

# Algebra I Transition to New TN Mathematics Standards

## Algebra I – Mathematical Processes

### New Course Level Expectations

- CLE 3102.1.1 Use mathematical language, symbols, definitions, proofs and counterexamples correctly and precisely in mathematical reasoning.
- CLE 3102.1.2 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 3102.1.3 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 3102.1.4 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 3102.1.5 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 3102.1.6 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 3102.1.7 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)**

- ✓ 3102.1.1 Develop meaning for mathematical vocabulary.
- ✓ 3102.1.2 Use the terminology of mathematics correctly.
- ✓ 3102.1.3 Understand and use mathematical symbols, notation, and common mathematical abbreviations correctly.
- ✓ 3102.1.4 Write a rule with variables that expresses a pattern.
- ✓ 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.
- ✓ 3102.1.6 Use a variety of strategies to estimate and compute solutions, including real-world problems.
- ✓ 3102.1.7 Identify missing or irrelevant information in problems.
- ✓ 3102.1.8 Recognize and perform multiple steps in problem solving when necessary.
- ✓ 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.
- ✓ 3102.1.11 Use manipulatives to model algebraic concepts.
- ✓ 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, i.e., change from a verbal description to a graph.
- ✓ 3102.1.14 Apply graphical transformations that occur when changes are made to coefficients and constants in functions.
- ✓ 3102.1.15 Apply arithmetic concepts in algebraic contexts.
- ✓ 3102.1.16 Understand and express the meaning of the slope and y-intercept of linear functions in real-world contexts.
- ✓ 3102.1.17 Connect the study of algebra to the historical development of algebra.
- ✓ 3102.1.18 Translate syntax of technology to appropriate mathematical notation.
- ✓ 3102.1.19 Recognize and practice appropriate use of technology in representations and in problem solving.
- ✓ 3102.1.20 Estimate solutions to evaluate the reasonableness of results and to check technological computation.

### **State Performance Indicators**

- SPI 3102.1.1 Interpret patterns found in sequences, tables, and other forms of quantitative information using variables or function notation.
- SPI 3102.1.2 Write an equation symbolically to express a contextual problem.
- SPI 3102.1.3 Apply properties to evaluate expressions, simplify expressions, and justify solutions to problems.
- SPI 3102.1.4 Translate between representations of functions that depict real-world situations.
- SPI 3102.1.5 Recognize and express the effect of changing constants and/or coefficients in problem solving.
- SPI 3102.1.6 Determine and interpret slope in multiple contexts including rate of change in real-world problems.

## Algebra I – Number and Operation

### Former Learning Expectations

- 1.1 Demonstrate an understanding of the subsets, properties, and operations of the real number system.
- 1.2 Demonstrate an understanding of the relative size of rational and irrational 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 Apply number theory concepts (e.g., primes, factors, divisibility and multiples) in mathematical problem solving.
- 1.6 Connect graphical and symbolic representations of absolute value.
- 1.7 Use real numbers to represent real-world applications (e.g., slope, rate of change, probability, and proportionality).

- 1.8 Use a variety of notations appropriately (e.g. exponential, functional, square root).
- 1.9 Select and apply an appropriate method (i.e., mental mathematics, paper and pencil, or technology) for computing with real numbers, and evaluate the reasonableness of results.
- 1.10 Perform operations on algebraic expressions and informally justify the procedures chosen.
- 1.11 Perform operations on matrices in real-world problem solving (i.e., addition, subtraction, and scalar multiplication).

### New Course Level Expectations

- CLE 3102.2.1 Understand computational results and operations involving real numbers in multiple representations.
- CLE 3102.2.2 Understand properties of and relationships between subsets and elements of the real number system.

<u>Former Standards 8<sup>th</sup> Grade</u> Review Material	<u>New Standards 8<sup>th</sup> Grade</u> Building blocks for new standards	<u>Former Standards Algebra I</u> Gateway 2008-2009	<u>New Standards Algebra I</u> New End of Course 2009-2010
<ul style="list-style-type: none"> <li>▪ Compute efficiently and accurately with whole numbers, fractions, decimals, and percents. <b>A</b></li> <li>▪ Work flexibly with fractions, decimals, and percents to solve one- and two-step word problems. <b>A</b></li> </ul>		<ul style="list-style-type: none"> <li>▪ Select a reasonable solution for a real-world division problem in which the remainder must be considered. <b>A</b></li> </ul>	
<ul style="list-style-type: none"> <li>▪ Identify the opposite and the reciprocal of a rational number. <b>A</b></li> </ul>		<ul style="list-style-type: none"> <li>▪ Identify the opposite of a rational number. <b>A</b></li> </ul>	
		<ul style="list-style-type: none"> <li>▪ Use exponents to simplify a monomial written in expanded form. <b>A</b></li> <li>▪ Identify the reciprocal of a rational number. <b>A</b></li> <li>▪ Use estimation to determine a reasonable solution for a tedious arithmetic computation. <b>A</b></li> <li>▪ Select ratios and proportions to represent real-world problems (e.g., scale drawings, sampling, etc.). <b>A</b></li> </ul>	
<ul style="list-style-type: none"> <li>▪ Apply order of operations in computing with rational numbers, no more than two parentheses, and exponents 1 or 2. <b>A</b></li> </ul>		<ul style="list-style-type: none"> <li>▪ Apply order of operations when computing with integers, no more than two sets of grouping symbols, exponents 1 and 2. <b>A</b></li> </ul>	<ul style="list-style-type: none"> <li>✓3102.2.1 Recognize and use like terms to simplify expressions.</li> <li>✓3102.2.2 Apply the order of</li> </ul>

