Algebra II Pacing Guide

Vision Statement

Imagine a classroom, a school, or a school district where all students have access to high-quality, engaging mathematics instruction. There are ambitious expectations for all, with accommodation for those who need it. Knowledgeable teachers have adequate resources to support their work and are continually growing as professionals. The curriculum is mathematically rich, offering students opportunities to learn important mathematical concepts and procedures with understanding. Technology is an essential component of the environment. Students confidently engage in complex mathematical tasks chosen carefully by teachers. They draw on knowledge from a wide variety of mathematical topics, sometimes approaching the same problem from different mathematical perspectives or representing the mathematics in different ways until they find methods that enable them to make progress. Teachers help students make, refine, and explore conjectures on the basis of evidence and use a variety of reasoning and proof techniques to confirm or disprove those conjectures. Students are flexible and resourceful problem solvers. Alone or in groups and with access to technology, they work productively and reflectively, with the skilled guidance of their teachers. Orally and in writing, students communicate their ideas and results effectively. They value mathematics and engage actively in learning it.

National Council of Teachers of Mathematics

Algebra II Quarterly Overview Sheet

1st Quarter	2nd Quarter	3rd Quarter	4th Quarter

AII.11 The student will identify properties of a normal distribution and apply those properties to determine probabilities associated with areas under the standard normal curve. (B1 AND B3)	**AII.1** **b)** The student, given rational, radical, or polynomial expressions, will add, subtract, multiply, divide, and simplify radical expressions containing rational numbers and variables, and expressions containing rational exponents; (C3)
	   c) write radical expressions as expressions containing rational exponents and vice versa; and (B3)
		AII.8 The student will investigate and describe the relationships among solutions of an equation, zeros of a function, x-intercepts of a graph, and factors of a polynomial expression. (C4)	**AII.7** The student will investigate and analyze functions algebraically and graphically. Key concepts include
			   g) inverse of a function; and (C4)
			   h) composition of multiple functions. (C3)
			Graphing calculators will be used as a tool to assist in investigation of functions.

AII.12 The student will compute and distinguish between permutations and combinations and use technology for applications. (C3)	**AII.4** The student will solve, algebraically and graphically, **d)** equations containing radical expressions. (C3)	**AII.1** **a)** The student, given rational, radical, or polynomial expressions, will add, subtract, multiply, divide, and simplify rational algebraic (C3)	**AII.10** The student will identify, create, and solve real-world problems involving inverse variation, joint variation, and a combination of direct and inverse variations. (C4)

AII.4 The student will solve, algebraically and graphically,
   a) absolute value equations and inequalities; (C3)
Graphing calculators will be used for solving and for confirming the algebraic solutions.
	AII.3 The student will perform operations on complex numbers, express the results in simplest form using patterns of the powers of i, and identify field properties that are valid for the complex numbers. (C4)	**AII.4** The student will solve, algebraically and graphically,
		   c) equations containing rational algebraic expressions; and (C3)
			AII.2 The student will investigate and apply the properties of arithmetic and geometric sequences and series to solve real-world problems, including writing the first n terms, finding the nth term, and evaluating summation formulas. Notation will include $\sum$ and a_n. (C6)

AII.6 The student will recognize the general shape of function (**absolute value**) families and will convert between graphic and symbolic forms of functions. A transformational approach to graphing will be employed. Graphing calculators will be used as a tool to investigate the shapes and behaviors of these functions. (C4)	**AII.4** **b)** The student will solve, algebraically and graphically, quadratic equations over the set of complex numbers; (C3)	**AII.6** The student will recognize the general shape of function (**square root, cube root, rational, polynomial, exponential, and logarithmic, rational families**) families and will convert between graphic and symbolic forms of functions. A transformational approach to graphing will be employed. Graphing calculators will be used as a tool to investigate the shapes and behaviors of these functions. (C4)	**AII.7** The student will investigate and analyze functions algebraically and graphically. Key concepts include
			   a) domain and range, including limited and discontinuous domains and ranges; (C5)
			   b) zeros; (C5)
			   c) x- and y-intercepts; (C5)
			   d) intervals in which a function is increasing or decreasing; (C5)
			   e) asymptotes; (C5)
			   f) end behavior; (C5)
			Graphing calculators will be used as a tool to assist in investigation of functions.

