Cambridge Public Schools
Algebra II Honors/College Prep Curriculum Map
2013 – 2014

The 2013-2014 school year will be the start of the district's full implementation to the new 2011 Massachusetts Mathematics Curriculum Framework for Grades 9 through 12.

Building on their work with linear, quadratic, and exponential functions, students extend their repertoire of functions to include logarithmic, polynomial, rational, and radical functions in Algebra II. Students work closely with the expressions that define the functions, are facile with algebraic manipulations of expressions, and continue to expand and hone their abilities to model situations and to solve equations, including solving quadratic equations over the set of complex numbers and solving exponential equations using the properties of logarithms.

In Algebra II, instructional time should focus on four critical areas:

1. **relate arithmetic of rational expressions to arithmetic of rational numbers;**
2. **expand understandings of functions and graphing to include trigonometric functions;**
3. **synthesize and generalize functions and extend understanding of exponential functions to logarithmic functions; and**
4. **relate data display and summary statistics to probability and explore a variety of data collection methods.**

(1) A central theme of Algebra II is that the arithmetic of rational expressions is governed by the same rules as the arithmetic of rational numbers. Students explore the structural similarities between the system of polynomials and the system of integers. They draw on analogies between polynomial arithmetic and base-ten computation, focusing on properties of operations, particularly the distributive property. Connections are made between multiplication of polynomials with multiplication of multi-digit integers, and division of polynomials with long division of integers. Students identify zeros of polynomials, including complex zeros of quadratic polynomials, and make connections between zeros of polynomials and solutions of polynomial equations. The Fundamental Theorem of Algebra is examined.

(2) Building on their previous work with functions and on their work with trigonometric ratios and circles in Geometry, students now use the coordinate plane to extend trigonometry to model periodic phenomena.

(3) Students synthesize and generalize what they have learned about a variety of function families. They extend their work with exponential functions to include solving exponential equations with logarithms. They explore the effects of transformations on graphs of diverse functions, including functions arising in an application, in order to abstract the general principle that transformations on a graph always have the same effect regardless of the type of the underlying function. They identify appropriate types of functions to model a situation, they adjust parameters to improve the model, and they compare models by analyzing appropriateness of fit and making judgments about the domain over which a model is a good fit. The description of modeling as "*the process of choosing and using mathematics and statistics to analyze empirical situations, to understand them better, and to make decisions*" is at the heart of this Model Algebra II course. The narrative discussion and diagram of the modeling cycle should be considered when knowledge of functions, statistics, and geometry is applied in a modeling context.

(4) Students see how the visual displays and summary statistics they learned in earlier grades relate to different types of data and to probability distributions. They identify different ways of collecting data—including sample surveys, experiments, and simulations — and the role that randomness and careful design play in the conclusions that can be drawn.

Standards for Mathematical Practice

The 2011 framework introduces Standards for Mathematical Practice. These standards complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle, and high school years. These standards are the same at all grades from Pre-Kindergarten to 12th grade. These eight practices can be clustered into the following categories as shown in the chart below:

Habits of Mind of a Productive Mathematical Thinker: MP.1: Make sense of problems and persevere in solving them. MP.6: Attend to precision.	***Reasoning and Explaining*** MP.2: Reason abstractly and quantitatively. MP.3: Construct viable arguments and critique the reasoning of others
	Modeling and Using Tools MP.4: Model with mathematics. MP.5: Use appropriate tools strategically.
	Seeing Structure and Generalizing MP.7: Look for and make use of structure. MP.8: Look for and express regularity in repeated reasoning.

The Standards for Mathematical Practice in High School

The Pre-K – 12 Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. The following lists examples of what the practice standards look like in High School.

Standards	***Explanations and Examples***
Students are expected to: **1. Make sense of problems and persevere in solving them**.	High school students start to examine problems by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. By high school, students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. They check their answers to problems using different methods and continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standards	***Explanations and Examples***
Students are expected to: **2. Reason abstractly and quantitatively.**	High school students seek to make sense of quantities and their relationships in problem situations. They abstract a given situation and represent it symbolically, manipulate the representing symbols, and pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Students use quantitative reasoning to create coherent representations of the problem at hand; consider the units involved; attend to the meaning of quantities, not just how to compute them; and know and flexibly use different properties of operations and objects.
Students are expected to: **3. Construct viable arguments and critique the reasoning of others.**	High school students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. High school students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. High school students learn to determine domains to which an argument applies, listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
Students are expected to: **4. Model with mathematics.**	High school students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. High school students making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standards	***Explanations and Examples***
Students are expected to: **5. Use appropriate tools strategically.**	High school students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. High school students should be sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. They are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.
Students are expected to: **6. Attend to precision.**	High school students try to communicate precisely to others by using clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
Students are expected to: **7. Look for and make use of structure.**	By high school, students look closely to discern a pattern or structure. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 – 3(x – y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y. High school students use these patterns to create equivalent expressions, factor and solve equations, and compose functions, and transform figures.

