Number Systems and Non-Linear Expressions & Equations

Big Idea

A2.1.1 Operations with Complex Numbers

A2.1.1.1 Represent and/or use imaginary numbers in equivalent forms (e.g., square roots and exponents).		How can imaginary numbers be represented in equivalent forms?	
Concepts	**Competencies**	**Resources**	**Assessments**
A2.1.1.1.1 Simplify/write square roots in terms of i (e.g., $\sqrt{-24} = 2i\sqrt{6}$). **A2.1.1.1.2** Simplify/evaluate expressions involving powers of i (e.g., $I^6 + I^3 = -1 - i$).	**CC.2.1.HS.F.6** Extend the knowledge of arithmetic operations and apply to complex numbers.	Big Ideas Algebra 2 Textbook Chapter 3	District Created Curriculum based assessment
Vocabulary: imaginary number, complex number, simplest radical form			

Number Systems and Non-Linear Expressions & Equations

Big Idea

A2.1.1 Operations with Complex Numbers

A2.1.1.2 Apply the order of operations in computation and in problem-solving situations.		How are operations on complex numbers performed?	
Concepts	**Competencies**	**Resources**	**Assessments**
A2.1.1.2.1 Add and subtract complex numbers (e.g., $(7 - 3i) - (2 + i) = 5 - 4i$). **A2.1.1.2.2** Multiply and divide complex numbers (e.g., $(7 - 3i)(2 + i) = 17 + i$).	**CC.2.1.HS.F.6** Extend the knowledge of arithmetic operations and apply to complex numbers.	Big Ideas Algebra 2 Textbook Chapter 3	District Created Curriculum based assessment

Vocabulary: imaginary number, complex number

Number Systems and Non-Linear Expressions & Equations

Big Idea

A2.1.2 Non-Linear Expressions

A2.1.2.1 Use exponents, roots, and/or absolute values to represent equivalent forms or to solve problems.	How can the properties of exponents be used to simplify expressions? How can exponents, roots, and logarithms be used to represent equivalent forms?

Concepts	Competencies	Resources	Assessments
A2.1.2.1.1 Use exponential expressions to represent rational numbers. **A2.1.2.1.2** Simplify/evaluate expressions involving positive and negative exponents and/or roots (may contain all types of real numbers—exponents should not exceed power of 10). **A2.1.2.1.3** Simplify/evaluate expressions involving multiplying with exponents (e.g., $x^6 \cdot x^7 = x^{13}$), powers of powers (e.g., $(x^6)^7 = x^{42}$), and powers of products (e.g., $(2x^2)^3 = 8x^6$). Note: Limit to rational exponents. **A2.1.2.1.4** Simplify or evaluate expressions involving logarithms and exponents (e.g., $\log_2 8 = 3$ or $\log_4 2 = \frac{1}{2}$).	**CC.2.1.HS.F.1** Apply and extend the properties of exponents to solve problems with rational exponents. **CC.2.2.HS.D.2** Write expressions in equivalent forms to solve problems.	Big Ideas Algebra 2 Textbook Chapter 5 (exponents) Chapter 6 (logarithms)	District Created Curriculum based assessment

Vocabulary: radical, radicand, exponent, base, product of powers, power of a power, quotient of powers, power of a product, power of a quotient, logarithm, e, natural logarithm

Number Systems and Non-Linear Expressions & Equations

Big Idea

A2.1.2 Non-Linear Expressions

A2.1.2.2 Simplify expressions involving polynomials.		How can polynomial expressions be simplified and factored?	
Concepts	**Competencies**	**Resources**	**Assessments**
A2.1.2.2.1 Factor algebraic expressions, including difference of squares and trinomials. Note: Trinomials limited to the form ax^2+bx+c where a is not equal to 0. **A2.1.2.2.2** Simplify rational algebraic expressions.	**CC.2.2.HS.D.1** Interpret the structure of expressions to represent a quantity in terms of its context. **CC.2.2.HS.D.2** Write expressions in equivalent forms to solve problems. **CC.2.2.HS.D.3** Extend the knowledge of arithmetic operations and apply to polynomials. **CC.2.2.HS.D.4** Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs. **CC.2.2.HS.D.5** Use polynomial identities to solve problems.	Big Ideas Algebra 2 Textbook Chapter 3 (quadratics) Chapter 7 (rationals)	District Created Curriculum based assessment

Vocabulary: polynomial, like terms, monomial, binomial, trinomial, constant, linear, quadratic, cubic, quartic, quintic, degree, factor, gcf, difference of two squares, perfect square trinomial

Number Systems and Non-Linear Expressions & Equations

Big Idea

A2.1.3 Non-Linear Equations

A2.1.3.1 Write and/or solve non-linear equations using various	How can various methods be used to solve non-linear equations?

methods.

