

Algebra II Transition to New TN Mathematics Standards

Algebra II – Mathematical Processes

New Course Level Expectations

- CLE 3103.1.1 Use mathematical language, symbols, definitions, proofs and counterexamples correctly and precisely in mathematical reasoning.
- CLE 3103.1.2 Apply and adapt a variety of appropriate strategies to problem solving, including testing cases, estimation, and then checking induced errors and the reasonableness of the solution.
- CLE 3103.1.3 Develop inductive and deductive reasoning to independently make and evaluate mathematical arguments and construct appropriate proofs; include various types of reasoning, logic, and intuition.
- CLE 3103.1.4 Move flexibly between multiple representations (contextual, physical, written, verbal, iconic/pictorial, graphical, tabular, and symbolic), to solve problems, to model mathematical ideas, and to communicate solution strategies.
- CLE 3103.1.5 Recognize and use mathematical ideas and processes that arise in different settings, with an emphasis on formulating a problem in mathematical terms, interpreting the solutions, mathematical ideas, and communication of solution strategies.
- CLE 3103.1.6 Employ reading and writing to recognize the major themes of mathematical processes, the historical development of mathematics, and the connections between mathematics and the real world.
- CLE 3103.1.7 Use technologies appropriately to develop understanding of abstract mathematical ideas, to facilitate problem solving, and to produce accurate and reliable models.

Checks for Understanding (Formative/Summative Assessment)

- ✓ 3103.1.1 Create and analyze scatter-plots of non-linear and transcendental functions.
- ✓ 3103.1.2 Compare and contrast sampling techniques and identify the best technique for a given situation.
- ✓ 3103.1.3 Use calculators to identify regression equations for nonlinear data.
- ✓ 3103.1.4 Identify the weaknesses of calculators and other technologies in representing non-linear data, such as graphs approaching vertical asymptotes, and use alternative techniques to identify these issues and correctly solve problems.
- ✓ 3103.1.5 Determine the accuracy and reliability of a mathematical model.
- ✓ 3103.1.6 Use graphical representations to perform operations on complex numbers.
- ✓ 3103.1.7 Use the unit circle to determine the exact value of trigonometric functions for commonly used angles (0° , 30° , 45° , 60° ...).
- ✓ 3103.1.8 Understand and describe the inverse relationship between exponential and logarithmic functions.
- ✓ 3103.1.9 Translate the syntax of technology to appropriate mathematical notation for non-linear and transcendental functions.
- ✓ 3103.1.10 Interpret the results of mathematical modeling in various contexts to answer questions.

State Performance Indicators

- SPI 3103.1.1 Move flexibly between multiple representations (contextual, physical, written, verbal, iconic/pictorial, graphical, tabular, and symbolic) of non-linear and transcendental functions to solve problems, to model mathematical ideas, and to communicate solution strategies.
- SPI 3103.1.2 Recognize and describe errors in data collection and analysis as well as identifying representations of data as being accurate or misleading.
- SPI 3103.1.3 Use technology tools to identify and describe patterns in data using non-linear and transcendental functions that approximate data as well as using those functions to solve contextual problems.
- SPI 3103.1.4 Use mathematical language, symbols, definitions, proofs and counterexamples correctly and precisely to effectively communicate reasoning in the process of solving problems via mathematical modeling with both linear and non-linear functions.

Algebra II – Number and Operation

Former Learning Expectations

- 1.1 Demonstrate an understanding of the subsets, elements, properties, and operations of the complex number system.
- 1.2 Connect physical, graphical, verbal, and symbolic representations of real numbers.
- 1.3 Articulate, model, and apply the concept of inverse (e.g. opposites, reciprocals, and powers and roots).
- 1.4 Describe, model, and apply inverse operations.
- 1.5 Connect physical, graphical, verbal, and symbolic representations of absolute value.
- 1.6 Use a variety of notations appropriately (e.g. logarithmic, factorial, sigma, delta, radical).
- 1.7 Perform operations on algebraic expressions and informally justify the procedures chosen.

New Course Level Expectations

- CLE 3103.2.1 Understand the hierarchy of the complex number system and relationships between the elements, properties and operations.
- CLE 3103.2.2 Connect numeric, analytic, graphical and verbal representations of both real and complex numbers.
- CLE 3103.2.3 Use appropriate technology (including graphing calculators and computer spreadsheets) to solve problems, recognize patterns and collect and analyze data.
- CLE 3103.2.4 Understand the capabilities and limitations of technology when performing operations, graphing, and solving equations involving complex numbers.

