

MCAP EOC Tutorials for Maryland are designed specifically for the Maryland College and Career Ready Standards to prepare students for the Maryland Comprehensive Assessment Program (MCAP). EOC Categories are at the heart of MCAP EOC Tutorial structure – bringing category-based learning to the student experience, and category-based performance and progress tracking to the teacher experience.

Math Tutorials offer targeted instruction, practice and review designed to develop computational fluency, deepen conceptual understanding, and apply mathematical practices. They automatically identify and address learning gaps down to elementary-level content, using adaptive remediation to bring students to grade-level no matter where they start. Students engage with the content in an interactive, feedback-rich environment as they progress through standards-aligned modules. By constantly honing the ability to apply their knowledge in abstract and real world scenarios, students build the depth of knowledge and higher order skills required to demonstrate their mastery when put to the test.

In each module, the Learn It and Try It make complex ideas accessible to students through focused content, modeled logic and process, multi-modal representations, and personalized feedback as students reason through increasingly challenging problems. The Review It offers a high impact summary of key concepts and relates those concepts to students' lives. The Test It assesses students' mastery of the module's concepts, providing granular performance data to students and teachers after each attempt. To help students focus on the content most relevant to them, unit-level pretests and posttests can quickly identify where students are strong and where they're still learning.

Test-Taking Strategies for EOC Tutorials allow students to practice and apply learning approaches that will hone their test-taking skills and focus them for success on the day of their EOC test.

### Unit 1: Real Number System 1

- **LAWS OF EXPONENTS**

- A.SSE.B.3c: Write expressions in equivalent forms to solve problems. Use the properties of exponents to transform expressions for exponential functions.

- **MONITORING PRECISION AND ACCURACY**

- N.Q.A.1: Reason quantitatively and use units to solve problems. 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.
- A.REI.B.3: Solve equations and inequalities in one variable. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

- N.Q.A.3: Reason quantitatively and use units to solve problems. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

## Unit 2: Real Number System 2

### • OPERATIONS ON RATIONAL AND IRRATIONAL NUMBERS

- N.RN.B.3: Use properties of rational and irrational numbers. 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.
- A1.R.4: Reasoning Evidence Statements Identify an option that would refute a conjecture/claim.
- A1.R.9: Reasoning Evidence Statements Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures about functions.
- A1.M.7: Modeling Evidence Statements Identify information or assumptions needed to solve a problem.

## Unit 3: Equations and Inequalities 1

### • ONE-STEP EQUATIONS AND INEQUALITIES

- A.CED.A.1: Create equations that describe the numbers or relationships. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
- A.REI.B.3: Solve equations and inequalities in one variable. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- A1.R.1: Reasoning Evidence Statements Given an equation reason about the number and/or nature of the solutions.
- A.CED.A.3: Create equations that describe the numbers or relationships. 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.

## Unit 4: Equations and Inequalities 2

### • MULTI-STEP EQUATIONS AND INEQUALITIES

- A.CED.A.1: Create equations that describe the numbers or relationships. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
- A1.M.6: Modeling Evidence Statements Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in the standards.
- A.REI.B.3: Solve equations and inequalities in one variable. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- A1.R.1: Reasoning Evidence Statements Given an equation reason about the number and/or nature of the solutions.

- A.REI.A.1: Understand solving equations as a process of reasoning and explain the reasoning. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
- A.CED.A.3: Create equations that describe the numbers or relationships. 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.

### Unit 5: Literal Equations

- **LITERAL EQUATIONS**

- A.REI.B.3: Solve equations and inequalities in one variable. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- A.CED.A.4: Create equations that describe the numbers or relationships. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
- A1.M.7: Modeling Evidence Statements Identify information or assumptions needed to solve a problem.

### Unit 6: Algebraic Expressions

- **AXIOMS OF EQUALITY**

- A.SSE.A.2: Interpret the structure of expressions. Use the structure of expressions to identify ways to rewrite it.
- A1.M.6: Modeling Evidence Statements Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in the standards.

- **FORMULATING AND SIMPLIFYING ALGEBRAIC EXPRESSIONS**

- A.SSE.A.1a: Interpret the structure of expressions. Interpret parts of an expression, such as terms, factors, and coefficients.

