# South Carolina College- and Career-Ready Standards for Mathematics
# High School Overview

*South Carolina College- and Career-Ready Standards for Mathematics* includes standards for the high school courses listed below. Each course is divided into Key Concepts that organize the content into broad categories of related standards. The placement of the SCCCR Content Standards for Mathematics into courses establishes a minimum level of consistency and equity for all students and districts in the state. Required course standards within these eight courses affords all stakeholders a clear understanding of learning expectations for each of the courses that districts choose to offer and students choose to take based on their college and career plans. Neither the order of Key Concepts nor the order of individual standards within a Key Concept is intended to prescribe an instructional sequence. The standards should serve as the basis for development of curriculum, instruction, and assessment.

- SCCCR Algebra 1
- SCCCR Foundations in Algebra
- SCCCR Intermediate Algebra
- SCCCR Algebra 2
- SCCCR Geometry
- SCCCR Probability and Statistics
- SCCCR Pre-Calculus
- SCCCR Calculus

Standards denoted by an asterisk (*) are SCCCR Graduation Standards, a subset of the SCCCR Content Standards for Mathematics that specify the mathematics high school students should know and be able to do in order to be both college- and career-ready. All SCCCR Graduation Standards are supported and extended by the SCCCR Content Standards for Mathematics. The course sequences students follow in high school should be aligned with their intended career paths that will either lead directly to the workforce or further education in post-secondary institutions. Selected course sequences will provide students with the opportunity to learn all SCCCR Graduation Standards as appropriate for their intended career paths.

In each of the SCCCR high school mathematics courses, students build on their earlier work as they expand their mathematical content knowledge and procedural skill through new mathematical experiences. Further, students deepen their mathematical knowledge and gain insight into the relevance of mathematics to other disciplines by applying their content knowledge and procedural skill in a variety of contexts. By expanding and deepening the conceptual understanding of mathematics, these high school courses prepare students for college and career readiness.

Manipulatives and technology are integral to the development of conceptual understanding in all high school mathematics courses. Using a variety of concrete materials and technological tools enables students to explore connections, make conjectures, formulate generalizations, draw conclusions, and discover new mathematical ideas by providing platforms for interacting with multiple representations. Students should use a variety of technologies, such as graphing utilities, spreadsheets, computer algebra systems, dynamic geometry software, and statistical packages, to solve problems and master standards.

# South Carolina College- and Career-Ready (SCCCR) Algebra 1 Overview

South Carolina College- and Career-Ready (SCCCR) Algebra 1 is designed to provide students with knowledge and skills to solve problems using simple algebraic tools critically important for college and careers. In SCCCR Algebra 1, students build on the conceptual knowledge and skills they mastered in earlier grades in areas such as algebraic thinking, data analysis, and proportional reasoning.

In this course, students are expected to apply mathematics in meaningful ways to solve problems that arise in the workplace, society, and everyday life through the process of modeling. Mathematical modeling involves creating appropriate equations, graphs, functions, or other mathematical representations to analyze real-world situations and answer questions. Use of technological tools, such as hand-held graphing calculators, is important in creating and analyzing mathematical representations used in the modeling process and should be used during instruction and assessment. However, technology should not be limited to hand-held graphing calculators. Students should use a variety of technologies, such as graphing utilities, spreadsheets, and computer algebra systems, to solve problems and to master standards in all Key Concepts of this course.

# South Carolina College- and Career-Ready (SCCCR) Algebra 1

## South Carolina College- and Career-Ready Mathematical Process Standards

The South Carolina College- and Career-Ready (SCCCR) Mathematical Process Standards demonstrate the ways in which students develop conceptual understanding of mathematical content and apply mathematical skills. As a result, the SCCCR Mathematical Process Standards should be integrated within the SCCCR Content Standards for Mathematics for each grade level and course. Since the process standards drive the pedagogical component of teaching and serve as the means by which students should demonstrate understanding of the content standards, the process standards must be incorporated as an integral part of overall student expectations when assessing content understanding.

Students who are college- and career-ready take a productive and confident approach to mathematics. They are able to recognize that mathematics is achievable, sensible, useful, doable, and worthwhile. They also perceive themselves as effective learners and practitioners of mathematics and understand that a consistent effort in learning mathematics is beneficial.

