

**Crook County School District # 1 Curriculum Guide**

**Algebra 2 Mathematics**

2013-2014

| MATHEMATICS COMMON CORE STATE STANDARDS<br>Algebra 2<br><b>Number &amp; Quantity The complex System N-CN</b><br>Perform arithmetic operations with complex numbers  |   |                        |  |
|---|---|------------------------|--|
| CC STANDARD   | Declarative Knowledge<br>Procedural knowledge   | Sample Assessment Item | Academic Vocabulary  |
| <p><u><a href="#">CCSS.Math.Content.HSN-CN.A.1</a></u></p> <p>Know there is a complex number <math>i</math> such that <math>i^2 = -1</math>, and every complex number has the form <math>a + bi</math> with <math>a</math> and <math>b</math> real.</p> | <ul style="list-style-type: none"> <li>Identify that <math>i</math> represents the square root of -1.</li> <li>State that <math>i^2 = -1</math>.</li> <li>Explain that the square root of a negative number is not a real number.</li> <li>Show that every complex number <math>a = bi</math> has a real and an imaginary part that <math>a</math> and <math>b</math> are both real numbers.</li> </ul> |                        | <p><b><u>Prior</u></b><br/>Real number</p> <p><b><u>Explicit</u></b><br/>Complex number<br/>Imaginary number</p> |
| <p><u><a href="#">CCSS.Math.Content.HSN-CN.A.2</a></u></p> <p>Use the relation <math>i^2 = -1</math> and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.</p>                                  | <ul style="list-style-type: none"> <li>Add and subtract complex numbers by combining like terms.</li> <li>Analyze the powers of <math>i</math> and predict <math>i^N</math>.</li> <li>Use the distributive property to find products of complex number.</li> </ul>  |                        |  |

| MATHEMATICS COMMON CORE STATE STANDARDS<br>Algebra 2<br><b>Number &amp; Quantity The complex System N-CN</b><br>Use complex numbers in polynomial identities and equations.                 |  |                        |  |
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| CC STANDARD   | Declarative Knowledge<br>Procedural knowledge  | Sample Assessment Item | Academic Vocabulary  |
| <a href="#">CCSS.Math.Content.HSN-CN.C.7</a><br>Solve quadratic equations with real coefficients that have complex solutions.   | <ul style="list-style-type: none"> <li>Identify different methods to solve Quadratic equations such as factoring, completing the square, graphing, or the quadratic formula.</li> <li>Assess the best method to solve a quadratic equation.</li> <li>Solve a quadratic equation with complex solutions.</li> </ul> |                        | <b><u>Prior</u></b><br>Quadratic                             |
| <a href="#">CCSS.Math.Content.HSN-CN.C.8</a><br>(+) Extend polynomial identities to the complex numbers. <i>For example, rewrite <math>x^2 + 4</math> as <math>(x + 2i)(x - 2i)</math>.</i> | <ul style="list-style-type: none"> <li>Identify that a polynomial can fit an identity form using complex numbers.</li> <li>Rewrite a polynomial arithmetically to fit the identity.</li> <li>Expand complex polynomial identities.</li> </ul>  |                        | <b><u>Explicit</u></b><br>Polynomial Identity                |
| <a href="#">CCSS.Math.Content.HSN-CN.C.9</a><br>(+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.  | <ul style="list-style-type: none"> <li>State the Fundamental Theorem of Algebra.</li> <li>Use the quadratic formula to prove there are two solutions to a quadratic equation.</li> <li>Describe the nature of the roots of a quadratic using the discriminate.</li> </ul>  |                        | <b><u>Introductory</u></b><br>Fundamental Theorem of Algebra |

| MATHEMATICS COMMON CORE STATE STANDARDS<br>Algebra 2<br><b>Algebra Seeing Structure in Expressions A-SSE</b><br>Interpret the structure of expressions.   |  |                        |                     |
|---|--|------------------------|---------------------|
| CC STANDARD   | Declarative Knowledge<br>Procedural knowledge  | Sample Assessment Item | Academic Vocabulary |
| <p><a href="#"><u>CCSS.Math.Content.HSA-SSE.A.1a</u></a></p> <p>Interpret expressions that represent a quantity in terms of its context.</p> <p>Interpret parts of an expression, such as terms, factors, and coefficients.</p> | <ul style="list-style-type: none"> <li>Identify the terms, factors, and coefficients in an expression.</li> <li>Describe the contextual meaning of the terms, factors, coefficients.</li> </ul>  |                        |                     |
| <p><a href="#"><u>CCSS.Math.Content.HSA-SSE.A.1b</u></a></p> <p>Interpret complicated expressions by viewing one or more of their parts as a single entity.</p>   | <ul style="list-style-type: none"> <li>Identify the context of the expression.</li> <li>Interpret the meaning of each part of the expression in its context.</li> <li>Interpret complicated expressions by viewing one or more of their parts as a single entity.</li> <li><i>For example, interpret <math>P(1-r)^n</math> as the product of <math>P</math> and a factor not depending on <math>P</math>.</i></li> </ul> |                        |                     |