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<ul style="list-style-type: none"> <li>▪ Determine the square roots of perfect squares (<math>&lt;169</math>). <b>A</b></li> </ul>	<p><b>SPI 0806.2.2 Identify numbers and square roots as rational or irrational.</b></p> <ul style="list-style-type: none"> <li>✓0806.2.2 Square numbers and simplify square roots.</li> <li>✓0806.2.3 Solve contextual problems involving powers and roots.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Determine the square root of a perfect square less than 169.</li> <li>▪ Add and subtract algebraic expressions. <b>A</b></li> </ul>	<p>operations to simplify and evaluate algebraic expressions.</p> <p><b>SPI 3102.2.1 Operate (add, subtract, multiply, divide, simplify, powers) with radicals and radical expressions including radicands involving rational numbers and algebraic expressions.</b></p> <ul style="list-style-type: none"> <li>✓3102.2.3 Operate with and simplify radicals (index 2, 3, n) and radical expressions including rational numbers and variables in the radicand.</li> <li>✓3102.2.4 Operate efficiently with both rational and irrational numbers.</li> </ul>
<ul style="list-style-type: none"> <li>▪ Use exponential, scientific, and calculator notation to represent large numbers in real-world situations.</li> </ul>	<p><b>SPI 0806.2.3 Use scientific notation to compute products and quotients.</b></p> <ul style="list-style-type: none"> <li>✓0806.2.1 Recognize and use exponential, scientific, and calculator notation.</li> <li>✓0806.2.6 Simplify expressions using the laws of exponents.</li> </ul> <p><b>SPI 0806.2.4 Solve real-world problems requiring scientific notation.</b></p> <ul style="list-style-type: none"> <li>✓0806.2.7 Add, subtract, multiply, and divide numbers expressed scientific notation.</li> </ul>		<p><b>SPI 3102.2.2 Multiply, divide, and square numbers expressed in scientific notation.</b></p> <ul style="list-style-type: none"> <li>✓3102.2.5 Perform operations with numbers in scientific notation (multiply, divide, powers).</li> <li>✓3102.2.6 Use appropriate technologies to apply scientific notation to real-world problems.</li> </ul>
<ul style="list-style-type: none"> <li>▪ Compare rational numbers using the appropriate symbol (<math>&lt;</math>, <math>&gt;</math>, <math>=</math>).</li> <li>▪ Determine the approximate locations of rational numbers on a number line. <b>A</b></li> </ul>	<p><b>SPI 0806.2.1 Order and compare rational and irrational numbers and locate on the number line.</b></p> <ul style="list-style-type: none"> <li>✓0806.2.4 Use a Venn diagram to represent the subsets of the real number system.</li> <li>✓0806.2.5 Identify the subset(s) of the real number system to which a number belongs.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Order a given set of rational numbers (both fraction and decimal notations).</li> <li>▪ Select the best estimate for the coordinate of a given point on a number line (only rational). <b>A</b> (formerly in Algebra)</li> </ul>	<p><b>SPI 3102.2.3 Describe and/or order a given set of real numbers including both rational and irrational numbers.</b></p> <ul style="list-style-type: none"> <li>✓3102.2.7 Identify the subsets in the real number system and understand their relationships.</li> <li>✓3102.2.8 Use multiple strategies to approximate the value of an irrational number including irrational square roots and</li> </ul>

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			including location on the real number line
<ul style="list-style-type: none"> <li>▪ Use estimation strategies to select a reasonable solution to a real-world problem involving computing with rational numbers.</li> </ul> <b>A</b>			