The Program for International Student Assessment defines mathematical literacy as "an individual's capacity to formulate, employ, and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts, and tools to describe, explain, and predict phenomena. It assists individuals to recognize the role that mathematics plays in the world and to make the well-founded judgments and decisions needed by constructive, engaged and reflective citizens" (Organization for Economic Cooperation and Development, 2012).

A mathematically literate student can:

1. **Make sense of problems and persevere in solving them.**
    a. Relate a problem to prior knowledge.
    b. Recognize there may be multiple entry points to a problem and more than one path to a solution.
    c. Analyze what is given, what is not given, what is being asked, and what strategies are needed, and make an initial attempt to solve a problem.
    d. Evaluate the success of an approach to solve a problem and refine it if necessary.

2. **Reason both contextually and abstractly.**
    a. Make sense of quantities and their relationships in mathematical and real-world situations.
    b. Describe a given situation using multiple mathematical representations.
    c. Translate among multiple mathematical representations and compare the meanings each representation conveys about the situation.
    d. Connect the meaning of mathematical operations to the context of a given situation.

3. **Use critical thinking skills to justify mathematical reasoning and critique the reasoning of others.**
    a. Construct and justify a solution to a problem.
    b. Compare and discuss the validity of various reasoning strategies.
    c. Make conjectures and explore their validity.
    d. Reflect on and provide thoughtful responses to the reasoning of others.

4. **Connect mathematical ideas and real-world situations through modeling.**
    a. Identify relevant quantities and develop a model to describe their relationships.
    b. Interpret mathematical models in the context of the situation.
    c. Make assumptions and estimates to simplify complicated situations.
    d. Evaluate the reasonableness of a model and refine if necessary.

5. **Use a variety of mathematical tools effectively and strategically.**
    a. Select and use appropriate tools when solving a mathematical problem.
    b. Use technological tools and other external mathematical resources to explore and deepen understanding of concepts.

6. **Communicate mathematically and approach mathematical situations with precision.**
    a. Express numerical answers with the degree of precision appropriate for the context of a situation.
    b. Represent numbers in an appropriate form according to the context of the situation.
    c. Use appropriate and precise mathematical language.
    d. Use appropriate units, scales, and labels.

7. **Identify and utilize structure and patterns.**
    a. Recognize complex mathematical objects as being composed of more than one simple object.
    b. Recognize mathematical repetition in order to make generalizations.
    c. Look for structures to interpret meaning and develop solution strategies.

# South Carolina College- and Career-Ready (SCCCR) Algebra 1

| Key Concepts | Standards | |
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| **Arithmetic with Polynomials and Rational Expressions** | **The student will:** | |
| | A1.AAPR.1* | Add, subtract, and multiply polynomials and understand that polynomials are closed under these operations. (Limit to linear; quadratic.) |
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| **Creating Equations** | **The student will:** | |
| | A1.ACE.1* | 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. (Limit to linear; quadratic; exponential with integer exponents.) |
| | A1.ACE.2* | Create equations in two or more variables to represent relationships between quantities. Graph the equations on coordinate axes using appropriate labels, units, and scales. (Limit to linear; quadratic; exponential with integer exponents; direct and indirect variation.) |
| | A1.ACE.4* | Solve literal equations and formulas for a specified variable including equations and formulas that arise in a variety of disciplines. |
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| **Reasoning with Equations and Inequalities** | **The student will:** | |
| | A1.AREI.1* | 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. |
| | A1.AREI.3* | Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. |
| | A1.AREI.4* | Solve mathematical and real-world problems involving quadratic equations in one variable. *(Note: A1.AREI.4a and 4b are not Graduation Standards.)*<br>a. Use the method of completing the square to transform any quadratic equation in $x$ into an equation of the form $(x-h)^2 = k$ that has the same solutions. Derive the quadratic formula from this form.<br>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 $a + bi$ for real numbers $a$ and $b$. (Limit to non-complex roots.) |
| | A1.AREI.5 | 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. |

