South Carolina
ALGEBRA I MIDDLE
2021-2022 Pacing Guide
CASE Benchmark Assessments

Note: The South Carolina College- and Career-Ready (SCCCR) Mathematical Process Standards describe the varieties of expertise that mathematics educators should seek to develop in their students. While they are not specifically stated in this pacing guide, students should be developing these skills throughout the school year.

Unit	Standards	Major Topics/Concepts
Exponents, Radicals, and Polynomials	A1.NRNS.1 A1.NRNS.2 A1.NRNS.3 A1.AAPR.1	Rewrite expressions involving simple radicals and rational exponents in different forms. Use the definition of the meaning of rational exponents to translate between rational exponent and radical forms. Explain why the sum or product of 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. Add, subtract, and multiply polynomials, and understand that polynomials are closed under these operations.
Quantities	A1.NQ.1 A1.NQ.2 A1.NQ.3	Use units of measurement to guide the solution of multi-step tasks. Choose and interpret appropriate labels, units, and scales when constructing graphs and other data displays. Label and define appropriate quantities in descriptive modeling contexts. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities in context.
Expressions and Equations	A1.ASE.1 A1.ACE.1 A1.ACE.4 A1.AREI.1 A1.AREI.3	Interpret the meanings of coefficients, factors, terms, and expressions based on their real-world contexts. Interpret complicated expressions as being composed of simpler expressions. Create and solve equations and inequalities in one variable that model real-world problems involving linear, quadratic, simple rational, and exponential relationships. Interpret the solutions, and determine whether they are reasonable. Solve literal equations and formulas for a specified variable including equations and formulas that arise in a variety of disciplines. Understand and justify that the steps taken when solving simple equations in one variable create new equations that have the same solution as the original. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
Multi-Variable Equations	A1.ACE.2 A1.AREI.10	Create equations in two or more variables to represent relationships between quantities. Graph the equations on coordinate axes using appropriate labels, units, and scales.

Unit	Standards	Major Topics/Concepts
		Explain that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.
1st Cumulative Benchmark **(covering all content to this point)**		
Systems of Equations	A1.ACE.2 A1.AREI.3 A1.AREI.5 A1.AREI.6a A1.AREI.6b A1.AREI.10 A1.AREI.11 A1.AREI.12	Create equations in two or more variables to represent relationships between quantities. Graph the equations on coordinate axes using appropriate labels, units, and scales. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. Justify that the solution to a system of linear equations is not changed when one of the equations is replaced by a linear combination of the other equation. Solve systems of linear equations algebraically and graphically focusing on pairs of linear equations in two variables. ✓ Solve systems of linear equations using the substitution method. ✓ Solve systems of linear equations using linear combination. Explain that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane. Solve an equation of the form $f(x) = g(x)$ graphically by identifying the x-coordinate(s) of the point(s) of intersection of the graphs of $y = f(x)$ and $y = g(x)$. Graph the solutions to a linear inequality in two variables.
Linear Functions	A1.FIF.1a A1.FIF.1b A1.FIF.1c A1.FIF.2 A1.FIF.4 A1.FIF.5 A1.FIF.6 A1.FIF.7 A1.FIF.9 A1.FLQE.2	Extend previous knowledge of a function to apply to general behavior and features of a function. ✓ 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. ✓ Represent a function using function notation, and explain that $f(x)$ denotes the output of function f that corresponds to the input x. ✓ Understand that the graph of a function labeled as f is the set of all ordered pairs (x, y) that satisfy the equation $y = f(x)$. Evaluate functions, and interpret the meaning of expressions involving function notation from a mathematical perspective and in terms of the context when the function describes a real-world situation. Interpret key features of a function that models the relationship between two quantities when given in graphical or tabular form. Sketch the graph of a function from a verbal description showing key features. Key features include intercepts; intervals where the function is increasing, decreasing, constant, positive, or negative; relative maximums and minimums; symmetries; end behavior and periodicity. Relate the domain and range of a function to its graph and, where applicable, to the quantitative relationship it describes.