<u>Former Standards Algebra I</u> <i>Review Material</i>	<u>New Standards Algebra I</u> <i>Building blocks for new standards</i>	<u>Former Standards Algebra II</u> <i>Curriculum for 2008-2009</i>	<u>New Standards Algebra II</u> <i>new End of Course 2009-2010</i>
<ul style="list-style-type: none"> ▪ Select the best estimate for the coordinate of a given point on a number line (only rational). (formerly in Algebra) ▪ Order a given set of rational numbers (both fraction and decimal notations). ▪ Identify the opposite of a rational number. ▪ Identify the reciprocal of a rational number. 	<p>SPI 3102.2.3 Describe and/or order a given set of real numbers including both rational and irrational numbers.</p>	<ul style="list-style-type: none"> ▪ Order a given set of real numbers. ▪ Identify the reciprocal of a real number. 	<p>SPI 3103.2.1 Describe any number in the complex number system.</p> <ul style="list-style-type: none"> ✓ 3103.2.1 Understand that to solve certain problems and equations, the real number system needs to be extended from real numbers to complex numbers. ✓ 3103.2.2 Define and give examples of each of the types of numbers in the complex number system. ✓ 3103.2.7 Graph complex numbers in the complex plane and recognize differences and similarities with the graphical representations of real numbers graphed on the number line. ✓ 3103.2.9 Find and describe geometrically the absolute value of a complex number.
<ul style="list-style-type: none"> ▪ Apply order of operations when computing with integers using no more than two sets of 	<p>SPI 3102.2.1 Operate (add, subtract, multiply, divide, simplify, powers) with radicals</p>	<ul style="list-style-type: none"> ▪ Perform basic operations using complex numbers (i.e., addition, subtraction, and multiplication). 	<p>SPI 3103.2.2 Compute with all real and complex numbers.</p> <ul style="list-style-type: none"> ✓ 3103.2.3 Identify and apply

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<p>grouping symbols and exponents 1 and 2.</p> <ul style="list-style-type: none"> ▪ Determine the square root of a perfect square less than 169. ▪ Add and subtract algebraic expressions. ▪ Use exponents to simplify a monomial written in expanded form. 	<p>and radical expressions including radicands involving rational numbers and algebraic expressions.</p> <ul style="list-style-type: none"> ✓ 3102.2.3 Operate with and simplify radicals (index 2, 3, n) and radical expressions including rational numbers and variables in the radicand. ✓ 3102.2.4 Operate efficiently with both rational and irrational numbers. ✓ 3102.2.7 Identify the subsets in the real number system and understand their relationships. ✓ 3102.2.8 Use multiple strategies to approximate the value of an irrational number including irrational square roots including location on the real number line. <p>SPI 3102.2.2 Multiply, divide, and square numbers expressed in scientific notation.</p> <ul style="list-style-type: none"> ✓ 3102.2.5 Perform operations with numbers in scientific notation (multiply, divide, powers). ✓ 3102.2.6 Use appropriate technologies to apply scientific notation to real-world problems. 	<ul style="list-style-type: none"> ▪ Determine the conjugate of a complex number. 	<p>properties of complex numbers (including simplification and standard form).</p> <ul style="list-style-type: none"> ✓ 3103.2.4 Add and subtract complex numbers. ✓ 3103.2.5 Multiply complex numbers. ✓ 3103.2.6 Define and utilize the complex conjugates to write the quotient of two complex numbers in standard form.
<ul style="list-style-type: none"> ▪ Select a reasonable solution for a real-world division problem in which the remainder must be considered. ▪ Select ratios and proportions to represent real-world problems (e.g., scale drawings, sampling, etc.). 			<p>SPI 3103.2.3 Use the number system, from real to complex, to solve equations and contextual problems.</p> <ul style="list-style-type: none"> ✓ 3103.2.8 Solve quadratic equations over the complex number system. ✓ 3103.2.10 Draw conclusions based on number concepts, algebraic properties, and/or relationships between expressions and numbers over

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			complex numbers. ✓ 3103.2.13 Analyze and evaluate contextual situations involving any type of number from the complex number system.
<ul style="list-style-type: none"> ▪ Use estimation to determine a reasonable solution for a tedious arithmetic computation. 			<ul style="list-style-type: none"> ✓ 3103.2.11 Understand the capabilities and limitations of technology. Make estimations without a calculator to detect potential errors. ✓ 3103.2.12 Select and use appropriate methods to make estimations without technology when solving contextual problems.

Algebra II – Algebra**Former Learning Expectations**

- 2.1 Analyze mathematical patterns related to algebra and geometry in real-world problem solving.
- 2.2 Use algebraic thinking to generalize a pattern by expressing the pattern in functional notation.
- 2.3 Solve linear systems using a variety of techniques, including matrices.
- 2.4 Communicate the meaning of variables in algebraic expressions, equations, and inequalities.
- 2.5 Manipulate the algebraic functions with constants and analyze graphs to describe the behavior of functions.
- 2.6 Apply the concept of rate of change.
- 2.7 Identify and represent a variety of functions (e.g. linear, quadratic, cubic).
- 2.8 Identify, describe, and articulate the characteristics and the parameters of a parent function.
- 2.9 Interpret results of algebraic procedures.
- 2.10 Apply the concept of variable in simplifying algebraic expressions, solving equations, and solving inequalities.
- 2.11 Interpret graphs that depict real-world phenomena.
- 2.12 Model real-world phenomena using functions and graphs.
- 2.13 Describe the domain and range of functions and articulate restrictions imposed either by the operations or by the real-life situations which the functions represent.
- 2.14 Use linear programming to solve real-world problems.