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| | A1.AREI.6* | Solve systems of linear equations algebraically and graphically focusing on pairs of linear equations in two variables.<br>*(Note: A1.AREI.6a and 6b are not Graduation Standards.)*<br>a. Solve systems of linear equations using the substitution method.<br>b. Solve systems of linear equations using linear combination. |
| | A1.AREI.10* | Explain that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane. |
| | A1.AREI.11* | 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 $y = g(x)$. (Limit to linear; quadratic; exponential.) |
| | A1.AREI.12* | Graph the solutions to a linear inequality in two variables. |
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| **Structure and Expressions** | **The student will:** | |
| | A1.ASE.1* | Interpret the meanings of coefficients, factors, terms, and expressions based on their real-world contexts. Interpret complicated expressions as being composed of simpler expressions. (Limit to linear; quadratic; exponential.) |
| | A1.ASE.2* | Analyze the structure of binomials, trinomials, and other polynomials in order to rewrite equivalent expressions. |
| | A1.ASE.3* | Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.<br>a. Find the zeros of a quadratic function by rewriting it in equivalent factored form 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. |
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| **Building Functions** | **The student will:** | |
| | A1.FBF.3* | Describe the effect of the transformations $kf(x)$, $f(x) + k$, $f(x + k)$, 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. (Limit to linear; quadratic; exponential with integer exponents; vertical shift and vertical stretch.) |
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| **Interpreting Functions** | **The student will:** | |
| | A1.FIF.1* | Extend previous knowledge of a function to apply to general behavior and features of a function.<br>a. 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.<br>b. Represent a function using function notation and explain that $f(x)$ denotes the output of function $f$ that corresponds to the input $x$.<br>c. Understand that the graph of a function labeled as $f$ is the set of all ordered pairs $(x, y)$ that satisfy the equation $y = f(x)$. |
| | A1.FIF.2* | 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. |

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| | A1.FIF.4* | 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. (Limit to linear; quadratic; exponential.) |
| | A1.FIF.5* | Relate the domain and range of a function to its graph and, where applicable, to the quantitative relationship it describes. (Limit to linear; quadratic; exponential.) |
| | A1.FIF.6* | 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. (Limit to linear; quadratic; exponential.) |
| | A1.FIF.7* | 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. (Limit to linear; quadratic; exponential only in the form $y = a^x + k$.) |
| | A1.FIF.8* | Translate between different but equivalent forms of a function equation to reveal and explain different properties of the function. (Limit to linear; quadratic; exponential.) *(Note: A1.FIF.8a is not a Graduation Standard.)*<br>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. |
| | A1.FIF.9* | Compare properties of two functions given in different representations such as algebraic, graphical, tabular, or verbal. (Limit to linear; quadratic; exponential.) |
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| **Linear, Quadratic, and Exponential** | **The student will:** | |
| | A1.FLQE.1* | 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.<br>*(Note: A1.FLQE.1a is not a Graduation Standard.)*<br>a. Prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals. |
| | A1.FLQE.2* | Create symbolic representations of linear and exponential functions, including arithmetic and geometric sequences, given graphs, verbal descriptions, and tables. (Limit to linear; exponential.) |
| | A1.FLQE.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. |
| | A1.FLQE.5* | Interpret the parameters in a linear or exponential function in terms of the context. (Limit to linear.) |

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| **Quantities** | **The student will:** | |
| | A1.NQ.1* | 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. |
| | A1.NQ.2* | Label and define appropriate quantities in descriptive modeling contexts. |
| | A1.NQ.3* | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities in context. |
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| **Real Number System** | **The student will:** | |
| | A1.NRNS.1* | Rewrite expressions involving simple radicals and rational exponents in different forms. |
| | A1.NRNS.2* | Use the definition of the meaning of rational exponents to translate between rational exponent and radical forms. |
| | A1.NRNS.3 | 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. |
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| **Interpreting Data** | **The student will:** | |
| | A1.SPID.6* | Using technology, create scatterplots 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. |
| | A1.SPID.7* | Create a linear function to graphically model data from a real-world problem and interpret the meaning of the slope and intercept(s) in the context of the given problem. |
| | A1.SPID.8* | Using technology, compute and interpret the correlation coefficient of a linear fit. |