Standards	***Explanations and Examples***
Students are expected to: **8. Look for and express regularity in repeated reasoning**.	High school students notice if calculations are repeated, and look both for general methods and for shortcuts. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, derive formulas or make generalizations, high school students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

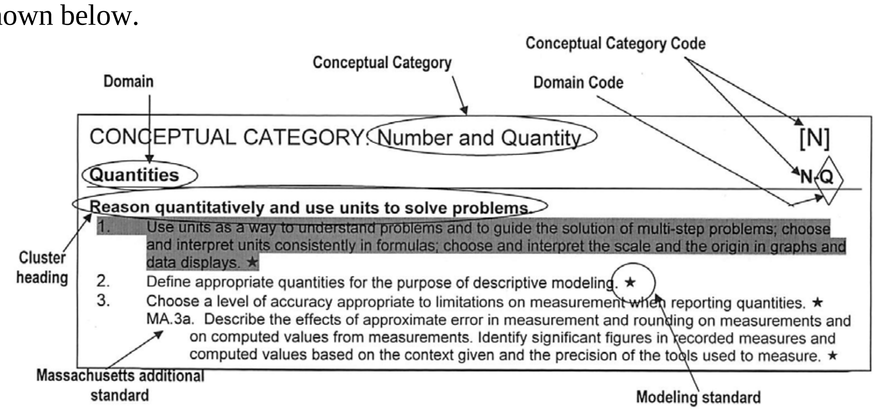
Organization of the High School Content Standards in the 2011 framework
The high school content standards specify the mathematics that all students should study in order to be college and career ready. Additional mathematics that students should learn in order to take advanced courses, such as calculus, advanced statistics, or discrete mathematics, is indicated by a (+) symbol. All standards without a (+) symbol should be in the common mathematics curriculum for all college and career ready students. Standards with a (+) symbol may also appear in courses intended for all students.

The high school standards are listed in **conceptual categories**:

- Number and Quantity (N)
- Algebra (A)
- Functions (F)
- Modeling (★)
- Geometry (G)
- Statistics and Probability (S)

Conceptual categories portray a coherent view of high school mathematics; a student's work with functions, for example, crosses a number of traditional course boundaries, potentially up through and including calculus. Similar to the grade level content standards, each conceptual category (except Modeling, see explanation following the illustration) is further subdivided into several domains, and each domain is subdivided into clusters.

Standards Identifiers/Coding
High school content standards are identified first by conceptual category, rather than by grade as for pre-kindergarten through grade 8 content standards. The code for each high school standard begins with the identifier for the conceptual category code (N, A, F, G, S), followed by the domain code, and the standard number, as shown below.



Unique Massachusetts Standards
Standards unique to Massachusetts are included in the appropriate domain and cluster and are initially coded by "MA." For example, the Massachusetts standard **MA.N.Q.3a** is identified with "MA" indicating a *Massachusetts* addition, "N" indicating it is from the *Number and Quantity* Conceptual Category, "Q" indicating the *Quantity* domain, and "3a" indicating that it is a further specification to the third standard in that domain.

The star symbol (★) following the standards in the illustration indicates those are also Modeling standards. Modeling is best interpreted not as a collection of isolated topics but 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 (★).