**Algebra I – Algebra****Former Learning Expectations**

- 2.1 Recognize, analyze, extend, and create a variety of patterns.
- 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.
- 2.4 Communicate the meaning of variables in algebraic expressions, equations, and inequalities.
- 2.5 Identify and represent a variety of functions.
- 2.6 Apply and interpret rates of change from graphical and numerical data.
- 2.7 Analyze graphs to describe the behavior of functions.
- 2.8 Interpret results of algebraic procedures.
- 2.9 Apply the concept of variable in simplifying algebraic expressions, solving equations, and solving inequalities.
- 2.10 Interpret graphs that depict real-world phenomena.
- 2.11 Model real-world phenomena using functions and graphs.
- 2.12 Articulate and apply algebraic properties in symbolic manipulation.
- 2.13 Analyze relationships which can and which cannot be represented by a function.
- 2.14 Graph inequalities and interpret graphs of inequalities.
- 2.15 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.
- 2.16 Describe the transformation of the graph that occurs when coefficients and/or constants of the corresponding linear equations are changed.
- 2.17 Find and represent solutions of quadratic equations.

**New Course Level Expectations**

- CLE 3102.3.1 Use algebraic thinking to analyze and generalize patterns.
- CLE 3102.3.2 Understand and apply properties in order to perform operations with, evaluate, simplify, and factor expressions and polynomials.
- CLE 3102.3.3 Understand and apply operations with rational expressions and equations.
- CLE 3102.3.4 Solve problems involving linear equations and linear inequalities.
- CLE 3102.3.5 Manipulate formulas and solve literal equations.
- CLE 3102.3.6 Understand and use relations and functions in various representations to solve contextual problems.
- CLE 3102.3.7 Construct and solve systems of linear equations and inequalities in two variables by various methods.
- CLE 3102.3.8 Solve and understand solutions of quadratic equations with real roots.
- CLE 3102.3.9 Understand and use exponential functions to solve contextual problems.

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		<ul style="list-style-type: none"> <li>▪ Evaluate a first degree algebraic expression given values for one or more variables. <b>A</b></li> <li>▪ Evaluate an algebraic expression given values for one or more variables using grouping symbols and/or exponents less than four. <b>A</b></li> </ul>	<b>SPI 3102.1.3 Apply properties to evaluate expressions, simplify expressions, and justify solutions to problems.</b>
<ul style="list-style-type: none"> <li>▪ Generalize a variety of patterns with symbolic rules. <b>A</b></li> </ul>		<ul style="list-style-type: none"> <li>▪ Extend a geometric pattern. <b>A</b></li> <li>▪ Extend a numerical pattern. <b>A</b></li> <li>▪ Select the algebraic notation which generalizes the pattern represented by data in a given table. <b>A</b></li> </ul>	<b>SPI 3102.1.1 Interpret patterns found in sequences, tables, and other forms of quantitative information using variables or function notation.</b> ✓ 3102.1.4 Write a rule with

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			variables that expresses a pattern. <b>SPI 3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.</b> ✓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"> <li>▪ Generate equivalent forms for simple algebraic expressions. <b>A</b></li> <li>▪ Evaluate a first-degree algebraic expression given values for two or more variables. <b>A</b></li> </ul>	✓0806.3.1 Perform basic operations on algebraic expressions (including grouping, order of operations, exponents, square/cube roots, simplifying and expanding). <b>A</b>	<ul style="list-style-type: none"> <li>▪ Multiply two polynomials with each factor having no more than two terms. <b>A</b> (formerly in Number &amp; Operations)</li> </ul>	✓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. <b>SPI 3102.3.2 Operate with polynomials and simplify results.</b> ✓3102.2.1 Recognize and use like terms to simplify expressions. ✓3102.2.2 Apply the order of operations to simplify and evaluate algebraic expressions. ✓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