New Course Level Expectations

- CLE 3103.3.1 Understand and apply properties of rational exponents and perform basic operations to simplify algebraic expressions.
- CLE 3103.3.2 Understand, analyze, transform and generalize mathematical patterns, relations and functions using properties and various representations.
- CLE 3103.3.3 Analyze and apply various methods to solve equations, absolute values, inequalities, and systems of equations over complex numbers.
- CLE 3103.3.4 Graph and compare equations and inequalities in two variables. Identify and understand the relationships between the algebraic and geometric properties of the graph.
- CLE 3103.3.5 Use mathematical models involving equations and systems of equations to represent, interpret and analyze quantitative relationships, change in various contexts, and other real-world phenomena.

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<ul style="list-style-type: none"> ▪ Multiply two polynomials with each factor having no more than two terms. (formerly in Number & Operations) ▪ Evaluate a first degree algebraic expression given values for one or more variables. ▪ Evaluate an algebraic expression given values for one or more variables using grouping symbols and/or exponents less than four. 	<p>SPI 3102.3.2 Operate with polynomials and simplify results.</p> <ul style="list-style-type: none"> ✓ 3102.1.9 Identify and use properties of the real numbers (including commutative, associative, distributive, inverse, identity element, closure, reflexive, symmetric, transitive, operation properties of equality). ✓ 3102.1.10 Use algebraic properties to develop a valid mathematical argument. ✓ 3102.2.1 Recognize and use like terms to simplify expressions. ✓ 3102.2.2 Apply the order of 	<ul style="list-style-type: none"> ▪ Determine the domain of polynomial, rational, square root, exponential and logarithmic functions. ▪ Multiply two polynomials with each factor having no more than two terms. (from Number & Operations) ▪ Add, subtract, and multiply algebraic expressions. (from Number & Operations) 	<p>SPI 3103.3.1 Add, subtract and multiply polynomials; divide a polynomial by a lower degree polynomial.</p> <ul style="list-style-type: none"> ✓ 3103.3.1 Perform operations on algebraic expressions and justify the procedures. ✓ 3103.3.21 Factor polynomials using a variety of methods including the factor theorem, synthetic division, long division, sums and differences of cubes, and grouping.

	<p>operations to simplify and evaluate algebraic expressions.</p> <ul style="list-style-type: none"> ✓3102.3.3 Justify correct results of algebraic procedures using extension of properties of real numbers to algebraic expressions. ✓3102.3.5 Add, subtract, and multiply polynomials including squaring a binomial. 3102.3.6 Find the quotient of a polynomial and a monomial. ✓3102.3.7 Use various models (including area models) to represent products of polynomials. <p>SPI 3102.1.3 Apply properties to evaluate expressions, simplify expressions, and justify solutions to problems.</p> <p>SPI 3102.3.3 Factor polynomials.</p> <ul style="list-style-type: none"> ✓3102.3.8 Find the GCF of the terms in a polynomial. ✓3102.3.9 Find two binomial factors of a quadratic expression. 		
<ul style="list-style-type: none"> ▪ Find the solution to a quadratic equation given in standard form (integral solutions and a leading coefficient of one) ▪ Select the solution to a quadratic equation given solutions represented in graphical form (integral solutions and a leading coefficient of one). ▪ Select one of the factors $(x + 3)$ of a quadratic equation (integral solutions and a leading coefficient of one). ▪ Select the discriminant of a quadratic equation (integral solutions and a leading coefficient of one). 	<p>SPI 3102.3.10 Find the solution of a quadratic equation and/or zeros of a quadratic function.</p> <ul style="list-style-type: none"> ✓3102.3.30 Solve quadratic equations using multiple methods: factoring, graphing, quadratic formula, or square root principle. ✓3102.3.31 Determine the number of real solutions for a quadratic equation including using the discriminant and its graph. ✓3102.3.32 Recognize the connection among factors, solutions (roots), zeros of related functions, and x-intercepts in equations that arise from 		<p>SPI 3103.3.2 Solve quadratic equations and systems, and determine roots of a higher order polynomial.</p> <ul style="list-style-type: none"> ✓3103.3.7 Solve quadratic equations by factoring, graphing, completing the square, extracting square roots and using the quadratic formula. ✓3103.3.10 Given a quadratic equation use the discriminant to determine the nature of the roots. ✓3103.3.22 Determine the number and possible types of zeros for a polynomial function and find the rational roots. ✓3103.3.23 Understand the