### Unit 7: Writing Expressions and Equations

- **FORMULATING AND SOLVING EQUATIONS FROM WORD PROBLEMS**

- A.SSE.A.1a: Interpret the structure of expressions. Interpret parts of an expression, such as terms, factors, and coefficients.
- A.CED.A.1: Create equations that describe the numbers or relationships. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
- A.REI.B.3: Solve equations and inequalities in one variable. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- A1.R.1: Reasoning Evidence Statements Given an equation reason about the number and/or nature of the solutions.

- A.CED.A.3: Create equations that describe the numbers or relationships. 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.
- **FORMULATING AND SOLVING INEQUALITIES FROM WORD PROBLEMS**
- A.SSE.A.1a: Interpret the structure of expressions. Interpret parts of an expression, such as terms, factors, and coefficients.
- A.CED.A.1: Create equations that describe the numbers or relationships. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
- A1.R.8: Reasoning Evidence Statements Given an equation or system of equations, present the solution steps as a logical argument that concludes with the set of solutions (if any).
- A.REI.B.3: Solve equations and inequalities in one variable. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- A.CED.A.3: Create equations that describe the numbers or relationships. 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.

## Unit 8: Functions 1

- **FUNCTIONS AND RELATIONS**
- F.IF.A.2: Understand the concept of a function and use function notation. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a real-world context.
- F.IF.A.1: Understand the concept of a function and use function notation. 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  $f$  is a function and  $x$  is an element of its domain, then  $f(x)$  denotes the output of  $f$  corresponding to the input  $x$ . The graph of  $f$  is the graph of the equation  $y = f(x)$ .
- F.IF.C.7b: Analyze functions using different representations. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- F.BF.A.1a: Build a function that models a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from a real-world context.
- **DOMAIN AND RANGE**
- F.IF.A.1: Understand the concept of a function and use function notation. 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  $f$  is a function and  $x$  is an element of its domain, then  $f(x)$  denotes the output of  $f$  corresponding to the input  $x$ . The graph of  $f$  is the graph of the equation  $y = f(x)$ .
- F.IF.B.5: Interpret functions that arise in applications in terms of the real-world context. Relate the domain of a function to a graph and, where applicable, to the quantitative relationship it describes.

- F.IF.C.7b: Analyze functions using different representations. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

## Unit 9: Functions 2

### • EVALUATING FUNCTIONS

- F.IF.A.2: Understand the concept of a function and use function notation. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a real-world context.
- F.LE.A.2: Construct and compare linear, quadratic, and exponential models and solve problems. Construct linear, and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
- A1.R.1: Reasoning Evidence Statements Given an equation reason about the number and/or nature of the solutions.

## Unit 10: Introduction to Linear Relationships

### • SLOPE

- F.IF.B.4: Interpret functions that arise in applications in terms of the real-world context. 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.
- F.LE.B.5: Interpret expressions for functions in terms of the situation they model. Interpret the parameters in a linear or exponential function in terms of a context.
- A1.R.11: Reasoning Evidence Statements Express reasoning about linear and exponential growth.
- F.IF.B.6: Interpret functions that arise in applications in terms of the real-world context. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

### • GRAPHING AND ANALYZING LINEAR FUNCTIONS

- F.LE.A.2: Construct and compare linear, quadratic, and exponential models and solve problems. Construct linear, and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
- F.IF.B.5: Interpret functions that arise in applications in terms of the real-world context. Relate the domain of a function to a graph and, where applicable, to the quantitative relationship it describes.
- A.REI.D.10: Represent and solve equations and inequalities graphically. 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).
- F.LE.B.5: Interpret expressions for functions in terms of the situation they model. Interpret the parameters in a linear or exponential function in terms of a context.
- F.IF.B.4: Interpret functions that arise in applications in terms of the real-world context. 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.

- F.IF.C.7a: Analyze functions using different representations. Graph linear and quadratic functions and show intercepts, maxima and minima.

- **GRAPHS OF LINEAR INEQUALITIES**

- A.REI.D.12: Represent and solve equations and inequalities graphically. 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.CED.A.3: Create equations that describe the numbers or relationships. 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.
- A1.R.3: Reasoning Evidence Statements Reasoning based on the principle that the graph of an equation and inequality in two variables is the set of all its solutions plotted in the coordinate plane.

## Unit 11: Linear Equations

- **SLOPE-INTERCEPT FORM OF A LINEAR EQUATION**

- F.LE.B.5: Interpret expressions for functions in terms of the situation they model. Interpret the parameters in a linear or exponential function in terms of a context.
- A.CED.A.2: Create equations that describe the numbers or relationships. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- A.REI.D.10: Represent and solve equations and inequalities graphically. 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).

