PreAP Algebra I Curriculum by A+ College Ready
Learning Objectives Outline

Name of the LTF Lesson

Approximate number of days the unit will take

Where the LTF lesson can be found on the LTF website

LTF Lesson: **Use Tables and Graphs to Determine the Better Deal (2 days)**
Algebra I Modules 1,11,14

These are the notes from the committee teachers to guide teachers about content in the unit and previous knowledge that may be used in the lesson. If content is not in a LTF lesson, the teacher notes will guide teachers on how to proceed.

Teacher Note: In this lesson, students extend their knowledge from previous lessons. Once again, students will be given a modeling situation and asked to create a table. They will analyze the table to find a mathematical pattern and write a function rule to model the situation. They will graph the table of values and analyze the graph. This lesson is an introduction to the rate of change and this concept will be covered more in depth in Unit 2.

AL Course of Study Standards

Standards written in student friendly learning objectives.

Common Core Identifier

Algebra I #12	I can create linear equations from graphs. I can create linear equations from situations from real-world situations. I can graph linear equations on coordinate axes with labels and scales.	A-CED2
8th Grade #14	I can construct a function to model a linear relationship between two quantities. I can determine the rate of change and initial value of the function from a description of a relationship. I can determine the rate of change and initial value of the function from two (x,y) values reading these from a table. I can determine the rate of change and initial value of the function from a description of a relationship or from two (x,y) values from a graph. I can interpret the rate of change and initial value of a linear function in terms of the situation it models.	8-F4
Algebra I #7a	I can interpret parts of an expression such as terms, factors, and coefficients in terms of its context for linear functions.	A-SSE1a

***Quiz 1.1**

This is a reference to a formative assessment that teachers could give at this time in the material. These assessments are made up of previously released LTF questions and problems written by our committee members.

If there are extra LTF Lessons listed at the end of the unit, these are optional lessons that can be used to challenge students or supplement if needed. We have labeled these lessons as OPTIONAL to indicate to the teacher that these are not necessary to complete the standards in the Alabama Course of Study.

If a part of the standard has a line through the middle, then that part of the standard is not covered in the unit or will be covered in another course.

If a standard could not be found in an LTF lesson, the committee either listed another source for the teacher or agreed that a textbook should address the standard sufficiently.

A National Math and Science Initiative Program
A+ COLLEGE READY
A Division of the A+ Education Partnership

PreAP Algebra I
Learning Objectives Outline

Unit 1: Functions
12 days of instruction plus assessment time-3 weeks

Teacher Note: The first five lessons build upon each other and reference the skills from previous lessons within each new lesson. They are a part of the "Laying a Foundation for Functions" series. In order for students to thoroughly understand function notation and the associated vocabulary, it is best to complete the lessons in the order listed below.

LTF Lesson: **Introduction to Function Notation (1 day)**

Algebra I Mathematical Foundations Module

Teacher Note: This lesson is a great introduction to functional notation and translating a verbal expression into functional notation. This short lesson teaches students to describe independent and dependent quantities. While it does not explicitly cover any common core standards, it is important for students to participate in this lesson in order to have a foundation of functions to build upon in future lessons.

LTF Lesson: **Connecting a Verbal Description to Table and Graph (2 days)**

Algebra I Modules 1,11,14

Teacher Note: In this lesson, students use their knowledge of independent and dependent variables from the previous lesson to describe relationship between situations. Students will explore patterns by analyzing a table of values to create a general function rule for a modeling situation. They will analyze a graph and answer questions about a modeling situation.

Algebra I #12	I can create linear equations from graphs. I can create linear equations from situations from real-world situations. I can graph linear equations on coordinate axes with labels and scales.	A-CED2
Algebra I #4	I can choose and interpret the scale and the origin in graphs of linear functions.	N-Q1 (Partial)

LTF Lesson: **Use Tables and Graphs to Determine the Better Deal (2 days)**

Algebra I Modules 1,11,14

Teacher Note: In this lesson, students extend their knowledge from previous lessons. Once again, students will be given a modeling situation and asked to create a table. They will analyze the table to find a mathematical pattern and write a function rule to model the situation. They will graph the table of values and analyze the graph. This lesson is an introduction to the rate of change and this concept will be covered more in depth in Unit 2.

Algebra I #12	I can create linear equations from graphs. I can create linear equations from situations from real-world situations. I can graph linear equations on coordinate axes with labels and scales.	A-CED2
8th Grade #14	I can construct a function to model a linear relationship between two quantities. I can determine the rate of change and initial value of the function from a description of a relationship. I can determine the rate of change and initial value of the function from two (x,y) values reading these from a table. I can determine the rate of change and initial value of the function from a description of a relationship or from two (x,y) values from a graph.	8-F4 Partial

	I can interpret the rate of change and initial value of a linear function in terms of the situation it models.	
Algebra I #7a	I can interpret parts of an expression such as terms, factors, and coefficients in terms of its context for linear functions.	A-SSE1a

LTF Lesson: **Connecting Table Graph and Function Notation (2 days)**

Algebra I Modules 1,11,14

Teacher Note: This lesson builds upon previous lessons to connect tables, graphs, and functional notation. The new concepts in this lesson are domain and formal functional notation.

Algebra I #25	I can use function notation. I can evaluate functions for inputs in their domains. I can interpret statements that use function notation in terms of a context for linear relationships.	F-IF2
Algebra I #12	I can create linear equations from graphs. I can create linear equations from situations from real-world situations. I can graph linear equations on coordinate axes with labels and scales.	A-CED2
8th Grade #11	I can understand that a function is a rule that assigns to each input ~~exactly~~ output. I can understand that the graph of a function is the set of ordered pairs consisting of an input and the corresponding output.	8-F1 (Partial)
Algebra I #24	I can understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain ~~exactly~~ one element of the range. I can define f as a function. I can understand that if x is an element of its domain, then f(x) is the output of f corresponding to the input of x. I can recognize the graph of *f* is the graph of the equation y=f(x) where f(x) is linear.	F-IF1 (Partial)
Algebra I #28	I can relate the domain of a function to its graph. I can relate the domain of a function to the linear relationship it describes. Example: If the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.	F-IF5
Algebra I #21	I can understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line)	A-REI10
Algebra I #4	I can choose and interpret the scale and the origin in graphs of linear functions.	N-Q1

***Quiz 1.1**

LTF Lesson: **Discrete and Continuous Data (2 days)**

Algebra I Modules 1,11,14

Teacher Note: This lesson continues to review and build upon the concepts learned in the first four lessons. The new concept in this lesson is an introduction to range and to discrete and continuous data. This lesson does a good job with the Common Core standard where students will determine a reasonable domain for a function.

