Virginia Mathematics

Algebra 2

Expressions and Operations	**EO.1** The student will perform operations on and simplify rational expressions. A2.EO.1
	EO.2 The student will perform operations on and simplify radical expressions. A2.EO.2
	EO.3 The student will perform operations on polynomial expressions and factor polynomial expressions in one and two variables. A2.EO.3
	EO.4 The student will perform operations on complex numbers. A2.EO.4
Add, subtract, multiply, or divide rational algebraic expressions, simplifying the result. A2.EO.1.A	**a** Add, subtract, multiply, or divide rational algebraic expressions, simplifying the result. A2.EO.1.A
Justify and determine equivalent rational algebraic expressions with monomial and binomial factors. Algebraic expressions should be limited to linear and quadratic expressions. A2.EO.1.B	**b** Justify and determine equivalent rational algebraic expressions with monomial and binomial factors. Algebraic expressions should be limited to linear and quadratic expressions. A2.EO.1.B
Recognize a complex algebraic fraction and simplify it as a product or quotient of simple algebraic fractions. A2.EO.1.C	**c** Recognize a complex algebraic fraction and simplify it as a product or quotient of simple algebraic fractions. A2.EO.1.C
Represent and demonstrate equivalence of rational expressions written in different forms. A2.EO.1.D	**d** Represent and demonstrate equivalence of rational expressions written in different forms. A2.EO.1.D

Simplify and determine equivalent radical expressions that include numeric and algebraic radicands. A2.E0.2.A	**a** **Simplify and determine equivalent radical expressions that include numeric and algebraic radicands.** A2.E0.2.A
Add, subtract, multiply, and divide radical expressions that include numeric and algebraic radicands, simplifying the result. Simplification may include rationalizing the denominator. A2.E0.2.B	**b** **Add, subtract, multiply, and divide radical expressions that include numeric and algebraic radicands, simplifying the result. Simplification may include rationalizing the denominator.** A2.E0.2.B
Convert between radical expressions and expressions containing rational exponents. A2.E0.2.C	**c** **Convert between radical expressions and expressions containing rational exponents.** A2.E0.2.C
Determine sums, differences, and products of polynomials in one and two variables. A2.E0.3.A	**a** **Determine sums, differences, and products of polynomials in one and two variables.** A2.E0.3.A
Factor polynomials completely in one and two variables with no more than four terms over the set of integers. A2.E0.3.B	**b** **Factor polynomials completely in one and two variables with no more than four terms over the set of integers.** A2.E0.3.B
Determine the quotient of polynomials in one and two variables, using monomial, binomial, and factorable trinomial divisors. A2.E0.3.C	**c** **Determine the quotient of polynomials in one and two variables, using monomial, binomial, and factorable trinomial divisors.** A2.E0.3.C
Represent and demonstrate equality of polynomial expressions written in different forms and verify polynomial identities	**d** **Represent and demonstrate equality of polynomial expressions written in different forms and verify polynomial identities including the difference of squares, sum and difference of cubes, and perfect square trinomials.** A2.E0.3.D

including the difference of squares, sum and difference of cubes, and perfect square trinomials. A2.E0.3.D	
Explain the meaning of i. A2.E0.4.A	**a** **Explain the meaning of i.** A2.E0.4.A
Identify equivalent radical expressions containing negative rational numbers and expressions in a + bi form. A2.E0.4.B	**b** **Identify equivalent radical expressions containing negative rational numbers and expressions in a + bi form.** A2.E0.4.B
Apply properties to add, subtract, and multiply complex numbers. A2.E0.4.C	**c** **Apply properties to add, subtract, and multiply complex numbers.** A2.E0.4.C
Equations and Inequalities	**EI.1** **The student will represent, solve, and interpret the solution to absolute value equations and inequalities in one variable.** A2.EI.1
	EI.2 **The student will represent, solve, and interpret the solution to quadratic equations in one variable over the set of complex numbers and solve quadratic inequalities in one variable.** A2.EI.2
	EI.3 **The student will solve a system of equations in two variables containing a quadratic expression.** A2.EI.3
	EI.4 **The student will represent, solve, and interpret the solution to an equation containing rational algebraic expressions.** A2.EI.4
	EI.5 **The student will represent, solve, and interpret the solution to an equation containing a radical expression.** A2.EI.5
	EI.6 **The student will represent, solve, and interpret the solution to a polynomial equation.** A2.EI.6
Create an absolute value equation in one variable to model a contextual situation. A2.EI.1.A	**a** **Create an absolute value equation in one variable to model a contextual situation.** A2.EI.1.A
Solve an absolute value equation in one variable algebraically and verify	**b** **Solve an absolute value equation in one variable algebraically and verify the solution graphically.** A2.EI.1.B