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			represent products of polynomials.
			<b>SPI 3102.3.3 Factor polynomials.</b> ✓3102.3.8 Find the GCF of the terms in a polynomial. ✓3102.3.9 Find two binomial factors of a quadratic expression.
			<b>SPI 3102.3.4 Operate with, evaluate, and simplify rational expressions including determining restrictions on the domain of the variables.</b> ✓3102.3.4 Simplify expressions using exponent rules including negative exponents and zero exponents. ✓3102.3.10 Add, subtract, multiply, and divide rational expressions and simplify results.
<ul style="list-style-type: none"> <li>▪ Solve one- and two-step linear equations involving integers. <b>A</b></li> <li>▪ Formulate multi-step equations that represent relationships and real-world situations. <b>A</b></li> <li>▪ Represent situations and solve real-world problems using symbolic algebra. <b>A</b></li> <li>▪ Apply given formulas to solve real-world problems.</li> <li>▪ Solve one-step linear inequalities. <b>A</b></li> </ul>	<p><b>SPI 0806.3.2 Solve the linear equation <math>f(x) = g(x)</math>.</b>            ✓0806.3.2 Represent algebraic relationships with equations and inequalities.            ✓0806.3.13 Represent situations and solve real-world problems using symbolic algebra.</p> <p><b>SPI 0806.3.3 Solve and graph linear inequalities in two variables.</b>            ✓0806.3.4 Understand the relationship between the graph of a linear inequality and its solutions.            ✓0806.3.5 Solve linear inequalities in two variables (including those whose solutions require multiplication or division by a negative number).            ✓0806.3.8 Recognize a proportion as a special case of a linear equation and understand that the</p>	<ul style="list-style-type: none"> <li>▪ Translate a verbal expression into an algebraic expression. <b>A</b></li> <li>▪ Translate a verbal sentence into an algebraic equation. <b>A</b></li> <li>▪ Solve one- and two-step linear equations using integers (with integral coefficients and constants). <b>A</b></li> <li>▪ Solve multi-step linear equations (more than two steps, variables on only one side of the equation). <b>A</b></li> <li>▪ Solve multi-step linear equations (more than two steps, with variables on both sides of the equation). <b>A</b></li> <li>▪ Solve multi-step linear equations (more than two steps, with one set of parentheses on each side of the equation). <b>A</b></li> <li>▪ Identify the graphical representation of the solution to a one-variable inequality on a</li> </ul>	<p><b>SPI 3102.1.2 Write an equation symbolically to express a contextual problem.</b>            ✓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.</p> <p><b>SPI 3102.3.5 Write and/or solve linear equations, inequalities, and compound inequalities including those containing absolute value.</b>            ✓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</p>

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	constant of proportionality is the slope, and the resulting graph is a line through the origin.	number line. <b>A</b> <ul style="list-style-type: none"> <li>▪ Solve multi-step linear inequalities in real-world situations. <b>A</b></li> <li>▪ Select the appropriate graphical representation of a given linear inequality. <b>A</b></li> </ul>	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. <b>SPI 3102.1.5 Recognize and express the effect of changing constants and/or coefficients in problem solving.</b> ✓ 3102.1.14 Apply graphical transformations that occur when changes are made to coefficients and constants in functions.
		<ul style="list-style-type: none"> <li>▪ Select the nonlinear graph that models the given real-world situation or vice versa. <b>A</b></li> </ul>	<b>SPI 3102.1.4 Translate between representations of functions that depict real-world situations.</b> <b>SPI 3102.3.6 Interpret various relations in multiple representations.</b> ✓ 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

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			another representation, for example, change from a verbal description to a graph.
		<ul style="list-style-type: none"> <li>▪ Determine the domain and/or range of a function represented by the graph of real-world situation. <b>A</b></li> </ul>	<p><b>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.</b></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"> <li>▪ Connect the appropriate graph to a linear equation. <b>A</b></li> <li>▪ Connect symbolic expressions and graphs of lines. <b>A</b></li>   <li>▪ Interpret graphs which represent rates of change. <b>A</b></li> </ul>	<p><b>SPI 0806.3.4 Translate between various representations of a linear function.</b></p> <p>✓0806.3.9 Given a function rule, create tables of values for x and y, and plot graphs of nonlinear functions.</p> <p><b>SPI 0806.3.5 Determine the slope of a line from an equation, two given points, a table or a graph.</b></p> <p><b>SPI 0806.3.6 Analyze the graph of a linear function to find solutions, roots, and intercepts.</b></p> <p>✓0806.3.6 Identify x- and y-intercepts and slope of linear equations from an equation, graph or table.</p> <p>✓0806.3.7 Analyze situations and solve problems involving constant rate of change.</p>	<ul style="list-style-type: none"> <li>▪ Select the graph that represents a given linear function expressed in slope-intercept form. <b>A</b></li> <li>▪ Select the linear graphs that models the given real-world situation described in a narrative (no data set given). <b>A</b></li> <li>▪ Select the linear graph that models the given real-world situation described in a tabular set of data. <b>A</b></li> <li>▪ Determine the slope from the graph of a linear equation (no labeled points). <b>A</b></li> <li>▪ Apply the concept of rate of change to solve real-world problems. <b>A</b></li> <li>▪ Recognize the graphical transformation that occurs when coefficients and/or constants of the corresponding linear equations are changed. <b>A</b></li> <li>▪ Apply the concept of slope to represent rate of change in a real-world situation. <b>A</b> (formerly in Number &amp; Operations)</li> </ul>	<p><b>SPI 3102.1.6 Determine and interpret slope in multiple contexts including rate of change in real-world problems.</b></p> <p>✓3102.1.16 Understand and express the meaning of the slope and y-intercept of linear functions in real-world contexts.</p> <p><b>SPI 3102.3.8 Determine the equation of a line and/or graph a linear equation.</b></p> <p>✓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.</p> <p>✓3102.3.20 Understand that a linear equation has a constant rate of change called slope and represent slope in various forms.</p> <p>✓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.</p> <p>✓3102.3.22 Express the equation of a line in standard form, slope-</p>

