factors with complex coefficients.	The expectation of the student is to extend the knowledge of factoring to completely factor general polynomial expressions.
A2.APR.A.2	Understand the Remainder Theorem and use it to solve problems.	The expectation of the student is to use factoring techniques to solve general polynomial equations, which could include complex solutions. Extend operations on polynomial expressions to include long division of a polynomial of degree 2 or higher by a binomial. Express the result as a quotient with a remainder. Understand the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division of $p(x)$ by $(x-a)$ is $p(a)$, so $p(a) = 0$ if and only if $(x-a)$ is a factor of $p(x)$.
A2.APR.A.3	Find the least common multiple of two or more polynomials.	The expectation of the student is to find the least common multiple of two or more polynomials.
A2.APR.A.4	Add, subtract, multiply and divide rational expressions.	The expectation of the student is to add, subtract, multiply and divide rational expressions.
A2.APR.A.5	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to sketch the function defined by the polynomial.	The expectation of the student is to identify zeros of polynomials when suitable factorizations are available, and use the zeros to sketch the function defined by the polynomial.
INTERPRETING FUNCTIONS: IF		
A2.IF.A	**Use and interpret functions.**	

A2.IF.A.1	Identify and interpret key characteristics of functions represented graphically, with tables and with algebraic symbolism to solve problems.	The expectation of the student is to identify domain and range of functions, and identify unique characteristics of functions represented graphically, with tables, with algebraic symbolism and translate between these representations. Function types include general polynomials, square roots, cube roots, absolute value of linear functions, simple piecewise- defined functions, step functions, exponential and logarithmic functions. These unique characteristics include the following: a. *x*- and *y*-intercepts, if any b. end behavior c. limited domains and ranges d. local maxima or minima values e. symmetries f. specific values of the function g. intervals of increasing and decreasing h. points of discontinuity i. vertical or horizontal asymptotes
A2.IF.A.2	Translate between equivalent forms of functions.	The expectation of the student is to translate between equivalent forms of functions. Find equivalent forms of functions to highlight key characteristics.
BUILDING FUNCTIONS: BF		
A2.BF.A	**Create new functions from existing functions.**	
A2.BF.A.1	Create new functions by applying the four arithmetic operations and composition of functions (modifying the domain and range as necessary).	The expectation of the student is to create functions by performing operations on functions, including addition, subtraction, multiplication, division and composition of functions. Modify the domain and range if necessary. (*e.g., to restrict a domain in order to avoid a zero denominator in a quotient of functions*)
A2.BF.A.2	Derive inverses of functions, and compose the inverse with the original function to show that the functions are inverses.	The expectation of the student is to derive inverses of simple functions, and compose the inverse with the original function to prove that the functions are inverses.

A2.BF.A.3	Describe the effects of transformations algebraically and graphically, creating vertical and horizontal translations, vertical and horizontal reflections and dilations (expansions/compressions) for linear, quadratic, cubic, square and cube root, absolute value, exponential and logarithmic functions.	The expectation of the student is to describe the effects of transformations algebraically and graphically, creating vertical and horizontal translations, vertical and horizontal reflections and dilations (scale changes causing expansions or compressions horizontally or vertically) for linear, quadratic, cubic, square and cube root, absolute value, exponential, logarithmic.
FUNCTION MODELING: FM		
A2.FM.A	**Use functions to model real-world problems.**	
A2.FM.A.1	Create functions and use them to solve applications of quadratic and exponential function modeling problems.	The expectation of the student is to create functions and use them to solve simple applications of quadratic and exponential function models. The student may use graphical and/or algebraic methods. (*e.g., price-demand-cost-revenue-profit situations, compound interest problems and exponential growth or decay problems)*
DATA AND STATISTICAL ANALYSIS: DS		
A2.DS.A	**Make inferences and justify conclusions.**	
A2.DS.A.1	Analyze how random sampling could be used to make inferences about population parameters.	The expectation of the student is to analyze how random sampling could be used to make inferences about a population.
A2.DS.A.2	Determine whether a specified model is consistent with a given data set.	The expectation of the student is to determine whether a specified model is consistent with a given data set. (e*.g., A model says a spinning coin falls heads up with probability 0.5. Would an experimental result of 5 tails in a row cause you to question the model?)*
A2.DS.A.3	Describe and explain the purposes, relationship to randomization and differences, among sample surveys, experiments and observational studies.	The expectation of the student is to describe and explain the purposes, relationship to randomization and differences among sample surveys, experiments and observational studies.
A2.DS.A.4	Use data from a sample to estimate characteristics of the population and recognize the meaning of the margin of error in these estimates.	The expectation of the student is to use data from a sample survey to estimate a population mean or proportion and recognize the meaning of the margin of error in these estimates.
A2.DS.A.5	Describe and explain how the relative sizes of a sample and the population affect the margin of error of predictions.	The expectation of the student is to describe and explain how the relative sizes of a sample and the population affect the margin of error of predictions and thus the validity of these predictions.

A2.DS.A.6	Analyze decisions and strategies using probability concepts.	The expectation of the student is to analyze decisions and strategies using probability concepts.
A2.DS.A.7	Evaluate reports based on data.	The expectation of the student is to evaluate reports based on data.
A2.DS.B	**Fit a data set to a normal distribution.**	
A2.DS.B.8	Know and use the characteristics of normally distributed data sets; predict what percentage of the data will be above or below a given value that is a multiple of standard deviations above or below the mean.	The expectation of the student is given a data set that is known to be normally distributed, predict what percentage of the data will be above or below a given value that is a multiple of standard deviations above or below the mean. *(e.g., Given the mean and standard deviation of heights of adult males, how many of a thousand randomly selected adults males would be expected to be taller than three standard deviations above the mean?)*
A2.DS.B.9	Fit a data set to a distribution using its mean and standard deviation to determine whether the data is approximately normally distributed.	The expectation of the student is to fit a data set to a distribution using its mean and standard deviation to determine whether the data is approximately normally distributed.