Achieve ADP Algebra II
End-of-Course Exam Content Standards

	Cord Algebra 2, Learning in Context Lesson(s)
Core: Operations on Numbers and Expressions Successful students will be able to perform operations with rational, real, and complex numbers, using both numeric and algebraic expressions, including expressions involving exponents and roots. There are a variety of types of test items including some that cut across the objectives in this standard and require students to make connections and, where appropriate, solve contextual problems.	
01. Real numbers	
a. Convert between and among radical and exponential forms of numerical expressions.	5.3
b. Simplify and perform operations on numerical expressions containing radicals.	5.2
c. Apply the laws of exponents to numerical expressions with rational and negative exponents to order and rewrite them in alternative forms.	5.1, 5.3
02. Complex numbers	
a. Represent complex numbers in the form $a+bi$, where a and b are real; simplify powers of pure imaginary numbers.	5.5
b. Perform operations on the set of complex numbers.	5.5
03. Algebraic expressions	
a. Convert between and among radical and exponential forms of algebraic expressions.	5.3
b. Simplify and perform operations on radical algebraic expressions.	5.2
c. Apply the laws of exponents to algebraic expressions, including those involving rational and negative exponents, to order and rewrite them in alternative forms.	5.3
d. Perform operations on polynomial expressions.	9.1, 9.2, 9.3
e. Perform operations on rational expressions, including complex fractions.	10.2, 10.3, 10.5
f. Identify or write equivalent algebraic expressions in one or more variables to extract information.	10.2, 10.3

Core: Equations and Inequalities Successful students will be able to solve and graph the solution sets of equations and inequalities and systems of linear equations and inequalities. The types of equations are to include linear, linear absolute value, quadratic, exponential, rational, radical, and higher order polynomials; the types of inequalities are to include linear and quadratic. There are a variety of types of test items including some that cut across the objectives in this standard and require students to make connections and, where appropriate, solve contextual problems. In contextual problems students will be required to graph and interpret their solutions in terms of the context. (Contextual test items will be limited to inequalities, systems of equations and inequalities, and those equations that do not represent a function.)	
E1. Linear equations and inequalities	
a. Solve equations and inequalities involving the absolute value of a linear expression.	1.3
b. Express and solve systems of linear equations in three variables with and without the use of technology.	2.5
c. Solve systems of linear inequalities in two variables and graph the solution set.	2.3, 2.4
d. Recognize and solve problems that can be represented by single variable linear equations or inequalities or systems of linear equations or inequalities involving two or more variables. Interpret the solution(s) in terms of the context of the problem.	1.2, 1.5, 2.1, 2.4
E2. Nonlinear equations and inequalities	
a. Solve single-variable quadratic, exponential, rational, radical, and factorable higher-order polynomial equations over the set of real numbers, including quadratic equations involving absolute value.	5.4, 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 8.5, 9.5, 10.4
b. Solve single variable quadratic equations and inequalities over the complex numbers; graph real solution sets on a number line.	6.5, 6.6
c. Use the discriminant, $D = b^2 - 4ac$, to determine the nature of the solutions of the equation $ax^2 + bx + c = 0$.	6.5
d. Graph the solution set of a two-variable quadratic inequality in the coordinate plane.	not covered
e. Rewrite nonlinear equations and inequalities to express them in multiple forms in order to facilitate finding a solution set or to extract information about the relationships or graphs indicated.	6.2, 6.3, 6.4, 6.5, 7.3

