Algebra II Curriculum Map

Algebra 2 Common Assessments

Course: Algebra II	**Unit Title / Timeframe:** **1- Number Systems / Review /Equations and Inequalities- 6 weeks**
Enduring Understandings	● Properties of the real number system may or may not hold in other mathematical systems. ● There are many ways to represent a number. ● Algebraic expressions and equations generalize relationships from specific cases.
Essential Questions	● What does it mean to be "symbolically fluent?" ● How can verbal, numerical, graphical and analytical representations be used to analyze and solve problems. ● How do we analyze and understand patterns, relations and functions?
Common Core/Massachusetts Standards / AP Standards	● Number Systems review **8-NS, N-CN** ● Solve linear equations/inequalities (simple and compound) review **A- REI.1** ● Solving fractional equations and rational equations (linear) using clearing method **A-REI** ● Solving literal equations to highlight a quantity of interest **A-CED.4**
Learning Targets	● Students will review Algebra 1 standards with linear equations and inequalities. Skills needed for Algebra 2.
Unit Checklist	**Linear Inequalities** · Compound "AND" & "OR"-flipping signs, open/closed circles, etc. · Graphing on a number line · Absolute Value (GOLA) · Two-Variables Inequalities (graphing and shading on a coordinate plane) **Absolute Value** · Solving Equations-splitting up and doing 2 checks · Solving Absolute Value Inequalities (GOLA)

	· Using the graphing calculator to check if you can **Writing Equations** · Using point-slope or slope-intercept form · Utilizing a graph or given information · Parallel and Perpendicular Lines **Solving Equations** · 1 variable equations · Special solution sets · Proper solution checks · Isolating a variable in a 2-variable equation · Literal equations with multiple variables **Graphing Linear Equations** · 3 forms of a line · Using slope, intercepts, or a table of values · Solving an equation graphically (with the calculator)
Instructional Strategies* **TI** = Technology Integration **ID** = Interdisciplinary Connections	Directed Notes, Practice Cooperative Learning-Partner Work, Use **Rule of Four** sheets with graphing calculator*
Assessment	List of Assessments *Additionally the use of IXL & Kuta Software
Major Resources	Text: Big Ideas Math Algebra 1 Chapters 1-4 Resource Book: McDougal Littell Algebra 2 Chapter 1

Course: Algebra II	**Unit Title/Timeframe:** **2 - Functions and their graphs - 6 weeks**
Enduring Understandings	● Change is fundamental to understanding functions.
Essential Questions	● How does output change as input changes? ● How can change be described algebraically?
Common Core/Massachusetts Standards / AP Standards	● Understand the concept of a function and function notation including domain and range **F-IF.1, F-IF.2** ● Interpret functions that arise in terms of the context. **F-IF 4,5** ● Solve and graph absolute value equations and inequalities **A - REI 10-12** ● Calculate and interpret the average rate of change of a function. Estimate the rate of change of a graph **F-IF.6** ● Graph linear functions using both standard and slope-intercept form **F-IF 7** ● Identify types of correlation and find lines of best fit **S-ID 6 a,b,c,7,8,9** ● Graph linear inequalities in two variables, piecewise functions, including step functions **F-IF 7**
Learning Targets	● Identify parent functions and transformations. ● Describe transformations of parent functions. ● Model with linear functions.
Unit Checklist	**<u>General Function Vocabulary</u>** · Using a graph to answer questions about a function · What is a function? One-to-one? · Increasing vs Decreasing · Function Notation · Maximums, Minimums, Intercepts **<u>Domain and Range</u>** · Finding the domain and range from a graph · Finding the domain (only) from an equation **<u>Transformations</u>**

