ALGEBRA 2 CURRICULUM

Course 17006

The main portion of this course broadens the topics that were first seen in Algebra I. The students will continue to study probability and statistics along with a variety of functions. With successful completion of this course, the student will be properly prepared for a Trigonometry course.

ALGEBRA 2 OUTLINE:

Goals	Skills	Summative Assessments	Time Frame	Main Resources
• Apply the order of operations in computation and in problem-solving situations. • Simplify expressions involving polynomials. • Describe and/or determine change. • Analyze and/or use patterns or relations. • Describe and/or determine families of functions. • Analyze and/or interpret data on a scatter plot and/or use a scatter plot to make predictions. • Apply probability to practical situations.	• Represent and/or use imaginary numbers in equivalent forms (e.g., square roots and exponents). • Use exponents, roots, and/or absolute values to represent equivalent forms or to solve problems. • Write and/or solve non-linear equations using various methods. • Create, interpret, and/or use polynomial, exponential, and/or logarithmic functions and their equations, graphs, or tables.	Mid-year and End of Year Benchmark Assessments,	1-year	Glencoe Algebra 2 ©2014

ALGEBRA 2 MAP:

TIME FRAME	BIG IDEAS	CONCEPTS	ESSENTIAL QUESTIONS	STANDARDS	OBJECTIVES	DIFFERENTIATION	ASSESSMENT
Week 1-2: Chapter 1: Equations and Inequalities	• Symbols allow you to express mathematical concepts in a condensed form. • Mathematical relationships among numbers can be represented, compared, and communicated. • Mathematical relations and functions can be modeled through multiple representations and analyzed to raise and answer questions.	1.1 Expressions and Formulas 1.2 Properties of Real Numbers 1.3 Solving Equations 1.4 Solving Absolute Value Equations 1.5 Solving Inequalities 1.6 Solving Compound and Absolute Value Inequalities	• How are symbols useful in mathematics? • How can expressions, equations, and inequalities be used to quantify, solve, model, and/or analyze mathematical situations? • How are relationships represented mathematically?	A1.1.1.5.1 Add, subtract and/or multiply polynomial expressions (express answers in simplest form – nothing larger than a binomial multiplied by a trinomial). A1.1.1.5.2 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is equal to 1 after factoring out all monomial factors). A1.1.1.5.3 Simplify/reduce a rational algebraic expression. A1.1.2.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear equations only). A1.1.3.1.1 Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities). A1.1.3.1.2 Identify or graph the solution set to a linear inequality on a number line. A1.1.3.2.2 Interpret solutions to	• 1.1: Use the order of operations to evaluate expressions • Use formulas • 1.2: Classify real numbers • Use the properties of real numbers to evaluate expressions. • 1.3: Translate verbal expressions into algebraic expressions and equations, and vice versa. • Solve equations using the properties of equality • 1.4: Evaluate expressions involving absolute values. • Solve absolute value equations • 1.5: Solve one-step inequalities. • Solve multi-step inequalities • 1.6: Solve compound inequalities. • Solve absolute value inequalities	• Leveled Worksheets (Study Guide and Intervention) • Skills Practice, Practice, Word Problems • Practice, Enrich	Homework (Teacher Editions, Suggested HW at beginning of each problem set) Participation Quiz (Mid Chapter Quiz/Test) Tests (Form 1, 2A, 2B, 2C)

				problems in the context of the problem situation (systems of 2 linear inequalities only). A2.1.2.2.1 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is not equal to 0). A2.1.2.2.2 Simplify rational algebraic expressions. A2.1.3.2.2 Use algebraic processes to solve a formula for a given variable (e.g., solve d = rt for r). CC.2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context. CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.			
Week 3 & 4: Chapter 2: Linear Relations and Functions	• You can represent mathematical ideas verbally, algebraically, numerically and graphically. • Functions describe the relationship between a set of input values and a set of output values. • Identifying parent functions and their	2.1 Relations and Functions 2.2 Linear Relations and Functions 2.3 Rate of Change and Slope 2.4 Writing Linear Equations 2.5 Scattter Plots and Lines of Regression 2.6 Special Functions	• How can mathematical ideas be represented? • What is the relationship between input and output values in a function? • How does knowing parent functions and transformations allow you to make generalizations about the function? • What real-life situations can be modeled using	A1.1.1.5.1 Add, subtract and/or multiply polynomial expressions (express answers in simplest form – nothing larger than a binomial multiplied by a trinomial). A1.1.1.5.2 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is equal to 1 after factoring out all monomial factors).	• 2.1: Analyze relations and functions • Use equations of relations and functions • Extend 2.1: • Use discrete and continuous functions to solve real-world problems • 2.2: Identify linear relations and functions • Write linear equations in standard form	• Leveled Worksheets (Study Guide and Intervention) • Skills Practice, Practice, Word Problems • Practice, Enrich	Homework (Teacher Editions, Suggested HW at beginning of each problem set) Participation Quiz (Mid Chapter Quiz/Test) Tests (Form 1, 2A, 2B, 2C)

	transformations helps students classify and make generalizations about functions	2.7 Parent Functions and Transformations 2.8 Graphing Linear and Absolute Value inequalities	equations? Inequalities? • What other skills require you to use linear functions?	A1.1.1.5.3 Simplify/reduce a rational algebraic expression. A1.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically. A1.2.1.1.3 Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table). A1.2.1.2.1 Create, interpret and/or use the equation, graph or table of a linear function. A1.2.1.2.2 Translate from one representation of a linear function to another (graph, table and equation). A1.2.2.1.1 Identify, describe and/or use constant rates of change. A1.2.2.1.2 Apply the concept of linear rate of change (slope) to solve problems. A1.2.2.1.3 Write or identify a linear equation when given the graph of the line 2 points on the line, or the slope and a point on a line, (Linear equation may be in point-slope, standard	• Extend 2.2: Distinguish among roots, solutions and zeros • 2.3: Find rate of change • Determine the slope of a line • 2.4: Write an equation of a line given the slope and a point on the line • Write an equation of a line parallel or perpendicular to a given line • Extend 2.4: Use functions to model direct variation • 2.5: Use scatter plots and prediction equations • Model data using lines of regression • Extend 2.5: Explore the difference between correlation and causation • Identify lurking variables • 2.6: Write and graph piecewise-defined functions • Write and graph step and absolute value functions • Explore 2.7: Use a graphing calculator to determine how changing the parameters m and b affects the graphs of functions • 2.7: Identify and use parent functions • Describe transformations of functions • 2.8: Graph linear inequalities		

				and/or slope-intercept form). A1.2.2.1.4 Determine the slope and/or y-intercept represented by a linear equation or graph. A2.1.2.2.1 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is not equal to 0). A2.1.2.2.2 Simplify rational algebraic expressions. A2.1.3.1.1 Write and/or solve quadratic equations (including factoring and using the Quadratic Formula). A2.1.3.1.2 Solve equations involving rational and/or radical expressions (e.g., $10/(x + 3) + 12/(x – 2) = 1$ or $\sqrt{(x2 + 21x)} = 14$). A2.1.3.1.4 Write, solve and/or apply linear or exponential growth or decay (including problem situations). A2.1.3.2.1 Determine how a change in one variable relates to a change in a second variable (e.g., y=4/x, if x doubles, what happens to y?). A2.1.3.2.2	• Graph absolute value inequalities		

				Use algebraic processes to solve a formula for a given variable (e.g., solve d = rt for r). A2.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern with a rule algebraically and/or graphically. A2.2.1.1.2 Identify and/or extend a pattern as either an arithmetic or geometric sequence (e.g., given a geometric sequence, find the 20th term). A2.2.1.1.3 Determine the domain, range or inverse of a relation. A2.2.1.1.4 Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function (e.g., intervals of increasing/decreasing, intercepts, zeros, and asymptotes). CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations. CC.2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context.			
Weeks 5-9 Systems of Equations and	• You can find the solution to a math problem by using	Explore Lesson 3.1: Graphing Technology Lab: Intersections of	• How can you find the solution to a math problem?	A1.1.2.1.1 Write, solve and/or apply a linear equation (including problem	• Explore 3.1 Find intersections of graphs using a	• If students demonstrate an understanding of	Homework (Teacher Editions, Suggested HW

Inequalities	a graph; analyzing a table of values; solving an equation; guessing and checking. • Having different strategies for solving systems of equations allows you to use the strategy that is most efficient. For example, if an estimate of the solution is sufficient, graphing can be used. You can use algebraic methods to find exact solutions. • Matrices provide a convenient way to organize data; they can be used to shorten notation; technology can be used to quickly perform matrix operations. • Transforming linear functions allows students to compare different but related functions at once on the same coordinate plane. • Linear regression is used to find a linear model that describes a general trend in real-world data. • Absolute-value equations and inequalities are	Graphs 3.1: Solving Systems of Equations 3.2: Solving Systems of Inequalities by Graphing Extend Lesson 3.2: Graphing Technology Lab: Systems of LInear Inequalities 3.3: Optimization with Linear Programming 3.4: Systems of Equations in Three Variables Explore Lesson 3.5: Spreadsheet Lab: Organizing Data with Matrices 3.5: Operations with Matrices 3.6: Multiplying Matrices Extend Lesson 3.6: Graphing Technology Lab: Operations with Matrices 3.7: Solving Systems of Equations Using Cramer's Rule 3.8: Solving Systems of Equations using Inverse Matrices	• What are the benefits of having different strategies for solving systems of equations? • What are the advantages of using matrices to solve problems? • What happens if you choose to test a point on the boundary? • Does the slope change when a linear function is translated? • How does a stretch or compression affect the function rule? • Why is the line called a line of best fit if there are other ways to draw a line through the data? • Would you be surprised if the correlation coefficient for this data were 0.09? • How do you combine the solutions to the two inequalities to find the solution when the compound inequality is a disjunction? a conjunction? • What linear equations make up each part of the graph of the two transformations? • How can you sketch the graph of the transformation without making a table of values?	situations). A1.1.2.1.2 Use and/or identify an algebraic property to justify any step in an equation solving process (linear equations only). A1.1.2.1.3 Interpret solutions to problems in the context of the problem situation (linear equations only). A1.1.2.2.1 Write and/or solve a system of linear equations (including problem situations) using graphing, substitution and/or elimination (limit systems to 2 linear equations). A1.1.2.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear equations only). A1.1.3.1.1 Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities). A1.1.3.1.2 Identify or graph the solution set to a linear inequality on a number line. A1.1.3.1.3 Interpret solutions to problems in the context of the problem situation (limit to linear inequalities).	graphing calculator • 3.1 Solve systems of linear equations graphically. • Solve systems of linear equations algebraically. • 3.2 Solve systems of inequalities by graphing. • Determine the coordinates of the vertices of a region formed by the graph of a system of inequalities. • Extend 3.2 Use a graphing calculator to solve systems of linear inequalities • 3.3 Find the maximum and minimum values of a function over a region. • Solve real-world optimization problems using linear programming. • 3.4 Solve systems of linear equations in three variables. • Solve real-world problems using systems of linear equations in three variables. • Explore 3.5 Organize and display data using matrices and spreadsheets • 3.5 Analyze data in matrices. • Perform algebraic operations with matrices. • 3.6 Multiply matrices. • Use the properties of matrix	how to graph a system of equations and find the point of intersection, • Then have them create a list of tips to help someone draw the graphs for a system of equations and find the point of intersection easily and efficiently. • Logical Learners Have students summarize the various algebraic methods for solving a system of equations using if-then statements and examples. Sample: If one of the equations has a variable with a coefficient of 1 (such as $x + 3y = 9$ or $5x + y = 13$), then consider the substitution method. • Extension Give an example of a system of equations that has infinitely many solutions. • If students demonstrate an understanding of how to solve a system of inequalities by graphing, • • Then have them write a list of tips to help someone draw the graphs of systems of	at beginning of each problem set) Participation Quiz (Mid Chapter Quiz/Test) Tests (Form 1, 2A, 2B, 2C)

	often used to model real-world situations involving distance or tolerance levels.	Extend Lesson 3.8: Graphing Technology Lab: Augmented Matrices		A1.1.3.2.1 Write and/or solve a system of linear inequalities using graphing (limit systems to 2 linear inequalities). A1.1.3.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear inequalities only). A2.1.3.1.1 Write and/or solve quadratic equations (including factoring and using the Quadratic Formula). A2.1.3.1.2 Solve equations involving rational and/or radical expressions (e.g., $10/(x + 3) + 12/(x – 2) = 1$ or $\sqrt{(x2 + 21x)} = 14$). A2.1.3.1.3 Write and/or solve a simple exponential or logarithmic equation (including common and natural logarithms). A2.1.3.1.4 Write, solve and/or apply linear or exponential growth or decay (including problem situations). A2.1.3.2.1 Determine how a change in one variable relates to a change in a second variable (e.g., y=4/x, if x doubles, what happens to y?). A2.1.3.2.2	multiplication. • Extend 3.6 Use a graphing calculator to explore operations with matrices. • 3.7 Evaluate determinants. • Solve systems of linear equations by using Cramer's Rule. • 3.8 Find the inverse of a 2 × 2 matrix. • Write and solve matrix equations for a system of equations. • Extend 3.8 Use a graphing calculator and the augmented matrix for a system of equations to solve the system.	inequalities and find the vertices easily and efficiently. • Intrapersonal Learners For Exercises 25–27, 37, and 38, tell students that systems of inequalities are often used to solve real-world problems. Challenge students to search newspapers, magazines, and the Internet for real-world information and use that information to write a real-world problem that can be solved using a system of inequalities. This will help students to better understand the concept of solving systems of inequalities. • **Extension** Plot the points (–2, 0), (0, 2), and (2, 0). Draw line segments connecting the points to form a triangular region. Write a system of inequalities that defines the region. $y \geq 0$, $y \leq –x + 2$, $y \leq x + 2$ • If students have trouble with the relationship between the	

