South Carolina College- and Career-Ready Standards for Mathematics

South Carolina State Department of Education Columbia, South Carolina 2015

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South Carolina College- and Career-Ready Standards for Mathematics
K – 12 Overview

The content standards in the *South Carolina College- and Career-Ready Standards for Mathematics* (SCCCR-M) represent a balance of conceptual and procedural knowledge and specify the mathematics that students will master in each grade level and high school course. The South Carolina College- and Career-Ready (SCCCR) Mathematical Process Standards describe the ways in which students will individually and collaboratively engage with the mathematics in the content standards. Therefore, instruction in each grade level and course must be based on the content standards and the SCCCR Mathematical Process Standards. The content standards and SCCCR Mathematical Process Standards work together to enable all students to develop the characteristics identified in the South Carolina Portrait of a College- and Career-Ready Mathematics Student. The SCCCR Mathematical Process Standards and the South Carolina Portrait of a College- and Career-Ready Mathematics Student are located on pages 6 through 8.

Each grade level and course is divided into Key Concepts that organize the content into broad categories of related standards. Neither the order of Key Concepts nor the order of individual standards within a Key Concept is intended to prescribe an instructional sequence. Each Key Concept contains standards that define what students will understand and be able to do. Some standards represent overarching content and include a list of related standards identified by lowercase letters. Standards are coded using the following methods.

In grades K – 8:

- GradeLevel.KeyConcept.StandardNumber (e.g., K.NS.1) or, if applicable,
- GradeLevel.KeyConcept.StandardNumberStandardLetter (e.g., K.NS.4a)

In courses:

- CourseName.KeyConcept.StandardNumber (e.g., A1.QE.2) or, if applicable,
- CourseName.KeyConcept.StandardNumberStandardLetter (e.g., A1.QE.1a)

The SCCCR-M standards will be the basis for the development of items on state-mandated assessments. Standards that contain the word "including" reference content that must be mastered. When used in a standard, the notation "e.g." references possible illustrative examples.

Districts, schools, and teachers should use the SCCCR-M standards to make curricular decisions across all grade levels and courses. These decisions involve choices regarding additional content, activities, and learning strategies and depend on the objectives of the particular courses. By constructing individual district mathematics curricula, districts may add or expand topics and organize content to fit a district's students' needs.

In mathematics, students are expected to apply their knowledge in meaningful ways to solve problems that arise in the workplace, society, and everyday life. Through the process of mathematical modeling, students create appropriate equations, functions, graphs, or other mathematical representations to analyze real-world situations and answer questions. Modeling is an open-ended process that involves cycles of reasoning and refinement where varied approaches and multiple solutions are possible. When students engage in the process of modeling, they strengthen conceptual understanding in mathematics, develop maturity as mathematical thinkers, and cultivate an appreciation of mathematical relevance to other disciplines.

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Manipulatives and technology are integral to the development of mathematical understanding in all grade levels and courses. Using a variety of concrete materials and technological tools helps students explore connections, make conjectures, formulate generalizations, draw conclusions, and discover new mathematical ideas by providing platforms for interacting with multiple representations.

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South Carolina College- and Career-Ready Mathematical Process Standards

The South Carolina College- and Career-Ready Mathematical Process Standards demonstrate the ways in which students develop conceptual understanding of mathematical content and apply mathematical skills. As a result, the South Carolina College- and Career-Ready Mathematical Process Standards should be integrated within the content standards for each grade level and course.

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. 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.
    c. Evaluate the success of an attempt to solve a problem and refine the approach 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 mathematical representations.
    c. Translate between mathematical representations and their meanings.
    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 strategies.
    c. Make conjectures and explore their validity.
    d. Use mathematical reasoning to reflect on and provide thoughtful responses to the reasoning of others.

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4. **Connect mathematical ideas and real-world/contextual 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. Determine when an approximation, an estimation, or an exact answer is most appropriate.
    b. Represent numbers in an appropriate form according to the context of the situation.
    c. Use appropriate and precise mathematical language.
    d. Specify units of measure according to the context of the situation.
    e. Choose appropriate units, scales, and labels on graphs.

7. **Identify and utilize structure and patterns.**
    a. Recognize complex 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.

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South Carolina Portrait of a College- and Career-Ready Mathematics Student

A South Carolina student who is college- and career-ready in mathematics will demonstrate:

- **Academic Success and Employability:** Student demonstrates strong conceptual knowledge and strategically applies appropriate academic and technical skills and tools to model and solve problems.

- **Interdependent Thinking and Collaborative Spirit:** Student collaborates effectively with others and respectfully critiques varied perspectives.

- **Intellectual Integrity and Curiosity:** Student researches by appropriately collecting, assimilating, and synthesizing data and information, cites relevant sources, and verifies with evidence. Student investigates mathematical situations in order to develop and test conjectures.

- **Logical Reasoning:** Student analyzes and evaluates evidence in a comprehensive and discerning manner and forms conclusions based on evidence using logic and reason.

- **Self-Reliance and Autonomy:** Student demonstrates qualities of an innovative, creative and independent learner and contributor to society, including goal setting, self-monitoring and regulation, constructive interactions with others, time management, and tenacity.

- **Effective Communication:** Student communicates appropriately, fluently, and with precision in a variety of written and oral modes, including appropriate technologies, based on audience, task, purpose, and discipline.

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South Carolina College- and Career-Ready Standards for Mathematics
Overview for Grades K – 5

The *South Carolina College- and Career-Ready Standards for Mathematics* (SCCCR-M) for grades K – 5 are divided into Key Concepts that organize the content into broad categories of related standards. 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.

Innovative Key Concepts in the SCCCR-M standards for grades K – 5 that have been included with the other commonly known strands or Key Concepts of mathematics are *Number Sense* and *Number Sense and Base Ten*. Research shows that while some students intuitively acquire certain counting principles and number relationships and are thus successful in mathematics, others struggle. To emphasize the importance of number development, and to ensure that all students develop the sense of numeracy that is necessary for mastery of basic facts and the later application to operations, the Key Concept of *Number Sense* is included as a foundational part of the SCCCR-M standards. Once students have developed a sense of numeracy, the standards in the Key Concept of *Number Sense and Base Ten* are designed to expand student understanding to comparative size and place value relationships.

The tables below show the progression of the broad Key Concepts across the primary grades K – 2 and the upper elementary grades 3 – 5. The progression can also be traced across those two groupings for a K – 5 view.

Key Concepts by Grade Band

Kindergarten	Grade 1	Grade 2
Number Sense		
Number Sense and Base Ten	Number Sense and Base Ten	Number Sense and Base Ten
Algebraic Thinking and Operations	Algebraic Thinking and Operations	Algebraic Thinking and Operations
Geometry	Geometry	Geometry
Measurement and Data Analysis	Measurement and Data Analysis	Measurement and Data Analysis

Grade 3	Grade 4	Grade 5
Number Sense and Base Ten	Number Sense and Base Ten	Number Sense and Base Ten
Algebraic Thinking and Operations	Algebraic Thinking and Operations	Algebraic Thinking and Operations
Number Sense – Fractions		
	Number Sense and Operations – Fractions	Number Sense and Operations – Fractions
Geometry	Geometry	Geometry
Measurement and Data Analysis	Measurement and Data Analysis	Measurement and Data Analysis

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Kindergarten

Key Concepts	Standards	
Number Sense	**The student will:**	
	K.NS.1	Count forward by ones to 100.
	K.NS.2	Count forward by ones beginning from any number less than 100.
	K.NS.3	Read numbers from 0-20 and represent a number of objects 0-20 with a written numeral.
	K.NS.4	Understand the relationship between number and quantity. Connect counting to cardinality by demonstrating an understanding that: a. number words are always assigned in the same order; b. the last number said tells the number of objects in the set; c. the number of objects is the same regardless of their arrangement or the order in which they are counted; d. each successive number name refers to a quantity that is one more and each previous number name refers to a quantity that is one less.
	K.NS.5	Count out a given number of objects from 1-20 and connect this sequence in a one-to-one manner and recognize instantly a quantity of up to ten objects.
	K.NS.6	Compare two sets of 0-10 objects each using *more, less* or *equal*.
	K.NS.7	Compare two written numerals up to 10 using *more, less* or *equal*.
	K.NS.8	Identify the positions first and last in a line of objects.
Number Sense and Base Ten	**The student will:**	
	K.NSBT.1	Compose and decompose numbers from 11-19 separating ten ones from the remaining ones.
Algebraic Thinking and Operations	**The student will:**	
	K.ATO.1	Model situations that involve addition and subtraction within 10.
	K.ATO.2	Solve story problems using objects and drawings to find sums up to 10 and differences within 10.
	K.ATO.3	Compose and decompose numbers up to 10 using objects, drawings, and equations.
	K.ATO.4	Create a sum of 10 using objects and drawings when given one of two addends 1-9.
	K.ATO.5	Identify simple repeating patterns.

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Geometry	**The student will:**	
	K.G.1	Describe positions of objects by appropriately using terms including *below, above, beside, between, inside, outside, in front of, behind*.
	K.G.2	Identify and name shapes and shapes of objects in everyday situations to include two-dimensional shapes (squares, rectangles, triangles, hexagons, and circles) and three-dimensional shapes (cones, cubes, cylinders, and spheres).
	K.G.3	Classify shapes as two-dimensional/flat or three-dimensional/solid and explain the reasoning used.
	K.G.4	Analyze and compare two- and three-dimensional shapes of different sizes and orientations using informal language.
	K.G.5	Model two-dimensional shapes using multiple representations.
	K.G.6	Combine shapes to form a larger shape.
Measurement and Data Analysis	**The student will:**	
	K.MDA.1	Identify and describe several measureable attributes of an object.
	K.MDA.2	Compare objects based on common measureable attributes.
	K.MDA.3	Sort and classify data into 2 or 3 categories.
	K.MDA.4	Represent data using object graphs and picture graphs and draw conclusions from the representations.

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Grade 1

Key Concepts	Standards	
Number Sense and Base Ten	**The student will:**	
	1.NSBT.1	Extend the number sequence to: a. count to 120, starting at any number within 120; b. count by 5s and 10s within 100; c. read, write and represent numbers to 100 using concrete models, standard form, number names, and expanded form.
	1.NSBT.2	Understand place value within 100 by demonstrating that: a. ten ones can be thought of as a bundle (group) called a "ten"; b. the tens digit in a two-digit number represents the number of tens; c. two-digit numbers can be decomposed into tens and ones.
	1.NSBT.3	Compare two two-digit numbers based on the meanings of the tens and ones digits, using the words *greater than*, *equal to*, or *less than.*
	1.NSBT.4	Add within 100, using place value understanding. a. Add a two-digit number and a one-digit number; b. Add a two-digit number and a multiple of 10; c. Understand that in adding two-digit numbers one adds ones and ones, tens and tens, and that sometimes it is necessary to compose a ten.
	1.NSBT.5	Determine the number that is 10 more or 10 less than a given number up to 100 and explain the reasoning used.
	1.NSBT.6	Subtract a multiple of 10 from a larger two-digit number.
	1.NSBT.7	Decompose two-digit numbers in multiple ways and record the decomposition in expanded form and as an equation.
Algebraic Thinking and Operations	**The student will:**	
	1.ATO.1	Solve story problems using addition (as a joining action and as a part-part-whole action) and subtraction (as a separation action, finding parts of the whole, and as a comparison) within 20.
	1.ATO.2	Solve story problems that include three whole number addends whose sum is less than or equal to 20.
	1.ATO.3	Apply properties of operations to add two or three numbers with a sum up to 20.
	1.ATO.4	Understand subtraction as an unknown addend problem.
	1.ATO.5	Recognize how counting relates to addition and subtraction.
	1.ATO.6	Add and subtract within 20 and demonstrate fluency with basic addition and related subtraction facts within 10.
	1.ATO.7	Understand the meaning of the equal sign and determine if equations involving addition and subtraction are true.
	1.ATO.8	Determine the missing number in addition and subtraction equations.
	1.ATO.9	Create and extend simple repeating and growing patterns and explain reasoning used.

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Geometry	**The student will:**	
	1.G.1	Distinguish between a two-dimensional shape's defining and non-defining attributes.
	1.G.2	Combine shapes to form a larger shape in more than one way.
	1.G.3	Partition two-dimensional shapes into two or four equal parts.
	1.G.4	Identify and describe two-dimensional shapes (rhombus and trapezoid) and three-dimensional shapes (right rectangular prism and right triangular prism).
Measurement and Data Analysis	**The student will:**	
	1.MDA.1	Order three objects by length using indirect comparison.
	1.MDA.2	Use nonstandard physical models to show the length of an object as the number of same size units of length.
	1.MDA.3	Use analog and digital clocks to tell and record time to the hour and half hour.
	1.MDA.4	Collect, organize, and represent data with up to 3 categories using object graphs, picture graphs, and t-charts or tallies.
	1.MDA.5	Draw conclusions from given object graphs, picture graphs, y-charts, tallies, and bar graphs.
	1.MDA.6	Identify a penny, nickel, dime and quarter and write the coin values using a ¢ symbol.