the solution graphically. A2.EI.1.B	
Create an absolute value inequality in one variable to model a contextual situation. A2.EI.1.C	**c** Create an absolute value inequality in one variable to model a contextual situation. A2.EI.1.C
Solve an absolute value inequality in one variable and represent the solution set using set notation, interval notation, and using a number line. A2.EI.1.D	**d** Solve an absolute value inequality in one variable and represent the solution set using set notation, interval notation, and using a number line. A2.EI.1.D
Verify possible solution(s) to absolute value equations and inequalities 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. A2.EI.1.E	**e** Verify possible solution(s) to absolute value equations and inequalities 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. A2.EI.1.E
Create a quadratic equation or inequality in one variable to model a contextual situation. A2.EI.2.A	**a** Create a quadratic equation or inequality in one variable to model a contextual situation. A2.EI.2.A
Solve a quadratic equation in one variable over the set of complex numbers algebraically. A2.EI.2.B	**b** Solve a quadratic equation in one variable over the set of complex numbers algebraically. A2.EI.2.B
Determine the solution to a quadratic inequality in one variable over the set of real numbers algebraically. A2.EI.2.C	**c** Determine the solution to a quadratic inequality in one variable over the set of real numbers algebraically. A2.EI.2.C

Verify possible solution(s) to quadratic equations or inequalities 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. A2.EI.2.D	**d** Verify possible solution(s) to quadratic equations or inequalities 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. A2.EI.2.D
Create a linear-quadratic or quadratic-quadratic system of equations to model a contextual situation. A2.EI.3.A	**a** Create a linear-quadratic or quadratic-quadratic system of equations to model a contextual situation. A2.EI.3.A
Determine the number of solutions to a linear-quadratic and quadratic-quadratic system of equations in two variables. A2.EI.3.B	**b** Determine the number of solutions to a linear-quadratic and quadratic-quadratic system of equations in two variables. A2.EI.3.B
Solve a linear-quadratic and quadratic-quadratic system of equations algebraically and graphically, including situations in context. A2.EI.3.C	**c** Solve a linear-quadratic and quadratic-quadratic system of equations algebraically and graphically, including situations in context. A2.EI.3.C
Verify possible solution(s) to linear-quadratic or quadratic-quadratic system of equations algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context. A2.EI.3.D	**d** Verify possible solution(s) to linear-quadratic or quadratic-quadratic system of equations algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context. A2.EI.3.D

Create an equation containing a rational expression to model a contextual situation. A2.EI.4.A	**a** **Create an equation containing a rational expression to model a contextual situation.** A2.EI.4.A
Solve rational equations with real solutions containing factorable algebraic expressions algebraically and graphically. Algebraic expressions should be limited to linear and quadratic expressions. A2.EI.4.B	**b** **Solve rational equations with real solutions containing factorable algebraic expressions algebraically and graphically. Algebraic expressions should be limited to linear and quadratic expressions.** A2.EI.4.B
Verify possible solution(s) to rational equations algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context. A2.EI.4.C	**c** **Verify possible solution(s) to rational equations algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context.** A2.EI.4.C
Justify why a possible solution to an equation containing a rational expression might be extraneous. A2.EI.4.D	**d** **Justify why a possible solution to an equation containing a rational expression might be extraneous.** A2.EI.4.D
Solve an equation containing no more than one radical expression algebraically and graphically. A2.EI.5.A	**a** **Solve an equation containing no more than one radical expression algebraically and graphically.** A2.EI.5.A
Verify possible solution(s) to radical equations algebraically, graphically, and with technology, to justify the reasonableness of answer(s). Explain the solution method and	**b** **Verify possible solution(s) to radical equations algebraically, graphically, and with technology, to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context.** A2.EI.5.B

