

MATH NATION Algebra 1 2017-2018 Scope and Sequence

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Section 1: Expressions

| Topic | Title | Standards | Objective |
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| 1 | Using Expressions to Represent Real-World Situations | <p>MAFS.912.A-APR.1.1 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.</p> <p>MAFS.912.A-SSE.1.1 Interpret expressions that represent a quantity in terms of its context. Interpret parts of an expression, such as terms, factors, and coefficients.</p> | This topic focuses on writing, interpreting, and evaluating algebraic expressions in a real-world context. |
| 2 | Understanding Polynomial Expressions | <p>MAFS.912.A-SSE.1.1 Interpret expressions that represent a quantity in terms of its context. Interpret parts of an expression, such as terms, factors, and coefficients.</p> | This topic focuses on classifying polynomials by their term and degree. Students will also learn how to identify the leading term and coefficient of a polynomial. |
| 3 | Algebraic Expressions Using the Distributive Property | <p>MAFS.912.A-SSE.1.2 Use the structure of an expression to identify ways to rewrite it.</p> | This topic focuses on rewriting expressions using the distributive property. |
| 4 | Algebraic Expressions Using the Commutative and Associative Properties | <p>MAFS.912.A-SSE.1.2 Use the structure of an expression to identify ways to rewrite it.</p> | This topic focuses on using the commutative and associative properties to write equivalent expressions. Students will also determine which properties have been used when writing equivalent expressions. |
| 5 | Properties of Exponents | <p>MAFS.912.A-SSE.1.2 Use the structure of an expression to identify ways to rewrite it.</p> | This topic reviews the properties of exponents. Students will apply the properties to rewrite expressions. |
| 6 | Radical Expressions and Expressions with Rational Exponents | <p>MAFS.912.N-RN.1.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.</p> <p>MAFS.912.N-RN.1.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.</p> | This topic focuses on the meaning of rational exponents. Students will rewrite expressions with radicals and rational exponents. |

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| 7 | Adding Expressions with Radicals and Rational Exponents | MAFS.912.N-RN.1.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents. | This topic focuses on using the definition of rational exponents and properties of exponents to add expressions with radicals and rational exponents. |
| 8 | More Operations with Radicals and Rational Exponents | MAFS.912.N-RN.1.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents. | This topic focuses on using the definition of rational exponents and properties of exponents to find products and quotients of expressions with radicals and rational exponents. |
| 9 | Operations with Rational and Irrational Numbers | MAFS.912.N-RN.2.3 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. | This topic focuses on performing and analyzing various operations and proofs with rational and irrational numbers, and making generalizations on the relationships between rational and irrational numbers. |

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Section 2: Equations and Inequalities

| Topic | Title | Standards | Objective |
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| 1 | Equations: True or False? | MAFS.912.A-REI.2.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. | This topic focuses on truth values of number sentences and algebraic equations. Students will find the value of a variable that makes an equation a true statement. |
| 2 | Identifying Properties When Solving Equations | <p>MAFS.912.A-REI.1.1 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 they original equation has a solution. Construct a viable argument to justify a solution method.</p> <p>MAFS.912.A-SSE.1.2 Use the structure of an expression to identify ways to rewrite it.</p> <p>MAFS.912.A-REI.2.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.</p> | This topic introduces the addition and multiplication properties of equality. Students will use those along with associative, commutative, and distributive properties to justify the steps to solving an equation in one variable. |
| 3 | Solving Equations | <p>MAFS.912.A-REI.2.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.</p> <p>MAFS.912.A-CED.1.1 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.</p> <p>MAFS.912.A-REI.1.1 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 they original equation has a solution. Construct a viable argument to justify a solution method.</p> | This topic continues to build on justifications for solving equations. Additionally, students will create and solve equations that represent real-world situations. |

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| 4 | Solving Equations Using the Zero Product Property | MAFS.912.A-REI.2.4. Solve quadratic equations in one variable. | This topic introduces the zero product property and how it is used to solve equations. |
| 5 | Solving Inequalities – Part 1 | MAFS.912.A-REI.2.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. MAFS.912.A-CED.1.1 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. | This topic reviews graphing inequalities and introduces the addition and subtraction properties of inequalities. |
| 6 | Solving Inequalities – Part 2 | MAFS.912.A-REI.2.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. MAFS.912.A-CED.1.1 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. | This topic introduces the multiplication property of inequality. Students will use all the new properties to solve inequalities. |
| 7 | Solving Compound Inequalities | MAFS.912.A-REI.2.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. | This topic focuses on solving compound inequalities and learning about the differences between "and" and "or" compound inequalities. |
| 8 | Rearranging Formulas | MAFS.912.A-CED.1.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. MAFS.912.A-CED.1.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. MAFS.912.A-REI.2.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. | This topic focuses on solving equations for a specified variable. |

