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Core Subject Area: Algebra II Mathematics

Mathematics, Algebra II

Standard	Designated Section
Domain: Number and Quantity	
Perform arithmetic operations with complex numbers.	
N.CN.1 Know there is a complex number i that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.	Module 3 Task 5 My Irrational and Imaginary Friends
N.CN.2 Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	Module 3 Task 5 My Irrational and Imaginary Friends
Use Complex numbers in polynomial identities and equations.	
N.CN.7 Solve quadratic equations with real coefficients that have complex solutions.	Module 3 Task 4 To Be Determined Module 3 Task 5 My Irrational and Imaginary Friends
N.CN.8 Extend polynomial identities to the complex numbers. *For example, rewrite* $x^2 + 4$ *as* $(x + 2i)(x - 2i)$.	Module 3 Task 4 To Be Determined Module 3 Task 5 My Irrational and Imaginary Friends

	Module 4 Task 4 Getting to the Root of the Problem Module 4 Task 6 Puzzling Over Polynomials
N.CN.9 Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.	Module 3 Task 4 To Be Determined Module 3 Task 5 My Irrational and Imaginary Friends Module 4 Task 3 Building Stronger Roots Module 4 Task 4 Getting to the Root of the Problem Module 4 Task 6 Puzzling Over Polynomials
Domain: Algebra	
Interpret the structure of expressions.	
A.SSE.1 Interpret expressions that represent a quantity in terms of its context. ★ a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret* $P(1+r)^n$ *as the product of P and a factor not depending on P.*	Module 4 Task 3 Building Stronger Roots Module 4 Task 5 Is This the End
A.SSE.2 Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$*, thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$.	**A.SSE.2 is throughout Module 3 and 4, both in the tasks and in the RSG's.
Write expressions in equivalent forms to solve problems.	
A.SSE.4 Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments*. ★	
Perform arithmetic operations on polynomials.	
A.APR.1 Understand that polynomials form a system analogous to the integers; namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	Module 3 Task 1 It All Adds Up Module 3 Task 2 Pascal's Pride Module 3 Task 3 Divide and Conquer Module 3 Task 6 Sorry, We're Closed
Understand the relationship between zeros and factors of polynomials.	
A.APR.2 Know and apply the Remainder Theorem: For a polynomial *p(x)* and a number *a,* the remainder on division by *x-a* is a factor of *p(x).*	Module 3 Task 3 Divide and Conquer

A.APR.3 Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.	Module 4 Task 3 Building Stronger Roots Module 4 Task 4 Getting to the Root of the Problem Module 4 Task 6 Puzzling Over Polynomials
Use polynomial identities to solve problems.	
A.APR.4 Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity* $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ *can be used to generate Pythagorean triples.*	**A.APR.4 is throughout Module 3 and 4, both in the tasks and in the RSG's.
A.APR.5 Know and apply the Binomial Theorem for the expansion of $(x+y)^n$ in powers of x and y for a positive integer n, where x and y are any given numbers, with coefficients determined by example by Pascal's Triangle.	Module 3 Task 2 Pascal's Pride
Rewrite rational expressions.	
A.APR.6 Rewrite simple rational expressions in different forms; write $\frac{a(x)}{b(x)}$ in the form $q(x) + \frac{r(x)}{b(x)}$ where $a(x), b(x), q(x) and\ r(x)$ are polynomials with degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or for the more complicated examples, a computer algebra system.	Module 5 Task 4 Are You Rational
A.APR.7 Understand the rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply and divide rational expressions.	Module 5 Task 4 Are You Rational Module 5 Task 5 Just Act Rational
Create equations that describe numbers or relationships.	
A.CED.1 Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*	**A.CED.1 is introduced and solidified in Algebra I and then implemented throughout curriculum
A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	Module 4 Task 1 Scott's March Madness Module 4 Task 6 Puzzling Over Polynomials Module 5 Task 1 Winner, Winner Module 5 Task 2 Shift and Stretch Module 5 Task 3 Rational Thinking
A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on*	**A.CED.3 is introduced and solidified in Algebra I and then implemented throughout curriculum

combinations of different foods.	
A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*	**A.CED.4 is introduced and solidified in Algebra I and then implemented throughout curriculum
Understand solving equations as a process of reasoning and explain the reasoning.	
A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	Module 5 Task 7 We All Scream **A.REI.2 is found in several RSG's throughout Module 5
Represent and solve equations and inequalities graphically.	
A.REI.11 Explain why the x-coordinates of the points where the graphs of the equations *y = f(x)* and *y = g(x)* intersect are the solutions of the equation *f(x) = g(x)*; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where *f(x)* and/or *g(x)* are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. ★	**A.REI.11 is introduced and solidified in Algebra I and then implemented throughout curriculum
Domain: Function	
Interpret functions that arise in applications in terms of a context.	
F.IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*★	Module 4 Task 2 You-mix Cubes Module 4 Task 5 Is This the End? Module 5 Task 6 Sign on the Dotted Line Module 6 Task 4 More Ferris Wheels
F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*★	Module 4 Task 2 You-mix Cubes Module 5 Task 1 Winner, Winner Module 5 Task 3 Rational Thinking
F.IF.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★	**F.IF.6 is introduced in Algebra I and then occurs throughout curriculum
Analyze functions using different representations.	
F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★	Module 2 Task 2 Falling Off a Log Module 3 Task 1 It All Adds Up Module 4 Task 2 You-mix Cubes