				Use algebraic processes to solve a formula for a given variable (e.g., solve d = rt for r). A2.2.2.1.1 Create, interpret and/or use the equation, graph or table of a polynomial function (including quadratics). A2.2.2.1.2 Create, interpret and/or use the equation, graph or table of an exponential or logarithmic function (including common and natural logarithms). A2.2.2.1.3 Determine, use and/or interpret minimum and maximum values over a specified interval of a graph of a polynomial, exponential or logarithmic function. A2.2.2.1.4 Translate a polynomial, exponential or logarithmic function from one representation to another (graph, table and equation). CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.		different regions of a graph of a system of inequalities, • Then have students use different colored pencils to shade the different regions of a graph defined by the inequalities in a linear programming problem. This should help students clarify the relationship between the various regions in these graphs • Extension Linear programming is a great lens for looking at effective business practice. Ask students to create a business similar to those mentioned in the Exercises. Students must determine their costs and profits for the chosen business and analyze the information to determine maximum profit options. Make the task more authentic by having students pursue a business that is of personal interest to them and estimate profit margins using the Internet as a resource.	

						• If some students struggle with solving real-world problems using systems of equations in three variables, • Then pair those students with students that are having success. Encourage students to explain to partners their explorations and plans for solving real-world problems using systems of three equations in three variables. Suggest that the listening partner take notes about the speaking partner's strategies, asking questions as needed for clarification. • Extension The values in the table represent the sums of each row and column. Have students find the missing value. Then have students identify the values for each symbol or set of symbols. (Hint: Let each symbol or set of symbols represent one variable.) • Verbal/Linguistic Learners Students may find it helpful to talk softly, or even silently, to themselves as	

						they work with matrices. For example, they might recite the words "row by column" to remind themselves how to write the dimensions of a matrix. When multiplying by a scalar, students may find it helps to say, for example, "5 times 1 is 5, and 5 times negative 3 is negative 15." In this way, students use more than one of their senses to check their calculations. • If students need more practice with matrices, • • Then have them use the class seating arrangement to form matrices, with each student's desk as an element. Have students make 24 large cards showing the values for the elements of two matrices. Form two matrices A4 × 3 and B3 × 4with student seats and give each student sitting in these "matrices" a card to show the element in that position. Have students model	

						the matrix multiplication AB = C. Begin by drawing a blank 4 × 4 matrix on the board. For each element on matrix C, have students walk out the products, compute the sums, and then write the results in the correct locations of the matrix on the board. • If students are using evaluation by diagonals for the first time, • • Then urge them to write down each step in the procedure. Have them compare their work with classmates to find any errors in either their calculations or their use of the procedure. • If students wish to review the process of the manipulation of matrices, • • Then ask students to write a brief reflection on their reactions to the various methods they have learned involving the manipulation of matrices. Ask them to comment on what aspects they found efficient and helpful, and	

						what aspects they found to be difficult or confusing. • Logical Learners Ask each student to write a comparison of the inverse of a matrix to the multiplicative and additive inverses of a number.	
Week 10-12 Quadratic Functions and Relations	• From the placement of a quadratic graph, you can see whether there are 0, 1, or 2 real solutions. The symmetry of the graph helps you identify a second solution when one solution is found. • If the equation has terms that you know are easily factorable, you could solve by factoring. If the equation has more complex terms, you could solve by using the Quadratic Formula, completing the square, or by graphing. You could also use one method to solve and a second method to check your answer.	4.1: Graphing Quadratic Functions Extend 4.1: Graphing Technology Lab: Modeling Real-World Data 4.2: Solving Quadratic Equations by Graphing Extend 4.2: Solving Quadratic Equations by Graphing 4.3: Solving Quadratic Equations by Factoring 4.4: Complex Numbers Extend 4-4: Algebra Lab: The Complex Number Plane 4-5: Completing the Square Extend 4-5: Graphing Technology Lab: Solving Quadratic Equations 4.6: The Quadratic Formula and the	• How can the graph of a quadratic function help you solve the corresponding quadratic equation? • How do you know what method to use when solving a quadratic equation?	A1.1.1.5.1 Add, subtract and/or multiply polynomial expressions (express answers in simplest form – nothing larger than a binomial multiplied by a trinomial). A1.1.1.5.2 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is equal to 1 after factoring out all monomial factors). A1.1.1.5.3 Simplify/reduce a rational algebraic expression. A1.1.2.1.1 Write, solve and/or apply a linear equation (including problem situations). A1.1.2.1.2 Use and/or identify an algebraic property to justify any step in an equation solving process (linear equations only). A1.1.2.1.3	• 4.1 Graph quadratic functions. • Find and interpret the maximum and minimum values of a quadratic function. • Extend 4.1 Use a graphing calculator to model data points for which the curve of best fit is a quadratic function. • 4.2 Solve quadratic equations by graphing. • Estimate solutions of quadratic equations by graphing. • Extend 4.2 Use a graphing calculator to solve quadratic equations. • 4.3 Write quadratic equations in standard form. • Solve quadratic equations by factoring. • 4.4 Perform operations with pure imaginary numbers. • Perform operations with complex numbers. • Extend 4.4 Graph complex numbers in	• If students struggle to solve real-world problems involving maximum or minimum values, • Then encourage students to explain to partners their plans for solving. Suggest that the listening partner take notes about the speaking partner's strategies, asking questions as needed for clarification. • **Visual/Spatial Learners** Provide students with a variety of parabolas. Ask students to sort the parabolas into three piles: those that model a quadratic equation with one real solution, those that model a quadratic equation with two real solutions, and those that model a quadratic equation with no real solutions. Finally, ask students to	Homework (Teacher Editions, Suggested HW at beginning of each problem set) Participation Quiz (Mid Chapter Quiz/Test) Tests (Form 1, 2A, 2B, 2C)

		Discriminant Explore 4-7: Graphing Technology Lab: Families of Parabolas 4-7: Transformations of Quadratic Graphs Extend 4-7: Algebra Lab: Quadratics and Rate of Change 4-8: Quadratic Inequalities Extend 4-8: Graphing Technology Lab: Modeling Motion		Interpret solutions to problems in the context of the problem situation (linear equations only). A1.1.2.2.1 Write and/or solve a system of linear equations (including problem situations) using graphing, substitution and/or elimination (limit systems to 2 linear equations). A1.1.2.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear equations only). A1.1.3.1.1 Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities). A1.1.3.1.2 Identify or graph the solution set to a linear inequality on a number line. A1.1.3.1.3 Interpret solutions to problems in the context of the problem situation (limit to linear inequalities). A1.1.3.2.1 Write and/or solve a system of linear inequalities using graphing (limit systems to 2 linear inequalities). A1.1.3.2.2 Interpret solutions to	the complex plane and determine absolute values of complex numbers. • 4.5 Solve quadratic equations by using the Square Root Property. • Solve quadratic equations by completing the square. • Extend 4.5 Use a calculator containing a computer algebra system to solve quadratic equations. • Extend 4.6 Solve quadratic equations by using the Quadratic Formula. • Use the discriminant to determine the number and type of roots of a quadratic equation. • Explore 4.7 Use a graphing calculator to investigate changes to parabolas. • 4.7 Write a quadratic function in the form $y = a(x – h)^2 + k$. • Transform graphs of quadratic functions of the form $y = a(x – h)^2 + k$. • 4.7 Write a quadratic function in the form $y = a(x – h)^2 + k$. • Transform graphs of quadratic functions of the form $y = a(x – h)^2 +$	name the real solutions for those in the piles having real solutions. • Extension Tell students that they can solve absolute value equations by graphing just as they solve quadratic equations by graphing. Write the following equations on the board: $\|x + 1\| = 0$ $\|x – 4\| – 1 = 0$ Have students use a graphing calculator to graph the related absolute value function for each equation. Then have them use the ZERO feature from the CALC menu to find its real solutions, if any, rounded to the nearest hundredth. –1; 3, 5 • If students think that the steps in Example 1 provide the only possible equation for the given roots, then provide each student with a sheet of grid paper. Have students begin by drawing a coordinate grid with two points on the x-axis plotted as the roots of a quadratic equation. Ask	

				problems in the context of the problem situation (systems of 2 linear inequalities only). A1.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically. A1.2.1.1.2 Determine if a relation is a function given a set of points or a graph. A1.2.1.1.3 Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table). A1.2.1.2.1 Create, interpret and/or use the equation, graph or table of a linear function. A1.2.1.2.2 Translate from one representation of a linear function to another (graph, table and equation). A1.2.2.1.1 Identify, describe and/or use constant rates of change. A1.2.2.1.2 Apply the concept of linear rate of change (slope) to solve problems. A1.2.2.1.3 Write or identify a linear equation when given the graph of the line 2 points	*k*. • Extend 4.7 Investigate the rate of change of quadratic functions by examining first- and second-order differences. • 4.8 Graph quadratic inequalities in two variables. • Solve quadratic inequalities in one variable. • Extend 4.8 Use a data collection device to investigate the relationship between the time and the distance traveled by a car on a ramp	students to draw several parabolas that might be the graphs of different equations having those two points as their solutions. Point out that this demonstrates that the steps shown in Example 1 yield just one of the possible equations having the given roots. • If students need help remembering the mathematical characteristics of i, Then have students write poems about the imaginary number i and the repeating values of its powers, perhaps including wordplay with the terms real and imaginary. The content of the poems should be helpful for remembering the mathematical characteristics of i. • Extension Tell students that you are thinking of two complex numbers that have a sum of 3 + i and a difference of –5 + 7i. Ask them to find the product of the two numbers. 8 + 19i • Verbal/Linguistic Learners Have students solve the equation x2 + 6x – 40 = 0 by	

				on the line, or the slope and a point on a line, (Linear equation may be in point-slope, standard and/or slope-intercept form). A1.2.2.1.4 Determine the slope and/or y-intercept represented by a linear equation or graph. A2.1.1.1.1 Simplify square roots in terms of i. (e.g., √–24 = 2i√6). A2.1.1.1.2 Simplify/evaluate expressions involving imaginary numbers powers of i (e.g., i6 + i3 = –1 + i). A2.1.1.2.1 Add and subtract complex numbers (e.g., (7 – 3i) – (2 + i) = 5 – 4i). A2.1.1.2.2 Multiply and divide complex numbers (e.g., (7 – 3i)(2 + i) = 17 + i). A2.1.2.2.1 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is not equal to 0). A2.1.2.2.2 Simplify rational algebraic expressions. A2.1.3.1.1 Write and/or solve quadratic equations (including factoring and using the Quadratic		completing the square. Then have them discuss with a partner as many ways as they can to check their solutions. • If students substitute values into the Quadratic Formula incorrectly, then encourage students to write down the values of a, b, and c from the standard form of the quadratic equation before they begin substituting them into the formula. • Intrapersonal Learners Have students observe or research some natural events that can be modeled by parabolas. Students should report their observations and findings to the class. If students are able to determine a quadratic function that models the event, they should present the function and explain how the characteristics of the equation can be used to analyze its graph. • Extension In this lesson on quadratic functions, only equations of	