- **POINT-SLOPE FORM OF A LINEAR EQUATION**

- A.CED.A.2: Create equations that describe the numbers or relationships. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

- **GRAPHING AND MANIPULATING  $Y = MX + B$**

- F.BF.B.3: Build new functions from existing functions. Identify the effect on the graph of replacing  $( )$  by  $( ) +$ ,  $( ) -$ ,  $( ) \cdot$ , and  $( ) \div$  for specific values of  $( )$  (both positive and negative); find the value of  $( )$  given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
- F.IF.B.4: Interpret functions that arise in applications in terms of the real-world context. 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.

- S.ID.C.7: Interpret Linear Models. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the real-world context of the data.
- F.LE.B.5: Interpret expressions for functions in terms of the situation they model. Interpret the parameters in a linear or exponential function in terms of a context.

### Unit 12: Introduction to Two-Variable Linear Systems 1

#### • SOLVING SYSTEMS OF LINEAR EQUATIONS: GUESS AND CHECK

- A1.R.8: Reasoning Evidence Statements Given an equation or system of equations, present the solution steps as a logical argument that concludes with the set of solutions (if any).
- A.CED.A.3: Create equations that describe the numbers or relationships. 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.
- F.BF.A.1a: Build a function that models a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from a real-world context.
- A.REI.C.6: Solve Systems of Equations. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
- A1.R.2: Reasoning Evidence Statements Given a system of equations reason about the number or nature of the solutions.

### Unit 13: Introduction to Two-Variable Linear Systems 2

#### • SOLVING SYSTEMS OF LINEAR EQUATIONS: GRAPHING

- A.CED.A.3: Create equations that describe the numbers or relationships. 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.
- A.REI.C.6: Solve Systems of Equations. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
- A1.R.2: Reasoning Evidence Statements Given a system of equations reason about the number or nature of the solutions.

### Unit 14: Solving Two-Variable Linear Systems

#### • SOLVING SYSTEMS OF LINEAR EQUATIONS: SUBSTITUTION

- A.CED.A.3: Create equations that describe the numbers or relationships. 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.
- A.REI.C.6: Solve Systems of Equations. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
- A1.M.6: Modeling Evidence Statements Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in the standards.

- A1.R.2: Reasoning Evidence Statements Given a system of equations reason about the number or nature of the solutions.
- **SOLVING SYSTEMS OF LINEAR EQUATIONS: ELIMINATION**
  - A.CED.A.3: Create equations that describe the numbers or relationships. 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.
  - A.REI.C.6: Solve Systems of Equations. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
  - A1.M.6: Modeling Evidence Statements Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in the standards.
  - A1.R.2: Reasoning Evidence Statements Given a system of equations reason about the number or nature of the solutions.
- **SOLVING SYSTEMS OF LINEAR INEQUALITIES**
  - A.CED.A.3: Create equations that describe the numbers or relationships. 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.
  - A.REI.D.12: Represent and solve equations and inequalities graphically. 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.
  - A1.M.6: Modeling Evidence Statements Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in the standards.
  - A.REI.C.6: Solve Systems of Equations. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
  - A1.R.3: Reasoning Evidence Statements Reasoning based on the principle that the graph of an equation and inequality in two variables is the set of all its solutions plotted in the coordinate plane.

## Unit 15: Exponential Functions and Inequalities

- **EXPONENTIAL FUNCTIONS**
  - F.IF.B.4: Interpret functions that arise in applications in terms of the real-world context. 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.
  - F.LE.A.1c: Construct and compare linear, quadratic, and exponential models and solve problems. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

- F.LE.B.5: Interpret expressions for functions in terms of the situation they model. Interpret the parameters in a linear or exponential function in terms of a context.
- A1.R.11: Reasoning Evidence Statements Express reasoning about linear and exponential growth.
- F.IF.B.5: Interpret functions that arise in applications in terms of the real-world context. Relate the domain of a function to a graph and, where applicable, to the quantitative relationship it describes.
- F.LE.A.2: Construct and compare linear, quadratic, and exponential models and solve problems. Construct linear, and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
- **EXPONENTIAL GROWTH AND DECAY**
  - A.SSE.A.1a: Interpret the structure of expressions. Interpret parts of an expression, such as terms, factors, and coefficients.
  - A.SSE.B.3c: Write expressions in equivalent forms to solve problems. Use the properties of exponents to transform expressions for exponential functions.
  - A1.R.11: Reasoning Evidence Statements Express reasoning about linear and exponential growth.
  - F.LE.A.1c: Construct and compare linear, quadratic, and exponential models and solve problems. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
  - F.LE.A.1a: Construct and compare linear, quadratic, and exponential models and solve problems. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
- **SOLVING EXPONENTIAL INEQUALITIES**
  - A1.R.11: Reasoning Evidence Statements Express reasoning about linear and exponential growth.
  - F.LE.A.2: Construct and compare linear, quadratic, and exponential models and solve problems. Construct linear, and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
  - F.LE.B.5: Interpret expressions for functions in terms of the situation they model. Interpret the parameters in a linear or exponential function in terms of a context.