Algebra I #25	I can use function notation. I can evaluate functions for inputs in their domains. I can interpret statements that use function notation in terms of a context for linear relationships.	F-IF2
Algebra I #12	I can create linear equations from graphs. I can create linear equations from situations from real-world situations. I can graph linear equations on coordinate axes with labels and scales.	A-CED2

Algebra I #28	I can relate the domain of a function to its graph. I can relate the domain of a function to the linear relationship it describes.	F-IF5
8th Grade #11	I can understand that the graph of a function is the set of ordered pairs consisting of an input and the corresponding output.	8-F1 (Partial)
Algebra I #21	I can understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line)	A-REI10
Algebra I #4	I can choose and interpret the scale and the origin in graphs of linear functions.	N-Q1

*** Quiz 1.2**

Not covered by LTF Lesson (1 day)

Teacher Note: There are many lessons that discuss step functions on Youtube and Teachertube. You can also google step functions and find information. This may be in Algebra I textbooks, but is probably found in the Algebra II or Precalculus textbooks.

Algebra I #30b	I can graph step functions that are modeled in real-world situations.	F-IF7b

Not covered by LTF Lesson (1 day)

Teacher Note: A lesson that addresses functions with different representations can be found at the following website http://www.insidemathematics.org/pdfs/algebra/sorting-functions/task.pdf
You could use graph C and its table to discuss relations that are not functions and cover standards 8th grade #11 and Algebra I #24. You might want to use some additional mapping questions and lists of ordered pairs from your textbook to emphasize relations that are not functions.

8th Grade #12	I can compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Example: Given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.	8-F2
8th Grade #11	I can understand that a function is a rule that assigns to each input exactly one output.	8-F1
Algebra I #24	I can understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range.	F-IF1

***Quiz 1.3**

Unit 2: Graphing and Analyzing Linear Functions
17 days of instruction plus assessment time-4 to 4.5 weeks

LTF Lesson: **Walk the Line (2 days)**

Middle Grades: Modules 1,11,14

Teacher Note: This activity does a good job connecting the function sense with the idea of linear movement.

8th Grade #15	I can sketch a graph of a function from a word problem that describes a real-world problem being modeled.	8-F5 (Partial)
Algebra I #5	I can define appropriate quantities for a real-world problem being modeled.	N-Q2
Algebra I #4	I can choose and interpret the scale and the origin in graphs of linear functions.	N-Q1

LTF Lesson: **Average Rate of Change (1 day)**

Middle Grades Module 3

Teacher Note: This is a great lesson to introduce average rate of change and for students to practice analyzing a graph. Students are asked to look at a graph to identify the average speed and rate of change over a specified interval.

Algebra I #29	I can calculate the average rate of change of a linear function (presented symbolically or as a table) over a specified interval. I can interpret the average rate of change of a linear function (presented symbolically or as a table) over a specified interval. I can estimate the rate of change from a graph.	F-IF6

LTF Lesson: **Calculating Average Rates of Change (1 day)**

Algebra I Modules 3 and 12

Teacher Note: This is an excellent lesson to provide students real-world situations that model an average rate of change. Students are given a modeling situation and asked to determine the coordinate of the points described in the situation, use the difference quotient to calculate the average rate of change, and verbally explain their answers.

Algebra I #29	I can calculate the average rate of change of a linear function (presented symbolically or as a table) over a specified interval. I can interpret the average rate of change of a linear function (presented symbolically or as a table) over a specified interval.	F-IF6 (Partial)
Algebra I #4	I can use units as a way to understand problems and to guide the solution of multistep problems. I can choose and interpret units consistently in formulas.	N-Q1
Algebra I #27	Given a verbal description of a linear relationship, I can interpret key features (intercepts and slope) of graphs and tables. Given a verbal description of a linear relationship I can sketch graphs and indicate intervals where the function is increasing and decreasing.	F-IF4 (Partial)

***Quiz 2.1**

LTF Lesson: **Slope Investigation (2 days)**

Algebra I Modules 3 and 12

Teacher Note: Before completing this lesson, students should be able to find the rate of change between two points. In this lesson, students analyze a table and a graph to interpret the meaning of rate of change in a modeling situation.

Algebra I #29	I can calculate the average rate of change of a linear function (presented symbolically or as a table) over a specified interval.	F-IF6

	I can interpret the average rate of change of a linear function (presented symbolically or as a table) over a specified interval.	

***Quiz 2.2**

LTF Lesson: **Analysis of Functions (2 days)**

Algebra I Modules 1,11,14

Teacher Note: This lesson allows students to look at various types of functions (linear, quadratic, piecewise, etc.) to determine the intervals of x where f(x) is increasing/decreasing, positive/negative, constant, or has positive/negative slope. Students will use inequalities to represent the intervals of increase or decrease. (Ex: 3<x<5) Students may need a review or small introduction to how to write one variable inequalities with and without inclusion. A comprehensive study of solving inequalities will be addressed in Unit 4.

8th Grade #15	I can analyze a graph and describe where the function is increasing or decreasing. I can determine if a function is linear or nonlinear by analyzing a graph.	8-F5 (Partial)
Algebra I #27	I can interpret intercepts of different types of functions. I can interpret intervals where the function is increasing, decreasing, positive, or negative.	F-IF4 (Partial)

***Quiz 2.3**

LTF Lesson: **Write the equation of the Line Review (Direct Instruction 2 days/ lesson 1 day)**

Algebra I Modules 1,11,14

Teacher Note: This lesson assumes that students have already mastered the skill of writing equations in all of the different forms. Most of the 8th grade standards dealing with writing equations of lines have been designated for this course, so this may be more of an introduction. The skill of writing the equation of a line given two points in point slope form, slope intercept form, and standard form should be taught using the textbook examples and practice. (Note: Common Core does not mention standard form.) Students are asked to analyze the graph to identify the slope and y-intercept and write the equation of the line in standard form and slope intercept form. Questions #1h and #1i introduce students to shift changes for a linear function. Questions #2e and #2f ask students to write the equations of parallel and perpendicular lines. This is not a common core standard for Algebra I but for Geometry.

Algebra I #24	I can identify the graph of *f(x)* is the graph of the linear equation *y=f(x)*.	F-IF1 (Partial)
8th Grade #13	I can interpret the equation y = mx + b as defining a linear function, whose graph is a straight line.	8-F3 (Partial)

***Quiz 2.4**

LTF Lesson: **Translations of Linear Functions (2.5 days)**

Algebra I Modules 1,11,14

Teacher Note: This lesson explores translating the graphs of lines and relates the shift change to the form y=m(x-h)+k. This lesson creates a great foundation for students to build upon when analyzing the vertex form of a quadratic equation and will help them extend the meaning of translations of non-linear functions in later units.

Algebra I #30a	I can graph linear functions, and show intercepts.	F-IF7a (Partial)
Algebra I #35	I can identify the effect on a linear graph of replacing f(x) by f(x)+k, and f(x+k) for specific values of k (both positive and negative).	F-BF3 (Partial)

*** Quiz 2.5**

LTF Lesson: **Piecewise functions (1 day)**

Algebra I Modules 1,11,14

Teacher Note: This lesson is an excellent culminating lesson for linear functions. Students interpret a graph and a table, calculates the average rate of change, write the equation of a line from a graph, and write a verbal description of a graph.

