Caverna High School Curriculum Plan Algebra 2

Pacing	Module	Standards	Topics with Learning Targets	Critical Vocabulary	Instructional Resources
August— October (45 days)	**Polynomial, Rational, and Radical Relationships**	*Number & Quantity* N.CN.A.1-2 N.CN.C.7 N.Q.A.2 *Algebra* A.APR.B.2, 3 A.APR.C.4 A.APR.D.6 A.REI.A.1,2 A.REI.B.4b A.REI.C.7 A.SSE.A.2 *Functions* F.IF.C.7 *Geometry* G.GPE.A.2 *Mathematical Practice* MP.1 MP.2 MP.4 MP.7 MP.8	A: Polynomials—From Base Ten to Base X (11 days) • I can interpret the structure of expressions. • I can use polynomial identities to solve problems. B: Factoring – Its Use and Its Obstacles (10 days) • I can reason quantitatively and use units to solve problems. • I can interpret the structure of expressions. • I can understand the relationship between zeros and factors of polynomials. • I can rewrite rational expressions. • I can analyze functions using different representations. C: Solving and Applying Equations - Polynomial, Rational, and Radical (14 days) • I can rewrite rational expressions. • I can understand solving equations as a process of reasoning and explain the reasoning. • I can solve equations and inequalities in one variable. • I can solve systems of equations. • I can translate between the geometric description and the equation for a conic section. D: A Surprise from Geometry—Complex Numbers Overcome All Obstacles (10 days) • I can perform arithmetic operations with complex numbers. • I can use complex numbers in polynomial identities and equations. • I can understand solving equations as a process of reasoning and explain the reasoning. • I can solve equations and inequalities in one variable. • I can solve systems of equations.	Axis of Symmetry Dilation at the Origin End Behavior Even/Odd Function Pythagorean Triple Rational Expression Square Root of a Number Vertex of a Parabola Arithmetic Sequence Binomial Coefficient of a Monomial Constant Function Cubic Function Degree of a Monomial Degree of a Polynomial Function Degree of a Polynomial in One Variable Discriminant of a Quadratic Function Equivalent Polynomial Function Graph of f Graph of $y = f(x)$ Increasing/Decreasing Like Terms of a Polynomial Linear Function Monomial Polynomial Expression Polynomial Function Polynomial Identity Quadratic Function Relative Maximum/Minimum Sequence Standard Form of a Polynomial in One Variable Terms of a Polynomial Trinomial Zeros or Roots of a Function	**CURRICULUM** **Eureka Math/EngageNY:** 11th grade Module 1 **FALs:** ○ Maximizing Profits: Selling Boomerangs ○ Generating Polynomials from Patterns ○ Representing Polynomials Graphically **Illustrative Mathematics:** ○ Computations with Complex Numbers ○ The Missing Coefficient ○ Graphing from Factors 1- 3 ○ Zero Product Property 1-4 **HMH text (Algebra 2):** ○ Unit 3 – Polynomial Functions, Expressions, and Equations ○ Unit 4 – Rational Functions, Expressions, and Equations ○ Unit 5 – Radical Functions, Expressions and Equations **INTERVENTIONS** **Struggling:** **Advanced:** **ASSESSMENTS** **Summative:** Eureka Math End-of-Module assessment, Teacher-made tests, STAR Math **Formative:** Eureka Math Exit tickets & Mid-Module Assessment, Teacher-made quizzes

October - November (20 days)	**Trigonometric Functions**	*Number and Quantity* N-Q.A.1 *Functions* F-IF.C.7e, F.TF.A.1,2 F.TF.B.5 F.TF.C.8 *Statistics & Probability* S.ID.B.6a *Mathematical Practice* MP.1 MP.2 MP.3 MP.4 MP.7 MP.8	A: The Story of Trigonometry and Its Contexts (11 days) • I can analyze functions using different representations. • I can extend the domain of trigonometric functions using the unit circle. B: Understanding Trigonometric Functions and Putting Them to Use (9 days) • I can analyze functions using different representations. • I can model periodic phenomena with trigonometric functions. • I can prove and apply trigonometric identities. • I can summarize, represent, and interpret data on two categorical and quantitative variables.	Amplitude Cosecant Cosine Cotangent Frequency Midline Period Periodic Function Radian Secant Sine Sinusoidal Function Tangent Trigonometric Identity Asymptote Circle Degree Even and Odd Functions Identity Rotation Sine, Cosine, Tangent	**CURRICULUM** **Eureka Math/EngageNY:** 11th grade Module 2 **FALs:** ○ Representing Trigonometric Functions **Illustrative Mathematics:** ○ Springboard Dive ○ Coffee and Crime ○ Used Subaru Foresters 1 ○ Olympic Men's 100-Meter Dash **HMH Text Algebra II:** ○ Unit 7 – Trigonometric Functions **INTERVENTIONS** **Struggling:** **Advanced:** **ASSESSMENTS** **Summative:** Eureka Math End-of-Module assessment, Teacher-made tests, STAR Math **Formative:** Eureka Math Exit tickets & Mid-Module Assessment, Teacher-made quizzes

