Algebra II Scope & Sequence - Charles A. Dana Center, March 2006

Algebra II Topics	Time Allotted	Texas Standards		Topic Descriptions	TAKS	Dana Center Resources			District Resources	
	Suggested time allotment for this topic	Knowledge and Skills Statements	Performance Descriptors		Texas Assessment of Knowledge and Skills Objectives[1]	*Algebra II Assessments*[2]	TEXTEAMS Institutes[3]	Agile Mind Topic	Textbook	Other
Foundations for Functions (7 weeks) The foundations for functions unit will build the concept of functions taught in Algebra I and will focus on addressing the foundation concepts such as parameter changes, domain and range, interdependence of variables and connections among multiple representations. These concepts will be revisited in the study of each unit dedicated to each of the functions studied in Algebra II.										
Beyond linear functions	2 weeks	2A.1 (Foundations for functions. The student uses properties and attributes of functions and applies functions to problem situations.) 2A.2 (Foundations for functions. The student understands the importance of the skills required to manipulate symbols in order to solve problems and uses the necessary algebraic skills required to simplify algebraic expressions and solve equations and inequalities in problem situations.) 2A.4 (Algebra and geometry. The student connects algebraic and geometric representations of functions.)	2A.1A; 2A.1B; 2A.4A	This topic links the basic functions to which students were introduced in Algebra I to the new functions they will master in Algebra II. The topic begins with a review of functions and how they can be used to model change, as well as a brief review of the characteristics of linear, exponential, and quadratic functions from Algebra I. The topic then extends students' understanding of the principles of linear functions to introduce two new functions: the inverse variation function $y = k/x$ and the absolute value function $y = \lvert x \rvert$.	1, 2, 3, 5, 9, 10	Catch It! p. 27 Exponential Function Parameters p. 83 Hit the Wall p. 3 Investigating the Effect of a, h, and k on $y=a\sqrt{(x-h)}+k$ p. 65 Logarithmic Function Parameters p. 95 A Matter of Representation p. 15 Saline Solution p. 313 Walk the Yo-Yo p. 11	*Algebra II/Precalculus, Part 1:* I.1.1 *Transformations;* I.2.1. *Matching Parent Functions*	1		
Understanding inverse relations	1.5 weeks	2A.4	2A.4C	This topic deals with inverse relations—relations that are produced by reversing a dependency relationship between two quantities. Students first explore the inverse of a linear function. Through this exploration, they learn how the domains and ranges of the function and its inverse are related and that the graphs are symmetric about the line $y = x$. They then investigate the inverses of exponential and quadratic functions and learn how these give rise to the logarithmic and square root functions.	1, 2, 3, 5, 9, 10	Weather Woes p. 123	*Algebra II/Precalculus, Part 1:* I.3.1 *Inverses*	2		

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Transformations on parent functions	2 weeks	2A.4 2A.7 (Quadratic and square root functions. The student interprets and describes the effects of changes in the parameters of quadratic functions in applied and mathematical situations.)	2A.4B; 2A.7B	In Algebra I students learned that they can think of any linear function model $y = mx + b$ as a transformation of the linear parent function $y = x$ and any quadratic function model $y = ax^2 + c$ as a transformation of the quadratic parent function $y = x^2$. The value of m or a controls vertical stretches, shrinks, and reflections of the parent graph, and the value of b or c shifts the graph up or down along the y-axis without changing its shape. In this topic, students explore a third parameter that controls horizontal shifts of graphs. They also learn how each of the three parameters has the same effect on the graph of any parent function.	1, 2, 5	Data Dilemma p. 33 Slip sliding Away p. 43 Transformation Two Step p. 53	*Algebra II/Precalculus, Part 1 :* I.1.1 *Transformations*	3		
Introduction to systems	1.5 weeks	2A.3 (Foundations for functions. The student formulates systems of equations and inequalities from problem situations, uses a variety of methods to solve them, and analyzes the solutions in terms of the situations.)	2A.3A; 2A.3B; 2A.3C	Students learned in Algebra I how to formulate and solve systems of linear equations using tables, graphs, and algebraic methods. In this topic, students adapt the techniques of table and graph-building to solve systems of equations in which one or more of the equations may not be linear. The work students do in this topic forms the foundation for later work in solving non-linear systems algebraically.	1, 2, 4, 5	Paintings on a Wall p. 303		4		