Algebra I #24	I can identify the graph of *f(x)* is the graph of the linear equation *y=f(x)*.	F-IF1
8th Grade #14	I can construct a function to model a linear relationship between two quantities. I can determine the rate of change and initial value of the function from a description of a relationship. I can determine the rate of change and initial value of the function from two (x,y) values, including reading these from a table or from a graph. I can interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.	8-F4
Algebra I #29	I can calculate the average rate of change of a linear function (presented symbolically or as a table) over a specified interval. I can interpret the average rate of change of a linear function (presented symbolically or as a table) over a specified interval. I can estimate the rate of change from a graph.	F-IF6
Algebra I #30b	I can graph piecewise-defined functions.	F-IF7b (Partial)
Algebra I #35	I can identify the effect on the graph of replacing f(x) by f(x) + k and f(x + k), for both positive and negative of k. I can find the value of k given the graphs.	F-BF3 (Partial)

***Quiz 2.6**

LTF Lesson: **Reading the Graph (1 day)**

Algebra 1 Modules 3 and 12

Teacher Note: This lesson provides a culminating activity for linear functions where students compare, analyze, and interpret two graphs using functional notation, average rate of change, and a verbal description.

8th Grade #12	I can compare properties of the graphs of two functions.	8-F2

LTF Lesson: **Characteristics of Functions (Alg 1) (1.5 day)**

Algebra I Modules 1,11,14

Teacher Note: This lesson analyzes a linear function and introduces students to functions that are not linear (quadratic, cubic, rational, exponential). If students have not previously been exposed to analyzing functions, they will need some instruction and guidance in finding x and y intercepts, axis of symmetry, maximum/minimum values, and average rate of change. This lesson does a good job of covering the Common Core standards of analyzing a table and a graph of a function to determine specific characteristics of a function. The average rate of change question stated in #5e (exponential functions) could be extended to the other questions and the teacher could have students find the average rate of change for a specified interval for question #1 (linear function) and question #2 (quadratic function).

8th Grade #15	I can describe where the function is increasing or decreasing by analyzing a graph. I can determine if a function is linear or nonlinear by analyzing a graph.	8-F5 (Partial)
Algebra I #25	I can use function notation and evaluate linear functions for inputs in their domains. I can interpret statements that use linear function notation in terms of a context.	F-IF2
Algebra I #29	I can calculate the average rate of change of a linear function (presented symbolically or as a table) over a specified interval. I can interpret the average rate of change of a linear function (presented symbolically or	F-IF6

	as a table) over a specified interval. I can estimate the rate of change from a graph for linear, exponential, and quadratic functions.	
Algebra I #27	I can interpret intercepts of functions. I can determine intervals where the function is increasing or decreasing by analyzing tables and graphs. I can determine where the function is positive or negative by analyzing tables and graphs. I can determine if a function has relative maximum and minimum by analyzing tables and graphs. I can discuss the symmetry of a graph and determine the axis of symmetry.	F-IF4 (Partial)

***Quiz 2.7**

Additional LTF Lesson: **Interpreting Rate Graphs(OPTIONAL)**

Middle Grades Modules 1,11,14

Teacher Note: This lesson could be used as a culminating lesson or assessment. This lesson allows students to explore a velocity model. Students are given a graph and a table and asked to analyze and interpret this rate situation.

Unit 3: Systems of Linear Equations
7 days of instruction plus assessment time-2 weeks

LTF Lesson: **Literal equations- Reviewing and foreshadowing (2 day)**

Algebra I Module 2

Teacher Note: The focus of this lesson is solving formulas***. Students may need a review of solving basic equations and need to practice their solving equation skills before completing this lesson.*** The textbook will have examples and practice to review the basic skills before moving into solving formulas. Emphasis should be placed on explaining what the solution means to the equation.

Algebra I #16	I can solve linear equations in one variable, including equations with coefficients represented by letters.	A-REI3 (Partial)
Algebra I #15	I can explain each step in solving a simple equation. I can construct a viable argument to justify a solution method.	A-REI1
Algebra I #14	I can rearrange formulas to highlight a particular variable, using the same reasoning as in solving equations. Example: Rearrange Ohm's law V = IR to highlight resistance R.	A-CED4

***Quiz 3.1**

LTF Lesson: **Linear Functions (1 day)**

Middle Grades Mathematical Foundations Module

Teacher Note: This lesson is an introduction to the vocabulary associated with solving linear systems. Students will write two linear functions, create a table, graph the functions and compare functions to find the best deal.

Algebra I #11	I can create linear equations in one variable and use them to solve real-world word problems.	A-CED1
8th Grade #14	I can construct a function to model a linear relationship between two quantities. I can determine the rate of change and initial value of the function from a description of a relationship or from two (x,y) values, including reading these from a table or from a graph. I can interpret the rate of change and initial value of a linear function in terms of the situation it models. I can interpret the rate of change and initial value of a linear function in terms of its graph. I can interpret the rate of change and initial value of a linear function table of values.	8-F4
Algebra I #19	I can solve systems of linear equations by examining the graphs of two linear equations.	A-REI6 (Partial)
Algebra I #46	I can interpret the rate of change and the intercept of a linear model by examining data(the x and y values) of a linear function.	S-ID7

Not covered by LTF Lesson (3 days)

Teacher Note: These skills must be covered before "Painting the House". Textbooks cover these skills of solving systems of equation by substitution and elimination.

8th grade #10b	I can solve simple cases by inspection. I can solve systems of two linear equations algebraically.	8-EE8b (Partial)
Algebra I #18	I can solve a system of equations by using the elimination method.	A-REI5
Algebra I #19	I can solve systems of linear equations by using the substitution method.	A-REI6

***Quiz 3.2**

LTF Lesson: **Painting the House (1 day)**

Algebra I Module 2

Teacher Note: In this real-world scenario, students are given the dimensions of a house and tasked with finding the amount of paint needed. Students will find the area of each section of the house. Students will compare two different price functions to find the best deal. Students will write a function to model the situation, create a table of values, and graph the functions.

8th Grade #10	I can understand that solutions to a system of two linear equations correspond to points of intersections of their graphs and that the points of intersection satisfy both equations simultaneously. I can solve systems of two linear equations algebraically, and estimate solutions by graphing the equations. I can solve real-world problems that involve finding the solution to two linear equations.	8-EE8a 8-EE8b Partial 8-EE8c
Algebra I #19	I can solve systems of linear equations approximately with graphs and find the true solution by utilizing the substitution method of solving equations.	A-REI6

***Quiz 3.3**

Additional LTF Lesson: **Solving Systems of Linear Equations (OPTIONAL)**

Algebra I Module 2

Teacher Note: In order to participate in this lesson, students should be able to solve a system of equations graphically and algebraically, write the equation of a line given two points, and to find the area of triangles, rectangles, and trapezoids. In this lesson, students are given the equations of lines. They must graph the lines, find their points of intersection, and find the area of the region inside the points of intersection. In order to find the length of the sides of the triangles, students must first find out where the two lines cross. This lesson would be good for challenging students.

