Virginia Mathematics

Algebra 1

Expressions and Operations A.EO	**EO.1** The student will represent verbal quantitative situations algebraically and evaluate these expressions for given replacement values of the variables. A.EO.1
	EO.2 The student will perform operations on and factor polynomial expressions in one variable. A.EO.2
	EO.3 The student will derive and apply the laws of exponents. A.EO.3
	EO.4 The student will simplify and determine equivalent radical expressions involving square roots of whole numbers and cube roots of integers. A.EO.4
Translate between verbal quantitative situations and algebraic expressions, including contextual situations. A.EO.1.A	**a** Translate between verbal quantitative situations and algebraic expressions, including contextual situations. A.EO.1.A
Evaluate algebraic expressions which include absolute value, square roots, and cube roots for given replacement values to include rational numbers, without rationalizing the denominator. A.EO.1.B	**b** Evaluate algebraic expressions which include absolute value, square roots, and cube roots for given replacement values to include rational numbers, without rationalizing the denominator. A.EO.1.B
Determine sums and differences of polynomial expressions in one variable, using a variety of strategies, including concrete objects and their related pictorial and symbolic models. A.EO.2.A	**a** Determine sums and differences of polynomial expressions in one variable, using a variety of strategies, including concrete objects and their related pictorial and symbolic models. A.EO.2.A

Determine the product of polynomial expressions in one variable, using a variety of strategies, including concrete objects and their related pictorial and symbolic models, the application of the distributive property, and the use of area models. The factors should be limited to five or fewer terms (e.g., (4x + 2)(3x + 5) represents four terms and (x + 1)(2x 2 + x + 3) represents five terms). A.EO.2.B	b Determine the product of polynomial expressions in one variable, using a variety of strategies, including concrete objects and their related pictorial and symbolic models, the application of the distributive property, and the use of area models. The factors should be limited to five or fewer terms (e.g., (4x + 2)(3x + 5) represents four terms and (x + 1)(2x 2 + x + 3) represents five terms). A.EO.2.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. A.EO.2.C	c 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. A.EO.2.C
Determine the quotient of polynomials, using a monomial or binomial divisor, or a completely factored divisor. A.EO.2.D	d Determine the quotient of polynomials, using a monomial or binomial divisor, or a completely factored divisor. A.EO.2.D
Represent and demonstrate equality of quadratic expressions in different forms (e.g., concrete, verbal, symbolic, and graphical). A.EO.2.E	e Represent and demonstrate equality of quadratic expressions in different forms (e.g., concrete, verbal, symbolic, and graphical). A.EO.2.E
Derive the laws of exponents through explorations of patterns,	a Derive the laws of exponents through explorations of patterns, to include products, quotients, and powers of bases. A.EO.3.A

to include products, quotients, and powers of bases. A.EO.3.A	
Simplify multivariable expressions and ratios of monomial expressions in which the exponents are integers, using the laws of exponents. A.EO.3.B	**b** Simplify multivariable expressions and ratios of monomial expressions in which the exponents are integers, using the laws of exponents. A.EO.3.B
Simplify and determine equivalent radical expressions involving the square root of a whole number in simplest form. A.EO.4.A	**a** Simplify and determine equivalent radical expressions involving the square root of a whole number in simplest form. A.EO.4.A
Simplify and determine equivalent radical expressions involving the cube root of an integer. A.EO.4.B	**b** Simplify and determine equivalent radical expressions involving the cube root of an integer. A.EO.4.B
Add, subtract, and multiply radicals, limited to numeric square and cube root expressions. A.EO.4.C	**c** Add, subtract, and multiply radicals, limited to numeric square and cube root expressions. A.EO.4.C
Generate equivalent numerical expressions and justify their equivalency for radicals using rational exponents, limited to rational exponents of 1 2 and 1 3 (e.g., √5 = 5 1 2; √8 3 = 8 1 3 = (2 3) 1 3 = 2). A.EO.4.D	**d** Generate equivalent numerical expressions and justify their equivalency for radicals using rational exponents, limited to rational exponents of 1 2 and 1 3 (e.g., √5 = 5 1 2; √8 3 = 8 1 3 = (2 3) 1 3 = 2). A.EO.4.D
Equations and Inequalities	**EI.1** The student will represent, solve, explain, and interpret the solution to multistep linear equations and inequalities in one variable and literal equations for a specified variable. A.EI.1