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| <p><u>CCSS.Math.Content.HSA-SSE.A.2</u></p> <p>Use the structure of an expression to identify ways to rewrite it.</p> | <ul style="list-style-type: none"> <li>• Identify that an expression can be rewritten or simplified.</li> <li>• Rewrite or simplify the expression.</li> <li>• <i>For example, see <math>x^4</math> as <math>(x^2)^2 - (y^2)^2</math>, thus recognizing it as a difference of squares that can be factored as <math>(x^2 - y^2)(x^2 + y^2)</math>.</i></li> </ul> |  |  |
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| <p>MATHEMATICS COMMON CORE STATE STANDARDS<br/>Algebra 2<br/><b>Algebra Seeing Structure in Expressions A-SSE</b><br/>Write expressions in equivalent forms to solve problems.</p>   |  |                        |   |
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| CC STANDARD  | Declarative Knowledge<br>Procedural knowledge  | Sample Assessment Item | Academic Vocabulary   |
| <p><u>CCSS.Math.Content.HSA-SSE.B.4</u></p> <p>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. <i>For example, calculate mortgage payments.</i></p> | <ul style="list-style-type: none"> <li>• Identify a sequence as geometric.</li> <li>• Identify the common ratio and the number of terms of the geometric sequence.</li> <li>• Construct the formula using the given information.</li> <li>• Evaluate the problem using the constructed formula.</li> </ul> |                        | <p><b><u>Prior</u></b><br/>Geometric Sequence<br/>Arithmetic sequence<br/>Common Ratio</p> <p><b><u>Explicit</u></b><br/>Geometric Series</p> |

| MATHEMATICS COMMON CORE STATE STANDARDS<br>Algebra 2<br><b>Algebra Arithmetic with Polynomials &amp; Rational Expressions A-APR</b><br>Perform arithmetic operations on polynomials.  |   |                           |                                       |
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| CC STANDARD   | Declarative Knowledge<br>Procedural knowledge   | Sample<br>Assessment Item | Academic<br>Vocabulary                |
| <a href="#">CCSS.Math.Content.HSA-APR.A.1</a><br><br>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. | <ul style="list-style-type: none"> <li>• Explain the property of closure of polynomial operations.</li> <li>• Add, subtract and multiply polynomials with degrees larger than 2.</li> </ul> |                           | <b><u>Prior</u></b><br>Degree Closure |

| MATHEMATICS COMMON CORE STATE STANDARDS<br>Algebra 2<br><b>Algebra Arithmetic with Polynomials &amp; Rational Expressions A-APR</b><br>Understand the relationship between zeros and factors of polynomials.  |   |                        |  |
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| CC STANDARD   | Declarative Knowledge<br>Procedural knowledge   | Sample Assessment Item | Academic Vocabulary  |
| <p><u><a href="#">CCSS.Math.Content.HSA-APR.B.2</a></u></p> <p>Know and apply the Remainder Theorem: For a polynomial <math>p(x)</math> and a number <math>a</math>, the remainder on division by <math>x - a</math> is <math>p(a)</math>, so <math>p(a) = 0</math> if and only if <math>(x - a)</math> is a factor of <math>p(x)</math>.</p> | <ul style="list-style-type: none"> <li>Use synthetic substitution to find <math>p(a)</math>.</li> <li>Determine whether <math>(x-a)</math> is a factor of <math>p(x)</math>.</li> </ul>   |                        | <p><b><u>Explicit</u></b><br/>Synthetic Substitution</p> <p><b><u>Introductory</u></b><br/>Remainder Theorem</p>   |
| <p><u><a href="#">CCSS.Math.Content.HSA-APR.B.3</a></u></p> <p>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.</p>  | <ul style="list-style-type: none"> <li>Factor the polynomial.</li> <li>Identify the zeros of the polynomial factors.</li> <li>Determine the behavior of the graph given the multiplicity of the zeros.</li> <li>Describe the end behavior of the polynomial using degree and leading coefficient.</li> <li>Construct a rough graph of the polynomial using the zeros and end behavior.</li> </ul> |                        | <p><b><u>Prior</u></b><br/>Zeros of Quadratics<br/>Roots<br/>Factors<br/>Leading Coefficient</p> <p><b><u>Explicit</u></b><br/>Multiplicity of Zeros<br/>End Behaviors</p> |