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			<p>intercept, and point-slope form.</p> <ul style="list-style-type: none"> <li>✓ 3102.3.23 Determine the graph of a linear equation including those that depict contextual situations.</li> <li>✓ 3102.3.24 Interpret the changes in the slope-intercept form and graph of a linear equation by looking at different values of the parameters, <math>m</math> and <math>b</math>.</li> </ul>
	<p><b>SPI 0806.3.1 Find solutions to systems of two linear equations in two variables.</b></p> <ul style="list-style-type: none"> <li>✓ 0806.3.3 Solve systems of linear equations in two variables and relate the systems to pairs of lines that intersect, are parallel, or are the same line.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Select the system of equations that could be used to solve a given real-world problem. <b>A</b></li> </ul>	<p><b>SPI 3102.3.9 Solve systems of linear equation/inequalities in two variables.</b></p> <ul style="list-style-type: none"> <li>✓ 3102.3.27 Determine the number of solutions for a system of linear equations (0, 1, or infinitely many solutions).</li> <li>✓ 3102.3.28 Solve systems of linear equations graphically, algebraically, and with technology.</li> <li>✓ 3102.3.29 Solve contextual problems involving systems of linear equations or inequalities and interpret solutions in context.</li> </ul>
		<ul style="list-style-type: none"> <li>▪ Find the solution to a quadratic equation given in standard form (integral solutions and a leading coefficient of one) <b>A</b></li> <li>▪ Select the solution to a quadratic equation given solutions represented in graphical form (integral solutions and a leading coefficient of one). <b>A</b></li> <li>▪ Select one of the factors <math>(x + 3)</math> of a quadratic equation (integral solutions and a leading coefficient of one). <b>A</b></li> <li>▪ Select the discriminant of a quadratic equation (integral solutions and a leading coefficient of one). <b>A</b></li> </ul>	<p><b>SPI 3102.3.10 Find the solution of a quadratic equation and/or zeros of a quadratic function.</b></p> <ul style="list-style-type: none"> <li>✓ 3102.3.30 Solve quadratic equations using multiple methods: factoring, graphing, quadratic formula, or square root principle.</li> <li>✓ 3102.3.31 Determine the number of real solutions for a quadratic equation including using the discriminant and its graph.</li> <li>✓ 3102.3.32 Recognize the connection among factors, solutions (roots), zeros of related functions, and <math>x</math>-intercepts in</li> </ul>

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			equations that arise from quadratic functions.
	<p><b>SPI 0806.3.7 Identify, compare and contrast functions as linear or nonlinear.</b></p> <p>✓0806.3.10 Distinguish quadratic and exponential functions as nonlinear using a graph and/or a table of values.</p> <p>✓0806.3.11 Distinguish between the equations of linear, quadratic, and exponential functions (e.g. function families such as <math>y=x^2</math>, <math>y=2^x</math>, and <math>y=2x</math>).</p> <p>✓0806.3.12 Understand how rates of change of nonlinear functions contrast with constant rates of change of linear functions.</p>		<p><b>SPI 3102.3.11 Analyze nonlinear graphs including quadratic and exponential functions that model a contextual situation.</b></p> <p>✓3102.3.17 Recognize “families” of functions.</p> <p>✓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.</p> <p>✓3102.3.33 Recognize data that can be modeled by an exponential function.</p> <p>✓3102.3.34 Graph exponential functions in the form <math>y = a(b^x)</math> where <math>b \neq 0</math>.</p> <p>✓3102.3.35 Apply growth/decay and simple/compound interest formulas to solve contextual problems.</p>

## Algebra I – Geometry and Measurement

### Former Learning Expectations

- 3.1 Apply geometric properties, formulas, and relationships to solve real-world problems.
- 3.2 Solve problems using the midpoint formula.
- 3.3 Apply right triangle relationships including the Pythagorean Theorem and the distance formula.
- 4.1 Use concepts of length, area, and volume to estimate and solve real-world problems.
- 4.2 Apply and communicate measurement concepts and relationships in algebraic and geometric problem-solving situations.

- 4.3 Demonstrate an understanding of rates and other derived and indirect measurements (e.g., velocity, miles per hour, revolutions per minute, cost per unit).
- 4.4 Make decisions about units, scales, and measurement tools that are appropriate for problem situations involving measurement.
- 4.5 Analyze precision, accuracy, tolerance, and approximate error in measurement situations.

### New Course Level Expectations

- CLE 3102.4.1 Use algebraic reasoning in applications involving geometric formulas and contextual problems.
- CLE 3102.4.2 Apply appropriate units of measure and convert measures in problem solving situations.

