**Algebra I – Expanded Crosswalk: 2009 and 2016 *Mathematics Standards of Learning* and *Curriculum Framework***

**Comparison of Mathematics Standards of Learning (SOL) and Essential Knowledge and Skills (EKS) – 2009 SOL to 2016 SOL**

| **2009 SOL** | **2016 SOL** |
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| **Expressions and Operations** |
| A.1 The student will represent verbal quantitative situations algebraically and evaluate these expressions for given replacement values of the variables.* Translate verbal quantitative situations into algebraic expressions and vice versa.
* Model real-world situations with algebraic expressions in a variety of representations (concrete, pictorial, symbolic, verbal).
* Evaluate algebraic expressions for a given replacement set to include rational numbers.
* Evaluate expressions that contain absolute value, square roots, and cube roots.
 | A.1 The student will1. represent verbal quantitative situations algebraically; and
2. evaluate algebraic expressions for given replacement values of the variables.
* Translate between verbal quantitative situations and algebraic expressions and equations. (a)

Equations are now included along with expressions. **NEW!*** Represent practical situations with algebraic expressions in a variety of representations (e.g., concrete, pictorial, symbolic, verbal). (a)
* Evaluate algebraic expressions, using the order of operations, which include absolute value, square roots, and cube roots for given replacement values to include rational numbers, without rationalizing the denominator. (b)

Expressions may contain absolute value, square roots, and cube roots without rationalizing denominators **CLARIFICATION** |
| A.2 The student will perform operations on polynomials, including1. applying the laws of exponents to perform operations on expressions;
2. adding, subtracting, multiplying, and dividing polynomials; and
3. factoring completely first- and second-degree binomials and trinomials in one or two variables. Graphing calculators will be used as a tool for factoring and for confirming algebraic factorizations. **MOVED to A.2c Essential Knowledge and Skills (EKS)**
* Simplify monomial expressions and ratios of monomial expressions in which the exponents are integers, using the laws of exponents.
* Model sums, differences, products, and quotients of polynomials with concrete objects and their related pictorial representations.
* Relate concrete and pictorial manipulations that model polynomial operations to their corresponding symbolic representations.
* Find sums and differences of polynomials.
* Find products of polynomials. The factors will have no more than five total terms (i.e. (4*x*+2)(3*x*+5) represents four terms and (*x*+1)(2*x*2 +*x*+3) represents five terms).
* Find the quotient of polynomials, using a monomial or binomial divisor, or a completely factored divisor.
* Factor completely first- and second-degree polynomials with integral coefficients.
* ~~Identify prime polynomials.~~ **REMOVED FROM ALGEBRA I**
* Use the x-intercepts from the graphical representation of the polynomial to determine and confirm its factors. **MOVED to A.7c,d**

NOTE: Students no longer identify a polynomial as prime | A.2 The student will perform operations on polynomials, including1. applying the laws of exponents to perform operations on expressions;
2. adding, subtracting, multiplying, and dividing polynomials; and
3. factoring completely first- and second-degree binomials and trinomials in one variable.
* Simplify monomial expressions and ratios of monomial expressions in which the exponents are integers, using the laws of exponents. (a)
* Model sums, differences, products, and quotients of polynomials with concrete objects and their related pictorial and symbolic representations. (b)

Includes both pictorial and symbolic representations **CLARIFICATION**Products of polynomials limited to five or fewer terms **CLARIFICATION*** Determine sums and differences of polynomials. (b)
* Determine products of polynomials. The factors should be limited to five or fewer terms (i.e., (4*x* + 2)(3*x* + 5) represents four terms and (*x* + 1)(2*x*2 + *x* + 3) represents five terms). (b)
* Determine the quotient of polynomials, using a monomial or binomial divisor, or a completely factored divisor. (b)
* Factor completely first- and second-degree polynomials in one variable with integral coefficients. After factoring out the greatest common factor (GCF), leading coefficients should have no more than four factors. (c)

Factoring binomials or trinomials limited to one variable (two variables included in Algebra II) and limit the leading coefficient to be an integer with no more than four factors after factoring out a greatest common factor **PARAMETER CHANGE*** Factor and verify algebraic factorizations of polynomials with a graphing utility. (c)
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| A.3 The student will express the square roots and cube roots of whole numbers and the square root of a monomial algebraic expression in simplest radical form.* Express square roots of a whole number in simplest form.
* Express the cube root of a whole number in simplest form.
* Express the principal square root of a monomial algebraic expression in simplest form where variables are assumed to have positive values.
 | A.3 The student will simplify1. square roots of whole numbers and monomial algebraic expressions;
2. cube roots of integers; and
3. numerical expressions containing square or cube roots.
* Express the square root of a whole number in simplest form. (a)
* Express the principal square root of a monomial algebraic expression in simplest form where variables are assumed to have positive values. (a)
* Express the cube root of an integer in simplest form. (b)

