MARLBORO CENTRAL SCHOOL DISTRICT – CURRICULUM MAP

Subject: Algebra II Common Core			Grade: High School (11th)	
Month	Unit / Theme	Content	CC Standards / Skills	Assessment
September	Module 1: Polynomial, Rational, and Radical Relationships	Polynomial Functions • Successive Differences of Polynomials • Multiplying Polynomials: Different Methods • Division of Polynomials • Long Division of Polynomials • Putting it All Together: Standard Form, Factored Form, Vertex Form(Complete the Square) • Using Division to obtain Factored Form • Operations with Polynomials • Solving Polynomials in Factored Form • Solving Quadratics using Complete the Square & Quadratic Formula • Mastering Factoring • Solve Quadratics by Factoring • Graphing Factored Polynomials • Structure of Graphed Polynomials: Odd or Even • Modeling with Polynomials: Word Problems • Factoring with a Remainder • Remainder Theorem • Modeling Real World Situations with Polynomials(River Bed)	**Reason quantitatively and use units to solve problems.** **N-Q.2**[51] Define appropriate quantities for the purpose of descriptive modeling. **Understand the relationship between zeros and factors of polynomials** **A-APR.2**[53] 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.3**[54] 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. **Use polynomial identities to solve problems** **A-APR.4** Prove[55] 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. **Rewrite rational expressions** **A-APR.6**[56] 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. **Understand solving equations as a process of reasoning and explain the reasoning** **A-REI.1**[57] 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. **Solve equations and inequalities in one variable** **A-REI.4**[58] Solve quadratic equations in one variable. b. 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*. **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.★	• Homework • Quizzes • Unit Test

			c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.	
October	Module 1: Polynomial, Rational, and Radical Relationships	Rational and Radical Functions • Equivalent Rational Expressions • Comparing Rational Expressions • Multiplying & Dividing Rational Expressions • Adding & Subtracting Rational Expressions • Solving Rational Equations • Word Problems Leading to Rational Equations • Radicals and Conjugates • Rationalize Denominators & Solve Radical Equations: Linear Equations • Radical Equations	**Interpret the structure of expressions** **A-SSE.2**[52] 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 $(x^2 – y^2)(x^2 + y^2)$.* **Understand solving equations as a process of reasoning and explain the reasoning** **A-REI.1**[57] 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.2** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	• Homework • Quizzes • Unit Test
October	Module 1: Polynomial, Rational, and Radical Relationships	Systems and Parabolic Functions • Systems in Three Variables • Solving Systems of Equations: Linear & Quadratics • Graphing Systems of Quadratics: Distance Formula, Completing the Square • Definition of a Parabola: Focus, Directrix, Axis of Symmetry, Vertex • Congruent Parabolas, Graphing Parabolas using Directrix & Focus • Vertex Form of a Parabola • The Effects of Scale Factors on Parabolas	**Understand solving equations as a process of reasoning and explain the reasoning** **A-REI.1**[57] 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. **Solve systems of equations** **A-REI.6**[59] Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. **A-REI.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 $x^2 + y^2 = 3$.* **Solve equations and inequalities in one variable** **A-REI.4**[58] Solve quadratic equations in one variable. b. 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.	• Homework • Quizzes • Unit Test

November			**Translate between the geometric description and the equation for a conic section** **G-GPE.2** Derive the equation of a parabola given a focus and directrix.	
November	Module 1: Polynomial, Rational, and Radical Relationships	Complex Numbers • Systems with No Real Solutions: Algebraically & Graphically • Operations with Complex Numbers • Complex Solution & the Discriminant • All types of roots & their equations • The Fundamental Theorem of Algebra	**Perform arithmetic operations with complex numbers.** **N-CN.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.2** Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. **Use complex numbers in polynomial identities and equations.** **N-CN.7** Solve quadratic equations with real coefficients that have complex solutions. **Solve equations and inequalities in one variable** **A-REI.4**[58] Solve quadratic equations in one variable. b. 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.	• Homework • Quizzes • Unit Test
December	Module 2: Trigonometric Functions	Unit Circle • Ferris Wheel: Exploring a Non-Linear Relationship • Ferris Wheel: Height & Co-Height Functions • Unit Circle • Sine & Cosine Functions: Domain, Range, Coterminal Angles • Tangent • Discover the Reciprocal Functions • Problems involving reciprocal functions & the unit circle • Sketch the Sine & Cosine Functions • Radian Measure • Discover Basic Trig Identities Using Graphs	**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. **F-TF.2**[60] 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.	• Homework • Quizzes • Unit Test
December	Module 2:	Graphs of Sinusoidal Functions	**Model periodic phenomena with trigonometric functions**	• Homework • Quizzes