Information from the *PARCC Model Content Framework for Mathematics* (August 31, 2012)
Algebra II

The following are examples of *Key Advances* from Previous Grades or Courses

- In Algebra I, students added, subtracted, and multiplied polynomials. In Algebra II, students divide polynomials with remainder, leading to the factor and remainder theorems. This is the underpinning for much of advanced algebra, including the algebra of rational expressions.
- Themes from middle school algebra continue and deepen during high school. As early as grade 6, students began thinking about solving equations as a process of reasoning (6.EE.5). This perspective continues throughout Algebra I and Algebra II (A-REI). "Reasoned solving" plays a role in Algebra II because the equations students encounter can have extraneous solutions (A-REI.2).
- In Algebra II, they extend the real numbers to complex numbers, and one effect is that they now have a complete theory of quadratic equations: Every quadratic equation with complex coefficients has (counting multiplicities) two roots in the complex numbers.
- In grade 8, students learned the Pythagorean theorem and used it to determine distances in a coordinate system (8.G.6–8). In Geometry, students proved theorems using coordinates (G-GPE.4–7). In Algebra II, students will build on their understanding of distance in coordinate systems and draw on their growing command of algebra to connect equations and graphs of conic sections (e.g., G-GPE.1).
- In Geometry, students began trigonometry through a study of right triangles. In Algebra II, they extend the three basic functions to the entire unit circle.
- As students acquire mathematical tools from their study of algebra and functions, they apply these tools in statistical contexts (e.g., S-ID.6). In a modeling context, they might informally fit an exponential function to a set of data, graphing the data and the model function on the same coordinate axes.

Discussion of Mathematical Practices in Relation to Course Content

While all of the mathematical practice standards are important in all three courses, four are especially important in the Algebra II course:

- ***Construct viable arguments and critique the reasoning of others*** (MP.3). As in geometry, there are central questions in advanced algebra that cannot be answered definitively by checking evidence. There are important results about *all* functions of a certain type — the factor theorem for polynomial functions, for example — and these require general arguments (A-APR.2). Deciding whether two functions are equal on an infinite set cannot be settled by looking at tables or graphs; it requires arguments of a different sort (F-IF.8).
- ***Attend to precision*** (MP.6). As in the previous two courses, the habit of using precise language is not only a tool for effective communication but also a means for coming to understanding. For example, when investigating loan payments, if students can articulate something like, "What you owe at the end of a month is what you owed at the start of the month, plus 1/12 of the yearly interest on that amount, minus the monthly payment," they are well along a path that will let them construct a recursively defined function for calculating loan payments (A-SSE.4).
- ***Look for and make use of structure*** (MP.7). The structure theme in Algebra I centered on seeing and using the structure of algebraic expressions. This continues in Algebra II, where students delve deeper into transforming expressions in ways that reveal meaning. The example given in the standards — that $x^4 - y^4$ can be seen as the difference of squares — is typical of this practice. This habit of seeing subexpressions as single entities will serve students well in areas such as trigonometry, where, for example, the factorization of $x^4 - y^4$ described above can be used to show that the functions $\cos^4 x - \sin^4 x$ and $\cos^2 x - \sin^2 x$ are, in fact, equal (A-SSE.2).

Discussion of Mathematical Practices in Relation to Course Content (continued…)

In addition, the standards call for attention to the structural similarities between polynomials and integers (A-APR.1). The study of these similarities can be deepened in Algebra II: Like integers, polynomials have a division algorithm, and division of polynomials can be used to understand the factor theorem, transform rational expressions, help solve equations, and factor polynomials.

- ***Look for and express regularity in repeated reasoning*** (MP.8). Algebra II is where students can do a more complete analysis of sequences (F-IF.3), especially arithmetic and geometric sequences, and their associated series. Developing recursive formulas for sequences is facilitated by the practice of abstracting regularity for how you get from one term to the next and then giving a precise description of this process in algebraic symbols (F-BF.2). Technology can be a useful tool here: Most Computer Algebra Systems allow one to model recursive function definitions in notation that is close to standard mathematical notation. And spreadsheets make natural the process of taking successive differences and running totals (MP.5).

The same thinking — finding and articulating the rhythm in calculations — can help students analyze mortgage payments, and the ability to get a closed form for a geometric series lets them make a complete analysis of this topic. This practice is also a tool for using difference tables to find simple functions that agree with a set of data.

Algebra II is a course in which students can learn some technical methods for performing algebraic calculations and transformations, but sense-making is still paramount (MP.1). For example, analyzing Heron's formula from geometry lets one connect the zeros of the expression to the degenerate triangles. As in Algebra I, the modeling practice is ubiquitous in Algebra II, enhanced by the inclusion of exponential and logarithmic functions as modeling tools (MP.4). Computer algebra systems provide students with a tool for modeling all kinds of phenomena, experimenting with algebraic objects (e.g., sequences of polynomials), and reducing the computational overhead needed to investigate many classical and useful areas of algebra (MP.5).