| MATHEMATICS COMMON CORE STATE STANDARDS<br>Algebra 2<br><b>Algebra Arithmetic with Polynomials &amp; Rational Expressions A-APR</b><br>Use polynomial identities to solve problems.  |   |                        |  |
|--|---|------------------------|--|
| CC STANDARD  | Declarative Knowledge<br>Procedural knowledge   | Sample Assessment Item | Academic Vocabulary  |
| <a href="#">CCSS.Math.Content.HSA-APR.C.4</a><br><br>Prove polynomial identities and use them to describe numerical relationships.   | <ul style="list-style-type: none"> <li>• Prove polynomial identities utilizing algebraic or visual models.</li> <li>• Demonstrate numerical patterns and relationships given numerical representations of polynomial identities.</li> <li>• <i>For example, the polynomial identity <math>(x^2+y^2)^2 = (x^2-y^2)^2 + (2xy)^2</math> can be used to generate Pythagorean triples.</i></li> </ul>  |                        |  |
| <a href="#">CCSS.Math.Content.HSA-APR.C.5</a><br><br>(+) 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. <sup>1</sup> | <ul style="list-style-type: none"> <li>• Construct Pascal's Triangle</li> <li>• Explain how Pascal's Triangle correlates to the coefficients of <math>(x+y)^N</math>.</li> <li>• Describe properties of the Binomial Theorem including the exponential progression and the sign variations.</li> <li>• Expand any binomial <math>(x+y)^N</math> using the Binomial Theorem and Pascal's Triangle where <math>x</math> and <math>y</math> have real coefficients.</li> </ul> |                        | <b>Explicit</b><br>Pascal's Triangle<br><br>Binomial Theorem |



| MATHEMATICS COMMON CORE STATE STANDARDS  |  |                           |   |
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| Algebra 2  |  |                           |   |
| <b>Algebra Arithmetic with Polynomials &amp; Rational Expressions A-APR</b>  |  |                           |   |
| Rewrite rational expressions.  |  |                           |   |
| CC STANDARD  | Declarative Knowledge<br>Procedural knowledge  | Sample<br>Assessment Item | Academic<br>Vocabulary                                    |
| <p><u>CCSS.Math.Content.HSA-APR.D.6</u></p> <p>Rewrite simple rational expressions in different forms; write <math>\frac{a(x)}{b(x)}</math> in the form <math>q(x) + \frac{r(x)}{b(x)}</math>, where <math>a(x)</math>, <math>b(x)</math>, <math>q(x)</math>, and <math>r(x)</math> are polynomials with the degree of <math>r(x)</math> less than the degree of <math>b(x)</math>, using inspection, long division, or, for the more complicated examples, a computer algebra system.</p> | <ul style="list-style-type: none"> <li>Explain the meaning of each function in <math>\frac{a(x)}{b(x)} = q(x) + \frac{r(x)}{b(x)}</math>.</li> <li>Divide two polynomials using inspection, long division, or for the more complicated examples, a computer algebra system.</li> <li>Determine the most efficient method to divide polynomials.</li> </ul> |                           | <p><b><u>Prior</u></b><br/>Function<br/>Notation</p>      |
| <p><u>CCSS.Math.Content.HSA-APR.D.7</u></p> <p>(+) 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.</p>  | <ul style="list-style-type: none"> <li>Explain the property of closure of operations on rational expressions including division by a non-zero rational expression.</li> <li>Add, subtract, multiply and divide rational expressions.</li> </ul>  |                           | <p><b><u>Explicit</u></b><br/>Rational<br/>Expression</p> |

| MATHEMATICS COMMON CORE STATE STANDARDS   |   |                           |  |
|---|---|---------------------------|--|
| Algebra 2   |   |                           |  |
| <b>Algebra Creating Equations A-CED</b>   |   |                           |  |
| Create equations that describe numbers or relationships.  |   |                           |  |
| CC STANDARD   | Declarative Knowledge<br>Procedural knowledge   | Sample<br>Assessment Item | Academic<br>Vocabulary   |
| <p><a href="#"><u>CCSS.Math.Content.HSA-CED.A.1</u></a></p> <p>Create equations and inequalities in one variable and use them to solve problems. <i>Include equations arising from linear and quadratic functions, and simple rational and exponential functions.</i></p> | <ul style="list-style-type: none"> <li>• Determine unknown quantity.</li> <li>• Assign a variable to the unknown.</li> <li>• Write an equation or inequality to represent the problem.</li> <li>• Determine a solution.</li> <li>• Evaluate the reasonableness of the solution.</li> </ul>  |                           | <p><b><u>Prior</u></b><br/>Exponential<br/>Function</p>                              |
| <p><a href="#"><u>CCSS.Math.Content.HSA-CED.A.2</u></a></p> <p>Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p>  | <ul style="list-style-type: none"> <li>• Identify the dependent and independent quantities.</li> <li>• Assign each quantity a variable.</li> <li>• Write an equation or inequality relating two or more variables which may be linear, exponential or quadratic.</li> <li>• Create a graph of the equation with appropriate labels and scales.</li> </ul> |                           | <p><b><u>Prior</u></b><br/>Dependent and<br/>Independent<br/>Variable<br/>Linear</p> |

