Washington Mathematics

Algebra 1

Standards for Mathematical Practice	**1** **Make sense of problems and persevere in solving them.** 1
	2 **Reason abstractly and quantitatively.** 2
	3 **Construct viable arguments and critique the reasoning of others.** 3
	4 **Model with mathematics.** 4
	5 **Use appropriate tools strategically.** 5
	6 **Attend to precision.** 6
	7 **Look for and make use of structure.** 7
	8 **Look for and express regularity in repeated reasoning.** 8
Number & Quantity	**Number & Quantity**
The Real Number System	**A** **Extend the properties of exponents to rational exponents.**
	1 Flexibly, efficiently, and accurately explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values using a variety of strategies, allowing for a notation for radicals in terms of rational exponents. N.RN.A.1
	2 Rewrite expressions involving radicals and rational exponents using the properties of exponents. Use properties of rational and irrational numbers. N.RN.A.2
	B **Use properties of rational and irrational numbers.**
	3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. N.RN.B.3

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Quantities

A Reason quantitatively and use units to solve problems.

1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N.Q.A.1

2 Define appropriate quantities for the purpose of descriptive modeling. N.Q.A.2

3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. N.Q.A.3

Algebra — **Algebra**

Seeing Structure in Expressions

A Interpret the structure of expressions.

1a Interpret expressions that represent a quantity in terms of its context within linear, exponential, and quadratic functions. A.SSE.A.1A

2 Use the structure of an expression to identify ways to rewrite it within exponential and quadratic functions. A.SSE.A.2

B Write expressions in equivalent forms to solve problems.

3a, c Flexibly, efficiently, and accurately create an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression including factoring quadratic expressions and using properties of exponents to create equivalent forms of exponential expressions to reveal properties of interest in the function. A.SSE.B.3A, C

Arithmetic with Polynomials and Rational Expressions

A Perform arithmetic operations on polynomials.

1 Flexibly, efficiently, and accurately demonstrate that polynomials form a system similar to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. A.APR.A.1

Creating Equations

A Create equations that describe numbers or relationships.

1 Flexibly, efficiently, and accurately create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear, quadratic, and exponential functions. A.CED.A.1

2 Flexibly, efficiently, and accurately create linear, quadratic, exponential equations to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A.CED.A.2

3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context within linear, quadratic, and exponential equations. A.CED.A.3

4 Flexibly, efficiently, and accurately rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations within linear, quadratic, and exponential equations. A.CED.A.4

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Reason with Equations and Inequalities

A Understand solving equations as a process of reasoning and explain the reasoning.

1 Explain each step in solving an equation as following from the equality of numbers asserted at the previous step flexibly, efficiently, and accurately selecting and demonstrating use of strategies to solve equations, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. A.REI.A.1

B Solve equations and inequalities in one variable.

3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. A.REI.B.3

4b Solve quadratic equations in one variable by inspection, taking square roots, and factoring as appropriate to the initial form of the equation. A.REI.B.4B

C Solve systems of equations.

5 Demonstrate using a variety of strategies that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. A.REI.C.5

6 Flexibly, efficiently, and accurately solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. A.REI.C.6

7 Flexibly, efficiently, and accurately solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. A.REI.C.7

D Represent and solve equations and inequalities graphically.

10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). A.REI.D.10

11 Using a variety of strategies explain the x-coordinates of the points where the graphs of the equations $yy = ff(xx)$ and $yy = gg(xx)$ intersect are the solutions of the equation $ff(xx) = gg(xx)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $ff(xx)$ and/or $gg(xx)$ are linear, exponential, and quadratic. A.REI.D.11

12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. A.REI.D.12

Functions

Functions

Int **Understand the concept of a function and use function notation.**

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1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If ff is a function and x is an element of its domain, then $ff(xx)$ denotes the output of f corresponding to the input xx. The graph of f is the graph of the equation $yy = ff(xx)$. F.IF.A.1

2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. F.IF.A.2

3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. F.IF.A.3

B Interpret functions that arise in applications in terms of the context.

4 For a function that models a relationship between two quantities in context, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries for functions including linear, exponential, and quadratic. F.IF.B.4

5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes in linear, exponential, or quadratic contexts. F.IF.B.5

6 Calculate and interpret the average rate of change of a function (represented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F.IF.B.6

C Analyze functions using different representations.

7a, e Graph linear, exponential, and quadratic functions expressed symbolically and show key features of the graph, including intercepts, maximum, minimum, and interpreting end behavior for exponential functions by hand in simple cases and using technology for more complicated cases. F.IF.C.7A, E

8 Flexibly, efficiently, and accurately write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function including zeros and symmetry, using factoring for quadratic functions and integer constants for time with exponential growth and decay. F.IF.C.8

9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Functions could be linear, exponential, or quadratic. F.IF.C.9

A Build a function that models a relationship between two quantities.

1a, b Flexibly, efficiently, and accurately write a function that describes a relationship between two quantities, including linear and exponential arithmetic and geometric sequences in context. F.BF.A.1A, B

2 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model linear and exponential situations, and translate between two forms. F.BF.A.2

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B Build new functions from existing functions.

3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Using a variety of strategies, experiment with cases and illustrate an explanation of the effects on the graph using technology. F.BF.B.3

Linear, Quadratic, and Exponential Models

A Construct and compare linear, quadratic, and exponential models and solve problems.

1 Distinguish between situations that can be modeled with linear functions (equal differences over equal intervals) and with exponential functions (equal factors over equal intervals), recognizing constant rates per unit interval, and growth or decay by a constant percent rate per unit interval. F.LE.A.1A, B, C

2 Flexibly, efficiently, and accurately construct linear and exponential functions given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F.LE.A.2

3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically. F.LE.A.3

B Interpret expressions for functions in terms of the situation they model.

5 Interpret the parameters in a linear or exponential function in terms of a context. F.LE.B.5

Statistics and Probability

Statistics and Probability

Interpreting Categorical and Quantitative Data

A Summarize, represent, and interpret data on a single count or measurement variable.

1 Represent data with plots on the real number line (dot plots, histograms, and box plots). S.ID.A.1

2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. S.ID.A.2

3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). S.ID.A.3

B Summarize, represent, and interpret data on two categorical and quantitative variables.

5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. S.ID.B.5

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6a, b, c Represent data on two quantitative variables on a scatter plot, and describe how the variables are related to solve problems in context by fitting functions to the data and explaining trends and relationships within the data. S.ID.B.6A, B, C

C Interpret linear models.

7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S.ID.C.7

8 Compute (using technology) and interpret the correlation coefficient of a linear fit. S.ID.C.8

9 Distinguish between correlation and causation. S.ID.C.9

Data Science

Formulate statistical investigative questions.

1 Formulate multivariable statistical investigative questions and determine how data can be collected and provide an answer, consider causality and prediction when posing the question. HS.DS.1

Collect and consider data.

2 Understand the issues of bias and confounding variables when collecting data and their impact on interpretation. Understand practices for collecting and handling data, including sensitive information and concerns for privacy and how that may affect data collection. HS.DS.2

Analyze the data.

3 Create and analyze data sets and data displays, including but not limited to scatter plots, regressions, histograms and boxplots using technology to sort or filter data, summarize, and describe relationships between quantitative variables. HS.DS.3

Interpret results.

4 Acknowledge the presence of missing data values and understand how missing values may add bias to analysis and interpretation. Examine and discuss competing explanations for data trends observed such as confounding variables. Respond to competing arguments or interpretations of the data of different community groups, paying careful attention to what conclusions the data supports, taking into account correlation versus causation. HS.DS.4