	· Using a given graph to create a new one · Using a table or visually moving points · Understand f(x) notation and parent functions **Absolute Value in 2-D** · Graphing absolute value functions · Finding an equation given a graph or points · Knowing what “a”, “h”, and “k” do **Piecewise Functions** · Evaluating a piecewise function and finding an ordered pair · Writing the equation given a graph · Word problems
Instructional Strategies* **TI** = Technology Integration **ID** = Interdisciplinary Connections	Directed Notes, Practice Cooperative Learning-Partner Work, Visual Representation: Students will manually graph and use the graphing calculator to display relationships and find domain and range of functions. **TI** Use calculator to find linear regressions Forensic Case 1 **TI-84** Representational Graphs graphs Louisiana Unit 1 Activity 7 Translating functions Louisiana Unit 1 Activity 10 Greatest Integer Discovery Worksheet DESE AMDM Unit V.C.8 Hurricanes and Shipping Costs V.C.9 Commute Home Activity 2.7 -graphing piecewise functions page 121 **TI**
Assessment	List of Assessments *Additionally the use of IXL & Kuta Software
Major Resources	Text: Big Ideas Math Algebra 2 Chapter 1.1-1.3 Resource Book: McDougal Littell Algebra 2 Chapter 2

Course: Algebra II	**Unit Title/Timeframe** **3- Systems of Linear Equations and Inequalities - 6 weeks**
Enduring Understandings	● Algebraic representations are used to communicate and generalize patterns in mathematics. ● Changes in quantities can be used to predict outcomes and solve problems.
Essential Questions	● How can expressions and equations be used to represent practical problems symbolically?
Common Core/Massachusetts Standards / AP Standards	● Solve systems of linear equations in two variables algebraically and graphically **A-CED, A-REI.5,6,7, F-IF** ● Solve systems of linear equations in 3 variables algebraically only **A-CED, A-REI, F-IF**
Learning Targets	● Describe different methods for solving systems of linear equations. ● Solve systems of linear equations. ● Solve systems of linear inequalities.
Unit Checklist	**<u>Systems of Equations</u>** · 2 Variable Systems graphically and algebraically · 3 Variable Systems by elimination and substitution · Word Problems in either 2 or 3 variables **<u>Systems of Inequalities</u>** · Dotted Lines, Shading, etc. · Final Solution Region · Up to four inequalities at once, including one variable
Instructional Strategies* **TI** = Technology Integration	Directed Notes, Practice Cooperative Learning-Partner Work,

ID = Interdisciplinary Connections	Visual Representation: Students will manually graph and use the graphing calculator to display relationships. **TI**
Assessment	List of Assessments *Additionally the use of IXL & Kuta Software
Major Resources	Text: Big Ideas Math Algebra 2 Chapter 1.4, Big Ideas Math Algebra 1 Chapter 5 Resource Book: McDougal Littell Algebra 2 Chapter 3

Course: *Algebra II* *Honors*	**Unit Title/Timeframe:** **4 - Matrices and Determinants - 3 weeks**
Enduring Understandings	• Matrices are an alternate way to solve systems of equations.
Essential Questions	• How can multiple representations of information be used to express relationships? • How can you use matrices to represent and manipulate data to model real-life situations?
Common Core/Massachusetts Standards / AP Standards	• Add and subtract matrices **N-VM** • Multiply a matrix by a scalar and multiply two matrices **N-VM** • Evaluate determinants of 2X2 and 3X3 matrices **N-VM** • Use Cramer's rule to solve systems of linear equations **A-REI** • Find inverses of 2X2 matrices, use technology for 3X3 matrices **N-VM**
Learning Target	• Perform operations with matrices • Solve systems of equations using matrices
Unit Checklist	**Matrix Operations** • Adding, Subtractions, Equating • Matrix Multiplication

	<u>Determinants</u> ● Finding Determinant of a 2x2 ● Finding Determinant of a 3x3 ● Cramer's Rule **<u>Inverses</u>** ● Inverse of a 2x2 by hand ● Inverse of a 3x3 with a graphing calculator **<u>Solving Systems</u>** ● Solving using Inverse Matrices ● Solving using Cramer's Rule
Instructional Strategies* **TI** = Technology Integration **ID** = Interdisciplinary Connections	Directed Notes, Practice Cooperative Learning-Partner Work, Use a graphing calculator for verifying inverses and determinants. All 3X3 matrix work to be done using calculator Activity 4.1 Using Matrix Operations p 207 **TI**
Assessment	List of Assessments *Additionally the use of IXL & Kuta Software
Major Resources	Text: McDougal Littell Algebra 2 Chapter 4 Resource Book: McDougal Littell Algebra 2 Chapter 4

Course: Algebra II	**Unit Title/Timeframe:** **5 - Quadratic Functions - 6 weeks**
Enduring Understandings	● Algebraic representations are used to communicate and generalize patterns in mathematics ● Patterns enable us to discover, analyze, describe, extend and formulate concrete understandings of real world phenomena through mathematics.
Essential Questions	● How can expressions and equations be used to represent practical problems symbolically? ● How can change be described mathematically?

