Maryland Mathematics

Integrated Algebra 1

Algebraic Thinking AT

A LOOK FOR AND MAKE USE OF STRUCTURE TO REWRITE EXPRESSIONS IN EQUIVALENT FORMS AND REASON ABOUT THEIR PROPERTIES. IA1.AT.A

1 Rewrite and interpret linear and exponential expressions to explain key properties of a relationship. IA1.AT.A.1

- a Interpret components of linear and exponential expressions (e.g., coefficients, constants, bases, and exponents) as single entities and explain their meaning in context. IA1.AT.A.1.A
- b Rewrite linear and exponential expressions in different equivalent forms to highlight and explain properties of the relationship (e.g., growth or decay rate, initial value, rate of change). IA1.AT.A.1.B
- c Compare equivalent forms of linear and exponential expressions to determine which is most useful for understanding or solving a problem in context. IA1.AT.A.1.C

B MAKE SENSE OF AND SOLVE EQUATIONS, INEQUALITIES, AND SYSTEMS OF EQUATIONS OR INEQUALITIES. IA1.AT.B

2 Create and solve one-variable equations, justify the solution process, and interpret the solution(s) in context. IA1.AT.B.2

- a Create linear and exponential equations in one variable to represent relationships between quantities. IA1.AT.B.2.A
- b Solve linear equations in one variable using flexible and efficient strategies. Justify the solution process using logical steps and explanations. Interpret the meaning of the solution in context. IA1.AT.B.2.B
- c Solve absolute value equations in one variable where the absolute value expression is isolated on one side of the equation. Justify the solution process and interpret the solution(s) in context. IA1.AT.B.2.C
- d Solve exponential equations where both sides have comparable exponential expressions, requiring at most two steps to rewrite expressions to the same base, and explain the reasoning using properties of exponents. IA1.AT.B.2.D

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3 Create and solve one-variable inequalities, justify the solution process, and interpret the solutions in context. IA1.AT.B.3

- a Create inequalities in one variable to represent constraints or conditions. IA1.AT.B.3.A
- b Solve linear inequalities in one variable, including those with variables on both sides, using flexible and efficient strategies. Represent the solution set using a number line and inequality notation. IA1.AT.B.3.B
- c Solve absolute value inequalities in one variable where the absolute value expression is isolated on one side of the inequality. Represent the solution set using compound inequalities and a number line. IA1.AT.B.3.C
- d Interpret the meaning of the solution set in the context of the problem, including what values are reasonable within the given situation. IA1.AT.B.3.D

4 Create linear and exponential equations in two variables, graph them, and use those graphs to represent and solve problems in context. IA1.AT.B.4

- a Create linear and exponential equations in two variables to model relationships, and graph them on the coordinate plane. IA1.AT.B.4.A
- b Use the understanding that the graph of an equation represents the set of all its solutions to identify solutions, describe patterns, and interpret the relationship between variables. IA1.AT.B.4.B

5 Create, solve, and analyze systems of two linear equations in two variables in context. IA1.AT.B.5

- a Create systems of linear equations to represent relationships. IA1.AT.B.5.A
- b Solve systems of linear equations using algebraic methods (i.e., substitution and linear combination). IA1.AT.B.5.B
- c Approximate or verify solutions to systems of equations by graphing and identifying the point of intersection. IA1.AT.B.5.C
- d Interpret the meaning of the solution in context. IA1.AT.B.5.D

6 Create linear inequalities in two variables to represent constraints in context and graph the solution set as a half-plane within the coordinate plane. IA1.AT.B.6

7 Represent and analyze systems of two linear inequalities in two variables in context. IA1.AT.B.7

- a Create systems of linear inequalities in two variables to represent constraints and relationships. IA1.AT.B.7.A
- b Graph the solution set to a system of linear inequalities as the intersection of the corresponding half-planes. IA1.AT.B.7.B
- c Interpret the meaning of the solution set in context and determine whether given ordered pairs are solutions to the system. IA1.AT.B.7.C

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8 Model and solve optimization problems using systems of linear inequalities. IA1.AT.B.8

a Represent contexts involving constraints and an objective to optimize (i.e., maximize or minimize) using a system of linear inequalities. IA1.AT.B.8.A

b Graph the feasible region and identify solutions that satisfy all constraints. IA1.AT.B.8.B

c Identify and justify the optimal solution(s) based on the objective, and interpret the meaning in context. IA1.AT.B.8.C

