# Hamilton-Wenham Regional School District

# HWRHS Common Core Standards Algebra 2

## Algebra 2 Units

Unit 1: Functions (Ch. 1 and 2)

Unit 2: Quadratics (Ch. 5)

Unit 3: Polynomials (Ch. 6)

Unit 4: Powers, Roots, Radicals (Ch. 7)

Unit 5: Exponential and Logarithmic Functions (Ch. 8)

Unit 6: Rational Equations and Functions (Ch. 9)

Unit 7: Trigonometric Functions (Ch. 13 and 14)

Unit 8: Statistics and Probability (Ch. 12)

## Algebra 2 Overview

Building on their work with linear, quadratic, and exponential functions, students extend their repertoire of functions to include polynomial, rational, and radical functions. Students work closely with the expressions that define the functions, 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.

The Mathematical Practice Standards apply throughout each unit and together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations. *Algebra 2* by Larson, Boswell, Kanold, and Stiff (McDougal Littell, 2004) is used as the primary resource. Chapter and content numbers included in parentheses refer this textbook.

## Algebra 2 Prerequisites

Algebra 2 students have successfully completed Algebra 1 and Geometry.

# Common Core (CC) Standards Curriculum Map Algebra 2

## Dan Hayden First Quarter

## Conceptual Category

Functions

### Unit 1(Ch. 1 and 2) Functions 10 days

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| --- | --- | --- | --- |
|  | Mathematical Practices and Essential Questions | Prior Learning | Instructional Activities(IA)  Formative Assessments(FA)  Summative Assessments(SA) |
| Unit 1.1 (1.4): Rewriting Equations and Formulas  A-CED 4 | SMP : 2, 5 | Working with multivariable equations | (IA): Rewrite various formulas for specific variable  (IA): pg. 29 #12-30 |
| Unit 1.2 (1.5): Problem Solving Using Algebraic Models  A-CED 1, 2, 3 | SMP: 1, 2, 4, 5  How do you solve real world problems using graphs and equations? | Solving linear equations | (IA): Model solving linear word problems  (IA): Individual or group work: practice solving linear word problems  (IA): pg. 38 #16-24 |
| Unit 1.3 (2.7): Piecewise Functions  A-REI 11  F-IF 7b | SMP: 4,5,6  What is a piecewise function?  What is a step function?  How can these functions be applied? | Graphing linear equations and inequalities | (IA): Review graphing basic linear equations  (IA): Use examples to demonstrate how to graph step and piecewise functions  (IA): pg. 117 #14-28, 36- 39  (FA): Quiz: 1.4, 1.5, 2.7 |
| Unit 1.4: (2.8): Absolute Value  A-REI 11  F-IF 7b  F-BF 3 | SMP: 4, 5, 6  What does an absolute value graph look like? Why? | Solving absolute value equations  Understand the concept of absolute value | (IA): Use examples to demonstrate how to graph an absolute value function  (IA): Introduce the effects of *h* and *k* (transformations) on an absolute value graph  (IA): pg. 125 #14-24, 34-38  (SA): Test Unit 1 |