				Formula). A2.1.3.1.2 Solve equations involving rational and/or radical expressions (e.g., 10/(x + 3) + 12/(x – 2) = 1 or √(x2 + 21x) = 14). A2.1.3.1.3 Write and/or solve a simple exponential or logarithmic equation (including common and natural logarithms). A2.1.3.1.4 Write, solve and/or apply linear or exponential growth or decay (including problem situations). A2.1.3.2.1 Determine how a change in one variable relates to a change in a second variable (e.g., y=4/x, if x doubles, what happens to y?). A2.1.3.2.2 Use algebraic processes to solve a formula for a given variable (e.g., solve d = rt for r). A2.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern with a rule algebraically and/or graphically. A2.2.1.1.2 Identify and/or extend a pattern as either an arithmetic or geometric sequence (e.g., given a geometric sequence, find the 20th term).		parabolas that open upward or downward are analyzed and graphed. Ask students to explain why parabolas opening to the right or left are not included in this lesson. As an example, you can draw a graph of a parabola on the board with a vertex at (–2, 0), axis of symmetry through y = 0, and through (0, 2). Sample answer: This lesson is about quadratic functions. Parabolas opening right or left do not represent functions since 2 elements in the range are paired with one element of the domain, except at the vertex. • If students are having trouble making connections between the graph of a quadratic inequality and the inequality itself, then have students think about how the graph of a quadratic inequality helps them understand the meaning of the inequality. Ask them to explore whether the	

				A2.2.1.1.3 Determine the domain, range or inverse of a relation. A2.2.1.1.4 Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function (e.g., intervals of increasing/decreasing, intercepts, zeros, and asymptotes). A2.2.2.1.1 Create, interpret and/or use the equation, graph or table of a polynomial function (including quadratics). A2.2.2.1.2 Create, interpret and/or use the equation, graph or table of an exponential or logarithmic function (including common and natural logarithms). A2.2.2.1.3 Determine, use and/or interpret minimum and maximum values over a specified interval of a graph of a polynomial, exponential or logarithmic function. A2.2.2.1.4 Translate a polynomial, exponential or logarithmic function from one representation to another (graph, table and equation). A2.2.2.2.1 Identify or describe the effect of changing		quadratic inequality itself or the graph of the inequality is more meaningful to them. Ask them to give explanations for their choices.	

				parameters within a family of functions (e.g., y = x2 and y = x2 + 3, or y = x2 and y = 3x2). CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers. CC.2.1.HS.F.7 Apply concepts of complex numbers in polynomial identities and quadratic equations to solve problems. CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations. CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions. CC.2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context. CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.			

Week 13-15 Polynomials and Polynomial Functions	• Polynomial functions can be used to precisely and accurately model complicated real-world situations. The process of finding their solutions can be simplified using strategies and knowledge such as rewriting, change of signs of terms, factoring, synthetic division, remainder and factor theorems, rational zero theorem.	5.1: Operations with Polynomials Extend 5.1: Algebra Lab: Dimensional Analysis 5.2: Dividing Polynomials Extend 5.2: Graphing Technology Lab: Dividing Polynomials Explore Lesson 5.3: Graphing Technology Lab: Power Functions 5.3: Polynomial Functions 5.4: Analyzing Graphs of Polynomial Functions Extend Lesson 5.4: Graphing Technology Lab: Modeling Data using Polynomial Functions Explore Lesson 5.5: Graphing Technology Lab: Solving Polynomial Equations by Graphing 5.5: Solving Polynomial Functions Extend Lesson 5.5: Graphing Technology Lab: Polynomial Identities 5.6: The Remainder	• Why is math used to model real-world situations? • What are the limits of mathematical modeling?	A1.1.1.5.1 Add, subtract and/or multiply polynomial expressions (express answers in simplest form – nothing larger than a binomial multiplied by a trinomial). A1.1.1.5.2 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is equal to 1 after factoring out all monomial factors). A1.1.1.5.3 Simplify/reduce a rational algebraic expression. A1.1.2.1.1 Write, solve and/or apply a linear equation (including problem situations). A1.1.2.1.2 Use and/or identify an algebraic property to justify any step in an equation solving process (linear equations only). A1.1.2.1.3 Interpret solutions to problems in the context of the problem situation (linear equations only). A1.1.2.2.1 Write and/or solve a system of linear equations (including problem situations) using graphing, substitution and/or elimination (limit systems to 2 linear equations).	• 5.1 Multiply, divide, and simplify monomials and expressions involving powers. • Add, subtract, and multiply polynomials. • Extend 5.1 & 5.2 • Use dimensional analysis to convert units and solve problems. • Divide polynomials using long division. • Divide polynomials using synthetic division. • 5.2 & Extend 5.2 • Divide polynomials using long division. • Divide polynomials using synthetic division. • Use a graphing calculator with CAS to divide polynomials. • Explore 5.3 Use a graphing calculator to explore power functions • 5.3 Evaluate polynomial functions. • Identify general shapes of graphs of polynomial functions. • 5.4 Graph polynomial functions and locate their zeros. • Find the relative maxima and minima of polynomial functions. • Extend 5.4 Use a graphing calculator to model data whose curve of best	• If students have difficulty describing or using properties of exponents, then have them write their own summary of the properties of powers, such as "to multiply expressions with exponents, you add the exponents; to divide, you subtract the exponents." • If some students have trouble keeping their concentration throughout the sequence of steps required in long division, then encourage them to compare intermediate results with a partner so they can ask questions and catch errors before completing the entire problem. • Logical Learners Power functions are single-term polynomial functions that can have any degree. Have students examine the graphs of a variety of power functions and describe their similarities and differences. • If students ask how math functions can	Homework (Teacher Editions, Suggested HW at beginning of each problem set) Participation Quiz (Mid Chapter Quiz/Test) Tests (Form 1, 2A, 2B, 2C)

		and Factor Theorems 5.7: Roots and Zeros Extend Lesson 5.7: Graphing Technology Lab: Analyzing Polynomial Functions 5.8: Rational Zero Theorem		A1.1.2.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear equations only). .1.3.1.1 Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities). A1.1.3.1.2 Identify or graph the solution set to a linear inequality on a number line. A1.1.3.1.3 Interpret solutions to problems in the context of the problem situation (limit to linear inequalities). A1.1.3.2.1 Write and/or solve a system of linear inequalities using graphing (limit systems to 2 linear inequalities). A1.1.3.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear inequalities only). A1.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically. A1.2.1.1.2 Determine if a relation is a function given a set of	fit is a polynomial function. • Explore 5.5 & 5.5 Use a graphing calculator to find approximate solutions for polynomial equations. • Factor polynomials. • Solve polynomial equations by factoring. • 5.5 & Extend 5.5 Factor polynomials. • Solve polynomial equations by factoring. • Prove polynomial identities • 5.6 Evaluate functions by using synthetic substitution. • Determine whether a binomial is a factor of a polynomial by using synthetic substitution. • 5.7 Determine the number and type of roots for a polynomial equation. • Find the zeros of a polynomial function. • Extend 5.7 & 5.8 Use a graphing calculator to analyze polynomial functions. • Identify possible rational zeros of a polynomial function. • Find all of the rational zeros of a polynomial function. • 5.8 Identify possible rational zeros of a polynomial function.	describe real-world situations, then have them discuss the appropriateness of describing real-world situations with mathematical functions. Help them to understand that a function is usually just an approximation of the real-world data, and is often only a reasonable model of a limited domain of values. • If some students need a visual to help them solve problems like Example 4 and Additional Example 4, then it may help them to construct cardboard models of the figures. • If students can describe two or three things about this lesson that they found difficult to understand, then have them address each item by writing explanations that will help them review the material later. • If students sometimes make mistakes in mathematics exercises because they cannot read their own handwriting, then	

				points or a graph. A1.2.1.1.3 Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table). A1.2.1.2.1 Create, interpret and/or use the equation, graph or table of a linear function. A1.2.1.2.2 Translate from one representation of a linear function to another (graph, table and equation). A1.2.2.1.1 Identify, describe and/or use constant rates of change. A1.2.2.1.2 Apply the concept of linear rate of change (slope) to solve problems. A1.2.2.1.3 Write or identify a linear equation when given the graph of the line 2 points on the line, or the slope and a point on a line, (Linear equation may be in point-slope, standard and/or slope-intercept form). A1.2.2.1.4 Determine the slope and/or y-intercept represented by a linear equation or graph. A2.1.2.2.1 Factor algebraic	• Find all of the rational zeros of a polynomial function	stress that throughout this course, students must work using neat and careful handwriting. It is extremely easy to misread coefficients and exponents, or misread i as the number 1. • Logical Learners Organize students into groups of four or five. Have the students in each group split the work shown in Example 3 into four or five steps. The students should give explanations to the group about their parts of the Example. In particular, students should explain any mathematical processes, the results of their steps, and how the results relate to the next step in the process.	

				expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is not equal to 0). A2.1.2.2.2 Simplify rational algebraic expressions. A2.1.3.1.1 Write and/or solve quadratic equations (including factoring and using the Quadratic Formula). A2.1.3.1.2 Solve equations involving rational and/or radical expressions (e.g., 10/(x + 3) + 12/(x – 2) = 1 or √(x2 + 21x) = 14). A2.1.3.1.3 Write and/or solve a simple exponential or logarithmic equation (including common and natural logarithms). A2.1.3.1.4 Write, solve and/or apply linear or exponential growth or decay (including problem situations). A2.1.3.2.1 Determine how a change in one variable relates to a change in a second variable (e.g., y=4/x, if x doubles, what happens to y?). A2.1.3.2.2 Use algebraic processes to solve a formula for a given variable (e.g., solve d = rt for r).			

				A2.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern with a rule algebraically and/or graphically. A2.2.1.1.2 Identify and/or extend a pattern as either an arithmetic or geometric sequence (e.g., given a geometric sequence, find the 20th term). A2.2.1.1.3 Determine the domain, range or inverse of a relation. A2.2.1.1.4 Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function (e.g., intervals of increasing/decreasing, intercepts, zeros, and asymptotes). A2.2.2.1.1 Create, interpret and/or use the equation, graph or table of a polynomial function (including quadratics). A2.2.2.1.2 Create, interpret and/or use the equation, graph or table of an exponential or logarithmic function (including common and natural logarithms). A2.2.2.1.3 Determine, use and/or interpret minimum and maximum values over a specified interval of a graph of a polynomial,			

				exponential or logarithmic function. A2.2.2.1.4 Translate a polynomial, exponential or logarithmic function from one representation to another (graph, table and equation). CC.2.1.HS.F.7 Apply concepts of complex numbers in polynomial identities and quadratic equations to solve problems. CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations. CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials. CC.2.2.HS.D.4 Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs. CC.2.2.HS.D.5 Use polynomial identities to solve problems.			

				CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms. CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.			
Week 15-18 Inverses and radical Functions and Relations	• Graphing data can make it easier to choose a model to represent a data set. • Inverse functions can be used to model a relationship so that either quantity is the independent variable. • Radical functions have a unique shape and domain which can be used to model situations where the independent quantity is only positive, like time.	6.1: Operations on Functions 6.2: Inverse Functions and Relations Extend 6.2: Graphing Technology Lab: Inverse Functions and Inequalities 6.3: Square Root Functions and Inequalities 6.4: nth Roots Extend 6.4: Graphing Technology Lab: Graphing nth Root Functions 6.5: Operations with Radical Expressions 6.6: Rational Exponents 6.7: Solving Radical Equations and Inequalities Extend 6.7: Graphing technology Lab: Solving Radical Equations and Inequalities	• How can you choose a model to represent a set of data? (Sample answer: You could create a scatter plot. Then, from the shape of the scatter plot, you could choose a function with a graph that fits the data.) • Why would you use the inverse of a function to model a real-world situation? (Sample answer: You could use a function or the inverse of the function to model a relationship so that either quantity could be the independent variable. Then, you could use the functions to solve problems involving either quantity.) • Why would you choose a square root function to model a set of data instead of a polynomial function? (Sample answer: The end behavior of a square root function	A1.1.1.5.1 Add, subtract and/or multiply polynomial expressions (express answers in simplest form – nothing larger than a binomial multiplied by a trinomial). A1.1.1.5.2 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is equal to 1 after factoring out all monomial factors). A1.1.1.5.3 Simplify/reduce a rational algebraic expression. A1.1.2.1.1 Write, solve and/or apply a linear equation (including problem situations). A1.1.2.1.2 Use and/or identify an algebraic property to justify any step in an equation solving process (linear equations only). A1.1.2.1.3 Interpret solutions to problems in the context of the problem situation	• 6.1 Find the sum, difference, product, and quotient of functions. • Find the composition of functions. • 6.2 Find the inverse of a function or relation. • Determine whether two functions or relations are inverses. • Extend 6.2 & 6.3 Compare a function and its inverse using a graphing calculator. • Graph and analyze square root functions. • Graph square root inequalities. • 6.3 & 6.4 Graph and analyze square root functions. • Graph square root inequalities. • Simplify radicals. • Use a calculator to approximate radicals. • 6.4 & Extend 6.4 Simplify radicals. • Use a calculator to approximate radicals. • Use a graphing calculator to graph	• Intrapersonal Learners Have students write expressions that involve compositions of functions and then annotate the expressions with notes to themselves such as, "[f ° g](x) is pronounced "f of g of x" and, "Start by finding the value g(x); then use that value as the input for f." • Extension Many states use function compositions to calculate speeding ticket amounts. They do this by calculating the number of miles over the speed limit a driver is traveling, multiplying this number by a per mile charge, and adding a flat rate. Ask students to create a composition of three different functions, substituting made-up or researched	Homework (Teacher Editions, Suggested HW at beginning of each problem set) Participation Quiz (Mid Chapter Quiz/Test) Tests (Form 1, 2A, 2B, 2C)

			might fit the data better than a polynomial function. Also, the domain of the square root function is $x \geq 0$, which may be applicable to many real-world situations that involve quantities such as time and distance.)	(linear equations only). A1.1.2.2.1 Write and/or solve a system of linear equations (including problem situations) using graphing, substitution and/or elimination (limit systems to 2 linear equations). A1.1.2.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear equations only). A1.1.3.1.1 Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities). A1.1.3.1.2 Identify or graph the solution set to a linear inequality on a number line. A1.1.3.1.3 Interpret solutions to problems in the context of the problem situation (limit to linear inequalities). A1.1.3.2.1 Write and/or solve a system of linear inequalities using graphing (limit systems to 2 linear inequalities). A1.1.3.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear	*n*th root functions. • 6.5 Simplify radical expressions. • Add, subtract, multiply, and divide radical expressions. • 6.6 Write expressions with rational exponents in radical form and vice versa. • Simplify expressions in exponential or radical form. • 6.7 Solve equations containing radicals. • Solve inequalities containing radicals. • Extend 6.7 Use a graphing calculator to solve radical equations and inequalities.	values for the posted speed limit, the per mile charge, and the flat rate. The function composition should be of the form $(f \circ g \circ h)(x)$ where x is the speed of the driver in miles per hour. • Kinesthetic Learners On a large coordinate grid, have students model the graph of the identity function $f(x) = x$ using a length of string, a piece of uncooked spaghetti, or something similar. Then place a second length of string to model the graph of $f(x) = 2x - 5$ from Example 2. Have students model the graph of the inverse of this function and relate the graphs of the function, and its inverse, to the graph of $f(x) = x$. • If students continue to struggle with graphing square root inequalities, yhen have students work in pairs or small groups to discuss how to graph square root inequalities such as those in Exercises 31–38.	

				inequalities only). A1.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically. A1.2.1.1.2 Determine if a relation is a function given a set of points or a graph. A1.2.1.1.3 Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table). A1.2.1.2.1 Create, interpret and/or use the equation, graph or table of a linear function. A1.2.1.2.2 Translate from one representation of a linear function to another (graph, table and equation). A1.2.2.1.1 Identify, describe and/or use constant rates of change. A1.2.2.1.2 Apply the concept of linear rate of change (slope) to solve problems. A1.2.2.1.3 Write or identify a linear equation when given the graph of the line 2 points on the line, or the slope and a point on a line, (Linear equation may be		Students should discuss how to determine the domain and range of an inequality, how to determine whether the boundary is solid or dashed, and how to determine where to shade the inequality. • Logical Learners Some students tend to think that x must represent a positive number and −x must represent a negative number. Reading −x as "the opposite of x" should help them understand that −x is 9 if x = −9. Also, explain that −9 has no square root that is a real number. That is, no real number can be squared to give −9. Remind students that $\sqrt{-9}$ is 3i, an imaginary number. • If students continue to struggle with graphing square root inequalities, then have students work in pairs or small groups to discuss how to graph square root inequalities such as those in Exercises 31–38. Students should	

				in point-slope, standard and/or slope-intercept form). A1.2.2.1.4 Determine the slope and/or y-intercept represented by a linear equation or graph. A2.1.2.2.1 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is not equal to 0). A2.1.2.2.2 Simplify rational algebraic expressions. A2.1.3.1.1 Write and/or solve quadratic equations (including factoring and using the Quadratic Formula). A2.1.3.1.2 Solve equations involving rational and/or radical expressions (e.g., 10/(x + 3) + 12/(x – 2) = 1 or √(x2 + 21x) = 14). A2.1.3.1.3 Write and/or solve a simple exponential or logarithmic equation (including common and natural logarithms). A2.1.3.1.4 Write, solve and/or apply linear or exponential growth or decay (including problem situations). A2.1.3.2.1		discuss how to determine the domain and range of an inequality, how to determine whether the boundary is solid or dashed, and how to determine where to shade the inequality. • If when presented with a radical expression such as $11+6\sqrt{3}$, some students persist in trying to add the 11 and the 6, then to help them understand why this cannot be done, compare the radical expression $11+6\sqrt{3}$ to the expression 11 + 6x. Stress that $6\sqrt{3}$ the radical is a multiplication expression just like 6x. Remind students that the order of operations requires that multiplication be performed before addition. Students may find it helpful to rewrite $11+6\sqrt{3}$, as $11+6\cdot\sqrt{3}$. • Interpersonal Learners Ask students to work in	

				Determine how a change in one variable relates to a change in a second variable (e.g., y=4/x, if x doubles, what happens to y?). A2.1.3.2.2 Use algebraic processes to solve a formula for a given variable (e.g., solve d = rt for r). A2.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern with a rule algebraically and/or graphically. A2.2.1.1.2 Identify and/or extend a pattern as either an arithmetic or geometric sequence (e.g., given a geometric sequence, find the 20th term). A2.2.1.1.3 Determine the domain, range or inverse of a relation. A2.2.1.1.4 Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function (e.g., intervals of increasing/decreasing, intercepts, zeros, and asymptotes). A2.2.2.1.1 Create, interpret and/or use the equation, graph or table of a polynomial function (including quadratics). A2.2.2.1.2		groups as they compare solving radical equations and inequalities to solving other types of equations and inequalities. Have them write or give a short presentation about the similarities and differences between the procedures used in the solution process.	

				Create, interpret and/or use the equation, graph or table of an exponential or logarithmic function (including common and natural logarithms). A2.2.2.1.3 Determine, use and/or interpret minimum and maximum values over a specified interval of a graph of a polynomial, exponential or logarithmic function. A2.2.2.1.4 Translate a polynomial, exponential or logarithmic function from one representation to another (graph, table and equation). A2.2.2.2.1 Identify or describe the effect of changing parameters within a family of functions (e.g., y = x2 and y = x2 + 3, or y = x2 and y = 3x2). CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations. CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities. CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.			

				CC.2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context. CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.			
Week 19-21 Exponential and Logarithmic Functions and Relations	• Exponential and Logarithmic functions are inverses. You can use them to model change over time where there are iterations (such as in compound interst with finances, or generations as with populations.) • Being financially literate can help you make wise financial decisions that will set you up for success in life.	7.1: Graphing Exponential Functions 7.2: Exploring Graphing Technology 7.2: Solving Exponential Equations and Inequalities 7.3: Logarithms and Logarithmic Functions 7.4 Solving Logarithmic Equations and Inequalities 7.5: Properties of Logarithms 7.6: Common Logarithms Extend 7.6 Graphing Technologies 7.7: Base e and Natural Logarithms Explore 7.8: Spreadsheet Lab 7.8: Using Exponential and Logarithmic Functions	• How can you make good decisions? (Sample answer: Determine the available options, compare the advantages and disadvantages of each option, analyze the consequences, and choose the best option.) • What factors can affect good decision making? (Sample answers: the amount of time that is available, the process used, the environment, the people that are involved, the available options.) • How can being financially literate help you to make good decisions? (Sample answer: If you are financially literate, you	A1.1.1.5.1 Add, subtract and/or multiply polynomial expressions (express answers in simplest form – nothing larger than a binomial multiplied by a trinomial). A1.1.1.5.2 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is equal to 1 after factoring out all monomial factors). A1.1.1.5.3 Simplify/reduce a rational algebraic expression. A1.1.2.1.1 Write, solve and/or apply a linear equation (including problem situations). A1.1.2.1.2 Use and/or identify an	• 7.1 Graph exponential growth functions. • Graph exponential decay functions. • Explore 7.2 & 7.2 Use a graphing calculator to solve exponential equations by graphing or by using the table feature. • Solve exponential equations. • Solve exponential inequalities. • 7.2 Solve exponential equations. • Solve exponential inequalities • 7.3 Evaluate logarithmic expressions. • Graph logarithmic functions. • 7.3 & Extend 7.3 Evaluate logarithmic expressions.	• ELL: Visual Because there are so many new properties taught in this chapter, suggest that students make up property posters. Encourage students to be as abbreviated as possible and to use color to help them see at a glance how the property works. • Logical Have pairs of students begin with $10, choose an interest rate that will be compounded continuously, and calculate how much they will have after 5, 10, 15, and 20 years. After each calculation, have students model the amount of	Homework (Teacher Editions, Suggested HW at beginning of each problem set) Participation Quiz (Mid Chapter Quiz/Test) Tests (Form 1, 2A, 2B, 2C)

			understand the vocabulary of financial terms and know how to analyze data and trends. Successfully applying these skills when considering your available options can help you to make good decisions in many real-world situations such as opening a bank account, applying for college loans, and buying a house.) • How do you use the concept of exponential growth to work with the principle of compound interest? • How do you convert between exponential and logarithmic form? • How do you use the inverse relationship between exponential and logarithmic functions to solve equations?	algebraic property to justify any step in an equation solving process (linear equations only). A1.1.2.1.3 Interpret solutions to problems in the context of the problem situation (linear equations only). A1.1.2.2.1 Write and/or solve a system of linear equations (including problem situations) using graphing, substitution and/or elimination (limit systems to 2 linear equations). A1.1.2.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear equations only). A1.1.3.1.1 Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities). A1.1.3.1.2 Identify or graph the solution set to a linear inequality on a number line. A1.1.3.1.3 Interpret solutions to problems in the context of the problem situation (limit to linear inequalities). A1.1.3.2.1 Write and/or solve a system of linear	• Graph logarithmic functions. • Use a graphing calculator to find an equation of best fit for exponential and logarithmic functions. • 7.4 Solve logarithmic equations. • Solve logarithmic inequalities. • 7.5 Simplify and evaluate expressions using the properties of logarithms. • Solve logarithmic equations using the properties of logarithms. • 7.6 Solve exponential equations and inequalities using common logarithms. • Evaluate logarithmic expressions using the Change of Base Formula. • 7.6 & Extend 7.6 Solve exponential equations and inequalities using common logarithms. • Evaluate logarithmic expressions using the Change of Base Formula. • Use a graphing calculator to solve exponential and logarithmic equations and inequalities. • 7.7 Evaluate	money they have on a bar graph. • Option 2 Approaching Level As a class, make a Venn diagram for the set of real numbers. Once the diagram is made, review with students what it means for a number to be a rational number, integer, whole number, natural number, or irrational number. Write an example of each type of real number on the diagram. Then discuss e as an irrational number. • Option 3 English Learners Write several exponential functions and their related logarithmic functions on the board. Ask students to read aloud each expression. For example, have students say two to the third power is equal to eight for 23 = 8. Then have students say the logarithm of eight with base two is equal to three for log2 8 = 3. • Option 4 Beyond Level Ask students to do a search for the tables of common	

