**YEAR AT A GLANCE:** *Algebra 2 and Algebra 2R* *(updated Dec 2022)*

| | **UNIT 12** | **UNIT 13** | **UNIT 1** | **UNIT 2** | **UNIT 3** |
|---|---|---|---|---|---|
| **Title** | Probability | Statistics | Algebraic Essentials Review | Functions as the Cornerstones of Algebra | Linear Functions, Equations and their Algebra |
| **Unit Length** *(weeks taught)* | 3 weeks | 5 weeks | 2 weeks | 2 weeks | 2 weeks |
| **Performance Task** *(e.g., Persuasive Essay, DBQ, Nutritional Analysis, etc.)* | Class projects using calculator simulation programs. Unit exam. Daily homework, quizzes, and weekly review assessments. | Class projects using calculator simulation programs. Unit exam. Daily homework, quizzes, and weekly review assessments. | Unit exam. Daily homework, quizzes, and weekly review assessments. | Unit exam. Daily homework, quizzes, and weekly review assessments. | Unit exam. Daily homework, quizzes, and weekly review assessments. |

| | | | | | |
|---|---|---|---|---|---|
| **Enduring Understanding** (The big ideas, the "why" we include these ideas | Students model probabilities found in experimental environment and decide whether they are consistent with theoretical probabilities.<br><br>Probability can be used to develop strategies and make informed decisions. | In real life, data sets are large and almost always approximately normal.<br><br>Normal models which include estimation of areas under the normal curve allow us to answer and model real life situations.<br><br>Sampling methods, when highly representative of a population, allow accurate predictions or inferences of population parameters.<br><br>The mean or proportion of a sample is the same as the mean or proportion of a population, within a margin of error.<br><br>If the difference between the statistics of two treatments is outside of a critical confidence interval, the difference is statistically significant.<br><br>Students will be able to select a method of gathering data from a random sample and understand data by critically differentiating | The arithmetic of rational expressions is governed by the same rules as the arithmetic of rational numbers. | Different types of relationships between quantities can be modeled with different types of functions.<br><br>Graphs are visual representations of solution sets of equations and inequalities.<br><br>Expressions that represent a quantity in terms of its context can be interpreted and its structure identified and rewritten. | Expressions that represent a quantity in terms of its context can be interpreted and its structure identified and rewritten. |

| | | | | | |
|---|---|---|---|---|---|
| | | the merit of reports and data encountered in daily life. | | | |
| **Essential Questions** (What do we want students to think about) | Do experimental probabilities match theoretical probabilities? | Why do we study normal distributions?<br><br>Why is random sampling of a population done when a census is impractical?<br><br>How can a researcher select a method of collecting data with as little bias as possible?<br><br>How does the mean or proportion of a sample compare to the mean or proportion of the population?<br><br>When does a statistic become extraordinary instead of ordinary?<br><br>How do you know when the difference between two treatments is statistically significant?<br><br>There are many "studies out there", how do I know if they are really accurate? How can probability be used to make fair decisions? | What is the difference between an equation and an expression? | What relationships between quantities can be modeled by functions?<br><br>What does it mean to solve equations graphically?<br><br>What are the similarities and differences between linear, quadratic, exponential functions, and other types of functions? | What does the graph of a function represent?<br><br>How can you represent the zeroes of a function?<br><br>How can you describe and show the ways you can find the zeroes (roots) of a function? |
| **Common Core Standards** | S-CP.1 Describe events as | S-IC.3 Recognize the purposes of and | A-CED.1 Create equations and | F-BF.4 Find inverse functions. a. Solve an | F-IF.6 Calculate and interpret the average |

| | | | | | |
|---|---|---|---|---|---|
| | 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”).<br><br>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.<br><br>S-CP.3 Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of | differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.<br><br>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.<br><br>S-IC.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.<br><br>S-IC.2 Decide if a specified model is consistent with results from a given | inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. Tasks are limited to exponential equations with rational or real exponents or rational functions.<br><br>N-RN.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.<br><br>A-SSE.2 Use the structure of an expression to identify ways to rewrite it. Tasks are limited to polynomial, rational, or exponential expressions. | equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse.<br><br>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. Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions.<br><br>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 | rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions.<br><br>F-LE.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). Tasks will involve solving mutistep problems by constructing linear and exponential functions.<br><br>F-LE.5 Interpret the parameters in a linear or exponential function in terms of a context. Tasks are limited to exponential |

| | | | | | |
|---|---|---|---|---|---|
| | 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.<br><br>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, | 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?<br><br>S-IC.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.<br><br>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.<br><br>S-ID.6(a) 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 | | 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. Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions. | functions with domains not in the integers.<br><br>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.<br><br>A-REI.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. Tasks are limited to 3 by 3 systems. |

| | | | | | |
|---|---|---|---|---|---|
| | 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.<br><br>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.<br><br>S-CP.6 Find the conditional probability of A | problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. Tasks are limited to exponential functions with domains not in the integers and trigonometric functions.<br><br>S-IC.6 Evaluate reports based on data. | | | |

| | | | | | |
|---|---|---|---|---|---|
| | given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.<br><br>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. | | | | |