November - January (45 days)	**Exponential and Logarithmic Functions**	*Number and Quantity* N.RN.A.1,2 N.Q.A.2 *Algebra* A.CED.A.1 A.REI.D.11 A.SSE.B.3c, 4 *Functions* F.BF.A.1a, 1b, 2 F.BF.B.3, 4, 4a, 5 F.IF.C.7e, 8b, 9 F.LE.A.2, 4 *Mathematical Practice* MP.1 MP.2 MP.4 MP.7 MP.8	A: Real Numbers (6 days) • I can extend the properties of exponents to rational exponents. • I can reason quantitatively and use units to solve problems. • I can interpret functions that arise in applications in terms of the context. • I can build a function that models a relationship between two quantities. • I can construct and compare linear and exponential models and solve problems. B: Logarithms (15 days) • I can reason quantitatively and use units to solve problems. • I can create equations that describe numbers or relationships. • I can build a function that models a relationship between two quantities. • I can construct and compare linear and exponential models and solve problems. C: Exponential and Logarithmic Functions and their Graphs (7 days) • I can interpret functions that arise in applications in terms of the context. • I can analyze functions using different representations. • I can build new functions from existing functions. • I can construct and compare linear and exponential models and solve problems. D: Using Logarithms in Modeling Situations (6 days) • I can write expressions in equivalent forms to solve problems. • I can create equations that describe numbers or relationships. • I can represent and solve equations and inequalities graphically. • I can understand the concept of a function and use function notation.	e ∑ Arithmetic Series Geometric Series Invertible Function Logarithm Series Compound Interest Exponential Decay Exponential Expression Exponential Growth Scientific Notation	**CURRICULUM** **Eureka Math/EngageNY:** 11th grade Module 3 **FALs:** ○ Representing Linear and Exponential Growth **Illustrative Mathematics:** ○ Modeling London's Population ○ Exponential Kiss ○ Kimi and Jordan ○ Skeleton Tower ○ Snake on a Plane ○ Invertible or Not ○ A Valuable Quarter ○ Boom Town **HMH text (Algebra 2):** Unit 6 – Exponential and Logarithmic Functions and Equations **INTERVENTIONS** **Struggling:** **Advanced:** **ASSESSMENTS** **Summative:** Eureka Math End-of-Module assessment, Teacher-made tests, STAR Math **Formative:** Eureka Math Exit tickets & Mid-Module Assessment, Teacher-made quizzes

			• I can interpret functions that arise in applications in terms of the context. • I can analyze functions using different representations. • I can build a function that models a relationship between two quantities. • I can build new functions from existing functions. • I can construct and compare linear and exponential models and solve problems. • I can interpret expressions for functions in terms of the situation they model. E. Geometric Series and Finance (11 days) • I can write expressions in equivalent forms to solve problems. • I can analyze functions using different representations. • I can build a function that models a relationship between two quantities. • I can interpret expressions for functions in terms of the situation they model.		

February - March (40 days)	**Inferences and Conclusions from Data**	*Statistics and Probability* S.CP.A.1-5 S.CP.B.6 S.CP.B.7 S.IC.A.1,2 S.IC.B.3, 5, 6 S.ID.A.4 *Mathematical Practice* MP.2 MP.3 MP.4 MP.5	A: Probability (7 days) • I can understand and evaluate random processes underlying statistical experiments. • I can understand independence and conditional probability and use them to interpret data. • I can use the rues of probability to compute probabilities of compound events in a uniform probability model. B: Modeling Data Distributions (14 days) • I can summarize, represent, and interpret data on a single count or measurable variable. C: Drawing Conclusions Using Data from a Sample (11 days) • I can understand and evaluate random processes underlying statistical experiments. • I can make inferences and justify conclusions from sample surveys, experiments, and observational studies. D: Drawing Conclusions Using Data from and Experiment (8 days) • I can make inferences and justify conclusions from sample surveys, experiments, and observational studies.	Complement of an Event Conditional Probability Experiment Hypothetical 1000 Table Independent Events Intersection of Two Events Lurking Variable Margin of Error Normal Distribution Observational Study Random Assignment Random Selection Sample Survey Treatment Union of Two Events Association Chance experiment Conditional relative frequency Distribution shape (skewed, symmetric) Event Mean Sample space Sampling variability Standard deviation	**CURRICULUM** **Eureka Math/EngageNY:** 11th grade Module 4 **FALs:** ○ Interpreting Data: Muddying the Waters ○ Representing Probabilities: Medical Testing ○ Devising a Measure: Correlation ○ Representing Data with Frequency Graphs ○ Representing Conditional Probabilities 1 ○ Representing Conditional Probabilities 2 **Illustrative Mathematics:** ○ Do You Fit in this Car? ○ Fred's Flare Formula ○ But Mango is My Favorite… ○ Guess the Probability ○ The Titanic 1 ○ Coffee at Mom's Diner **HMH text (Algebra 2):** ○ Unit 8 – Probability ○ Unit 9 – Statistics **INTERVENTIONS** **Struggling:** **Advanced:** **ASSESSMENTS** **Summative:** Eureka Math End-of-Module assessment, Teacher-made tests, STAR Math **Formative:** Eureka Math Exit tickets & Mid-Module Assessment, Teacher-made quizzes
Review & Exams – 30 Days **April - May**					