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Exponential and Logarithmic Functions (5-7 weeks) This unit includes equations, inequalities, and systems. There should be an emphasis on the connection between the 5 representations: graph, table, problem situation, pictorial, symbolic. Within this unit, connections to foundations for functions and how all functions have same traits should be made. Make explicit connections between exponential and log functions as inverse functions.										
Exponential functions	2-2.5 weeks	2A.4 2A.11 (Exponential and logarithmic functions. The student formulates equations and inequalities based on exponential and logarithmic functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation.)	2A.4A; 2A.4B; 2A.11B; 2A.11C	In this topic students learn how to use exponential functions to model changes In the values of the dependent variable produced through multiplication by a positive constant other than 1. Through fitting models to data, students solidify their understanding of the characteristics of the general exponential function ***y*** = ***bx***. Students then numerically and graphically investigate the transcendental number e and learn about its role in compounding of interest. Finally, students explore the effects of the three parameters ***a***, ***h***, and ***k*** on the graph of an exponential function.	1, 2, 3, 5, 9, 10	Desert Bighorn Sheep p. 255 Exponential Function Parameters p. 83 A Graduation Present p. 293	Algebra II/Precalculus, Part 1: II.1 *Median Income* *Algebra II/Precalculus, Part 1: II.1.1 Bacteria Growth; II.1.2 Exponential Decay*	**5**		
Logarithmic functions	1.5-2 weeks	2A.4 2A.11	2A.4A; 2A.4B; 2A.4C; 2A.11A; 2A.11B; 2A.11C	This topic develops the basic ideas behind logarithmic functions. Students strengthen their understanding of the inverse relationship between exponential and logarithmic functions as they translate between exponential and logarithmic forms of expressions. They develop properties of logarithms and learn how to use these properties to solve problems algebraically. Finally, they learn how to change the base of a logarithmic function and when this change of base property is most useful.	1, 2, 3, 5, 9, 10	Comparing an Expontial Function and its Inverse p. 265 Logarithmic Function Parameters p. 95	Algebra II/Precalculus, Part 1: 2.2.1 *The Energy of Earthquakes*	**6**		
Solving equations and inequalities	1.5 weeks	2A.2 2A.11	2A.2A; 2A.11D; 2A.11.E; 2A.11F	In this topic, students formulate exponential and logarithmic equations and inequalities to represent specific problem situations. They use the connection to the associated exponential and logarithmic functions to explore solutions to these equations and inequalities graphically and with tables. Students also investigate analytic solution techniques.	1, 2, 3, 5, 9, 10	Desert Bighorn Sheep p. 255 A Graduation Present p. 293 Saving Money, Making Money p. 283		**7**		