Common Core/Massachusetts Standards / AP Standards	• Introduce vertex, standard and intercept forms of quadratic functions **F-IF** • Graph quadratic equations **F-IF** • Solve quadratic equations using: factoring, square roots, completing the square, quadratic formula and graphing calculator **A-REI, N-CN** • Write a quadratic equation given characteristics of their graphs, include systems of 3 equations in 3 unknowns **A-CED** • Model real life problems using quadratic equations, include applications of vertex and zeros **Modeling** • Perform arithmetic operations with complex numbers **N-CN** • Factoring over complex numbers **A.SS.E.2**
Learning Targets	• Describe transformations of quadratic functions. • Identify characteristics of quadratic functions. • Write equations of parabolas. • Model with quadratic functions. • Perform operations with complex numbers. • Solve quadratic equations by completing the square. • Describe how to use the quadratic formula. • Solve nonlinear systems and quadratic inequalities. • Solving efficiently using the 4 methods/Identify proper methods based on different problems.
Unit Checklist	**<u>Graphing Parabolas</u>** · 3 Forms: Standard, Vertex, and Intercept Form · Axis of symmetry, reflection, vertex and other vocabulary/concepts · Quadratic Inequalities (2D and 1D) · Writing Equations of Parabolas (Vertex & Intercept Form) **<u>Simplifying</u>** · Square roots (real and imaginary) · Operations with complex imaginary numbers **<u>Solving</u>**

	· By Square Rooting · By Factoring and using the ZPP · By the Quadratic Formula · By Completing the Square · Complex Solution Checks - Applications of word problems.
Instructional Strategies* **TI** = Technology Integration **ID** = Interdisciplinary Connections	Directed Notes, Practice Cooperative Learning-Partner Work, Heavy use of graphing calculator to find vertex, minimum and maximum of parabolas **TI** Suggested Activity 5-3 Solving Quadratic Equations page 271 using TI 84 Suggested Activity 5-5 Finding Minimums and Maximums page 290 using TI 84 Common Experiences: Quadratic Rule of Four/max, min
Assessment	List of Assessments *Additionally the use of IXL & Kuta Software
Major Resources	Text: Big Ideas Math Algebra 2 Chapters 2-3 Resource Book: McDougal Littell Algebra 2 Chapter 5

Course: Algebra II	**Unit Title/Timeframe:** **6- Polynomials Functions - 6 weeks**
Enduring Understandings	● Reasoning allows us to make conjectures and to prove conjectures. ● Patterns enable us to discover, analyze, describe, extend and formulate concrete understandings of real world phenomena through mathematics.
Essential Questions	● Why does a cubic equation have to have at least one real root? ● How does end behavior change in the polynomial family?

Common Core/Massachusetts Standards / AP Standards	● Use properties of exponents to simplify expressions **8-EE** ● Discuss end behavior of polynomial functions and graph them **A-APR, F-IF** ● Evaluate polynomial functions by substitution ● Add/subtract/multiply polynomials **A-APR** ● Factor by grouping, sum/difference of cubes and "quadratic form" to solve polynomial equations **A-APR** ● Divide polynomials using long division, and synthetic division **A-APR** ● Relate remainder theorem and factor theorem to long division **A-APR** ● Find rational roots of polynomial equations using Possible Rational Root theorem **A-APR** ● Analyzing graphs of polynomial functions including real-life models **Modeling**
Learning Targets	● Graph polynomial functions. ● Add, subtract, multiply, divide, and factor polynomials. ● Solve polynomial equations. ● Model with and analyze graphs of polynomial functions. (Intercepts/Multiplicities)
Unit Checklist	**<u>Polynomial Basics</u>** · Exponent Rules · Synthetic Substitution · End Behavior **<u>Multiplying Polynomials</u>** · Multiple Distributing with more than 2 terms · Raising a binomial to a power · Using special patterns and Pascal's Triangle · Sum & Product of Roots **<u>Factoring/Solving</u>** · Special Patterns (Sum/Difference of Cubes) · Quadratic Form (substituting "u") · Grouping · Solving with the ZPP and possible quad formula · Checking the Fundamental Theorem of Algebra **<u>Unfactorable Polynomials</u>** · Synthetic Division and Polynomial Division