Unit 4: Systems of Linear Inequalities
4 days of instruction plus assessment time-1 week

Not covered in LTF (2 days)

Teacher Note: The textbook has lessons and examples to teach the skill of solving and graphing multi-step linear inequalities. When teaching the inequality unit, be sure to include writing and solving a word problem that models an inequality. **After discussion and analysis of the Alabama Course of Study standards, the committee has come to the conclusion that a vertical team discussion about the inclusion or necessity of compound inequalities should be determined by each district.

Algebra I #16	I can solve linear inequalities in one variable. I can graph the solution to linear inequalities.	A-REI3 (Partial)

***Quiz 4.1**

LTF Lesson: **Maximizing Profit (2 days)**

Algebra I Modules 9 and 15

Teacher Note: This lesson is an excellent way to allow students to explore linear programming. It would be beneficial to practice the skill of graphing linear inequalities before exploring linear programming through word problems in this lesson. The textbook has lessons and examples on graphing linear inequalities.

Algebra I #11	I can create inequalities in a real-world word problem.	A-CED1
Algebra I #13	I can represent constraints by equations or inequalities. I can represent constraints by systems of equations and/or inequalities. I can interpret the validity of the solutions in a linear programming modeling situation.	A-CED3
Algebra I #23	I can graph the solutions to a linear inequality as a half-plane. I can distinguish between dotted lines that represent just less than or greater than and a solid line that represents less than and equal to or greater than or equal to. I can graph the solution set to a system of linear inequalities as the intersection of the two inequalities.	A-REI12

***Quiz 4.2**

Unit 5: Graphing and Analyzing Exponential Functions
10 days of instruction plus assessment time-2.5 weeks

Teacher Note: The four lessons in this unit build upon each other and reference the skills from previous lessons within each new lesson. In order for students to thoroughly understand exponential functions and the associated vocabulary, it is best to complete the lessons in the order listed below.

LTF Lesson: **Exponential Function Exploration (2 days)**

Algebra I Module 8

Teacher Note: This lesson includes a discovery activity that serves as a good introduction to exponential functions. In this lesson, students make a table, draw a graph, and discover the equation of an exponential function to model a situation. This lesson includes finding the area of a rectangle.

Algebra I #11	I can create equations that represent exponential functions. I can use exponential equations to solve real-world problems that deal with growth and decay.	A-CED1
Algebra I #12	I can create exponential equations to represent relationships between quantities in a real-world situation. I can graph exponential equations on coordinate axes with labels and scale.	A-CED2
Algebra I #30c	Given an exponential function, I can graph the function and discuss end behavior.	F-IF7e (Partial)
Algebra I #4	I can choose and interpret the scale and the origin in graphs of exponential functions.	N-Q1
Algebra I #25	I can use function notation for exponential functions. I can evaluate exponential functions for inputs in their domains. I can interpret statements that use exponential function notation in terms of a context.	F-IF2
Algebra I #33a	I can use steps for calculation (recursive formula) to determine an exponential function (explicit formula) expression from a context.	F-BF 1a

LTF Lesson: **Exponential Growth (2 days)**

Algebra I Mathematical Foundations Section

Teacher Note: In this lesson, students analyze the growth rate of a plant and of a rabbit population. Students analyze a pattern to write an exponential function to represent a modeling situation and use the table and equation to make prediction about population growth.

Algebra I #11	I can create equations that represent exponential functions and use them to solve real-world problems that deal with growth and decay.	A-CED1
Algebra I #33a	I can use steps for calculation (recursive formula) to determine an exponential function (explicit formula) expression from a context.	F-BF 1a

How do you start, How do you change? (1.5 days)

(Non LTF lesson by Kitty Morgan)

Teacher Note: This is an excellent lesson to help students understand how to write an exponential function. This lesson provides students several different situations to practice creating and analyzing exponential growth and decay functions. This lesson draws upon students' work and conclusions from the two exponential function lessons listed above. A discussion about decimal accuracy due to use of money in #1-4 might need to occur.

Algebra I #7b	I can interpret exponential expressions by viewing one or more of their parts as a single entity.	A-SSE1b
Algebra I #31b	I can interpret exponential functions by using the properties of exponents. I can classify exponential functions as representing exponential growth and decay.	F-IF8b

Algebra I #27	For an exponential function that models a real-world situation given as a graph or table, I can interpret intercepts. I can determine intervals where the function is increasing or decreasing. I can determine intervals where the function is positive or negative.	F-IF4
Algebra I #25	I can use function notation and evaluate exponential functions for inputs in their domain. I can interpret statements that use exponential function notation in terms of a context.	F-IF2
Algebra I #24	I can identify the graph of f(x) is the graph of the exponential equation y=f(x).	F-IF1
Algebra I #6	I can choose an appropriate rounding method for a real-world situation.	N-Q3

*Quiz 5.1

Not Covered by LTF

Teacher Note: The textbook can be used for examples and practice with compound interest. You might need to briefly cover the properties of exponents and explain how it applies to exponential functions.

Algebra I #9d	I can use the properties of exponents to transform expressions for exponential functions. 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%.	A-SSE3c

Cool It! (2 days)

(Non LTF lesson by Kitty Morgan)

Teacher Note: This activity requires the student to analyze the vertical shift change of an exponential function and allows the student to synthesize all of the information previously discussed in Unit 5.

Algebra I #33b	I can graph an exponential function that has a vertical shift.	F-BF1b
Algebra I #29	I can calculate the average rate of change of an exponential function over a given interval from points in a table or symbolically. I can interpret the average rate of change of an exponential function over a given interval from points in a table or symbolically. I can estimate the rate of change from an exponential graph.	F-IF6
Algebra I #35	Given an original exponential function and a modified function, I can determine if the graph will shift vertically and write the equation.	F-BF3 (Partial)
Algebra I #40	I can interpret the domain and range in an exponential function in terms of context.	F-LE5
Algebra I #27	I can interpret intercepts, intervals where the function is increasing or decreasing, and end behavior of exponential functions by using graphs and tables.	F-IF4 (Partial)

*5.2 Quiz

Let's Make a Deal -(2 days with no calculator knowledge/1 day with calculator knowledge)

(Non LTF by Kitty Morgan)

Teacher Notes: This lesson is a culminating activity that allows students to compare constant growth with constant percentage growth. This lesson was designed to help students analyze and compare the similarities and differences between linear and exponential functions. Given two modeling situations, students will write an equation, create a table, and analyze the graph to determine which situation represents the better deal. Students will need graphing calculators for this lesson.

Algebra I #37	I can distinguish between situations that can be modeled with linear functions and with exponential functions.* 37a) I can prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.* 37b) I can recognize situations in which one quantity changes at a constant rate per unit interval relative to another.* 37c) I can recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. *	F-LE1 F-LE1a F-LE1b F-LE1c
Algebra I #22	I can 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 $f(x) = g(x)$. I can 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. (The crossed out functions will be addressed in a future course)	A-REI11
Algebra I #39	I can observe, using graphs and tables, that a quantity increasing exponentially eventually exceeds a quantity increasing linearly.	F-LE3
Algebra I #7a	I can interpret parts of an expression such as terms, factors, and coefficients in terms of its context. (linear and exponential)	A-SSE1a
Algebra I #28	I can relate the domain of a function to its graph and relationship it describes.	F-IF5

***5.3 Quiz**

Unit 6: Arithmetic and Geometric Sequences
6 days of instruction plus assessment time-1.5 weeks

Teacher Note: This unit work should stress the connection of arithmetic sequences to linear functions and geometric sequences to exponential functions.