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Grade 2

Key Concepts	Standards	
Number Sense and Base Ten	**The student will:**	
	2.NSBT.1	Understand place value within 1,000 by demonstrating that: a. 100 can be thought of as a bundle (group) of ten tens called a "hundred"; b. the hundreds digit in a three-digit number represents the number of hundreds; c. three-digit numbers can be decomposed in multiple ways.
	2.NSBT.2	Count within 1000 by 2s, 5s, 10s, and 100s beginning with 0.
	2.NSBT.3	Read, write and represent numbers to 1000 using concrete models, standard form, number names and expanded form.
	2.NSBT.4	Compare two three-digit numbers based on the meanings of the hundreds, tens and ones digits, using the symbols >, =, or <.
	2.NSBT.5	Add and subtract fluently within 100.
	2.NSBT.6	Add up to four two-digit numbers using strategies and algorithms based on knowledge of place value and properties of operations.
	2.NSBT.7	Add and subtract within 1000, using place value understanding and strategies.
	2.NSBT.8	Use relationships to determine the number that is 10 or 100 more or less than a given number up to 900 and explain the reasoning used.
Algebraic Thinking and Operations	**The student will:**	
	2.ATO.1	Solve one- and two-step story problems involving addition and subtraction within 100.
	2.ATO.2	Demonstrate fluency with basic addition facts and related subtraction facts within 20.
	2.ATO.3	Determine whether a number up to 20 is odd or even using pairings of objects to represent the numbers.
	2.ATO.4	Use addition to find the total number of objects arranged in a rectangular array with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal groups.
Geometry	**The student will:**	
	2.G.1	Recognize, build, and sketch two-dimensional shapes (pentagon and octagon) and recognize and build three-dimensional shapes (square pyramid) based on defining attributes (e.g., number of angles, equal length of sides, right angles, closed, number of faces, etc.)
	2.G.2	Understand that when partitioning a two-dimensional shape into two, four, or eight equal parts, the parts become smaller as the number of parts increase.
	2.G.3	Identify two-dimensional regular and irregular shapes as polygons and non-polygons.

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Measurement and Data Analysis	**The student will:**	
	2.MDA.1	Select and use appropriate tools to measure the length of an object.
	2.MDA.2	Measure the same object or distance using a standard unit of one length and then a standard unit of a different length and explain how and why the measurements differ.
	2.MDA.3	Estimate length/distance in customary units (inch, foot, yard) and metric units (millimeter, centimeter, meter).
	2.MDA.4	Measure to determine how much longer one object is than another, using standard length units.
	2.MDA.5	Use analog and digital clocks to tell and record time to the nearest five-minute interval using *a.m.* and *p.m.*
	2.MDA.6	Solve story problems involving dollar bills using the $ symbol or involving quarters, dimes, nickels and pennies using the ¢ symbol.
	2.MDA.7	Generate data by measuring objects in whole-unit lengths and organize the data in a line plot using a horizontal scale.
	2.MDA.8	Collect, organize, and represent data with up to four categories using picture graphs and bar graphs with a single-unit scale.
	2.MDA.9	Draw conclusions and make predictions from data representations.

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Grade 3

Key Concepts	Standards	
Number Sense and Base Ten	**The student will:**	
	3.NSBT.1	Use place value understanding to round whole numbers to the nearest 10 or 100.
	3.NSBT.2	Add and subtract whole numbers fluently within 1000.
	3.NSBT.3	Multiply one-digit whole numbers by multiples of 10 in the range 10-90.
	3.NSBT.4	Read and write numbers within 1,000,000 in standard and expanded form.
	3.NSBT.5	Compare and order numbers within 1,000,000 and represent the comparison using the symbols >, =, or <.
Number Sense – Fractions	**The student will:**	
	3.NF.1	Develop an understanding of fractions as numbers. a. A fraction 1/b (called a unit fraction) is the quantity formed by one part when a whole is partitioned into b equal parts; b. A fraction *a/b* is the quantity formed by *a* parts of size *1/b*; c. Represent a fraction on a number line based on counts of a unit fraction.
	3.NF.2	Explain fraction equivalence by demonstrating an understanding that: a. two fractions are equal if they are the same size, based on the same whole, or at the same point on a number line; b. fraction equivalence can be represented using set, area, and linear models; c. whole numbers can be written as fractions (e.g., 4 = 4/1 and 1 = 3/3); d. fractions with the same numerator or same denominator can be compared by reasoning about their size based on the same whole.
	3.NF.3	Recognize and represent a mixed number as an equivalent fraction greater than one.
Algebraic Thinking and Operations	**The student will:**	
	3.ATO.1	Use drawings and symbols to represent multiplication of two single-digit whole numbers and explain the relationship between the factors (0-10) and the product.
	3.ATO.2	Use drawings and symbols to represent division and explain the relationship among the whole-number quotient (0-10), divisor (1-10), and dividend.
	3.ATO.3	Solve contextual problems using basic multiplication and related division facts. Represent the problem situation using an equation with a symbol for the unknown.
	3.ATO.4	Determine the unknown whole number in a multiplication or division equation relating three whole numbers when the unknown is a missing factor, product, dividend, divisor, or quotient.
	3.ATO.5	Apply properties of operations as strategies to multiply and divide and explain the reasoning.
	3.ATO.6	Understand division as a missing factor problem.
	3.ATO.7	Demonstrate fluency with basic multiplication and related division facts within 100.
	3.ATO.8	Solve two-step contextual problems using the four operations of addition, subtraction, multiplication and division.
	3.ATO.9	Identify a rule for an arithmetic pattern.

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Geometry	**The student will:**	
	3.G.1	Understand that shapes in different categories may share attributes but the shared attributes can define a larger category.
	3.G.2	Partition two-dimensional shapes into equal areas and describe these areas using the same unit fraction.
	3.G.3	Use a right angle as a benchmark to identify and sketch angles (right, acute, obtuse).
	3.G.4	Identify a 3-dimensional shape based on a given 2-dimensional net and explain the reasoning.
Measurement and Data Analysis	**The student will:**	
	3.MDA.1	Use analog and digital clocks to determine and record time to the nearest minute, using a.m. and p.m.; measure time intervals in minutes; and solve problems involving addition and subtraction of time intervals in minutes.
	3.MDA.2	Estimate and measure liquid volumes (capacity) in customary units (cp., pt., qt., gal.) and metric units (ml, L) to the nearest whole unit
	3.MDA.3	Collect, organize, and classify data with multiple categories and draw a scaled picture graph or a scaled bar graph to represent the data.
	3.MDA.4	Generate data by measuring length to the nearest inch, half-inch, foot, yard, millimeter, centimeter, or meter, and organize the data in a line plot using a horizontal scale.
	3.MDA.5	Understand the concept of area measurement. a. Recognize area as an attribute of plane figures; b. Measure area by counting standard unit squares; c. Determine the area of a rectilinear figure and relate to multiplication and addition.
	3.MDA.6	Determine the perimeter of a polygon (regular and irregular).

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Grade 4

Key Concepts	Standards	
Number Sense and Base Ten	**The student will:**	
	4.NSBT.1	Understand that, in a multi-digit whole number, a digit represents ten times what it would represent in the place to its right.
	4.NSBT.2	Recognize and use number patterns to read and write in standard form large numbers including billions.
	4.NSBT.3	Round whole numbers to any given place value.
	4.NSBT.4	Add and subtract multi-digit whole numbers.
	4.NSBT.5	Multiply up to a four-digit number by a one-digit number and multiply a two-digit number by a two-digit number using strategies based on place value and the properties of operations.
	4.NSBT.6	Divide up to a four-digit dividend by a one-digit divisor using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division.
Number Sense and Operations – Fractions	**The student will:**	
	4.NF.1	Explain why a fraction, a/b, is equivalent to a fraction, *(*n*x*a*)/(*n*x*b*)*, by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
	4.NF.2	Compare two given fractions with different numerators and different denominators using a variety of methods, and represent the comparison using the symbols <,>,=.
	4.NF.3	Develop an understanding of addition and subtraction of fractions based on unit fractions. a. Compose and decompose a fraction in more than one way, recording each composition and decomposition as an addition or subtraction equation; b. Add and subtract mixed numbers with like denominators, representing the mixed numbers as their equivalent fractions; c. Solve contextual problems involving addition and subtraction of fractions referring to the same whole and having like denominators.
	4.NF.4	Apply and extend understanding of multiplication to multiply a whole number by a fraction to solve mathematical and contextual problems.
	4.NF.5	Express a fraction with a denominator of 10 as an equivalent fraction with a denominator of 100 and use this technique to add two fractions with respective denominators 10 and100.
	4.NF.6	Write a fraction with a denominator of 10 or 100 using decimal notation and read and write a decimal as a fraction.
	4.NF.7	Compare and order decimals to hundredths and justify using concrete and visual models.

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Algebraic Thinking and Operations	**The student will:**	
	4.ATO.1	Interpret a multiplication equation as a comparison. For example, interpret 35 = 5x7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
	4.ATO.2	Solve contextual problems using multiplication (product unknown) and division (group size unknown, number of groups unknown).
	4.ATO.3	Solve multi-step contextual problems using the four operations. Represent the problem using an equation with a variable as the unknown quantity.
	4.ATO.4	Recognize that a whole number is a multiple of each of its factors. Find all factors for a whole number in the range 1-100 and determine whether the whole number is prime or composite.
	4.ATO.5	Generate a number or shape pattern that follows a given rule and determine an element that falls later in the sequence
Geometry	**The student will:**	
	4.G.1	Draw points, lines, line segments, rays and angles (right, acute, obtuse). Identify these in two-dimensional figures.
	4.G.2	Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.
Measurement and Data Analysis	**The student will:**	
	4.MDA.1	Convert measurements within a single system of measurement, customary (in., ft., yd., oz., lb., Tbsp., cp., pt., qt., gal., sec., min., hr.) or metric (g, kg, mm, cm, m, km, mL, L) from a larger to a smaller unit.
	4.MDA.2	Solve contextual problems involving distance, intervals of time, liquid volume, mass, and money using the four operations.
	4.MDA.3	Apply the area and perimeter formulas for rectangles.
	4.MDA.4	Make a line plot to display a data set of measurements in fractions of a unit.
	4.MDA.5	Measure angles in whole number degrees using a protractor.
	4.MDA.6	Solve addition and subtraction problems to find unknown angles.
	4.MDA.7	Determine the value of a collection of coins and bills greater than $1.00.

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Grade 5

Key Concepts	Standards	
Number Sense and Base Ten	**The student will:**	
	5.NSBT.1	Understand in a multi-digit whole number, a digit in one place represents 10 times what it represents in the place to its right, and represents 1/10 times what it represents in the place to its left.
	5.NSBT.2	Write and evaluate numerical expressions involving whole number exponents as a power of 10. a. Understand how the whole number exponents as a power of 10 affects the value of the base; b. Identify the relationship between the exponent and the number of zeros in the product.
	5.NSBT.3	Read, write and compare decimal numbers to thousandths in standard and expanded form.
	5.NSBT.4	Round decimals to any given place value within thousandths.
	5.NSBT.5	Divide up to a four-digit dividend by a two-digit divisor, using strategies based on place value, the properties of operations, and the relationship between multiplication and division.
	5.NSBT.6	Add, subtract, multiply, and divide decimals to hundredths using models or drawings.
Number Sense and Operations – Fractions	**The student will:**	
	5.NF.1	Add and subtract fractions with unlike denominators including mixed numbers, using a variety of strategies.
	5.NF.2	Solve contextual problems involving addition and subtraction of fractions with unlike denominators.
	5.NF.3	Understand the relationship between fractions and division of whole numbers by interpreting a fraction as the numerator divided by the denominator (a/b = $a \div b$).
	5.NF.4	Extend the concept of multiplication to multiply a fraction or whole number by a fraction. a. Interpret multiplication of a fraction by a whole number and a whole number by a fraction and compute the product; b. Interpret multiplication in which both factors are fractions less than one and compute the product; c. Recognize the relationship between multiplying fractions and finding the areas of rectangles with fractional side lengths.

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	5.NF.5	Explain the reasonableness of a product when multiplying with fractions. a. Estimate the size of the product based on the size of the two factors; b. Explain why multiplying a given number by a number greater than 1 (e.g., fractions, mixed numbers, whole numbers) results in a product larger than the given number; c. Explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; d. Explain why multiplying the numerator and denominator by the same number has the same effect as multiplying the fraction by 1.
	5.NF.6	Solve contextual problems involving multiplication of fractions including mixed numbers.
	5.NF.7	Extend the concept of division to divide unit fractions and whole numbers. a. Interpret division of a unit fraction by a non-zero whole number and compute the quotient; b. Interpret division of a whole number by a unit fraction and compute the quotient.
	5.NF.8	Solve contextual and mathematical problems involving division of unit fractions and whole numbers by using visual fraction models and equations.
Algebraic Thinking and Operations	**The student will:**	
	5.ATO.1	Write and evaluate numerical expressions involving parentheses.
	5.ATO.2	Translate verbal phrases into numerical expressions and interpret numerical expressions as verbal phrases.
	5.ATO.3	Investigate the relationship between two numerical patterns. a. Generate two numerical patterns given two rules and organize in tables; b. Translate the two numerical patterns into two sets of ordered pairs; c. Graph the two sets of ordered pairs on the same coordinate plane; d. Identify the relationship between the two numerical patterns.
Geometry	**The student will:**	
	5.G.1	Define a coordinate system. a. The *x*- and *y*- axes are perpendicular number lines that intersect at 0 (the origin); b. Any point on the coordinate plane can be represented by its coordinates; c. The first number in an ordered pair is the *x*-coordinate and represents the horizontal distance from the origin; d. The second number in an ordered pair is the *y*-coordinate and represents the vertical distance from the origin.
	5.G.2	Plot and interpret points in the first quadrant of the coordinate plane to represent contextual and mathematical situations.
	5.G.3	Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.
	5.G.4	Classify two-dimensional figures in a hierarchy based on their attributes.

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Measurement and Data Analysis	**The student will:**	
	5.MDA.1	Convert between measurement units within a given measurement system.
	5.MDA.2	Create a line plot consisting of unit fractions and use operations on fractions to solve problems related to the line plot.
	5.MDA.3	Understand the concept of volume measurement. a. Recognize volume as an attribute of right rectangular prisms; b. Measure volume by counting standard unit cubes; c. Determine the volume of right rectangular prisms and relate to the operations of multiplication and addition.
	5.MDA.4	Differentiate among perimeter, area and volume and identify when the application of those concepts is appropriate for a given situation.

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South Carolina College- and Career-Ready Standards for Mathematics
Overview for Grades 6 – 8

This overview illustrates relationships among mathematical concepts. In grades 6 – 8, it is important for students to broaden their understanding of the interconnectedness of mathematical concepts that were introduced in grades K – 5 and will continue throughout grades 9 – 12 and beyond.