Former Standards 8 <sup>th</sup> Grade Review Material	New Standards 8 <sup>th</sup> Grade Building blocks for new standards	Former Standards Algebra I Gateway 2008-2009	New Standards Algebra I New End of Course 2009-2010
<ul style="list-style-type: none"> <li>▪ Use ordered pairs to describe given points in a coordinate system. <b>A</b></li> </ul>		<ul style="list-style-type: none"> <li>▪ Identify ordered pairs in the coordinate plane. <b>A</b></li> </ul>	
<ul style="list-style-type: none"> <li>▪ Use ratios and proportions to represent real-world situations (i.e., scale drawings and probability). <b>A</b></li> <li>▪ Solve real-world problems involving rate/time/distance (i.e., <math>d = rt</math>). <b>A</b></li> <li>▪ Solve problems involving scale factors using ratios and proportion. <b>A</b></li> <li>▪ Recognize similar geometric figures. <b>A</b></li> </ul>		<ul style="list-style-type: none"> <li>▪ Apply proportion and the concepts of similar triangles to find the length of a missing side of a triangle. <b>A</b></li> </ul>	
<ul style="list-style-type: none"> <li>▪ Calculate rates involving cost per unit to determine the best buy. <b>A</b></li> </ul>		<ul style="list-style-type: none"> <li>▪ Calculate rates involving cost per unit to determine the best buy (no more than three samples). <b>A</b></li> </ul>	
<ul style="list-style-type: none"> <li>▪ Estimate length, perimeter, circumference, area, and volume using a variety of strategies. <b>A</b></li> <li>▪ Apply formulas to find the circumference and area of circles. <b>A</b></li> <li>▪ Apply formulas to find the area of triangles, parallelograms, and trapezoids. <b>A</b></li> <li>▪ Estimate or find the area of irregular and complex shapes. <b>A</b></li> </ul>		<ul style="list-style-type: none"> <li>▪ Estimate the area of irregular geometric figures on a grid. <b>A</b></li> <li>▪ Apply the given formula to determine the area or perimeter of a rectangle. <b>A</b></li> <li>▪ Apply the given formula to find the area of a circle, the circumference of a circle, or the volume of a rectangular solid.</li> <li>▪ Select the area representation for a given product of two one-variable binomials with positive</li> </ul>	<p><b>SPI 3102.4.1 Develop and apply strategies to estimate the area of any shape on a plane grid.</b></p> <p>✓3102.4.1 Using algebraic expressions solve for measures in geometric figures as well as for perimeter, area, and volume.</p>

		constants and coefficients. <b>A</b>	
<ul style="list-style-type: none"> <li>Solve real-world problems using the Pythagorean theorem (no radicals). <b>A</b></li> </ul>	<p><b>SPI 0806.4.1 Use the Pythagorean theorem to solve contextual problems.</b></p> <ul style="list-style-type: none"> <li>✓0806.4.1 Model the Pythagorean Theorem.</li> <li>✓0806.4.2 Use the converse of the Pythagorean Theorem to determine if a triangle is a right triangle.</li> </ul>	<ul style="list-style-type: none"> <li>Apply the given Pythagorean Theorem to a real life problem illustrated by a diagram (no radicals in answer). <b>A</b></li> </ul>	<p><b>SPI 3102.4.2 Solve contextual problems using the Pythagorean Theorem.</b></p> <ul style="list-style-type: none"> <li>✓3102.4.2 Use the Pythagorean Theorem to find the missing measure in a right triangle including those from real-world situations.</li> </ul>
	<p><b>SPI 0806.4.2 Apply the Pythagorean theorem to find distances between points in the coordinate plane to measure lengths and analyze polygons and polyhedra.</b></p>	<ul style="list-style-type: none"> <li>Calculate the distance between two points given the Pythagorean Theorem and the distance formula. <b>A</b></li> </ul>	<p><b>SPI 3102.4.3 Solve problems involving the distance between points or midpoint of a segment.</b></p> <ul style="list-style-type: none"> <li>✓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.</li> <li>✓3102.4.4 Develop the midpoint formula for segments on a number line or in the coordinate plane.</li> </ul>
<ul style="list-style-type: none"> <li>Convert from one unit to another within the same system. <b>A</b></li> </ul>	<p><b>SPI 0806.4.4 Convert between and within the U.S. Customary System and the metric system.</b></p> <ul style="list-style-type: none"> <li>✓0806.4.6 Make within-system and between-system conversions of derived quantities including distance, temperature, and money.</li> </ul>		<p><b>SPI 3102.4.4 Convert rates and measurements.</b></p> <ul style="list-style-type: none"> <li>✓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.</li> </ul>
<ul style="list-style-type: none"> <li>Apply spatial reasoning and visualization to solve real-world problems. <b>A</b></li> <li>Apply geometric ideas and relationships in areas outside the mathematics classroom (i.e., art, science, and everyday life). <b>A</b></li> </ul>			