	EI.2 The student will represent, solve, explain, and interpret the solution to a system of two linear equations, a linear inequality in two variables, or a system of two linear inequalities in two variables. A.EI.2
	EI.3 The student will represent, solve, and interpret the solution to a quadratic equation in one variable. A.EI.3
Write a linear equation or inequality in one variable to represent a contextual situation. A.EI.1.A	**a** Write a linear equation or inequality in one variable to represent a contextual situation. A.EI.1.A
Solve multistep linear equations in one variable, including those in contextual situations, by applying the properties of real numbers and/or properties of equality. A.EI.1.B	**b** Solve multistep linear equations in one variable, including those in contextual situations, by applying the properties of real numbers and/or properties of equality. A.EI.1.B
Solve multistep linear inequalities in one variable algebraically and graph the solution set on a number line, including those in contextual situations, by applying the properties of real numbers and/or properties of inequality. A.EI.1.C	**c** Solve multistep linear inequalities in one variable algebraically and graph the solution set on a number line, including those in contextual situations, by applying the properties of real numbers and/or properties of inequality. A.EI.1.C
Rearrange a formula or literal equation to solve for a specified variable by applying the properties of equality. A.EI.1.D	**d** Rearrange a formula or literal equation to solve for a specified variable by applying the properties of equality. A.EI.1.D
Determine if a linear equation in one variable has one solution, no solution, or an infinite number of solutions. A.EI.1.E	**e** Determine if a linear equation in one variable has one solution, no solution, or an infinite number of solutions. A.EI.1.E

Verify possible solution(s) to multistep linear equations and inequalities in one variable algebraically, graphically, and with technology to justify the reasonableness of the answer(s). Explain the solution method and interpret solutions for problems given in context. A.EI.1.F	**f** **Verify possible solution(s) to multistep linear equations and inequalities in one variable algebraically, graphically, and with technology to justify the reasonableness of the answer(s). Explain the solution method and interpret solutions for problems given in context.** A.EI.1.F
Create a system of two linear equations in two variables to represent a contextual situation. A.EI.2.A	**a** **Create a system of two linear equations in two variables to represent a contextual situation.** A.EI.2.A
Apply the properties of real numbers and/or properties of equality to solve a system of two linear equations in two variables, algebraically and graphically. A.EI.2.B	**b** **Apply the properties of real numbers and/or properties of equality to solve a system of two linear equations in two variables, algebraically and graphically.** A.EI.2.B
Determine whether a system of two linear equations has one solution, no solution, or an infinite number of solutions. A.EI.2.C	**c** **Determine whether a system of two linear equations has one solution, no solution, or an infinite number of solutions.** A.EI.2.C
Create a linear inequality in two variables to represent a contextual situation. A.EI.2.D	**d** **Create a linear inequality in two variables to represent a contextual situation.** A.EI.2.D
Represent the solution of a linear inequality in two variables graphically on a coordinate plane. A.EI.2.E	**e** **Represent the solution of a linear inequality in two variables graphically on a coordinate plane.** A.EI.2.E

Create a system of two linear inequalities in two variables to represent a contextual situation. A.EI.2.F	**f** **Create a system of two linear inequalities in two variables to represent a contextual situation.** A.EI.2.F
Represent the solution set of a system of two linear inequalities in two variables, graphically on a coordinate plane. A.EI.2.G	**g** **Represent the solution set of a system of two linear inequalities in two variables, graphically on a coordinate plane.** A.EI.2.G
Verify possible solution(s) to a system of two linear equations, a linear inequality in two variable, or a system of two linear inequalities algebraically, graphically, and with technology to justify the reasonableness of the answer(s). Explain the solution method and interpret solutions for problems given in context. A.EI.2.H	**h** **Verify possible solution(s) to a system of two linear equations, a linear inequality in two variable, or a system of two linear inequalities algebraically, graphically, and with technology to justify the reasonableness of the answer(s). Explain the solution method and interpret solutions for problems given in context.** A.EI.2.H
Solve a quadratic equation in one variable over the set of real numbers with rational or irrational solutions, including those that can be used to solve contextual problems. A.EI.3.A	**a** **Solve a quadratic equation in one variable over the set of real numbers with rational or irrational solutions, including those that can be used to solve contextual problems.** A.EI.3.A
Determine and justify if a quadratic equation in one variable has no real solutions, one real solution, or two real solutions. A.EI.3.B	**b** **Determine and justify if a quadratic equation in one variable has no real solutions, one real solution, or two real solutions.** A.EI.3.B