9 Use technology to solve systems of equations consisting of a linear equation and an exponential in two variables and interpret the solution within a given context. IA1.AT.B.9

C REASON ABOUT FUNCTIONS. IA1.AT.C

10 Identify, represent, and analyze functions in terms of their domain and range. IA1.AT.C.10

a Determine whether a relationship is a function by verifying that each element of the domain is assigned to exactly one element of the range using tables, graphs, and equations. IA1.AT.C.10.A

b Determine whether a function is one-to-one by analyzing tables, graphs, or equations, and justify the reasoning based on the relationship between inputs and outputs. IA1.AT.C.10.B

c Use function notation to evaluate functions for specific input values, x, and describe how the output changes with respect to the input. Interpret the meaning of specific values and patterns in context. IA1.AT.C.10.C

d Represent the graph of a function as the set of ordered pairs (x,) and explain how it illustrates the relationship between domain and range. IA1.AT.C.10.D

11 Calculate or estimate and interpret the average rate of change over a specified interval of linear and exponential functions presented graphically, symbolically, or in a table. IA1.AT.C.11

12 Compare key properties (i.e., rates of change, intercepts, patterns of growth) of two functions, one linear and one exponential, when each is represented in a different way (i.e., algebraically, graphically, numerically in tables, or by narrative descriptions). IA1.AT.C.12

D MODEL WITH FUNCTIONS. IA1.AT.D

13 Analyze and model arithmetic and geometric sequences using recursive and explicit representations. IA1.AT.D.13

a Identify whether a sequence is arithmetic or geometric and create an explicit rule to describe the pattern. IA1.AT.D.13.A

b Rewrite a recursive representation of an arithmetic or geometric sequence to an explicit rule. IA1.AT.D.13.B

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c Model contexts involving arithmetic or geometric patterns using an explicit or recursive rule, and use the rule to solve problems. IA1.AT.D.13.C

14 Represent functions using tables and graphs, and interpret key features in context. Key features include: domain, intercepts, intervals of increase and decrease, positive and negative values, end behavior, asymptote, and points of transition between pieces. IA1.AT.D.14

- a Analyze linear and exponential functions by identifying patterns in tables and graphs. Distinguish between constant and proportional growth. IA1.AT.D.14.A
- b Extend the understanding of functions to include piecewise-defined and absolute value functions. Represent them in tables and graphs and explain how absolute value functions can be represented as a specific case of piecewise functions. IA1.AT.D.14.B
- c Relate key features of a function's graph and table to the characteristics of a context, and justify the appropriateness of a function model based on that context. IA1.AT.D.14.C

15 Distinguish between situations that can be modeled with linear functions and with exponential functions. IA1.AT.D.15

- a Given a relationship in context where the rate of change over equal intervals is constant, identify it as linear and create a linear function to model the relationship. IA1.AT.D.15.A
- b Given a relationship in context where a quantity changes by a constant percent per unit interval relative to another, identify it as exponential and create an exponential function to model the relationship. IA1.AT.D.15.B

16 Analyze how changes to a function's input or output affect the graph and its meaning in context. IA1.AT.D.16

- a Identify how replacing with and changes the graph of a linear, exponential, or absolute value function. Describe the direction of the change and determine the value of k when given a graph. IA1.AT.D.16.A
- b Explain how changing the input or output of a function affects the quantities represented in context. Use the structure and features of the parent function to justify how these changes impact the initial context. IA1.AT.D.16.B

17 Find and interpret the inverse of a linear function in context. IA1.AT.D.17

- a Show that a linear function is one-to-one and therefore has an inverse that is also a function. IA1.AT.D.17.A
- b Find the inverse of a linear function represented with an equation or a table. IA1.AT.D.17.B
- c Interpret the meaning of the inverse in context as a relationship that maps outputs of the original function back to their corresponding inputs. IA1.AT.D.17.C

Geometric Reasoning GR

A REASON ABOUT TRANSFORMATIONS AND CONGRUENCE. IA1.GR.A

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1 Apply definitions of rotations, reflections, and translations to transform figures and use these transformations to verify congruence. IA1.GR.A.1

a Describe rotations, reflections, and translations as functions that take points in the plane as inputs and give corresponding points as outputs. IA1.GR.A.1.A

b Verify experimentally that rigid transformations preserve distance, angle measure, and parallelism, and use this understanding to justify congruence. IA1.GR.A.1.B