	quadratic functions.		connection between the roots, zeros, x-intercepts, factors of polynomials, and solutions of polynomial equations.
	<p>SPI 3102.3.4 Operate with, evaluate, and simplify rational expressions including determining restrictions on the domain of the variables.</p> <p>✓3102.3.4 Simplify expressions using exponent rules including negative exponents and zero exponents.</p> <p>3102.3.10 Add, subtract, multiply, and divide rational expressions and simplify results.</p>	<ul style="list-style-type: none"> ▪ Simplify expressions with rational and negative exponents. (from Number & Operations) 	<p>SPI 3103.3.3 Add, subtract, multiply, divide and simplify rational expressions including those with rational and negative exponents.</p> <p>✓3103.3.15 Find the sum of an geometric series whose common ratio, r, is in the interval $(-1,1)$.</p>
			<p>SPI 3103.3.4 Use the formulas for the general term and summation of finite arithmetic and both finite and infinite geometric series.</p> <p>✓ 3103.3.2 Determine the domain of a function represented in either symbolic or graphical form.</p> <p>✓ 3103.3.14 Define and use arithmetic and geometric sequences and series including using sigma and pi notation.</p>
<ul style="list-style-type: none"> ▪ Determine the domain and/or range of a function represented by the graph of real-world situation. 	<p>SPI 3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.</p> <p>3102.3.16 Determine if a relation is a function from its graph or from a set of ordered pairs.</p>	<ul style="list-style-type: none"> ▪ Determine the range of a wide variety of functions given a graph. ▪ Select a graph that represents an absolute value equation on a coordinate plane. (from Number & Operations) 	<p>SPI 3103.3.5 Describe the domain and range of functions and articulate restrictions imposed either by the operations or by the contextual situations which the functions represent.</p>
			<p>SPI 3103.3.6 Combine functions (such as polynomial, rational, radical and absolute value expressions) by addition, subtraction, multiplication, division, or by composition and</p>

			evaluate at specified values of their variables.
		<ul style="list-style-type: none"> Identify the exponential form of a logarithmic expression and vice versa. (from Number & Operations) Determine the inverse of a logarithmic function given its graph. 	SPI 3103.3.7 Identify whether a function has an inverse, whether two functions are inverses of each other, and/or explain why their graphs are reflections over the line $y = x$. ✓3103.3.3 Determine and graph the inverse of a function with and without technology.
<ul style="list-style-type: none"> Select the system of equations that could be used to solve a given real-world problem. 	SPI 3102.3.9 Solve systems of linear equation/inequalities in two variables. ✓3102.3.27 Determine the number of solutions for a system of linear equations (0, 1, or infinitely many solutions). ✓3102.3.28 Solve systems of linear equations graphically, algebraically, and with technology. ✓3102.3.29 Solve contextual problems involving systems of linear equations or inequalities and interpret solutions in context.	<ul style="list-style-type: none"> Solve a system of linear equations with 2 variables (e.g. substitution, elimination, Cramer's Rule, and graphing). 	SPI 3103.3.8 Solve systems of three linear equations in three variables. ✓3103.3.8 Solve a three by three system of linear equations algebraically and by using inverse matrices and determinants with and without technology.
			SPI 3103.3.9 Graph the solution set of two or three linear or quadratic inequalities. ✓3103.3.18 Solve compound inequalities involving disjunction and conjunction and linear inequalities containing absolute values. ✓3103.3.19 Solve linear programming problems.
<ul style="list-style-type: none"> Select the graph that represents a given linear function expressed in slope-intercept form. Select the linear graphs that models the given real-world situation described in a narrative (no data set given). 	SPI 3102.1.5 Recognize and express the effect of changing constants and/or coefficients in problem solving. 3102.1.14 Apply graphical transformations that occur when changes are made to coefficients	<ul style="list-style-type: none"> Predict the graphical transformation that occurs when coefficients and/or constants of given function are changed (no trigonometric or logarithmic functions). Describe the transformation that 	SPI 3103.3.10 Identify and/or graph a variety of functions and their transformations. ✓3103.3.4 Analyze the effect of changing various parameters on functions and their graphs. ✓3103.3.5 Graph piece-wise and

- Select the linear graph that models the given real-world situation described in a tabular set of data.
- Determine the slope from the graph of a linear equation (no labeled points).
- Apply the concept of rate of change to solve real-world problems.
- Recognize the graphical transformation that occurs when coefficients and/or constants of the corresponding linear equations are changed.
- Apply the concept of slope to represent rate of change in a real-world situation. *(formerly in Number & Operations)*

and constants in functions.

SPI 3102.1.6 Determine and interpret slope in multiple contexts including rate of change in real-world problems.

- ✓ 3102.1.16 Understand and express the meaning of the slope and y-intercept of linear functions in real-world contexts.

SPI 3102.3.8 Determine the equation of a line and/or graph a linear equation.