The *South Carolina College- and Career-Ready Standards for Mathematics* (SCCCR-M) for grades 6 – 8 are divided into Key Concepts that organize the content into broad categories of related standards. 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.

The Key Concepts vary throughout the three grade levels and two major shifts occur. The Key Concept shifts from Data Analysis and Statistics (DS) in grade 6 to Data Analysis, Statistics, and Probability (DSP) in grades 7 and 8 because probability is not introduced until grade 7. Students in grades 6 and 7 focus on the key concept of Ratios and Proportional Relationships (RP); however, this Key Concept is replaced by Functions (F) in grade 8.

The table below shows the progression of the Key Concepts across grades 6 – 8.

Key Concepts by Grade Band

Grade 6	Grade 7	Grade 8
• Number System • Ratios and Proportional Relationships • Expressions, Equations, and Inequalities • Geometry and Measurement • Data Analysis and Statistics	• Number System • Ratios and Proportional Relationships • Expressions, Equations, and Inequalities • Geometry and Measurement • **Data Analysis, Statistics, and Probability**	• Number System • **Functions** • Expressions, Equations, and Inequalities • Geometry and Measurement • **Data Analysis, Statistics, and Probability**

Specific vocabulary is used throughout the SCCCR-M standards for grades 6 – 8 to indicate various levels of understanding:

- The words **investigate** and **explore** indicate the initial understanding of a concept. For example:
  - 7.DSP.6: **Investigate** the relationship between theoretical and experimental probabilities.

    This standard indicates an initial understanding of theoretical and experimental probabilities. The educator may consider using inquiry-based methods to introduce this concept.

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- 8.EEI.3: **Explore** the relationship between quantities in decimal and scientific notation.

  This standard indicates an initial understanding of scientific notation. The educator may consider using inquiry-based methods to introduce this concept.

- Once students have an initial understanding, they are asked to **apply** this knowledge, often in real-world and mathematical situations. For example:

  - 7.DSP.7: **Apply** the concepts of theoretical and experimental probabilities.

    The standard 7.DSP.6 indicates an initial understanding of theoretical and experimental probabilities while the standard 7.DSP.7 requires students to apply this knowledge.

  - 8.EEI.4: **Apply** the concepts of decimal and scientific notation to solve real-world and mathematical problems.

    The standard 8.EEI.3 indicates an initial understanding of the relationship between decimal and scientific notation while the standard 8.EEI.4 requires students to apply this knowledge.

- When standards expand upon the previous knowledge of students, the standard indicates that students will **extend** their knowledge. For these standards, educators should assist students in building upon previous knowledge to enrich their understanding of the interconnectedness of mathematics. For example:

  - 6.NS.8: **Extend** knowledge of the coordinate plane to solve real-world and mathematical problems.

    In grade 5, students explore graphing ordered pairs in the first quadrant of the coordinate plane. This grade 6 standard extends that knowledge to include all four quadrants as a result of the introduction of integers.

- The word **discover** in a standard indicates that students will be given the opportunity to determine a formula through the use of manipulatives or inquiry-based activities. For example:

  - 6.GM.2: Pack a right rectangular prism (fractional edge lengths) with unit cubes of fractional edge lengths to **discover** the formulas for volume ($V = lwh, V = Bh$) are the same for whole or fractional edge lengths. Apply these formulas to solve real-world and mathematical problems.

    In grade 5, students packed a right rectangular prism with unit cubes of whole number edge lengths. In grade 6, students build on that knowledge by rediscovering the formulas for the volume of a right rectangular prism with fractional edge lengths. Students should be allowed to determine this formula on their own and make a connection with the formulas discovered in grade 5.

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- The words **translate among** or **translate between** are often associated with multiple representations of a concept and indicate that given representations *a* and *b*, students must be able to convert from *a* to *b* and vice versa. For example:
    - 7.GM.1: Determine the scale factor and **translate between** scale models and actual measurements (e.g., lengths, area) of real-world objects and geometric figures using proportional reasoning.

      For this standard, students may be given the measurements of a scale model and asked to determine the corresponding measurements of an actual object. Conversely, they may also be given the measurements of an actual object and asked to determine the corresponding measurements of a scale model.

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Grade 6

Key Concepts	Standards	
The Number System	**The student will:**	
	6.NS.1	Use a variety of procedures to compute and represent quotients of positive rational numbers, including fractions divided by fractions. Include visual models, equations, and real-world situations.
	6.NS.2	Fluently compute the division of multi-digit whole numbers using a standard algorithmic approach.
	6.NS.3	Fluently compute the addition, subtraction, multiplication, and division of multi-digit decimal numbers using a standard algorithmic approach.
	6.NS.4	Perform computations with two whole numbers. a. Compute the greatest common factor (GCF) within 100. b. Compute the least common multiple (LCM) within 12. c. Express sums of two whole numbers, each within 100, using the distributive property to factor out the GCF of the original addends.
	6.NS.5	Understand that the positive and negative representations of a number are opposites in direction and value. Use these numbers to represent quantities in real-world situations and explain the meaning of zero in each situation.
	6.NS.6	Associate rational numbers with a location on a number line and extend to the coordinate plane. a. Understand the concept of opposite numbers, including zero, and their relative locations on the number line. b. Understand that the signs of the coordinates in ordered pairs indicate their location on an axis or in a quadrant on the coordinate plane. c. Understand that (a,b), (-a,b), (a,-b), and (-a,-b) are reflections of each other on the coordinate plane across one or both axes. d. Plot rational numbers on number lines and ordered pairs on coordinate planes.
	6.NS.7	Understand and apply the concepts of comparing, ordering, and absolute value to rational numbers. a. Interpret statements using less than (<), greater than (>), and equal to (=) as relative locations on the number line. b. Use concepts of equality and inequality to write and explain real-world and mathematical situations. c. Use absolute value of a rational number to represent real-world situations and understand that absolute value represents a number's distance from zero on the number line. d. Recognize the difference between comparing absolute values and ordering rational numbers. For negative rational numbers, understand that as the absolute value increases, the value of the negative number decreases.

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	6.NS.8	Extend knowledge of the coordinate plane to solve real-world and mathematical problems. a. Plot points in all four quadrants. b. Find the distance between two points when ordered pairs have the same *x*-coordinates or same *y*-coordinates. c. Relate finding the distance between two points in a coordinate plane to absolute value using a number line.
	6.NS.9	Translate among multiple representations of rational numbers (fractions, decimal numbers, percentages). Fractions should be limited to those with denominators of 2, 3, 4, 5, 8, and 10.
Ratios and Proportional Relationships	**The student will:**	
	6.RP.1	Interpret the concept of a ratio as the relationship between two quantities including part to part and part to whole.
	6.RP.2	Investigate relationships between ratios and rates. a. Translate between multiple representations of ratios (*a/b*, *a:b*, *a to b*). b. Recognize that a rate is a type of ratio involving two different units. c. Convert from rates to unit rates.
	6.RP.3	Apply the concepts of ratios and rates to solve real-world and mathematical problems. a. Create a table consisting of equivalent ratios and plot the results on the coordinate plane. b. Use multiple representations including tape diagrams, tables, double number lines, and equations to find missing values of equivalent ratios. c. Use two tables to compare related ratios. d. Apply concepts of unit rate to solve problems including unit pricing and constant speed. e. Understand that a percentage is a rate per 100 and use this to solve problems involving wholes, parts, and percentages. f. Use unit rates to solve one-step dimensional analysis problems.
Expressions, Equations, and Inequalities	**The student will:**	
	6.EEI.1	Write and evaluate numerical expressions involving whole-number exponents.
	6.EEI.2	Extend the concepts of numerical expressions to algebraic expressions. a. Translate between verbal phrases involving variables and algebraic expressions. b. Investigate and identify parts of algebraic expressions using mathematical terminology including term, coefficient, constant, and factor. c. Evaluate real-world and algebraic expressions for specific values using the Order of Operations.
	6.EEI.3	Apply mathematical properties (e.g., commutative, associative, distributive) to generate equivalent expressions.
	6.EEI.4	Apply mathematical properties (e.g., commutative, associative, distributive) to justify that two expressions are equivalent.
	6.EEI.5	Understand that the solution set for an equation or inequality consists of values that make the equation or inequality true.

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	6.EEI.6	Write expressions using variables to represent quantities in real-world and mathematical situations. Understand the meaning of the variable in the context of the situation.
	6.EEI.7	Write and solve one-step linear equations in one variable involving nonnegative rational numbers for real-world and mathematical situations.
	6.EEI.8	Extend knowledge of inequalities used to compare numerical expressions to include algebraic expressions. a. Write an inequality of the form $x > c$ or $x < c$ and graph the solution set on a number line. b. Recognize that inequalities have infinitely many solutions.
	6.EEI.9	Investigate multiple representations of relationships in real-world and mathematical situations. a. Write an equation that models a relationship between independent and dependent variables. b. Analyze the relationship between independent and dependent variables using graphs and tables. c. Relate graphs and tables to equations.
Geometry and Measurement	**The student will:**	
	6.GM.1	Solve real-world and mathematical problems involving area of polygons. a. Compute the area of right triangles by composing two triangles into a rectangle. b. Compute the area of other triangles by composing two triangles into a parallelogram. c. Compute the area of special quadrilaterals and polygons by decomposing these figures into triangles and rectangles.
	6.GM.2	Pack a right rectangular prism (fractional edge lengths) with unit cubes of fractional edge lengths to discover the formulas for volume ($V = lwh, V = Bh$) are the same for whole or fractional edge lengths. Apply these formulas to solve real-world and mathematical problems.
	6.GM.3	Apply the concepts of polygons and the coordinate plane to real-world and mathematical situations. a. Given coordinates of the vertices, draw a polygon in the coordinate plane. b. Find the length of an edge if the vertices have the same *x*-coordinates or same *y*-coordinates.
	6.GM.4	Unfold three-dimensional figures into two-dimensional rectangles and triangles (nets) in order to find the surface area and solve real-world and mathematical problems.
Data Analysis and Statistics	**The student will:**	
	6.DS.1	Differentiate between statistical questions and non-statistical questions.
	6.DS.2	Use center, spread, and shape to describe the distribution of a set of data collected to answer a statistical question.
	6.DS.3	Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.
	6.DS.4	Select and create an appropriate display for numerical data including dot plots, histograms, and box plots.

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	6.DS.5	Describe numerical data sets in relation to their real-world context. a. State the sample size. b. Describe the qualitative aspects of the data (e.g., how it was measured, units of measurement). c. Give measures of center (median, mean). d. Give measures of variability (interquartile range, mean absolute deviation). e. Describe the overall pattern (shape) of the distribution. f. Justify the choices for measure of center and measure of variability based on the shape of the distribution. g. Describe the impact that inserting or deleting a data point has on the measures of center (median, mean) for a data set.

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Grade 7

Key Concepts	Standards	
The Number System	**The student will:**	
	7.NS.1	Extend prior knowledge of operations with positive rational numbers to add and subtract all rational numbers and represent the sum or difference on a number line. a. Understand that the additive inverse of a number is its opposite and their sum is equal to zero. b. Understand that the sum of two rational numbers ($p + q$) represents a distance from p on the number line equal to $\|q\|$ where the direction is indicated by the sign of q. c. Translate between the subtraction of rational numbers and addition using the additive inverse, $p - q = p + (-q)$. d. Demonstrate that the distance between two rational numbers on the number line is the absolute value of their difference. e. Apply mathematical properties (e.g., commutative, associative, distributive, or the properties of identity and inverse elements) to add and subtract rational numbers.
	7.NS.2	Extend prior knowledge of operations with positive rational numbers to multiply and divide all rational numbers. a. Understand that the multiplicative inverse of a number is its reciprocal and their product is equal to one. b. Understand rules for multiplying signed numbers. c. Understand rules for dividing signed numbers and that a quotient of integers (with a non-zero divisor) is a rational number. d. Apply mathematical properties (e.g., commutative, associative, distributive, or the properties of identity and inverse elements) to multiply and divide rational numbers. e. Understand that some rational numbers can be written as integers and all rational numbers can be written as fractions or decimal numbers that terminate or repeat.
	7.NS.3	Apply the concepts of all four operations with rational numbers to solve real-world and mathematical problems.
	7.NS.4	Understand and apply the concepts of comparing and ordering to rational numbers. a. Interpret statements using less than (<), greater than (>), less than or equal to (≤), greater than or equal to (≥) and equal to (=) as relative locations on the number line. b. Use concepts of equality and inequality to write and explain real-world and mathematical situations.
	7.NS.5	Translate among multiple representations of rational numbers (fractions, decimal numbers, percentages).

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Ratios and Proportional Relationships	**The student will:**	
	7.RP.1	Compute unit rates including those involving complex fractions with like or different units.
	7.RP.2	Identify and model proportional relationships given multiple representations, including tables, graphs, equations, diagrams, verbal descriptions, and real-world situations. a. Determine when two quantities are in a proportional relationship. b. Recognize or compute the constant of proportionality. c. Understand that the constant of proportionality is the unit rate. d. Use equations to model proportional relationships. e. Investigate the graph of a proportional relationship and explain the meaning of specific points (e.g., origin, unit rate) in the context of the situation.
	7.RP.3	Solve real-world and mathematical problems involving ratios and percentages using proportional reasoning (e.g., multi-step dimensional analysis, percent increase/decrease, tax).
Expressions, Equations, and Inequalities	**The student will:**	
	7.EEI.1	Apply mathematical properties (e.g., commutative, associative, distributive) to simplify and factor linear algebraic expressions with rational coefficients.
	7.EEI.2	Recognize that algebraic expressions may have a variety of equivalent forms and determine an appropriate form for a given real-world situation.
	7.EEI.3	Use appropriate procedures to efficiently solve multi-step real-world and mathematical problems involving rational numbers. Determine the reasonableness of the solution.
	7.EEI.4	Apply the concepts of linear equations and inequalities in one variable to real-world and mathematical situations. a. Write and fluently solve linear equations of the form $ax + b = c$ and $a(x + b) = c$. b. Write and solve multi-step linear equations that include the use of the distributive property and combining like terms. c. Write and solve two-step linear inequalities. Graph the solution set on a number line and interpret its meaning. d. Identify and justify the steps for solving multi-step linear equations and two-step linear inequalities.
	7.EEI.5	Understand and apply the laws of exponents to simplify numerical expressions that include whole-number exponents.
Geometry and Measurement	**The student will:**	
	7.GM.1	Determine the scale factor and translate between scale models and actual measurements (e.g., lengths, area) of real-world objects and geometric figures using proportional reasoning.
	7.GM.2	Construct triangles and other geometric figures. a. Construct triangles given all measurements of either angles or sides. b. Decide if the measurements determine a unique triangle or no triangle. c. Construct other geometric figures given specific parameters about angles or sides.
	7.GM.3	Describe two-dimensional cross-sections of three-dimensional figures, specifically right rectangular prisms and right rectangular pyramids.