Unit	Standards	Major Topics/Concepts
		Given a function in graphical, symbolic, or tabular form, determine the average rate of change of the function over a specified interval. Interpret the meaning of the average rate of change in a given context.
		Graph functions from their symbolic representations. Indicate key features including intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior and periodicity. Graph simple cases by hand, and use technology for complicated cases.
		Compare properties of two functions given in different representations such as algebraic, graphical, tabular, or verbal.
		Create symbolic representations of linear and exponential functions, including arithmetic and geometric sequences, given graphs, verbal descriptions, and tables.
Quadratic Expressions and Equations	A1.ASE.2 A1.ASE.3a A1.ACE.1 A1.ACE.2 A1.ACE.4 A1.AREI.1 A1.AREI.4	Analyze the structure of binomials, trinomials, and other polynomials in order to rewrite equivalent expressions. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. ✓ Find the zeros of a quadratic function by rewriting it in equivalent factored forms, and explain the connection between the zeros of the function, its linear factors, the x-intercepts of its graph, and the solutions to the corresponding quadratic equation. Create and solve equations and inequalities in one variable that model real-world problems involving linear, quadratic, simple rational, and exponential relationships. Interpret the solutions, and determine whether they are reasonable. Create equations in two or more variables to represent relationships between quantities. Graph the equations on coordinate axes using appropriate labels, units, and scales. Solve literal equations and formulas for a specified variable including equations and formulas that arise in a variety of disciplines. Understand and justify that the steps taken when solving simple equations in one variable create new equations that have the same solution as the original. Solve mathematical and real-world problems involving 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 $a + bi$ for real numbers a and b. (Limit to non-complex roots.)

Unit	Standards	Major Topics/Concepts
		✓ 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 $a + bi$ for real numbers a and b. (Limit to non-complex roots.)
2nd Cumulative Benchmark **(covering all content to this point)**		
Quadratic Functions	A1.FBF.3 A1.FIF.1a A1.FIF.1b A1.FIF.1c A1.FIF.2 A1.FIF.4 A1.FIF.5 A1.FIF.6 A1.FIF.7 A1.FIF.8a A1.FIF.9	Describe the effect of the transformations $k \cdot f(x)$, $f(x) + k$, $f(x + k)$, and combinations of such transformations on the graph of $y = f(x)$ for any real number k. Find the value of k given the graphs, and write the equation of a transformed parent function given its graph. Extend previous knowledge of a function to apply to general behavior and features of a function. ✓ 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. ✓ Represent a function using function notation, and explain that $f(x)$ denotes the output of function f that corresponds to the input x. ✓ Understand that the graph of a function labeled as f is the set of all ordered pairs (x, y) that satisfy the equation $y = f(x)$. Evaluate functions, and interpret the meaning of expressions involving function notation from a mathematical perspective and in terms of the context when the function describes a real-world situation. Interpret key features of a function that models the relationship between two quantities when given in graphical or tabular form. Sketch the graph of a function from a verbal description showing key features. Key features include intercepts; intervals where the function is increasing, decreasing, constant, positive, or negative; relative maximums and minimums; symmetries; end behavior and periodicity. Relate the domain and range of a function to its graph and, where applicable, to the quantitative relationship it describes. Given a function in graphical, symbolic, or tabular form, determine the average rate of change of the function over a specified interval. Interpret the meaning of the average rate of change in a given context. Graph functions from their symbolic representations. Indicate key features including intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior and periodicity. Graph simple cases by hand, and use technology for complicated cases. Translate between different but equivalent forms of a function equation to reveal and explain different properties of the function.

Unit	Standards	Major Topics/Concepts
		✓ 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. Compare properties of two functions given in different representations such as algebraic, graphical, tabular, or verbal.
Exponential Functions	A1.ACE.1 A1.ACE.2 A1.FBF.3 A1.FIF.1a A1.FIF.1b A1.FIF.1c A1.FIF.2 A1.FIF.4 A1.FIF.5 A1.FIF.6 A1.FIF.7 A1.FIF.8 A1.FLQE.1 A1.FLQE.2 A1.FLQE.5	Create and solve equations and inequalities in one variable that model real-world problems involving linear, quadratic, simple rational, and exponential relationships. Interpret the solutions, and determine whether they are reasonable. Create equations in two or more variables to represent relationships between quantities. Graph the equations on coordinate axes using appropriate labels, units, and scales. Describe the effect of the transformations $k \cdot f(x)$, $f(x) + k$, $f(x + k)$, and combinations of such transformations on the graph of $y = f(x)$ for any real number k. Find the value of k given the graphs, and write the equation of a transformed parent function given its graph. Extend previous knowledge of a function to apply to general behavior and features of a function. ✓ 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. ✓ Represent a function using function notation, and explain that $f(x)$ denotes the output of function f that corresponds to the input x. ✓ Understand that the graph of a function labeled as f is the set of all ordered pairs (x, y) that satisfy the equation $y = f(x)$. Evaluate functions, and interpret the meaning of expressions involving function notation from a mathematical perspective and in terms of the context when the function describes a real-world situation. Interpret key features of a function that models the relationship between two quantities when given in graphical or tabular form. Sketch the graph of a function from a verbal description showing key features. Key features include intercepts; intervals where the function is increasing, decreasing, constant, positive, or negative; relative maximums and minimums; symmetries; end behavior and periodicity. Relate the domain and range of a function to its graph and, where applicable, to the quantitative relationship it describes. Given a function in graphical, symbolic, or tabular form, determine the average rate of change of the function over a specified interval. Interpret the meaning of the average rate of change in a given context.