 Simplify cube roots of all integers (previously limited to whole numbers)  **NEW!*** Simplify a numerical expression containing square or cube roots. (c)
* Add, subtract, and multiply two monomial radical expressions limited to a numerical radicand. (c)

Simplify numerical expressions containing square or cube roots and add, subtract, and multiply two monomial radical expressions limited to a numerical radicand **NEW!** |
| **Equations and Inequalities** |
| A.4 The student will solve multistep linear and quadratic equations in two variables, including1. solving literal equations (formulas) for a given variable; **MOVED TO A.4c**
2. justifying steps used in simplifying expressions and solving equations, using field properties and axioms of equality that are valid for the set of real numbers and its subsets; **MOVED to A.4a,b EKS**
3. solving quadratic equations algebraically and graphically; **MOVED TO A.4b**
4. solving multistep linear equations algebraically and graphically; **MOVED TO A.4a**
5. solving systems of two linear equations in two variables algebraically and graphically; and **MOVED TO A.4d**
6. solving real-world problems involving equations and systems of equations.

**MOVED TO A.4e**Graphing calculators will be used both as a primary tool in solving problems and to verify algebraic solutions. **MOVED to A.4 EKS*** Solve a literal equation (formula) for a specified variable.
* Simplify expressions and solve equations, using the field properties of the real numbers and properties of equality to justify simplification and solution.
* Solve quadratic equations.
* Identify the roots or zeros of a quadratic function over the real number system as the solution(s) to the quadratic equation that is formed by setting the given quadratic expression equal to zero. **MOVED to A.7c**
* Solve multistep linear equations in one variable.
* Confirm algebraic solutions to linear and quadratic equations, using a graphing calculator.
* Given a system of two linear equations in two variables that has a unique solution, solve the system by substitution or elimination to find the ordered pair which satisfies both equations.
* Given a system of two linear equations in two variables that has a unique solution, solve the system graphically by identifying the point of intersection.
* Determine whether a system of two linear equations has one solution, no solution, or infinite solutions.
* Write a system of two linear equations that models a real-world situation.
* Interpret and determine the reasonableness of the algebraic or graphical solution of a system of two linear equations that models a real-world situation.
* Determine if a linear equation in one variable has one, an infinite number, or no solutions.†

 †Revised March 2011 | A.4 The student will solve 1. multistep linear equations in one variable algebraically;
2. quadratic equations in one variable algebraically;
3. literal equations for a specified variable;
4. systems of two linear equations in two variables algebraically and graphically; and
5. practical problems involving equations and systems of equations.
* Determine whether a linear equation in one variable has one, an infinite number, or no solutions. (a)
* Apply the properties of real numbers and properties of equality to simplify expressions and solve equations. (a, b)

Apply properties of real numbers and properties of equality **PARAMETER CHANGE*** Solve multistep linear equations in one variable algebraically. (a)
* Solve quadratic equations in one variable algebraically. Solutions may be rational or irrational. (b)

Clarified that both rational and irrational solutions to quadratics will be included **CLARIFICATION*** Solve a literal equation for a specified variable. (c)
* Given a system of two linear equations in two variables that has a unique solution, solve the system by substitution or elimination to identify the ordered pair which satisfies both equations. (d)
* Given a system of two linear equations in two variables that has a unique solution, solve the system graphically by identifying the point of intersection. (d)
* Solve and confirm algebraic solutions to a system of two linear equations using a graphing utility. (d)
* Determine whether a system of two linear equations has one, an infinite number, or no solutions. (d)
* Write a system of two linear equations that models a practical situation. (e)
* Interpret and determine the reasonableness of the algebraic or graphical solution of a system of two linear equations that models a practical situation. (e)
* Solve practical problems involving equations and systems of equations. (e)
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| A.5 The student will solve multistep linear inequalities in two variables, including1. solving multistep linear inequalities algebraically and graphically;
2. justifying steps used in solving inequalities, using axioms of inequality and properties of order that are valid for the set of real numbers and its subsets; **MOVED to A.5a EKS**
3. solving real-world problems involving inequalities; and
4. solving systems of inequalities.
* Solve multistep linear inequalities in one variable.
* Justify steps used in solving inequalities, using axioms of inequality and properties of order that are valid for the set of real numbers.
* Solve real-world problems involving inequalities.
* Solve systems of linear inequalities algebraically and graphically.
 | A.5 The student will 1. solve multistep linear inequalities in one variable algebraically and represent the solution graphically;
2. represent the solution of linear inequalities in two variables graphically;
3. solve practical problems involving inequalities; and
4. represent the solution to a system of inequalities graphically.
* Solve multistep linear inequalities in one variable algebraically and represent the solution graphically. (a)