<ul style="list-style-type: none"> <li>▪ Determine the measure of an angle of a triangle given the measures of the other two angles. <b>A</b></li> <li>▪ Identify relationships among the angles (i.e., complementary, supplementary, interior, exterior, vertical, and corresponding). <b>A</b></li> <li>▪ Solve problems using angle relationships (i.e., complementary, supplementary, interior, exterior, vertical, and corresponding). <b>A</b></li> </ul>	<p><b>SPI 0806.4.3 Find measures of the angles formed by parallel lines cut by a transversal.</b></p> <ul style="list-style-type: none"> <li>✓0806.4.5 Analyze the congruent and supplementary relationships of angles formed by parallel lines and transversals (such as alternate interior, alternate exterior, corresponding, and adjacent).</li> </ul>		
	<p><b>SPI 0806.4.5 Identify the intersection of two or more geometric figures in the plane.</b></p> <ul style="list-style-type: none"> <li>✓0806.4.7 Visualize or describe the cross-section resulting from the intersection of a plane with a 3-dimensional figure.</li> <li>✓0806.4.8 Build, draw, and work with 2- and 3-dimensional figures by means of orthogonal views, projective views, and/or nets.</li> </ul>		
<ul style="list-style-type: none"> <li>▪ Select units of appropriate size and type to measure angles, perimeter, area, surface area, and volume. <b>A</b></li> </ul>	<ul style="list-style-type: none"> <li>✓0806.4.3 Select or use the appropriate measurement instrument to determine or create a given length, area, volume, angle, weight, or mass.</li> <li>✓0806.4.4 Understand how the precision of measurement influences accuracy of quantities derived from these measurements.</li> </ul>		
<ul style="list-style-type: none"> <li>▪ Apply relationships among the angles and side lengths of similar geometric figures. <b>A</b></li> <li>▪</li> </ul>			
<ul style="list-style-type: none"> <li>▪ Classify types of two- and three-dimensional objects using their defining properties. <b>A</b></li> </ul>			

## Algebra I – Data Analysis, Probability, and Statistics

### Former Learning Expectations

- 5.1 Collect, represent, and describe linear and nonlinear data sets developed from the real world.
- 5.2 Make predictions from a linear data set using a line of best fit.
- 5.3 Interpret a set of data using the appropriate measure of central tendency.
- 5.4 Choose, construct, and analyze appropriate graphical representations for a data set.
- 5.5 Demonstrate an understanding of the concept of random sampling.

- 5.6 Apply counting principles of permutations and combinations using appropriate technology.
- 5.7 Model situations to determine theoretical and experimental probabilities.

### New Course Level Expectations

- CLE 3102.5.1 Describe and interpret quantitative information.
- CLE 3102.5.2 Use statistical thinking to draw conclusions and make predictions.
- CLE 3102.5.3 Understand basic counting procedures and concepts of probability.

Former Standards 8 <sup>th</sup> Grade Review Material	New Standards 8 <sup>th</sup> Grade Building blocks for new standards	Former Standards Algebra I Gateway 2008-2009	New Standards Algebra I New End of Course 2009-2010
<ul style="list-style-type: none"> <li>▪ Interpret appropriate graphical representations of data (i.e., histograms, box plots, and scatterplots). <b>A</b></li> <li>▪ Recognize misleading presentations of data. <b>A</b></li> </ul>	<p><b>SPI 0806.5.4 Recognize misrepresentations of published data in the media.</b></p> <ul style="list-style-type: none"> <li>✓0806.5.8 Consider the source, design, analysis, and display of data to evaluate statistics reported in the media.</li> <li>✓0806.5.4 Explain the benefits and the limitations of various representations of data (i.e., bar graphs, line graphs, circle graphs, histograms, stem-and-leaf plots, box plots, scatterplots).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Interpret bar graphs representing real-world data. <b>A</b></li> <li>▪ Interpret circle graphs (pie charts) representing real-world data. <b>A</b></li> </ul>	<p><b>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).</b></p> <ul style="list-style-type: none"> <li>✓ 3102.5.1 Identify patterns or trends in data.</li> <li>✓ 3102.5.2 Develop a meaning for and identify outliers in a data set and verify.</li> <li>✓ 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).</li> <li>✓ 3102.5.6 Draw qualitative graphs of functions and describe a general trend or shape.</li> <li>✓ 3102.5.7 Compare two data sets using graphs and descriptive statistics.</li> </ul>
<ul style="list-style-type: none"> <li>▪ Determine the mean of a given set of real-world data. <b>A</b></li> <li>▪ Determine the median of a given set of real-world data (even number of data). <b>A</b></li> </ul>		<ul style="list-style-type: none"> <li>▪ Determine the mean (average) of a given set of real-world data (no more than five two-digit numbers). <b>A</b></li> <li>▪ Determine the median for a given set of real-world data (even number of data). <b>A</b></li> </ul>	<p><b>SPI 3102.5.2 Identify the effect on mean, median, mode, and range when values in the data set are changed.</b></p> <ul style="list-style-type: none"> <li>✓ 3102.5.3 .When a set of data is changed, identify effects on measures of central tendency, range, and inter-quartile range.</li> <li>✓ 3102.5.4 Explore quartiles,</li> </ul>