| MATHEMATICS COMMON CORE STATE STANDARDS<br>Algebra 2<br><b>Algebra Creating Equations A-CED</b><br>Create equations that describe numbers or relationships.  |  |                        |   |
|--|--|------------------------|---|
| CC STANDARD  | Declarative Knowledge<br>Procedural knowledge  | Sample Assessment Item | Academic Vocabulary   |
| <a href="#">CCSS.Math.Content.HSA-CED.A.3</a><br><br>Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.                            | <ul style="list-style-type: none"> <li>Determine unknown quantities.</li> <li>Assign a variable to each unknown.</li> <li>Write equations or inequalities to represent each constraint.</li> <li>Write an objective function.</li> <li>Solve for the viable and nonviable option using systems or graphing.</li> <li>Evaluate the reasonableness of the solution.</li> <li><i>For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.</i></li> </ul> |                        | <b><u>Explicit</u></b><br>Constraint<br>Objective<br>Function |
| <a href="#">CCSS.Math.Content.HSA-CED.A.4</a><br><br>Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. <i>For example, rearrange Ohm's law <math>V = IR</math> to highlight resistance <math>R</math>.</i> | <ul style="list-style-type: none"> <li>Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.</li> </ul>  |                        |   |

| MATHEMATICS COMMON CORE STATE STANDARDS  |  |                           |  |
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| Algebra 2  |  |                           |  |
| <b>Algebra Reasoning with Equations &amp; Inequalities A-REI</b>   |  |                           |  |
| Understand solving equations as a process of reasoning and explain the reasoning.  |  |                           |  |
| CC STANDARD  | Declarative Knowledge<br>Procedural knowledge  | Sample<br>Assessment Item | Academic<br>Vocabulary   |
| <a href="#"><u>CCSS.Math.Content.HSA-REI.A.2</u></a><br><br>Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. | <ul style="list-style-type: none"> <li>• Solve single variable rational and radical equations using inverse operations.</li> <li>• Determine whether the solution to a rational or radical equation is extraneous.</li> <li>• Create a rational or radical equation that contains extraneous solutions.</li> </ul> |                           | <p><b><u>Prior</u></b><br/>Inverse<br/>Operation<br/>Radical</p> <p><b><u>Explicit</u></b><br/>Extraneous<br/>Solution</p> |

| MATHEMATICS COMMON CORE STATE STANDARDS<br>Algebra 2<br><b>Algebra Reasoning with Equations &amp; Inequalities A-REI</b><br>Represent and solve equations and inequalities graphically.   |  |                           |   |
|---|--|---------------------------|---|
| CC STANDARD   | Declarative Knowledge<br>Procedural knowledge  | Sample<br>Assessment Item | Academic<br>Vocabulary  |
| <p><u><a href="#">CCSS.Math.Content.HSA-REI.D.11</a></u> Explain why the <math>x</math>-coordinates of the points where the graphs of the equations <math>y = f(x)</math> and <math>y = g(x)</math> intersect are the solutions of the equation <math>f(x) = g(x)</math>; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where <math>f(x)</math> and/or <math>g(x)</math> are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.</p> | <ul style="list-style-type: none"> <li>Solve a system of equations which may include linear, polynomial, rational, absolute value, exponential or logarithmic functions.</li> <li>Utilize technology to find the solution to a system of equations by graphing, tables and successive approximations.</li> <li>Explain why the <math>x</math>-coordinates of the points where the graphs of the equations <math>y=f(x)</math> and <math>y=g(x)</math> intersect are the solutions of the equation <math>f(x) = g(x)</math>.</li> </ul> |                           | <p><b>Prior</b><br/>Absolute value<br/>Function<br/>System of Equations</p> <p><b>Explicit</b><br/>Logarithm<br/>Logarithmic Function</p> |

| MATHEMATICS COMMON CORE STATE STANDARDS<br>Algebra 2<br><b>Interpreting Functions F-IF</b><br>Interpret functions that arise in applications in terms of the context.   |  |                        |   |
|---|--|------------------------|---|
| CC STANDARD   | Declarative Knowledge<br>Procedural knowledge  | Sample Assessment Item | Academic Vocabulary   |
| <u>CCSS.Math.Content.HSF-IF.B.4</u> 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. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> | <ul style="list-style-type: none"> <li>Describe the features of the graph of a function including intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</li> <li>Sketch graphs showing key features given a verbal description of the relationship.</li> </ul> |                        | <p><b><u>Prior</u></b><br/>Symmetry<br/>Intercepts<br/>Increasing<br/>Decreasing</p> <p><b><u>Explicit</u></b><br/>Interval (s)<br/>Notation<br/>Relative<br/>Maximum<br/>Minimum</p> <p><b><u>Introductory</u></b><br/>Periodicity</p> |

| MATHEMATICS COMMON CORE STATE STANDARDS<br>Algebra 2<br><b>Interpreting Functions F-IF</b><br>Interpret functions that arise in applications in terms of the context.   |  |                           |                                 |
|---|--|---------------------------|---------------------------------|
| CC STANDARD   | Declarative Knowledge<br>Procedural knowledge  | Sample<br>Assessment Item | Academic<br>Vocabulary          |
| <u>CCSS.Math.Content.HSF-IF.B.5</u> Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. <i>For example, if the function <math>h(n)</math> gives the number of person-hours it takes to assemble <math>n</math> engines in a factory, then the positive integers would be an appropriate domain for the function.</i> | <ul style="list-style-type: none"> <li>Explain any restrictions on the domain of a graph of a function both algebraically and contextually.</li> </ul>   |                           | <b>Prior</b><br>Domain<br>Range |
| <u>CCSS.Math.Content.HSF-IF.B.6</u> 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.  | <ul style="list-style-type: none"> <li>Describe rate of change algebraically and contextually.</li> <li>Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval.</li> <li>Estimate the rate of change from a graph.</li> </ul> |                           | <b>Prior</b><br>Rate of change  |

