Jefferson County High School
Course Syllabus

A. Course: Algebra II

B. Department: Mathematics

C. Course Description: Algebra II includes the topics of the complex number system, relations and functions, exponents and logarithms, quadratic relations, systems of equations and inequalities, probability and statistics, and trigonometry. This is a TN Ready course.

D. Grade Term: Semester

E. Grading Scale:

Range		Regular	Honors/ College-Level	A.P.
93-100	A	4.0	4.5	5.0
85-92	B	3.0	3.5	4.0
75-84	C	2.0	2.5	3.0
70-74	D	1.0	1.5	2.0

F. Term Dates
a. 1st 9 Weeks August 5, 2016 – October 7, 2016
b. 2nd 9 Weeks October 8, 2016 – December 16, 2016
c. 3rd 9 Weeks January 5, 2017 – March 15, 2017
d. 4th 9 Weeks March 16, 2017 – May 25, 2017

G. Textbook(s): Glencoe Algebra 2

H. Other Required Reading

I. Other Resources
a. Odysseyware
b. Khan Academy
c. Teacher-created resources

J. Major Assignments
a. Projects (may be assigned)
b. Unit tests

K. Procedures for Parental Access to Instructional Materials
a. Aspen Parent Portal
b. Instructor’s Website

c. Email Instructor
d. Parent Teacher Conference
    a. There are two designated conference dates during the school year.
    b. Parents who would like to request additional meetings may make appointments for conferences with the teachers (during their planning periods), counselors, or a principal by telephoning the school office.

L. Field Trips

a. Any schedule fieldtrip will have a definite educational purpose and will reflect careful planning. Signed permission forms will be obtained when an off campus trip is planned.
b. Math Contest – Spring Semester

M. Standards & Objectives

a. I Can Statement Scope & Sequence

<table>
<tr><td colspan="2">2016.17 Algebra 2, First 9 Weeks</td></tr>
<tr><td>The following practice standards will be used throughout the semester:
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.</td><td></td></tr>
<tr><td colspan="2">Ongoing Standards
The following ongoing standards will be practiced all semester long and embedded into instruction instead of being taught in isolation.
WCE.AII.1 Move flexibly between multiple representations (contextual, physical, written, verbal, iconic/pictorial, graphical, tabular, and symbolic) of non-linear and transcendental functions to solve problems, to model mathematical ideas, and to communicate solution strategies.
A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
F.BF.1 Write a function that describes a relationship between two quantities.
WCE.AII.2 Graph a variety of functions identifying the domain, range, x-intercept(s), y-intercept, increasing intervals, decreasing intervals, the maximums, and minimums of a function by looking at its graph.
WCE.AII.3 Describe the domain and range of functions and articulate restrictions imposed either by the operations or by the contextual situations which the functions represent.
WCE.AII.4 Multiply polynomials.</td></tr>
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Standards	**Student Friendly "I Can" Statements**
Unit 1 Analyzing Functions	
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.	I can view graphs as relationships between quantities and identify the following when given a graph: • Vertex • Maximum or minimum • Axis of symmetry • Domain and range of quadratic functions • Intercepts • Increasing and decreasing intervals • Relative maximums and minimums • End behavior
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.	I can calculate and estimate the rate of change from a graph.
F.BF.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.	I can identify the effect on a graph from a constant k. (i.e. $(x)+k$, $f(kx)$, $k\,f(x)$, and $f(x+k)$) whether k is positive or negative. I can identify and explain the difference between an even and odd function.
F.BF.4 Find inverse functions. a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, $f(x) = 2x^3$ or $f(x) = (x+1)/(x-1)$ for $x \neq 1$. b. (+) Verify by composition that one function is the inverse of another.	I can write the inverse of a function by solving f(x) = c for x. I can write the inverse of a function by interchanging the values of the x and y values and solving for y. I can verify that one function is the inverse of another by using the composition of functions, i.e. $(f^{-1}(f))$.

WCE.AII.5 Evaluate composite functions at integer values and write an expression for the composite of two simple functions.	I can evaluate composite functions at integer values and write an expression for the composite of two simple functions.
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.	I can name the vertex, max or min, and the *x* and *y* intercepts of an absolute value function. I can graph an absolute value function by hand and using technology.
A-CED.1. Create equations and inequalities in one variable and use them to solve problems. WCE.AII.6 Solve absolute value equations and inequalities.	I can review solving absolute value equations and inequalities.
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.	I understand that the intersection of two equations is the solution to the system of equations. Include cases where the functions are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. I can find the intersection of any two functions using graphing technology.
Unit 2 Quadratic Functions, Equations and Relations	
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.	I can identify that *i* is a complex number where $i^2 = -1$ and $i = \sqrt{-1}$. I can identify that a complex number is written in the form $a + bi$ where a and b are real numbers.
N.CN.2 Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	I can simplify the square root of a negative number. I can add, subtract, and multiply complex numbers. I can find powers of *i*.
	Given a complex number, I can find its conjugate and use it to find quotients of complex numbers.
A.REI.4 Solve quadratic equations in one variable. b. Solve quadratic equations by inspection (e.g., for $x^2=49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a±bi for real numbers a and b.	I can solve quadratic equations using a variety of methods.