				inequalities using graphing (limit systems to 2 linear inequalities). A1.1.3.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear inequalities only). A1.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically. A1.2.1.1.2 Determine if a relation is a function given a set of points or a graph. A1.2.1.1.3 Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table). A1.2.1.2.1 Create, interpret and/or use the equation, graph or table of a linear function. A1.2.1.2.2 Translate from one representation of a linear function to another (graph, table and equation). A1.2.2.1.1 Identify, describe and/or use constant rates of change. A1.2.2.1.2 Apply the concept of linear rate of change (slope) to solve	expressions involving the natural base and natural logarithm. • Solve exponential equations and inequalities using natural logarithms. • Explore 7.8 & 7.8 Use a spreadsheet to display the growth of an investment over time. • Use logarithms to solve problems involving exponential growth and decay. • Use logarithms to solve problems involving logistic growth. • 7.8 & Extend 7.8 Use logarithms to solve problems involving exponential growth and decay. • Use logarithms to solve problems involving logistic growth. • Use a data collection device to investigate the differences between types of insulated cups and cooling time.	logarithms of numbers either in the appendices of older algebra texts or online. As a class, learn to read and use these tables. Then ask students to use the tables to evaluate several common logarithms, such as log10125. Then have students compare their results with what they get when they evaluate the same logarithms using their calculator. • **Verbal/Linguistic Learners** Ask students where they have heard the term *exponential* before and what they think it might mean. Students may have heard terms like *exponential growth* on a television news program and they might think that exponential means "enormous." Use students' answers to introduce the concept of exponential functions. • **Extension** Have students extend the solution to Example 3 for an increasing number of compounding periods. Try daily	

				problems. A1.2.2.1.3 Write or identify a linear equation when given the graph of the line 2 points on the line, or the slope and a point on a line, (Linear equation may be in point-slope, standard and/or slope-intercept form). A1.2.2.1.4 Determine the slope and/or y-intercept represented by a linear equation or graph. A2.1.2.2.1 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is not equal to 0). A2.1.2.2.2 Simplify rational algebraic expressions. A2.1.3.1.1 Write and/or solve quadratic equations (including factoring and using the Quadratic Formula). A2.1.3.1.2 Solve equations involving rational and/or radical expressions (e.g., $10/(x + 3) + 12/(x – 2) = 1$ or $\sqrt{(x2 + 21x)} = 14$). A2.1.3.1.3 Write and/or solve a simple exponential or logarithmic equation (including common and natural logarithms).		compounding (n = 365), and then explore what happens if n is varied up to tens of thousands of times per year. The final amount approaches an upper limit, which in this case is about $4694.03. • If students need help visualizing the relative locations of the digits in equivalent logarithmic and exponential equations, then have students create colorful posters showing several equivalent exponential and logarithmic equations, such as $23 = 8$ and $3 = \log_2 8$. Suggest that students use a different color for each of the digits 2, 3, and 8. • Extension Ask students to evaluate $\log_3 9$ and $\log_3 27$. 2, 3 Then ask them to predict the value of $\log_3 (9 \cdot 27)$. After they have made their predictions, ask them to check to see if 3 raised to their predicted values is equal to $9 \cdot 27$, or 243. Have them predict the value of log3(mn). log3 m +	

				A2.1.3.1.4 Write, solve and/or apply linear or exponential growth or decay (including problem situations). A2.1.3.2.1 Determine how a change in one variable relates to a change in a second variable (e.g., y=4/x, if x doubles, what happens to y?). A2.1.3.2.2 Use algebraic processes to solve a formula for a given variable (e.g., solve d = rt for r). A2.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern with a rule algebraically and/or graphically. A2.2.1.1.2 Identify and/or extend a pattern as either an arithmetic or geometric sequence (e.g., given a geometric sequence, find the 20th term). A2.2.1.1.3 Determine the domain, range or inverse of a relation. A2.2.1.1.4 Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function (e.g., intervals of increasing/decreasing, intercepts, zeros, and asymptotes).		log3 n • Interpersonal Learners Immediately after discussing Example 4, have pairs of students rework the Example together without looking at the solution in the text. Have the partners take turns explaining the solution steps to each other. Have them also discuss the reasonableness of their solutions. • Extension Show students the following: log10 3 ≈ 0.4771 log10 30 ≈ 1.4771 log10 300 ≈ 2.4771 log10 3000 ≈ 3.4771 Ask students to predict log10 30,000. 4.4771 Have students use properties of logarithms to explain this pattern. Sample explanation: 3, 30, 300, and 3000 can be written as 3 × 100, 3 × 101, 3 × 102, and 3 × 103 respectively. Then the base 10 logarithms of each can be rewritten as a sum of two logarithms. For example, log10 3000 can be written as log10 (3	

				A2.2.2.1.1 Create, interpret and/or use the equation, graph or table of a polynomial function (including quadratics). A2.2.2.1.2 Create, interpret and/or use the equation, graph or table of an exponential or logarithmic function (including common and natural logarithms). A2.2.2.1.3 Determine, use and/or interpret minimum and maximum values over a specified interval of a graph of a polynomial, exponential or logarithmic function. A2.2.2.1.4 Translate a polynomial, exponential or logarithmic function from one representation to another (graph, table and equation). A2.2.2.2.1 Identify or describe the effect of changing parameters within a family of functions (e.g., y = x2 and y = x2 + 3, or y = x2 and y = 3x2). CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations. CC.2.2.HS.C.3 Write functions or sequences that model		· 103). Then it follows that log10 (3 · 103) = log10 3 + log10 103 = log10 (3) + 3 = 3.4771. • Logical Learners Ask students to recall that an equation like 4x = 19 from Example 3 could be written in logarithmic form as log4 19 = x. Although this logarithm cannot be directly evaluated, the Change of Base Formula can be used to give the correct result of x ≈ 2.1234. • If some students mistakenly think that an equation like 4e–2x - 5 = 3 contains two variables, then point out that the letter e represents a constant, just as π does. Both e and π are irrational numbers, which cannot be expressed exactly with numerals. To help students avoid this confusion, have them highlight the variables in the equation with a marker. • Logical Learners Have students work in pairs or small groups. Ask them to examine the growth and	

				relationships between two quantities. CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions. CC.2.2.HS.C.5 Construct and compare linear, quadratic and exponential models to solve problems. CC.2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context. CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.		decay formulas used in Examples 1– 3 and to discuss how the equations are related. In particular, ask them to discuss how they can identify which equations are used for exponential decay situations (minus/negative sign) and which are used for exponential growth. • Extension Mathematically and scientifically talented students can research the growth rates of different bacteria types. Students can explore how these growth rates are determined, environmental factors that cause them to thrive or inhibit their prosperity, and graph the growth of different types for comparison purposes.	
Weeks 22-23 Rational Functions and Relations	• Geometric relationships can be described, analyzed, and classified based on spatial reasoning and/or visualization. • Mathematical relationships can be represented as expressions,	8.1: Multiplying and Dividing Rational Expressions 8.2: Adding and Subtracting Rational Expressions 8.3: Graphing Reciprocal Functions 8.4: Graphing rational Functions 8.4: Extend:	• Why are graphs useful? (Sample answer: Graphs are useful because they can help you visualize relationships between real-world quantities. They can also be used to estimate function values.)	A1.1.1.5.1 Add, subtract and/or multiply polynomial expressions (express answers in simplest form – nothing larger than a binomial multiplied by a trinomial). A1.1.1.5.2 Factor algebraic expressions, including	• 8.1: Simplify rational expressions • Simplify complex fractions • 8.2:Determine the LCCM of Polynomials • Add and subtract rational expressions • 8.3: Determine properties of reciprocal functions	• Interpersonal Place students in groups of four. Since there are several tasks involved in graphing reciprocal functions of the form	Homework (Teacher Editions, Suggested HW at beginning of each problem set) Participation Quiz (Mid Chapter

	equations, and inequalities in mathematical situations.	Graphing Rational Functions 8.5: Variation Functions 8.6: Solving Rational Equations and Inequities 8.6 Extend: Graphing Rational Equation and Inequalities	• How are the properties of a rational function reflected in its graph? (Sample answer: Vertical asymptotes occur at values that make the denominator 0; horizontal asymptotes occur when the degree of the numerator is less than or equal to the degree of the denominator; oblique asymptotes occur when the degrees of the numerator and denominator differ by 1; holes occur when the numerator and denominator share a binomial factor.) • How can analyzing a rational function algebraically and graphically help you to see the "whole picture?" (Sample answer: An algebraic analysis can help you to determine points of discontinuity that may not be clear or noticeable when viewing the graph of the function. A graphical analysis can help you to see the asymptotes and end behavior of the function.) • Why is it important to state the restricted values before simplifying a rational	difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is equal to 1 after factoring out all monomial factors). A1.1.1.5.3 Simplify/reduce a rational algebraic expression. A1.1.2.1.1 Write, solve and/or apply a linear equation (including problem situations). A1.1.2.1.2 Use and/or identify an algebraic property to justify any step in an equation solving process (linear equations only). A1.1.2.1.3 Interpret solutions to problems in the context of the problem situation (linear equations only). A1.1.2.2.1 Write and/or solve a system of linear equations (including problem situations) using graphing, substitution and/or elimination (limit systems to 2 linear equations). A1.1.2.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear equations only). A1.1.3.1.1 Write or solve compound inequalities and/or graph their solution sets on a	• Graph transformations of reciprocal functions • 8.4 Graph rational functions with vertical and horizontal asymptotes • Graph rational functions with oblique asymptotes and point discontinuity • Extend 8.4: Use a graphing calculator to explore the graphs of rational functions • 8.5: Recognize and solve direct and joint variation problems • Recognize and solve inverse and combined variation problems • 8.6: Solve rational equations • Solve rational inequalities • Extend 8.6: Use a graphing calculator to solve rational equations by graphing or by using the table feature	$f(x)=\frac{a}{x-h}+k$, have the group members decide which tasks they should each complete in order to graph a given function. For example, one member can be responsible for finding the a, h, and k values, another can identify the asymptotes, another can substitute values in order to determine points on the graph, and a fourth member can graph the points and draw the curve of the function. • Logical As you explain the various types of variation functions, have students copy and complete the following table to help them organize all the types studied. • If students are having difficulty with these problems, then encourage them to use several steps, writing each one below the previous and keeping each line equivalent to the one above. Caution them to make only one	Quiz/Test) Tests (Form 1, 2A, 2B, 2C)

			expression? • How do you know when a rational expression can be simplified? • How do the concepts of nth roots relate with rational exponents? • Why is it necessary to check the possible solutions for extraneous roots when solving a radical equation	number line (may include absolute value inequalities). A1.1.3.1.2 Identify or graph the solution set to a linear inequality on a number line. A1.1.3.1.3 Interpret solutions to problems in the context of the problem situation (limit to linear inequalities). A1.1.3.2.1 Write and/or solve a system of linear inequalities using graphing (limit systems to 2 linear inequalities). A1.1.3.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear inequalities only). A1.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically. A1.2.1.1.2 Determine if a relation is a function given a set of points or a graph. A1.2.1.1.3 Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table). A1.2.1.2.1 Create, interpret and/or		change per step. • Extension To prepare students for the next lesson and to build a strong base for future work with rational expressions, give them an expression like $\frac{5x^2(x^2+3)}{5x(x+3)}$. Ask them to explain in detail, citing fundamentals from arithmetic, why the fives can be divided out but not the threes. Also explain why the first x2 and x can be divided by x to simplify, but not those within parentheses. Students' explanations should mention that common factors of both the numerator and denominator can be divided out, but not terms that are parts of polynomials. Substitution of a number, like 2, for x may help some students reach this realization. • If students have difficulty adding and subtracting rational expressions, then have students	

				use the equation, graph or table of a linear function. A1.2.1.2.2 Translate from one representation of a linear function to another (graph, table and equation). A1.2.2.1.1 Identify, describe and/or use constant rates of change. A1.2.2.1.2 Apply the concept of linear rate of change (slope) to solve problems. A1.2.2.1.3 Write or identify a linear equation when given the graph of the line 2 points on the line, or the slope and a point on a line, (Linear equation may be in point-slope, standard and/or slope-intercept form). A1.2.2.1.4 Determine the slope and/or y-intercept represented by a linear equation or graph. A2.1.3.1.1 Write and/or solve quadratic equations (including factoring and using the Quadratic Formula). A2.1.3.1.2 Solve equations involving rational and/or radical expressions (e.g., $10/(x + 3) + 12/(x – 2) = 1$ or $\sqrt{(x2 + 21x)} = 14$).		work with a partner, one in the role of a coach, the other in the role of an athlete. The athlete works a problem, using steps and explaining the thinking while the coach listens and watches for errors, correcting as necessary. Then the partners exchange roles. • Visual/Spatial Learners Have students graph one of the functions from the lesson on a large sheet of poster board to clearly show how the graph approaches but never reaches an asymptote. Encourage students to use a variety of colored markers. • Extension Challenge students to explain the rules for finding horizontal and oblique asymptotes. While the chapter shows students how to find them, the explanation of why the rules work can be left to high ability students. Scaffold the task by having students examine graphs of varying degrees in the numerator and	