interpret solutions for problems given in context. A2.EI.5.B	
Justify why a possible solution to an equation with a square root might be extraneous. A2.EI.5.C	c Justify why a possible solution to an equation with a square root might be extraneous. A2.EI.5.C
Determine a factored form of a polynomial equation, of degree three or higher, given its zeros or the x-intercepts of the graph of its related function. A2.EI.6.A	a Determine a factored form of a polynomial equation, of degree three or higher, given its zeros or the x-intercepts of the graph of its related function. A2.EI.6.A
Determine the number and type of solutions (real or imaginary) of a polynomial equation of degree three or higher. A2.EI.6.B	b Determine the number and type of solutions (real or imaginary) of a polynomial equation of degree three or higher. A2.EI.6.B
Solve a polynomial equation over the set of complex numbers. A2.EI.6.C	c Solve a polynomial equation over the set of complex numbers. A2.EI.6.C
Verify possible solution(s) to polynomial equations of degree three or higher algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions in context. A2.EI.6.D	d Verify possible solution(s) to polynomial equations of degree three or higher algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions in context. A2.EI.6.D
Functions	F.1 The student will investigate, analyze, and compare square root, cube root, rational, exponential, and logarithmic function families, algebraically and graphically, using transformations. A2.F.1

F.2 The student will investigate and analyze characteristics of square root, cube root, rational, polynomial, exponential, logarithmic, and piecewise-defined functions algebraically and graphically. A2.F.2

Distinguish between the graphs of parent functions for square root, cube root, rational, exponential, and logarithmic function families. A2.F.1.A	**a** Distinguish between the graphs of parent functions for square root, cube root, rational, exponential, and logarithmic function families. A2.F.1.A
Write the equation of a square root, cube root, rational, exponential, and logarithmic function, given a graph, using transformations of the parent function, including f(x) + k; f(kx); f(x + k); and kf(x), where k is limited to rational values. Transformations of exponential and logarithmic functions, given a graph, should be limited to a single transformation. A2.F.1.B	**b** Write the equation of a square root, cube root, rational, exponential, and logarithmic function, given a graph, using transformations of the parent function, including f(x) + k; f(kx); f(x + k); and kf(x), where k is limited to rational values. Transformations of exponential and logarithmic functions, given a graph, should be limited to a single transformation. A2.F.1.B
Graph a square root, cube root, rational, exponential, and logarithmic function, given the equation, using transformations of the parent function including f(x) + k; f(kx); f(x + k); and kf(x), where k is limited to rational values. Use technology to verify transformations of the functions. A2.F.1.C	**c** Graph a square root, cube root, rational, exponential, and logarithmic function, given the equation, using transformations of the parent function including f(x) + k; f(kx); f(x + k); and kf(x), where k is limited to rational values. Use technology to verify transformations of the functions. A2.F.1.C
Determine when two variables are directly proportional, inversely proportional, or neither, given a table of values.	**d** Determine when two variables are directly proportional, inversely proportional, or neither, given a table of values. Write an equation and create a graph to represent a direct or inverse variation, including situations in context. A2.F.1.D