Common Core High School Math Standards for Algebra 2

NUMBER & QUANTITY	**N-CN.A Perform arithmetic operations with complex numbers**	N.CN.A.1 Know there is a complex number *i* such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real. N.CN.A.2 Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers
	N-CN.C Use complex numbers in polynomial identities and equations	N.CN.C.7 Solve quadratic equations with real coefficients that have complex solutions.
	N-Q.A **Reason quantitatively and use units to solve problems**	N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.
	N-RN.A Extend the properties of exponents to rational exponents	N.RN.A.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5*. N.RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.

ALGEBRA	**A-APR.B Understand the relationship between zeros and factors of polynomials.**	A.APR.B.2 Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$. A.APR.B.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.
	A-APR.C Use polynomial identities to solve problems	A.APR.C.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.D Rewrite rational expressions	A.APR.D.6 Rewrite simple rational expressions in different forms; write $^{a(x)}/_{b(x)}$ in the form $q(x) + {}^{r(x)}/_{b(x)}$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the 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.
	A-SSE.A **Interpret the structure of expressions**	A.SSE.A.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.B **Write expressions in equivalent forms to solve problems**	A.SSE.B.3c Use the properties of exponents to transform expressions for exponential functions. *For example the expression* 1.15^t *can be rewritten as* $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.* A.SSE.B.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.**
	A-CED.A **Create equations that describe numbers or relationships**	A-CED.A.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-REI.A **Understand solving equations as a process of reasoning and explain the reasoning**	A.REI.A.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. A.REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
	A-REI.B **Solve equations and inequalities in one variable**	A.REI.B.4b Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.
	A-REI.C Solve systems of equations	A.REI.C.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.
	A-REI.D **Represent and solve equations and inequalities graphically**	A.REI.D.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. ★

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FUNCTIONS	**F-IF.A** **Understand the concept of a function and use function notation**	F.IF.A.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x). F.IF.A.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
	F-IF.C **Analyze functions using different representations**	F.IF.C.7e Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. F.IF.C.8b Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)12^t$, $y = (1.2)^t/10$, and classify them as representing exponential growth or decay. F.IF.C.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-BF.A **Build a function that models a relationship between two quantities**	F.BF.A.1a Determine an explicit expression, a recursive process, or steps for calculation from a context. F.BF.A.2 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*
	F-BF.B **Build new functions from existing functions**	F.BF.B.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. F.BF.B.4 Find inverse functions. F.BF.B.4a 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, $f(x) = 2x^3$ or $f(x) = (x+1)/(x-1)$ for $x \neq 1$.* F.BF.B.5 Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.
	F-LE.A **Construct and compare linear, quadratic and exponential models and solve problems**	F.LE.A.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F.LE.A.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.
	F-TF.B Model periodic phenomena with trigonometric functions	F.TF.B.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.*

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	F-TF.C Prove and apply trigonometric identities	F.TF.C.8 Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.

STATISTICS	**S-CP.A Understand independence and conditional probability and use them to interpret data**	S.CP.A.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). S.CP.A.2 Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent. S.CP.A.3 Understand the conditional probability of *A* given *B* as *P*(*A* and *B*)/*P*(*B*), and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*. S.CP.A.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. S.CP.A.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.
	S-CP.B Use the rules of probability to compute probabilities of compound events.	S.CP.B.6 Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms of the model. S.CP.B.7 Apply the Addition Rule, P(A or B) = P(A) + P(B) - P(A and B), and interpret the answer in terms of the model.
	S-IC.A Understand and evaluate random processes underlying statistical experiments	S.IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. S.IC.A.2Decide 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 5 tails in a row cause you to question the model*?
	S-IC.B Make inferences and justify conclusions from sample surveys, experiments, and observational studies	S.IC.B.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. S.IC.B.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. S.IC.B.6 Evaluate reports based on data.
	S-ID.A **Summarize, represent and interpret data on a single count or measurement variable**	S.ID.A.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.
	S-ID.B **Summarize, represent and interpret data on two categorical and quantitative variables**	S-ID.B.6a Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

	S-ID.C **Interpret linear models**	S-ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID.C.8 Compute (using technology) and interpret the correlation coefficient of a linear fit. S-ID.C.9 Distinguish between correlation and causation.
GEOMETRY	**G-GPE.A Translate between the geometric description and the equation for a conic section**	G.GPE.A.2 Derive the equation of a parabola given a focus and directrix.
MODELING	**Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (★).**	
MATHEMATICAL PRACTICE	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics.** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**	

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