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| 9 | Solution Sets to Equations with Two Variables | <p>MAFS.912.A-CED.1.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p> <p>MAFS.912.A-REI.4.10 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).</p> | This topic introduces equations in two variables. Students will represent the solutions on a graph and determine if the functions are discrete or continuous. |
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Section 3: Introduction to Functions

| Topic | Title | Standards | Objective |
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| 1 | Input and Output Values | <p>MAFS.912.F-IF.1.1 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 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.</p> <p>MAFS.912.F-IF.1.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.</p> | <p>This topic introduces the concepts of domain and range, relating them to independent and dependent variables. Students learn to represent real-world situations in function notation and solve these situations.</p> |
| 2 | Representing, Naming, and Evaluating Functions | <p>MAFS.912.F-IF.1.1 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 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.</p> <p>MAFS.912.F-IF.1.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.</p> <p>MAFS.912.F-IF.2.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.</p> | <p>This topic focuses on finding domain and range for given functions and evaluating functions for specific values of the domain. Students also write and solve functions to represent real-world situations.</p> |

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| 3 | Adding and Subtracting Functions | <p>MAFS.912.A-SSE.1.1 Interpret expressions that represent a quantity in terms of its context. Interpret parts of an expression, such as terms, factors, and coefficients.</p> <p>MAFS.912.A-SSE.1.2 Use the structure of an expression to identify ways to rewrite it.</p> <p>MAFS.912.A-APR.1.1 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.</p> | This topic focuses on adding and subtracting polynomials written in function notation. |
| 4 | Multiplying Functions | <p>MAFS.912.A-SSE.1.1 Interpret expressions that represent a quantity in terms of its context. Interpret parts of an expression, such as terms, factors, and coefficients.</p> <p>MAFS.912.A-SSE.1.2 Use the structure of an expression to identify ways to rewrite it.</p> <p>MAFS.912.A-APR.1.1 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.</p> | This topic focuses on multiplying polynomial expressions using both modeling techniques and the distributive property. The polynomials are written in function notation. |
| 5 | Closure Property | <p>MAFS.912.A-APR.1.1 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.</p> | Students explore the closure property with polynomials and discover polynomials are closed under the same operations as integers. |
| 6 | Real-World Combinations and Compositions of Functions | <p>MAFS.912.F-BF.1.1.b.c. Write a function that describes a relationship between two quantities.</p> <p>b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.</p> <p>c. Compose functions. For example, if t is the temperature in the atmosphere as a function of height, and h is the height of a weather balloon as a function of time, then $t \circ h$ is the temperature at the location of the weather balloon as a function of time.</p> | This topic focuses applying student knowledge of function operations to real-world situations. Students are also introduced to compositions of functions. |

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| 7 | Key Features of Graphs of Functions – Part 1 | MAFS.912.F-IF.2.4 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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. | This topic introduces the graphs of functions. Students also explore solutions and intercepts of functions, when functions are increasing and decreasing, and relative maximums and minimums. |
| 8 | Key Features of Graphs of Functions – Part 2 | MAFS.912.F-IF.2.4 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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. | This topic introduces the graphs of functions. Students explore solutions and intercepts of functions, when functions are increasing and decreasing, and relative maximums and minimums. |
| 9 | Average Rate of Change Over An Interval | MAFS.912.F-IF.2.6 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. | This topic introduces the concept of determining the rate of change over a specified interval. |
| 10 | Transformations of Functions | MAFS.912.F-BF.2.3 Identify the effect on the graph of replacing y by ky , and 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. | This topic focuses on the horizontal and vertical transformations of any function. |