# Common Core (CC) Standards Curriculum Map Algebra 2

## Dan Hayden First Quarter

## Conceptual Category

Functions

### Unit 2 Quadratics (Ch. 5) 21 days

|  |  |  |  |
| --- | --- | --- | --- |
| CC Standard and Content | Mathematical Practices and Essential Questions | Prior Learning | Instructional Activities(IA)  Formative Assessments(FA)  Summative Assessments(SA) |
| Unit 2.1 (5.1): Graphing Quadratic Functions  A-CED 2  A-REI 11  F-IF 4, 5  F-IF 7b  F-BF3 | SMP: 4, 5, 6  How do we use our understanding of quadratics to graph a quadratic function? | Solving and graphing basic quadratic equations and functions | (IA): Review basic quadratic graph  (IA): Show how to find vertex, axis of symmetry, and basic characteristics of the graph  (IA): Introduce standard, vertex and intercept forms  (IA): Writing equations in standard form  (IA): pg. 253 #17-49  (FA): Quiz Graphing |
| Unit 2.2 (5.2): Solving Quadratic Equations by Factoring  A-CED 1  A-SSE 1, 2  F-IF 4 | SMP: 1, 2, 7, 8  How can we find the solutions (x-intercepts) of a quadratic equation? | Factoring basic quadratic equations. | (IA): Review factoring methods  (IA): Introduce special factoring methods (difference of perfect squares, perfect square trinomials)  (IA): Review solving quadratic equations by factoring  (IA): Create a quadratic equation to solve a word problem  (IA) pg. 260 #23-88  (FA): Quiz Factoring |
| Unit 2.3 (5.3): Solving Quadratic Equations by Finding Square Roots.  A-CED 1 | SMP: 1, 5, 7 ,8  How can we find the solutions (x-intercepts) of a quadratic equation? | Understanding and using square roots. | (IA): Simplify a radical expression  (IA): Solve equations by finding square roots  (IA): Understand which method (square roots or factoring) to utilize to solve an equation.  (IA) pg. 267 #19-68 |
| Unit 2.4 (5.4): Complex Numbers  N-CN 1, 2, 7, 8 | SMP: 1, 2, 5  What is an imaginary number?  Why do we have imaginary numbers? |  | (IA): Introduce the complex number *i*  (IA): Perform basic operations with complex numbers  (IA): Solving quadratic equations involving complex number solutions  (IA): pg. 277 #17-55 |
| Unit 2.5(5.6): Quadratic Formula and the Discriminant  A-CED 1  N-CN 7 | SMP: 1, 4, 6  How can we find the solutions (x-intercepts) of a quadratic equation?  What does finding a zero mean? | Solving basic quadratic equations | (IA): Introduce the quadratic formula  (IA): Review simplifying radical expressions  (IA): Relate the solutions to a quadratic equation to the graph of the quadratic  (IA): Create a quadratic to model real-world problems and use the quadratic formula to solve  (IA): Understand which method (factoring, square roots, quadratic formula) to use to solve an equation  (IA): pg. 295 #17-64  (FA): Quiz: Solving Quadratic Equations |
| Unit 2.6 (5.8): Modeling With Quadratic Functions  A-CED 1  F-BF 1 | SMP: 1, 4, 6  What relationships can be modeled by a quadratic? | Scatter-Plots and lines of best fit | (IA): Writing quadratic equations based on given information using the different forms (standard, intercept, vertex)  (IA): Use graphing calculator to plot a scatter plot and find a line of best fit  (IA): pg. 309 #7-24, 36-39  (SA): Ch. 5 Test |

# Common Core (CC) Standards Curriculum Map Algebra 2

## Dan Hayden Second Quarter

## Conceptual Category

Algebra

### Unit 3 Polynomials (Ch. 6) 22days

|  |  |  |  |
| --- | --- | --- | --- |
| CC Standard and Content | Mathematical Practices and Essential Questions | Prior Learning | Instructional Activities(IA)  Formative Assessments(FA)  Summative Assessments(SA) |
| Unit 3.1 (6.1): Properties of Exponents  N-RN-1 | SMP: 5, 7, 8  How do we use the properties of exponents? | Understanding and use properties of exponents | (IA): Review properties of exponents  (IA): pg. 326 #16-47 |
| Unit 3.2 (6.2): Evaluating and Graphing Polynomial Functions  A-REI 11  F-IF 4  F-IF 7c | SMP: 5, 6  How do you evaluate and graph a polynomial function? | Graphing linear and quadratic equations. | (IA): Review direct substitution  (IA): Introduce synthetic substitution  (IA): Introduce end behavior  (IA): Use the graphing calculator or application to graph polynomials  (IA): pg. 333 # 27-46, 49-64  (SA): Quiz: Properties of Exponents and Evaluating Functions |
| Unit 3.3 (6.3): Adding, Subtracting, and Multiplying Polynomials  A-APR 1 | SMP: 5, 8  Are polynomials closed under the operations of addition, subtraction, and multiplication | Adding, Subtracting, and Multiplying linear expressions | (IA): Demonstrate how to add, subtract, and multiply polynomials using examples in the book  (IA): pg. 341 # 13-61 |
| Unit 3.4 (6.4): Factoring and Solving Polynomial Equations  A-CED 1  A-SSE 1, 2  F-IF 4 | SMP: 1, 2, 5  Why do I want to factor polynomials? | Factoring quadratics | (IA): Review factoring of quadratics and solving quadratics by factoring  (IA): Introduce factoring by grouping to factoring a polynomial  (IA): Solve polynomials by factoring  (IA): pg. 349 #18-26, 41-85 |
| Unit 3.5 (6.5): The Remainder and Factor Theorems  A-APR 2, 3 | SMP: 2, 4  How do I find the zeros of a polynomial? | Long division  Factoring quadratics | (IA): Review long division and apply it to dividing polynomials  (IA): Review synthetic substitution and relate it to synthetic division  (IA): Introduce and explain the Remainder Theorem  (IA): pg. 356 #16-54  (SA): Quiz: Solving Polynomials by factoring or synthetic division |
| Unit 3.6 (6.6): Finding Rational Zeros  A-APR 2, 3 | SMP: 2, 4, 7  How do I find the zeros of a polynomial? | Factoring quadratics | (IA): Review synthetic division  (IA):Use the synthetic division and Rational Zero Theorem to find the rational zeros of a polynomial  (IA): pg. 362 #15-58 |
| Unit 3.7 (6.7): Using the Fundamental Theorem of Algebra  N-CN 9  A-APR 3 | SMP: 2, 4, 7  How do I find the zeros of a polynomial? | Factoring quadratics | (IA): Introduce and explain the Fundamental Theorem of Algebra  (IA): Find all zeros (real and imaginary) of a polynomial  (IA): Use a graphing calculator or application to approximate zeros  (IA): Apply theorems to solve real-world problems  (IA): pg. 369 #21-54 |
| Unit 3.8 (6.8): Analyzing Graphs of Polynomial Functions  A-REI 11  F-IF 4, 5  F-IF 7c | SMP: 2,3, 5  What is end behavior?  What is the difference between local or absolute minimum/maximum and how do I find them? |  | (IA): Review end behavior  (IA): Talk about turning points and how they relate to the degree of the polynomial  (IA): Find the real zeros of a graph and relate to the degree of the polynomial  (IA): Find all minimums and maximums (local or absolute) and describe the difference  (IA): pg. 377 #23-34  (SA): Ch. 6 Test |