Fluency Recommendations

A-APR.6 This standard sets an expectation that students will divide polynomials with remainder by inspection in simple cases. For example, one can view the rational expression $\frac{x+4}{x+3}$ as

$$\frac{x+4}{x+3} = \frac{(x+3)+1}{x+3} = 1 + \frac{1}{x+3}$$

A-SSE.2 The ability to see structure in expressions and to use this structure to rewrite expressions is a key skill in everything from advanced factoring (e.g., grouping) to summing series to the rewriting of rational expressions to examine the end behavior of the corresponding rational function.

F-IF.3 Fluency in translating between recursive definitions and closed forms is helpful when dealing with many problems involving sequences and series, with applications ranging from fitting functions to tables to problems in finance.

Time Period 1: Quadratic Equations and Relations
(6 days + 2 days for testing and review)

Notes:
- Prior Knowledge: Students will have explored transformations of quadratic functions in Algebra I, and will also have background knowledge of how to find real roots of quadratic equations. They will also have explored real-world applications of quadratic functions.
- Algebra II Focus: Students will extend their understandings of quadratic functions to solving quadratic equations with complex roots. They will also continue to model and fit quadratic data in context, and use technology to represent a system of quadratic equations. Finally, they will use geometric structures to derive the equation of a parabola using the focus and directrix.
- Going Forward: In Pre-Calculus, students will continue their work with complex numbers. They perform arithmetic operations with complex numbers and represent them and the operations on the complex plane and as vectors. Students investigate and identify the characteristics of the graphs of polar equations, using graphing tools. They will also extend their understanding of conic sections.

Essential Concepts	Essential Questions
Modeling Data with Quadratic Functions	• How do we model data with quadratic functions?
Properties of Parabolas	• How do we find the maximum and minimum values of quadratic functions?
Systems of Quadratic Functions	• How do we use tables or technology to find the solution(s) to a system of quadratic functions?
Translating Parabolas	• How do we use the vertex form of a quadratic function?
Complex Numbers	• How do we identify and graph complex numbers? • How do we add, subtract, and multiply complex numbers?
The Quadratic Formula	• How do we determine the types of solutions by using a discriminant?
Exploring Conic Sections: Parabolas	• How do we write the equation for a parabola given a graph (using the focus and directrix)?

Common Core State Standards for Mathematical Practice
2. Reason abstractly and quantitatively.
4. Model with mathematics.
7. Look for and make use of structure.

Standards

- Standards with a star ★ indicate Modeling standards, connected to Math Practice Standard 4.
- Standards with a plus sign (+) indicate a standard beyond College and Career Ready.
- Standards with a green closed square ■ represent Major Content from the PARCC Assessment.
- Standards with a blue open square □ represent Supporting Content from the PARCC Assessment.
- Standards with a yellow open circle ○ represent Additional Content from the PARCC Assessment.

Reason quantitatively and use units to solve problems. □

N-Q.2 Define appropriate quantities for the purpose of descriptive modeling. ★

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.

N-CN.8 (+) Extend polynomial identities to the complex numbers. *For example, rewrite* $x^2 + 4$ *as* $(x + 2i)(x – 2i)$.

N-CN.9 (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

Solve equations and inequalities in one variable.[1] □

A-REI.4 Solve quadratic equations in one variable.

- **A-REI.4a** 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.
- **A-REI.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.MA.4c** Demonstrate an understanding of the equivalence of factoring, completing the square, or using the quadratic formula to solve quadratic equations.

Solve systems of equations.[2] ○

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* $x^2 + y^2 = 3$.

Build a function that models a relationship between two quantities.[3] ■

F-BF.1 Write a function that describes a relationship between two quantities. ★

- **F-BF.1a** Determine an explicit expression, a recursive process, or steps for calculation from a context.★

[1] Limit to quadratic equations with real coefficients.
[2] Expand to include linear/quadratic systems.
[3] Expand to include quadratic and exponential functions.

Build new functions from existing functions.[4]

F-BF.3 Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, 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.*

Translate between the geometric description and the equation for a conic section.

G-GPE.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

G-GPE.2 Derive the equation of a parabola given a focus and directrix.

Summarize, represent, and interpret data on a single count or measurement variable.