| MATHEMATICS COMMON CORE STATE STANDARDS<br>Algebra 2<br><b>Interpreting Functions F-IF</b><br>Analyze functions using different representations.   |   |                        |  |
|--|---|------------------------|--|
| CC STANDARD  | Declarative Knowledge<br>Procedural knowledge   | Sample Assessment Item | Academic Vocabulary  |
| <p><u>CCSS.Math.Content.HSF-IF.C.7b</u> Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.</p> <p>Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.</p> | <ul style="list-style-type: none"> <li>Describe characteristics of square root, cube root, piecewise, step and absolute value functions.</li> <li>Graph functions expressed symbolically by hand in simple cases and using technology for more complicated cases.</li> </ul>  |                        | <p><b>Explicit</b></p> <p>Piece-wise function</p> <p>Step function</p> <p>Cube root function</p> <p>Square root function</p> |
| <p><u>CCSS.Math.Content.HSF-IF.C.7c</u> Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.</p>  | <ul style="list-style-type: none"> <li>Factor the polynomial.</li> <li>Identify the zeros of the polynomial factors.</li> <li>Determine the behavior of the graph given the multiplicity of the zeros.</li> <li>Describe the end behavior of the polynomial using degree and leading coefficient.</li> <li>Construct a graph of the polynomial using the zeros and end behavior.</li> </ul> |                        |  |



| Algebra 2  |   |                           |   |
|--|---|---------------------------|---|
| Interpreting Functions F-IF  |   |                           |   |
| Analyze functions using different representations.   |   |                           |   |
| CC STANDARD  | Declarative Knowledge<br>Procedural knowledge   | Sample<br>Assessment Item | Academic<br>Vocabulary                                      |
| <p><u>CCSS.Math.Content.HSF-IF.C.7e</u> Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.</p>   | <ul style="list-style-type: none"> <li>Describe characteristics of exponential, logarithmic and trigonometric functions</li> <li>Graph trigonometric functions including the midline, period and amplitude as well as end behavior when applicable.</li> <li>Graph logarithmic and exponential functions including the intercept and end behavior.</li> </ul>       |                           | <p><b>Explicit</b><br/>Period<br/>Midline<br/>Amplitude</p> |
| <p><u>CCSS.Math.Content.HSF-IF.C.8a</u> Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.</p> <p>Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.</p> | <ul style="list-style-type: none"> <li>Factor a quadratic function.</li> <li>Complete the square on a quadratic function.</li> <li>Find the zeros of a quadratic function.</li> <li>Find the extreme values and symmetry of a quadratic function.</li> <li>Interpret the zeros, extreme values and symmetry of a quadratic function in terms of context.</li> </ul> |                           | <p><b>Explicit</b><br/>Extreme Value</p>                    |

| MATHEMATICS COMMON CORE STATE STANDARDS<br>Algebra 2<br><b>Interpreting Functions F-IF</b><br>Analyze functions using different representations.  |  |                        |  |
|---|--|------------------------|--|
| CC STANDARD   | Declarative Knowledge<br>Procedural knowledge  | Sample Assessment Item | Academic Vocabulary                                  |
| <p><u>CCSS.Math.Content.HSF-IF.C.8b</u> Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as <math>y = (1.02)^t</math>, <math>y = (0.97)^t</math>, <math>y = (1.01)12t</math>, <math>y = (1.2)^t/10</math>, and classify them as representing exponential growth or decay.</p> | <ul style="list-style-type: none"> <li>• Compare and contrast exponential growth and decay.</li> <li>• Classify exponential functions both algebraically and graphically as exponential growth or decay.</li> </ul>  |                        | <p><b>Prior</b><br/>Exponential growth and decay</p> |
| <p><u>CCSS.Math.Content.HSF-IF.C.9</u> Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <i>For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.</i></p>                                       | <ul style="list-style-type: none"> <li>• Identify the key characteristics of a function algebraically, graphically, numerically in tables, or by verbal descriptions.</li> <li>• Compare properties of two functions each represented in a different way.</li> </ul> |                        |  |

| MATHEMATICS COMMON CORE STATE STANDARDS<br><b>Algebra 2</b><br><b>Building Functions F-BF</b><br>Build a function that models a relationship between two quantities.   |  |                           |                        |
|--|--|---------------------------|------------------------|
| CC STANDARD  | Declarative Knowledge<br>Procedural knowledge  | Sample<br>Assessment Item | Academic<br>Vocabulary |
| <p><u><a href="#">CCSS.Math.Content.HSF-BF.A.1b</a></u></p> <p>Write a function that describes a relationship between two quantities.</p> <p>Combine standard function types using arithmetic operations. <i>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.</i></p> | <ul style="list-style-type: none"> <li>• Perform arithmetic operations on functions.</li> <li>• Combine functions in context using arithmetic operations.</li> </ul> |                           |                        |