- ✓ 3102.3.18 Analyze the characteristics of graphs of basic linear relations and linear functions including constant function, direct variation, identity function, vertical lines, absolute value of linear functions. Use technology where appropriate.
- ✓ 3102.3.20 Understand that a linear equation has a constant rate of change called slope and represent slope in various forms.
- ✓ 3102.3.21 Determine the equation of a line using given information including a point and slope, two points, a point and a line parallel or perpendicular, graph, intercepts.
- ✓ 3102.3.22 Express the equation of a line in standard form, slope-intercept, and point-slope form.
- ✓ 3102.3.23 Determine the graph of a linear equation including those that depict contextual situations.
- ✓ 3102.3.24 Interpret the changes in the slope-intercept form and graph of a linear equation by looking at different parameters, m and b in the slope-intercept form.

has changed a “parent function” to the given related function (e.g., right shift of 3 units, reflection in the x-axis).

step functions.

- ✓ 3103.3.11 Describe and articulate the characteristics and parameters of a parent function.

✓ **SPI 3103.3.11 Graph conic**

			<p>sections (circles, parabolas, ellipses and hyperbolas) and understand the relationship between the standard form and the key characteristics of the graph.</p> <ul style="list-style-type: none"> ✓ 3103.3.9 Find an equation for a parabola when given its graph or when given its roots. ✓ 3103.3.12 Understand the relationship between real zeros of a function and the x-intercepts of its graph. ✓ 3103.3.20 Understand the relationships between the equations of conic sections and their graphs.
	<p>SPI 3102.3.11 Analyze nonlinear graphs including quadratic and exponential functions that model a contextual situation.</p> <ul style="list-style-type: none"> ✓ 3102.3.17 Recognize “families” of functions. ✓ 3102.3.19 Explore the characteristics of graphs of various nonlinear relations and functions including inverse variation, quadratic, and square root function. Use technology where appropriate. ✓ 3102.3.33 Recognize data that can be modeled by an exponential function. ✓ 3102.3.34 Graph exponential functions in the form $y = a(b^x)$ where $b \neq 0$. 3102.3.35 Apply growth/decay and simple/compound interest formulas to solve contextual problems. 	<ul style="list-style-type: none"> ▪ Select the graph that models a given real-world situation (i.e., linear and non-linear). 	<p>SPI 3103.3.12 Interpret graphs that depict real-world phenomena.</p>
		<ul style="list-style-type: none"> ▪ Identify matrices that model given real-world situations. ▪ Apply properties of logarithms to 	<p>SPI 3103.3.13 Solve contextual problems using quadratic, rational, radical and</p>

		<p>simplify a logarithmic expression.</p> <ul style="list-style-type: none"> ▪ Solve real world problems given logarithmic and exponential formulas (e.g. Ph scale, Richter scale.) 	<p>exponential equations, finite geometric series or systems of equations.</p> <ul style="list-style-type: none"> ✓ 3103.3.6 Simplify expressions and solve equations containing radicals. ✓ 3103.3.13 Solve problems using exponential functions requiring the use of logarithms for their solutions. ✓ 3103.3.16 Prove basic properties of logarithms using properties of exponents and apply those properties to solve problems. ✓ 3103.3.17 Know that the logarithm and exponential functions are inverses and use this information to solve real-world problems.
			<p>SPI 3103.3.14 Solve problems involving the binomial theorem and its connection to Pascal's Triangle, combinatorics, and probability.</p>
<ul style="list-style-type: none"> ▪ Extend a geometric pattern. ▪ Extend a numerical pattern. ▪ Select the algebraic notation which generalizes the pattern represented by data in a given table. 	<p>SPI 3102.1.1 Interpret patterns found in sequences, tables, and other forms of quantitative information using variables or function notation.</p> <ul style="list-style-type: none"> ✓ 3102.1.4 Write a rule with variables that expresses a pattern. <p>SPI 3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.</p> <ul style="list-style-type: none"> ✓ 3102.3.1 Recognize and extend arithmetic and geometric sequences. ✓ 3102.3.2 Explore patterns including Pascal's Triangle and the Fibonacci sequence. 	<ul style="list-style-type: none"> ▪ Select the algebraic equation that generalizes the pattern represented by data in a given table. ▪ Select functional notation to generalize a given numeric pattern. 	
<ul style="list-style-type: none"> ▪ Translate a verbal expression 	<p>SPI 3102.1.2 Write an</p>	<ul style="list-style-type: none"> ▪ Translate a verbal sentence into 	

into an algebraic expression.

- Translate a verbal sentence into an algebraic equation.
- Solve one- and two-step linear equations using integers (with integral coefficients and constants).
- Solve multi-step linear equations (more than two steps, variables on only one side of the equation).
- Solve multi-step linear equations (more than two steps, with variables on both sides of the equation).
- Solve multi-step linear equations (more than two steps, with one set of parentheses on each side of the equation).
- Identify the graphical representation of the solution to a one-variable inequality on a number line.
- Solve multi-step linear inequalities in real-world situations.
- Select the appropriate graphical representation of a given linear inequality.

equation symbolically to express a contextual problem.