Core: Polynomial and Rational Functions Successful students will be able to use tables, graphs, verbal statements and symbols to represent and analyze quadratic, rational, and higher order polynomial functions. They will be able to recognize and solve problems that can be modeled using these functions. There are a variety of types of test items including some that cut across the objectives in this standard and require students to make connections and solve rich contextual problems.	
P1. Quadratic functions	
a. Determine key characteristics of quadratic functions and their graphs.	6.1, 7.3
b. Represent quadratic functions using tables, graphs, verbal statements, and equations. Translate among these representations.	6.1, 6.2, 6.3, 6.4, 6.5, 6.6
c. Describe the effect that changes in the parameters of a quadratic function have on the shape and position of its graph.	6.1, 7.3
d. Recognize, express, and solve problems that can be modeled using quadratic functions. Interpret their solutions in terms of the context.	6.1, 6.2, 6.3, 6.4, 6.5, 6.6, Chapter 6 Math Applications
P2. Higher-order polynomial and rational functions	
a. Determine key characteristics of power functions in the form $f(x) = ax^n, a \neq 0$, for positive integral values of n and their graphs.	4.5, Chapter 9 Math Lab Activity 2
b. Determine key characteristics of polynomial functions and their graphs.	9.4, 9.5, Chapter 9 Math Lab Activity 2
c. Represent polynomial functions using tables, graphs, verbal statements, and equations. Translate among these representations.	9.4, 9.5
d. Determine key characteristics of simple rational functions and their graphs.	10.1, 10.6
e. Represent simple rational functions using tables, graphs, verbal statements, and equations. Translate among these representations.	10.1, 10.6
f. Recognize, express, and solve problems that can be modeled using polynomial and simple rational functions. Interpret their solutions in terms of the context.	Chapter 9 Math Applications, Chapter 10 Math Applications

Core: Exponential Functions Successful students will be able to use tables, graphs, verbal statements and symbols to represent, analyze, model, and interpret graphs of exponential functions. While some facility with the properties of logarithms may be helpful it is not required on the core exam. There are a variety of types of test items including some that cut across the objectives in this standard and require students to make connections and solve rich contextual problems.	
X1. Exponential functions	
a. Determine key characteristics of exponential functions and their graphs.	8.1
b. Represent exponential functions using tables, graphs, verbal statements, and equations. Represent exponential expressions in multiple forms. Translate among these representations.	8.1
c. Describe the effect that changes in a parameter of an exponential function have on the shape and position of its graph.	8.1
d. Recognize, express, and solve problems that can be modeled using exponential functions, including those where logarithms provide an efficient method of solution. Interpret their solutions in terms of the context.	Chapter 8 Math Applications
Core: Function Operations and Inverses Successful students will be able to perform function operations of addition, subtraction, multiplication, division, and composition and to combine several functions defined over restricted domains to form a piecewise-defined function. They will be able to determine, graph and analyze the inverse of a function and use composition to determine whether two functions are inverses. There are a variety of types of test items including some that cut across the objectives in this standard and require students to make connections.	
F1. Function operations	
a. Combine functions by addition, subtraction, multiplication, and division.	4.2
b. Determine the composition of two functions, including any necessary restrictions on the domain.	4.2
F2. Inverse functions	
a. Describe the conditions under which an inverse relation is a function.	4.3
b. Determine and graph the inverse relation of a function.	4.3

F3. Piecewise-defined functions	
a. Determine key characteristics of absolute value, step, and other piecewise-defined functions.	4.4
b. Represent piecewise-defined functions using tables, graphs, verbal statements, and equations. Translate among these representations.	4.4
c. Recognize, express, and solve problems that can be modeled using absolute value, step, and other piecewise-defined functions. Interpret their solutions in terms of the context.	4.4, Chapter 4 Math Applications

Module: Data and Statistics Successful students will be able to analyze, interpret, compare, and compute with summary statistics for sets of data. Analysis of bivariate data includes the determination and interpretation of regression lines and correlation coefficients. While some important components in the study of data and statistics, such as sampling techniques, question formulation, and experiment design are addressed when possible on this module of the Algebra II End-of-Course Exam, those topics will be expected to be assessed in more depth in the classroom. This module includes a variety of types of test items including some that cut across the objectives in this standard and require students to make connections and solve rich contextual problems.	
S1. Summarization and comparison of data sets	
a. Summarize and compare data sets using statistical methods.	1.6, 3.1
b. Determine, use, and identify potential misuses of weighted averages.	not covered
c. Use a computer or calculator to find a linear regression equation (least squares line) as a model for data that suggest a linear trend, and determine the correlation coefficient.	1.6
S2. Interpretation and communication through data	
a. Analyze the strength of the linear relationship indicated by the regression line.	1.6
b. Interpret data and communicate conclusions effectively.	1.6
c. Make judgments regarding accuracy, reasonableness, and bias in the use of data.	1.6
d. Critique and justify various methods of sampling and data collection used in real world problems.	1.6