Write an equation and create a graph to represent a direct or inverse variation, including situations in context. A2.F.1.D	
Compare and contrast the graphs, tables, and equations of square root, cube root, rational, exponential, and logarithmic functions. A2.F.1.E	**e** Compare and contrast the graphs, tables, and equations of square root, cube root, rational, exponential, and logarithmic functions. A2.F.1.E
Determine and identify the domain, range, zeros, and intercepts of a function presented algebraically or graphically, including graphs with discontinuities. A2.F.2.A	**a** Determine and identify the domain, range, zeros, and intercepts of a function presented algebraically or graphically, including graphs with discontinuities. A2.F.2.A
Compare and contrast the characteristics of square root, cube root, rational, polynomial, exponential, logarithmic, and piecewise-defined functions. A2.F.2.B	**b** Compare and contrast the characteristics of square root, cube root, rational, polynomial, exponential, logarithmic, and piecewise-defined functions. A2.F.2.B
Determine the intervals on which the graph of a function is increasing, decreasing, or constant. A2.F.2.C	**c** Determine the intervals on which the graph of a function is increasing, decreasing, or constant. A2.F.2.C
Determine the location and value of absolute (global) maxima and absolute (global) minima of a function. A2.F.2.D	**d** Determine the location and value of absolute (global) maxima and absolute (global) minima of a function. A2.F.2.D
Determine the location and value of relative (local) maxima or	**e** Determine the location and value of relative (local) maxima or relative (local) minima of a function. A2.F.2.E

relative (local) minima of a function. A2.F.2.E	
For any value, x, in the domain of f, determine f(x) using a graph or equation. Explain the meaning of x and f(x) in context, where applicable. A2.F.2.F	f For any value, x, in the domain of f, determine f(x) using a graph or equation. Explain the meaning of x and f(x) in context, where applicable. A2.F.2.F
Describe the end behavior of a function. A2.F.2.G	g Describe the end behavior of a function. A2.F.2.G
Determine the equations of any vertical and horizontal asymptotes of a function using a graph or equation (rational, exponential, and logarithmic). A2.F.2.H	h Determine the equations of any vertical and horizontal asymptotes of a function using a graph or equation (rational, exponential, and logarithmic). A2.F.2.H
Determine the inverse of a function algebraically and graphically, given the equation of a linear or quadratic function (linear, quadratic, and square root). Justify and explain why two functions are inverses of each other. A2.F.2.I	i Determine the inverse of a function algebraically and graphically, given the equation of a linear or quadratic function (linear, quadratic, and square root). Justify and explain why two functions are inverses of each other. A2.F.2.I
Graph the inverse of a function as a reflection over the line y = x. A2.F.2.J	j Graph the inverse of a function as a reflection over the line y = x. A2.F.2.J
Determine the composition of two functions algebraically and graphically. A2.F.2.K	k Determine the composition of two functions algebraically and graphically. A2.F.2.K

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 univariate quantitative data represented by a smooth curve, including a normal curve.** A2.ST.1
	ST.2	**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, quadratic, exponential, or a combination of these functions.** A2.ST.2
	ST.3	**The student will compute and distinguish between permutations and combinations.** A2.ST.3
Formulate investigative questions that require the collection or acquisition of a large set of univariate quantitative data or summary statistics of a large set of univariate quantitative data and investigate questions using a data cycle. A2.ST.1.A	**a**	**Formulate investigative questions that require the collection or acquisition of a large set of univariate quantitative data or summary statistics of a large set of univariate quantitative data and investigate questions using a data cycle.** A2.ST.1.A
Collect or acquire univariate data through research, or using surveys, observations, scientific experiments, polls, or questionnaires. A2.ST.1.B	**b**	**Collect or acquire univariate data through research, or using surveys, observations, scientific experiments, polls, or questionnaires.** A2.ST.1.B
Examine the shape of a data set (skewed versus symmetric) that can be represented by a histogram, and sketch a smooth curve to model the distribution. A2.ST.1.C	**c**	**Examine the shape of a data set (skewed versus symmetric) that can be represented by a histogram, and sketch a smooth curve to model the distribution.** A2.ST.1.C
Identify the properties of a normal distribution. A2.ST.1.D	**d**	**Identify the properties of a normal distribution.** A2.ST.1.D