LTF Lesson: **Writing Equations Using Sequences (2 days)**

Algebra I Math Foundations

Teacher Note: This lesson is an excellent introduction to the vocabulary associated with sequences. Problems 1-3 address arithmetic sequences. Problems 4-8 address sequences that are not linear and may be used as additional problems as an extra challenge to students.

Algebra I #38	I can construct linear functions and relate the functions to arithmetic sequences given two input-output pairs (include reading these from a table).	F-LE2 Partial
Algebra I #34	I can write arithmetic sequences both recursively and with an explicit formula. I can use arithmetic sequences to model situations. I can translate between the recursive form and the explicit form.	F-BF2 Partial

LTF Lesson: **Arithmetic Sequences (2 days)**

Middle Grades Module 8

Teacher Note: This lesson builds on the previous lesson and introduces students to the explicit formula for an arithmetic sequence.

Algebra I #38	I can construct linear functions and relate the functions to arithmetic sequences given two input-output pairs (include reading these from a table).	F-LE2 Partial
Algebra I #34	I can write arithmetic sequences both recursively and with an explicit formula. I can use arithmetic sequences to model situations. I can translate between the recursive form and the explicit form.	F-BF2 Partial

***Quiz 6.1**

LTF Lesson: **Limits-A Physical Approach (2 days)**

Middle Grades Limits

Teacher Notes: This activity was chosen because a student must take previous output and manipulate it to get the next output in the table to show the recursive nature of the series. The student must then define the pattern with a formula in the last step. The example in Algebra I #26 is an example of a recursive sequence and does not indicate that you must discuss the Fibonacci sequence at this point.

Algebra I #26	I can recognize that arithmetic and geometric sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.	F-IF3
Algebra I #38	I can construct exponential functions and relate them to geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).	F-LE2 Partial
Algebra I #34	I can write geometric sequences both recursively and with an explicit formula. I can use geometric sequences to model situations. I can translate between the recursive form and the explicit form.	F-BF2 Partial

Teacher note: Additional opportunities to practice arithmetic and geometric sequence skills by incorporating textbook or other resources are strongly suggested to help students master these concepts. (2 days)

***Quiz 6.2**

Unit 7: Descriptive Statistics and Conditional Probability
14 days of instructional days plus assessment time-3 weeks

LTF Lesson: **Fitting a Line to Data (2 days)**

Algebra I Modules 1,11,14

Teacher Notes: This lesson is a non-calculator activity that introduces the line of best fit, using a line to make a prediction, and using the residual to determine how well the line fits the scatterplots data.

8th Grade #25	I can construct and interpret scatter plots for bivariate (x and y variables) data to investigate patterns between two quantities. I can describe patterns such as positive or negative association, linear association, and nonlinear association.	8-SP1 Partial
8th Grade #26	I can understand that straight lines are widely used to model relationships between two variables. For scatter plots that suggest a linear association, I can informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.	8-SP2
8th Grade #27	I can use the equation of a linear model to solve problems in the context of bivariate data, interpreting the slope and intercept.	8-SP3
Algebra I #45	Represent data on two variables on a scatter plot, and describe how the variables are related. I can fit a function to the data (linear). I can use functions fitted to data to solve problems in the context of the data. I can informally assess the fit of a function by plotting and analyzing residuals (the difference between the value of the line and the actual point's y-value). I can fit a linear function for a scatter plot that suggests a linear association.	S-ID6 S-ID6a S-ID6b S-ID6c

LTF Lesson: **Study of Population Growth (2 days or 3 days)**

Algebra I Module 10

Teacher Note- Students will use a graphing calculator to analyze a table that displays the population growth of several states over a period of one hundred years. In order to cover standard #47 students must use the regression capabilities of their graphing calculator to get a value of r that shows the correlation of the data to the regression function given. The student must have the DIAGNOSTIC ON (found in catalog) in order to see the value of r. The most efficient use of this lesson is to assign each state's population to different pairs/groups of students and display and analyze the results as a whole class. This lesson analyzes functions that are linear, exponential and neither.

Algebra I #45	Represent data on two variables on a scatter plot, and describe how the variables are related. I can fit a function to the data (linear and exponential). I can use functions fitted to data to solve problems in the context of the data. I can informally assess the fit of a function by plotting and analyzing residuals (the difference between the value of the line and the actual point's y-value). I can fit a linear function for a scatter plot that suggests a linear association.	S-ID6 S-ID6a S-ID6b S-ID6c
Algebra I #47	I can compute (using technology) the correlation coefficient of a linear fit. I can interpret the correlation coefficient of a linear fit.	S-ID8
Algebra I #33	I can write a function that describes a relationship between two quantities.* (linear and exponential)	F-BF1
Algebra I #40	I can determine the domain and range in a linear or exponential function in terms of a context when given a modeling situation. (linear and exponential of form $f(x)=b^x+k$)	F-LE5
8th Grade #13	I can give examples of functions that are not linear.	8-F3
Algebra I	I can choose a level of accuracy appropriate to limitations on measurement when	N-Q3

#6	reporting quantities.	
Algebra I #21	I can understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	A-REI10

Content not covered explicitly by LTF Lesson (.5 day)

Teacher Note: khanacademy.org has a great video that explains correlation versus causation to the students. Use the following link. http://www.khanacademy.org/math/statistics/v/correlation-and-causality

Algebra I #48	I can distinguish between correlation and causation.	S-ID9

***Quiz 7.1**

LTF Lesson: **Measures of Central Tendencies (1 day)**

Middle Grades Module 4

Teacher Note: In #3 of this lesson, if you will make large pieces of paper with the ages on them so that students may represent the different characters in the story and let them physically move in and out of the line up as the different scenarios change, the students will actually be part of the data and better visualize how the mean and median change.

Algebra I #43	I can interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	S-ID3

***Quiz 7.2**

LTF Lesson: **Bar Graphs and Histograms (1 day)**

Middle Grades Module 4

Teacher Note: This lesson guides students to define data as categorical or quantitative and distinguishes between what type of graph is used to graph each type of data.

Algebra I #41	I can represent data with histograms on the real number line.	S-ID1

***Quiz 7.3**

LTF Lesson: **Use Dot plots(line plots) to Determine Mean, Median, Mode and Range (1 day)**

Algebra 1 Module 4

Teacher Note: In this lesson students will plot data and explore the data looking at dot plots.

Algebra I #41	I can represent data with dot plots on the real number line.	S-ID1

LTF Lesson: **Box and Whisker Plots (2 days)**

Middle Grades Module 4

Teacher Note: This lesson introduces students to the five-number summary and to vocabulary about data including the outliers, gaps and clusters. The lesson allows students to use graphing calculators and compare two box plots.