Concepts	Competencies	Resources	Assessments
A2.1.3.1.1 Write and/or solve quadratic equations (including factoring and using the Quadratic Formula). **A2.1.3.1.2** Solve equations involving rational and/or radical expressions (e.g., $10/(x + 3) + 12/(x – 2) = 1$ or $\sqrt{x^2} + 21x = 14$). **A2.1.3.1.3** Write and/or solve a simple exponential or logarithmic equation (including common and natural logarithms). **A2.1.3.1.4** Write, solve, and/or apply linear or exponential growth or decay (including problem situations).	**CC.2.2.HS.C.2** Graph and analyze functions, and use their properties to make connections between the different representations. **CC.2.2.HS.C.3** Write functions or sequences that model relationships between two quantities. **CC.2.2.HS.C.4** Interpret the effects transformations have on functions, and find the inverses of functions. **CC.2.2.HS.C.5** Construct and compare linear, quadratic, and exponential models to solve problems. **CC.2.2.HS.C.6** Interpret functions in terms of the situations they model. **CC.2.2.HS.D.5** Use polynomial identities to solve problems. **CC.2.2.HS.D.6** Extend the knowledge of rational functions to rewrite in equivalent forms. **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.	Big Ideas Algebra 2 Textbook Chapter 3 (quadratics) Chapter 5 (radicals) Chapter 7 (rationals) Chapter 6 (growth/decay)	District Created Curriculum based assessment

	CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. CC.2.2.HS.D.9 Use reasoning to solve equations, and justify the solution method. CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.		
Vocabulary: quadratic equation, quadratic formula, completing the square, solve by factoring, radical equation, rational equation, logarithmic equation			

Number Systems and Non-Linear Expressions & Equations

Big Idea

A2.1.3 Non-Linear Equations

A2.1.3.2 Describe and/or determine change.		How does a change in one variable effect another variable?	
Concepts	**Competencies**	**Resources**	**Assessments**
A2.1.3.2.1 Determine how a change in one variable relates to a change in a second variable (e.g., $y = 4/x$; if x doubles, what happens to y?). **A2.1.3.2.2** Use algebraic processes to solve a formula for a given variable (e.g., solve $d = rt$ for r).	**CC.2.2.HS.C.2** Graph and analyze functions, and use their properties to make connections between the different representations. **CC.2.2.HS.C.3** Write functions or sequences that model relationships between two quantities. **CC.2.2.HS.C.4** Interpret the effects transformations have on	Big Ideas Algebra 2 Textbook Chapter 8 (sequences) Chapters 1&2 (transformations) Chapter 5 (inverses of functions)	District Created Curriculum based assessment

	functions, and find the inverses of functions. **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships. **CC.2.2.HS.D.8** Apply inverse operations to solve equations or formulas for a given variable. **CC.2.2.HS.D.9** Use reasoning to solve equations, and justify the solution method.		
Vocabulary: variable, direct variation, inverse variation, joint variation, literal equation			

Functions and Data Analysis			
Big Idea			
A2.2.1 Patterns, Relations, and Functions			
A2.2.1.1 Analyze and/or use patterns or relations.		How are patterns used to analyze data and relations?	
Concepts	**Competencies**	**Resources**	**Assessments**
A2.2.1.1.1 Analyze a set of data for the existence of a pattern, and represent the pattern with a rule algebraically and/or graphically. **A2.2.1.1.2** Identify and/or extend a pattern as either an arithmetic or geometric sequence (e.g., given a geometric sequence, find the 20th term).	**CC.2.1.HS.F.7** Apply concepts of complex numbers in polynomial identities and quadratic equations to solve problems. **CC.2.2.HS.C.1** Use the concept and notation of functions to interpret and apply them in terms of their context. **CC.2.2.HS.C.2** Graph and analyze functions, and use their properties to make	Big Ideas Algebra 2 Textbook Chapter 1 (linear models) Chapter 2 (quadratic models) Chapter 8 (sequences) Chapter 4 (polynomials)	District Created Curriculum based assessment

A2.2.1.1.3 Determine the domain, range, or inverse of a relation. **A2.2.1.1.4** Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function (e.g., intervals of increase/decrease, intercepts, zeros, and asymptotes).	connections between the different representations. **CC.2.2.HS.C.3** Write functions or sequences that model relationships between two quantities. **CC.2.2.HS.C.5** Construct and compare linear, quadratic, and exponential models to solve problems. **CC.2.2.HS.C.6** Interpret functions in terms of the situations they model. **CC.2.3.HS.A.10** Translate between the geometric description and the equation for a conic section. **CC.2.4.HS.B.2** Summarize, represent, and interpret data on two categorical and quantitative variables.		
Vocabulary: data, domain, range, arithmetic sequence, geometric sequence, intervals of increase/decrease, intercepts, zeros, asymptotes			