	Trigonometric Functions	• Parts of a Sinusoidal Wave: Amplitude, Frequency, Period, Midline, Phase Shift • Parts of a Sinusoidal Wave: Amplitude, Frequency, Period, Midline, Phase Shift • Connecting the Ferris Wheel to Sinusoidal Waves • Applications of Sinusoidal Waves	**F-TF.5**[61] Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.★ **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.★ e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. **Prove and apply trigonometric identities** **Summarize, represent, and interpret data on two categorical and quantitative variables** **S-ID.6**[62] Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.★ a. 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.*	• Unit Test
January	Module 2: Trigonometric Functions	Other trigonometric functions and identities • The Tangent Graph & Tangent Identities • The Pythagorean Identities • Proving Trig 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.	• Homework • Quizzes • Unit Test
January	Module 3: Functions	Real Numbers • Integer Exponents • Base 10 & Scientific Notation • Positive & Negative Rational Exponents • Properties of Exponents & Radicals • Experimenting with Irrational Exponents(OPTIONAL) • Introduction to Euler's Number	**Extend the properties of exponents to rational exponents.** **N-RN.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.2**[63] Rewrite expressions involving radicals and rational exponents using the properties of exponents. **Reason quantitatively and use units to solve problems.** **N-Q.2**[64] Define appropriate quantities for the purpose of descriptive modeling. **F-IF.6**[71] 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.★ **Build a function that models a relationship between two quantities**	• Homework • Quizzes • Unit Test

			F-BF.1 Write a function that describes a relationship between two quantities.★ a. Determine an explicit expression, a recursive process, or steps for calculation from a context.[74] **F-LE.2**[77] 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).★	
February	Module 3: Functions	Logarithms • Exponential Equations: Common Bases • Calculating Simple Logarithms • Applying Logarithms to Counting • Using Log Tables to Discover Log Product Property • Expanding on the Product Rule • The Rest of the Log Properties • Change of Base Formula • Solving Logarithmic Equations	**Reason quantitatively and use units to solve problems.** **N-Q.2**[64] Define appropriate quantities for the purpose of descriptive modeling. **Create equations that describe numbers or relationships** **A-CED.1**[67] 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*.★ **F-BF.1** Write a function that describes a relationship between two quantities.★ a. Determine an explicit expression, a recursive process, or steps for calculation from a context.[74] **F-LE.4**[78] 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.★	• Homework • Quizzes • Unit Test
February	Module 3: Functions	Exponential and Logarithm Functions and their Graphs • Graphing Log Functions • Graphing Logarithmic & Exponential Functions • Inverse Functions • Transformations of Exponential & Logarithmic Functions • Graphing the Natural Log	**Interpret functions that arise in applications in terms of the context** **F-IF.4**[70] 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*.★ **Interpret expressions for functions in terms of the situation they model** **F-LE.5**[79] Interpret the parameters in a linear or exponential function in terms of a context.★ **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.★ e. Graph exponential and logarithmic functions, showing intercepts and end behavior. **Build a function that models a relationship between two quantities**	• Homework • Quizzes • Unit Test

			F-BF.1 Write a function that describes a relationship between two quantities.★ a. Determine an explicit expression, a recursive process, or steps for calculation from a context.[74] **Build new functions from existing functions** **F-BF.3**[76] 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.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 x^3 or f(x) = (x+1)/(x–1) for x ≠ 1.* **Construct and compare linear, quadratic, and exponential models and solve problems** **F-LE.2**[77] 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.4**[78] 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 3: Functions	Using Logarithms in Modeling Situations • Modeling with Linear, Quadratic, Exponential & Sinusoidal • Parts of an Exponential Function: Utilizing Beans • Solving Exponential Equations • Solving Exponential Systems & Inequalities • Geometric Sequences • Applications of Exponential Functions: Percent Rate of Change • Modeling with Exponential Functions	**Write expressions in equivalent forms to solve problems** **A-SSE.3**[65] Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.★ c. 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%*. **Create equations that describe numbers or relationships** **A-CED.1**[67] 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*.★ **Represent and solve equations and inequalities graphically** **A-REI.11**[68] 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.,	• Homework • Quizzes • Unit Test