Clarified that solving multistep linear inequalities in one variable would be algebraic and representing a solution would be graphical **CLARIFICATION*** Apply the properties of real numbers and properties of inequality to solve multistep linear inequalities in one variable algebraically. (a)

Apply properties of real numbers and properties of inequality **PARAMETER CHANGE*** Represent the solution of a linear inequality in two variables graphically. (b)
* Solve practical problems involving linear inequalities. (c)
* Determine whether a coordinate pair is a solution of a linear inequality or a system of linear inequalities. (c) **NEW!**
* Represent the solution of a system of two linear inequalities graphically. (d)

Clarified that solutions to systems of inequalities should be represented graphically **CLARIFICATION*** Determine and verify algebraic solutions using a graphing utility.

(a, b, c, d) **NEW!** |
| A.6 The student will graph linear equations and linear inequalities in two variables, includinga) determining the slope of a line when given an equation of the line, the graph of the line, or two points on the line. Slope will be described as rate of change and will be positive, negative, zero, or undefined; andb) writing the equation of a line when given the graph of the line, two points on the line, or the slope and a point on the line.* Graph linear equations and inequalities in two variables, including those that arise from a variety of real-world situations.

Graph linear inequalities **MOVED to A.5b**Graph linear equations **MOVED to A.6c*** Use the parent function y = x and describe transformations defined by changes in the slope or y-intercept.
* Find the slope of the line, given the equation of a linear function.
* Find the slope of a line, given the coordinates of two points on the line.
* Find the slope of a line, given the graph of a line.
* Recognize and describe a line with a slope that is positive, negative, zero, or undefined.
* Use transformational graphing to investigate effects of changes in equation parameters on the graph of the equation.
* Write an equation of a line when given the graph of a line.
* Write an equation of a line when given two points on the line whose coordinates are integers.
* Write an equation of a line when given the slope and a point on the line whose coordinates are integers.
* Write an equation of a vertical line as *x* = a.
* Write the equation of a horizontal line as *y* = *c*.
 | A.6 The student will 1. determine the slope of a line when given an equation of the line, the graph of the line, or two points on the line;
2. write the equation of a line when given the graph of the line, two points on the line, or the slope and a point on the line; and
3. graph linear equations in two variables.
* Determine the slope of the line, given the equation of a linear function. (a)
* Determine the slope of a line, given the coordinates of two points on the line. (a)
* Determine the slope of a line, given the graph of a line. (a)
* Recognize and describe a line with a slope or rate of change that is positive, negative, zero, or undefined. (a)
* Write the equation of a line when given the graph of a line. (b)
* Write the equation of a line when given two points on the line whose coordinates are integers. (b)
* Write the equation of a line when given the slope and a point on the line whose coordinates are integers. (b)
* Write the equation of a vertical line as x = a. (b)
* Write the equation of a horizontal line as y = c. (b)
* Write the equation of a line parallel or perpendicular to a given line through a given point. (b) **NEW!**
* Graph a linear equation in two variables, including those that arise from a variety of practical situations. (c)
* Use the parent function y = x and describe transformations defined by changes in the slope or y-intercept. (c)
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| **Functions** |
| A.7 The student will investigate and analyze function (linear and quadratic) families and their characteristics both algebraically and graphically, including1. determining whether a relation is a function;
2. domain and range;
3. zeros of a function;
4. *x*- and *y*-intercepts;
5. finding the values of a function for elements in its domain; and
6. making connections between and among multiple representations of functions including concrete, verbal, numeric, graphic, and algebraic.
* Determine whether a relation, represented by a set of ordered pairs, a table, or a graph is a function.
* Identify the domain, range, zeros, and intercepts of a function presented algebraically or graphically.
* For each *x* in the domain of *f*, find *f*(*x*).
* Represent relations and functions using concrete, verbal, numeric, graphic, and algebraic forms. Given one representation, students will be able to represent the relation in another form.
* ~~Detect patterns in data and represent arithmetic and geometric patterns algebraically.~~ **REMOVED FROM ALGEBRA I – INCLUDED IN ALGEBRA II**
 | A.7 The student will investigate and analyze linear and quadratic function families and their characteristics both algebraically and graphically, including1. determining whether a relation is a function;
2. domain and range;
3. zeros;
4. intercepts;
5. values of a function for elements in its domain; and
6. connections between and among multiple representations of functions using verbal descriptions, tables, equations, and graphs.
* Determine whether a relation, represented by a set of ordered pairs, a table, a mapping, or a graph is a function. (a)