	· Solving/Factoring a polynomial after given one root/factor · Listing all possible rational roots using the Rational Root Theorem **Graphing** · Factored form-using multiplicity rules · Standard form-finding roots first
Instructional Strategies* **TI** = Technology Integration **ID** = Interdisciplinary Connections	Directed Notes, Practice Cooperative Learning-Partner Work,
Assessment	List of Assessments *Additionally the use of IXL & Kuta Software
Major Resources	Text: Big Ideas Math Algebra 2 Chapter 4 Resource Book: McDougal Littell Algebra 2 Chapter 6

Course: Algebra II	**Unit Title/Timeframe:** **7. Rational Functions - 3 weeks**
Enduring Understandings	● Patterns enable us to discover, analyze, describe, extend, and formulate concrete understandings of mathematical and real world phenomena. ● Changes in quantities can be used to predict outcomes and solve problems
Essential Questions	● Compare and contrast working with numerical fractions and polynomial fractions.
Common Core/Massachusetts Standards / AP Standards	● Simplify rational expressions using factoring **A-APR, A-SSE** ● Multiply and divide rational expressions **A-APR, A-SSE** ● Add and subtract rational expressions **A-APR, A-SSE** ● Solving rational expressions **A-REI**
Learning Targets	● Add, subtract, multiply, and divide rational expressions. ● Solve rational equations. ● Describe how to graph rational functions.
Unit Checklist	**<u>Multiplying and Dividing</u>** · Factoring in order to reduce · NOT reducing parts of polynomials · Taking the reciprocal when dividing **<u>Adding and Subtracting</u>** · Writing the LCD out · Each factor the # of times it appears most · Simplifying complex fractions (1 of 2 methods) **<u>Solving Equations</u>** · Cross multiplying when possible · Multiplying through by the LCD · Extraneous solutions **<u>Applications to Graphs</u>** · Checking for extraneous solutions

	· Excluded values (open circles and asymptotes)
Instructional Strategies* **TI** = Technology Integration **ID** = Interdisciplinary Connections	Directed Notes, Practice Cooperative Learning-Partner Work, Technology Activity in text page 561 **TI**
Assessment	List of Assessments *Additionally the use of IXL & Kuta Software
Major Resources	Text: Big Ideas Math Algebra 2 Chapter 7 Resource Book: McDougal Littell Algebra 2 Chapter 9

Course: Algebra II	**Unit Title/Timeframe:** **8. Radical Functions - 6 weeks**
Enduring Understandings	● Radical rules for simplifying are analogous to exponent rules ● Using a function's inverse can help you understand the function
Essential Questions	● How do I find an inverse function? ● Will a function always have an inverse that is also a function? ● What families of functions are inverses of each and how do we use them?
Common Core/Massachusetts Standards / AP Standards	● Apply properties of integer exponents to fractional exponents. **F-IF-8** ● Show that rational exponent properties are analogous to radical properties and use them to simplify radical expressions. **F-IF-8** ● Write and graph radical functions for both square roots and cube roots. **F-IF-7** ● Define and show examples of inverse functions graphically and algebraically. **F-BF-4** ● Find and prove inverses of a function, restricting the domain where necessary. **F-BF-4**