Functions and Data Analysis			
Big Idea			
A2.2.2 Applications of Functions			
A2.2.2.1 Create, interpret, and/or use polynomial, exponential, and/or logarithmic functions and their equations, graphs, or tables.		How can non-linear functions be represented by graphs and tables?	
Concepts	**Competencies**	**Resources**	**Assessments**

A2.2.2.1.1 Create, interpret, and/or use the equation, graph, or table of a polynomial function (including quadratics). **A2.2.2.1.2** Create, interpret, and/or use the equation, graph, or table of an exponential or logarithmic function (including common and natural logarithms). **A2.2.2.1.3** Determine, use, and/or interpret minimum and maximum values over a specified interval of a graph of a polynomial, exponential, or logarithmic function. **A2.2.2.1.4** Translate a polynomial, exponential, or logarithmic function from one representation of a function to another (graph, table, and equation).	**CC.2.1.HS.F.3** Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays. **CC.2.1.HS.F.4** Use units as a way to understand problems and to guide the solution of multi-step problems. **CC.2.2.HS.C.3** Write functions or sequences that model relationships between two quantities. **CC.2.2.HS.C.4** Interpret the effects transformations have on functions, and find the inverses of functions. **CC.2.2.HS.C.5** Construct and compare linear, quadratic, and exponential models to solve problems. **CC.2.2.HS.C.6** Interpret functions in terms of the situations they model. **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships. **CC.2.3.HS.A.10** Translate between the geometric description and the equation for a conic section.	Big Ideas Algebra 2 Textbook Chapter 4 (polynomials) Chapter 6 (exp/logarithms)	District Created Curriculum based assessment

Vocabulary: polynomial function, exponential function, logarithmic function, rational function, transformation, asymptote, zero, maximum/minimum, increase/decrease interval

Functions and Data Analysis			
Big Idea			
A2.2.2 Applications of Functions			
A2.2.2.2 Describe and/or determine families of functions.		How can a transformed function be related to its parent function?	
Concepts	**Competencies**	**Resources**	**Assessments**
A2.2.2.2.1 Identify or describe the effect of changing parameters within a family of functions (e.g., $y = x^2$ and $y = x^2 + 3$, or $y = x^2$ and $y = 3x^2$).	**CC.2.2.HS.C.4** Interpret the effects transformations have on functions, and find the inverses of functions. **CC.2.2.HS.C.5** Construct and compare linear, quadratic, and exponential models to solve problems. **CC.2.2.HS.C.6** Interpret functions in terms of the situations they model.	Big Ideas Algebra 2 Textbook Chapter 1 (transformations) Chapter 2 (quadratic transformations) Chapter 4 (polynomial transformations)	District Created Curriculum based assessment
Vocabulary: parent function, transformation (translation, reflection, stretch, compression)			

Functions and Data Analysis			
Big Idea			
A2.2.3 Data Analysis			
A2.2.3.1 Analyze and/or interpret data on a scatter plot and/or use a scatter plot to make predictions.		How can scatter plots be used to interpret data and make predications?	
Concepts	**Competencies**	**Resources**	**Assessments**

A2.2.3.1.1 Draw, identify, find, interpret, and/or write an equation for a regression model (lines and curves of best fit) for a scatter plot. **A2.2.3.1.2** Make predictions using the equations or graphs of regression models (lines and curves of best fit) of scatter plots.	**CC.2.1.HS.F.3** Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays. **CC.2.1.HS.F.5** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **CC.2.4.HS.B.2** Summarize, represent, and interpret data on two categorical and quantitative variables. **CC.2.4.HS.B.3** Analyze linear models to make interpretations based on the data.	Big Ideas Algebra 2 Textbook Chapter 1 Chapter 2	District Created Curriculum based assessment
Vocabulary: scatter plot, data, regression model, line of best fit, curve of best fit			

Functions and Data Analysis			
Big Idea **A2.2.3 Data Analysis**			
A2.2.3.2 Apply probability to practical situations.		How can the probability of an event be calculated?	
Concepts	**Competencies**	**Resources**	**Assessments**
A2.2.3.2.1 Use combinations, permutations, and the fundamental counting principle to solve problems involving probability. **A2.2.3.2.2** Use odds to find	**CC.2.4.HS.B.4** Recognize and evaluate random processes underlying statistical experiments. **CC.2.4.HS.B.5** Make inferences and justify conclusions based on sample	Big Ideas Algebra 2 Textbook Chapter 10 (probability)	District Created Curriculum based assessment

probability and/or use probability to find odds. **A2.2.3.2.3** Use probability for independent, dependent, or compound events to predict outcomes.	surveys, experiments, and observational studies. **CC.2.4.HS.B.6** Use the concepts of independence and conditional probability to interpret data. **CC.2.4.HS.B.7** Apply the rules of probability to compute probabilities of compound events in a uniform probability model.		
Vocabulary: probability, fundamental counting principle, permutation, combination, odds, independent events, dependent events, compound events, conditional probability			