AII.1 The student, given rational, radical, or polynomial expressions, will **d)** factor polynomials completely. (C4)	**AII.5** The student will solve nonlinear systems of equations, including linear-quadratic and quadratic-quadratic, algebraically and graphically. Graphing calculators will be used as a tool to visualize graphs and predict the number of solutions. (C4)	**AII.9** The student will collect and analyze data, determine the equation of the curve of best fit, make predictions, and solve real-world problems, using mathematical models. Mathematical models will include polynomial, exponential, and logarithmic functions. (C6)	

1st Quarter

Unit: Statistics

<table>
<tr><td>Process standards: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations.</td></tr>
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AII.11

The student will identify properties of a normal distribution and apply those properties to determine probabilities associated with areas under the standard normal curve.

Essential Knowledge and Skills *Essential Vocabulary:*	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
• Identify the properties of a normal probability distribution. • Describe how the standard deviation and the mean affect the graph of the normal distribution. • Compare two sets of normally distributed data using a standard normal distribution and z-scores. • Represent probability as area under the curve of a standard normal probability distribution. • Use the graphing calculator or a standard normal probability table to determine probabilities or percentiles based on z-scores.		• A normal distribution curve is a symmetrical, bell-shaped curve defined by the mean and the standard deviation of a data set. The mean is located on the line of symmetry of the curve. • Areas under the curve represent probabilities associated with continuous distributions. • The normal curve is a probability distribution and the total area under the curve is 1. • For a normal distribution, approximately 68 percent of the data fall within one standard deviation of the mean, approximately 95 percent of the data fall within two standard deviations of the mean, and approximately 99.7 percent of the data fall within three standard deviations of the mean.	

| | | • The mean of the data in a standard normal distribution is 0 and the standard deviation is 1.

• The standard normal curve allows for the comparison of data from different normal distributions.

• A z-score is a measure of position derived from the mean and standard deviation of data.

• A z-score expresses, in standard deviation units, how far an element falls from the mean of the data set.

• A z-score is a derived score from a given normal distribution.

• A standard normal distribution is the set of all z-scores. | |

Unit: Statistics

AII.12

The student will compute and distinguish between permutations and combinations and use technology for applications.

Essential Knowledge and Skills	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
Essential Vocabulary:			
• Compare and contrast permutations and combinations. • Calculate the number of permutations of *n* objects taken *r* at a time. • Calculate the number of combinations of *n* objects taken *r* at a time. • Use permutations and combinations as counting techniques to solve real-world problems.		• The *Fundamental Counting Principle* states that if one decision can be made *n* ways and another can be made *m* ways, then the two decisions can be made *nm* ways. • *Permutations* are used to calculate the number of possible arrangements of objects. • *Combinations* are used to calculate the number of possible selections of objects without regard to the order selected.	Smart Lesson TEI

Unit: Equations and Inequalities

AII.4

The student will solve, algebraically and graphically,
   a) absolute value equations and inequalities;
   b) quadratic equations over the set of complex numbers;
Graphing calculators will be used for solving and for confirming the algebraic solutions.