| MATHEMATICS COMMON CORE STATE STANDARDS  |  |                           |   |
|--|--|---------------------------|---|
| Algebra 2  |  |                           |   |
| Building Functions F-BF  |  |                           |   |
| Build a function that models a relationship between two quantities.  |  |                           |   |
| CC STANDARD  | Declarative Knowledge<br>Procedural knowledge  | Sample<br>Assessment Item | Academic<br>Vocabulary  |
| <p><b>CSS.Math.Content.HSF-BF.B.3</b> Identify the effect on the graph of replacing <math>f(x)</math> by <math>f(x) + k</math>, <math>k f(x)</math>, <math>f(kx)</math>, and <math>f(x + k)</math> for specific values of <math>k</math> (both positive and negative); find the value of <math>k</math> 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.</p> | <ul style="list-style-type: none"> <li>Identify the effect on a graph of replacing <math>f(x)</math> by <math>f(x) + k</math>, <math>k f(x)</math>, <math>f(kx)</math>, and <math>f(x + k)</math> for specific values of <math>k</math> (both positive and negative) with and without using technology.</li> <li>Find the value of <math>k</math> given the graphs.</li> <li>Prove that a function is even or odd using their graphs and algebraic expressions.</li> </ul> |                           | <p><b>Prior</b><br/>Transformations</p> <p><b>Explicit</b><br/>Even function<br/>Odd function</p> |
| <p><b>CCSS.Math.Content.HSF-BF.B.4</b> Find inverse functions.</p> <p><b>CCSS.Math.Content.HSF-BF.B.4a</b> Solve an equation of the form <math>f(x) = c</math> for a simple function <math>f</math> that has an inverse and write an expression for the inverse. <i>For example, <math>f(x) = 2x^3</math> or <math>f(x) = (x+1)/(x-1)</math> for <math>x \neq 1</math>.</i></p>  | <ul style="list-style-type: none"> <li>Explain the steps to finding the inverse of a function.</li> <li>Find the inverse of a function.</li> </ul>   |                           | <p><b>Explicit</b><br/>Inverse of a function</p>  |

| MATHEMATICS COMMON CORE STATE STANDARDS  |   |                           |   |
|--|---|---------------------------|---|
| Algebra 2  |   |                           |   |
| Linear, Quadratic and Exponential Models F-LE  |   |                           |   |
| Construct and compare linear, quadratic, and exponential models and solve problems.  |   |                           |   |
| CC STANDARD  | Declarative Knowledge<br>Procedural knowledge   | Sample<br>Assessment Item | Academic<br>Vocabulary  |
| <p><u><a href="#">CCSS.Math.Content.HSF-LE.A.4</a></u></p> <p>For exponential models, express as a logarithm the solution to <math>ab^{ct} = d</math> where <math>a</math>, <math>c</math>, and <math>d</math> are numbers and the base <math>b</math> is 2, 10, or <math>e</math>; evaluate the logarithm using technology.</p> | <ul style="list-style-type: none"> <li>• Describe how logarithms relate to exponents.</li> <li>• Evaluate a logarithm where base <math>b</math> is 2, 10 or <math>e</math> algebraically or with technology.</li> <li>• Simplify expressions using the properties of logarithms where base <math>b</math> is 2, 10 or <math>e</math>.</li> <li>• Solve a logarithmic equation where base <math>b</math> is 2, 10 or <math>e</math>.</li> <li>• Solve an exponential equation using a logarithm to express the solution to <math>ab^{ct} = d</math> where <math>a</math>, <math>c</math>, and <math>d</math> are numbers and the base <math>b</math> is 2, 10, or <math>e</math>.</li> </ul> |                           | <p><b><u>Prior</u></b><br/>Exponential</p> <p><b><u>Explicit</u></b><br/>Logarithm<br/>Base of a<br/>Logarithm <math>e</math></p> |

| MATHEMATICS COMMON CORE STATE STANDARDS<br><b>Algebra 2</b><br><b>Trigonometric Functions F-TF</b><br>Extend the domain of trigonometric functions using the unit circle.  |  |                        |  |
|--|--|------------------------|--|
| CC STANDARD  | Declarative Knowledge<br>Procedural knowledge  | Sample Assessment Item | Academic Vocabulary  |
| <u>CCSS.Math.Content.HSF-TF.A.1</u><br>Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.   | <ul style="list-style-type: none"> <li>Explain that the radian measure of an angle is the length of the arc on the unit circle subtended by the angle.</li> </ul>  |                        | <u><b>Prior</b></u><br>Arc<br><br><u><b>Explicit</b></u><br>Radian measure<br>Unit circle<br><br><u><b>Introductory</b></u><br>subtended |
| <u>CCSS.Math.Content.HSF-TF.A.2</u><br>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. | <ul style="list-style-type: none"> <li>Convert radians to degrees and degrees to radians.</li> <li>Label the basic radians on the unit circle.</li> <li>Approximate all positive real number radian and degree measures on the unit circle.</li> </ul> |                        |  |