Determine whether a relation represented by a mapping is a function **NEW!** * Identify the domain, range, zeros, and intercepts of a function presented algebraically or graphically. (b, c, d)
* Use the *x*-intercepts from the graphical representation of a quadratic function to determine and confirm its factors. (c, d)
* For any value, *x,* in the domain of *f*, determine *f*(*x*). (e)
* Represent relations and functions using verbal descriptions, tables, equations, and graph. Given one representation, represent the relation in another form. (f)
* Investigate and analyze characteristics and multiple representations of functions with a graphing utility. (a, b, c, d, e, f) **NEW!**
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| **Statistics** |
| A.8 The student, given a situation in a real-world context, will analyze a relation to determine whether a direct or inverse variation exists, and represent a direct variation algebraically and graphically and an inverse variation algebraically.* Given a situation, including a real-world situation, determine whether a direct variation exists.
* Given a situation, including a real-world situation, determine whether an inverse variation exists.
* Write an equation for a direct variation, given a set of data.
* Write an equation for an inverse variation, given a set of data.
* Graph an equation representing a direct variation, given a set of data.
 | A.8 The student, given a data set or practical situation, will analyze a relation to determine whether a direct or inverse variation exists, and represent a direct variation algebraically and graphically and an inverse variation algebraically.* Given a data set or practical situation, determine whether a direct variation exists.
* Given a data set or practical situation, determine whether an inverse variation exists.
* Given a data set or practical situation, write an equation for a direct variation.
* Given a data set or practical situation, write an equation for an inverse variation.
* Given a data set or practical situation, graph an equation representing a direct variation.
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| A.9 ~~The student, given a set of data, will interpret variation in real-world contexts and calculate and interpret mean absolute deviation, standard deviation, and z-scores.~~ **REMOVED FROM ALGEBRA I** * ~~Analyze descriptive statistics to determine the implications for the real-world situations from which the data derive.~~ **REMOVED FROM ALGEBRA I**
* ~~Given data, including data in a real-world context, calculate and interpret the mean absolute deviation of a data set.~~ **REMOVED FROM ALGEBRA I**
* ~~Given data, including data in a real-world context, calculate variance and standard deviation of a data set and interpret the standard deviation.~~ **REMOVED FROM ALGEBRA I**
* ~~Given data, including data in a real-world context, calculate and interpret z-scores for a data set~~. **REMOVED FROM ALGEBRA I**
* ~~Explain ways in which standard deviation addresses dispersion by examining the formula for standard deviation.~~ **REMOVED FROM ALGEBRA I**
* ~~Compare and contrast mean absolute deviation and standard deviation in a real-world context.~~ **REMOVED FROM ALGEBRA I**

**NOTE: Select essential knowledge and skills from this standard is included in Algebra, Functions, and Data Analysis and/or Algebra II** |  |
| A.10 ~~The student will compare and contrast multiple univariate data sets, using box- and-whisker plots.~~ **REMOVED FROM ALGEBRA I*** ~~Compare, contrast, and analyze data, including data from real-world situations displayed in box-and-whisker plots~~. **REMOVED FROM ALGEBRA I**

**NOTE: Select essential knowledge and skills from this standard is now included in Grade 8 Mathematics.** |  |
| A.11 The student will collect and analyze data, determine the equation of the curve of best fit in order to make predictions, and solve real-world problems, using mathematical models. Mathematical models will include linear and quadratic functions. **MOVED to A.9** * Write an equation for a curve of best fit, given a set of no more than twenty data points in a table, a graph, or real-world situation.
* Make predictions about unknown outcomes, using the equation of the curve of best fit.
* ~~Design experiments and collect data to address specific, real-world questions.~~ **REMOVED FROM ALGEBRA I**
* Evaluate the reasonableness of a mathematical model of a real-world situation.
 | A.9 The student will collect and analyze data, determine the equation of the curve of best fit in order to make predictions, and solve practical problems, using mathematical models of linear and quadratic functions. * Determine an equation of a curve of best fit, using a graphing utility, given a set of no more than twenty data points in a table, a graph, or a practical situation.

Clarified to be performed with the use of a graphing utility **CLARIFICATION*** Make predictions, using data, scatterplots, or the equation of the curve of best fit.
* Solve practical problems involving an equation of the curve of best fit.
* Evaluate the reasonableness of a mathematical model of a practical situation.
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