2 Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. IA1.GR.A.2

B CONJECTURE ABOUT AND VERIFY GEOMETRIC RELATIONSHIPS. IA1.GR.B

3 Apply triangle congruence theorems (SSS, SAS, ASA, AAS, HL) to reason logically about geometric diagrams, including verifying congruence and solving for unknown measures. IA1.GR.B.3

4 Understand and apply theorems and criteria for parallel and perpendicular lines. IA1.GR.B.4

a Use theorems about parallel lines cut by a transversal to identify and apply angle pair relationships, including corresponding, alternate interior, alternate exterior, and consecutive interior angles. IA1.GR.B.4.A

b Verify the slope criteria for parallel and perpendicular lines and apply them to solve geometric problems (e.g., determine when lines are parallel or perpendicular and find equations of lines that satisfy given geometric conditions). IA1.GR.B.4.B

5 Use angle relationships and slope criteria to verify properties of parallelograms. IA1.GR.B.5

a Use angle relationships from parallel lines and transversals, along with triangle congruence theorems, to verify properties of parallelograms, including congruent opposite sides, congruent opposite angles, and diagonals that bisect each other. IA1.GR.B.5.A

b Apply the slope criteria for parallel and perpendicular lines to verify when a quadrilateral is a parallelogram in a coordinate plane. IA1.GR.B.5.B

Reasoning with Data, Statistics, and Probability DS

A MAKE SENSE OF STATISTICAL INQUIRY. IA1.DS.A

1 Distinguish between correlation and causation. IA1.DS.A.1

2 Understand and apply statistics as a process for making inferences about population parameters using random samples. IA1.DS.A.2

a Explain the importance of randomization in selecting samples to ensure unbiased and representative data. IA1.DS.A.2.A

b Analyze the representativeness of a sample and its implications for making inferences about the population. IA1.DS.A.2.B

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3 Analyze and interpret how data are represented and used in arguments or reports. IA1.DS.A.3

a Identify key components of data-based arguments, including claims, visualizations (e.g., graphs, tables), and the statistical language used to support conclusions. IA1.DS.A.3.A

b Evaluate the accuracy and effectiveness of visualizations in representing data and supporting a claim or conclusion. IA1.DS.A.3.B

c Describe how data were collected and whether the method (e.g., sampling, use of randomization) supports valid conclusions. IA1.DS.A.3.C

4 Plan statistical investigations. IA1.DS.A.4

a Formulate statistical questions that can be answered with data. IA1.DS.A.4.A

b Determine effective data collection methods that enhance accuracy, validity, and representativeness of the data. IA1.DS.A.4.B

B DESCRIBE, ANALYZE, AND COMPARE DATA USING VISUAL AND NUMERICAL REPRESENTATIONS TO MODEL SITUATIONS AND DRAW INFERENCES. IA1.DS.B

5 Analyze and compare one-variable data visualizations on the real number line to draw conclusions. IA1.DS.B.5

a Compare multiple data visualizations to identify the unique statistical information each provides and their usefulness in different contexts. IA1.DS.B.5.A

b Analyze and compare the shape, center, and spread of data sets using appropriate visualizations. IA1.DS.B.5.B

6 Construct and interpret two-way frequency tables to analyze associations between two categorical variables. IA1.DS.B.6

a Use the tables to decide if events are independent IA1.DS.B.6.A

b Use the tables to find joint and marginal probabilities. IA1.DS.B.6.B

7 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. IA1.DS.B.7

a Fit a linear or exponential function to data; use functions fitted to data to solve problems in the context of the data. IA1.DS.B.7.A

b Informally assess the fit of a linear or exponential function visually by analyzing the graph and analytically by evaluating the appropriateness of the chosen model in representing the data and context. IA1.DS.B.7.B

8 Analyze and interpret the key components of linear and exponential models in the context of the data with and without technology. IA1.DS.B.8

a Interpret slope (rate of change) and the intercept (constant term) of a linear model to describe patterns and relationships in the data. IA1.DS.B.8.A

b Analyze the growth factor or average rate of change in exponential models to describe patterns, interpret trends, and make predictions in context. IA1.DS.B.8.B