## Unit 16: Sequences

- **SEQUENCES**
  - F.IF.A.3: Understand the concept of a function and use function notation. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by  $f(0) = f(1) = 1$ ,  $f(n + 1) = f(n) + f(n - 1)$  for  $n \geq 1$ .
  - F.BF.A.1a: Build a function that models a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from a real-world context.
  - F.LE.A.1a: Construct and compare linear, quadratic, and exponential models and solve problems. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions

grow by equal factors over equal intervals.

- F.IF.A.3: Understand the concept of a function and use function notation. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by  $f(0) = f(1) = 1$ ,  $f(n + 1) = f(n) + f(n - 1)$  for  $n \geq 1$ .
- F.IF.A.3: Understand the concept of a function and use function notation. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by  $f(0) = f(1) = 1$ ,  $f(n + 1) = f(n) + f(n - 1)$  for  $n \geq 1$ .

- **ARITHMETIC AND GEOMETRIC SEQUENCES**

- F.BF.A.1a: Build a function that models a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from a real-world context.
- F.IF.A.3: Understand the concept of a function and use function notation. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by  $f(0) = f(1) = 1$ ,  $f(n + 1) = f(n) + f(n - 1)$  for  $n \geq 1$ .
- F.LE.A.2: Construct and compare linear, quadratic, and exponential models and solve problems. Construct linear, and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

## Unit 17: Polynomials

- **POLYNOMIAL BASICS**

- **ADDITION AND SUBTRACTION OF POLYNOMIALS**

- A.APR.A.1: Perform arithmetic operations on polynomials. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

- **MULTIPLICATION OF POLYNOMIALS**

- A.APR.A.1: Perform arithmetic operations on polynomials. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

## Unit 18: Factoring Polynomials

- **FACTORING QUADRATIC TRINOMIALS**

- A.SSE.B.3a: Write expressions in equivalent forms to solve problems. Factor a quadratic expression to reveal the zeros of the function it defines.
- F.IF.C.8a: Analyze functions using different representations. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a real-world context.
- A.SSE.A.2: Interpret the structure of expressions. Use the structure of expressions to identify ways to rewrite it.

- **FACTORING SPECIAL CASES**

- A.SSE.A.2: Interpret the structure of expressions. Use the structure of expressions to identify ways to rewrite it.
- A.SSE.B.3a: Write expressions in equivalent forms to solve problems. Factor a quadratic expression to reveal the zeros of the function it defines.
- **FACTORIZING HIGHER-ORDER POLYNOMIALS**
- A.APR.B.3: Understand the relationship between zeros and factors of polynomials. Identify zeros of polynomials when suitable factorizations are available and/or use the zeros to construct a rough graph of the function defined by the polynomial.

### Unit 19: Introduction to Quadratic Functions 1

- **QUADRATIC FUNCTIONS**
- F.IF.C.8a: Analyze functions using different representations. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a real-world context.
- F.IF.C.7a: Analyze functions using different representations. Graph linear and quadratic functions and show intercepts, maxima and minima.
- **COMPLETING THE SQUARE**
- A.REI.B.4b: Solve equations and inequalities in one variable. Solve quadratic equations with rational number coefficients by inspection (e.g., for  $x^2 = 49$ ), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions.
- A.REI.B.4a: Solve equations and inequalities in one variable. Use the method of completing the square to transform any quadratic equation in  $ax^2 + bx + c = 0$  into an equation of the form  $(x - p)^2 = q$  that has the same solutions. Derive the quadratic formula from this form.
- F.IF.C.8a: Analyze functions using different representations. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a real-world context.
- A.SSE.B.3b: Write expressions in equivalent forms to solve problems. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

### Unit 20: Introduction to Quadratic Functions 2

- **REPRESENTATIONS OF QUADRATIC FUNCTIONS**
- A.REI.B.4b: Solve equations and inequalities in one variable. Solve quadratic equations with rational number coefficients by inspection (e.g., for  $x^2 = 49$ ), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions.
- A1.M.6: Modeling Evidence Statements Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in the standards.