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Quadratic and square root functions (7-11 weeks) This unit includes equations, inequalities, and systems. There should be an emphasis on the connection between the 5 representations: graph, table, problem situation, pictorial, symbolic. Within this unit, connections to foundations for functions and how all functions have same traits should be made.										
Quadratic functions	2.5-3.5 weeks	2A.4 2A.6 (Quadratic and square root functions. The student understands that quadratic functions can be represented in different ways and translates among their various representations.) 2A.7	2A.4A; 2A.4B; 2A.6A; 2A.6B; 2A.6C; 2A.7A; 2A.7B	This topic extends students' previous work with quadratic functions. Students use finite differences to fit quadratic models to data. They also make connections among the general, vertex, and factored forms of a quadratic function, and they learn how to transform between forms to obtain needed information about the function.	1, 2, 5	Basketball Throw p. 129 Motion Under Gravity p. 145 Parabolic Paths p. 159 Toricelli's Law p. 189		**8**		
Quadratic equations	1-2 weeks	2A.2 2A.5 (Algebra and geometry. The student knows the relationship between the geometric and algebraic descriptions of conic sections.) 2A.8 (Quadratic and square root functions. The student formulates equations and inequalities based on quadratic functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation.)	2A.2A; 2A.2B; 2A.5E; 2A.8A; 2A.8B; 2A.8C; 2A.8D	In this topic students use quadratic functions to formulate equations that will help them answer questions about specific situations and learn how to use tables to begin to investigate solutions. Students also investigate how factoring, graphing, completing the square, and the quadratic formula can also be used to solve quadratic equations, and they learn about the connections among different solution techniques.	1, 2, 5	Basketball Throw p. 129 Motion Under Gravity p. 145 Parabolic Paths p. 159 Toricelli's Law p. 189		**9**		
Square root functions and equations	2.5-3.5 weeks	2A.4 2A.9 (Quadratic and square root functions. The student formulates equations and inequalities based on square root functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation.)	2A.4A; 2A.4B; 2A.4C; 2A.9A; 2A.9B; 2A.9C; 2A.9D; 2A.9F; 2A.9.G	In this topic students strengthen their understanding of the square root function. They explore transformations on the parent square root function: to model data and they formulate equations arising from square root functions. They explore solutions for these equations using tables and graphs, and they learn how the inverse relationship between square root and quadratic functions facilitates solving these equations analytically. They also investigate the notion of extraneous roots.	1, 2, 5	I Can See Forever p. 229 Investigating the Effect of a, h, and k on $y=a\sqrt{(x-h)}+k$ p. 65 I Was Going How Fast? p. 239 Tic Toc p. 245	Algebra II/Precalculus, Part 2: Algebra II: II.1.2.1 The Pendulum Swings	**10**		

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Quadratic and square root inequalities	1-2 weeks	2A.2 2A.8 2A.9	2A.2A; 2A.8A; 2A.8B; 2A.8C; 2A.8D; 2A.9D; 2A.9.E; 2A.9.F	This topic builds on students' understanding of quadratic and square root functions and equations as it explores situations that can be described by quadratic and square root inequalities. Students formulate inequalities to fit different situations and explore solutions to these inequalities using tables, graphs, and analytic techniques.	1, 2, 4, 5, 10	Basketball Throw p. 129 Motion Under Gravity p. 145 Parabolic Paths p. 145 Toricelli's Law p. 189 Doing What Mathematicians Do p. 195 Fixed Area Rectangles p. 207 Fixed Perimeter Rectangles p. 137 Pizza Wars p. 21		**11**		
Rational Functions (1.5-3 weeks) This unit includes equations, inequalities, and systems. There should be an emphasis on the connection between the 5 representations: graph, table, problem situation, pictorial, symbolic. Within this unit, connections to foundations for functions and how all functions have same traits should be made.										
Rational functions	1-2 weeks	2A.4 2A.10 (Rational functions. The student formulates equations and inequalities based on rational functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation.)	2A.4A; 2A.4B; 2A.10A; 2A.10B; 2A.10C; 2A.10F; 2A.10G	This topic builds on students' early work with inverse variation and the parent function: Students learn about the general characteristics and behavior of rational functions and apply their knowledge of transforming functions to create and understand graphs of rational functions. Students also use rational functions to model and investigate situations involving manufacturing costs and chemical mixtures.	1, 2, 5	Pizza Wars, Part 2 p. 319 Saline Solution p. 313 What's My Equation? p. 339 You're Toast, Dude p. 331	*Algebra II/Precalculus, Part 2: Algebra II:* III.2.2 *The Long and the Short of It*	**12**		
Rational equations and inequalities	0.5-1 week	2A.2 2A.10	2A.2A; 2A.10D; 2A.10.E; 2A.10F	In this topic, students formulate rational equations and inequalities that arise from rational functions. They learn strategies for identifying and applying the algebraic skills needed to solve these rational equations and inequalities in a variety of situations.	4, 5	Pizza Wars, Part 2 p. 319 What's My Equation? p. 339 You're Toast, Dude p. 331		**13**		
Analyzing, Formulating, and Solving Systems (3.5-6 weeks) This unit includes systems of equations and inequalities involving all the parent functions. There should be an emphasis on the connection among the 5 representations: graph, table, problem situation, pictorial, symbolic.										
Equations with more than 2 unknowns	2-3 weeks	2A.3	2A.3A; 2A.3B; 2A.3C	This topic extends students' earlier work with systems of equations. Students solve linear systems of three equations and three unknowns through elimination and connect the solutions to the geometric representation of the system. Students also learn analytic techniques to solve systems that include equations that are nonlinear.		Spinning Square p. 177 Comparing Volumes p. 213		**14**		

