South Dakota Mathematics

# Algebra I

## Expressions

### Rational and Irrational Numbers

1. Explain why the sum or product of two rational numbers is rational; the sum of a rational and an irrational number is irrational; and the product of a nonzero rational and an irrational number is irrational. A1.E.1

### Polynomials, Radical Expressions and Rational Exponents

2. Understand polynomials to be a sum of algebraic terms having variables, coefficients, exponents, and/or constants. A1.E.2
3. Add, subtract and multiply polynomials. A1.E.3
4. Understand rational exponents as a way to represent roots as powers. A1.E.4
5. Simplify numerical expressions containing exponents and/or roots, including negative and rational exponents. A1.E.5
6. Simplify algebraic expressions using the laws of exponents A1.E.6

## Algebraic Functions

### Domain and Range, Function Notation

1. Use function notation, evaluate functions, and interpret statements that use function notation in terms of a context. A1.AF.1

### Construct and Compare

2. Determine whether a relationship is a function given a graph, an equation, or a table of values. A1.AF.2
3. Compare linear, quadratic, and exponential growth using tables and graphs to show that exponential growth eventually exceeds others A1.AF.3
4. Differentiate between real-world scenarios that can be modeled by exponential or linear functions by determining whether the relationship has a common difference or a common ratio. A1.AF.4

## Linear Functions, Equations, and Inequalities

### Create and Solve

1. Represent and solve real-world problems, using linear expressions, equations, and inequalities in one variable. Interpret the solution as reasonable or unreasonable in context. A1.LF.1
2. Solve linear equations and linear inequalities in one variable, including those with rational number coefficients, variables on both sides of the equal or inequality sign, and literal equations, explaining the process used. A1.LF.2
3. Construct linear functions from arithmetic sequences with and without context. A1.LF.3
4. Write arithmetic sequences using explicit and recursive formulas. A1.LF.4

### Interpret Key Features

5. Identify the parts of expressions such as terms, factors, variables, constants, and coefficients. A1.LF.5
6. Determine reasonable domain and range values of linear functions representing real-world situations, both continuous and discrete. A1.LF.6
7. Interpret the key features of linear functions that model a relationship between two quantities in a given context. A1.LF.7
8. Use different representations of a linear function, including graphs, tables, and equations. A1.LF.8
9. Calculate and interpret the rate of change of a linear function represented in a table, graph, or as an equation in context of real-world and mathematical problems. A1.LF.9
10. Translate between equivalent forms of equations for linear functions, including standard, point-slope, and slope intercept forms; recognize that each form reveals key features in a given context. A1.LF.10

### Systems of Equations and Inequalities

11. Estimate the solution of a system of linear equations by graphing the equations on a coordinate plane A1.LF.11
12. Solve a system of linear equations with integer coefficients algebraically (substitution and elimination). A1.LF.12
13. Solve linear inequalities and systems of linear inequalities in two variables by graphing. A1.LF.13
14. Explain why a solution to the equation $f(x) = g(x)$ is the x-coordinate where the y-coordinate of $f(x)$ and $g(x)$ are the same using graphs, tables, or approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, quadratic, and exponential. A1.LF.14

### Statistical Relationships

15. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. A1.LF.15
16. Compute (using technology) and interpret the correlation coefficient of a linear fit. A1.LF.16
17. Distinguish between correlation and causation. A1.LF.17

## Quadratic Functions and Equations

### Create and Solve

1. Solve quadratic equations with real number solutions, containing one variable, including those with variables on both sides of the equal sign. Equations should be solved by: graphing, factoring, completing the square (leading coefficient is one, $b$ value is even), taking the square root and using the quadratic formula. A1.QF.1
2. Interpret the solutions for quadratic equations as reasonable or unreasonable in context. A1.QF.2
3. Graph quadratic functions in standard and vertex form A1.QF.3

### Interpret Key Features

4. Determine the domain and range of quadratic functions. A1.QF.4
5. Determine reasonable domain and range values of quadratic functions representing real-world situations. A1.QF.5
6. Interpret the key features of a quadratic function (direction, roots, zeros, x-intercepts, and maximum or minimum values) that models a relationship between two quantities in a given context. A1.QF.6

### Graphing and Transformations

7. Graph and describe how transformations (stretches, translations, and reflections) affect linear, absolute value, and quadratic functions. A1.QF.7

## Exponential Functions and Equations

### Create and Solve

1. Construct exponential equations from geometric sequences with and without context. A1.EF.1
2. Use properties of exponents to write equivalent expressions for exponential functions. A1.EF.2
3. Write geometric sequences using explicit and recursive formulas. A1.EF.3

### Interpret Key Features

4. Determine the domain and range of exponential functions A1.EF.4
5. Determine reasonable domain and range values of exponential functions representing real-world situations. A1.EF.5
6. Interpret the key features of an exponential function that models a relationship between two quantities in a given context. A1.EF.6

### Graphing

7. Graph exponential functions that model real-world problems (growth, decay, and compound interest), showing key attributes. A1.EF.7

### Statistical Relationships

8. Interpret the quantities in an exponential equation in the context of a real-world problem, including growth, decay, and compound interest. A1.EF.8

## Statistics and Probability

### Numerical Data

1. Use box plots and histograms to determine the statistics appropriate to the shape of the data distribution; compare the center (mean and median) and spread (standard deviation and IQR) of two or more data sets A1.SP.1
2. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points. A1.SP.2

### Bivariate Data

3. Interpret relative frequencies and associations in two-way tables. A1.SP.3