Verify possible solution(s) to a quadratic equation in one variable algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context. A.EI.3.C	**c** **Verify possible solution(s) to a quadratic equation in one variable algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context.** A.EI.3.C
Functions	**F.1** **The student will investigate, analyze, and compare linear functions algebraically and graphically, and model linear relationships.** A.F.1
	F.2 **The student will investigate, analyze, and compare characteristics of functions, including quadratic, and exponential functions, and model quadratic and exponential relationships.** A.F.2
Determine and identify the domain, range, zeros, slope, and intercepts of a linear function, presented algebraically or graphically, including the interpretation of these characteristics in contextual situations. A.F.1.A	**a** **Determine and identify the domain, range, zeros, slope, and intercepts of a linear function, presented algebraically or graphically, including the interpretation of these characteristics in contextual situations.** A.F.1.A
Investigate and explain how transformations to the parent function y = x affects the rate of change (slope) and the y-intercept of a linear function. A.F.1.B	**b** **Investigate and explain how transformations to the parent function y = x affects the rate of change (slope) and the y-intercept of a linear function.** A.F.1.B
Write equivalent algebraic forms of linear functions, including slope-intercept form, standard form, and point-slope form, and analyze and interpret the information	**c** **Write equivalent algebraic forms of linear functions, including slope-intercept form, standard form, and point-slope form, and analyze and interpret the information revealed by each form** A.F.1.C

revealed by each form A.F.1.C	
Write the equation of a linear function to model a linear relationship between two quantities, including those that can represent contextual situations. Writing the equation of a linear function will include the following situations: A.F.1.D	i given the graph of a line; A.F.1.D.I
	ii given two points on the line whose coordinates are integers; A.F.1.D.II
	iii given the slope and a point on the line whose coordinates are integers; A.F.1.D.III
	iv vertical lines as x = a; and A.F.1.D.IV
	v horizontal lines as y = c. A.F.1.D.V
Write the equation of a line parallel or perpendicular to a given line through a given point. A.F.1.E	e Write the equation of a line parallel or perpendicular to a given line through a given point. A.F.1.E
Graph a linear function in two variables, with and without the use of technology, including those that can represent contextual situations. A.F.1.F	f Graph a linear function in two variables, with and without the use of technology, including those that can represent contextual situations. A.F.1.F
For any value, x, in the domain of f, determine f(x), and determine x given any value f(x) in the range of f, given an algebraic or graphical representation of a linear function. A.F.1.G	g For any value, x, in the domain of f, determine f(x), and determine x given any value f(x) in the range of f, given an algebraic or graphical representation of a linear function. A.F.1.G
Compare and contrast the characteristics of linear functions represented algebraically, graphically, in tables, and in contextual situations. A.F.1.H	h Compare and contrast the characteristics of linear functions represented algebraically, graphically, in tables, and in contextual situations. A.F.1.H

Determine whether a relation, represented by a set of ordered pairs, a table, a mapping, or a graph is a function; for relations that are functions, determine the domain and range. A.F.2.A	a Determine whether a relation, represented by a set of ordered pairs, a table, a mapping, or a graph is a function; for relations that are functions, determine the domain and range. A.F.2.A
Given an equation or graph, determine key characteristics of a quadratic function including xintercepts (zeros), y-intercept, vertex (maximum or minimum), and domain and range (including when restricted by context); interpret key characteristics as related to contextual situations, where applicable. A.F.2.B	b Given an equation or graph, determine key characteristics of a quadratic function including xintercepts (zeros), y-intercept, vertex (maximum or minimum), and domain and range (including when restricted by context); interpret key characteristics as related to contextual situations, where applicable. A.F.2.B
Graph a quadratic function, f(x), in two variables using a variety of strategies, including transformations f(x) + k and kf(x), where k is limited to rational values. A.F.2.C	c Graph a quadratic function, f(x), in two variables using a variety of strategies, including transformations f(x) + k and kf(x), where k is limited to rational values. A.F.2.C
Make connections between the algebraic (standard and factored forms) and graphical representation of a quadratic function. A.F.2.D	d Make connections between the algebraic (standard and factored forms) and graphical representation of a quadratic function. A.F.2.D
Given an equation or graph of an exponential function in the form y = abx (where b is limited to a natural number), interpret key	e Given an equation or graph of an exponential function in the form y = abx (where b is limited to a natural number), interpret key characteristics, including y-intercepts and domain and range; interpret key characteristics as related to contextual situations, where applicable. A.F.2.E

