

Algebra II

Adopted 2023

Number and Quantity

The Real Number System

- A. Extend the properties of exponents to rational exponents. [A2.N.RN.A](#)
 - 1. Extend the properties of integer exponents to rational exponents. [A2.N.RN.A.1](#)
 - a. Develop the meaning of rational exponents by applying the properties of integer exponents. [A2.N.RN.A.1.A](#)
 - b. Explain why $x^{1/n}$ can be written as the n th root of x . [A2.N.RN.A.1.B](#)
 - c. Rewrite expressions involving radicals and rational exponents using the properties of exponents. [A2.N.RN.A.1.C](#)
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Quantities

- A. Reason quantitatively and use units to understand problems. [A2.N.Q.A](#)
 - 1. Use units as a way to understand real-world problems. [A2.N.Q.A.1](#)
 - a. Choose and interpret the scale and the origin in graphs and data displays. [A2.N.Q.A.1.A](#)
 - b. Use appropriate quantities in formulas, converting units as necessary. [A2.N.Q.A.1.B](#)
 - c. Define and justify appropriate quantities within a context for the purpose of modeling. [A2.N.Q.A.1.C](#)
 - d. Choose an appropriate level of accuracy when reporting quantities. [A2.N.Q.A.1.D](#)

Matrices

- A. Perform operations on matrices and use matrices in applications. **A2.N.M.A**
 - 1. Use matrices to represent data in a real-world context. Interpret rows, columns, and dimensions of matrices in terms of the context. **A2.N.M.A.1**
 - 2. Perform operations on matrices in a real-world context. **A2.N.M.A.2**
 - a. Multiply a matrix by a scalar to produce a new matrix. **A2.N.M.A.2.A**
 - b. Add and/or subtract matrices by hand and using technology. **A2.N.M.A.2.B**
 - c. Multiply matrices of appropriate dimensions, by hand in simple cases and using technology for more complicated cases. **A2.N.M.A.2.C**
 - d. Describe the roles that zero matrices and identity matrices play in matrix addition and multiplication, recognizing that they are similar to the roles of 0 and 1 in the real number system. **A2.N.M.A.2.D**
 - 3. Create and use augmented matrices to solve systems of linear equations in real-world contexts, by hand and using technology. **A2.N.M.A.3**
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Algebra

Seeing Structure in Expressions

- A. Interpret the structure of expressions. **A2.A.SSE.A**
 - 1. Interpret expressions that represent a quantity in terms of its context. **A2.A.SSE.A.1**
 - a. Interpret parts of an expression, such as terms, factors, and coefficients. **A2.A.SSE.A.1.A**
 - b. Interpret complicated expressions by viewing one or more of their parts as a single entity. **A2.A.SSE.A.1.B**
 - A. Understand the relationship between zeros and factors of polynomials. **A2.A.APR.A**
 - 1. Know and apply the Factor Theorem: For a polynomial $p(x)$ and a number a , $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$. **A2.A.APR.A.1**
 - 2. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. **A2.A.APR.A.2**
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Creating Equations

- A. Create equations that describe numbers or relationships. **A2.A.CED.A**
 - 1. Create equations and inequalities in one variable and use them to solve problems in a real-world context. **A2.A.CED.A.1**
 - 2. Create equations and inequalities in two variables to represent relationships between quantities and use them to solve problems in a real-world context. Graph equations and inequalities with two variables on coordinate axes with labels and scales, and use the graphs to make predictions. **A2.A.CED.A.2**
 - 3. Rearrange formulas to isolate a quantity of interest using algebraic reasoning. **A2.A.CED.A.3**

Reasoning with Equations and Inequalities

- A. Understand solving equations as a process of reasoning and explain the reasoning. **A2.A.REI.A**
 - 1. Understand solving equations as a process of reasoning and explain the reasoning. Construct a viable argument to justify a solution method. **A2.A.REI.A.1**
 - 2. Solve radical equations in one variable, and identify extraneous solutions when they exist. **A2.A.REI.A.2**
 - B. Solve systems of equations. **A2.A.REI.B**
 - 3. Write and solve a system of linear equations in a real-world context. **A2.A.REI.B.3**
 - 4. Solve a system consisting of a linear equation and a quadratic equation in two variables algebraically, graphically, and using technology. **A2.A.REI.B.4**
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Functions