Module: Probability Successful students will be able to quantify the likelihood that an event will occur through combinatorics and other counting principles, relative frequency, distributions, and the comparison of theoretical probability to simulations. Also included are binomial expansion and the relationship to Pascal's triangle and binomial distributions. There are a variety of types of test items including some that cut across the objectives in this standard and require students to make connections and solve rich contextual problems.	
R1. Permutations, combinations, and probability	
a. Determine the number of ways events can occur using permutations, combinations, and other systematic counting methods.	14.1, 14.3, 14.4
b. Relate the expansion of $(x+y)^n$ (i.e., the binomial theorem) with the possible outcomes of a binomial experiment and/or the nth row of Pascal's triangle.	11.5
c. Apply probability concepts to calculate the probability of events and to make informed decisions in practical situations.	14.2
d. Analyze and interpret actual data to estimate probabilities and predict outcomes, including those involving relative frequency.	14.1, 14.2, Chapter 14 Math Labs, Chapter 14 Math Applications
e. Compare theoretical probabilities with the results of simple experiments (*e.g.*, tossing number cubes, flipping coins, spinning spinners).	14.1, 14.2, Chapter 14 Math Labs, Chapter 14 Math Applications
f. Compute and graph cumulative frequencies.	Covered in *Cord Algebra 1, Mathematics in Context*
R2. Probability distributions	
a. Identify and distinguish between discrete and continuous probability distributions.	not covered
b. Identify the principal characteristics of the normal distribution and use them to estimate probabilities.	not covered
c. Identify and describe the key characteristics of and create frequency distributions of both discrete and continuous data.	not covered

Module: Logarithmic Functions Successful students will be able to define, represent, and model using logarithmic functions. Recognition of the inverse relationship between logarithmic and exponential functions is essential to this concept. They will apply the laws of logarithms, solve logarithmic equations, and use logarithms to solve exponential equations. There are a variety of types of test items including some that cut across the objectives in this standard and require students to make connections and solve rich contextual problems.	
L1. Logarithmic expressions and equations	
a. Apply the properties of logarithms and use them to manipulate logarithmic expressions.	8.2, 8.3, 8.4
b. Solve logarithmic equations, paying attention to the possibility of extraneous roots.	8.5
L2. Logarithmic functions	
a. Determine key characteristics of logarithmic functions.	8.2
b. Represent logarithmic functions using tables, graphs, verbal statements, and equations. Translate among these representations.	8.2, 8.3, 8,4
c. Describe the effect that changes in the parameters of a logarithmic function have on the shape and position of its graph.	8.2
d. Recognize, express, and solve problems that can be modeled using logarithmic functions. Interpret their solutions in terms of the context of the problem.	8.2, 8.3, 8.4, 8.5, 8.6, Chapter 8 Math Applications
Module: Trigonometric Functions Successful students will be able to recognize and model periodic phenomena using trigonometric functions. They will understand the relationship among the unit circle, the geometric definitions of sine and cosine, and the degree and radian measures of angles and will apply this understanding to graph trigonometric functions, determine key characteristics of the functions and their graphs, and describe the effect of transformations on both the symbolic and graphical representations of the functions. There are a variety of types of assessment items including some that cut across the objectives in this standard and require students to make connections and solve rich contextual problems.	
T1. Trigonometric functions	
a. Recognize periodic phenomena and determine key characteristics of such phenomena.	13.1
b. Use the relationship of the sine and cosine functions to a central angle of the unit circle to determine the exact trigonometric ratio of angles on the unit circle. (0° to 360°, 0 to 2π)	12.2
c. Explain and use both degree and radian measure for angles.	12.2