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Matrices as a tool for solving systems	0.5-1 week	2A.2 2A.3	2A.2A; 2A.3B	In this topic students learn how to represent a problem situation leading to a system of equations using matrices. They explore matrix operations and learn how to solve systems using inverses, Gaussian elimination, and Cramer's Rule.		A Linear Programming Model:Parking at the Mall p. 107 Paintings on a Wall p. 303		**15**		
Systems of inequalities	1-2 weeks	2A.3	2A.3A; 2A.3B; 2A.3C	This topic explores situations that can be described using systems of inequalities. Students formulate systems involving linear and non-linear situations.		The Mild and Wild Amusement Park p. 115		**16**		
Conics (4-5 weeks) Although much of the focus in Algebra II is on functions, conics, as relations, are also critical. This unit will show the relationship between the algebraic and geometric representations of conics as well as how parameter changes in equations for conics are connected to parameter changes of functions.										
Representing conics	2-2.5 weeks	2A.5	2A.5A; 2A.5C	In this topic students learn how the intersection of a plane and a cone generates different conic sections. Students use the distance formula and their geometric understanding of a circle to develop a symbolic representation of the circle and then use the definitions of an ellipse, a parabola, and a hyperbola to develop their symbolic representations.	6, 8	Contemplating Comets p. 353 Lost in Space p. 361	*Algebra II/Precalculus, Part 2: Algebra II:* IV.1.1 *The Cone and the Intersecting Plane*	**17**		
Graphing conics	2-2.5 weeks	2A.5	2A.5B; 2A.5D; 2A.5E	In this topic students learn how to recognize each of the different conics from its symbolic form, complete the square to transform from standard form to transformation form, and use the transformation form to graph the conic.	6, 8	Contemplating Comets p. 353 Kalotonic Kaper p. 369 Lost in Space p. 361		**18**		

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Other topics (0-4 weeks)										
Probability and the binomial theorem		**[Precalculus]** P.4 (The student uses sequences and series as well as tools and technology to represent, analyze, and solve real-life problems.)	P.4D	This topic builds on fundamental counting principles to develop techniques for computing combinations and permutations. Students then learn how to use permutations and combinations to compute probabilities and explore the binomial theorem and its connection to probability.				19		
Arithmetic and geometric sequences and series		**[Precalculus]** P.4	P.4A; P.4B; P.4C	In this topic students explore the basic characteristics of arithmetic and geometric sequences and series. They find general terms and sums, and they derive summation formulas for finite arithmetic and geometric series. Finally, they explore the notions of convergence and divergence as they develop the formula for the sum of an infinite geometric series.				20		

[1]TAKS objectives do not include any student expectations from the Algebra II course. However, Algebra II course content reinforces and extends student expectations from previous courses.
1 (The student will describe functional relationships in a variety of ways.); 2 (The student will demonstrate an understanding of the properties and attributes of functions.); 3 (The student will demonstrate and understanding of linear functions.); 4 (The student will formulate and use linear equations and inequalities.); 5 (The student will demonstrate an understanding of quadratic and other non-linear functions.); 6 (The student will demonstrate an understanding of geometric relationships and spatial reasoning.); 7 (The student will demonstrate an understanding of two- and three-dimensional representations of geometric relationships and shapes.); 8 (The student will demonstrate an understanding of the concepts and uses of measurement and similarity.) 9 (The student will demonstrate an understanding of percents, proportional relationships, probability, and statistics in application problems.); 10 (The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.)

[2] This column includes *Assessments* that are incorporated into topics, as well as those related to topic content. Titles in bold and marked with a √ reflect assessments that are incorporated into the content of a topic.
Italic titles marked with a * indicate assessments for which students will be well prepared upon completion of a topic.

[3] The referenced TEXTEAMS activities provide professional development to support teachers in the delivery of the topic content.