S-ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

S-ID.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. ★

Pacing:

Chapter 5: Quadratic Equations and Functions	**4 days**
5.1 Modeling Data with Quadratic Functions	1 day
5.2 Properties of Parabolas 5.3 Translating Parabolas	1 day
Additional: Systems of Quadratic Functions	1 day
5.6 Complex Numbers 5.7 The Quadratic Formula	1 day
Chapter 10: Quadratic Relations	**4 days**
10.1 Exploring Conic Sections	1 day
10.2 Parabolas	1 day
Chapter Review TEST on Chapters 5 and 10	2 days

[4] Expand to include quadratic and absolute value functions.

Time Period 2: Polynomials and Polynomial Functions

(6 days + 2 days for testing and review)

Notes:

- Prior Knowledge: Students will have explored both linear and quadratic functions in Algebra I.
- Algebra II Focus: During this unit, students will extend their knowledge of polynomials by examining functions of degree three and greater, and will also extend their understanding of odd and even symmetries. They will also investigate and build polynomial functions using technology. Through their work with factoring and proving polynomial identities, students will because proficient in making use of structure and repeated reasoning.
- Going Forward: In Pre-Calculus, students will continue their investigations of key components of polynomial functions. They will also deepen their understanding of The Fundamental Theorem of Algebra.

Essential Concepts	Essential Questions
Polynomial Functions	• How do we classify polynomials? • How do we model polynomial data using functions? • How do we analyze a polynomial in factored form?
Dividing Polynomials	• How do we divide polynomials using long division? • How do we divide polynomials using synthetic division? • What is the remainder theorem?
Polynomial Equations	• How can we solve polynomial equations by factoring? • How can we solve polynomial equations using technology?

Honors Should Add:

The Fundamental Theorem of Algebra	• How can we use the Fundamental Theorem of Algebra to solve polynomial equations with complex roots?
The Binomial Theorem	• How do we use Pascal's Triangle? • How do we use the Binomial Theorem?

Common Core State Standards for Mathematical Practice

5. Use appropriate tools strategically.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Standards

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- Standards with a yellow open circle represent Additional Content from the PARCC Assessment.

Use complex numbers in polynomial identities and equations.
N-CN.9 (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

Interpret the structure of expressions.
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* $(x^2 – y^2)(x^2 + y^2)$*.*

Perform arithmetic operations on polynomials. (TESTED IN ALGEBRA 1)
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.
A-APR.MA.1a Divide polynomials.

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 $p(a)$, so $p(a) = 0$ if and only if $(x – a)$ is a factor of $p(x)$.
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.

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.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 numbers, with coefficients determined for example by Pascal's Triangle.[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.★

Interpret functions that arise in applications in terms of the 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.* ★
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. ★

[5] The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.

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. ★

F-IF.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. ★

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.*

Build a function that models a relationship between two quantities.

F-BF.1 Write a function that describes a relationship between two quantities. ★

F-BF.1b 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.* ★

Build new functions from existing functions.

F-BF.3 Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, 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.*

Pacing:

Chapter 6: Polynomials and Polynomial Functions	College Preparatory	Honors
6.1 Polynomials Functions 6.2 Polynomials and Linear Factors	2 days	1 day
6.3 Dividing Polynomials	2 days	1 day
6.4 Polynomial Equations 6.5 Theorems about Roots of Polynomial Equations	2 days	1 day
6.6 The Fundamental Theorem of Algebra		1 day
6.8 The Binomial Theorem		2 days
Chapter Review TEST on Chapter 6	2 days	2 days

Time Period 3: Rational Functions and Equations
(6 days + 2 days for testing and review)

Notes:
- Prior Knowledge: Again, students have already been introduced to several function families (both in Algebra I and during the last two units of Algebra II). They have already also been using technology to study solutions for equations.
- Algebra II Focus: Students will extend their knowledge to rational functions and equations. Students will be able to connect rewriting rational expressions to the remainder theorem from the last unit, and will continue to use technology to verify solutions and identify removable discontinuities and asymptotes.
- Going Forward: In Pre-Calculus, students will continue to deepen their understanding of rational functions, identifying their characteristics and using them to sketch the graphs of those functions.

Essential Concepts	Essential Questions
Inverse Variation	• What is inverse variation? • How do we graph and translate inverse variations?
Rational Functions	• What are the properties of rational functions? • How do we graph rational functions?
Rational Expressions	• How do we multiply and divide rational functions?
Solving Rational Equations	• How do we use rational equations in solving problems?