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	7.GM.4	Investigate the concept of circles. a. Demonstrate an understanding of the proportional relationships between diameter, radius, and circumference of a circle. b. Know that the constant of proportionality between the circumference and diameter is π. c. Explore the relationship between circumference and area using a visual model. d. Use the formulas for circumference and area of circles appropriately to solve real-world and mathematical problems.
	7.GM.5	Write equations to solve problems involving the relationships between angles formed by intersecting lines including supplementary, complementary, vertical, and adjacent.
	7.GM.6	Apply the concepts of two- and three-dimensional figures to real-world and mathematical situations. a. Understand that the concept of area is applied to two-dimensional figures such as triangles, quadrilaterals, and polygons. b. Understand that the concepts of volume and surface area are applied to three-dimensional figures such as cubes, right rectangular prisms, and right triangular prisms. c. Use the formulas for area, volume, and surface area appropriately.
Data Analysis, Statistics, and Probability	**The student will:**	
	7.DSP.1	Investigate concepts of random sampling. a. Understand that a sample is a subset of a population and both possess the same characteristics. b. Differentiate between random and non-random sampling. c. Understand that generalizations from a sample are valid only if the sample is representative of the population. d. Understand that random sampling is used to gather a representative sample and supports valid inferences about the population.
	7.DSP.2	Draw inferences about a population by collecting multiple random samples of the same size to investigate variability in estimates of the parameter (characteristic of interest).
	7.DSP.3	Visually compare the centers, spreads, and overlap of two displays of data that are graphed on the same scale.
	7.DSP.4	Compare the numerical measures of center and variability from two random samples to draw inferences about the populations.
	7.DSP.5	Investigate the concept of probability of chance events. a. Determine probabilities of simple events. b. Understand that probability measures likelihood of a chance event occurring. c. Understand that the probability of a chance event is a number between 0 and 1. d. Understand that a probability closer to 1 indicates a likely chance event. e. Understand that a probability close to ½ indicates that a chance event is neither likely nor unlikely. f. Understand that a probability closer to 0 indicates an unlikely chance event.
	7.DSP.6	Investigate the relationship between theoretical and experimental probabilities. a. Predict outcomes using theoretical probability. b. Perform experiments that model theoretical probability. c. Compare theoretical and experimental probabilities.

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	7.DSP.7	Apply the concepts of theoretical and experimental probabilities. a. Differentiate between uniform and non-uniform probability models (distributions). b. Develop both uniform and non-uniform probability models. c. Perform experiments to test the validity of probability models.
	7.DSP.8	Extend the concepts of simple events to investigate compound events. a. Understand that the probability of a compound event is between 0 and 1. b. Identify the outcomes in a sample space using organized lists, tables, and tree diagrams. c. Determine probabilities of compound events using organized lists, tables, and tree diagrams. d. Design and use simulations to collect data and determine probabilities.

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Grade 8

Key Concepts	Standards	
The Number System	**The student will:**	
	8.NS.1	Explore the real number system and its appropriate usage in real-world situations. a. Recognize the differences between rational and irrational numbers. b. Understand that all real numbers have a decimal expansion. c. Model the hierarchy of the real number system including natural, whole, integer, rational, and irrational numbers.
	8.NS.2	Estimate and compare the value of irrational numbers by plotting them on a number line.
	8.NS.3	Translate among multiple representations of rational numbers (fractions, decimal numbers, percentages). Extend to include the conversion of repeating decimal numbers to fractions.
Functions	**The student will:**	
	8.F.1	Understand the definition of a function. a. Relate inputs (x) and outputs (y) to independent and dependent variables. b. Recognize that a function has multiple representations including mappings, tables, graphs, equations, and verbal descriptions. c. Graph a function from a table of values. Understand that the graph and table both represent a set of ordered pairs of that function.
	8.F.2	Compare two functions using multiple representations including tables, graphs, equations, and verbal descriptions in order to draw conclusions.
	8.F.3	Investigate the differences between linear and nonlinear functions. a. Define an equation in slope-intercept form ($y = mx + b$) as being a linear function. b. Recognize that the graph of a linear function has a constant rate of change. c. Provide examples of nonlinear functions.
	8.F.4	Apply the concepts of linear functions to real-world and mathematical situations. a. Understand that slope is the constant rate of change and the y-intercept is the point where $x = 0$. b. Determine the slope and y-intercept of a linear function given multiple representations including two points, tables, graphs, equations, and verbal descriptions. c. Construct a function that models a linear relationship between two quantities. d. Interpret the meaning of the slope and y-intercept of a linear function.
	8.F.5	Apply the concepts of linear and non-linear functions to graphs. a. Analyze and describe attributes of graphs of functions (e.g., increasing/decreasing, linear/nonlinear). b. Sketch the graph of a function from a verbal description.

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Expressions, Equations, and Inequalities	**The student will:**	
	8.EEI.1	Understand and apply the laws of exponents to simplify numerical expressions that include integer exponents.
	8.EEI.2	Investigate concepts of square and cube roots. a. Find the exact and approximate solutions to equations of the form $x^2 = p$ and $x^3 = p$ where p is a positive rational number. b. Evaluate square roots of perfect squares. c. Evaluate cube roots of perfect cubes. d. Recognize that square roots of non-perfect squares are irrational.
	8.EEI.3	Explore the relationship between quantities in decimal and scientific notation. a. Express very large and very small quantities in scientific notation in the form $a \times 10^b = p$ where a is a single digit and b is an integer. b. Translate between decimal notation and scientific notation. c. Estimate and compare the relative size of two quantities in scientific notation.
	8.EEI.4	Apply the concepts of decimal and scientific notation to solve real-world and mathematical problems. a. Perform operations using numbers expressed in scientific notation. Include problems using both decimal and scientific notation. b. Select appropriate units of measure when representing answers in scientific notation. c. Translate how different technological devices display numbers in scientific notation.
	8.EEI.5	Apply concepts of proportional relationships to real-world and mathematical situations. a. Graph proportional relationships. b. Interpret unit rate as the slope of the graph. c. Compare two different proportional relationships given multiple representations including tables, graphs, equations, diagrams, and verbal descriptions.
	8.EEI.6	Apply concepts of slope and y-intercept to graphs, equations, and proportional relationships. a. Explain why the slope, m, is the same between any two distinct points on a non-vertical line using similar triangles. b. Derive the slope-intercept form ($y = mx + b$) for a non-vertical line. c. Relate equations for proportional relationships ($y = kx$) with the slope-intercept form ($y = mx + b$) where $b = 0$.
	8.EEI.7	Extend concepts of linear equations and inequalities in one variable to more complex multi-step equations and inequalities in real-world and mathematical situations. a. Solve linear equations and inequalities that include the use of the distributive property, combining like terms, and variables on both sides. b. Recognize the three types of solutions to linear equations: one solution ($x = a$), infinitely many solutions ($a = a$), or no solutions ($a = b$). c. Generate linear equations with the three types of solutions. d. Justify why linear equations have a specific type of solution.

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	8.EEI.8	Investigate and solve real-world and mathematical problems involving systems of linear equations in two variables with integer coefficients. a. Graph systems of linear equations and estimate their point of intersection. b. Understand why a solution to a system of linear equations is represented on a graph as the point of intersection of the two lines. c. Solve systems of linear equations algebraically, including methods of substitution and elimination, or through inspection.
Geometry and Measurement	**The student will:**	
	8.GM.1	Investigate the properties of rigid transformations (rotations, reflections, translations). a. Verify that lines are mapped to lines, including parallel lines. b. Verify that corresponding angles are congruent c. Verify that corresponding line segments are congruent.
	8.GM.2	Apply the properties of rigid transformations (rotations, reflections, translations). a. Recognize that two-dimensional figures are only congruent if a series of rigid transformations can be performed to map the pre-image to the image. b. Given two congruent figures, describe the series of rigid transformations that justifies this congruence.
	8.GM.3	Use coordinate geometry to describe the effect of transformations (rotations, reflections, translations, dilations) on two-dimensional figures.
	8.GM.4	Apply the properties of transformations (rotations, reflections, translations, dilations). a. Recognize that two-dimensional figures are only similar if a series of transformations can be performed to map the pre-image to the image. b. Given two similar figures, describe the series of transformations that justifies this similarity.
	8.GM.5	Extend previous knowledge of angles to properties of triangles, similar figures, and parallel lines cut by a transversal. Discover that the three angles in a triangle sum to 180 degrees. a. Discover the relationship between interior and exterior angles of a triangle. b. Identify congruent and supplementary pairs of angles when two parallel lines are cut by a transversal. c. Recognize that two similar figures have congruent corresponding angles.
	8.GM.6	Use models to demonstrate a proof of the Pythagorean Theorem and its converse.
	8.GM.7	Apply the Pythagorean Theorem to model and solve real-world and mathematical problems in two and three dimensions involving right triangles.
	8.GM.8	Find the distance between any two points in the coordinate plane using the Pythagorean Theorem.
	8.GM.9	Solve real-world and mathematical problems involving volumes of cones, cylinders, and spheres and the surface area of cylinders.

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Data Analysis, Statistics, and Probability	**The student will:**	
	8.DSP.1	Investigate bivariate data. a. Collect bivariate data. b. Graph the bivariate data on a scatter plot. c. Describe patterns observed on a scatter plot including clustering, outliers, and association including positive, negative, or no correlation and linear or non-linear.
	8.DSP.2	Draw an approximate line of best fit on a scatter plot that appears to have a linear association and informally assess the fit of the line to the data points.
	8.DSP.3	Apply concepts of an approximate line of best fit in real-world situations. a. Find an approximate equation for the line of best fit. b. Interpret the slope and intercept. c. Solve problems using the equation.
	8.DSP.4	Investigate bivariate categorical data in two-way tables. a. Organize bivariate categorical data in a two-way table. b. Interpret data in two-way tables using relative frequencies. c. Explore patterns of possible association between the two categorical variables.

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

In each of the South Carolina College- and Career-Ready (SCCCR) high school 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 success in advanced mathematics courses as well as in post-secondary education and careers.

This document contains content standards for the high school courses listed below.

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

Each course is divided into Key Concepts that organize the content into broad categories of related standards. 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. Standards that contain the word "including" reference content that must be mastered.

Many mathematical concepts are too comprehensive to be included in a single course and are thus introduced in one course and extended in subsequent courses. As one example, the Function Theory Key Concept is included in SCCCR Algebra 1, SCCCR Algebra 2, and SCCCR Pre-Calculus. The concept of function is formally introduced in SCCCR Algebra 1 with the inclusion of the definition of function. In SCCCR Algebra 2, the concept is extended by introducing inverses of functions. Full development of the concept of inverse function is completed in SCCCR Pre-Calculus with the creation of invertible functions from non-invertible functions.

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

South Carolina College- and Career-Ready (SCCCR) Algebra 1 is designed to prepare students for success in advanced mathematics courses by providing a foundation in algebra. 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.

The Key Concepts in this course are listed below.

- Quantities and Expressions (A1.QE)
- Function Theory (A1.F)
- Linear Equations, Functions, and Inequalities (A1.L)
- Polynomials (A1.P)
- Quadratic Equations and Functions (A1.Q)
- Exponential Functions (A1.E)

Standards in the Function Theory Key Concept illustrate the importance of developing an understanding of general function concepts that apply to all functions. These standards provide coherence to the study of the different families of functions students will encounter in high school. Standards that are specific to a particular family of functions are included in the Key Concepts devoted to that particular function family.

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.

The standards found in SCCCR Algebra 1 will be the basis for the development of items on the state-mandated Algebra 1 End-of-Course assessment (Algebra 1 EOCEP) administered at the completion of SCCCR Algebra 1.

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

Key Concepts	Standards
Quantities and Expressions	**The student will:**
	A1.QE.1 Reason quantitatively by using units appropriately in modeling situations. a. Understand that quantities are numbers with units, including derived units, and involve measurement. b. Specify and define quantities that appropriately describe the attributes of interest in a real-world problem, such as per-capita income, person-hours, or fatalities per vehicle-mile traveled. c. Choose and interpret appropriate labels, units, and scales when quantities are displayed in a graph. d. Report the solution to a real-world problem using quantities with the appropriate level of accuracy for the given context.
	A1.QE.2 Rewrite algebraic expressions involving integer exponents in equivalent forms by applying the laws of exponents and the commutative, associative, and distributive properties.
	A1.QE.3 Interpret the meanings of coefficients, factors, terms, and expressions based on their contexts.
	A1.QE.4 Rewrite numerical and algebraic expressions involving square roots and cube roots using rational exponents.
	A1.QE.5 Rewrite numerical and algebraic radical expressions involving square roots in simplest radical form.
Function Theory	**The student will:**
	A1.F.1 Extend previous knowledge of a function to apply to general behavior and features of functions. a. Understand the formal definition of a function where the input/output relationship becomes a correspondence between two sets, the domain and range. Provide examples and non-examples from both mathematical and non-mathematical contexts. b. Determine if a relation is a function from a variety of representations, including mappings, sets of ordered pairs, graphs, tables, equations, and verbal descriptions. c. Represent a function using function notation and explain that $f(x)$ denotes the output of function f that corresponds to the input x. Explain 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. d. Explain that the solution set for the equation that defines a function is the set of all ordered pairs on the graph of the function. e. Given an equation, graph, or verbal description of a function, specify the domain and range appropriate for the situation. Include functions with continuous and discrete domains.