Essential Knowledge and Skills	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
Essential Vocabulary:			
• <mark>Solve</mark> absolute value equations and inequalities algebraically and graphically. • <mark>Solve</mark> a quadratic equation over the set of complex numbers using an appropriate strategy. • <mark>Calculate</mark> the discriminant of a quadratic equation to determine the number of real and complex solutions. • <mark>Apply</mark> an appropriate equation to solve a real-world problem. • <mark>Recognize</mark> that the quadratic formula can be derived by applying the completion of squares to any quadratic equation in standard form.[†] [†]**Revised March 2011**		• A quadratic function whose graph does not intersect the *x*-axis has roots with imaginary components. • The quadratic formula can be used to solve any quadratic equation. • The value of the discriminant of a quadratic equation can be used to describe the number of real and complex solutions. • The definition of absolute value (for any real numbers a and b, where b $\geq$ 0, if $\left| a \right| = b$, then a = b or a = - b) is used in solving absolute	

		value equations and inequalities. • Absolute value inequalities can be solved graphically or by using a compound statement. • Real-world problems can be interpreted, represented, and solved using equations and inequalities. • Equations can be solved in a variety of ways. • Set builder notation may be used to represent solution sets of equations and inequalities.	

Unit: Functions

AII.6

The student will recognize the general shape of function (***absolute value,*** square root, cube root, rational, polynomial, exponential, and logarithmic) families and will convert between graphic and symbolic forms of functions. A transformational approach to graphing will be employed. Graphing calculators will be used as a tool to investigate the shapes and behaviors of these functions.

Essential Knowledge and Skills *Essential Vocabulary:*	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
• Recognize graphs of parent functions. • Given a transformation of a parent function, identify the graph of the transformed function. • Given the equation and using a transformational approach, graph a function. • Given the graph of a function, identify the parent function. • Given the graph of a function, identify the transformations that map the preimage to the image in order to determine the equation of the image. • Using a transformational approach, write the equation of a function given its graph.		• The graphs/equations for a family of functions can be determined using a transformational approach. • Transformations of graphs include translations, reflections, and dilations. • A parent graph is an anchor graph from which other graphs are derived with transformations.	

Unit: Expressions and Operations

Process standards: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations.

AII.1

The student, given rational, radical, or polynomial expressions, will
   d) factor polynomials completely.

Essential Knowledge and Skills	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
Essential Vocabulary:			
• <mark>Factor</mark> polynomials by applying general patterns including difference of squares, sum and difference of cubes, and perfect square trinomials. • <mark>Factor</mark> polynomials completely over the integers. • <mark>Verify</mark> polynomial identities including the difference of squares, sum and difference of cubes, and perfect square trinomials.[†] [†]**Revised March 2011**		• The complete factorization of polynomials has occurred when each factor is a prime polynomial. • Pattern recognition can be used to determine complete factorization of a polynomial.	

Unit: Expressions and Operations

AII.3

The student will perform operations on complex numbers, express the results in simplest form using patterns of the powers of i, and identify field properties that are valid for the complex numbers.

Essential Knowledge and Skills *Essential Vocabulary:*	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
- Recognize that the square root of −1 is represented as i. - Determine which field properties apply to the complex number system. - Simplify radical expressions containing negative rational numbers and express in a+bi form. - Simplify powers of i. - Add, subtract, and multiply complex numbers. - Place the following sets of numbers in a hierarchy of subsets: complex, pure imaginary, real, rational, irrational, integers, whole, and natural. - Write a real number in a+bi form. - Write a pure imaginary number in a+bi form.		- Complex numbers are organized into a hierarchy of subsets. - A complex number multiplied by its conjugate is a real number. - Equations having no real number solutions may have solutions in the set of complex numbers. - Field properties apply to complex numbers as well as real numbers. All complex numbers can be written in the form a+bi where a and b are real numbers and i is $\sqrt{-1}$.	Smart Lesson TEI

2nd Quarter

Unit: Expressions and Operations

Process standards: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations.

AII.3

The student will perform operations on complex numbers, express the results in simplest form using patterns of the powers of *i*, and identify field properties that are valid for the complex numbers.