Algebra I #41	I can represent data with box plots (box and whisker) on the real number line.	S-ID1
Algebra I #43	I can interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	S-ID3
8th Grade #25	I can describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	8-SP1 (Partial)
Algebra I #42	I can use statistics appropriate to the shape of the data distribution (choose the best representation) to compare center (median, mean)and spread (interquartile range, standard deviation) of two or more different data sets.	S-ID2

***Quiz 7.4**

Not Covered by LTF Lesson(1 day)

Teacher Note: This next lesson introduces the students to a two-way frequency table, but does not adequately cover the association that #44 and 8th grade #28 suggest. The vocabulary in the following standards may be new to teachers and students and the following website will help with the new vocabulary and give an example of a two-way frequency table that does discuss how the data in the table can be interpreted and the association of the data can be discussed. http://stattrek.com/statistics/two-way-table.aspx

Algebra I #44	I can summarize categorical data for two categories in two-way frequency tables. I can Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). I can recognize possible associations and trends in the data.	S-ID5
8th Grade #28	I can understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies & relative frequencies in a two-way table. I can construct & interpret a two-way table summarizing data on 2 categorical variables collected from the same subjects. I can use relative frequencies calculated for rows or columns to describe possible association between the two variables. Example: Collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?	8-SP4

LTF Lesson: **Movie Probability (Middle Grades) (1day)**

Middle Grades Module 6

Teacher Note: This lesson introduces the students to a two-way frequency table, but does not adequately cover the association that #44 and 8th grade #28 suggest. The vocabulary in the following standards may be new to teachers and students and the following website will help with the new vocabulary and give an example of a two-way frequency table that does discuss how the data in the table can be interpreted and the association of the data can be discussed. http://stattrek.com/statistics/two-way-table.aspx

Algebra I #49	I can describe events as subsets of a sample space (the set of outcomes), using characteristics (or categories) of the outcomes (simple probability). I can determine the probability of unions of two outcomes (or). I can determine the probability of intersection of two outcomes(and) I can determine the probability of the complement of an outcome (not).	S-CP1
Algebra I #44	I can summarize categorical data for two categories in two-way frequency tables. I can Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies).	S-ID5
8th Grade #28	I can understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies & relative frequencies in a two-way table. I can interpret a two-way table summarizing data on 2 categorical variables collected from the same subjects.	8-SP4 Partial

Not Covered by LTF Lesson (1 day)

Teacher Note: The textbook provides examples and practice of the following standard. The following website provides additional examples http://www.mathgoodies.com/lessons/vol6/independent_events.html

Algebra I #50	I can 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.	S-CP2

***Quiz 7.5**

Unit 8: Pythagorean Theorem, Radicals and Rational Exponents
6 days of instruction plus assessment time-1.5 weeks

Not covered by LTF lesson (3 days)

Teacher Note: Solving quadratic equations by inspection is a great introduction to the Pythagorean Theorem. You may want to include instruction on simplifying radicals in this unit. **After discussion and analysis of the Alabama Course of Study standards, the committee has come to the conclusion that a vertical team discussion about the inclusion or necessity of simplifying and performing operations with radicals should be determined by each district. The Alabama Course of Study does not explicitly state simplifying radicals as a standard. However, it will be helpful for students to learn this skill so they can utilize it in future math classes.

Algebra I #17b	I can solve quadratic equations by inspection (e.g. for $x^2 = 49$). I can solve quadratic equations by taking square roots.	A-REI4b (Partial)

Not covered by LTF lesson (2 days)

Teacher Note: The following resource is an excellent model of the proof of the Pythagorean Theorem. This activity gives a full explanation of how to present the material with student activity pages and teacher notes. This lesson can be found at http://www.map.mathshell.org/materials/lessons.php There is a powerpoint and blackline masters that well help teach this. In order to cover the entire standard, the converse of the theorem must be covered by the teacher through other resources.

8th Grade #21	I can explain a proof of the Pythagorean Theorem.	8-G6 Partial

Teacher Note: In order to cover the following standard, the teacher must incorporate other resources.

8th Grade #23	I can apply the Pythagorean Theorem to find distance between two points in a coordinate system.	8-G8

LTF Lesson: **Pythagorean Theorem Applications Problems #1-4 (1 day)**

Geometry Module 2

Teacher Note: Problems #1-4 in this lesson model the Pythagorean Theorem in real-life situations. Problems #5-10 have application problems that include similar triangles; finding the area of a trapezoid, circle, or rhombus; and finding the volume and surface area of a pyramid and could be used for challenging students.

8th Grade #22	I can apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	8-G7

*Quiz 8.1

Additional LTF Lesson: Brenna Rescues Andrew (OPTIONAL)

Teacher Note: You can use this instead of or in addition to Pythagorean Theorem Application Problems #1-4. This lesson provides extra Pythagorean modeling problems. Problems #1abc, #2abc, #3abc, #4abc address these standards directly. Problems #1def, #2def, #3def, #4def all require dimensional analysis. This may be a good place to incorporate and teach dimensional analysis.

Unit 9: Polynomials

8 days of instruction plus assessment time-2 weeks

Teacher Note: It is easy to incorporate the connection to radicals and exponents at this point in the curriculum. Students have just seen radicals when solving Pythagorean theorem problems. They will now be exploring the rules of exponents when they study monomials. The textbook has lessons to cover these skills.

Not covered by LTF lesson (8 days)

Teacher Note: In order to cover the standards below, the rules of exponents should first be explored with monomials.

The textbook provides examples and practice of multiplying like bases $\left(2x^3\right)\left(5x^4\right)$ and power to a power $\left(2x^3\right)^5$.

**After discussion and analysis of the Alabama Course of Study standards, the committee has come to the conclusion that a vertical team discussion about the inclusion or necessity of operations with negative exponents should be determined by each district. Negative exponents are mentioned in #3 of 7th Grade Course of Study, but only for numerical expressions.

Students have been exposed to square roots and cube roots in 7th Grade COS #4.

In Standard #2, students are gaining the understanding that $\sqrt[3]{125} = (125)^{\frac{1}{3}}$ and that the answer to both is 5.

In Standard #1, the student is synthesizing the rules of exponents for monomials with standard #2.

Algebra I #2	I can rewrite expressions involving radicals and rational exponents using the properties of exponents.	N-RN2
Algebra I #1	I can explain the notation for radicals in terms of rational exponents. Example: We define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.	N-RN1

***Quiz 9.1**

Teacher note: The textbook provides examples and practice of the following standards.

Algebra I #10	I can add and subtract polynomial expressions. I can multiply polynomial expressions.	A-APR1

***Quiz 9.2**

Unit 10: Graphing and Analyzing Quadratic Functions
6 instructional days plus assessment time-1.5 Weeks

LTF Lesson: **Investigation- Graphing Quadratic Functions (2 days)**

Algebra I Modules 1, 11, and 14

Teacher Note: This lesson allows the student to use a graphing calculator to discover changes in quadratic graphs. It also uses a few linear problems to try and pull in the idea of steepness in linear versus quadratic graphs.