Learning Targets	• Represent roots using rational exponents. • Describe the properties of rational exponents and radicals. • Solve radical equations and inequalities. • Explore inverses of functions
Unit Checklist	**<u>Simplifying Expressions</u>** · Converting exponent/radical forms · Using the same exponent rules with fractions · Evaluating a number to a fractional power · Like radicals and other basic radical properties · Simplifying under a radical with index>2 **<u>Function Composition</u>** · Basic operations on functions · Performing composition with functions · Using radical and exponent rules within composition **<u>Graphing Radical Functions</u>** · Square & cube root differences · Transformation rules **<u>Solving Equations</u>** · Squaring/cubing both sides for radical equations · "Rooting" both sides for power equations · NOT distributing an exponent/radical · Extraneous solutions
Instructional Strategies* **TI** = Technology Integration **ID** = Interdisciplinary Connections	Directed Notes, Practice Cooperative Learning-Partner Work, Technology Activities
Assessment	List of Assessments *Additionally the use of IXL & Kuta Software
Major Resources	Text: Big Ideas Math Algebra 2 Chapter 5 Resource Book: McDougal Littell Algebra 2 Chapter 7

Course: Algebra II	**Unit Title/Timeframe:** **9. Exponential Functions - 3 weeks**
Enduring Understandings	● Exponential growth is different from linear or quadratic growth ● Exponential functions can be used to model real world phenomena including many applications to finance and compound interest
Essential Questions	● How can I tell if a function is exponential growth, decay, or neither? ● What is an asymptote and what it is used to show graphically
Common Core/Massachusetts Standards / AP Standards	● Graph exponential growth and decay functions and identifying asymptotes **F-IF-8** ● Identifying growth, decay, etc.from equations and graphs **F-IF-8** ● Model real life problems with exponential functions **F-IF-5** ● Understand that “e” is a constant used for continuous growth and apply to real life problems **F-IF-5** ● Interpret functions including polynomial, rational, logarithmic, exponential, trigonometric (end of year review) **F.IF.MA.10**
Learning Targets	● Determine whether a function represents exponential growth or decay. ● Simplify exponential expressions. ● Solve exponential equations. ● Model exponential functions.
Unit Checklist	**<u>Growth & Decay</u>** · Identifying Growth vs. Decay depending on the “b” value · Using a negative “a” value

	· Graphing and using an asymptote · Identifying Linear, Quadratic, and Exponential models **Word Problems** · "Initial Value" and "Growth Factor" · Writing exponential equations from a word problem · Using/understanding the number "e" · Calculating an amount after a given time
Instructional Strategies* **TI** = Technology Integration **ID** = Interdisciplinary Connections	Directed Notes, Practice Cooperative Learning-Partner Work, Technology
Assessment	List of Assessments *Additionally the use of IXL & Kuta Software
Major Resources	Text: Big Ideas Math Algebra 2 Chapter 6 Resource Book: McDougal Littell Algebra 2 Chapter 8

Course: Algebra II	**Unit Title/Timeframe:** **10. Probability- 3 weeks (extension if time permits)**
Enduring Understandings	● Sample space is a list of all possible outcomes of an event ● An event and its complement create a probability of 1 ● Events that are mutually exclusive have no effect on each other ● Events that are dependent on a previous outcome are termed conditional probabilities
Essential Questions	● How are our mathematical calculations different when dealing with dependent vs. independent events? ● How can I use conditional probability to find out the likelihood of outcomes of events?

	• How can I use the counting principle to calculate a sample space?
Common Core/Massachusetts Standards / AP Standards	• Describe events as subsets of a sample space using characteristics of the outcomes, or as unions, intersections, or complements of other events **S-CP-1** • 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-2** • Understand the conditional probability of *A* given *B* as *P*(*A* and *B*)/*P*(*B*), and interpret independence of *A* and *B*. **S-CP-3** • Construct and interpret two-way frequency tables of data **S-CP-4** • Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations **S-CP-5** • 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-6** • Apply the Addition Rule, *P*(*A* or *B*) = *P*(*A*) + *P*(*B*) – *P*(*A* and *B*), and interpret the answer in terms of the model. **S-CP-7**
Learning Targets	• Define theoretical and experimental probability. • Use two-way tables to find probabilities. • Compare independent and dependent events. • Interpret and construct probability and binomial distributions.
Instructional Strategies* **TI** = Technology Integration **ID** = Interdisciplinary Connections	Directed Notes, Practice Cooperative Learning-Partner Work, Technology
	List of Assessments *Additionally the use of IXL & Kuta Software
Major Resources	Text: Big Ideas Math Algebra 2 Chapter 10 Resource Book: McDougal Littell Algebra 1 Chapter 2.8