Algebra 2R includes running statistical simulations to study and analyze the inferential statistics, whereas Algebra 2 does not.

| | **UNIT 4** | **UNIT 5** | **UNIT 6** | **UNIT 7** | **UNIT 8** |
|---|---|---|---|---|---|
| **Title** | Exponential and Logarithmic Functions | Sequences and Series | Quadratic Functions and their Algebra | Transformations of Functions | Radicals and the Quadratic Formula |
| **Unit Length** *(weeks taught)* | 6 weeks | 2 weeks | 5 weeks | 1 week | 2 weeks |
| **Performance Task** *(e.g., Persuasive Essay, DBQ, Nutritional Analysis, etc.)* | Unit exam. Daily homework, quizzes, and weekly review assessments. Newton's Law of Cooling Project. | Unit exam. Daily homework, quizzes, and weekly review assessments. | Unit exam. Daily homework, quizzes, and weekly review assessments.Project on solving quadratic equations in a variety of different methods. | Unit exam. Daily homework, quizzes, and weekly review assessments. Project on DESMOS seeing the evolution of the effects of transformations on a variety of functions. | Unit exam. Daily homework, quizzes, and weekly review assessments. |
| **Enduring Understanding** (The big ideas, the "why" we include these ideas | Expressions that represent a quantity in terms of its context can be interpreted and its structure identified and rewritten. Exponential functions represent a variety of real world applications; specifically exponential growth and decay models. | The sum of a finite arithmetic sequence can be used as a problem solving strategy. The formula for the sum of a finite geometric series (when the common ratio is not 1) is derived and used to solve problems. | Expressions that represent a quantity in terms of its context can be interpreted and its structure identified and rewritten.<br><br>Zeros of polynomials are identified when suitable factorizations are available and used to construct a rough graph of the function defined by the polynomial. | Relations and functions can be represented numerically, graphically, algebraically, and/or verbally.<br><br>The properties of functions and function operations are used to model and analyze real-world applications and quantitative relationships. | Expressions that represent a quantity in terms of its context can be interpreted and its structure identified and rewritten.<br><br>Zeros of polynomials are identified when suitable factorizations are available and used to construct a rough graph of the function defined by the polynomial. |
| **Essential Questions** (What do we want students to | What does the graph of a function represent? | How can the formulas for the sum of a finite geometric and the sum | What does the graph of a function represent? | Why are relations and functions represented in multiple ways? | What does the graph of a function represent? |

| | | | | | |
|---|---|---|---|---|---|
| think about) | How can you represent the zeroes of a function?<br><br>How can you describe and show the ways you can find the zeroes (roots) of a function?<br><br>How is Newton's Law of Cooling used to determine temperature changes? | of an arithmetic series be derived and used to solve problems? | How can you represent the zeroes of a function?<br><br>How can you describe and show the ways you can find the zeroes (roots) of a function? | How are the properties of functions and functional operations useful? | How can you represent the zeroes of a function?<br><br>How can you describe and show the ways you can find the zeroes (roots) of a function?<br><br>How do asymptotes impact the end behavior of rational functions? |
| **Common Core Standards** | N-RN.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.<br><br>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 | F-IF.3 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.<br><br>F-BF.2 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and | 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; | 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. | 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; |

| | | | | | |
|---|---|---|---|---|---|
| | radicals in terms of rational exponents.<br><br>F-LE.5 Interpret the parameters in a linear or exponential function in terms of a context. Tasks are limited to exponential functions with domains not in the integers.<br><br>F-LE.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). Tasks will involve solving multistep problems by constructing linear and exponential functions | translate between the two forms.<br><br>F-LE.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).<br><br>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. | symmetries; end behavior; and periodicity.<br><br>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 $(x^2 – y^2)(x^2 + y^2)$.<br><br>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.<br><br>A-REI.4 Solve quadratic equations in one variable.<br>a.Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)^2 = q$ that has the same solutions. Derive the quadratic | | symmetries; end behavior; and periodicity.<br><br>A-REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.<br><br>N-RN.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.<br><br>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.<br><br>A-REI.4b Solve quadratic equations in one variable.<br>b.Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, |