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		f. Given an element of either the domain or range of a function, find the corresponding value(s) from the equation or the graph and interpret these values in terms of a real-world context.
	A1.F.2	Interpret graphs of functions, presented with or without scales, which represent mathematical and real-world situations. a. Provide a qualitative analysis of the graph of a function that models the relationship between two quantities and interpret key features of the graph in terms of the context of the quantities. Key features include intercepts, extrema, intervals where the function is increasing, decreasing, constant, positive, or negative. b. Sketch a graph showing key features given a verbal description of the relationship between two quantities.
	A1.F.3	Determine, with and without technology, the solution(s) of the equation $f(x) = g(x)$ by identifying the x-coordinate(s) of the point(s) of intersection of the graphs of $y = f(x)$ and $y = g(x)$.
Linear Equations, Functions, and Inequalities	**The student will:**	
	A1.L.1	Extend previous knowledge of solving equations and inequalities in one variable. a. Understand that the steps taken when solving linear equations in one variable create new equations that have the same solution as the original. Justify each step in solving an equation. b. Represent real-world problems, including those involving proportional relationships, using linear equations and inequalities in one variable and solve such problems. Interpret the solution in terms of the context and determine whether it is reasonable. c. Solve compound linear inequalities in one variable and represent and interpret the solution on a number line. Write a compound linear inequality given its number line representation. d. Solve absolute value linear equations and inequalities in one variable. e. Solve literal equations and formulas for a specified variable. Include equations and formulas that arise in a variety of disciplines.
	A1.L.2	Analyze a relationship between two quantities represented in tabular or verbal forms to determine if the relationship is linear.
	A1.L.3	Create a linear function to model a real-world problem and interpret the meaning of the slope and intercepts in the context of the given problem. Recognize that a function represents a proportional relationship when the y-intercept is zero.
	A1.L.4	Apply transformations $kf(x)$ and $f(x) + k$, for any real number k, to the parent function $f(x) = x$ when represented in graphical, tabular, and algebraic form, including transformations that occur in real-world situations. Relate the slope-intercept form $y = mx + b$ to transformations of the parent function.
	A1.L.5	Translate among verbal, tabular, graphical, and symbolic representations of linear and piece-wise linear functions, including absolute value and step functions. Explain how each representation reveals different information about the function.
	A1.L.6	Translate among equivalent forms of equations for linear functions, including slope-intercept, point-slope, and standard forms. Explain how each form reveals different information about a given situation.

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	A1.L.7	Write equations of linear functions given two points, one point and a slope, and a slope and the y-intercept.
	A1.L.8	Extend previous knowledge of solving mathematical and real-world problems that can be modeled with a system of two linear equations in two variables. a. Describe the relationship between the solution of a pair of linear equations in two variables and the point of intersection of the graphs of the corresponding lines. Solve pairs of linear equations in two variables by graphing; approximate solutions when the coordinates of the intersection are non-integer numbers. b. Solve pairs of linear equations in two variables using substitution and elimination. c. Determine whether a system of linear equations has no solution, one solution, or an infinite number of solutions. Relate the number of solutions to pairs of lines that are intersecting, parallel or identical. d. Verify whether a pair of numbers satisfies a system of two linear equations in two unknowns by substituting the numbers into both equations.
	A1.L.9	Construct a scatter plot to determine the possible association between two quantities. For associations that appear linear, informally fit a linear function to the data and compare the function to the line generated by technology. Interpret the coefficients m and b to explain the nature of the relationship between the two quantities and use the function to make predictions and solve problems.
Polynomials	**The student will:**	
	A1.P.1	Identify whether an expression is a polynomial and classify it according to degree and number of terms.
	A1.P.2	Apply the properties of operations and laws of exponents to perform operations with polynomials (add, subtract, multiply, divide by a monomial, and factor). a. Model addition, subtraction, and multiplication of linear polynomials using area models. b. Know and apply the structures of special products to find the product of $(a+b)^2$, $(a-b)^2$, and $(a-b)(a+b)$. c. Multiply polynomials by applying the distributive property. Include multiplying two binomials and multiplying a binomial by a trinomial. d. Analyze the structure of binomials, trinomials and other polynomials in order to factor them using an appropriate strategy, including greatest common factor, difference of two squares, perfect square quadratic trinomials, and grouping.
	A1.P.3	Define a variable and create polynomial expressions to model quantities in real-world situations, interpreting the parts of the expression in the context of the situation.

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Quadratic Equations and Functions	**The student will:**	
	A1.Q.1	Apply algebraic techniques to solve mathematical and real-world problems involving quadratic equations. a. Solve quadratic equations, including those with rational coefficients, by taking square roots, factoring, completing the square, and applying the quadratic formula as appropriate for the given form of the equation. Recognize that equations can have one real solution, two real solutions, or no real solutions. b. Derive the quadratic formula by completing the square on the standard form of the quadratic equation. c. Create equations in one variable to model quadratic relationships arising in real-world and mathematical problems, defining variables with appropriate units, and solve such equations. Interpret the solutions and determine whether they are reasonable.
	A1.Q.2	Apply analytic and graphical properties of quadratic functions to solve mathematical and real-world problems. a. Describe the key features of the parent quadratic function $y = x^2$, including the vertex, axis of symmetry, domain, range, minimum/maximum, intercepts, direction of opening, and ordered pairs (±1, 1) and (±2, 4). b. Apply the transformations $kf(x)$, $-f(x)$, $f(x) + k$, and $f(x + k)$, for any real number k, to the parent function $f(x) = x^2$ when represented in graphical, tabular, and algebraic form, and relate the vertex form $y = a(x - h)^2 + k$ to transformations of the parent function. c. Sketch the graph of a quadratic function choosing appropriate scales and units for the given context, and interpret the key features, including maximum/minimum, zeros, y-intercept, and domain, in terms of the context. d. Determine the equation that defines a quadratic function by analyzing its graph. e. Explain how the equation for the axis of symmetry, $x = -\frac{b}{2a}$, of a quadratic function relates to the midpoint of the segment joining zeros as determined by the quadratic formula and use the equation for the axis to find the vertex of the quadratic function. f. 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.
	A1.Q.3	Model and solve a variety of real-world problems using quadratic equations, including problems involving projectile motion and optimization.

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Exponential Functions	**The student will:**	
	A1.E.1	Evaluate exponential functions at integer inputs without technology and at non-integer inputs with technology.
	A1.E.2	Graph the parent exponential function, $f(x) = b^x$, where $b > 0$ and $b \neq 1$, and describe the key features of the graph, including domain, range, asymptote, and y-intercept. Understand which values of b indicate exponential growth and which indicate exponential decay.
	A1.E.3	Describe the meaning of the values of a and c in exponential functions of the form $f(x) = ab^x + c$ in real-world contexts and relate the values of a and c to transformations of the parent function.
	A1.E.4	Differentiate between linear and exponential functions and use them to model relationships which exhibit growth or decay. a. Understand that linear functions change by equal differences over equal intervals and that exponential functions change by equal factors over equal intervals in order to distinguish between situations that can be modeled with linear functions and those that can be modeled with exponential functions. b. Recognize that sequences are functions with discrete domains in that their domains are a subset of the integers. Express arithmetic and geometric sequences as functions, both recursively and explicitly. Use such functions to model linear and exponential relationships presented graphically, tabularly, or verbally.

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South Carolina College- and Career-Ready (SCCCR) Foundations in Algebra Overview

South Carolina College- and Career-Ready (SCCCR) Foundations in Algebra is the first course in a two-course sequence designed to prepare students for success in advanced mathematics courses by providing a foundation in algebra, probability, and statistics. This course builds on the conceptual knowledge and skills students mastered in earlier grades in areas such as algebraic thinking, probability, data analysis, and proportional reasoning.

The Key Concepts in this course are listed below.

- Quantities and Expressions (FA.QE)
- Function Theory (FA.F)
- Linear Equation, Functions, and Inequalities (FA.L)
- Rational Functions (FA.R)
- Exponential Functions (FA.E)
- Probability (FA.PR)

Standards in the Function Theory Key Concept illustrate the importance of developing an understanding of general function concepts that apply to all functions. These standards provide coherence to the study of the different families of functions students will encounter in high school. Standards that are specific to a particular family of functions are included in the Key Concepts devoted to that particular function family.

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.

Because SCCCR Foundations in Algebra is the first course in a two-course sequence, students who successfully complete SCCCR Foundations in Algebra must subsequently enroll in SCCCR Intermediate Algebra. Upon completion of the SCCCR Foundations in Algebra/SCCCR Intermediate Algebra two-course sequence, students must take the state-mandated Algebra 1 End-of-Course assessment (Algebra 1 EOCEP) administered at the completion of the second course, SCCCR Intermediate Algebra.

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South Carolina College- and Career-Ready (SCCCR) Foundations in Algebra

Key Concepts	Standards	
Quantities and Expressions	**The student will:**	
	FA.QE.1	Reason quantitatively by using units appropriately in modeling situations. a. Understand that quantities are numbers with units, including derived units, and involve measurement. b. Specify and define quantities that appropriately describe the attributes of interest in a real-world problem, such as per-capita income, person-hours, or fatalities per vehicle-mile traveled. c. Choose and interpret appropriate labels, units, and scales when quantities are displayed in a graph. d. Report the solution to a real-world problem using quantities with the appropriate level of accuracy for the given context.
	FA.QE.2	Extend previous knowledge of exponents to write numerical and algebraic expressions in different forms. a. Apply the laws of exponents and the commutative, associative, and distributive properties to evaluate and generate equivalent numerical and algebraic expressions involving integer and rational exponents. b. Translate between radical and exponential forms of numerical and algebraic expressions. c. Rewrite numerical and algebraic radical expressions involving square roots in simplest radical form.
	FA.QE.3	Interpret the meanings of coefficients, factors, terms, and expressions based on their contexts.

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Function Theory	**The student will:**	
	FA.F.1	Extend previous knowledge of a function to apply to general behavior and features of functions. a. Understand the formal definition of a function where the input/output relationship becomes a correspondence between two sets, the domain and range. Provide examples and non-examples from both mathematical and non-mathematical contexts. b. Determine if a relation is a function from a variety of representations, including mappings, sets of ordered pairs, graphs, tables, equations, and verbal descriptions. c. Represent a function using function notation and explain that $f(x)$ denotes the output of function f that corresponds to the input x. Explain 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. d. Explain that the solution set for the equation that defines a function is the set of all ordered pairs on the graph of the function. e. Given an equation, graph, or verbal description of a function, specify the domain and range appropriate for the situation. Include functions with continuous and discrete domains. f. Given an element of either the domain or range of a function, find the corresponding value(s) from the equation or the graph and interpret these values in terms of a real-world context.
	FA.F.2	Interpret graphs of functions, presented with or without scales, which represent mathematical and real-world situations. a. Provide a qualitative analysis of the graph of a function that models the relationship between two quantities and interpret key features of the graph in terms of the context of the quantities. Key features include intercepts, extrema, intervals where the function is increasing, decreasing, constant, positive, or negative. b. Sketch a graph showing key features given a verbal description of the relationship between two quantities.
	FA.F.3	Determine, with and without technology, the solution(s) of the equation $f(x) = g(x)$ by identifying the x-coordinate(s) of the point(s) of intersection of the graphs of $y = f(x)$ and $y = g(x)$.

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Linear Equations, Functions, and Inequalities	**The student will:**	
	FA.L.1	Extend previous knowledge of solving equations and inequalities in one variable. a. Understand that the steps taken when solving linear equations in one variable create new equations that have the same solution as the original. Justify each step in solving an equation. b. Represent real-world problems, including those involving proportional relationships, using linear equations and inequalities in one variable and solve such problems. Interpret the solution in terms of the context and determine whether it is reasonable. c. Solve compound linear inequalities in one variable and represent and interpret the solution on a number line. Write a compound linear inequality given its number line representation. d. Solve absolute value linear equations and inequalities in one variable. e. Solve literal equations and formulas for a specified variable. Include equations and formulas that arise in a variety of disciplines.
	FA.L.2	Analyze a relationship between two quantities represented in tabular or verbal forms to determine if the relationship is linear.
	FA.L.3	Create a linear function to model a real-world problem and interpret the meaning of the slope and intercepts in the context of the given problem. Recognize that a function represents a proportional relationship when the y-intercept is zero.
	FA.L.4	Apply transformations $kf(x)$ and $f(x) + k$, for any real number k, to the parent function $f(x) = x$ when represented in graphical, tabular, and algebraic form, including transformations that occur in real-world situations. Relate the slope-intercept form $y = mx + b$ to transformations of the parent function.
	FA.L.5	Translate among verbal, tabular, graphical, and symbolic representations of linear and piece-wise linear functions, including absolute value and step functions. Explain how each representation reveals different information about the function.
	FA.L.6	Translate among equivalent forms of equations for linear functions, including slope-intercept, point-slope, and standard forms. Explain how each form reveals different information about a given situation.
	FA.L.7	Write equations of linear functions given two points, one point and a slope, and a slope and the y-intercept.