Essential Knowledge and Skills	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
Essential Vocabulary:			
 • Recognize that the square root of –1 is represented as *i*. • Determine which field properties apply to the complex number system. • Simplify radical expressions containing negative rational numbers and express in a+b*i* form. • Simplify powers of *i*. • Add, subtract, and multiply complex numbers. • Place the following sets of numbers in a hierarchy of subsets: complex, pure imaginary, real, rational, irrational, integers, whole, and natural. • Write a real number in a+b*i* form. • Write a pure imaginary number in a+b*i* form.		• Complex numbers are organized into a hierarchy of subsets. • A complex number multiplied by its conjugate is a real number. • Equations having no real number solutions may have solutions in the set of complex numbers. • Field properties apply to complex numbers as well as real numbers. • All complex numbers can be written in the form a+b*i* where *a* and *b* are real numbers and *i* is $\sqrt{-1}$.	

Unit: Equations and Inequalities

Process standards: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations.

AII.4

The student will solve, algebraically and graphically,
      b) quadratic equations over the set of complex numbers;
Graphing calculators will be used for solving and for confirming the algebraic solutions.

Essential Knowledge and Skills	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
Essential Vocabulary:			
- Solve a quadratic equation over the set of complex numbers using an appropriate strategy. - Calculate the discriminant of a quadratic equation to determine the number of real and complex solutions. - Apply an appropriate equation to solve a real-world problem. - Recognize that the quadratic formula can be derived by applying the completion of squares to any quadratic equation in standard form.[†] [†]**Revised March 2011**		- A quadratic function whose graph does not intersect the *x*-axis has roots with imaginary components. - The quadratic formula can be used to solve any quadratic equation. - The value of the discriminant of a quadratic equation can be used to describe the number of real and complex solutions. - Real-world problems can be interpreted, represented, and solved using equations and inequalities. - Equations can be solved in a variety of ways. - Set builder notation may be used to represent solution sets of equations and inequalities.	

Unit: Functions

Process standards: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations.

AII.7

The student will investigate and analyze functions algebraically and graphically. Key concepts include
   a) domain and range, including limited and discontinuous domains and ranges;
   b) zeros;
   c) *x*- and *y*-intercepts;
   d) intervals in which a function is increasing or decreasing;
   e) asymptotes;
   f) end behavior;
Graphing calculators will be used as a tool to assist in investigation of functions.

Essential Knowledge and Skills *Essential Vocabulary:*	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
• Identify the domain, range, zeros, and intercepts of a function presented algebraically or graphically. • Describe restricted/discontinuous domains and ranges. • Given the graph of a function, identify intervals on which the function is increasing and decreasing. • Find the equations of vertical and horizontal asymptotes of functions. • Describe the end behavior of a function.		• Functions may be used to model real-world situations. • The domain and range of a function may be restricted algebraically or by the real-world situation modeled by the function. • A function can be described on an interval as increasing, decreasing, or constant.	Smart Lesson TEI

		• Asymptotes may describe both local and global behavior of functions. • End behavior describes a function as x approaches positive and negative infinity. • A zero of a function is a value of x that makes $f(x)$ equal zero.	

Unit: Functions

Process standards: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations.

AII.8

The student will investigate and describe the relationships among solutions of an equation, zeros of a function, x-intercepts of a graph, and factors of a polynomial expression.

Essential Knowledge and Skills	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
Essential Vocabulary:			

• Describe the relationships among solutions of an equation, zeros of a function, x-intercepts of a graph, and factors of a polynomial expression.
 	
• Define a polynomial function, given its zeros.
 	
• Determine a factored form of a polynomial expression from the x-intercepts of the graph of its corresponding function.
 	
• For a function, identify zeros of multiplicity greater than 1 and describe the effect of those zeros on the graph of the function.
 	
• Given a polynomial equation, determine the number of real solutions and nonreal solutions.
		• The *Fundamental Theorem of Algebra* states that, including complex and repeated solutions, an nth degree polynomial equation has exactly n roots (solutions).
		
		• The following statements are equivalent:
		
		  – k is a zero of the polynomial function f;
		  – $(x - k)$ is a factor of $f(x)$;
		  – k is a solution of the polynomial equation $f(x) = 0$; and
		  – k is an x-intercept for the graph of $y = f(x)$.	