- A.REI.B.4b: Solve equations and inequalities in one variable. Solve quadratic equations with rational number coefficients by inspection (e.g., for  $x^2 = 49$ ), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions.
- A.CED.A.1: Create equations that describe the numbers or relationships. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

## Unit 21: Solving Quadratic Functions

### • SOLVING QUADRATIC EQUATIONS BY FACTORING

- A1.M.6: Modeling Evidence Statements Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in the standards.
- A.REI.B.4b: Solve equations and inequalities in one variable. Solve quadratic equations with rational number coefficients by inspection (e.g., for  $x^2 = 49$ ), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions.
- A.SSE.B.3a: Write expressions in equivalent forms to solve problems. Factor a quadratic expression to reveal the zeros of the function it defines.
- F.IF.C.7a: Analyze functions using different representations. Graph linear and quadratic functions and show intercepts, maxima and minima.
- F.IF.C.8a: Analyze functions using different representations. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a real-world context.
- A1.R.1: Reasoning Evidence Statements Given an equation reason about the number and/or nature of the solutions.
- A.CED.A.3: Create equations that describe the numbers or relationships. 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.

### • QUADRATIC FORMULA

- A1.M.6: Modeling Evidence Statements Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in the standards.
- A.REI.B.4b: Solve equations and inequalities in one variable. Solve quadratic equations with rational number coefficients by inspection (e.g., for  $x^2 = 49$ ), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions.
- A1.R.1: Reasoning Evidence Statements Given an equation reason about the number and/or nature of the solutions.

- A.CED.A.3: Create equations that describe the numbers or relationships. 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.

## Unit 22: Nonlinear Functions

### • ANALYZING GRAPHS OF QUADRATIC FUNCTIONS

- F.IF.B.5: Interpret functions that arise in applications in terms of the real-world context. Relate the domain of a function to a graph and, where applicable, to the quantitative relationship it describes.
- F.BF.B.3: Build new functions from existing functions. Identify the effect on the graph of replacing  $( )$  by  $( ) + , ( ), ( ),$  and  $( + )$  for specific values of  $( )$  (both positive and negative); find the value of  $( )$  given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
- A.CED.A.3: Create equations that describe the numbers or relationships. 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.
- F.IF.C.7a: Analyze functions using different representations. Graph linear and quadratic functions and show intercepts, maxima and minima.
- F.IF.B.4: Interpret functions that arise in applications in terms of the real-world context. 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.
- A.APR.B.3: Understand the relationship between zeros and factors of polynomials. Identify zeros of polynomials when suitable factorizations are available and/or use the zeros to construct a rough graph of the function defined by the polynomial.
- F.IF.C.9: Analyze functions using different representations. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

### • SYSTEMS OF NONLINEAR EQUATIONS

- A1.R.2: Reasoning Evidence Statements Given a system of equations reason about the number or nature of the solutions.

## Unit 23: Parent Functions

### • LINEAR AND EXPONENTIAL PARENT FUNCTIONS

- F.LE.A.2: Construct and compare linear, quadratic, and exponential models and solve problems. Construct linear, and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
- A.REI.D.10: Represent and solve equations and inequalities graphically. 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).

- F.IF.B.5: Interpret functions that arise in applications in terms of the real-world context. Relate the domain of a function to a graph and, where applicable, to the quantitative relationship it describes.
- F.LE.B.5: Interpret expressions for functions in terms of the situation they model. Interpret the parameters in a linear or exponential function in terms of a context.
- F.IF.B.4: Interpret functions that arise in applications in terms of the real-world context. 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.
- F.LE.A.1a: Construct and compare linear, quadratic, and exponential models and solve problems. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
- **QUADRATIC PARENT FUNCTION**
  - F.IF.B.5: Interpret functions that arise in applications in terms of the real-world context. Relate the domain of a function to a graph and, where applicable, to the quantitative relationship it describes.