| MATHEMATICS COMMON CORE STATE STANDARDS  |  |                           |                        |
|--|--|---------------------------|------------------------|
| Algebra 2  |  |                           |                        |
| Trigonometric Functions F-TF   |  |                           |                        |
| Model periodic phenomena with trigonometric functions.   |  |                           |                        |
| CC STANDARD  | Declarative Knowledge<br>Procedural knowledge  | Sample<br>Assessment Item | Academic<br>Vocabulary |
| <p><u>CCSS.Math.Content.HSF-TF.B.5</u></p> <p>Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.</p> | <ul style="list-style-type: none"> <li>Identify an appropriate trigonometric function to model a situation with given conditions.</li> <li>Write a trigonometric function to model a situation with given conditions.</li> <li>Interpret the trigonometric function model contextually.</li> </ul> |                           |                        |

| MATHEMATICS COMMON CORE STATE STANDARDS  |   |                           |  |
|--|---|---------------------------|--|
| Algebra 2  |   |                           |  |
| Trigonometric Functions F-TF   |   |                           |  |
| Prove and apply trigonometric identities.  |   |                           |  |
| CC STANDARD  | Declarative Knowledge<br>Procedural knowledge   | Sample<br>Assessment Item | Academic<br>Vocabulary   |
| <p><u>CCSS.Math.Content.HSF-TF.C.8</u> Prove the Pythagorean identity <math>\sin^2(\theta) + \cos^2(\theta) = 1</math> and use it to find <math>\sin(\theta)</math>, <math>\cos(\theta)</math>, or <math>\tan(\theta)</math> given <math>\sin(\theta)</math>, <math>\cos(\theta)</math>, or <math>\tan(\theta)</math> and the quadrant of the angle.</p> | <ul style="list-style-type: none"> <li>Find the sine, cosine, and tangent ratios from a right triangle.</li> <li>Describe the relationship between the coordinates <math>x</math> and <math>y</math> to cosine and sine.</li> <li>Prove the Pythagorean identity <math>\sin^2(\theta) + \cos^2(\theta) = 1</math>.</li> <li>Use Pythagorean identity to find use it to find <math>\sin(\theta)</math>, <math>\cos(\theta)</math>, or <math>\tan(\theta)</math> given <math>\sin(\theta)</math>, <math>\cos(\theta)</math>, or <math>\tan(\theta)</math> and the quadrant of the angle.</li> </ul> |                           | <p><b><u>Prior</u></b><br/>                     Quadrant<br/>                     Sine<br/>                     Cosine<br/>                     Tangent</p> <p><b><u>Explicit</u></b><br/>                     Pythagorean<br/>                     identity</p> |

| MATHEMATICS COMMON CORE STATE STANDARDS<br><b>Algebra 2</b><br><b>Statistics &amp; Probability Interpreting Categorical &amp; Quantitative Data S-ID</b><br>Summarize, represent, and interpret data on a single count or measurement variable.   |   |                           |  |
|---|---|---------------------------|--|
| CC STANDARD   | Declarative Knowledge<br>Procedural knowledge   | Sample<br>Assessment Item | Academic<br>Vocabulary   |
| <u>CCSS.Math.Content.HSS-ID.A.4</u><br>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. | <ul style="list-style-type: none"> <li>Describe characteristics of normal distribution, mean, and standard deviation.</li> <li>Estimate population percentages using normal distribution.</li> <li>Decide when a data set is not a normal distribution.</li> <li>Use calculators, spreadsheets, and tables to estimate areas under the normal curve.</li> </ul> |                           | <u><b>Prior</b></u><br>Mean<br>Standard deviation<br><br><u><b>Explicit</b></u><br>Normal distribution |



| MATHEMATICS COMMON CORE STATE STANDARDS<br><b>Algebra 2</b><br><b>Statistics &amp; Probability Inferences &amp; Justifying Conclusions S-IC</b><br>Understand and evaluate random processes underlying statistical experiments.   |  |                        |   |
|---|--|------------------------|---|
| CC STANDARD   | Declarative Knowledge<br>Procedural knowledge  | Sample Assessment Item | Academic Vocabulary   |
| <u>CCSS.Math.Content.HSS-IC.A.1</u><br>Understand statistics as a process for making inferences about population parameters based on a random sample from that population.  | <ul style="list-style-type: none"> <li>• Explain how a random sample relates to a whole population.</li> <li>• Make inferences about a population based on the statistics from a random sample.</li> </ul> |                        | <u>Explicit</u><br>Random sample  |
| <u>CCSS.Math.Content.HSS-IC.A.2</u><br>Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. <i>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?</i> | <ul style="list-style-type: none"> <li>• Determine a model to represent a probability situation.</li> <li>• Evaluate whether an experiment is consistent with a specified model.</li> </ul>                |                        | <u>Prior</u><br>Theoretical probability<br>Experimental probability<br><br><u>Explicit</u><br>Model |