Unit: Statistics

AII.9

The student will collect and analyze data, determine the equation of the curve of best fit, make predictions, and solve real-world problems, using mathematical models. Mathematical models will include polynomial, exponential, and logarithmic functions.

Essential Knowledge and Skills	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
Essential Vocabulary:			
• Collect and analyze data. • Investigate scatterplots to determine if patterns exist and then identify the patterns. • Find an equation for the curve of best fit for data, using a graphing calculator. Models will include polynomial, exponential, and logarithmic functions. • Make predictions, using data, scatterplots, or the equation of the curve of best fit. • Given a set of data, determine the model that would best describe the data.		• Data and scatterplots may indicate patterns that can be modeled with an algebraic equation. • Graphing calculators can be used to collect, organize, picture, and create an algebraic model of the data. • Data that fit polynomial ($f(x) = a_n x^n + a_{n-1} x^{n-1} + ... + a_1 x + a_0$, where n is a nonnegative integer, and the coefficients are real numbers), exponential ($y = b^x$), and logarithmic ($y = \log_b x$) models arise from real-world situations.	

3rd Quarter

Unit: Expressions and Operations

Process standards: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations.

AII.1

The student, given rational, radical, or polynomial expressions, will
- b) add, subtract, multiply, divide, and simplify radical expressions containing rational numbers and variables, and expressions containing rational exponents;
- c) write radical expressions as expressions containing rational exponents and vice versa; and

Essential Knowledge and Skills	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
Essential Vocabulary:			
• Simplify radical expressions containing positive rational numbers and variables. • Convert from radical notation to exponential notation, and vice versa. • Add and subtract radical expressions. • Multiply and divide radical expressions not requiring rationalizing the denominators.		• Radical expressions can be written and simplified using rational exponents. • Only radicals with a common radicand and index can be added or subtracted.	

Unit: Equations and Inequalities

Process standards: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations.

AII.4

The student will solve, algebraically and graphically,
      d) equations containing radical expressions.
Graphing calculators will be used for solving and for confirming the algebraic solutions.

Essential Knowledge and Skills *Essential Vocabulary:*	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
• <mark>Solve</mark> an equation containing a radical expression algebraically and graphically. • <mark>Verify</mark> possible solutions to an equation containing rational or radical expressions. • <mark>Apply</mark> an appropriate equation to solve a real-world problem.		• Real-world problems can be interpreted, represented, and solved using equations and inequalities. • The process of solving radical or rational equations can lead to extraneous solutions. • Equations can be solved in a variety of ways. • Set builder notation may be used to represent solution sets of equations and inequalities.	

Unit: Functions

AII.6

The student will recognize the general shape of function (absolute value, **square root, cube root, rational, polynomial, exponential, and logarithmic**) families and will convert between graphic and symbolic forms of functions. A transformational approach to graphing will be employed. Graphing calculators will be used as a tool to investigate the shapes and behaviors of these functions.

Essential Knowledge and Skills	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
Essential Vocabulary:			
• Recognize graphs of parent functions. • Given a transformation of a parent function, identify the graph of the transformed function. • Given the equation and using a transformational approach, graph a function. • Given the graph of a function, identify the parent function. • Given the graph of a function, identify the transformations that map the preimage to the image in order to determine the equation of the image. • Using a transformational approach, write the equation of a function given its graph.		• The graphs/equations for a family of functions can be determined using a transformational approach. • Transformations of graphs include translations, reflections, and dilations. • A parent graph is an anchor graph from which other graphs are derived with transformations.	

Unit: Functions

Process standards: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations.

AII.7

The student will investigate and analyze functions algebraically and graphically. Key concepts include
   g) inverse of a function; and
   h) composition of multiple functions.
Graphing calculators will be used as a tool to assist in investigation of functions.