N.CN.7 Solve quadratic equations with real coefficients that have complex solutions.	I can solve real-world quadratic problems and identify which answer(s) are appropriate. I can solve quadratic equations with real coefficients. I can determine when a quadratic equation in standard form, $ax^2 + bx = c$ has complex roots by looking at a graph or by inspecting the discriminant.
G.GPE.2 Derive the equation of a parabola given a focus and directrix.	I can derive the equation of a parabola given a focus and directrix.
A.REI.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.	I can solve systems of linear equations algebraically and graphically. (includes systems of three variable linear equations) * Time cannot be spent on linear equations in two variables
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 $x^2 + y^2 = 3$.	I can solve a system containing a linear equation and a quadratic equation graphically and algebraically. I can graph a system containing a linear inequality and a quadratic inequality.
Unit 3 Polynomial Functions, Expressions, and Equations	
F.BF.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.	I can identify the effect on a graph from a constant k. (i.e. $(x)+k$, $f(kx)$, $k\,f(x)$, and $f(x+k)$) whether k is positive or negative. I can graph a cubic function.
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.	I can graph polynomial functions in both standard and vertex form and identify key features using inspection and technology.
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.	I can compare properties of two functions when represented in different ways (algebraically, graphically, numerically in tables or by verbal descriptions).

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.	I can multiply polynomials and use the patterns observed in identities such as the difference of squares to multiply polynomials.
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 $(x^2 – y^2)(x^2 + y^2)$.	I can recognize the patterns in the sum and differences of cubes. I can factor sum and difference of cubic 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.	
WCE.AII.7 Divide a polynomial by a lower degree polynomial.	I can divide polynomials using long division and synthetic division.
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).	I can explain and apply the Remainder Theorem to check answers when dividing polynomials. I understand that *a* is a root of a polynomial function if and only if *x-a* is a factor of the function.
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.	I can find the zeros of a polynomial when the polynomial is factored.
Unit 4- Rational Functions, Expressions, and Equations	
WCE.AII.8 Add subtract, multiply, and divide simple rational expressions.	I can add, subtract, multiply, and divide simple rational expressions.
A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	I can simplify rational expressions by adding, subtracting, multiplying or dividing. I can define extraneous solution. I can solve a rational equation in one variable. I can determine which numbers cannot be solutions of rational equation and explain why they cannot be solutions.

Unit 5- Radical Functions, Expressions, and Equations	
F.BF.4 Find inverse functions. a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) = 2 x3 or f(x) = (x+1)/(x-1) for x ≠ 1.	I can find the inverses of simple quadratic and cubic functions.
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.	I can name the vertex, max or min, and the *x* and *y* intercepts of a quadratic and a polynomial function. I can graph a quadratic and a polynomial function by hand and using technology.
N.RN.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{\frac{1}{3}}$ to be the $(5^{\frac{1}{3}})^3 = 5^{(\frac{1}{3})3}(5^{\frac{1}{3}})^3$ cube root of 5 because we want to hold, so must equal 5.	I can evaluate and simplify an expression with a rational exponent.
N.RN.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.	I can move flexibly between radical notation and rational exponents.
A.REI.2 Solve simple rational and <u>radical equations</u> in one variable, and give examples showing how extraneous solutions may arise.	I can solve an equation containing radicals or rational exponents. I can determine which numbers cannot be solutions of a radical equation and explain why they cannot be solutions.
2016.17 Algebra 2, Second 9 Weeks	
Unit 6 Exponential and Logarithmic Functions and Equations	
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.	I can distinguish between explicit and recursive formulas for sequences.