characteristics, including y-intercepts and domain and range; interpret key characteristics as related to contextual situations, where applicable. A.F.2.E	
Graph an exponential function, f(x), in two variables using a variety of strategies, including transformations f(x) + k and kf(x), where k is limited to rational values. A.F.2.F	**f** Graph an exponential function, f(x), in two variables using a variety of strategies, including transformations f(x) + k and kf(x), where k is limited to rational values. A.F.2.F
For any value, x, in the domain of f, determine f(x) of a quadratic or exponential function. Determine x given any value f(x) in the range of f of a quadratic function. Explain the meaning of x and f(x) in context. A.F.2.G	**g** For any value, x, in the domain of f, determine f(x) of a quadratic or exponential function. Determine x given any value f(x) in the range of f of a quadratic function. Explain the meaning of x and f(x) in context. A.F.2.G
Compare and contrast the key characteristics of linear functions (f(x) = x), quadratic functions (f(x) = x 2), and exponential functions (f(x) = bx) using tables and graphs. A.F.2.H	**h** Compare and contrast the key characteristics of linear functions (f(x) = x), quadratic functions (f(x) = x 2), and exponential functions (f(x) = bx) using tables and graphs. A.F.2.H
Statistics	**ST.1** The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on representing bivariate data in scatterplots and determining the curve of best fit using linear and quadratic functions. A.ST.1
Formulate investigative questions that require the collection or acquisition of bivariate data. A.ST.1.A	**a** Formulate investigative questions that require the collection or acquisition of bivariate data. A.ST.1.A

Determine what variables could be used to explain a given contextual problem or situation or answer investigative questions. A.ST.1.B	**b** **Determine what variables could be used to explain a given contextual problem or situation or answer investigative questions.** A.ST.1.B
Determine an appropriate method to collect a representative sample, which could include a simple random sample, to answer an investigative question. A.ST.1.C	**c** **Determine an appropriate method to collect a representative sample, which could include a simple random sample, to answer an investigative question.** A.ST.1.C
Given a table of ordered pairs or a scatterplot representing no more than 30 data points, use available technology to determine whether a linear or quadratic function would represent the relationship, and if so, determine the equation of the curve of best fit. A.ST.1.D	**d** **Given a table of ordered pairs or a scatterplot representing no more than 30 data points, use available technology to determine whether a linear or quadratic function would represent the relationship, and if so, determine the equation of the curve of best fit.** A.ST.1.D
Use linear and quadratic regression methods available through technology to write a linear or quadratic function that represents the data where appropriate and describe the strengths and weaknesses of the model. A.ST.1.E	**e** **Use linear and quadratic regression methods available through technology to write a linear or quadratic function that represents the data where appropriate and describe the strengths and weaknesses of the model.** A.ST.1.E
Use a linear model to predict outcomes and evaluate the strength and validity of these predictions, including	**f** **Use a linear model to predict outcomes and evaluate the strength and validity of these predictions, including through the use of technology.** A.ST.1.F

through the use of technology. A.ST.1.F

Investigate and explain the meaning of the rate of change (slope) and y-intercept (constant term) of a linear model in context. A.ST.1.G

g Investigate and explain the meaning of the rate of change (slope) and y-intercept (constant term) of a linear model in context. A.ST.1.G

Analyze relationships between two quantitative variables revealed in a scatterplot. A.ST.1.H

h Analyze relationships between two quantitative variables revealed in a scatterplot. A.ST.1.H

Make conclusions based on the analysis of a set of bivariate data and communicate the results. A.ST.1.I

i Make conclusions based on the analysis of a set of bivariate data and communicate the results. A.ST.1.I