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Section 4: Linear Equations, Functions, and Inequalities

| Topic | Title | Standards | Objective |
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| 1 | Arithmetic Sequences | <p>MAFS.912.F-IF.1.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.</p> <p>MAFS.912.F-LE.1.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input/output pairs (including reading these from a table).</p> <p>MAFS.912.F-BF.1.1a Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context.</p> | <p>This topic focuses on arithmetic sequences. Students discover how to write recursive and explicit formulas when given a table of values. Students are also asked to find terms using the formulas they create. Students will also discover the connections between arithmetic sequences and linear functions.</p> |
| 2 | Rate of Change of Linear Functions | <p>MAFS.912.A-CED.1.3 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.</p> <p>MAFS.912.A-REI.4.10 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).</p> <p>MAFS.912.S-ID.3.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.</p> <p>MAFS.912.F-LE.2.5 Interpret the parameters in a linear or exponential function in terms of a context.</p> <p>MAFS.912.F-IF.3.7.a Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology in more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> | <p>This topic reviews the concept of slope. Students will graph a series of real-world situations and then analyze the rate of change.</p> |

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| 3 | Interpreting Rate of Change and y-intercept in a Real-World Context – Part 1 | <p>MAFS.912.F-LE.1.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input/output pairs (including reading these from a table).</p> <p>MAFS.912.F-LE.2.5 Interpret the parameters in a linear or exponential function in terms of a context.</p> <p>MAFS.912.S-ID.3.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.</p> <p>MAFS.912.A-CED.1.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p> <p>MAFS.912.A-CED.1.3 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.</p> <p>MAFS.912.A-REI.4.10 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).</p> <p>MAFS.912.F-IF.3.7.a Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology in more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> | <p>This topic continues to develop the concept of slope and leads students to discover what the intercept represents. Through writing equations of real world situations, students will discover slope-intercept form of linear equations.</p> |
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| 4 | Interpreting Rate of Change and y-intercept in a Real-World Context – Part 2 | <p>a. MAFS.912.S-ID.3.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.</p> <p>MAFS.912.A-CED.1.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p> <p>MAFS.912.A-CED.1.3 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.</p> <p>MAFS.912.A-REI.4.10 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).</p> <p>MAFS.912.F-IF.3.7.a Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology in more complicated cases.</p> <p>a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> | <p>This topic continues to develop the concept of slope and leads students to discover what the intercept represents. Through writing equations of real world situations, students will discover slope-intercept form of linear equations.</p> |
| 5 | Introduction to Systems of Equations | <p>a. MAFS.912.A-REI.4.10 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).</p> <p>MAFS.912.A-REI.3.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.</p> <p>MAFS.912.F-IF.3.7.a Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology in more complicated cases.</p> <p>a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> | <p>The topic introduces systems of linear equations. Students will discover that the solution to a system is the point of intersection of the two lines.</p> |

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| 6 | Finding Solution Sets to Systems of Equations Using Substitution and Graphing | <p>a. MAFS.912.A-CED.1.3 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.</p> <p>MAFS.912.A-REI.4.10 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).</p> <p>MAFS.912.A-REI.4.11 Explain why the coordinates of the points where the graphs of the equations intersect are the solutions of the equation; find the solutions approximately (e.g., using technology to graph the functions, make tables of values, or find successive approximations). Include cases where and/or are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.</p> <p>MAFS.912.A-REI.3.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.</p> <p>MAFS.912.F-LE.2.5 Interpret the parameters in a linear or exponential function in terms of a context.</p> <p>MAFS.912.F-IF.3.7.a Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology in more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> | <p>This topic focuses on systems of linear equations. Students write and solve systems of linear equations that represent real-world situations. They will also discover that given a system containing and, the solution is that value of for which.</p> |
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| 7 | Using Equivalent Systems of Equations | <p>MAFS.912.A-REI.3.5 Prove 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.</p> <p>MAFS.912.A-REI.3.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.</p> <p>MAFS.912.F-IF.3.7.a Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology in more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> | This topic introduces equivalent systems of equations. Students will discover that equivalent systems have the same solutions. |
| 8 | Finding Solution Sets to Systems of Equations Using Elimination | <p>MAFS.912.A-REI.3.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.</p> <p>MAFS.912.A-CED.1.3 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.</p> | This topic introduces creating equivalent systems of equations and solving by elimination. |
| 9 | Solution Sets to Inequalities with Two Variables | <p>MAFS.912.A-CED.1.3 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.</p> <p>MAFS.912.A-REI.4.12 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.</p> <p>MAFS.912.F-LE.2.5 Interpret the parameters in a linear or exponential function in terms of a context.</p> | This topic focuses on linear inequalities with two variables. Students learn how to create inequalities from real-world situations and then graph these inequalities on a coordinate plane. The solution set, intercept, and intercept are all discussed as they relate to each problem. |