# Common Core (CC) Standards Curriculum Map Algebra 2

## Dan Hayden Second Quarter

## Conceptual Category

Functions

### Unit 4 Powers, Roots, and Radicals (Ch. 7) 15 days

|  |  |  |  |
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| CC Standard and Content | Mathematical Practices and Essential Questions | Prior Learning | Instructional Activities(IA)  Formative Assessments(FA)  Summative Assessments(SA) |
| Unit 4.1 (7.1): nth Roots and Rational Exponents  N-RN 1, 2 | SMP: 2, 5  What is an nth root? | Using properties of exponents | (IA): Review rational exponents and what it means  (IA): Find nth roots without a calculator  (IA): Solve equations using nth roots  (IA): pg. 404 #13-40 |
| Unit 4.2 (7.2): Properties of Rational Exponents  N-RN 1, 2 | SMP: 2, 5, 7  How do you evaluate expressions with rational exponents? | Using properties of exponents | (IA): Review properties of exponents and apply them to rational exponents  (IA): Simplify expressions involving rational exponents  (IA): pg. 411 #22-81  (FA): Quiz: 7.1-7.2 |
| Unit 4.3 (7.3): Power Functions and Function Operations  F-IF 5  F-BF 1 | SMP: 2, 7, 8 |  | (IA): Review basic operations on functions  (IA): Introduce the composition of a function  (IA): Find the domain of a composition  (IA): Use composition to solve real world problems  (IA): pg. 418 #12-51 |
| Unit 4.4 (7.4): Inverse Functions  F-BF 4 | SMP: 2, 5, 7  How do you find the inverse of a function? | Understand what a relation is | (IA): Find an inverse of a relation and relate that to the graph  (IA): Find the inverse of a linear and nonlinear functions  (IA): pg. 426 #16-24, 36-47  (FA): Quiz 7.3-7.4 |
| Unit 4.5 (7.5): Graphing Square Root and Cube Root Functions  A-REI 11  F-IF 4  F-IF 7 b  F-BF 3 | SMP:3, 6, 7  What does the graph of a square root look like?  What does the graph of a cube root look like? | Graphing basic functions and relations | (IA): Show the parent graph of square roots and explain how to graph a square root by hand  (IA): Introduce the effects of *h* and *k* (transformations) on a square root graph  (IA): Find the domain and range of a square root graph  (IA): Show the parent graph of cube roots and explain how to graph cube root by hand  (IA): Introduce the effects of *h* and *k* (transformations) on a cube root graph  (IA): pg. 434 #15-39 |
| Unit 4.6 (7.6): Solving Radical Equations  A-REI 2 | SMP: 1, 5  How do you solve radical equations? |  | (IA): Demonstrate how to solve radical equations through various examples  (IA): Individual or group practice solving radical equations  (IA): pg. 441 #23-54  (SA): Ch. 7 Test |