d. Represent trigonometric functions using tables, graphs, verbal statements, and equations. Translate among these representations.	12.3, 12.4
e. Determine key characteristics of trigonometric functions and their graphs.	12.3, 12.4
f. Describe the effect that changes in the parameters of an equation of a trigonometric function in the form, $f(x) = A\sin B(x-C)+D$ (or the similar cosine function) have on the shape and position of its graph.	12.3, 12.4
g. Recognize, express, and solve problems that can be modeled using trigonometric or other periodic functions.	12.3, 12.4, 12.5, 12.6, Chapter 12 Math Applications
Module: Matrices Successful students will be able to compute with and use matrices to organize information, solve systems of equations, and perform transformations of geometric figures. They will use and interpret matrix notation to represent a vector and perform operations on vectors and matrices. There are a variety of types of test items including some that cut across the objectives in this standard and require students to make connections and solve contextual problems.	
M1. Matrix arithmetic	
a. Perform addition, subtraction, and scalar multiplication of matrices.	3.1, 3.2
b. Perform matrix multiplication.	3.2
M2. Solving systems of equations using matrices	
a. Find the determinant of a 2x2 or 3x3 matrix.	3.3
b. Determine the inverse of a 2x2 or 3x3 matrix or indicate that no inverse exists.	3.4
c. Represent 2-variable and 3-variable systems of linear equations using matrices and use them to solve the system.	3.5
d. Solve a matrix equation.	3.4
M3. Matrix transformations	
a. Use matrix tools to represent and transform geometric objects in the coordinate plane.	Chapter 3 Math Lab Activity 2
M4. Vectors	
a. Represent vectors as matrices in two dimensions.	not covered
b. Add, subtract, and compute the dot product of two dimensional vectors; multiply a two-dimensional vector by a scalar.	not covered

Module: Conic Sections Successful students will be able to represent, analyze, and model using the circle, ellipse, and hyperbola. In addition parabolas with a horizontal axis are included. There are a variety of types of test items including some that cut across the objectives in this standard and require students to make connections and solve rich contextual problems.	
C1. Conic sections	
a. Identify a parabola, circle, ellipse, or hyperbola from its equation, description, or key characteristics.	7.2
b. Represent conic sections whose axes are parallel to the x and y-axes using graphs, verbal statements, and equations. Translate among these representations. Represent the equations of conic sections in multiple forms to extract information about the parabola, circle, ellipse, or hyperbola.	7.3, 7.4, 7.5, 7.6
c. Describe the effect that changes in the parameters of a particular conic section have on its shape and position.	7.3, 7.4, 7.5, 7.6
d. Recognize, express, and solve problems that can be modeled using conic sections. Interpret their solutions in terms of the context of the problem.	7.3, 7.4, 7.5, 7.6, Chapter 7 Math Applications
Module: Sequences and Series This module addresses the patterns in arithmetic and geometric sequences and series. Students are expected to apply the formulas for finding the nth term of a sequence or series, the nth partial sum of finite series, and the infinite sum of a geometric series when it exists. General iterative relationships and recursive models are applied to patterns and problems. There will be a variety of types of test items including some that cut across the objectives in this standard and require students to make connections and solve rich contextual problems, where appropriate.	
I1. Arithmetic and geometric sequences and series	
a. Represent the general term of an arithmetic or geometric sequence and use it to generate the sequence or determine the value of any particular term.	11.2, 11.3, 11.4
b. Represent partial sums of an arithmetic or geometric sequence and determine the value of a particular partial sum or sum of a finite sequence.	11.2, 11.3
c. Recognize when an infinite geometric sum can be determined and determine the sum when possible.	11.4

d. Convert the recursive model for linear growth ($a_1 = a, a_{n+1} = a_n + d$, where a is the first term and d is the constant difference) to a closed linear form ($a_n = a + (n-1)d$).	11.2
e. Convert the recursive model of geometric growth ($p_1 = a, p_{n+1} = rp_n$ where a is the first term and r is the constant growth rate) to a closed exponential form ($p_n = ar^{n-1}$).	11.3
f. Recognize, express, and solve problems that can be modeled using a finite geometric series. Interpret their solutions in terms of the context of the problem.	11.3, Chapter 11 Math Applications
I2. Other types of iteration and recursion	
a. Use recursion to generate and describe, analyze, and interpret patterned relationships other than arithmetic or geometric sequences.	11.5
b. Use iterative methods to solve problems.	Chapter 5 Math Lab Activity 2