| MATHEMATICS COMMON CORE STATE STANDARDS<br><b>Algebra 2</b><br><b>Statistics &amp; Probability Inferences &amp; Justifying Conclusions S-IC</b><br>Make inferences and justify conclusions from sample surveys, experiments, and observational studies. |  |                        |                                    |
|---|--|------------------------|------------------------------------|
| CC STANDARD   | Declarative Knowledge<br>Procedural knowledge  | Sample Assessment Item | Academic Vocabulary                |
| <u>CCSS.Math.Content.HSS-IC.B.3</u><br>Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.   | <ul style="list-style-type: none"> <li>• Compare and contrast sample surveys, experiments and observational studies.</li> <li>• Assess when each method of data collection is most appropriate.</li> <li>• Explain how randomization relates to surveys, experiments and observational studies.</li> </ul> |                        |                                    |
| <u>CCSS.Math.Content.HSS-IC.B.4</u><br>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.   | <ul style="list-style-type: none"> <li>• Estimate a population mean or proportion using a sample survey.</li> <li>• Find the margin of error.</li> </ul>   |                        | <b>Explicit</b><br>Margin of error |

| MATHEMATICS COMMON CORE STATE STANDARDS<br><b>Algebra 2</b><br><b>Statistics &amp; Probability Inferences &amp; Justifying Conclusions S-IC</b><br>Make inferences and justify conclusions from sample surveys, experiments, and observational studies. |   |                           |   |
|---|---|---------------------------|---|
| CC STANDARD   | Declarative Knowledge<br>Procedural knowledge   | Sample<br>Assessment Item | Academic<br>Vocabulary  |
| <u>CCSS.Math.Content.HSS-IC.B.5</u><br>Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.  | <ul style="list-style-type: none"> <li>Compare the data between two treatments in a randomized experiment.</li> <li>Evaluate whether the differences between parameters are significant.</li> </ul> |                           | <b><u>Prior</u></b><br>Parameter<br><br><b><u>Explicit</u></b><br>Statistically significant differences |
| <u>CCSS.Math.Content.HSS-IC.B.6</u><br>Evaluate reports based on data.  | <ul style="list-style-type: none"> <li>Evaluate reports based on data.</li> </ul>   |                           |   |

| MATHEMATICS COMMON CORE STATE STANDARDS<br><b>Algebra 2</b><br><b>Statistics &amp; Probability Using Probability to Make Decisions S-MD</b><br>Use probability to evaluate outcomes of decisions.       |  |                           |                        |
|---|--|---------------------------|------------------------|
| CC STANDARD   | Declarative Knowledge<br>Procedural knowledge  | Sample<br>Assessment Item | Academic<br>Vocabulary |
| <a href="#">CCSS.Math.Content.HSS-MD.B.6</a> (+)<br>Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).  | <ul style="list-style-type: none"> <li>Determine whether an outcome is fair.</li> <li>Make fair decisions based on probability.</li> </ul> |                           |                        |
| <a href="#">CCSS.Math.Content.HSS-MD.B.7</a> (+)<br>Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game). | <ul style="list-style-type: none"> <li>Analyze decisions and strategies using probability concepts.</li> </ul>                             |                           |                        |

**The properties of operations**

Here  $a$ ,  $b$  and  $c$  stand for arbitrary numbers in a given number system. The properties of operations apply to the rational number system, the real number system, and the complex number system.

*Associative property of addition*  $(a + b) + c = a + (b + c)$

*Commutative property of addition*  $a + b = b + a$

*Additive identity property of 0*  $a + 0 = 0 + a = a$

*Associative property of multiplication*  $(a \times b) \times c = a \times (b \times c)$

*Commutative property of multiplication*  $a \times b = b \times a$

*Multiplicative identity property of 1*  $1 \times a = a \times 1 = a$

*Distributive property of multiplication over addition*  $a \times (b + c) = a \times b + a \times c$

Common Core Student Math Vocabulary

2013-2014 Version

**Vocabulary Explicitly Taught**

1. Complex Number
2. Imaginary Number
3. Polynomial Identity
4. Fundamental Theorem of Algebra
5. Finite Geometric Series
6. Remainder Theorem
7. Synthetic substitution
8. Multiplicity of Zeros
9. End behavior
10. Pascal's Triangle
11. Binomial Theorem
12. Rational expression
13. Constraint
14. Objective Function
15. Extraneous Solution
16. Logarithm, base of a logarithm
17. Normal distribution
18. Random Sample
19. Margin of error
20. Statistically Significant differences
21.  $e$
22. Interval
23. Interval notation
24. Relative maximum and minimum
25. Periodicity
26. Piece-wise function
27. Step function
28. Cube root function
29. Period
30. Midline
31. Amplitude
32. Extreme values
33. Even and odd functions
34. Inverse function
35. Radian measure
36. Unit Circle
37. Pythagorean Identity
38. Model for Probability