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.	I can write a recursive and explicit formula for an arithmetic or geometric sequence. I can differentiate between arithmetic and geometric sequences. I can decide when a real world problem models an arithmetic or geometric sequence and write an equation to model the situation.
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.	I can derive the formula for the sum of a finite geometric series.
WCE.AII.9 Find the summation of finite arithmetic and infinite geometric series.	Find the sum of arithmetic and geometric sequences and series without a formula and represent them using sigma notation. I can determine the common difference or common ratio between two terms in an arithmetic or geometric sequence.
F.BF.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(k)x), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs.	I can graph and analyze exponential growth and decay functions. I can graph and analyze functions with base e.
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 (including reading these from a table).	I can apply compound interest problems to exponential functions.
A.SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. c. 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%.	I can rewrite exponential functions using the properties of exponents.

F.BF.1 Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.	I can write an explicit and/or recursive expression of a function to describe a real-world problem. I can combine different parent functions to write a function that describes a real-world problem.
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. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	I can graph exponential and logarithmic functions and identify o Intercepts • End behavior
F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^y$, $y = (0.97)^y$, $y = (1.01)^{12y}$, $y = (1.2)^{y/10}$, and classify them as representing exponential growth or decay.	I can use the properties of logarithms to condense and expand expressions. I can solve exponential and logarithmic equations. I can use properties of exponents to rewrite an exponential function to emphasize one of its properties. I can define an exponential function, $f(x) = ab^x$. I can explain the meaning of each variable in a real-world exponential function in standard form.
F.LE.4 For exponential models, express as a logarithm the solution to $a\, b^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.	I can translate between exponential and logarithmic forms.
F.LE.5 Interpret the parameters in a linear or exponential function in terms of a context.	I can explain the meaning (using appropriate units) of the constants a,b,c and the y-intercept in the exponential function, $f(x) = a*b^x + c$.

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. i) Tasks are limited to exponential equations with rational or real exponents and rational functions. ii) Tasks have a real-world context.	I can distinguish between exponential functions that model exponential growth and decay. I can compose an original problem situation and construct an exponential function to model it.
S.ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.	I can create a scatter plot from two quantitative variables and identify outliers.
a. Fit a function to the data; use the 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 and exponential models.	I can use technology to find the function of best fit for a scatterplot and use that function to make predictions.
Unit 7- Trigonometric Functions	
F.TF.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.	I can define a unit circle, a central angle and an intercepted arc. I can define the radian measure of an 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.	I can find the values of trigonometric functions on the unit circle. I can define coterminal angles. I can use reference angles to evaluate trigonometric ratios. I can draw positive or negative angles in standard position using radians or degrees.
F.TF.8 Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find sin (θ), cos (θ), or tan (θ), given sin (θ), cos (θ), or tan (θ), and the quadrant of the angle.	I can use the unit circle to prove the Pythagorean identity. I can use the Pythagorean identity to calculate other trigonometric ratios.

F.IF.7e Graph exponential and logarithmic functions, showing intercepts and end behavior, and <u>trigonometric functions, showing period, midline, and amplitude.</u>	I can graph trig functions by stretching, compressing and reflecting.
F.TF.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.	I can define amplitude, period, frequency and midline of a trigonometric function. I can explain the connection between frequency and period.
Unit 8- Probability	
S.CP.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).	I can define a sample space and events within the sample space. I can identify subsets within a sample space. I can give examples of unions, intersections and complements of sets and events.
S.CP.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.	I can collect data about students in my school. I can organize the data in a chart. I can calculate the probability of independent and dependent events. I can determine if the events are dependent or independent.
S.CP.2 Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.	I can identify two events as independent or not. I can predict if two events are independent, explain my reasoning, and verify my statement by calculating probabilities.
S.CP.3 Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.	I can calculate conditional probability. I can calculate simple conditional probability based on the data.

S.CP.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.	I can calculate the probability of an event.
S.CP.6 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.	I can interpret probability based on the context of the given problem.
S.CP.7 Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.	I can apply the addition rule to two events and interpret the results in terms of the context. I can choose a probability model for a problem situation.
WCE.AII.10 Exhibit knowledge of joint probability.	I can exhibit knowledge of joint probability.
Unit 9 Statistics	
S.IC.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	I can recognize that statistics involve drawing conclusions about a population based on the results obtained from a random sample of the 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?	I can decide if a model is consistent with the results from an experiment.
S.IC.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	I can identify situations as sample survey, experiment, or observational study and can discuss the importance of randomization in these processes. I can explain why randomization is used to draw a sample that represents a population well.
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.	I can estimate the total population values including the margin of error using sample means.

S.IC.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	I can compare data sets using graphs and summary statistics.
S.IC.6 Evaluate reports based on data.	I can make data-based decisions.
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.	I can calculate the mean, standard deviation and variance for a set of data. I can apply the 68-95-99.7 rule for the normal distribution using calculators, spreadsheets, and tables to estimate areas.