#### Unit 24: Transformations of Parent Functions

- **TRANSFORMATIONS OF THE LINEAR AND EXPONENTIAL PARENT FUNCTIONS**
  - A1.R.10: Reasoning Evidence Statements Express reasoning about transformations of functions.
  - F.BF.B.3: Build new functions from existing functions. Identify the effect on the graph of replacing  $(x)$  by  $(x) + h$ ,  $(x) - h$ ,  $(kx)$ , and  $(kx + h)$  for specific values of  $h$  (both positive and negative); find the value of  $k$  given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
  - F.BF.B.3: Build new functions from existing functions. Identify the effect on the graph of replacing  $(x)$  by  $(x) + h$ ,  $(x) - h$ ,  $(kx)$ , and  $(kx + h)$  for specific values of  $h$  (both positive and negative); find the value of  $k$  given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
  - F.BF.B.3: Build new functions from existing functions. Identify the effect on the graph of replacing  $(x)$  by  $(x) + h$ ,  $(x) - h$ ,  $(kx)$ , and  $(kx + h)$  for specific values of  $h$  (both positive and negative); find the value of  $k$  given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
- **TRANSFORMATIONS OF THE QUADRATIC PARENT FUNCTION**
  - A1.R.10: Reasoning Evidence Statements Express reasoning about transformations of functions.
  - F.BF.B.3: Build new functions from existing functions. Identify the effect on the graph of replacing  $(x)$  by  $(x) + h$ ,  $(x) - h$ ,  $(kx)$ , and  $(kx + h)$  for specific values of  $h$  (both positive and negative); find the value of  $k$  given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using

technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

- F.BF.B.3: Build new functions from existing functions. Identify the effect on the graph of replacing  $f(x)$  by  $f(x) + k$ ,  $f(x) - k$ ,  $f(kx)$ , and  $f\left(\frac{x}{k}\right)$  for specific values of  $k$  (both positive and negative); find the value of  $k$  given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
- F.BF.B.3: Build new functions from existing functions. Identify the effect on the graph of replacing  $f(x)$  by  $f(x) + k$ ,  $f(x) - k$ ,  $f(kx)$ , and  $f\left(\frac{x}{k}\right)$  for specific values of  $k$  (both positive and negative); find the value of  $k$  given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

## Unit 25: Working with Functions

### • LINEAR VERSUS NONLINEAR FUNCTIONS

- F.LE.A.1a: Construct and compare linear, quadratic, and exponential models and solve problems. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
- F.LE.A.1b: Construct and compare linear, quadratic, and exponential models and solve problems. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
- F.IF.B.6: Interpret functions that arise in applications in terms of the real-world context. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
- A.REI.D.10: Represent and solve equations and inequalities graphically. 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).

### • ABSOLUTE VALUE FUNCTIONS

- A.REI.D.10: Represent and solve equations and inequalities graphically. 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).
- F.IF.C.7b: Analyze functions using different representations. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- F.IF.B.4: Interpret functions that arise in applications in terms of the real-world context. 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.

### • MULTIPLE REPRESENTATIONS OF FUNCTIONS

- F.IF.C.9: Analyze functions using different representations. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

### Unit 26: Statistics

- **DATA ANALYSIS**
- **FREQUENCY TABLES**

### Unit 27: Two-Variable Data

- **SCATTERPLOTS**
  - S.ID.B.6: Summarize, represent, and interpret data on two categorical and quantitative variables. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
  - S.ID.C.9: Interpret Linear Models. Distinguish between correlation and causation.
  - S.ID.C.7: Interpret Linear Models. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the real-world context of the data.
- **SCATTERPLOTS AND MODELING**
  - S.ID.B.6a: Summarize, represent, and interpret data on two categorical and quantitative variables. Fit a function to the data; use functions fitted to data to solve problems in the real-world context of the data. Use given functions or choose a function suggested by the real-world context. Emphasize linear, quadratic, and exponential models.
  - S.ID.B.6b: Summarize, represent, and interpret data on two categorical and quantitative variables. Informally assess the fit of a function by plotting and analyzing residuals.
  - S.ID.C.8: Interpret Linear Models. Compute (using technology) and interpret the correlation coefficient of a linear fit.

### Unit 28: Test-Taking Strategies

- **STUDY HABITS**
- **BEING PREPARED AND GETTING STARTED**
- **WORDING IN TEST QUESTIONS**
- **WORDING IN ANSWER CHOICES**
- **QUESTIONS WITH PASSAGES AND VISUAL DATA**
- **ESSAY AND SHORT ANSWER QUESTIONS**
- **WORD PROBLEMS**