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	FA.L.8	Extend previous knowledge of solving mathematical and real-world problems that can be modeled with linear systems in two variables, including those involving equations as well as inequalities. a. Describe the relationship between a solution of a pair of linear equations in two variables and the point of intersection of the graphs of the corresponding lines. Solve pairs of linear equations in two variables by graphing; approximate solutions when the coordinates of the intersection are non-integer numbers. b. Solve pairs of linear equations in two variables using substitution and elimination. c. Determine whether a system of linear equations has no solution, one solution, or an infinite number of solutions. Relate the number of solutions to pairs of lines that are intersecting, parallel or identical. d. Verify whether a pair of numbers satisfies a system of two linear equations in two unknowns by substituting the numbers into both equations. e. Graph the solution of a linear inequality in two variables as a half-plane, and graph the solution set of a system of linear inequalities as the intersection of the corresponding half-planes.
	FA.L.9	Construct a scatter plot to determine the possible association between two quantities. For associations that appear linear, informally fit a linear function to the data and compare the function to the line generated by technology. Interpret the coefficients m and b to explain the nature of the relationship between the two quantities and use the function to make predictions and solve problems.
Rational Functions	**The student will:**	
	FA.R.1	Graph the reciprocal function $f(x) = \frac{1}{x}$ and describe the key features of the graph, including domain, range, intercepts, asymptotes, symmetry, and intervals of increase and decrease.
	FA.R.2	Model real-world situations and solve problems involving inverse variation using the function $f(x) = \frac{k}{x}$.
Exponential Functions	**The student will:**	
	FA.E.1	Evaluate exponential functions at integer inputs without technology and at non-integer inputs with technology.
	FA.E.2	Graph the parent exponential function, $f(x) = b^x$, where $b > 0$ and $b \neq 1$, and describe the key features of the graph, including domain, range, asymptote, and y-intercept. Understand which values of b indicate exponential growth and which indicate exponential decay.
	FA.E.3	Describe the meaning of the values of a and c in exponential functions of the form $f(x) = ab^x + c$ in real-world contexts and relate the values of a and c to transformations of the parent function.

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	FA.E.4	Differentiate between linear and exponential functions and choose the appropriate model to represent mathematical and real-world relationships. a. Understand that linear functions change by equal differences over equal intervals and that exponential functions change by equal factors over equal intervals in order to distinguish between situations that can be modeled with linear functions and those that can be modeled with exponential functions. b. Recognize that sequences are functions with discrete domains in that their domains are a subset of the integers. Express arithmetic and geometric sequences as functions, both recursively and explicitly. Use such functions to model linear and exponential relationships presented graphically, tabularly, or verbally. c. Create exponential functions that model real-world situations, including those that involve growth and decay, and use the functions and their graphs to solve problems.
Probability	**The student will:**	
	FA.PR.1	Understand and use Venn diagrams. a. Use Venn diagrams to represent intersections, unions, and complements. b. Relate intersections, unions, and complements to the words *and*, *or*, and *not*. c. Represent sample spaces for compound events using Venn diagrams.
	FA.PR.2	Understand and apply concepts of probability. a. Describe two or more events as complementary, dependent, independent, and mutually exclusive. b. Explain the Law of Large Numbers and its application to probability. c. Apply the Addition Rule and the Multiplication Rule to determine probabilities, including conditional probabilities, and interpret the results in terms of the probability model. d. Distinguish between experimental and theoretical probabilities. Collect data on a chance event and use the relative frequency to estimate the theoretical probability of that event. Determine whether a given probability model is consistent with experimental results. e. Compute conditional probability using two-way tables. Justify the results in terms of the probability model and interpret the results in context.

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

South Carolina College- and Career-Ready (SCCCR) Intermediate Algebra is the second course in a two-course sequence designed to prepare students for success in advanced mathematics courses by providing a foundation in algebra, probability, and statistics. Students must successfully complete SCCCR Foundations in Algebra before enrolling in the second course, SCCCR Intermediate Algebra. This second course builds on the conceptual knowledge and skills students mastered in SCCCR Foundations in Algebra and in earlier grades in areas such as algebraic thinking, statistics, data analysis, and proportional reasoning.

The Key Concepts in this course are listed below.

- Number and Quantity (IA.NQ)
- Function Theory (IA.F)
- Polynomials (IA.P)
- Quadratic Equations and Functions (IA.Q)
- Radical Functions (IA.RD)
- Statistics (IA.S)

Standards in the Function Theory Key Concept illustrate the importance of developing an understanding of general function concepts that apply to all functions. These standards provide coherence to the study of the different families of functions students will encounter in high school. Standards that are specific to a particular family of functions are included in the Key Concepts devoted to that particular function family.

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, statistical software, and computer algebra systems, to solve problems and to master standards in all Key Concepts of this course.

Upon completion of the SCCCR Foundations in Algebra/SCCCR Intermediate Algebra two-course sequence, students must take the state-mandated Algebra 1 End-of-Course assessment (Algebra 1 EOCEP) administered at the completion of the second course, SCCCR Intermediate Algebra.

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South Carolina College- and Career-Ready (SCCCR) Intermediate Algebra

Key Concepts	Standards	
Number and Quantity	**The student will:**	
	IA.NQ.1	Reason quantitatively by using units appropriately in modeling situations. a. Understand that quantities are numbers with units, including derived units, and involve measurement. b. Specify and define quantities that appropriately describe the attributes of interest in a real-world problem, such as per-capita income, person-hours, or fatalities per vehicle-mile traveled. c. Choose and interpret appropriate labels, units, and scales when quantities are displayed in a graph. d. Report the solution to a real-world problem using quantities with the appropriate level of accuracy for the given context.
	IA.NQ.2	Know there is a complex number i where $i^2 = -1$ and that every complex number has the form $a + bi$ where a and b are real numbers.
Function Theory	**The student will:**	
	IA.F.1	Determine the average rate of change over a specified interval of a function represented in graphical, tabular, and symbolic forms. Include functions that model real-world problems and interpret the meaning of the average rate of change in the given context.
	IA.F.2	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. Write the equation of a transformed parent function given its graph.
Polynomials	**The student will:**	
	IA.P.1	Identify whether an expression is a polynomial and classify it according to degree and number of terms.
	IA.P.2	Apply the properties of operations and laws of exponents to perform operations with polynomials (add, subtract, multiply, divide by a monomial, and factor). a. Model addition, subtraction, and multiplication of linear polynomials using area models. b. Know and apply the structures of special products to find the product of $(a + b)^2$, $(a - b)^2$, and $(a - b)(a + b)$. c. Multiply polynomials by applying the distributive property. Include multiplying two binomials and multiplying a binomial by a trinomial. d. Analyze the structure of binomials, trinomials and other polynomials in order to factor them using an appropriate strategy, including greatest common factor, difference of two squares, perfect square quadratic trinomials, and grouping.
	IA.P.3	Define a variable and create polynomial expressions to model quantities in real-world situations, interpreting the parts of the expression in the context of the situation.

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Quadratic Equations and Functions	**The student will:**	
	IA.Q.1	Apply algebraic techniques to solve mathematical and real-world problems involving quadratic equations. a. Solve quadratic equations, including those with rational coefficients, by taking square roots, factoring, completing the square, and applying the quadratic formula as appropriate for the given form of the equation. Recognize that equations can have one real solution, two real solutions, or two complex solutions. b. Solve quartic equations that are in quadratic form. c. Derive the quadratic formula by completing the square on the standard form of the quadratic equation. d. Create equations in one variable to model quadratic relationships arising in real-world and mathematical problems, defining variables with appropriate units, and solve such equations. Interpret the solutions and determine whether they are reasonable. e. Solve a system of two equations consisting of a linear and a quadratic equation, or two quadratic equations, algebraically and graphically. Understand that such systems may have zero, one, two, or infinitely many solutions.
	IA.Q.2	Apply analytic and graphical properties of quadratic functions to solve mathematical and real-world problems. a. Describe the key features of the parent quadratic function $y = x^2$, including the vertex, axis of symmetry, domain, range, minimum/maximum, intercepts, direction of opening, and ordered pairs (±1, 1) and (±2, 4). b. Apply the transformations $kf(x)$, $-f(x)$, $f(x) + k$, and $f(x + k)$, for any real number k, to the parent function $f(x) = x^2$ when represented in graphical, tabular, and algebraic form. c. Rewrite a quadratic function from standard form to vertex form, $y = a(x - h)^2 + k$, by completing the square to determine the axis of symmetry, vertex, and range and relate this form to transformations of the parent function. d. Explain how the equation for the axis of symmetry, $x = -\frac{b}{2a}$, of a quadratic function relates to the midpoint of the segment joining zeros as determined by the quadratic formula and use the equation for the axis to find the vertex of the quadratic function. e. Sketch the graph of a quadratic function choosing appropriate scales and units for the given context, and interpret the key features, including maximum/minimum, zeros, y-intercept, and domain, in terms of the context. f. Determine the equation that defines a quadratic function by analyzing its graph. g. 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.
	IA.Q.3	Model and solve a variety of real-world problems using quadratic equations, including problems involving projectile motion and optimization.

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Radical Equations and Functions	**The student will:**	
	IA.RD.1	Solve algebraically and graphically equations involving square roots, indicating the existence of any extraneous solutions.
	IA.RD.2	Graph $f(x) = \sqrt{x}$ and $f(x) = \sqrt[3]{x}$ and their transformations and describe the key features of the graphs, including the domain, range, intercepts, and symmetry.
	IA.RD.3	Use radical functions and equations to model and solve real-world problems, including those involving the distance formula and those involving the period of a pendulum.
Statistics	**The student will:**	
	IA.S.1	Classify variables as: categorical or quantitative; discrete or continuous; and nominal, ordinal, ratio, or interval.
	IA.S.2	Create graphical displays of categorical and quantitative data. a. Create graphical displays of univariate categorical data, including Pareto charts and pie charts. b. Create graphical displays of univariate quantitative data, including stem-and-leaf plots, box plots, dot plots, histograms, frequency polygons, and cumulative frequency distributions (ogives), using appropriate technology.
	IA.S.3	Analyze and compare data sets graphically and quantitatively. a. Recognize and explain misleading uses of data and distortions in data displays. b. Analyze graphical displays of quantitative data to identify shape, center, spread, clusters, gaps, and outliers. c. Explain the meanings of the standard deviation and interquartile range of a data set and the significance of these values relative to the values in the data set. d. Classify distributions as symmetric, positively skewed, or negatively skewed and explain the significance of the shape of a distribution on determining appropriate measures of center (mean and median) and spread (standard deviation and interquartile range). e. Predict the effect of transformations of data on the shape of the distribution and on measures of center and spread. f. Compare the distributions of two or more univariate data sets by analyzing centers and spreads, clusters and gaps, shapes, and outliers. g. Analyze bivariate categorical data using two-way tables and identify possible associations between the two categories using marginal, joint, and conditional frequencies.

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South Carolina College- and Career-Ready (SCCCR) Algebra 2 Overview

In South Carolina College- and Career-Ready (SCCCR) Algebra 2, students extend their study of foundational algebraic concepts, such as linear functions, equations and inequalities, quadratic functions, absolute value functions, and exponential functions, from SCCCR Algebra 1 or the SCCCR Foundations in Algebra/SCCCR Intermediate Algebra two-course sequence. Additionally, students study new families of functions that are also essential for advanced mathematics courses.

The Key Concepts in this course are listed below.

- Number and Quantity (A2.NQ)
- Function Theory (A2.F)
- Polynomial Equations, Functions, and Inequalities (A2.P)
- Rational Expressions, Equations, and Functions (A2.R)
- Radical Expressions, Equations, and Functions (A2.RD)
- Exponential/Logarithmic Equations and Functions (A2.EL)

Standards in the Function Theory Key Concept illustrate the importance of extending an understanding of general function concepts that apply to all functions. These standards provide coherence to the study of the different families of functions students will encounter in this and future courses. Standards that are specific to a particular family of functions are included in the Key Concepts devoted to that particular function family.

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.

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South Carolina College- and Career-Ready (SCCCR) Algebra 2

Key Concepts	Standards	
Number and Quantity	**The student will:**	
	A2.NQ.1	Reason quantitatively by using units appropriately in modeling situations. a. Understand that quantities are numbers with units, including derived units, and involve measurement. b. Specify and define quantities that appropriately describe the attributes of interest in a real-world problem, such as per-capita income, person-hours, or fatalities per vehicle-mile traveled. c. Choose and interpret appropriate labels, units, and scales when quantities are displayed in a graph. d. Report the solution to a real-world problem using quantities with the appropriate level of accuracy for the given context.
	A2.NQ.2	Understand complex numbers and perform arithmetic with complex numbers. a. Know there is a complex number i where $i^2 = -1$ and that every complex number has the form $a + bi$ where a and b are real numbers. b. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, multiply, and divide complex numbers and express those results in $a + bi$ form.
Function Theory	**The student will:**	
	A2.F.1	Determine the average rate of change over a specified interval of a function represented in graphical, tabular, and symbolic forms. Include functions that model real-world problems and interpret the meaning of the average rate of change in the given context.
	A2.F.2	Create functions to describe the relationship between two quantities by forming the sum, difference, and product of standard function types and determine the domains of the resulting functions.
	A2.F.3	Understand the concept of inverse function graphically and symbolically, and calculate inverses of functions which have inverses. a. Understand that an inverse function can be obtained by expressing the dependent variable of one function as the independent variable of another, as f and g are inverse functions if and only if $f(x) = y$ and $g(y) = x$, for all values of x in the domain of f and all values of y in the domain of g. b. Find the inverse of an invertible function algebraically. c. Understand that if the graph of a function contains a point (a, b), then the graph of the inverse relation of the function contains the point (b, a) and the inverse is a reflection over the line $y = x$. Given the graph of a function, draw the graph of the inverse. d. Determine if a function has an inverse by demonstrating whether or not the function is one-to-one using the horizontal line test.

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	A2.F.4	Understand composition of functions as an algebraic operation and combine functions with composition. a. Use composition to combine functions that are represented in graphical, tabular, and symbolic form and determine the domain and range of the composition. Interpret the composition of functions in real-world situations. b. Demonstrate the following properties of composition of functions. i. The function $f(x) = x$ is the identity for composition. ii. The composition of a function and its inverse yields the identity function. iii. Composition of functions is not a commutative operation. c. 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. Write the equation of a transformed parent function given its graph.
Polynomial Equations, Functions, and Inequalities	**The student will:**	
	A2.P.1	Demonstrate that the sum, difference, and product of two polynomials result in a polynomial, and analyze the relationships between the degrees of the polynomials in such algebraic operations.
	A2.P.2	Describe the properties of the graphs of $f(x) = x^n$ for n = 2, 3, and 4, including shape, relative magnitude, domain, range, symmetry, intercepts, relative extrema, and end behavior.
	A2.P.3	Rewrite a quadratic function from standard form to vertex form by completing the square to determine the axis of symmetry, vertex, and range.
	A2.P.4	Solve polynomial equations, including quadratic equations that have complex solutions. a. Determine by substitution if a given complex number is the solution of a quadratic equation. b. Use a variety of techniques, including taking square roots, factoring, completing the square, and the quadratic formula to solve quadratic equations with complex solutions. c. Solve cubic equations and quartic equations algebraically and with technology. Algebraic methods include factoring the greatest common factor, factoring by grouping, factoring sums and differences of two cubes, and factoring quartics in quadratic form.
	A2.P.5	Graph, approximately, a polynomial function of degree 4 or less having only real roots by considering the leading term and the multiplicities of its roots when given the polynomial's factorization. Write a polynomial function of least degree corresponding to a given graph.