		• Modeling with Exponential Functions Cont. • Newton's Law of Cooling	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.★ **F-IF.3**[69] Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.* **F-IF.6**[71] 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.★ **Analyze functions using different representations** **F-IF.8**[72] Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as* $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, *and classify them as representing exponential growth or decay.* **F-IF.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). **F-BF.1** Write a function that describes a relationship between two quantities.★ a. Determine an explicit expression, a recursive process, or steps for calculation from a context. (Real world context.) b. Write a function that describes a relationship between two quantities. **F-BF.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.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,* $f(x) = 2x^3$ *or* $f(x) = (x+1)/(x-1)$ *for* $x \neq 1$. **F-LE.4**[78] 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.★ **Interpret expressions for functions in terms of the situation they model**	

			F-LE.5[79] Interpret the parameters in a linear or exponential function in terms of a context.⋆	
	Module 3: Functions	Geometric Series and Finance • Summation & Geometric Series • Interest Modeling Problems: Savings & Auto Loans • Interest Modeling Problems: Credit Cards • Interest Modeling Problems: Buying a House • Million Dollar Problem	**A-SSE.4**[66] 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*.⋆ **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.⋆ e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. **F-IF.8**[72] Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as* $y = (1.02)_t$, $y = (0.97)_t$, $y = (1.01)_{12t}$, $y = (1.2)_{t/10}$, *and classify them as representing exponential growth or decay.* **F-IF.9**[73] 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.1** Write a function that describes a relationship between two quantities.⋆ b. Write a function that describes a relationship between two quantities. **F-BF.2** Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.⋆ **Interpret expressions for functions in terms of the situation they model** **F-LE.5**[79] Interpret the parameters in a linear or exponential function in terms of a context.⋆	• Homework • Quizzes • Unit Test
March	Module 4: Inferences and Conclusions from Data	Probability • Determining Sample Space with Experiment • Constructing & Interpreting Two-Way Table	**S-IC.2** Decide if a specified model is consistent with results from a given date-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?*.⋆	• Homework • Quizzes • Unit Test

		• Conditional Probabilities from Two-Way Tables • Conditional Probabilities from Two-Way Tables: Expand to Independent Events • Events & Venn Diagrams • Probability Rules: Complements & And • Probability Rules: Complements & OR	**Understand independence and conditional probability and use them to interpret data** **S-CP.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.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.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.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. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results*.⋆ **S-CP.5** Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer*.⋆ **Use the rules of probability to compute probabilities of compound events in a uniform probability model** **S-CP.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.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.⋆	
April	Module 4: Inferences and Conclusions from Data	Modeling Data Distributions • Determining Sample Space with Experiment • Constructing & Interpreting Two-Way Table	**Summarize, represent, and interpret data on a single count or measurement variable** **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	• Homework • Quizzes • Unit Test

		• Conditional Probabilities from Two-Way Tables • Conditional Probabilities from Two-Way Tables: Expand to Independent Events • Events & Venn Diagrams • Probability Rules: Complements & And • Probability Rules: Complements & OR	is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.⋆	
April	Module 4: Inferences and Conclusions from Data	Drawing Conclusions Using Data from a Sample • Types of Studies • Differentiating Between a Sample & Population • Variability & Sample Proportions • Introduction to Margin of Error & Population Proportion • Calculations with Margin of Error & Population Proportions • Sampling Variability in the Sample Mean • Exploring Sampling Variability in the Sample Mean II • Margin of Error when Estimating a Population Mean • Calculating Margin of Error with Population • Evaluating Reports involving Margin of Error	**Understand and evaluate random processes underlying statistical experiments** **S-IC.1** Understand statistics as a process for making inferences about population parameters based on a random sample from that population.⋆ **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.⋆ **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.⋆ **S-IC.6** Evaluate reports based on data.⋆	• Homework • Quizzes • Unit Test
May	Module 4: Inferences and Conclusions from Data	Drawing Conclusions Using Data from an Experiment • Experiments and the Role of Random Assignment • Differences due to Random Assignment	**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.⋆ **Make inferences and justify conclusions from sample surveys, experiments, and observational studies**	• Homework • Quizzes • Unit Test

		• Finding Differences between 2 Treatments • Determining if differences are statistically significant • Introduction to Hypothesis Testing • Conducting All Phases of an Experiment • Evaluating Reports of an Experiment	**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.⋆	
June	Course Final Exam			
	Review for NYS Regents Exam			Castle Learning