- ✓ 3102.1.5 Use formulas, equations, and inequalities to solve real-world problems including time/rate/distance, percent increase/decrease, ratio/proportion, and mixture problems.
- SPI 3102.3.5 Write and/or solve linear equations, inequalities, and compound inequalities including those containing absolute value.**
- ✓ 3102.3.11 Solve multi-step linear equations with one variable.
 - ✓ 3102.3.12 Recognize and articulate when an equation has no solution, a single solution, or all real numbers as solutions.
 - ✓ 3102.3.13 Solve multi-step linear inequalities with one variable and graph the solution on a number line.
 - ✓ 3102.3.14 Solve absolute value equations and inequalities (including compound inequalities) with one variable and graph their solutions on a number line.
 - ✓ 3102.3.15 Determine domain and range of a relation and articulate restrictions imposed either by the operations or by the real life situation that the function represents.
 - ✓ 3102.3.25 Find function values using $f(x)$ notation or graphs.
 - ✓ 3102.3.26 Graph linear inequalities on the coordinate plane and identify regions of the graph containing ordered pairs in the solution.

✓

an algebraic equation and vice versa.

- Solve multi-step (more than two steps) linear equations (one set of parentheses on each side of the equations and/or variables on both sides).
- Solve one-variable linear equations with rational expressions.

<ul style="list-style-type: none"> ▪ Select the nonlinear graph that models the given real-world situation or vice versa. 	<p>SPI 3102.1.4 Translate between representations of functions that depict real-world situations.</p> <p>SPI 3102.3.6 Interpret various relations in multiple representations.</p> <ul style="list-style-type: none"> ✓ 3102.1.12 Create and work flexibly among representations of relations (including verbal, equations, tables, mappings, graphs). ✓ 3102.1.13 Change from one representation of a relation to another representation, for example, change from a verbal description to a graph. 	<ul style="list-style-type: none"> ✓ Select the graph that represents a given linear function expressed in slope-intercept form. ✓ Identify the graphical representation of the solution to a one-variable inequality on a number line. ✓ Select the graph of a two-variable inequality. 	
<ul style="list-style-type: none"> ▪ Calculate the distance between two points given the Pythagorean Theorem and the distance formula. ▪ Identify ordered pairs in the coordinate plane. 	<p>SPI 3102.4.3 Solve problems involving the distance between points or midpoint of a segment.</p> <ul style="list-style-type: none"> ✓ 3102.4.3 Understand horizontal/vertical distance in a coordinate system as absolute value of the difference between coordinates. develop the distance formula for a coordinate plane using the Pythagorean Theorem. ✓ 3102.4.4 Develop the midpoint formula for segments on a number line or in the coordinate plane. 		

Algebra II – Geometry and Measurement

Former Learning Expectations

- 3.1 Apply geometric properties, formulas, and relationships to solve real-world problems.
- 3.2 Justify conclusions using deductive reasoning.
- 3.3 Use inductive reasoning to make conjectures.
- 3.4 Communicate position using spatial sense with two- and three-dimensional coordinate systems.
- 3.5 Perform a given transformation and predict the results of the transformation.
- 4.1 Apply measurement concepts and relationships in algebraic and geometric problem-solving situations.
- 4.2 Apply appropriate techniques, tools, and formulas to determine measurements.

New Course Level Expectations

- CLE 3103.4.1 Understand the trigonometric functions and their relationship to the unit circle.
- CLE 3103.4.2 Know and use the basic identities of sine, cosine, and tangent as well as their reciprocals.
- CLE 3103.4.3 Graph all six trigonometric functions and identify their key characteristics.
- CLE 3103.4.4 Know and use the law of sines to find missing sides and angles of a triangle, including the ambiguous case.
- CLE 3103.4.5 Use trigonometric concepts, properties and graphs to solve problems.

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			<p>SPI 3103.4.1 Exhibit knowledge of unit circle trigonometry.</p> <p>✓3103.4.1 Convert between radians and degrees and vice versa.</p> <p>✓3103.4.3 Extend the trigonometric functions to periodic functions on the real line by defining them as functions on the unit circle.</p>
			<p>SPI 3103.4.2 Match graphs of basic trigonometric functions with their equations.</p> <p>✓3103.4.2 Determine the period and the amplitude of a periodic function.</p> <p>✓3103.4.5 Determine the domain and range of the six trigonometric functions given a graph.</p>
		<p>▪ Predict the graphical transformation that occurs when coefficients and/or constants of given function are changed (no trigonometric or logarithmic functions).</p>	<p>SPI 3103.4.3 Describe and articulate the characteristics and parameters of parent trigonometric functions to solve contextual problems.</p> <p>✓3103.4.4 Understand the</p>