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	A2.P.6	Apply graphical and analytic knowledge to solve problems involving systems of equations and problems involving systems of inequalities. a. Solve a system of two equations consisting of a linear and a quadratic equation, or two quadratic equations, algebraically and graphically. Understand that such systems may have zero, one, two, or infinitely many solutions. b. Represent two-by-two and three-by-three linear systems in matrix form and use row reduction to solve such systems. c. Graph the solution of a linear inequality in two variables as a half-plane, and graph the solution set of a system of linear inequalities as the intersection of the corresponding half-planes. d. Use linear programming to optimize functions arising in real-world situations involving constraints which can be represented as a system of linear inequalities.
	A2.P.7	Model and solve real-world problems with polynomial functions and equations.
Rational Expressions, Equations, and Functions	**The student will:**	
	A2.R.1	Apply algebraic techniques to manipulate rational expressions and solve rational equations. a. Use algebraic techniques to find the sum, difference, product, and quotient of rational expressions or to simplify a complex fraction. b. Solve a rational equation which can be transformed into a polynomial equation of degree 4 or less, indicating the existence of any extraneous solutions.
	A2.R.2	Understand analytic and graphical properties of the reciprocal function. a. Graph $f(x) = \frac{1}{x}$ and its transformations and describe the key features of the graph, including domain, range, intercepts, asymptotes, symmetry, and intervals of increase and decrease. b. Show that $f(x) = \frac{1}{x}$ is its own inverse and explain this relationship graphically in terms of the symmetry about the line $y = x$.
	A2.R.3	Model real-world situations involving inverse variation with the function $f(x) = \frac{k}{x}$.
Radical Expressions, Equations, and Functions	**The student will:**	
	A2.RD.1	Apply algebraic knowledge to write radical expressions in different forms and to solve radical equations. a. Translate between radical and exponential forms of numerical and algebraic expressions and write radical expressions in simplest radical form. b. Apply the laws of exponents and properties of operations to evaluate and generate equivalent numerical and algebraic expressions involving rational exponents. c. Solve radical equations algebraically and graphically, indicating the existence of any extraneous solutions.
	A2.RD.2	Understand analytic and graphical properties of the square root and cube root functions. a. Graph $f(x) = \sqrt{x}$ and $f(x) = \sqrt[3]{x}$ and their transformations and describe the key features of the graphs, including the domain, range, intercepts, and symmetry.

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		b. Determine inverses of $f(x) = \sqrt{x}$ and $f(x) = \sqrt[3]{x}$ algebraically and graphically, specifying the domain and range of the inverses.
	A2.RD.3	Use radical functions to model and solve real-world problems, including those involving vehicle stopping distance and involving the period of a pendulum.
Exponential / Logarithmic Equations and Functions	**The student will:**	
	A2.EL.1	Understand the inverse relationship between exponential and logarithmic functions. a. Translate between exponential and logarithmic forms of an equation using the definition of logarithm. b. Graph $f(x) = \log_b x$ and $g(x) = b^x$ describing key features, including domain, range, end behavior, intercepts, and asymptotes. c. Demonstrate graphically that a logarithm and the exponential with the same base are inverse functions.
	A2.EL.2	Evaluate logarithmic functions. a. Calculate, without technology, the value of a logarithm when its argument can be written as an integer power of its base. b. Calculate, with technology, the value of a logarithm with any base.
	A2.EL.3	Solve simple exponential and logarithmic equations algebraically and graphically.
	A2.EL.4	Use exponential and logarithmic functions to solve problems. a. Create exponential functions that model real-world situations, including those involving growth and decay, and use the functions and their graphs to solve problems. b. Use logarithmic functions to model real-world scenarios, including those involving the Decibel, Richter, and pH scales, and use those functions and their graphs to solve problems.

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South Carolina College- and Career-Ready (SCCCR) Geometry Overview

In South Carolina College- and Career-Ready (SCCCR) Geometry, students build on the conceptual knowledge and skills they mastered in previous mathematics courses in areas such as algebraic thinking, geometry, measurement, probability, and proportional reasoning.

The Key Concepts in this course are listed below.

- Constructions, Transformations, and Coordinate Geometry (G.CTC)
- Reasoning and Proof (G.RP)
- Lines and Angles (G.LA)
- Triangles (G.T)
- Quadrilaterals and Other Polygons (G.QP)
- Circles (G.C)
- Three-Dimensional Figures (G.TD)

Standards in the Key Concept Constructions, Transformations, and Coordinate Geometry are meant to be applied throughout the course in order for students to make critical connections among geometric relationships synthetically (without coordinates) and analytically (with coordinates). Students also construct logical arguments and formal proofs of geometric relationships throughout the course as they develop their deductive reasoning skills and understanding of more sophisticated theorems based on simpler axioms introduced early in the course.

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, diagrams, or other mathematical representations to analyze real-world situations and solve problems. Use of mathematical tools is important in creating and analyzing the mathematical representations used in the modeling process. In order to represent and solve problems, students should learn to use a variety of mathematical tools and technologies, such as a compass, a straightedge, graph paper, patty paper, graphing utilities, and dynamic geometry software.

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South Carolina College- and Career-Ready (SCCCR) Geometry

Key Concepts	Standards	
Constructions, Transformations, and Coordinate Geometry	**The student will:**	
	G.CTC.1	Construct geometric figures using a variety of tools, including a compass, a straightedge, dynamic geometry software, and paper folding, and use these constructions to make conjectures about geometric relationships. Constructions should include but are not limited to: a. congruent segments and congruent angles; b. segment bisectors and angle bisectors; c. perpendicular lines and parallel lines; d. equilateral triangles; e. inscribed and circumscribed circles of a triangle; f. tangent lines from a point on a circle or to a circle from an exterior point.
	G.CTC.2	Understand and apply transformations. a. Represent translations, reflections, rotations, and dilations of objects in the plane by using paper folding, sketches, coordinates, function notation, and dynamic geometry software, and use various representations to help understand the effects of simple transformations and their compositions. b. Predict and describe the results of transformations on a given figure using geometric terminology from the definitions of the transformations. c. Describe a sequence of transformations that maps a figure onto its image. d. Identify types of symmetry of polygons, including line, point, rotational, and self-congruence, and use symmetry to analyze mathematical situations. e. Demonstrate that two figures are congruent by identifying a combination of translations, rotations, and reflections in various representations that move one figure onto the other. f. Demonstrate that two figures are similar by identifying a combination of translations, rotations, reflections, and dilations in various representations that move one figure onto the other.

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	G.CTC.3	Represent and analyze figures in the coordinate plane. a. Analyze slopes of lines to determine whether lines are parallel, perpendicular, or neither. b. Write the equation of a line passing through a given point that is parallel or perpendicular to a given line. c. Derive the formulas for determining distance and midpoint and use those formulas to solve mathematical and real-world problems. d. Represent the sum and difference of two vectors geometrically using the parallelogram method. e. Use a scale drawing to determine the magnitude and direction of a resultant vector by direct measurement. f. Derive the standard equation of a circle given the center and radius using the definition of a circle and the distance formula. g. Determine the center and radius of a circle given the standard equation and write the standard equation of a circle given sufficient information for determining the center and radius. h. Rewrite the general form of the equation of a circle in standard form by completing the square. i. Graph circles on the coordinate plane and use circle properties to solve mathematical and real-world problems.
	G.CTC.4	Represent and analyze figures in a three-dimensional coordinate system. a. Graph points on a three-dimensional coordinate system and explain how each coordinate of the point indicates the distance from the origin along the corresponding axis. b. Determine the distance from a point to the origin in the three-dimensional coordinate system.
Reasoning and Proof	**The student will:**	
	G.RP.1	Understand the axiomatic structure of geometry by using undefined terms, definitions, postulates, conjectures, theorems, and corollaries.
	G.RP.2	Identify and determine the validity of the converse, inverse, and contrapositive of a conditional statement. Determine the validity of a biconditional statement by analyzing the associated conditionals.
	G.RP.3	Distinguish between inductive and deductive reasoning.
	G.RP.4	Demonstrate that certain conjectures are false by producing counterexamples.
	G.RP.5	Identify and explain, both symbolically and with examples, uses of the Law of Detachment and the Law of Syllogism and relate these laws of logic to the construction of a deductive proof.
	G.RP.6	Construct logical arguments and proofs of theorems and other results in geometry, including coordinate proofs and proofs by contradiction. Express proofs in a form that justifies the reasoning, including two-column proofs, paragraph proofs, and flow charts.

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Lines and Angles	**The student will:**	
	G.LA.1	Define angle, circle, perpendicular, parallel, and skew in terms of the undefined notions of point, line, plane, and distance, and use geometric figures to represent and describe real-world objects.
	G.LA.2	Prove and apply in mathematical and real-world contexts theorems about lines and angles, including but not limited to the following: a. vertical angles are congruent; b. when a transversal crosses parallel lines, alternate interior angles are congruent, alternate exterior angles are congruent, and corresponding angles are congruent; c. when a transversal crosses parallel lines, consecutive interior angles are supplementary; d. any point on a perpendicular bisector of a line segment is equidistant from the endpoints of the segment; e. perpendicular lines form four right angles.
	G.LA.3	Apply properties of pairs of angles, including linear pairs, vertical angles, complementary angles, and supplementary angles, to solve problems and justify results.
	G.LA.4	Describe and identify the intersections of lines, planes, and other geometric figures.
Triangles	**The student will:**	
	G.T.1	Understand and apply triangle congruency relationships. a. Prove two triangles are congruent by applying the Side-Angle-Side, Angle-Side-Angle, Side-Side-Side, Angle-Angle-Side, and Hypotenuse-Leg congruence conditions. b. Prove theorems about the relationships within triangles, including the Midsegment Theorem, the Angle Sum Theorem, and Exterior Angle Theorem, and apply these relationships to solve problems. c. Verify experimentally the conclusions of the concurrency theorems for the medians, altitudes, angle bisectors, and perpendicular bisectors in triangles and apply these relationships to solve problems. d. Prove properties of equilateral and isosceles triangles and apply them to solve problems and justify results.

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	G.T.2	Understand and apply triangle inequality relationships. a. Verify experimentally the conclusion of the Triangle Inequality Theorem using constructions or manipulatives and apply the theorem to solve problems and justify results. b. Prove the Hinge Theorem and its converse and apply them to solve problems and justify results. c. Prove that two triangles are similar using the Angle-Angle criterion and apply the proportionality of corresponding sides to solve problems and justify results. d. Prove the Triangle Proportionality Theorem, the Geometric Mean Theorem for right triangles, and the Angle Bisector Theorem and apply these theorems to solve problems and justify results. e. Use properties of similar triangles to solve real-world and mathematical problems involving sides, perimeters, and areas of triangles.
	G.T.3	Understand and apply right triangle relationships. a. Prove the Pythagorean Theorem using triangle similarity and use the theorem and its converse to solve problems and justify results. b. Understand and apply properties of 45-45-90 and 30-60-90 triangles to solve problems and justify results. c. Understand how the properties of similar right triangles allow the trigonometric ratios to be defined and determine the sine, cosine, and tangent of an acute angle in a right triangle. d. Determine the lengths of sides and the measures of angles of a right triangle by applying the trigonometric ratios sine, cosine, and tangent in real-world and mathematical problems using calculators, computers, or trigonometric tables. e. Explain and use the relationship between the sine and cosine of complementary angles. f. Derive the formula $A = \frac{1}{2}ab \cdot sinC$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
Quadrilaterals and Other Polygons	**The student will:**	
	G.QP.1	Understand and apply properties of special quadrilaterals. a. Prove theorems about parallelograms and apply those theorems to solve problems and justify results. Theorems include but are not limited to: parallelograms have congruent opposite angles; diagonals of a parallelogram bisect each other; rectangles have congruent diagonals; and rhombi have perpendicular diagonals. b. Prove that given quadrilaterals are parallelograms, rhombi, rectangles, squares, or trapezoids. Include coordinate proofs.

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	G.QP.2 Understand and apply properties of polygons. a. Find measures of interior and exterior angles of polygons. Explain and justify the methods used. b. Apply congruence and similarity among quadrilaterals and other polygons to solve problems. c. Analyze how changes in the dimensions of quadrilaterals and regular polygons affect perimeter and area. d. Derive the formula for the area of any regular polygon in terms of its apothem and perimeter and understand how the limiting case of this formula leads to the formula for the area of a circle. Use these formulas to solve mathematical and real-world problems.
Circles	**The student will:**
	G.C.1 Understand and apply properties of circles and their parts. a. Define and identify the following terms and use the relationships among them to solve mathematical and real-world problems: radius, diameter, arc, measure of an arc, chord, secant, tangent, and concentric circles. b. Demonstrate that the radius of a circle is perpendicular to a tangent line at the point of tangency and use this relationship to solve mathematical and real-world problems. c. Identify and describe relationships among central angles, inscribed angles, circumscribed angles, and their intercepted arcs and use those relationships to solve mathematical and real-world problems. d. Prove that the pairs of opposite angles of a quadrilateral inscribed in a circle are supplementary and use this relationship to solve problems. e. Find the measure of line segments, angles, and intercepted arcs formed by the intersection of two secant lines, two tangent lines, or a secant line and a tangent line with a circle to solve mathematical and real-world problems. f. Demonstrate that all circles are similar.
	G.C.2 Understand and apply properties of circumferences and areas of circles. a. Solve mathematical and real-world problems involving the circumference and area of a circle and analyze how a change in radius affects circumference and area. b. Derive the formula for the length of an arc intercepted by a central angle and apply this relationship to solve mathematical and real-world problems. c. Derive the formula for the area of a sector and apply this relationship to solve mathematical and real-world problems. d. Use geometric probability to solve mathematical and real-world problems involving circles and polygons.