# Common Core (CC) Standards Curriculum Map Algebra 2

## Dan Hayden Third Quarter

## Conceptual Category

Functions

### Unit 5 Exponential and Logarithmic Functions (Ch.8) 15 days

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| CC Standard and Content | Mathematical Practices and Essential Questions | Prior Learning | Instructional Activities(IA)  Formative Assessments(FA)  Summative Assessments(SA) |
| Unit 5.1 (8.1-8.2): Exponential Growth and Decay  A-SSE 1  A-REI 11  F-BF 3  F-IF 7e | SMP: 1, 2, 4, 5, 6,  What do exponential growth and decay graphs look like?  What is an asymptote? | Graphing basic functions and relations | (IA): Graph basic growth and decay functions  (IA): Describe and demonstrate how to determine if graph is growth, decay, or neither.  (IA): Introduce the effects of *h* and *k* (transformations) on an exponential graph  (IA): Use exponential growth and decay models to solve real world problems (including but not limited to compound interest)  (IA): Create exponential growth and decay equations to model real world problem and solve  (IA) pg. 469 #13-54, 56-64  (IA) pg. 477 #11-55  (FA): Quiz: Graphing Exponential Functions  (IA or FA): Crash Course in Financial Math |
| Unit 5.2 (8.3): the number e  A-SSE 11  F-IF 7e | SMP: 1, 4, 5  What is the number e, and why do we have it? |  | (IA): Simplify natural base expressions  (IA): Describe and demonstrate how to determine if natural base graph is growth, decay, or neither.  (IA): Use natural base equations to solve real world problems  (IA): pg. 483 #17-60, 76 -80 |
| Unit 5.3 (8.4): Logarithmic Functions  A-REI 11  F-IF 4  F-IF 7e  F-BF 4 | SMP: 2, 5, 7  What is a logarithm? | Understand and use exponents | (IA): Introduce the definition of logarithm and use the definition to rewrite expressions between logarithmic form and exponential form  (IA): Evaluate logarithms without using a calculator  (IA): Find the inverse of a logarithmic function  (IA): Graph a basic logarithmic function  (IA): Introduce the effects of *h* and *k* (transformations) on a logarithmic graph  (IA): pg. 490 #16-70 |
| Unit 5.4 (8.5): Properties of Logarithms | SMP: 2, 5, 7  How do you evaluate a logarithm? |  | (IA): Introduce the properties of logarithms and use to expand and condense logarithmic expressions  (IA): Introduce the change-of-base formula and use to evaluate a logarithm  (IA): pg. 496 #14-73  (FA): Quiz 8.3-8.5 |
| Unit 5.5 (8.6): Solving Exponential and Logarithmic Equations  F-LE 4 | SMP: 1, 2, 5  How do you solve an exponential and logarithmic equation? | Solving equations | (IA): Introduce the two ways to solve an exponential equation  (IA): Introduce the two ways to solve a logarithmic equation  (IA): Individual or group practice: solving exponential and logarithmic equations  (IA): pg. 505 # 25-60  (SA): Ch. 8 Test |

# Common Core (CC) Standards Curriculum Map Algebra 2

## Dan Hayden Third Quarter

## Conceptual Category

Algebra

### Unit 6 Rational Equations and Functions (Ch. 9) 11 days

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| --- | --- | --- | --- |
| CC Standard and Content | Mathematical Practices and Essential Questions | Prior Learning | Instructional Activities(IA)  Formative Assessments(FA)  Summative Assessments(SA) |
| Unit 6.1 (9.2+9.3): Graphing Simple Rational Functions  A-REI 11  F-IF 4  F-IF 7 | SMP: 5, 6, 7  How do you find the vertical and horizontal asymptotes? | Graphing functions and equations. | (IA): Define rational function and show basic rational function graph called a hyperbola  (IA): Identify vertical and horizontal asymptotes of basic and more complex rational functions  (IA): Practice graphing basic rational functions by hand  (IA): Use a graphing calculator or application to graph more complex rational functions  (IA): pg. 543 #11-40  (IA): pg. 550 #11-37  (FA): Quiz: Graphing Rational Functions (9.2-9.3) |
| Unit 6.2(9.4): Multiplying and Dividing Rational Expressions  A-APR 7 | SMP: 2, 7  Are rational functions closed under multiplication and division? | Multiplying and dividing polynomials | (IA): Review factoring polynomials  (IA): Review simplifying expressions  (IA): Demonstrate how to multiply and divide rational expressions by using examples from the book  (IA): pg. 558 #16-49 |
| Unit 6.3 (9.5): Addition, Subtraction, and Complex Fractions  A-APR 6  A-APR 7 | SMP: 2, 7  Are rational functions closed under addition and subtraction?  What is a complex fraction? | Adding and subtracting fractions. | (IA): Review adding and subtracting basic fractions  (IA): Demonstrate how to add and subtract rational expressions by using examples from the book  (IA): pg. 566 #26-46  (FA): Quiz: Multiply, Divide, Add, Subtract Rational Expressions (9.4-9.5) |
| Unit 6.4 (9.6): Solving Rational Equations  A-REI 2 | SMP: 1, 2, 5, 7  How do you solve a rational equation? |  | (IA): Review least common denominator and how to find  (IA): Demonstrate how to solve rational equations by using examples from the book  (IA): Explain how you can get an extraneous solution  (IA): pg 571 #21-50  (SA): Ch. 9 Test |