Former Standards Algebra I <i>Review Material</i>	New Standards Algebra I <i>Building blocks for new standards</i>	Former Standards Algebra II <i>Curriculum for 2008-2009</i>	New Standards Algebra II <i>new End of Course 2009-2010</i>
		Describe the transformation that has changed a "parent function" to the given related function (e.g., right shift of 3 units, reflection in the x-axis).	relationship between the radius, the central angle, and radian measure. ✓3103.4.6 Know and be able to use the fundamental trigonometric identities, including the Pythagorean identities, reciprocal identities, sum of sine and cosine, and odd and even identities.
<ul style="list-style-type: none"> ▪ Estimate the area of irregular geometric figures on a grid. ▪ Apply the given formula to determine the area or perimeter of a rectangle. ▪ Apply the given formula to find the area of a circle, the circumference of a circle, or the volume of a rectangular solid. ▪ Select the area representation for a given product of two one-variable binomials with positive constants and coefficients. 	<p>SPI 3102.4.1 Develop and apply strategies to estimate the area of any shape on a plane grid.</p> <p>✓3102.4.1 Using algebraic expressions solve for measures in geometric figures as well as for perimeter, area, and volume.</p>	<ul style="list-style-type: none"> ▪ Apply the given formula to find area and circumference of circles, area and perimeter of polygons, and volume of regular solids. ▪ Select the area representation for a given product of two binomials. 	
<ul style="list-style-type: none"> ▪ Apply the given Pythagorean Theorem to a real life problem illustrated by a diagram (no radicals in answer). 	<p>SPI 3102.4.2 Solve contextual problems using the Pythagorean Theorem.</p> <p>✓3102.4.2 Use the Pythagorean Theorem to find the missing measure in a right triangle including those from real-world situations.</p>	<ul style="list-style-type: none"> ▪ Apply the given Pythagorean Theorem to real-world problems. 	
<ul style="list-style-type: none"> ▪ Calculate rates involving cost per unit to determine the best buy (no more than three samples). 	<p>SPI 3102.4.4 Convert rates and measurements.</p> <p>✓3102.4.5 Use dimensional analysis to convert rates and measurements both within a system and between systems and check the appropriateness of the solution.</p>		
<ul style="list-style-type: none"> ▪ Apply proportion and the concepts of similar triangles to find the length of a missing side 		<ul style="list-style-type: none"> ▪ Apply proportion and the concepts of similar triangles to solve real world problems. 	

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of a triangle.			

Algebra II – Data Analysis, Probability, and Statistics

Former Learning Expectations

- 5.1 Understand concept of randomness in sampling.
- 5.2 Apply appropriate technology in data collection and analysis.
- 5.3 Apply counting principles of permutations and combinations using appropriate technology.
- 5.4 Apply theoretical and experimental probability to analyze the likelihood of an event.
- 5.5 Collect, represent, and describe linear and nonlinear data sets developed from real world.
- 5.6 Make predictions from a data set using curve fitting with appropriate technology.
- 5.7 Make inferences about a data set using appropriate measures of central tendency and dispersion.
- 5.8 Describe and apply the normal distribution and its properties.
- 5.9 Identify mutually exclusive and non-mutually exclusive events.
- 5.10 Analyze the probability of dependent events and of independent events.

- 5.11 Use simulations to estimate probability.
- 5.12 Choose, construct, and analyze appropriate graphical representations for a data set.
- 5.13 Analyze the validity of statistical conclusions and the use, misuse, and abuse of data.

New Course Level Expectations

- CLE 3103.5.1 Describe, interpret, and apply quantitative data.
- CLE 3103.5.2 Evaluate and critique various ways of collecting data and using information based on data published in the media.
- CLE 3103.5.3 Use data and statistical thinking to draw inferences, make predictions, justify conclusions and identify and explain misleading uses of data.
- CLE 3103.5.4 Develop an understanding of probability concepts in order to make informed decisions.

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<ul style="list-style-type: none"> ▪ Determine the mean (average) of a given set of real-world data (no more than five two-digit numbers). ▪ Determine the median for a given set of real-world data (even number of data). 	<p>SPI 3102.5.2 Identify the effect on mean, median, mode, and range when values in the data set are changed.</p> <ul style="list-style-type: none"> ✓ 3102.5.3 When a set of data is changed, identify effects on measures of central tendency, range, and inter-quartile range. ✓ 3102.5.4 Explore quartiles, deciles, and percentiles of a distribution. 	<ul style="list-style-type: none"> ▪ Determine the measures of central tendency for a given set of real-world data. 	<p>SPI 3103.5.1 Compute, compare and explain summary statistics for distributions of data including measures of center and spread.</p> <p>SPI 3103.5.2 Compare data sets using graphs and summary statistics.</p> <ul style="list-style-type: none"> ✓ 3103.5.5 Calculate measures of central tendency and spread (variance and standard deviation).
<ul style="list-style-type: none"> ▪ Choose the matching linear graph given a set of ordered pairs. ▪ Make a prediction from the graph of a real-world linear data set. 	<p>SPI 3102.5.3 Using a scatter-plot, determine if a linear relationship exists and describe the association between variables.</p> <p>SPI 3102.5.4 Generate the equation of a line that fits linear data and use it to make a prediction.</p> <ul style="list-style-type: none"> ✓ 3102.5.8 Examine real-world graphical relationship (including scatter-plots) to determine type 	<ul style="list-style-type: none"> ▪ Choose the matching linear graph when given a set of ordered pairs representing real-world data. 	<p>SPI 3103.5.3 Analyze patterns in a scatter-plot and describe relationships in both linear and non-linear data.</p> <ul style="list-style-type: none"> ✓ 3103.5.1 Collect, represent and describe both linear and non-linear data developed from contextual situations. ✓ 3103.5.2 Organize and display data using appropriate methods (including spreadsheets and technology tools) to detect