Honors should add:

Rational Expressions	• How do we add and subtract rational expressions?

Common Core State Standards for Mathematical Practice
1. Make sense of problems and persevere in solving them.
5. Use appropriate tools strategically.
7. Look for and make use of structure.

Standards

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Interpret the structure of expressions. ■

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* $(x^2 - y^2)(x^2 + y^2)$*.*

Rewrite rational expressions. □

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.7 (+) Understand that 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.

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.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. ★ (**TESTED IN ALGEBRA 1**)

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.

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.★

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. ★

- **F-IF.7c** Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. ★

Build a function that models a relationship between two quantities. ■

F-BF.1 Write a function that describes a relationship between two quantities. ★

- **F-BF.1b** 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.* ★

Build new functions from existing functions.

F-BF.4 Find inverse functions.

F-BF.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* $x \neq 1$.

Pacing:

Chapter 9: Rational Functions	**8 days**
9.1 Inverse Variation 9.2 Graphing Inverse Variations	1 day
9.3 Rational Functions and Their Graphs	1 day
9.4 Rational Expressions 9.5 Adding and Subtracting Rational Expressions (Honors)	2 days
9.6 Solving Rational Equations	2 days
Chapter Review TEST on Chapter 9	2 days

Time Period 4: Radical Functions and Equations
(8 days + 2 days for testing and review)

Notes:

- Prior Knowledge: Students began studying radicals in Algebra I, and are now very familiar with using technology to investigate key features of functions. Students have also worked with binomial multiplication in both Algebra I (real numbers) and in earlier units in Algebra II (complex numbers).
- Algebra II Focus: In this unit, students will build on their understanding of exponent and radical properties and build, solve, and evaluate the reasonableness of radical equations. They will also examine these functions in context and use technology to identify important characteristics of radical functions.
- Going Forward: Students will continue to improve fluency with radical equations in Pre-Calculus, making connections between fractional exponents and radicals.

Essential Concepts	Essential Questions
Multiplying and Dividing Radical Expressions	• How do we multiply radical expressions? • How do we divide radical expressions?
Solving Radical Equations	• How do we solve equations with radicals?
Inverse Relations and Functions	• How do we find the inverse of a relation or function using radicals?
Graphing Radical Functions	• How do we graph radical functions?

Common Core State Standards for Mathematical Practice

2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reason of others.
5. Use appropriate tools strategically.

Standards

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Reason quantitatively and use units to solve problems. □
N-Q.2 Define appropriate quantities for the purpose of descriptive modeling. ★

Interpret the structure of expressions. ■
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* $(x^2 - y^2)(x^2 + y^2)$.

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.

Analyze functions using different representations. ■
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.* ★

Build new functions from existing functions. ○
F-BF.4 Find inverse functions.
  F-BF.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* $x \neq 1$.

Pacing:

Chapter 7: Radical Functions and Rational Exponents	**10 days**
7.1 Roots and Radical Expressions 7.4 Rational Exponents	1 day
7.2 Multiplying and Dividing Radical Expressions 7.3 Binomial Radical Expressions	2 days
7.6 Function Operations 7.7 Inverse Relations and Functions	3 days
7.8 Graphing Radical Functions	2 days
Chapter Review TEST on Chapter 7	2 days

Time Period 5: Exponential and Logarithmic Functions and Equations
(10 days + 2 days for testing and review)

Notes:
- Prior Knowledge: Students are already familiar with properties of exponents from Algebra I. They have also construction exponential functions, and modeled these functions in specific contexts.
- Algebra II Focus: Now, students will extend their knowledge of exponential functions to domains beyond integers, and will also examine data that can be modeled with logarithmic functions. They will also understand how to use the properties of logarithms while operating on both exponential and logarithmic equations.
- Going forward: Students will expand their understanding of logarithmic functions in order to solve practical problems (including the role of *e*, natural and common logarithms, and the solution of logarithmic equations).

Essential Concepts	Essential Questions
Logarithmic Functions as Inverses	• How do we write and evaluate logarithmic functions? • How do we graph logarithmic functions?
Properties of Logarithms	• What are the properties of logarithms and how can we use them to simplify expressions and solve equations?
Exponential and Logarithmic Equations	• How can we solve exponential equations? • How can we solve logarithmic equations?
Natural Logarithms	• How can we evaluate natural logarithmic expressions? • How can we solve equations using natural logarithms?