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| 10 | Finding Solution Sets to Systems of Linear Inequalities | <p>MAFS.912.A-CED.1.3 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.</p> <p>MAFS.912.A-REI.4.12 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-plane.</p> | <p>This topic focuses on finding solution sets to systems of linear inequalities. Students will learn how to write a system of linear inequalities, graph the system and then find various solution sets.</p> |
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Section 5: Quadratic Equations and Functions – Part 1

| Topic | Title | Standards | Objective |
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| 1 | Real-World Examples of Quadratic Functions | MAFS.912.F-IF.2.4 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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. | This topic focuses on real-world examples of quadratics. Students are first introduced to the concept of a quadratic function by analyzing a real-world situation where the rate of change is not constant. Students are also introduced to some of the key features of quadratics. |
| 2 | Factoring Quadratic Expressions | MAFS.912.A-SSE.2.3.a Choose and produce an equivalent expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines. MAFS.912.A-SSE.1.2 Use the structure of an expression to identify ways to rewrite it. | This topic focuses on factoring quadratics. Students are introduced to two methods of factoring: 1. Using the Area Model; 2. Factoring by Grouping and Using the Distributive Property. |
| 3 | Solving Quadratic Equations by Factoring | MAFS.912.A-SSE.2.3.a Choose and produce an equivalent expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines. MAFS.912.A-REI.2.4.b Solve quadratic equations in one variable. b. Solve quadratic equations by inspection, 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. | This topic introduces solving quadratic equations. Students will find the factors of a quadratic equation and use the zero product property to determine the solutions. |

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| 4 | Solving Other Quadratic Equations by Factoring | <p>MAFS.912.A-SSE.2.3.a Choose and produce an equivalent expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines.</p> <p>MAFS.912.A-REI.2.4.b Solve quadratic equations in one variable. b. Solve quadratic equations by inspection, 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.</p> | This topic focuses on factoring and solving quadratic equations not in standard form and quadratics with coefficient of the quadratic term not equal to one. |
| 5 | Solving Quadratic Equations by Factoring – Special Cases | <p>MAFS.912.A-SSE.2.3.a Choose and produce an equivalent expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines.</p> <p>MAFS.912.A-REI.2.4.b Solve quadratic equations in one variable. b. Solve quadratic equations by inspection, 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.</p> <p>MAFS.912.A-SSE.1.2 Use the structure of an expression to identify ways to rewrite it.</p> | This topic focuses on factoring and solving the special cases of quadratics: perfect square trinomials and difference of squares. |
| 6 | Solving Quadratic Equations by Taking Square Roots | <p>MAFS.912.A-CED.1.1 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.</p> <p>MAFS.912.A-REI.2.4.b Solve quadratic equations in one variable. b. Solve quadratic equations by inspection, 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.</p> <p>MAFS.912.A-SSE.1.2 Use the structure of an expression to identify ways to rewrite it.</p> | This topic focuses on solving quadratics equations in the form by taking the square root. |

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| 7 | Solving Quadratic Equations by Completing the Square | <p>MAFS.912.A-REI.2.4.a.b Solve quadratic equations in one variable.</p> <p>a. Use the method of completing the square to transform any quadratic equation in into an equation of the form that has the same solutions. Derive the quadratic formula from this form.</p> <p>b. Solve quadratic equations by inspection, 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.</p> | This topic introduces students to the process of the completing the square of a quadratic equation and using this equivalent form to solve the equation. |
| 8 | Deriving the Quadratic Formula | <p>MAFS.912.A-REI.2.4.a Solve quadratic equations in one variable.</p> <p>a. Use the method of completing the square to transform any quadratic equation in into an equation of the form that has the same solutions. Derive the quadratic formula from this form.</p> | This topic guides students through the process of deriving the Quadratic Formula by completing the square. |
| 9 | Solving Quadratic Equations Using the Quadratic Formula | <p>MAFS.912.A-CED.1.1 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.</p> <p>MAFS.912.A-REI.2.4.b Solve quadratic equations in one variable.</p> <p>b. Solve quadratic equations by inspection, 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.</p> | This topic focuses on using the Quadratic Formula to find solutions to quadratic equations. |