b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. e. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	Module 5 Task 1 Winner, Winner Module 5 Task 2 Shift and Stretch Module 5 Task 3 Rational Thinking Module 5 Task 6 Sign on the Dotted Line
F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.	Module 2 Task 3 Chopping Logs Module 2 Task 4 Log-Arithm-etic
F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.	**F.IF.9 is introduced and solidified in Algebra I and then implemented throughout curriculum
Build a function that models a relationship between two quantities.	
F.BF.1 Write a function that describes a relationship between two quantities.* b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*	Module 1 Task 1 Brutus Bites Back Module 1 Task 2 Flipping Ferraris Module 1 Task 3 Tracking the Tortoise Module 3 Task 1 It All Adds Up Module 3 Task 6 Sorry, We're Closed Module 4 Task 1 Scott's March Madness Module 8 Task 2 Imagineering Module 8 Task 3 The Bungee Jump Simulator Module 8 Task 4 Composing and Decomposing Module 8 Task 5 Translating My Composition Module 8 Task 6 Different Combinations
Build new functions that exist from existing functions.	
F.BF.3 Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.	Module 2 Task 2 Falling Off a Log Module 4 Task 2 You-mix Cubes Module 4 Task 5 Is This the End? Module 5 Task 2 Shift and Stretch Module 6 Task 4 More Ferris Wheels Module 7 Task 1 High Noon and Sunset Shadows Module 7 Task 3 Getting on the Right Wavelength Module 8 Task 1 Function Family Reunion

	Module 8 Task 5 Translating My Composition
F.BF.4 Find inverse functions. a. Solve an equation of the form *f(x) = c* for a simple function *f* that has an inverse and write an expression for the inverse. *For example, f(x) = 2 x3 or f(x) = (x+1)/(x-1) for x ≠ 1.*	Module 1 Task 1 Brutus Bites Back Module 1 Task 2 Flipping Ferraris Module 1 Task 3 Tracking the Tortoise Module 1 Task 4 Pulling a Rabbit Out of a Hat Module 1 Task 5 Inverse Universe Module 7 Task 2 High Tide Module 7 Task 3 Getting on the Right Wavelength
F.BF.5(+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.	Module 2 Task 1 Log Logic Module 2 Task 2 Falling Off a Log
Construct and compare linear, quadratic and exponential models and solve problems.	
F.LE.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	Module 4 Task 1 Scott's March Madness Module 4 Task 5 Is This the End?
F.LE.4 For exponential models, express as a logarithm the solution to $ab^{ct} = d$ $where\ a, c\ and\ d$ are numbers and the base *b* is 2, 10, or *e*; evaluate the logarithm using technology.	Module 2 Task 1 Log Logic Module 2 Task 3 Chopping Logs Module 2 Task 4 Log-Arithm-etic Module 2 Task 5 Powerful Tens
Extend the domain of trigonometric functions using the unit circle.	
F.TF.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.	Module 6 Task 6 Diggin' It Module 6 Task 7 Staking It Module 6 Task 8 "Sine"ing and "Cosine"ing It Module 6 Task 9 Water Wheels and Unit Circle
F.TF.2 Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.	Module 6 Task 3 More "Sine" Language Module 6 Task 5 Moving Shadows Module 6 Task 6 Diggin' It Module 6 Task 7 Staking It Module 6 Task 8 "Sine"ing and "Cosine"ing It Module 6 Task 9 Water Wheels and Unit Circle Module 7 Task 4 Off on a Tangent
Model periodic phenomena with trigonometric functions.	

F.TF.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. ★	Module 6 Task 1 George W. Ferris' Day Off Module 6 Task 2 "Sine" Language Module 6 Task 4 More Ferris Wheels Module 6 Task 5 Moving Shadows Module 7 Task 1 High Noon and Sunset Shadows Module 7 Task 2 High Tide Module 7 Task 3 Getting on the Right Wavelength Module 7 Task 4 Off on a Tangent
Prove and apply trigonometric identities.	
F.TF.8 Prove the Pythagorean identity $sin^2(\theta) + cos^2(\theta) = 1$ and use it to find sin (θ), cos (θ), or tan (θ), given sin (θ), cos (θ), or tan (θ), and the quadrant of the angle.	Module 7 Task 5 Maintaining Your Identity
Domain: Statistics	
Summarize, represent and interpret data on a single count or measurement system.	
S.ID.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	Module 9 Task 1 What is Normal? Module 9 Task 2 Just Act Normal Module 9 Task 3 Y B Normal? Module 9 Task 4 Wow! That's Weird!
Understand and evaluate random processes underlying statistical experiments.	
S.IC.1 Understand that statistics allows inferences to be made about population parameters based on a random sample from that population.	Module 9 Task 5 Would You Like to Try a Sample? Module 9 Task 6 Let's Investigate Module 9 Task 7 Slacker's Simulation
S.IC.2 Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of five tails in a row cause you to question the model?*	Module 9 Task 6 Let's Investigate
Make inferences and justify conclusions from sample surveys, experiments and observational studies.	
S.IC.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	Module 9 Task 6 Let's Investigate Module 9 Task 7 Slacker's Simulation
S.IC.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.	Module 9 Task 5 Would You Like to Try a Sample?
S.IC.5 Use data from a randomized experiment to compare two treatments; use simulations	

to decide if differences between parameters are significant.	
S.IC.6 Evaluate reports based on data.	
Use probability to evaluate outcomes of decisions.	
S.MD.6 (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).	
S.MD.7 (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).	