Common Core State Standards for Mathematical Practice
2. Reason abstractly and quantitatively
4. Model with mathematics
6. Attend to precision.

Standards

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Reason quantitatively and use units to solve problems. (TESTED IN ALGEBRA 1)

N-Q.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

Write expressions in equivalent forms to solve problems.[6]

A-SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

A-SSE.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%.*

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. ★

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. ★

Interpret functions that arise in applications in terms of the context.[7]

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.* ★

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. ★

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[6] Expand to include quadratics and exponential expressions.

[7] Emphasize the selection of appropriate function model; expand to include rational, square, and cube functions.

Analyze functions using different representations.[8]

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. ★

- **F-IF.7e** Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. ★

F-IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

- **F-IF.8b** Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as* $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, *and* $y = (1.2)^{t/10}$, *and classify them as representing exponential growth or decay.*
- **F-IF.MA.8c** Translate among different representations of functions and relations: graphs, equations, point sets, and tables.

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.*

Build a function that models a relationship between two quantities.

F-BF.1 Write a function that describes a relationship between two quantities. ★

- **F-BF.1b** 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.* ★

Construct and compare linear, quadratic, and exponential models and solve problems.

F-LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions. ★ (**TESTED IN ALGEBRA 1**)

- **F-LE.1a** Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. ★
- **F-LE.1b** Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. ★
- **F-LE.1c** Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. ★

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). ★

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. ★

Interpret expressions for functions in terms of the situation they model.

F-LE.5 Interpret the parameters in a linear or exponential function in terms of a context. ★

Summarize, represent, and interpret data on two categorical and quantitative variables.

S-ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

- **S-ID.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. ★

[8] Expand to include rational and radical functions; focus on using key features to guide selection of appropriate type of function model.

Pacing:

Chapter 8: Exponential and Logarithmic Functions	**10 days**
8.3 Logarithmic Functions as Inverses	2 days
8.4 Properties of Logarithms	2 days
8.5 Exponential and Logarithmic Equations	2 days
8.6 Natural Logarithms	2 days
Chapter Review TEST on Chapter 8	2 days

Time Period 6: Sequences and Series
(6 days + 2 days for testing and review)

Notes:
- Prior Knowledge: Students will have been introduced to arithmetic and geometric sequences as well as general recursive processes in Algebra I. They will also have already connected both of these to linear and exponential equations.
- Algebra II Focus: In this course, students will extend their understanding of sequences and apply it to arithmetic and geometric series, and explore and derive both recursive and explicit formulas for sequences and series.
- Going Forward: Students will extend and build upon the concept of finding area under a curve when they reach Calculus.

Essential Concepts	Essential Questions
Arithmetic Series	• How do we write and evaluate arithmetic series? • How do we use summation notation?
Geometric Series	• How do we evaluate a finite geometric series? • How do we evaluate an infinite geometric series?
Area under A Curve	• How can we use rectangles to estimate the area under a curve?

Common Core State Standards for Mathematical Practice
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Standards
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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.* ★

Understand the concept of a function and use function notation. □
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* $n \geq 1$.

Build a function that models a relationship between two quantities. ■
F-BF.1 Write a function that describes a relationship between two quantities. ★
  F-BF.1a Determine an explicit expression, a recursive process, or steps for calculation from a context. ★
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. ★

Construct and compare linear, quadratic, and exponential models and solve problems.

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). ★

Pacing:

Chapter 11: Sequences and Series	**8 days**
11.2 Arithmetic Sequences 11.3 Geometric Sequences	1 day
11.4 Arithmetic Series	2 days
11.5 Geometric Series	2 days
11.6 Area under a Curve	1 day
Chapter Review TEST on Chapter 11	2 days

Time Period 7: Trigonometric Functions
(10 days + 2 days for testing and review)

Notes:

- Prior Knowledge: Students will already be familiar with using technology to investigate function families from both Algebra I and earlier Algebra II units. They know how to transform functions and explore how different parameters affect functions. They are also used to modeling various situations with different types of functions. Students will also be familiar with sine, cosine and tangent from Geometry.
- Algebra II Focus: In this unit, students will extend their understanding of functions to three trigonometric functions. They will transform these functions and their transformations. They will also be introduced to radians, which they will use to connect circular and trigonometric functions. Finally, they will model these functions in context.
- Going Forward: Students in Pre-Calculus will review unit circle trigonometry, proving trigonometric identities, solving trigonometric equations, and graphing trigonometric functions. They will use this knowledge to model periodic phenomena with trigonometric functions and prove trigonometric identities.