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| 10 | Quadratic Functions in Action | <p>MAFS.912.A-CED.1.1 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.</p> <p>MAFS.912.A-REI.2.4.b Solve quadratic equations in one variable. b. Solve quadratic equations by inspection, 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 and write them as for real numbers and.</p> <p>MAFS.912.A-SSE.2.3.a.b Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</p> <p>a. Factor a quadratic expression to reveal the zeros of the function it defines.</p> <p>b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.</p> <p>MAFS.912.F-IF.3.8.a Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.</p> <p>a. Use the process of factoring and completing the square in quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.</p> | <p>This topic revisits quadratics in the real-world and focuses on writing quadratic functions in equivalent forms to reveal key features. Students will interpret what those key features represent in a real-world context.</p> |
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Section 6: Quadratic Equations and Functions – Part 2

| Topic | Title | Standards | Objective |
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| 1 | Observations from a Graph of a Quadratic Function | <p>MAFS.912.F-IF.2.4 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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</p> <p>MAFS.912.F-IF.3.8.a Write a function defined by an expression in different but equivalent forms to reveal explain different properties of a function. a. Use the process of factoring and completing the square in quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.</p> <p>MAFS.912.A-CED.1.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p> | <p>This topic focuses on interpreting key features of a graph. Students are also introduced to the vertex form of a quadratic function and will create equations from the graph of the function.</p> |
| 2 | Nature of the Solutions of Quadratic Equations and Functions | <p>MAFS.912.A-REI.2.4.b Solve quadratic equations in one variable. Solve quadratic equations by inspection, 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 and write them as for real numbers and.</p> | <p>This topic helps students discover how to use the discriminant to determine the nature of solutions of quadratics.</p> |

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| 3 | Graphing Quadratic Functions Using a Table | <p>MAFS.912.A-CED.1.1 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.</p> <p>MAFS.912.A-CED.1.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p> <p>MAFS.912.F-IF.3.7.a Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology in more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> | This topic focuses on graphing quadratic functions by using a table of values. |
| 4 | Graphing Quadratic Functions Using the Vertex and Intercepts | <p>MAFS.912.A-CED.1.1 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.</p> <p>MAFS.912.F-IF.3.7.a Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology in more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> <p>MAFS.912.F-IF.3.8.a Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. 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 context.</p> | This topic focuses on graphing quadratic functions when given a quadratic function in standard form. Students will find the vertex and the intercepts and graph the quadratic. |

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| 5 | Graphing Quadratic Functions Using Vertex Form – Part 1 | <p>MAFS.912.F-IF.3.7.a Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology in more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> <p>MAFS.912.F-IF.3.8.a Write a function defined by an expression in different but equivalent forms to reveal explain different properties of a function. a. Use the process of factoring and completing the square in quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.</p> <p>MAFS.912.A-SSE.1.1.b Interpret expressions that represent a quantity in terms of its context. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.</p> | <p>This topic focuses on graphing quadratic functions in vertex form. If quadratics are not in vertex form, students will write the function in vertex form to reveal the vertex.</p> |
| 6 | Graphing Quadratic Functions Using Vertex Form – Part 2 | <p>MAFS.912.F-IF.3.7.a Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology in more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> <p>MAFS.912.F-IF.3.8.a Write a function defined by an expression in different but equivalent forms to reveal explain different properties of a function. a. Use the process of factoring and completing the square in quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.</p> <p>MAFS.912.F-IF.3.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).</p> | <p>This topic focuses on graphing quadratic functions in vertex form. If quadratics are not in vertex form, students will write the function in vertex form to reveal the vertex.</p> |
| 7 | Transformations of the Dependent Variable of Quadratic Functions | <p>MAFS.912.F-BF.2.3 Identify the effect on the graph of replacing y by ky, and 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.</p> | <p>This topic focuses on transformations of quadratic functions, including vertical shifts, reflections, and vertical stretching and compressing.</p> |

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| 8 | <p>Transformations of the Independent Variable of Quadratic Functions</p> | <p>MAFS.912.F-BF.2.3 Identify the effect on the graph of replacing y by ky, and 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.</p> | <p>This topic focuses on transformations of quadratic functions, including horizontal shifts and horizontal stretching and compressing.</p> |
| 9 | <p>Finding Solution Sets to Systems of Equations Using Tables of Values and Successive Approximations</p> | <p>MAFS.912.A-REI.4.11 Explain why the coordinates of the points where the graphs of the equations intersect are the solutions of the equation; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where and/or are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.</p> | <p>This topic introduces systems of linear and quadratic functions. Students will find the solutions by graphing, looking at tables, and successive approximations.</p> |