				A2.1.3.1.3 Write and/or solve a simple exponential or logarithmic equation (including common and natural logarithms). A2.1.3.1.4 Write, solve and/or apply linear or exponential growth or decay (including problem situations). A2.1.3.2.1 Determine how a change in one variable relates to a change in a second variable (e.g., y=4/x, if x doubles, what happens to y?). A2.1.3.2.2 Use algebraic processes to solve a formula for a given variable (e.g., solve d = rt for r). A2.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern with a rule algebraically and/or graphically. A2.2.1.1.2 Identify and/or extend a pattern as either an arithmetic or geometric sequence (e.g., given a geometric sequence, find the 20th term). A2.2.1.1.3 Determine the domain, range or inverse of a relation. A2.2.1.1.4 Identify and/or determine		denominator and look for general patterns in the asymptotes. • Verbal/Linguistic Learners Have students write a list of tips to help someone draw the graphs of rational functions. • Logical Learners Have students think about the difference between "pure" mathematics, such as solving an equation, and "applied" mathematics, such as solving a real-world problem. Ask them to list some ways in which these two are alike and some ways in which they are different. •	

				the characteristics of an exponential, quadratic, or polynomial function (e.g., intervals of increasing/decreasing, intercepts, zeros, and asymptotes). A2.2.2.1.1 Create, interpret and/or use the equation, graph or table of a polynomial function (including quadratics). A2.2.2.1.2 Create, interpret and/or use the equation, graph or table of an exponential or logarithmic function (including common and natural logarithms). A2.2.2.1.3 Determine, use and/or interpret minimum and maximum values over a specified interval of a graph of a polynomial, exponential or logarithmic function. A2.2.2.1.4 Translate a polynomial, exponential or logarithmic function from one representation to another (graph, table and equation). A2.2.2.2.1 Identify or describe the effect of changing parameters within a family of functions (e.g., y = x2 and y = x2 + 3, or y = x2 and y = 3x2). CC.2.2.HS.C.2 Graph and analyze functions and use their			

				properties to make connections between the different representations. CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions. CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms. CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships. CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.			
Week 25-27 Conic Sections	•	9.1: Midpoint and Distance Formulas 9.2: Parabolas 9.3 Explore: Graphing Equations of Circles 9.3: Circles 9.4 Explore: Ellipses 9.4: Ellipses 9.5: Hyperbolas 9.6: Identifying Conic Sections 9.6 Extend: Graphing and Analyzing Quadratic Relations	• How does mathematics help us to describe the physical world? (Sample answer: Mathematics enables us to model real-world situations, which allows us to analyze and understand these situations better, and thus make better decisions.)	A1.1.1.5.1 Add, subtract and/or multiply polynomial expressions (express answers in simplest form – nothing larger than a binomial multiplied by a trinomial). A1.1.1.5.2 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is	•		Homework (Teacher Editions, Suggested HW at beginning of each problem set) Participation Quiz (Mid Chapter Quiz/Test) Tests (Form 1, 2A, 2B, 2C)

		9.7 Explore: Grapping Linear and Nonlinear Systems 9.7: Solving Linear-Nonlinear Systems	• What are the similarities and differences between parabolas and ellipses? (Sample answer: Similarities: Curved graphs; equations contain a variable raised to second power. Differences: Parabolas have one focus and one vertex; ellipses have two foci, 2 vertices, and 2 co-vertices.) • What are the similarities and differences between hyperbolas and the other conic sections? (Sample answer: Similarities: Curved graphs; equations contain one or two variables raised to second power. Differences: Hyperbolas have two branches; other conic sections are continuous.) • Why are parabolas, circles, ellipses, and hyperbolas called conic sections? (Sample answer: They are the cross sections formed by a plane and a double napped cone.)	equal to 1 after factoring out all monomial factors). A1.1.1.5.3 Simplify/reduce a rational algebraic expression. A1.1.2.1.1 Write, solve and/or apply a linear equation (including problem situations). A1.1.2.1.2 Use and/or identify an algebraic property to justify any step in an equation solving process (linear equations only). A1.1.2.1.3 Interpret solutions to problems in the context of the problem situation (linear equations only). A1.1.2.2.1 Write and/or solve a system of linear equations (including problem situations) using graphing, substitution and/or elimination (limit systems to 2 linear equations). A1.1.2.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear equations only). A1.1.3.1.1 Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities).			

				A1.1.3.1.2 Identify or graph the solution set to a linear inequality on a number line. A1.1.3.1.3 Interpret solutions to problems in the context of the problem situation (limit to linear inequalities). A1.1.3.2.1 Write and/or solve a system of linear inequalities using graphing (limit systems to 2 linear inequalities). A1.1.3.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear inequalities only). A1.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically. A1.2.1.1.2 Determine if a relation is a function given a set of points or a graph. A1.2.1.1.3 Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table). A1.2.1.2.1 Create, interpret and/or use the equation, graph or table of a linear function.			

				A1.2.1.2.2 Translate from one representation of a linear function to another (graph, table and equation). A1.2.2.1.1 Identify, describe and/or use constant rates of change. A1.2.2.1.2 Apply the concept of linear rate of change (slope) to solve problems. A1.2.2.1.3 Write or identify a linear equation when given the graph of the line 2 points on the line, or the slope and a point on a line, (Linear equation may be in point-slope, standard and/or slope-intercept form). A1.2.2.1.4 Determine the slope and/or y-intercept represented by a linear equation or graph. A2.1.3.1.1 Write and/or solve quadratic equations (including factoring and using the Quadratic Formula). A2.1.3.1.2 Solve equations involving rational and/or radical expressions (e.g., $10/(x + 3) + 12/(x – 2) = 1$ or $\sqrt{}(x2 + 21x) = 14$). A2.1.3.1.3 Write and/or solve a simple exponential or			

				logarithmic equation (including common and natural logarithms). A2.1.3.1.4 Write, solve and/or apply linear or exponential growth or decay (including problem situations). A2.1.3.2.1 Determine how a change in one variable relates to a change in a second variable (e.g., y=4/x, if x doubles, what happens to y?). A2.1.3.2.2 Use algebraic processes to solve a formula for a given variable (e.g., solve d = rt for r). A2.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern with a rule algebraically and/or graphically. A2.2.1.1.2 Identify and/or extend a pattern as either an arithmetic or geometric sequence (e.g., given a geometric sequence, find the 20th term). A2.2.1.1.3 Determine the domain, range or inverse of a relation. A2.2.1.1.4 Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function (e.g., intervals of			

				increasing/decreasing, intercepts, zeros, and asymptotes). A2.2.2.1.1 Create, interpret and/or use the equation, graph or table of a polynomial function (including quadratics). A2.2.2.1.2 Create, interpret and/or use the equation, graph or table of an exponential or logarithmic function (including common and natural logarithms). A2.2.2.1.3 Determine, use and/or interpret minimum and maximum values over a specified interval of a graph of a polynomial, exponential or logarithmic function. A2.2.2.1.4 Translate a polynomial, exponential or logarithmic function from one representation to another (graph, table and equation). A2.2.2.2.1 Identify or describe the effect of changing parameters within a family of functions (e.g., y = x2 and y = x2 + 3, or y = x2 and y = 3x2). CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.			

				CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions. CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms. CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships. CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.			
Week 28-30 Sequences and Series	• Arithmetic and Geometric Sequences and Series can be used to model patterns of change, such as with numbers, Recursive and Iterative Functions, and Binomial Expansion.	10.1: Sequences as Functions 10.2: Arithmetic Sequences and Series 10.3: Geometric Sequences and Series 10.4 Explore: Area Under a Curve 10.4: Infinite Geometric Series 10.4 Extend: Graphing Limits 10.5: Recursion and Iteration 10.5 Extend: Amortizing Loans 10.6: Binomial Theorem	• Where are patterns found in the real world? (Sample answer: in nature, architecture, music, science, art.) • How can recognizing patterns help you solve real-world problems? (Sample answer: Recognizing a pattern can help you to predict future behavior.) • What types of patterns can be modeled	A1.1.1.5.1 Add, subtract and/or multiply polynomial expressions (express answers in simplest form – nothing larger than a binomial multiplied by a trinomial). A1.1.1.5.2 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is equal to 1 after factoring out all monomial factors). A1.1.1.5.3	• 10.1: Relate arithmetic sequences to linear functions • Relate geometric sequences to exponential functions • 10.2: Use arithmetic sequences • Find sums of arithmetic series • 10.3: Use geometric sequences • Find sums of geometric series • Explore 10.4: Approximate the area under a curve	• Logical Have students make a chart that compares and contrasts arithmetic and geometric sequences and series, explaining what the variables represent in each formula. • Interpersonal Create a friendly competition between two groups of students, the Binomial Theorem	Editions, Suggested HW at beginning of each problem set) Participation Quiz (Mid Chapter Quiz/Test) Tests (Form 1, 2A, 2B, 2C)

		10.6 Extend: Combinations and Pascal's Triangle 10.7: Proof by Mathematical Induction	mathematically? (Sample answer: numerical patterns involving real number operations such as addition and multiplication.) • Why is it helpful to represent a numeric pattern with a formula? (Sample answer: By using a formula to represent a numeric pattern, you can find any term. If given a term, you can use the formula to determine the location of the term in the pattern. You can also determine other characteristics of the pattern such as whether the sequence representing the pattern is linear or whether the series representing the sequence is convergent or divergent.)	Simplify/reduce a rational algebraic expression. A1.1.2.1.1 Write, solve and/or apply a linear equation (including problem situations). A1.1.2.1.2 Use and/or identify an algebraic property to justify any step in an equation solving process (linear equations only). A1.1.2.1.3 Interpret solutions to problems in the context of the problem situation (linear equations only). A1.1.2.2.1 Write and/or solve a system of linear equations (including problem situations) using graphing, substitution and/or elimination (limit systems to 2 linear equations). A1.1.2.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear equations only). A1.1.3.1.1 Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities). A1.1.3.1.2 Identify or graph the solution set to a linear inequality on a number	over a specified interval, using the sum of rectangular areas under the curve • 10.4: Find sums of infinite geometric series • Write repeating decimals as fractions • Extend 10.4: Use a graphing calculator to investigate limits of sequences • 10.5: Recognize and use special sequences • Iterate functions • Extend 10.5:Use a spreadsheet to analyze the payments, interest, and balance of a loan • 10.6: Use Pascal's triangle to expand powers of binomials • use the Binomial Theorem to expand powers of binomials • Extend 10.6: Use combinations and Pascal's triangle to determine the number of ways the prizes of a game can be chosen • 10.7: Prove statements by using mathematical induction • Disprove statements by finding a counterexample	Expanders and thePolynomial Multipliers. Write an expression such as (2x + y)5 on the board. Have each group expand the expression using the method for which their group is named. Compare the expanded expressions and the times the groups take to find them. • Option 2: Approaching Level: To explain conceptually how mathematical induction works, set up a series of 5 evenly spaced dominoes in a line, one behind the other. Knock the first domino over. Ask students to describe what they observe. Tell students that you think, based on what was just observed, that the 29th domino will get knocked over if you knock over the first domino. Set up 30 dominos to test and prove your assumption is true. Then ask the class what they think would happen to the 500th domino. Tell students that they just used inductive reasoning.	

				line. A1.1.3.1.3 Interpret solutions to problems in the context of the problem situation (limit to linear inequalities). A1.1.3.2.1 Write and/or solve a system of linear inequalities using graphing (limit systems to 2 linear inequalities). A1.1.3.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear inequalities only). A1.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically. A1.2.1.1.2 Determine if a relation is a function given a set of points or a graph. A1.2.1.1.3 Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table). A1.2.1.2.1 Create, interpret and/or use the equation, graph or table of a linear function. A1.2.1.2.2 Translate from one representation of a linear function to another		• Explain that when they say that a mathematical statement is true for n = 1, it is the same as proving the first domino can be knocked down. Then proving it is true for k + 1 if it is true for k, means that you have proved that if any domino falls, the next one in line will fall. So, if #1 falls, #2 will fall, and if #2 falls, then #3 will fall, and so on. • Option 3: English Learners: Have students create a list of the different mathematical notations (symbols) as they are presented in this chapter. As each notation is presented, ask students to record the notation, an example, its name, and why it is useful in their study of mathematics. • Option 4: Beyond Level: With manipulatives or sketches, students use various geometric elements to model problems involving arithmetic or geometric sequences. Then have students write a general	