<b>Former Standards 8<sup>th</sup> Grade</b> Review Material	<b>New Standards 8<sup>th</sup> Grade</b> Building blocks for new standards	<b>Former Standards Algebra I</b> Gateway 2008-2009	<b>New Standards Algebra I</b> New End of Course 2009-2010
<ul style="list-style-type: none"> <li>▪ Connect data sets and their graphical representations (i.e., histograms, stem-and-leaf plots, box plots, and scatterplots). <b>A</b></li> <li>Make conjectures and predictions based on data. <b>A</b></li> </ul>	<p><b>SPI 0806.5.3 Generalize the relationship between two sets of data using scatterplots and lines of best fit.</b></p> <ul style="list-style-type: none"> <li>✓0806.5.5 Create and interpret box-and-whisker plots and scatterplots.</li> <li>✓0806.5.6 Use observations about differences between two or more samples to make conjectures about the populations from which the samples were taken.</li> <li>✓0806.5.7 Estimate lines of best fit to make and test conjectures.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Choose the matching linear graph given a set of ordered pairs. <b>A</b></li> <li>▪ Make a prediction from the graph of a real-world linear data set. <b>A</b></li> </ul>	<p>deciles, and percentiles of a distribution.</p> <p><b>SPI 3102.5.3 Using a scatter-plot, determine if a linear relationship exists and describe the association between variables.</b></p> <p><b>SPI 3102.5.4 Generate the equation of a line that fits linear data and use it to make a prediction.</b></p> <ul style="list-style-type: none"> <li>✓ 3102.5.8 Examine real-world graphical relationship (including scatter-plots) to determine type of relationship (linear or nonlinear) and any association (positive, negative or none) between the variables of the data set.</li> <li>✓ 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.</li> <li>✓ 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.</li> <li>✓ 3102.5.11 Use an equation that fits data to make a prediction.</li> </ul>
<ul style="list-style-type: none"> <li>▪ Connect the symbolic representation of a probability to an experiment. <b>A</b></li> <li>▪ Identify an appropriate sample to test a given hypothesis. <b>A</b></li> </ul>	<p><b>SPI 0806.5.1 Calculate probabilities of events for simple experiments with equally probable outcomes.</b></p> <p><b>SPI 0806.5.2 Use a variety of methods to compute probabilities for compound events (e.g., multiplication, organized lists, tree diagrams, area models).</b></p> <ul style="list-style-type: none"> <li>✓0806.5.1 Solve simple problems</li> </ul>	<ul style="list-style-type: none"> <li>▪ Apply counting principles of permutations or combinations in real-world situations. <b>A</b></li> </ul>	<p><b>SPI 3102.5.5 Determine theoretical and/or experimental probability of an event and/or its complement including using relative frequency.</b></p> <ul style="list-style-type: none"> <li>✓ 3102.5.12 Use techniques (Venn Diagrams, tree diagrams, or counting procedures) to identify the possible outcomes of an experiment or sample</li> </ul>

<b>Former Standards 8<sup>th</sup> Grade</b> Review Material	<b>New Standards 8<sup>th</sup> Grade</b> Building blocks for new standards	<b>Former Standards Algebra I</b> Gateway 2008-2009	<b>New Standards Algebra I</b> New End of Course 2009-2010
	<p>involving probability and relative frequency.</p> <ul style="list-style-type: none"> <li>✓0806.5.2 Compare probabilities of two or more events and recognize when certain events are equally likely.</li> <li>✓0806.5.3 Recognize common misconceptions associated with dependent and independent events.</li> </ul>		<p>space and compute the probability of an event.</p> <ul style="list-style-type: none"> <li>✓ 3102.5.13 Determine the complement of an event and the probability of that complement.</li> <li>✓ 3102.5.15 Explore joint and conditional probability.</li> <li>✓ 3102.5.14 Determine if two events are independent or dependent.</li> <li>✓ 3102.5.16 Identify situations for which the Law of Large Numbers applies.</li> <li>✓ 3102.5.17 Perform simulations to estimate probabilities.</li> <li>✓ 3102.5.18 Make informed decisions about practical situations using probability concepts.</li> </ul>