| | | | | | |
|---|---|---|---|---|---|
| | A-CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.<br><br>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. Tasks are limited to exponential equations with rational or real exponents or rational functions.<br><br>A-SSE.3 Choose and produce an equivalent form of an expression | | formula from this form.<br>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 ± bi for real numbers a and<br><br>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 | | 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 ± bi for real numbers a and b. |

| | | | | | |
|---|---|---|---|---|---|
| | to reveal and explain properties of the quantity represented by the expression. Tasks are limited to exponential expressions with rational or real exponents.<br><br>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; | | graphs and algebraic expressions for them.<br><br>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.<br><br>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.<br><br>G-GPE.2  Derive the equation of a parabola given a focus and directrix. | | |

| | | | | | |
|---|---|---|---|---|---|
| | symmetries; end behavior; and periodicity. Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions.<br><br>F-IF.7(e) Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.<br><br>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.<br><br>F-IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.<br><br>F-BF.1 Write a function that describes a relationship between two quantities<br>a. Determine an explicit expression, a recursive process, or steps for calculation from a context. Tasks may involve linear functions, quadratic functions, or exponential functions.<br>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. | | | | |

Algebra 2R contains a thorough algebraic investigation and the analysis of functions with an emphasis on end behavior and limits, whereas end behavior and limits are not covered in Algebra 2.

| | **UNIT 9** | **UNIT 10** | | | |
|---|---|---|---|---|---|
| **Title** | Complex Numbers | Polynomial Functions, Rational Expressions, Functions and Inequalities | | | |
| **Unit Length** *(weeks taught)* | 1 week | 8 weeks | | | |
| **Performance Task** *(e.g., Persuasive Essay, DBQ, Nutritional Analysis, etc.)* | Unit exam. Daily homework, quizzes, and weekly review assessments. | Unit exam. Daily homework, quizzes, and weekly review assessments. Curve sketching project on polynomial functions. Project on limits of functions by exploring the graphs of rational functions including their asymptotes. | | | |
| **Enduring Understanding** (The big ideas, the "why" we include these ideas | Real and complex numbers are important in solving and understanding polynomial equations.<br><br>The domain and range of polynomial | Expressions that represent a quantity in terms of its context can be interpreted and its structure identified and rewritten.<br><br>Polynomials form a system analogous to the integers which are closed under the | | | |

| | | | | | |
|---|---|---|---|---|---|
| | functions can be extended to include the set of complex numbers. Solve quadratic equations with real coefficients that have complex solutions. Extend polynomial identities to the complex numbers. | operations of addition, subtraction, and multiplication and polynomial identities are proven to describe numerical relationships.<br><br>Remainder Theorem can be applied for a polynomial p(x).<br><br>Zeros of polynomials are identified when suitable factorizations are available and used to construct a rough graph of the function defined by the polynomial. | | | |
| **Essential Questions** (What do we want students to think about) | How do polynomial functions model real-world problems and their solutions<br><br>Why are complex numbers necessary<br><br>How are operations and properties of complex numbers related to those of real numbers? | What does the graph of a function represent?<br><br>How can you represent the zeroes of a function?<br><br>How can you describe and show the ways you can find the zeroes (roots) of a function? | | | |
| **Common Core Standards** | N-CN.1 Know there is a complex number i such that i^2 = | F-IF.4: For a function that models a relationship between two quantities, | | | |

| | | | | | |
|---|---|---|---|---|---|
| | –1, and every complex number has the form a + bi with a and b real.<br><br>N-CN.2 Use the relation $i^2 = –1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.<br><br>A-REI.4 Solve quadratic equations in one variable.<br>a.Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.<br>b.Solve quadratic equations by inspection (e.g., for $x^2 = 49$), | 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. Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions.<br><br>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 | | | |

| | | | | | |
|---|---|---|---|---|---|
| | 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 ± bi for real numbers a and<br><br>N-CN.7 Solve quadratic equations with real coefficients that have complex solutions. | using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions.<br><br>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.<br><br>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. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. Graph | | | |

| | | | | | |
|---|---|---|---|---|---|
| | | exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.<br><br>A-APR.4 Prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity (x2 + y2)2 = (x2 – y2)2 + (2xy)2 can be used to generate Pythagorean triples.<br><br>A-APR.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-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 p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).<br><br>A-REI.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. Tasks are limited to simple rational or radical equations.<br><br>A-REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.<br><br>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. Tasks are limited to exponential equations with rational or real exponents or rational functions. | | | |