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Section 7: Exponential Functions

| Topic | Title | Standards | Objective |
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| 1 | Geometric Sequences | <p>MAFS.912.F-IF.1.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.</p> <p>MAFS.912.F-LE.1.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input/output pairs (including reading these from a table).</p> <p>MAFS.912.F-BF.1.1a Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context.</p> | <p>This topic introduces geometric sequences. Students learn to find a recursive formula and an explicit formula for each geometric sequence, and then find the value of an "nth" term in the sequence. Students use these formulas to sketch a graph of the function. Students will also make the connection between geometric sequences and exponential functions.</p> |
| 2 | Exponential Functions | <p>MAFS.912.F-LE.1.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input/output pairs (including reading these from a table).</p> | <p>This topic introduces exponential functions. Students will represent exponential functions graphically, algebraically, verbally, and in tables. Additionally, students will write equations of exponential functions.</p> |

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| 3 | Graphs of Exponential Functions – Part 1 | <p>MAFS.912.A-SSE.2.3.c Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</p> <p>c. Use the properties of exponents to transform expressions for exponential functions.</p> <p>MAFS.912.F-IF.2.4 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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</p> <p>MAFS.912.F-IF.3.7.e Graph functions expressed symbolically and show key features of the graph by hand in simple cases and using technology for more complicated cases. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude and using phase shift.</p> <p>MAFS.912.F-IF.3.8.b Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions.</p> | <p>This topic focuses on graphing exponential functions and describing the end behavior of the functions. Students will understand the connection between the y-intercept, the rate of growth or decay, and end behavior.</p> |
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| 4 | Graphs of Exponential Functions – Part 2 | <p>MAFS.912.A-SSE.2.3.c Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</p> <p>c. Use the properties of exponents to transform expressions for exponential functions.</p> <p>MAFS.912.F-IF.2.4 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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</p> <p>MAFS.912.F-IF.3.7.e Graph functions expressed symbolically and show key features of the graph by hand in simple cases and using technology for more complicated cases. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude and using phase shift.</p> <p>MAFS.912.F-IF.3.8.b Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions.</p> | <p>This topic focuses on graphing exponential functions and describing the end behavior of the functions. Students will understand the connection between the y-intercept, the rate of growth or decay, and end behavior.</p> |
| 5 | Growth and Decay Rates of Exponential Functions | <p>MAFS.912.A-CED.1.1 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.</p> <p>MAFS.912.F-IF.3.8.b Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.</p> <p>b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as,,, and, classify them as representing exponential growth or decay.</p> <p>MAFS.912.F-LE.2.5 Interpret the parameters in a linear or exponential function in terms of a context.</p> | <p>In this topic, students learn how to determine if a real-life situation can be modeled by an exponential growth or exponential decay function and what the rate of growth or decay is.</p> |

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| 6 | Transformations of Exponential Functions | MAFS.912.F-BF.2.3 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. | In this topic, students learn about vertical and horizontal translations and compressions of exponential functions algebraically and graphically. |
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Section 8: Summary of Functions

| Topic | Title | Standards | Objective |
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| 1 | Comparing Linear, Quadratic, and Exponential Functions – Part 1 | <p>MAFS.912.F-IF.3.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.</p> <p>MAFS.912.F-IF.2.4 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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</p> <p>MAFS.912.F-IF.2.6 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.</p> <p>MAFS.912.F-LE.1.1.a.b.c Distinguish between situations that can be modeled with linear functions and with exponential functions.</p> <p>a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.</p> <p>b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.</p> <p>c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.</p> <p>MAFS.912.F-LE.1.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically or (more generally) as a polynomial function.</p> | This topic focuses on comparing and contrasting the key features of linear, quadratic, and exponential functions. |

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| 2 | Comparing Linear, Quadratic, and Exponential Functions – Part 2 | <p>MAFS.912.F-IF.3.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.</p> <p>MAFS.912.F-IF.2.4 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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</p> <p>MAFS.912.F-IF.2.6 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.</p> <p>MAFS.912.F-LE.1.1.a.b.c Distinguish between situations that can be modeled with linear functions and with exponential functions.</p> <p>a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.</p> <p>b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.</p> <p>c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.</p> <p>MAFS.912.F-LE.1.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically or (more generally) as a polynomial function.</p> | This topic focuses on comparing and contrasting the key features of linear, quadratic, and exponential functions. |
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| 3 | Comparing Arithmetic and Geometric Sequences | <p>MAFS.912.F-IF.1.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.</p> <p>MAFS.912.F-LE.1.1.a.b Distinguish between situations that can be modeled with linear functions and with exponential functions.</p> <p>a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.</p> <p>b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.</p> <p>MAFS.912.F-LE.1.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically or (more generally) as a polynomial function.</p> | <p>This topic compares real-world situations that model arithmetic and geometric sequences. Students determine which type of sequence represents given situations; and it also explains why the domain of sequences are a set or a subset of integers</p> |
| 4 | Exploring non-Arithmetic, non-Geometric Sequences | <p>MAFS.912.F-BF.1.1.a. Write a function that describes a relationship between two quantities.</p> <p>a. Determine an explicit expression, a recursive process, or steps for calculation from a context.</p> <p>MAFS.912.F-IF.1.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.</p> | <p>In this topic, students will write and solve a recursive and/or explicit formula for a sequence that is not arithmetic or geometric.</p> |