Interpreting Functions

- A. Interpret functions that arise in applications in terms of the context. **A2.F.IF.A**
 - 1. For a function that models a relationship between two quantities, 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. **A2.F.IF.A.1**
 - 2. Calculate and interpret the average rate of change of a function (presented algebraically or as a table) over a specified interval. Estimate and interpret the rate of change from a graph. **A2.F.IF.A.2**
 - 3. Understand geometric formulas as functions. **A2.F.IF.A.3**
- B. Analyze functions using different representations. **A2.F.IF.B**
 - 4. Graph functions expressed algebraically and show key features of the graph by hand and using technology. **A2.F.IF.B.4**
 - 5. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. **A2.F.IF.B.5**
 - a. Rewrite quadratic functions to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a real-world context. **A2.F.IF.B.5.A**
 - b. Know and use the properties of exponents to interpret expressions for exponential functions in terms of a real-world context. **A2.F.IF.B.5.B**
 - 6. Compare properties of functions represented algebraically, graphically, numerically in tables, or by verbal descriptions. **A2.F.IF.B.6**
 - a. Compare properties of two different functions. Functions may be of different types and/or represented in different ways. **A2.F.IF.B.6.A**
 - b. Compare properties of the same function on two different intervals or represented in two different ways. **A2.F.IF.B.6.B**

Building Functions

- A. Build a function that models a relationship between two quantities. **A2.F.BF.A**
1. Build a function that describes a relationship between two quantities. **A2.F.BF.A.1**
 - a. Combine standard function types using arithmetic operations. **A2.F.BF.A.1.A**
 - b. Combine standard function types using composition. **A2.F.BF.A.1.B**
 2. Define sequences as functions, including recursive definitions, whose domain is a subset of the integers. Write explicit and recursive formulas for arithmetic and geometric sequences in context and connect them to linear and exponential functions. **A2.F.BF.A.2**
- B. Build new functions from existing functions. **A2.F.BF.B**
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. **A2.F.BF.B.3**
 - a. Determine whether a function is one-to-one. **A2.F.BF.B.3.A**
 - b. Find the inverse of a function on an appropriate domain. **A2.F.BF.B.3.B**
 - c. Given an invertible function on an appropriate domain, identify the domain of the inverse function. **A2.F.BF.B.3.C**
 4. Find the inverse of a function. **A2.F.BF.B.4**
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Linear, Quadratic, and Exponential Models

- A. Construct and compare linear, quadratic, and exponential models and solve problems. **A2.F.LE.A**
1. Know the relationship between exponential functions and logarithmic functions. **A2.F.LE.A.1**
 - a. Solve exponential equations using a variety of strategies, including logarithms. **A2.F.LE.A.1.A**
 - b. Understand that a logarithm is the solution to $ab^{ct} = d$, where a , b , c , and d are numbers. **A2.F.LE.A.1.B**
 - c. Evaluate logarithms using technology. **A2.F.LE.A.1.C**
 2. Know that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or cubically. **A2.F.LE.A.2**
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Statistics and Probability

Interpreting Categorical and Quantitative Data

- A. Summarize, represent, and interpret data on a single count or measurement variable. **A2.S.ID.A**
 - 1. Use statistics appropriate to the shape of the data distribution to compare center (mean, median, and/or mode) and spread (range, standard deviation) of two or more different data sets. **A2.S.ID.A.1**
 - 2. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages using the Empirical Rule. **A2.S.ID.A.2**
 - 3. Compute, interpret, and compare z-scores for normally distributed data in a real-world context. **A2.S.ID.A.3**
 - B. Summarize, represent, and interpret data on two categorical and quantitative variables. **A2.S.ID.B**
 - 4. Represent data from two quantitative variables on a scatter plot, and describe how the variables are related. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. **A2.S.ID.B.4**
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Making Inferences and Justifying Conclusions

- A. Make inferences and justify conclusions from sample surveys, experiments, and observational studies. **A2.S.IC.A**
 - 1. Recognize the purposes of and differences among sample surveys, experiments, and observational studies. **A2.S.IC.A.1**
 - 2. Identify potential sources of bias in statistical studies. **A2.S.IC.A.2**
 - 3. Distinguish between a statistic and a parameter. Evaluate reports based on data and recognize when poor conclusions are drawn from well-collected data. **A2.S.IC.A.3**

Conditional Probability and the Rules of Probability

- A. Understand independence and conditional probability and use them to create visual representations of data. **A2.S.CP.A**
 - 1. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. Categorize events as independent or dependent. **A2.S.CP.A.1**
- B. Understand and apply basic concepts of probability. **A2.S.CP.B**
 - 2. Apply statistical counting techniques. **A2.S.CP.B.2**
 - a. Use the Fundamental Counting Principle to compute probabilities of compound events and solve problems. **A2.S.CP.B.2.A**
 - b. Use permutations and combinations to compute probabilities of compound events and solve problems. **A2.S.CP.B.2.B**
 - 3. Use the Law of Large Numbers to assess the validity of a statistical claim. **A2.S.CP.B.3**
- C. Use the rules of probability to compute probabilities of compound events in a uniform probability model. **A2.S.CP.C**
 - 4. Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A and interpret the answer in terms of the given context. **A2.S.CP.C.4**