Essential Knowledge and Skills	Essential Questions	Essential Understandings All Students should...	Tasks/ Recommended Activities
Essential Vocabulary:			
• Find the inverse of a function. • Graph the inverse of a function as a reflection across the line $y = x$. • Investigate exponential and logarithmic functions, using the graphing calculator. • Convert between logarithmic and exponential forms of an equation with bases consisting of natural numbers. • Find the composition of two functions. • Use composition of functions to verify two functions are inverses.		• If (a, b) is an element of a function, then (b, a) is an element of the inverse of the function. • Exponential ($y = a^x$) and logarithmic ($y = \log_a x$) functions are inverses of each other. • Functions can be combined using composition of functions.	

Unit: Statistics

AII.9

The student will collect and analyze data, determine the equation of the curve of best fit, make predictions, and solve real-world problems, using mathematical models. Mathematical models will include polynomial, exponential, and logarithmic functions.

Essential Knowledge and Skills	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
Essential Vocabulary:			
• Collect and analyze data. • Investigate scatterplots to determine if patterns exist and then identify the patterns. • Find an equation for the curve of best fit for data, using a graphing calculator. Models will include polynomial, exponential, and logarithmic functions. • Make predictions, using data, scatterplots, or the equation of the curve of best fit. • Given a set of data, determine the model that would best describe the data.		• Data and scatterplots may indicate patterns that can be modeled with an algebraic equation. • Graphing calculators can be used to collect, organize, picture, and create an algebraic model of the data. • Data that fit polynomial ($f(x) = a_n x^n + a_{n-1} x^{n-1} + ... + a_1 x + a_0$, where n is a nonnegative integer, and the coefficients are real numbers), exponential ($y = b^x$), and logarithmic ($y = \log_b x$) models arise from real-world situations.	

Unit: Statistics

AII.10

The student will identify, create, and solve real-world problems involving inverse variation, joint variation, and a combination of direct and inverse variations.

Essential Knowledge and Skills	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
Essential Vocabulary:			
• Translate "*y* varies jointly as *x* and *z*" as $y = kxz$. • Translate "*y* is directly proportional to *x*" as $y = kx$. • Translate "*y* is inversely proportional to *x*" as $y = \dfrac{k}{x}$. • Given a situation, determine the value of the constant of proportionality. • Set up and solve problems, including real-world problems, involving inverse variation, joint variation, and a combination of direct and inverse variations.		• Real-world problems can be modeled and solved by using inverse variation, joint variation, and a combination of direct and inverse variations. • Joint variation is a combination of direct variations.	

4th Quarter

Unit: Expressions and Operations

AII.1

The student, given rational, radical, or polynomial expressions, will
   a) add, subtract, multiply, divide, and simplify rational algebraic expressions;

Essential Knowledge and Skills	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
Essential Vocabulary:			
• <mark>Add, subtract, multiply, and divide</mark> rational algebraic expressions. • <mark>Simplify</mark> a rational algebraic expression with common monomial or binomial factors. • <mark>Recognize</mark> a complex algebraic fraction, and simplify it as a quotient or product of simple algebraic fractions.		• Computational skills applicable to numerical fractions also apply to rational expressions involving variables.	

Unit: Functions

Process standards: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations.

AII.2

The student will investigate and apply the properties of arithmetic and geometric sequences and series to solve real-world problems, including writing the first n terms, finding the nth term, and evaluating summation formulas. Notation will include $\sum$ and a_n.

Essential Knowledge and Skills	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
Essential Vocabulary:			
• Distinguish between a sequence and a series.		• Sequences and series arise from real-world situations.	
• Generalize patterns in a sequence using explicit and recursive formulas.			
• Use and interpret the notations $\sum$, n, n^{th} term, and a_n.		• The study of sequences and series is an application of the investigation of patterns.	
• Given the formula, find a_n (the nth term) for an arithmetic or a geometric sequence.			
• Given formulas, write the first n terms and find the sum, S_n, of the first n terms of an arithmetic or geometric series.		• A sequence is a function whose domain is the set of natural numbers.	
• Given the formula, find the sum of a convergent infinite series.		• Sequences can be defined explicitly and recursively.	
• Model real-world situations using sequences and series.			