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| 5 | Modeling with Functions | <p>MAFS.912.A-CED.1.1 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.</p> <p>MAFS.912.A-CED.1.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p> <p>MAFS.912.A-CED.1.3 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.</p> <p>MAFS.912.A-REI.2.4.b Solve quadratic equations in one variable. b. Solve quadratic equations by inspection, 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.</p> <p>MAFS.912.F-IF.2.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.</p> <p>MAFS.912.F-IF.3.7.a Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology in more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</p> | <p>In this topic, students will model with situations given in a verbal, tabular, and graphical representation.</p> |
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| 6 | Understanding Piecewise-Defined Functions | <p>MAFS.912.F-IF.1.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.</p> <p>MAFS.912.F-IF.1.1 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 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 $y = f(x)$.</p> <p>MAFS.912.F-IF.3.7b Graph functions expressed symbolically and show key features of the graph by hand in simple cases and using technology for more complicated cases. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions</p> | <p>This topic introduces the concept of a piecewise-defined function. Students learn that a function can be comprised of specific "pieces" as defined by its domain. Students will graph piece-wise defined functions set within real-world contexts.</p> |
| 7 | Absolute Value Functions | <p>MAFS.912.F-IF.3.7b Graph functions expressed symbolically and show key features of the graph by hand in simple cases and using technology for more complicated cases. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions</p> | <p>This topic introduces students to the concept of absolute value functions and shows how they are an example of a piecewise-defined function.</p> |
| 8 | Graphing Power Functions – Part 1 | <p>MAFS.912.F-IF.3.7b Graph functions expressed symbolically and show key features of the graph by hand in simple cases and using technology for more complicated cases. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions</p> | <p>This topic focuses on square root, cube root, and cubic functions.</p> |
| 9 | Graphing Power Functions – Part 2 | <p>MAFS.912.F-IF.3.7b Graph functions expressed symbolically and show key features of the graph by hand in simple cases and using technology for more complicated cases. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions</p> | <p>This topic focuses on square root, cube root, and cubic functions.</p> |

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| 10 | Finding Zeroes of Polynomial Functions of Higher Degrees | MAFS.912.A-APR.2.3 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. | This topic focuses on finding the zeroes of a higher degree polynomial equations. Additionally, students will recognize graphs of polynomial functions by finding the zeroes. |
| 11 | End Behavior of Graphs of Polynomial | MAFS.912.F-IF.3.7.c Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology in more complicated cases. c. Graph polynomial functions, identifying zeros when suitable functions are available, and showing end behavior. | This topic focuses on end behavior of graphs of polynomials. Students will use this knowledge to sketch the graph of polynomials. |
| 12 | Graphing Polynomial Functions of Higher Degrees | MAFS.912.F-IF.3.7c Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. c. Graph polynomial functions, identifying zeros when suitable functions are available, and showing end behavior. MAFS.912.A-APR.2.3 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. | This topic provides an introduction to graphing polynomial functions. Students will identify the zeros of a polynomial and its end behavior depending on its leading coefficient and degree. Students will use this information to sketch a graph of a polynomial function in factored form. |
| 13 | Recognizing Even and Odd Functions | MAFS.912.F-BF.2.3 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. | This topic teaches the skill of recognizing even and odd functions from their graphs and algebraic expressions for them. |
| 14 | Solutions to Systems of Functions | MAFS.912.A-REI.4.11 Explain why the-coordinates of the points where the graphs of the equations and intersect are the solutions of the equation; find the solutions approximately (e.g., using technology to graph the functions, make tables of values, or find successive approximations). Include cases where and/or are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. | This topic focuses on systems of functions involving polynomial, rational, absolute value, exponential, and logarithmic functions. Students will find solutions using tables and a graph. |