Describe and interpret a data distribution represented by a smooth curve by analyzing measures of center, measures of spread, and shape of the curve. A2.ST.1.E	**e** **Describe and interpret a data distribution represented by a smooth curve by analyzing measures of center, measures of spread, and shape of the curve.** A2.ST.1.E
Calculate and interpret the z-score for a value in a data set. A2.ST.1.F	**f** **Calculate and interpret the z-score for a value in a data set.** A2.ST.1.F
Compare two data points from two different distributions using z-scores. A2.ST.1.G	**g** **Compare two data points from two different distributions using z-scores.** A2.ST.1.G
Determine the solution to problems involving the relationship of the mean, standard deviation, and z-score of a data set represented by a smooth or normal curve. A2.ST.1.H	**h** **Determine the solution to problems involving the relationship of the mean, standard deviation, and z-score of a data set represented by a smooth or normal curve.** A2.ST.1.H
Apply the Empirical Rule to answer investigative questions. A2.ST.1.I	**i** **Apply the Empirical Rule to answer investigative questions.** A2.ST.1.I
Compare multiple data distributions using measures of center, measures of spread, and shape of the distributions. A2.ST.1.J	**j** **Compare multiple data distributions using measures of center, measures of spread, and shape of the distributions.** A2.ST.1.J
Formulate investigative questions that require the collection or acquisition of bivariate data and investigate questions using a data cycle. A2.ST.2.A	**a** **Formulate investigative questions that require the collection or acquisition of bivariate data and investigate questions using a data cycle.** A2.ST.2.A

Collect or acquire bivariate data through research, or using surveys, observations, scientific experiments, polls, or questionnaires. A2.ST.2.B	**b** **Collect or acquire bivariate data through research, or using surveys, observations, scientific experiments, polls, or questionnaires.** A2.ST.2.B
Represent bivariate data with a scatterplot using technology. A2.ST.2.C	**c** **Represent bivariate data with a scatterplot using technology.** A2.ST.2.C
Determine whether the relationship between two quantitative variables is best approximated by a linear, quadratic, exponential, or a combination of these functions. A2.ST.2.D	**d** **Determine whether the relationship between two quantitative variables is best approximated by a linear, quadratic, exponential, or a combination of these functions.** A2.ST.2.D
Determine the equation(s) of the function(s) that best models the relationship between two variables using technology. Curves of best fit may include a combination of linear, quadratic, or exponential (piecewise-defined) functions. A2.ST.2.E	**e** **Determine the equation(s) of the function(s) that best models the relationship between two variables using technology. Curves of best fit may include a combination of linear, quadratic, or exponential (piecewise-defined) functions.** A2.ST.2.E
Use the correlation coefficient to designate the goodness of fit of a linear function using technology. A2.ST.2.F	**f** **Use the correlation coefficient to designate the goodness of fit of a linear function using technology.** A2.ST.2.F
Make predictions, decisions, and critical judgments using data, scatterplots, or the equation(s) of the mathematical model. A2.ST.2.G	**g** **Make predictions, decisions, and critical judgments using data, scatterplots, or the equation(s) of the mathematical model.** A2.ST.2.G

Evaluate the reasonableness of a mathematical model of a contextual situation. A2.ST.2.H	**h** **Evaluate the reasonableness of a mathematical model of a contextual situation.** A2.ST.2.H
Compare and contrast permutations and combinations to count the number of ways that events can occur. A2.ST.3.A	**a** **Compare and contrast permutations and combinations to count the number of ways that events can occur.** A2.ST.3.A
Calculate the number of permutations of n objects taken r at a time. A2.ST.3.B	**b** **Calculate the number of permutations of n objects taken r at a time.** A2.ST.3.B
Calculate the number of combinations of n objects taken r at a time. A2.ST.3.C	**c** **Calculate the number of combinations of n objects taken r at a time.** A2.ST.3.C
Use permutations and combinations as counting techniques to solve contextual problems. A2.ST.3.D	**d** **Use permutations and combinations as counting techniques to solve contextual problems.** A2.ST.3.D
Calculate and verify permutations and combinations using technology. A2.ST.3.E	**e** **Calculate and verify permutations and combinations using technology.** A2.ST.3.E