				(graph, table and equation). A1.2.2.1.1 Identify, describe and/or use constant rates of change. A1.2.2.1.2 Apply the concept of linear rate of change (slope) to solve problems. A1.2.2.1.3 Write or identify a linear equation when given the graph of the line 2 points on the line, or the slope and a point on a line, (Linear equation may be in point-slope, standard and/or slope-intercept form). A1.2.2.1.4 Determine the slope and/or y-intercept represented by a linear equation or graph. A2.1.3.1.1 Write and/or solve quadratic equations (including factoring and using the Quadratic Formula). A2.1.3.1.2 Solve equations involving rational and/or radical expressions (e.g., $10/(x + 3) + 12/(x – 2) = 1$ or $\sqrt{(x2 + 21x)} = 14$). A2.1.3.1.3 Write and/or solve a simple exponential or logarithmic equation (including common and natural logarithms).		rule for the nth term of their sequence. For example, the figures below show an arithmetic sequence in the number of red dots. The rule for the sequence is an = 3 + 2(n − 1). • Interpersonal Learners Have students in small groups discuss any confusions they may have about the key concepts for arithmetic and geometric sequences. Suggest they help each other organize and complete their notes on these topics. • Interpersonal Learners Discuss the difference between a sequence and a series, and ask students to suggest ways to remember which is which. • If you think students might be interested in learning how this lesson applies to real-world situations, then have students research how biologists and ecologists use geometric series in their work to count	

				A2.1.3.1.4
				Write, solve and/or apply linear or exponential growth or decay (including problem situations).
				
				A2.1.3.2.1
				Determine how a change in one variable relates to a change in a second variable (e.g., y=4/x, if x doubles, what happens to y?).
				
				A2.1.3.2.2
				Use algebraic processes to solve a formula for a given variable (e.g., solve d = rt for r).
				
				A2.2.1.1.1
				Analyze a set of data for the existence of a pattern and represent the pattern with a rule algebraically and/or graphically.
				
				A2.2.1.1.2
				Identify and/or extend a pattern as either an arithmetic or geometric sequence (e.g., given a geometric sequence, find the 20th term).
				
				A2.2.1.1.3
				Determine the domain, range or inverse of a relation.
				
				A2.2.1.1.4
				Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function (e.g., intervals of increasing/decreasing, intercepts, zeros, and asymptotes).
						and predict the population changes for various organisms.
						• Logical Learners Have students research and read about the famous mathematical puzzle called Zeno's paradox. Have them discuss this story of the tortoise's race in terms of the content of this lesson.
						•
						• Kinesthetic Learners Have students research and then play the game Tower of Hanoi. The object of the Tower of Hanoi game is to move a stack of 8 disks of graduated sizes from one of 3 pegs to a vacant peg in the fewest number of moves by following these rules:
						  • You may move only one disk at a time.
						  • A disk must be placed on top of another disk, not underneath.
						  • A smaller disk may be placed on top of a larger disk, but not vice versa
						• Extension Write a sequence like 2, 5, 7, 12, 19, 31, … , on the board and see if students can	

				A2.2.2.1.1 Create, interpret and/or use the equation, graph or table of a polynomial function (including quadratics). A2.2.2.1.2 Create, interpret and/or use the equation, graph or table of an exponential or logarithmic function (including common and natural logarithms). A2.2.2.1.3 Determine, use and/or interpret minimum and maximum values over a specified interval of a graph of a polynomial, exponential or logarithmic function. A2.2.2.1.4 Translate a polynomial, exponential or logarithmic function from one representation to another (graph, table and equation). A2.2.2.2.1 Identify or describe the effect of changing parameters within a family of functions (e.g., y = x2 and y = x2 + 3, or y = x2 and y = 3x2). CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations. CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the		identify the pattern. Such a sequence, called a Lucas sequence, is similar to the Fibonacci sequence in that each term beginning with the third term is the sum of the two terms immediately preceding it. Have them write their own Lucas sequences with any two starting terms • If you want to give students the opportunity to be creative, • Then have pairs of students work together to make up a jingle or a poem that describes the patterns in the Binomial Theorem. Ask students to incorporate at least three of the five items listed in the Concept Summary on page 701 of the Student Edition. • Kinesthetic Learners Have students demonstrate proof by induction by organizing themselves into a line. Instruct each person to tell any message he hears to the person behind him. Tell the first person a	

				inverses of functions. CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms. CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships. CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.		message. Explain that the first person telling the next person assures that n = 1 is true. Your instructions to tell all messages heard to the next person assures that k + 1 is true.	
Week 31-33 Statistics and Probability	• Patterns in information can be used to make wise decisions. • Probability can be used to make predictions from patterns. • Statistics can be manipulated to influence the behaviors or beliefs of an audience.	11.1: Designing a Study 11.1 Extend: Graphing Simulations and Margin of Error 11.2: Distributions of Data 11.3 Probability Distributions 11.4: The Binomial Distribution 11.5:The Normal Distribution 11.5 Extend: Normal Approximation of Binomial Distributions 11.6: Confidence Intervals and Hypothesis Testing	• How can you effectively evaluate information? (Sample answer: First, determine whether the information source is credible. Then critically analyze the information to determine whether it is useful for the given situation.) • How can you use information to make decisions? (Sample answer: You can look for trends, and then make a decision based on what has happened in the past and/or is reflected in the	A1.1.1.5.1 Add, subtract and/or multiply polynomial expressions (express answers in simplest form – nothing larger than a binomial multiplied by a trinomial). A1.1.1.5.2 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is equal to 1 after factoring out all monomial factors). A1.1.1.5.3 Simplify/reduce a rational algebraic expression.	• 11.1: Classify study types • Design statistical studies • Extend 11.1: Use a simulation to develop margins of error for various sizes of random samples • 11.2: Use the shapes of distributions to select appropriate statistics • Use the shapes of distributions to compare data • 11.3: Construct a probability distribution • Analyze a probability	• Kinesthetic Ask each student to use a tape measure to measure the distance around the wrists of 15 classmates to the nearest tenth of a centimeter. Have students find the mean and standard deviation of their data. Then have them determine if their data appears to be normally distributed, positively skewed, or negatively skewed. • Visual/Spatial	Homework (Teacher Editions, Suggested HW at beginning of each problem set) Participation Quiz (Mid Chapter Quiz/Test) Tests (Form 1, 2A, 2B, 2C)

			information.) • How can probability be used in decision making? (Sample answer: You can use probability to predict the most likely outcomes, and then make a decision based on those findings.) • Can statistics lie? (Sample answer: Statistics can "lie" when they are manipulated and then used to influence the intended audiences' beliefs and behaviors.)	A1.1.2.1.1 Write, solve and/or apply a linear equation (including problem situations). A1.1.2.1.2 Use and/or identify an algebraic property to justify any step in an equation solving process (linear equations only). A1.1.2.1.3 Interpret solutions to problems in the context of the problem situation (linear equations only). A1.1.2.2.1 Write and/or solve a system of linear equations (including problem situations) using graphing, substitution and/or elimination (limit systems to 2 linear equations). A1.1.2.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear equations only). A1.1.3.1.1 Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities). A1.1.3.1.2 Identify or graph the solution set to a linear inequality on a number line. A1.1.3.1.3 Interpret solutions to	distribution and its summary statistics • 11.4: Identify and conduct a binomial experiment • Find probabilities using binomial distributions • 11.5: Use the Empirical Rule to analyze normally distributed variables • Apply the standard normal distribution and z-values • Extend 11.5: Use a normal distribution to approximate a binomial distribution • 11.6: Find confidence intervals for normally distributed data • Perform hypothesis tests on normally distributed data	Have students work in pairs to make up a crossword puzzle using the terms studied in this chapter. Use either the definition or an example of the terms in the across and down hints. Make photocopies of the puzzle to distribute to the class. Ask students to keep the puzzles to use as a chapter review. • Option 2 Approaching Level: Visual/Spatial Have students work in pairs to make up a crossword puzzle using the terms studied in this chapter. Use either the definition or an example of the terms in the across and down hints. Make photocopies of the puzzle to distribute to the class. Ask students to keep the puzzles to use as a chapter review. • Options 3 English Learners: Ask students to work with a partner. One partner writes an expression, such as 12C3, and	

				problems in the context of the problem situation (limit to linear inequalities). A1.1.3.2.1 Write and/or solve a system of linear inequalities using graphing (limit systems to 2 linear inequalities). A1.1.3.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear inequalities only). A1.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically. A1.2.1.1.2 Determine if a relation is a function given a set of points or a graph. A1.2.1.1.3 Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table). A1.2.1.2.1 Create, interpret and/or use the equation, graph or table of a linear function. A1.2.1.2.2 Translate from one representation of a linear function to another (graph, table and equation). A1.2.2.1.1		hands it to the other partner, who reads the notation aloud (for example, “the number of combinations of 12 items taken 3 at a time”) and calculates the value. 220 The partners discuss and correct this value as necessary. Then they exchange roles. • Option 4 Beyond Level: Ask students to make a chart showing the relationship between the binomial coefficients and combinatorial notation. • Verbal/Linguistic Learners Divide students into small groups. Have each group design a survey question and practice asking it in such a way that there is bias built into the tone of voice and facial expression of the questioner. Then have them ask other groups the question and record their answers. As a class, discuss whether the answers corresponded to the bias that the question was	

				Identify, describe and/or use constant rates of change. A1.2.2.1.2 Apply the concept of linear rate of change (slope) to solve problems. A1.2.2.1.3 Write or identify a linear equation when given the graph of the line 2 points on the line, or the slope and a point on a line, (Linear equation may be in point-slope, standard and/or slope-intercept form). A1.2.2.1.4 Determine the slope and/or y-intercept represented by a linear equation or graph. A2.1.3.1.1 Write and/or solve quadratic equations (including factoring and using the Quadratic Formula). A2.1.3.1.2 Solve equations involving rational and/or radical expressions (e.g., $10/(x + 3) + 12/(x – 2) = 1$ or $\sqrt{}(x2 + 21x) = 14$). A2.1.3.1.3 Write and/or solve a simple exponential or logarithmic equation (including common and natural logarithms). A2.1.3.1.4 Write, solve and/or apply linear or exponential growth or decay		designed to elicit. • Extension Have students investigate techniques that could be used to select random samples. For example, a random number table from the appendix of a statistics text or the random number generator of a spreadsheet or calculator could be used. • Interpersonal Learners Have students work in pairs to think of examples of data that may have distributions that are symmetric, negatively skewed, or positively skewed. • Extension Have students complete Exercise 14. Examples of data that may have bimodal distributions are the annual tuitions for private and public schools, the selling prices for suburban and urban houses, and the heights of 6th grade and 12th grade students. Have students think of other examples that may result in bimodal distributions. • Social Learners It	

				(including problem situations). A2.1.3.2.1 Determine how a change in one variable relates to a change in a second variable (e.g., y=4/x, if x doubles, what happens to y?). A2.1.3.2.2 Use algebraic processes to solve a formula for a given variable (e.g., solve d = rt for r). A2.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern with a rule algebraically and/or graphically. A2.2.1.1.2 Identify and/or extend a pattern as either an arithmetic or geometric sequence (e.g., given a geometric sequence, find the 20th term). A2.2.1.1.3 Determine the domain, range or inverse of a relation. A2.2.1.1.4 Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function (e.g., intervals of increasing/decreasing, intercepts, zeros, and asymptotes). A2.2.2.1.1 Create, interpret and/or use the equation, graph or table of a polynomial		is important to be aware that some students may have cultural or familial prohibitions against cards, dice, or gambling of any kind. Explain that, historically, the laws of probability were actually developed in the context of gambling but are now used in many other ways, including medicine and meteorology. • Kinesthetic Learners Have students in small groups do a binomial experiment by tossing a ball into a wastebasket about 20 times to establish the probability of scoring a goal. Then have them find the probability that they will score exactly 4 goals in 8 tries. • If students need an aid in drawing a normal curve, then it may be useful to know that the concave side of the curve switches from facing downward to facing upward at points that are one standard deviation from the mean. Drawing a normal curve for each	

				function (including quadratics). A2.2.2.1.2 Create, interpret and/or use the equation, graph or table of an exponential or logarithmic function (including common and natural logarithms). A2.2.2.1.3 Determine, use and/or interpret minimum and maximum values over a specified interval of a graph of a polynomial, exponential or logarithmic function. A2.2.2.1.4 Translate a polynomial, exponential or logarithmic function from one representation to another (graph, table and equation). A2.2.2.2.1 Identify or describe the effect of changing parameters within a family of functions (e.g., $y = x2$ and $y = x2 + 3$, or $y = x2$ and $y = 3x2$). CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations. CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions. CC.2.2.HS.D.10 Represent, solve and		problem can help students with their estimates. • Verbal/Linguistic Learners The formal conclusion of a hypothesis test is stated as "Reject the null hypothesis" or "Do not reject the null hypothesis." Students should always restate conclusions in their own words. • Extension When the null hypothesis is rejected when it is actually true, the result is called a Type I error. When the null hypothesis is not rejected when it is actually false, the result is called a Type II error. Have students explore the risks of making Type I and Type II errors with different significant levels. What conclusions can they make? The risk of making a Type I error is identical to the significance level. Reducing the risk of a Type I error increases the risk of a Type II error by widening the acceptance level.	

				interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms. CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships. CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.			
Week 34-36 Trigono-metric Functions	• Trigonometric functions are periodic, and can be used to model situations involving recurrence of events, and physical situations involving right triangles. • Adding or subtracting to any function translates the graph; multiplying a function dilates the graph; multiplying a function by a negative number reflects the graph. • The composition of a trigonometric function and its	12.1 Explore: Spreadsheet Investigating Special Right Triangles 12.1: Trigonometric Functions in Right Triangles 12.2:Angles and Angle Measure 12.2 Extend: Areas of Parallelograms 12.3: Trigonometric Functions of General Angles 12.4: Law of Sines 12.4 Extend: Angular Polygons 12.5 Law of Cosines 12.6: Circular and Periodic Functions 12.7: Graphing Trigonometric Functions 12.8 Explore: Graphing Trigonometric Graphs 12.8 Translations of	• What types of real-world problems can be modeled and solved using trigonometry? (Sample answer: periodic functions and physical situations involving triangles such as construction and surveying problems.) • How are transformations of trigonometric functions similar to transformations of other functions you have studied? (Sample answer: Adding or subtracting to any function translates the graph; multiplying a function dilates the	A1.1.1.5.1 Add, subtract and/or multiply polynomial expressions (express answers in simplest form – nothing larger than a binomial multiplied by a trinomial). A1.1.1.5.2 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is equal to 1 after factoring out all monomial factors). A1.1.1.5.3 Simplify/reduce a rational algebraic expression. A1.1.2.1.1 Write, solve and/or apply a linear equation (including problem	• Explore 12.1: Use a spreadsheet to investigate ratios of side lengths in special right triangles • 12.1: Find values of trigonometric functions • Use trigonometric functions to find side lengths and angle measures of right triangles • 12.2: Draw and find angles in standard position • Convert between degree measures and radian measures • Extend 12.2: Use the sine ratio to find the area of a parallelogram • 12.3: Find values of trigonometric	• Intrapersonal Have students choose an angle measuring greater than 90°, draw an angle with that measure in standard position, find the reference angle, and give the values of all 6 of the trigonometric functions in both degrees and radians. • Kinesthetic Have students work in groups of three or four. Provide each group with drinking straws, scissors, and glue. Ask students to make a poster of the Key Concepts in Lesson 12-4 and	Homework (Teacher Editions, Suggested HW at beginning of each problem set) Participation Quiz (Mid Chapter Quiz/Test) Tests (Form 1, 2A, 2B, 2C)

	inverse is the identity function; the graphs are symmetric with respect to the line y = x; the domain of an inverse trigonometric function must be restricted in order to be a function.	Trigonometric Graphs 12.9: Inverse Trigonometric Functions	graph; multiplying a function by a negative number reflects the graph.) • How are inverses of trigonometric functions similar to inverses of other functions you have studied? (Sample answer: The composition of a trigonometric function and its inverse is the identity function; the graphs are symmetric with respect to the line y = x; the domain of an inverse trigonometric function must be restricted in order to be a function.)	situations). A1.1.2.1.2 Use and/or identify an algebraic property to justify any step in an equation solving process (linear equations only). A1.1.2.1.3 Interpret solutions to problems in the context of the problem situation (linear equations only). A1.1.2.2.1 Write and/or solve a system of linear equations (including problem situations) using graphing, substitution and/or elimination (limit systems to 2 linear equations). A1.1.2.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear equations only). A1.1.3.1.1 Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities). A1.1.3.1.2 Identify or graph the solution set to a linear inequality on a number line. A1.1.3.1.3 Interpret solutions to problems in the context of the problem situation (limit to linear inequalities).	functions for general angles • Find values of trigonometric functions by using reference angles • 12.4: Find the area of a triangle using two sides and an included angle • Use the Law of Sines to solve triangles • Extend 12.4: Investigate measures in regular polygons using trigonometry • 12.5: Use the Law of Cosines to solve triangles • Choose methods to solve triangles • 12.6: Find values of trigonometric functions based on the unit circle • Use the properties of periodic functions to evaluate trigonometric functions • 12.7: Describe and graph the sine, cosine, and tangent functions • Describe and graph other trigonometric functions • Explore 12.8: Use a graphing calculator to explore transformations of the graphs of trigonometric functions • 12.8: Graph horizontal translations of trigonometric graphs and find	Lesson 12-5, using straws to form the triangles. • Option 2 Approaching Level: Working in groups of three or four, students draw a variety of right triangles, each having one angle that measures 30°. Have students measure the lengths of the hypotenuse and the leg opposite the 30° angle to the nearest millimeter. Then ask students to find the sine of 30° in each triangle to determine that sin 30° is the same for each triangle, 0.5. Discuss results with students. Then draw a right triangle with a 30° angle on the board. Label the hypotenuse 8 cm. Ask students how they could find the length of the leg opposite the 30° angle. • Option 3 English Learners: Working in groups of three or four, students draw a variety of right triangles, each having one angle that measures 30°. Have students measure the lengths of the	

				A1.1.3.2.1 Write and/or solve a system of linear inequalities using graphing (limit systems to 2 linear inequalities). A1.1.3.2.2 Interpret solutions to problems in the context of the problem situation (systems of 2 linear inequalities only). A1.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically. A1.2.1.1.2 Determine if a relation is a function given a set of points or a graph. A1.2.1.1.3 Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table). A1.2.1.2.1 Create, interpret and/or use the equation, graph or table of a linear function. A1.2.1.2.2 Translate from one representation of a linear function to another (graph, table and equation). A1.2.2.1.1 Identify, describe and/or use constant rates of change.	phase shifts • Graph vertical translations of trigonometric graphs • 12.9: Find values of inverse trigonometric functions • Solve equations by using inverse trigonometric functions	hypotenuse and the leg opposite the 30° angle to the nearest millimeter. Then ask students to find the sine of 30° in each triangle to determine that sin 30° is the same for each triangle, 0.5. Discuss results with students. Then draw a right triangle with a 30° angle on the board. Label the hypotenuse 8 cm. Ask students how they could find the length of the leg opposite the 30° angle. • Option 4 Beyond Level: Tell students that you want them to draw a triangle and determine its area using each of the following three different ways: • using the basic formula for the area of a triangle $A=\frac{1}{2}bh$ The lengths of the base and height are needed. • using Heron's formula The lengths of all three sides are needed. • using the formula	

				A1.2.2.1.2 Apply the concept of linear rate of change (slope) to solve problems. A1.2.2.1.3 Write or identify a linear equation when given the graph of the line 2 points on the line, or the slope and a point on a line, (Linear equation may be in point-slope, standard and/or slope-intercept form). A1.2.2.1.4 Determine the slope and/or y-intercept represented by a linear equation or graph. A2.1.3.1.1 Write and/or solve quadratic equations (including factoring and using the Quadratic Formula). A2.1.3.1.2 Solve equations involving rational and/or radical expressions (e.g., $10/(x + 3) + 12/(x – 2) = 1$ or $\sqrt{(x2 + 21x)} = 14$). A2.1.3.1.3 Write and/or solve a simple exponential or logarithmic equation (including common and natural logarithms). A2.1.3.1.4 Write, solve and/or apply linear or exponential growth or decay (including problem situations). A2.1.3.2.1		$A=\frac{1}{2}bc \sin A$ The lengths of two sides and the sine of their included angle are needed. Students may use a protractor and a ruler as needed. Then have students tell what information about the triangle they needed to know when using each method. • Visual/Spatial Learners Have students use a stack of books and a notebook to model a ramp and investigate how steep the ramp needs to be for a toy car to roll down it without being pushed. Have them report their results in terms of the trigonometric functions of a right triangle. • If students need further practice with coterminal angles, then have them work with a partner so that one person models an angle with two pencils or yardsticks. The other partner then names a positive and negative angle, less than or more than a full circle, that are	

				Determine how a change in one variable relates to a change in a second variable (e.g., y=4/x, if x doubles, what happens to y?). A2.1.3.2.2 Use algebraic processes to solve a formula for a given variable (e.g., solve d = rt for r). A2.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern with a rule algebraically and/or graphically. A2.2.1.1.2 Identify and/or extend a pattern as either an arithmetic or geometric sequence (e.g., given a geometric sequence, find the 20th term). A2.2.1.1.3 Determine the domain, range or inverse of a relation. A2.2.1.1.4 Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function (e.g., intervals of increasing/decreasing, intercepts, zeros, and asymptotes). A2.2.2.1.1 Create, interpret and/or use the equation, graph or table of a polynomial function (including quadratics). A2.2.2.1.2		each coterminal with the modeled angle. • Extension There are infinitely many angles coterminal with a given angle. Have students write an expression that gives the angle measure of all angles coterminal with an angle of 50°. 50° + k · 360°, where k is any integer. • Auditory/Musical Learners Have students work in small groups to create a jingle, song, rap, or short poem to help them remember the trigonometric values for special angles. • Intrapersonal Learners Have students write a journal entry about which example they found the most challenging and why. Ask them to include any questions they still have about the lesson. • Extension Have students compute the area of a 3-4-5 right triangle using the area formula presented in this lesson. Have them use the formula for all three angles of the triangle. 6; 6; 6 • If students	

				Create, interpret and/or use the equation, graph or table of an exponential or logarithmic function (including common and natural logarithms). A2.2.2.1.3 Determine, use and/or interpret minimum and maximum values over a specified interval of a graph of a polynomial, exponential or logarithmic function. A2.2.2.1.4 Translate a polynomial, exponential or logarithmic function from one representation to another (graph, table and equation). A2.2.2.2.1 Identify or describe the effect of changing parameters within a family of functions (e.g., y = x2 and y = x2 + 3, or y = x2 and y = 3x2). CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations. CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions. CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities		struggle with any of the methods shown to solve a triangle, then have students discuss in small groups how to choose which method to use when solving a triangle. Have them compare their approaches and develop a brief explanation to help others decide. Then have each group share their conclusions with the class. • Extension Have students use the Law of Cosines to attempt to solve a “triangle” with sides 5, 12, and 18 (such a triangle does not exist). Have them explain what they discover and what it means. Students will get an error when attempting to find the inverse cosine because the value is not between –1 and 1. This means that no such triangle exists. • Naturalist Learners Have students research various kinds of circular calendars, such as those used by the Maya, to predict the weather and determine the best time for planting crops.	

				algebraically and graphically. CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms. CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships. CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.		• Visual/Spatial Learners Have groups of students make posters showing sketches of the graphs of the six trigonometric functions. Encourage students to color-code the key features of all the graphs, such as period, amplitude, asymptotes, and so on. • If students struggle with translations of trigonometric graphs, then make coordinate axes with masking tape on the classroom floor. Give students at least 15 feet of rope and have them stand along the x-axis, positioning the rope to model the graph of y = sin x. As you call out equations of functions with graphs being horizontal phase shifts of the graph of y = sin x, students can step left or right to model the translated graph. Similarly, call out functions with graphs being vertical shifts of the graph y = sin x. • Visual/Spatial	

						Learners Ask students to find Arcsin 2. If they use a calculator, suggest that they study the graph of y= sin x to explain why an error message was the result. The graph of y = sin x has no y-values greater than 1 or less than –1.	