Algebra I #9c	I can determine a quadratic equation when given its graph. [state of AL standard]	Alabama standard
Algebra I #12	I can graph quadratic equations in two or more variables on coordinate axes with labels and scales to represent a real-world situation.	A-CED2
Algebra I #27	For a quadratic function that models a relationship between two quantities: I can interpret intercepts of functions. I can determine intervals where the function is increasing or decreasing by analyzing tables and graphs. I can determine where the function is positive or negative by analyzing tables and graphs. I can determine if a function has relative maximum and minimum by analyzing tables and graphs.	F-IF4
Algebra I #35	I can identify the effect on the graph of replacing f(x) by f(x) + k and f(x + k), for specific values of k (both positive and negative); find the value of k given the graphs. I can experiment with cases and illustrate an explanation of the effects on the graph using technology. (Linear and quadratic)	F-BF3 (Partial)

Teacher Note: You can incorporate the following standard into this LTF lesson. Use Problem #1 to teach students to calculate the average rate of change from a table of values over a specified interval. Use Problem #2 to teach students to estimate the average rate of change from the graph.

Algebra I #29	I can calculate the average rate of change of a quadratic function (presented symbolically or as a table) over a specified interval. I can interpret the average rate of change of a quadratic function (presented symbolically or as a table) over a specified interval. I can estimate the rate of change from the graph of a quadratic function.	F-IF6

***Quiz 10.1**

LTF Lesson: **Graphing Quadratic Functions- Example 1 (2 days)**

Algebra I Modules 1, 11, and 14

Teacher Note: Only use Example 1 from this lesson at this point; Example 2 is included in a later unit. Example 1 is an introduction of what type of situation models a quadratic function and the domain and range, intercepts, and vertex of quadratics are introduced in a real-world model.

Algebra I #27	For a quadratic function that models a relationship between two quantities: I can interpret intercepts of functions. I can determine intervals where the function is increasing or decreasing by analyzing tables and graphs. I can determine where the function is positive or negative by analyzing tables and graphs. I can determine if a function has relative maximum and minimum by analyzing tables and graphs.	F-IF4
Algebra I #30a	I can graph quadratic functions and show intercepts, maxima, and minima.*	F-IF7a

***Quiz 10.2**

LTF Lesson: **Quadratic Optimization (2 days)**

Algebra I Modules 9 and 15

Teacher Note: In addition to addressing quadratic models, this lesson includes perimeter and area of a rectangle, which addresses ARMT measurement standards. Students will use system of equations to solve for the length of a rectangle, and substitute the length into the area formula. The resulting formula will be a factored quadratic that must be graphed (a graphing utility could be used) and then the maximum area is obtained. This lesson is an excellent motivation for students to make the connection between the roots of the graph and the equation of the quadratic.

Algebra I #12	I can create quadratic equations in two or more variables to represent relationships between quantities. I can graph quadratic equations in two or more variables on coordinate axes with labels and scales to represent a real-world situation.	A-CED2
Algebra I #27	For a quadratic function that models a relationship between two quantities: I can interpret intercepts of functions. I can determine intervals where the function is increasing or decreasing by analyzing tables and graphs. I can determine if a function has relative maximum and minimum by analyzing tables and graphs.	F-IF4
Algebra I #9c	I can determine a quadratic equation when given its roots. [state of AL standard]	Alabama standard

***Quiz 10.3**

Unit 11: Factoring and the Quadratic Formula
21 days of instruction plus assessment time-5.5 weeks

Not covered by LTF Lessons (16 days)

Teacher Note: The following standards represent skills and should be addressed in your textbook. After the students have mastered the following skills, the skills will be reinforced in LTF Lessons. Algebra I #3 is included here because it can be incorporated when discussing the different types of solutions given from the quadratic formula.

Algebra I #8	I can use the structure of an expression to identify ways to rewrite it. 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 $(x^2 - y^2)(x^2 + y^2)$.	A-SSE2
Algebra I #9a	I can factor a quadratic expression to reveal the zeros of the function it defines.	A-SSE3a
Algebra I #17b	I can solve quadratic equations by factoring by using the following techniques: *A. Difference of two squares* *B. Factoring $x^2 + bx + c$ where c is positive and negative* *C. Factoring $ax^2 + bx + c$* *D. Factoring by grouping* I can solve quadratic equations by the quadratic formula. I can recognize when the quadratic formula gives complex solutions~~, and write them as a ± bi for real numbers a and b.~~ (recognize that there are non-real solutions when working with the quadratic formula, but students will explore the details of imaginary numbers and writing solutions in the form a ± bi in later courses)	A-REI4b
Algebra I #3	I can explain why the sum or product of two rational numbers is rational. I can explain that the sum of a rational number and an irrational number is irrational. I can explain that the product of a nonzero rational number & an irrational number is irrational.	N-RN3

Algebra I #17a	I can use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. I can derive the quadratic formula from this form.	A-REI4a
Algebra I #17b	I can solve quadratic equations by completing the square.	A-REI4b
Algebra I #31a	I can use the process of 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.	F-IF8a (Partial)
Algebra I #9b	Given a quadratic function, I can complete the square to reveal the maximum or minimum value of the function it defines.	A-SSE3b
Algebra I #17b	I can analyze the initial form of the quadratic equation to determine the most appropriate method to solve and solve accordingly.	A-REI4b

LTF Lesson: **Another way to look at factoring (2 days)**

Algebra I Modules 1, 11, and 14

Teacher Note: This lesson is a great summary activity to help students look at factoring in a different way. In order to participate in this lesson, students should already know how to factor and should be proficient in using a graphing calculator.

Algebra I #7a	I can define, identify, and interpret parts of an expression such as terms, factors, and coefficients in terms of its context.* (quadratic)	A-SSE1a
Algebra I #7b	I can interpret complicated expressions by viewing one or more of their parts as a single entity.* (quadratic)	A-SSE1b
Algebra I #9a	I can factor a quadratic expression to reveal the zeros of the function it defines.	A-SSE3a
Algebra I #17b	I can solve quadratic equations by factoring.	A-REI4b

LTF Lesson: **Graphing Quadratic Functions- Example 2 and Problems #1 and #2 (3 days)**

Algebra I Modules 1, 11, and 14

Teacher Note: The quadratic equations in this activity can be solved by factoring and additional opportunities to factor and interpret quadratic graphs without the use of graphing calculators. A discussion of axis of symmetry would be appropriate for this lesson.