	<p>of relationship (linear or nonlinear) and any association (positive, negative or none) between the variables of the data set.</p> <ul style="list-style-type: none"> ✓ 3102.5.9 Determine an equation for a line that fits real-world linear data. interpret the meaning of the slope and y-intercept in context of the data. ✓ 3102.5.10 Using technology with a set of contextual linear data to examine the line of best fit. determine and interpret the correlation coefficient. ✓ 3102.5.11 Use an equation that fits data to make a prediction. 		<p>patterns and departures from patterns.</p> <ul style="list-style-type: none"> ✓ 3103.5.3 Read and interpret data from a two-way table. ✓ 3103.5.9 Use data to detect patterns.
			<p>SPI 3103.5.4 Apply the characteristics of the normal distribution.</p> <ul style="list-style-type: none"> ✓ 3103.5.8 Know the Empirical Rule for one, two and three standard deviations for a normal distribution.
			<p>SPI 3103.5.5 Determine differences between randomized experiments and observational studies.</p> <ul style="list-style-type: none"> ✓ 3103.5.4 Understand the impact of various sampling methods and use them to draw valid conclusions. ✓ 3103.5.10 Design simple experiments to collect data to answer questions of interest. ✓ 3103.5.11 Evaluate published data by considering the source, the design of the study and the analysis and representation (or misrepresentation) of the data. ✓ 3103.5.12 Investigate bias and the phrasing of questions during data acquisition to formulate reasonable conclusions.

<ul style="list-style-type: none"> ▪ Interpret bar graphs representing real-world data. ▪ Interpret circle graphs (pie charts) representing real-world data. 	<p>SPI 3102.5.1 Interpret displays of data to answer questions about the data set(s) (e.g., identify pattern, trends, and/or outliers in a data set).</p> <ul style="list-style-type: none"> ✓ 3102.5.1 Identify patterns or trends in data. ✓ 3102.5.2 Develop a meaning for and identify outliers in a data set and verify. ✓ 3102.5.5 Construct and interpret various forms of data representations, (including line graphs, bar graphs, circle graphs, histograms, scatter-plots, box-and-whiskers, stem-and-leaf, and frequency tables). ✓ 3102.5.6 Draw qualitative graphs of functions and describe a general trend or shape. ✓ 3102.5.7 Compare two data sets using graphs and descriptive statistics. 	<ul style="list-style-type: none"> ▪ Make a prediction from the graph of a real-world data set. ▪ Find the equation for the line of best fit given a scatterplot depicting real-world data. 	<p>SPI 3103.5.6 Find the regression curve that best fits both linear and non-linear data (using technology such as a graphing calculator) and use it to make predictions.</p> <ul style="list-style-type: none"> ✓ 3103.5.6 Use technology to find the appropriate regression equation for both linear and non-linear data.
		<ul style="list-style-type: none"> ▪ Categorize the correlation of a scatterplot using real-world data (i.e., positive, negative, strong, or weak). 	<p>SPI 3103.5.7 Determine and recognize when the correlation coefficient measures goodness of fit.</p> <ul style="list-style-type: none"> ✓ 3103.5.7 Recognize when the correlation coefficient measures goodness of fit and does not imply causation.
<ul style="list-style-type: none"> ▪ Apply counting principles of permutations or combinations in real-world situations. 	<p>SPI 3102.5.5 Determine theoretical and/or experimental probability of an event and/or its complement including using relative frequency.</p> <ul style="list-style-type: none"> ✓ 3102.5.12 Use techniques (Venn Diagrams, tree diagrams, or counting procedures) to identify the possible outcomes of an experiment or sample space and compute the probability of an event. 	<ul style="list-style-type: none"> ▪ Determine the number of possible outcomes for a given experiment (i.e. the multiplication counting principle, permutations, or combinations). ▪ Determine the theoretical probability of a simple event for a given situation. ▪ Determine the theoretical probability of a compound event (i.e., dependent or independent, union and intersection). 	<p>SPI 3103.5.8 Apply probability concepts such as conditional probability and independent events to calculate simple probability.</p> <ul style="list-style-type: none"> ✓ 3103.5.13 Apply both theoretical and experimental probability to analyze the likelihood of an event.

- ✓ 3102.5.13 Determine the complement of an event and the probability of that complement.
- ✓ 3102.5.15 Explore joint and conditional probability.
- ✓ 3102.5.14 Determine if two events are independent or dependent.
- ✓ 3102.5.16 Identify situations for which the Law of Large Numbers applies.
- ✓ 3102.5.17 Perform simulations to estimate probabilities.
- ✓ 3102.5.18 Make informed decisions about practical situations using probability concepts.