Unit	Standards	Major Topics/Concepts
		Graph functions from their symbolic representations. Indicate key features including intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior and periodicity. Graph simple cases by hand, and use technology for complicated cases. Translate between different but equivalent forms of a function equation to reveal and explain different properties of the function.
		Distinguish between situations that can be modeled with linear functions or exponential functions by recognizing situations in which one quantity changes at a constant rate per unit interval as opposed to those in which a quantity changes by a constant percent rate per unit interval.
		Create symbolic representations of linear and exponential functions, including arithmetic and geometric sequences, given graphs, verbal descriptions, and tables.
		Interpret the parameters in a linear or exponential function in terms of the context.
Comparing Functions	A1.FBF.3 A1.FIF.1a A1.FIF.1b A1.FIF.1c A1.FIF.2 A1.FIF.4 A1.FIF.5 A1.FIF.6 A1.FIF.7 A1.FIF.9 A1.FLQE.1a A1.FLQE.2 A1.FLQE.3 A1.FLQE.5	Describe the effect of the transformations $k \cdot f(x)$, $f(x) + k$, $f(x + k)$, and combinations of such transformations on the graph of $y = f(x)$ for any real number k. Find the value of k given the graphs, and write the equation of a transformed parent function given its graph. Extend previous knowledge of a function to apply to general behavior and features of a function. ✓ 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. ✓ Represent a function using function notation, and explain that $f(x)$ denotes the output of function f that corresponds to the input x. ✓ Understand that the graph of a function labeled as f is the set of all ordered pairs (x, y) that satisfy the equation $y = f(x)$. Evaluate functions, and interpret the meaning of expressions involving function notation from a mathematical perspective and in terms of the context when the function describes a real-world situation. Interpret key features of a function that models the relationship between two quantities when given in graphical or tabular form. Sketch the graph of a function from a verbal description showing key features. Key features include intercepts; intervals where the function is increasing, decreasing, constant, positive, or negative; relative maximums and minimums; symmetries; end behavior and periodicity. Relate the domain and range of a function to its graph and, where applicable, to the quantitative relationship it describes.

Unit	Standards	Major Topics/Concepts
		Given a function in graphical, symbolic, or tabular form, determine the average rate of change of the function over a specified interval. Interpret the meaning of the average rate of change in a given context.
		Graph functions from their symbolic representations. Indicate key features including intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior and periodicity. Graph simple cases by hand, and use technology for complicated cases.
		Compare properties of two functions given in different representations such as algebraic, graphical, tabular, or verbal.
		Distinguish between situations that can be modeled with linear functions or exponential functions by recognizing situations in which one quantity changes at a constant rate per unit interval as opposed to those in which a quantity changes by a constant percent rate per unit interval. ✓ Prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals.
		Create symbolic representations of linear and exponential functions, including arithmetic and geometric sequences, given graphs, verbal descriptions, and tables.
		Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or more generally as a polynomial function.
		Interpret the parameters in a linear or exponential function in terms of the context.
Data and Statistics	A1.FLQE.5 A1.SPID.6 A1.SPID.7 A1.SPID.8	Interpret the parameters in a linear or exponential function in terms of the context.
		Using technology, create scatter plots, and analyze those plots to compare the fit of linear, quadratic, or exponential models to a given data set. Select the appropriate model, fit a function to the data set, and use the function to solve problems in the context of the data.
		Create a linear function to model data graphically from a real-world problem, and interpret the meaning of the slope and intercept(s) in the context of the given problem.
		Using technology, compute and interpret the correlation coefficient of a linear fit.
Final Comprehensive Benchmark **(covering all content)**		