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Section 9: One-Variable Statistics

| Topic | Title | Standards | Objective |
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| 1 | Dot Plots | MAFS.912.S-ID.1.1 Represent data with plots on the real number line (dot plots, histograms, and box plots). | This topic introduces statistics and the two types of data: quantitative and categorical. Students learn how to create dot plots. |
| 2 | Histograms | MAFS.912.S-ID.1.1 Represent data with plots on the real number line (dot plots, histograms, and box plots). | This topic focuses creating histograms and determining the number of groups and the range of values within groups. |
| 3 | Box Plots – Part 1 | MAFS.912.S-ID.1.1 Represent data with plots on the real number line (dot plots, histograms, and box plots). | This topic focuses on box plots. Students learn how to calculate number summaries and how to use this information to construct box plots. |
| 4 | Box Plots – Part 2 | MAFS.912.S-ID.1.1 Represent data with plots on the real number line (dot plots, histograms, and box plots). | This topic focuses on box plots. Students keep learning on how to construct box plots. |
| 5 | Measures of Center and Shapes of Distributions | MAFS.912.S-ID.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. | This topic discusses three common measures of center: mean, median, and mode. Students learn the difference between normal and skewed distributions and which measures of center are most appropriate given particular situations. |
| 6 | Measures of Spread – Part 1 | MAFS.912.S-ID.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. | This topic introduces two common ways to measure spread: interquartile range and standard deviation. Students learn the Empirical Rule and how it is used to measure spread in a normal distribution. |

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| 7 | Measures of Spread – Part 2 | MAFS.912.S-ID.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. | This topic introduces two common ways to measure spread: interquartile range and standard deviation. Students learn the Empirical Rule and how it is used to measure spread in a normal distribution. |
| 8 | The Empirical Rule | MAFS.912.S-ID.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. | This topic introduces the concept of the Empirical Rule and how it is used to determine probabilities in a normal distribution. |
| 9 | Outliers in Data Sets | MAFS.912.S-ID.1.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). | This topic focuses on outliers and how they affect the measurement of center and spread. |

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Section 10: Two-Variable Statistics

| Topic | Title | Standards | Objective |
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| 1 | Relationship between Two Categorical Variables – Marginal and Joint Relative Frequency – Part 1 | MAFS.912.S-ID.2.5 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. | This topic introduces two-way frequency (contingency) tables as a way to represent two categorical variables. Students learn the difference between marginal frequencies and joint frequencies. |
| 2 | Relationship between Two Categorical Variables – Marginal and Joint Relative Frequency – Part 2 | MAFS.912.S-ID.2.5 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. | This topic introduces two-way frequency (contingency) tables as a way to represent two categorical variables. Students learn the difference between marginal frequencies and joint frequencies. |
| 3 | Relationship between Two Categorical Variables – Conditional Frequency | MAFS.912.S-ID.2.5 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. | In this topic, students learn about conditional relative frequencies and how they can be used to determine if there is a relationship between two categorical variables. |
| 4 | Scatter Plots and Function Models | MAFS.912.S-ID.2.6.a.b.c Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit the function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association. MAFS.912.S-ID.3.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. | In this topic, students learn to classify and interpret scatterplots. Students also learn how to find the line of best fit using graphing technology. |

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| 5 | Residuals and Residual Plots – Part 1 | <p>MAFS.912.S-ID.2.6.b Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.</p> <p>b. Informally assess the fit of a function by plotting and analyzing residuals.</p> | <p>This topic focuses on residuals and residual plots and how they are used to determine whether a certain function is a good fit for a model.</p> |
| 6 | Residuals and Residual Plots – Part 2 | <p>MAFS.912.S-ID.2.6.b Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.</p> <p>b. Informally assess the fit of a function by plotting and analyzing residuals.</p> | <p>This topic focuses on residuals and residual plots and how they are used to determine whether a certain function is a good fit for the data.</p> |
| 7 | Examining Correlation | <p>MAFS.912.S-ID.2.6.c Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.</p> <p>c. Fit a linear function for a scatter plot that suggests a linear association.</p> <p>MAFS.912.S-ID.3.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.</p> <p>MAFS.912.S-ID.3.9 Distinguish between correlation and causation.</p> | <p>This topic introduces the concept of correlation, the correlation coefficient, and what "r" tells us about the type of linear relationship between two variables. The topic also discusses the concept of causation and how this is different than correlation.</p> |