Algebra I #11	I can create equations arising from quadratic functions and use them to solve problems.	A-CED1
Algebra I #28	I can relate the domain of a quadratic function to its graph.	F-IF5
Algebra I #31a	I can use the process of factoring in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.	F-IF8a (Partial)
Algebra I #33	I can write a function that describes a relationship between two quantities. (quadratic)	F-BF1
Algebra I #29	I can calculate the average rate of change of a quadratic function (presented symbolically or as a table) over a specified interval. I can interpret the average rate of change of a quadratic function (presented symbolically or as a table) over a specified interval. I can estimate the rate of change from a quadratic graph.	F-IF6
Algebra I #45a	I can fit a function to the data; use functions fitted to data to solve problems in the context of the data. (quadratic)	S-ID6a (Partial)

***Quiz 11.1**

Unit 12: Analyzing Families of Functions and Piecewise Functions

12 days of instruction plus assessment time-1.5 weeks

Teacher Note: In this unit, students will synthesize their knowledge of graphs and functions. Students will revisit some function types studied earlier in the year as well as explore new functions. In order to cover the increased rigor and content of the 2010 Alabama Course of Study, several LTF lessons from Algebra II modules are recommended. These first three lessons build on each other and are most effective if used in the suggested order.

LTF Lesson: **Characteristics of Functions (4 days)**

Algebra II Modules 1, 11, and 14

Teacher Note: In this lesson, students explore a variety of function types including linear, quadratic, cubic, absolute value, square root, exponential, and rational. (The 2010 Alabama Course of Study for Algebra I does not require students to explore rational functions, so problems #8 and #9 in this lesson are optional.) For each function in this lesson, students will complete a table and create a graph. Students then examine the characteristics of each graph (i.e. y intercept, symmetry, even/odd function, intervals of increase/decrease, maximum/minimum, and domain/range.) Because some of the analysis terms may be new to student's vocabulary (i.e. even/odd functions), it is recommended that the teacher complete the first example with the students to explain and teach new vocabulary. Students should then be able to analyze the other problems independently. Periodicity will be covered in future courses.

8th Grade #13	I can give examples of functions that are not linear.	8-F3
Algebra I #21	I can understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	A-REI10
Algebra I #27	For a function that models a relationship between two quantities: I can interpret intercepts of functions. I can determine intervals where the function is increasing or decreasing by analyzing tables and graphs. I can determine if a function has relative maximum and minimum by analyzing tables and graphs.	F-IF4
Algebra I #28	I can relate the domain of a function to its graph.	F-IF5 Partial
Algebra I #30b	I can graph square root and absolute value functions	F-IF7b Partial
Algebra I #35	I can recognize even and odd functions from their graphs and algebraic expressions for them.	F-BF3 Partial

Teacher Note: You can incorporate the following standard into this LTF lesson. Use Part II Problem #1, Problem #2, and Problem #6 to compare linear, quadratic, and exponential functions from a table and a graph.

Algebra I #39	I can observe, using graphs and tables, that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	F-LE3

Teacher Note: You can introduce the following standard through this LTF lesson. In this lesson, students graph the reflection of each function over the line y=x, which is an introduction to inverse functions. Students can examine the graphs in this lesson to begin the discussion of inverse functions. In addition to recognizing the graph of inverse functions, students are expected to solve algebraically (linear functions only) for the inverse function. Problem #1 could be used as an example to solve for the inverse function. The textbook should provide more practice with this skill.

Algebra I #36	I can find inverse functions by solving a linear equation of the form $f(x) = c$, and write an expression for the inverse. (Linear functions only)	F-BF4a

LTF Lesson: **Transformations of Functions Exploration (2 days)**

Algebra II Modules 1, 11, and 14

Teacher Note: In this lesson, students explore families of functions to analyze the effects of horizontal and vertical shifting of graphs as well as the effect of scalar multiplication. Students explore quadratic functions, absolute value, cubic functions, and square root functions. At the end of this lesson, there is an activity sheet where students summarize the parent function and its domain, range, and graph. Algebra I students are expected to master all of the functions on the first page and only the exponential growth function from the second page. (The other functions on the second page will be explored and mastered in Algebra II.)

Algebra I #30b	I can graph square root and absolute value functions.	F-IF7b
Algebra I #35	I can 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). I can find the value of k given the graphs. I can experiment with cases and illustrate an explanation of the effect on the graph using technology. (quadratic and absolute value)	F-BF3 Partial

LTF Lesson: **Even/Odd Functions (2 days)**

Algebra II Modules 1, 11, and 14

Teacher Note: This lesson builds upon students' work from the "Transformations of Functions Exploration" lesson, starting with an analysis of the answer sheet from that lesson where the students compare each family of functions. Students analyze and discuss in depth the defining characteristics of an even function (function symmetric with respect to the y axis) and an odd function (function symmetric with respect to the origin). Students graph several new functions and analyze the characteristics of the functions, including domain/range and even/odd functions. Students use the graphing calculator to support their work in this lesson.

Algebra I #30b	I can graph square root and absolute value functions.	F-IF7b
Algebra I #35	I can 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) I can find the value of k given the graphs. I can experiment with cases and illustrate an explanation of the effects on the graph using technology. (Linear, quadratic, and absolute value). I can recognize even and odd functions from their graphs and algebraic expressions for them.	F-BF3

Not covered by LTF Lessons (2 days)

Teacher Note: Since students have spent several days exploring a variety of function types, this would be a good time to discuss nonlinear systems of equations. The textbook should provide examples and practice with the skill of solving a system of equations with a linear equation and a quadratic equation.

Algebra I #20	I can solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. Example: Find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.	A-REI7

Teacher Note: The textbook provides examples to compare different types, different representation, and different models of linear, exponential, and quadratic functions. This standard provides a summary and comparison of the different functions students have learned throughout the year and, more specifically, within this last unit.

Algebra I #32	I can compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *(compare linear, exponential, and quadratic)* Example: Given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.	F-IF9

LTF Lesson: **Adaptation of Algebra I 2007 EOC Free Response (2 days)**

Modules 1, 11, and 14

Teacher Note: This lesson provides a summary of many concepts taught throughout the year. Students will sketch a graph from a verbal description, write the equation of linear and quadratic equations, examine intervals of increase and decrease, as well as incorporate the domain and range of functions. They will be reintroduced to piecewise functions.

Algebra I #27	For a function that models a relationship between two quantities: I can interpret intercepts of functions. I can determine intervals where the function is increasing or decreasing by analyzing tables and graphs.	F-IF4
Algebra I #30b	I can graph piecewise-defined functions.	F-IF7b Partial
Algebra I #12	I can create equations in two or more variables to represent relationships between quantities. I can graph equations on coordinate axes with labels and scales to represent relationships between quantities.	A-CED2
Algebra I #28	I can relate the domain of a function to its graph.	F-IF5

***Quiz 12.1**

Additional LTF Lesson: **Adaptation of AP Calculus 1997 AB-2 (OPTIONAL)**

Algebra I Module 2

Teacher Note: This lesson provides extra practice problems to reiterate standards already covered in previous lessons. Students analyze key characteristics of a linear graph and a quadratic graph. This lesson pulls together many different standards and provides a good review of the year. Some of the questions may be a bit challenging for students.

Algebra I #30a	I can graph linear and quadratic functions, and show intercepts, maxima, and minima.	F-IF7A
Algebra I #27	For a quadratic function that models a relationship between two quantities, I can 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.* *	F-IF4
Algebra I #29	I can calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. I can estimate the rate of change from a graph. *	F-IF6