Unit: Equations and Inequalities

Process standards: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations.

AII.4

The student will solve, algebraically and graphically,

     c)   equations containing rational algebraic expressions; and

Graphing calculators will be used for solving and for confirming the algebraic solutions.

Essential Knowledge and Skills *Essential Vocabulary:*	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
- Solve equations containing rational algebraic expressions with monomial or binomial denominators algebraically and graphically. - Verify possible solutions to an equation containing rational or radical expressions. - Apply an appropriate equation to solve a real-world problem. - Recognize that the quadratic formula can be derived by applying the completion of squares to any quadratic equation in standard form.[†] **[†]Revised March 2011**		- Real-world problems can be interpreted, represented, and solved using equations and inequalities. - The process of solving radical or rational equations can lead to extraneous solutions. - Equations can be solved in a variety of ways.	

Unit: Equations and Inequalities

Process standards: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations.

AII.5

The student will solve nonlinear systems of equations, including linear-quadratic and quadratic-quadratic, algebraically and graphically. Graphing calculators will be used as a tool to visualize graphs and predict the number of solutions.

Essential Knowledge and Skills	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
Essential Vocabulary:			
- Predict the number of solutions to a nonlinear system of two equations. - Solve a linear-quadratic system of two equations algebraically and graphically. - Solve a quadratic-quadratic system of two equations algebraically and graphically.		- Solutions of a nonlinear system of equations are numerical values that satisfy every equation in the system. - The coordinates of points of intersection in any system of equations are solutions to the system. - Real-world problems can be interpreted, represented, and solved using systems of equations.	Smart Lesson TEI

Unit: Functions

Process standards: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations.

AII.6

The student will recognize the general shape of function (absolute value, square root, cube root, **rational,** polynomial, exponential, and logarithmic) families and will convert between graphic and symbolic forms of functions. A transformational approach to graphing will be employed. Graphing calculators will be used as a tool to investigate the shapes and behaviors of these functions.

Essential Knowledge and Skills	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
Essential Vocabulary:			
• Recognize graphs of parent functions. • Given a transformation of a parent function, identify the graph of the transformed function. • Given the equation and using a transformational approach, graph a function. • Given the graph of a function, identify the parent function. • Given the graph of a function, identify the transformations that map the preimage to the image in order to determine the equation of the image. • Using a transformational approach, write the equation of a function given its graph.		• The graphs/equations for a family of functions can be determined using a transformational approach. • Transformations of graphs include translations, reflections, and dilations. • A parent graph is an anchor graph from which other graphs are derived with transformations.	

Unit: Functions

Process standards: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations.

AII.7

The student will investigate and analyze functions algebraically and graphically. Key concepts include
  a) domain and range, including limited and discontinuous domains and ranges;
  b) zeros;
  c) *x*- and *y*-intercepts;
  d) intervals in which a function is increasing or decreasing;
  e) asymptotes;
  f) end behavior;
Graphing calculators will be used as a tool to assist in investigation of functions.

Essential Knowledge and Skills *Essential Vocabulary:*	Essential Questions	Essential Understandings All Students should…	Tasks/ Recommended Activities
• Identify the domain, range, zeros, and intercepts of a function presented algebraically or graphically. • Describe restricted/discontinuous domains and ranges. • Given the graph of a function, identify intervals on which the function is increasing and decreasing. • Find the equations of vertical and horizontal asymptotes of functions. • Describe the end behavior of a function.		• Functions may be used to model real-world situations. • The domain and range of a function may be restricted algebraically or by the real-world situation modeled by the function. • A function can be described on an interval as increasing, decreasing, or constant. • Asymptotes may describe both local and	

		global behavior of functions. • End behavior describes a function as x approaches positive and negative infinity. • A zero of a function is a value of x that makes $f(x)$ equal zero.	