Essential Concepts	Essential Questions
Angles and the Unite Circle	• How do we work with angles in standard position? • How do we find coordinates of points on the unit circle?
Radian Measure	• How do we use radian measure for angles? • How to we find the length of an arc of a circle?
The Sine Function	• How do we graph the sine function? • How do we translate the sine function?
The Cosine Function	• How do we graph the cosine function? • How do we translate the cosine function?
The Tangent Function	• How do we graph the tangent function?
Trigonometric Identities	• How can we verify the three Pythagorean identities?

Common Core State Standards for Mathematical Practice

Standards

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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 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.

Model periodic phenomena with trigonometric functions.

F-TF.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. ★

Prove and apply trigonometric identities.

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

Pacing:

Chapter 13: Periodic Functions and Trigonometry	**10 days**
13.1 Exploring Periodic Data	1 day
13.2 Angles and the Unit Circle 13.3 Radian Measure	3 days
13.4 The Sine Function	2 days
13.5 The Cosine Function	2 days
13.6 The Tangent Function	1 day
13.7 Translating Sine and Cosine Functions	1 day
Chapter 14: Trigonometric Identities and Equations	**2 days**
14.1 Trigonometric Identities	2 days
Chapter Review TEST on Chapters 13 and 14	2 days

Time Period 8: Probability and Statistics
(12 days + 2 days for testing and review)

Notes:

- Prior Knowledge: Students will have been introduced to probability in both Algebra I and geometry. They know how to find probabilities of both simple and compound events and design and use simulations. Additionally, they have already been introduced to many types of function families (both in Algebra I and Algebra II). Additionally, students know how to calculate measures of central tendency and draw and interpret box-and-whisker plots.
- Algebra II Focus: Now, students will work to develop rules for probability and conditional probability. They will extend their knowledge of polynomials to binomial distributions, and their knowledge of rational expressions to find the probability of multiple events. Students will also apply their knowledge of function families to perform regression on sets of data and find the function model that best fits the data. They will use tools such as computer spreadsheets and technology to model this data, and draw conclusions.
- Going Forward:

Essential Concepts	Essential Questions
Standard Deviation	• How to we find the standard deviation of a set of values? • How do we use standard deviation in real-world situations?
Working with Samples	• How do we find sample proportions? • How do we find the margin of error?
The Normal Distribution	• How do we use a normal distribution? • How do we use the standard normal curve?
Comparing Samples	• How do we compare treatments? • How do we decide if differences between parameters are significant?

Honors should add:

Essential Concepts	Essential Questions
Permutations and Combinations	• How do we count permutations? • How do we count combinations?
The Binomial Theorem	• How do we use the Binomial Theorem to find probabilities?
Probability of Multiple Events	• How do we find the probability of A and B? • How do we find the probability of A or B?
Probability Distributions	• How do we make a probability distribution? • How do we use a probability distribution in conducting a simulation?
Conditional Probability	• How do we use formulas and tree diagrams to find conditional probabilities?

Common Core State Standards for Mathematical Practice:

1. Make Sense of problems in solving them.
3. Construct viable arguments and critique the reasoning of others.
6. Attend to precision.

Standards

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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 is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★

Understand and evaluate random processes underlying statistical experiments.

S-IC.1 Understand statistics as a process for making inferences to be made about population parameters based on a random sample from that population. ★

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 5 tails in a row cause you to question the model?* ★

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.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).[9] ★

[9] Replacing the hockey goalie with an extra skater.

Pacing:

Chapter 12: Probability and Statistics	**College Preparatory**	**Honors**
12.3 Analyzing Data	2 days	
12.4 Standard Deviation	2 days	1 day
12.5 Working with Samples	3 days	1 day
12.7 Normal Distributions	3 days	2 days
Additional: Comparing samples	2 days	1 day
Chapter Review TEST on Chapter 12	2 days	

Honors should add:

Chapter 6: Polynomials and Polynomial Functions	**3 days**
6.7 Permutations and Combinations	2 days
6.8 The Binomial Theorem	1 day
Chapter 9: Rational Functions	**1 days**
9.7 The Probability of Multiple Events	1 day
Chapter 12: Probability and Statistics	**3 days**
12.1 Probability Distributions	1 day
12.2 Conditional Probability	2 days