# Common Core (CC) Standards Curriculum Map Algebra 2

## Dan Hayden Fourth Quarter

## Conceptual Category

Functions

### Unit 7 Trigonometric Functions (Ch. 13 and 14) 14 days

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| --- | --- | --- | --- |
| CC Standard and Content | Mathematical Practices and Essential Questions | Prior Learning | Instructional Activities(IA)  Formative Assessments(FA)  Summative Assessments(SA) |
| Unit 7.1 (13.2): General Angles and Radian Measure  F-TF 1  F-TF 2 | SMP: 2, 5, 7  What is a radian?  What is the unit circle? | Understanding and using basic trigonometric ratios | (IA): Review angle measures in standard position  (IA): Introduce radian measure and conversions between radian and degree  (IA): Introduce and complete the unit circle  (IA): Apply arc length to solve a real world problems  (IA): pg. 780 #25-83 |
| Unit 7.2 (13.3): Trigonometric Functions of any angle  F-TF1  F-TF 2 | SMP: 2, 5, 6  What is a reference angle? | Understanding and using basic trigonometric ratios | (IA): Demonstrate how to evaluate the six trigonometric ratios at a given point using examples from the book  (IA): Introduce reference angle  (IA): Use reference angle to evaluate trigonometric functions  (IA): pg. 788 #23-60  (FA): Quiz 13.2-13.3 |
| Unit 7.3 (13.4): Inverse Trigonometric Functions  F-TF 7 | SMP: 2, 5, 6  What does it mean to take the inverse of sine? | Understanding and using basic trigonometric ratios | (IA): Explain what the inverse of the three basic trigonometric functions are and apply to all six trigonometric functions  (IA): Find the angle measure of any trigonometric ratio  (IA): pg. 795 #18-25, 44-51 |
| Unit 7.4 (14.1): Graphing Sine, Cosine, and Tangent Functions  F-IF 7e  F-TF 5 | SMP: 2, 4, 5, 7  What does the graph of sine, cosine, or tangent look like? |  | (IA): Explain the characteristics of sine and cosine graphs (range, amplitude, period, frequency) and how to find these from the equation  (IA): Graph sine and cosine functions  (IA): Use a sine or cosine function to model a real world problem  (IA): Explain the characteristics of a tangent graph  (IA): Graph tangent function  (IA):pg. 835 #17-49 |
| Unit 7.5 (14.2): Translations and Reflections of Trigonometric Graphs  F-IF 7e  F-TF 5 | SMP: 2, 4, 5 |  | (IA): Introduce the effects of *h* and *k* (transformations) on a trigonometric function  (IA): Graph a trigonometric function with a vertical and/or horizontal shift  (IA): Use a sine or cosine function to model a real world problem  (IA): pg. 844 #17-43  (FA): Quiz: Graphing Trigonometric Functions |
| Unit 7.6 (14.3): Verifying Trigonometric Identities  F-TF 8 | SMP: 2, 3  What is a trigonometric identity and how can you use the identities to evaluate trigonometric ratios |  | (IA): Explain the fundamental trigonometric identities (may prove some)  (IA): Demonstrate how to find trigonometric ratios using a trigonometric identity by using examples from the book  (IA): pg. 852 #16-27  (SA): Trigonometric Test (Ch. 13+14) |

# Common Core (CC) Standards Curriculum Map Algebra 2

## Dan Hayden Fourth Quarter

## Conceptual Category

Statistics and Probability

### Unit 8 Statistics and Probability (Ch. 12) <Estimated time in days for completion>

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| --- | --- | --- | --- |
| CC Standard and Content | Mathematical Practices and Essential Questions | Prior Learning | Instructional Activities(IA)  Formative Assessments(FA)  Summative Assessments(SA) |
| TBD |  |  |  |