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Three-Dimensional Figures	**The student will:**
	G.TD.1 Understand and apply properties of three-dimensional solids. a. Use geometric shapes, their measures, and their properties to describe three-dimensional solids and their symmetries. b. Draw a top-view, front-view, side-view, and an isometric view of a given three-dimensional object. c. Describe the shapes of two-dimensional cross-sections of three-dimensional objects and use those cross-sections to solve mathematical and real-world problems. d. Describe the three-dimensional object generated by revolving a two-dimensional object about a line.
	G.TD.2 Understand and apply properties of surface-areas and volumes of three-dimensional solids. a. Derive surface area and volume formulas for prisms and cylinders and explain the relationship between these formulas and the surface area and volume formulas for pyramids and cones. b. Apply surface area and volume formulas for prisms, cylinders, pyramids, cones, and spheres to solve problems and justify results, including problems that involve algebraic expressions, composite figures, and real-world applications. c. Apply geometric properties of solids, including prisms, pyramids, cylinders, cones, and spheres, to model and solve real-world problems. d. Analyze how changes in one or more dimensions affect the surface area and volume of a three-dimensional object.

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South Carolina College- and Career-Ready (SCCCR)
Probability and Statistics Overview

South Carolina College- and Career-Ready (SCCCR) Probability and Statistics is designed to prepare students for success in post-secondary statistics courses. In SCCCR Probability and Statistics, students build on the conceptual knowledge and skills they mastered in previous mathematics courses in areas such as probability, data presentation and analysis, correlation, and regression.

The Key Concepts in this course are listed below.

- Probability (PS.P)
- Probability Distributions (PS.PD)
- Descriptive Statistics (PS.DS)
- Inferential Statistics (PS.IS)
- Correlation and Regression (PS.CR)
- Statistical Research (PS.SR)

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, functions, graphs, distributions, 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, simulation applications, spreadsheets, and statistical software, to solve problems and to master standards in all Key Concepts of this course.

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South Carolina College- and Career-Ready (SCCCR)
Probability and Statistics

Key Concepts	Standards
Probability	**The student will:**
	PS.P.1 Understand and use Venn diagrams. a. Use Venn diagrams to represent intersections, unions, and complements. b. Relate intersections, unions, and complements to the words *and*, *or*, and *not*. c. Represent sample spaces for compound events using Venn diagrams.
	PS.P.2 Understand and apply concepts of probability. a. Describe two or more events as complementary, dependent, independent, and mutually exclusive. b. Explain the Law of Large Numbers and its application to probability. c. Apply the Addition Rule and the Multiplication Rule to determine probabilities, including conditional probabilities, and interpret the results in terms of the probability model. d. Use permutations and combinations to solve mathematical and real-world problems, including determining probabilities of compound events. Justify the results in terms of the probability model and interpret the results in context. e. Use geometric probability to solve mathematical and real-world problems. Justify the results in terms of the probability model and interpret the results in context. f. Distinguish between experimental and theoretical probabilities. Collect data on a chance event and use the relative frequency to estimate the theoretical probability of that event. Determine whether a given probability model is consistent with experimental results. g. Compute conditional probability using two-way tables. Justify the results in terms of the probability model and interpret the results in context.
Probability Distributions	**The student will:**
	PS.PD.1 Understand probability distributions and use them to solve problems. a. Construct and compare theoretical and experimental probability distributions and use those distributions to find expected values. b. Use the binomial and geometric probability distributions for discrete random variables to solve real-world problems. Justify the results in terms of the probability model and interpret the results in context. c. Identify the expected value of a random variable as the mean of its probability distribution. Find expected values by assigning probabilities to payoff values. Use expected values to evaluate and compare strategies in real-world scenarios. d. Identify properties of a normal distribution and apply the normal distribution to determine probabilities and percentiles using tables and technology.
	PS.PD.2 Recognize when the Empirical Rule is applicable and use it to solve mathematical and real-world problems. Justify the results in terms of the probability model and interpret the results in context.

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	PS.PD.3	Explain the Central Limit Theorem and its application to sampling distributions of a sample proportion, a sample mean, a difference between two sample proportions, and a difference between two sample means.
	PS.PD.4	Create and analyze control charts to determine whether a process is in control. Justify the conclusions and interpret the results in context.
Descriptive Statistics	**The student will:**	
	PS.DS.1	Classify variables as: categorical or quantitative; discrete or continuous; and nominal, ordinal, ratio, or interval.
	PS.DS.2	Create graphical displays of categorical and quantitative data. a. Create graphical displays of univariate categorical data, including Pareto charts and pie charts. b. Create graphical displays of univariate quantitative data, including stem-and-leaf plots, box plots, dot plots, histograms, frequency polygons, and cumulative frequency distributions (ogives), using appropriate technology.
	PS.DS.3	Analyze and compare data sets graphically and quantitatively. a. Recognize and explain misleading uses of data and distortions in data displays. b. Analyze graphical displays of quantitative data to identify shape, center, spread, clusters, gaps, and outliers. c. Explain the meanings of the standard deviation and interquartile range of a data set and the significance of these values relative to the values in the data set. d. Classify distributions as symmetric, positively skewed, or negatively skewed and explain the significance of the shape of a distribution on determining appropriate measures of center (mean and median) and spread (standard deviation and interquartile range). e. Predict the effect of transformations of data on the shape of the distribution and on measures of center and spread. f. Compare the distributions of two or more univariate data sets by analyzing centers and spreads, clusters and gaps, shapes, and outliers. g. Analyze bivariate categorical data using two-way tables and identify possible associations between the two categories using marginal, joint, and conditional frequencies.
Inferential Statistics	**The student will:**	
	PS.IS.1	Differentiate between statistics and parameters and between descriptive statistics and inferential statistics.
	PS.IS.2	Find and interpret point estimates and margins of error in order to construct confidence intervals for parameters including proportion and mean. Use confidence intervals to make decisions and evaluate claims about data.
	PS.IS.3	Apply hypothesis testing procedures, including large and small sample tests, for proportion and mean. Interpret the p-values in context and make decisions and evaluate claims based upon the results of the tests.
	PS.IS.4	Differentiate between Type I and II errors, and explain how the implications of Type I and Type II errors inform the choice of significance levels and sensitivities of tests.

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Correlation and Regression	**The student will:**	
	PS.CR.1	Analyze scatterplots to describe the relationship between two variables indicating form, direction, and strength of the relationship. Identify and describe the significance of any clusters, outliers, and influential points.
	PS.CR.2	Use technology to determine regression lines (lines of best fit) and correlation coefficients for bivariate data sets. Interpret the meaning of the slope and intercept in the context of the data. Use regression lines to make predictions and use correlation coefficients to assess the reliability of the predictions.
	PS.CR.3	Distinguish between interpolation and extrapolation and explain the limitations of each method.
	PS.CR.4	Create residual plots and analyze those plots to compare the fit of linear, quadratic, and exponential models to a given data set. Select the appropriate model and use it to make predictions.
	PS.CR.5	Differentiate between correlation and causation when describing the relationship between two variables. Identify potential lurking variables which may explain an association between two variables.
Statistical Research	**The student will:**	
	PS.SR.1	Evaluate claims and conclusions in published reports or articles based on data by analyzing study design and the collection, analysis, and display of the data. Identify sources and causes of bias in statistical studies and describe methods to control or reduce bias.
	PS.SR.2	Distinguish between experiments and observational studies. Determine which of two or more possible experimental designs will best answer a given research question and justify the choice.
	PS.SR.3	Plan and conduct a survey to answer a statistical question. The plan should address sampling technique and methods to reduce bias. Create a presentation summarizing the findings and justifying the conclusion(s) using appropriate statistical terms.
	PS.SR.4	Plan and conduct an experiment to answer a statistical question. The plan should address control, randomization, and measurement of experimental error. Create a report on the experiment summarizing the findings and justifying the conclusion(s) using appropriate statistical terms.
	PS.SR.5	Create a research question, design a statistical study to answer the research question, and conduct the study. Create a report on the study summarizing the findings and justifying the conclusion(s) using appropriate statistical terms.

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South Carolina College- and Career-Ready (SCCCR) Pre-Calculus Overview

In South Carolina College- and Career-Ready (SCCCR) Pre-Calculus, students build on the conceptual knowledge and skills for mathematics they mastered in previous mathematics courses. The standards for those courses provide students with a foundation in the theory of functions, roots and factors of polynomials, exponential and logarithmic functions, the complex number system, and an introduction to trigonometry.

The Key Concepts in this course are listed below.

- Number and Coordinate Systems (PC.NC)
- Function Theory (PC.F)
- Trigonometry (PC.T)
- Polynomial Functions, Equations, and Inequalities (PC.P)
- Rational Functions, Equations, and Inequalities (PC.R)
- Exponential and Logarithmic Functions and Equations (PC.EL)
- Conic Sections (PC.C)

Standards in the Function Theory Key Concept extend students' understanding of general function concepts that apply to all functions. These standards provide coherence to the study of the different families of functions students will encounter in this and future courses. Standards that are specific to a particular family of functions are included in the Key Concepts devoted to that particular function family.

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.

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South Carolina College- and Career-Ready (SCCCR) Pre-Calculus

Key Concepts	Standards	
Number and Coordinate Systems	**The student will:**	
	PC.NC.1	Represent complex numbers and arithmetic algebraically and geometrically. a. Graph complex numbers in the complex plane, and represent complex numbers in rectangular and polar forms. b. Perform addition, subtraction, multiplication, division, and conjugation of complex numbers in rectangular and polar forms, and describe these operations geometrically. c. Determine the modulus of a complex number by multiplying by its conjugate and determine the distance between two complex numbers by calculating the modulus of their difference. d. Use DeMoivre's Theorem to calculate a power of a complex number.
	PC.NC.2	Understand the polar coordinate system and relate polar and rectangular representations. a. Translate between polar and rectangular coordinates, and plot points in the polar coordinate system. b. Graph polar curves, including roses and cardioids, by plotting points and by making use of symmetry and periodicity. c. Translate between and compare the polar and rectangular forms of equations for circles, lines, and rays.
Function Theory	**The student will:**	
	PC.F.1	Describe the key features of functions, including domain, range, relative extrema, intercepts, asymptotes, end behavior, and intervals on which the function is increasing, decreasing, positive, negative, and continuous.
	PC.F.2	Understand graphically that a function is invertible if it is always increasing or decreasing on its domain. Construct an invertible function from a non-invertible function by restricting the domain of the function to an interval on which the function is always increasing or decreasing.
	PC.F.3	Recognize even and odd functions by analyzing the symmetry of their graphs and determine whether a function is even, odd, or neither from a symbolic representation.
	PC.F.4	Perform composition of two or more given functions and given a function determine two or more functions which form the given function under composition.

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Trigonometry	**The student will:**
	PC.T.1 Understand and use angle measure. a. Measure angles using radians and degrees and convert between the two measures. b. Explain the meaning of radians in terms of radius and arc length along a circle.
	PC.T.2 Understand and evaluate trigonometric functions defined in terms of the unit circle. a. Define sine, cosine, and tangent as functions of an angle in terms of the x- and y-coordinates of the point on the unit circle corresponding to that angle and understand these definitions as extensions of the right triangle definitions. b. Define the tangent, cotangent, secant, and cosecant functions as ratios involving sine and cosine. c. Write cotangent, secant, and cosecant functions as the reciprocals of tangent, cosine, and sine, respectively. d. Evaluate any trigonometric function given the value of one trigonometric function and the quadrant in which the terminal side of the angle lies. e. Define the six inverse trigonometric functions using the standard domain restrictions. f. Evaluate, with technology, the six trigonometric functions at any angle in their domains and the six inverse trigonometric functions at any number in their domain. g. Evaluate, without the use of technology, the six trigonometric functions at the special angles of 0, π/6, π/4, π/3, and π/2 and their multiples. h. Evaluate, without the use of technology, the inverse sine, inverse cosine, and inverse tangent functions at numbers in their domain that evaluate to one of the special angles.
	PC.T.3 Fluently manipulate expressions involving trigonometric functions in order to simplify those expressions and solve equations. a. Simplify expressions involving the composition of a trigonometric function and an inverse trigonometric function. b. Rewrite trigonometric expressions in equivalent forms using properties of the trigonometric functions and by using substitution of trigonometric identities, factoring, and other algebraic techniques. c. Solve trigonometric equations.
	PC.T.4 Understand and explain the key features of trigonometric and inverse trigonometric functions and their graphs. a. Graph the six trigonometric functions and their transformations and describe key features of the graphs, including continuity, discontinuity, domain, range, amplitude, period, intercepts, relative extrema, asymptotes, end behavior, and intervals on which the function is increasing, decreasing, positive, negative. Apply the unit circle definitions to explain those key features. b. Graph the six inverse trigonometric functions and describe the key features of the graphs, including domain, range, intercepts, and asymptotes. Apply the concept of inverse function to explain those key features.

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	PC.T.5	Derive and verify trigonometric identities. a. Justify the Pythagorean, even/odd, and cofunction identities for sine and cosine using their unit circle definitions and symmetries of the unit circle. b. Derive the Pythagorean, even/odd, and cofunction identities for tangent, cotangent, secant, and cosecant using the corresponding identities for sine and cosine. c. Apply the sum and difference formulas for sine, cosine, and tangent to solve problems. Derive the double-angle and half-angle formulas for sine, cosine, and tangent using the sum and difference formulas. d. Verify trigonometric identities using the standard identities.
	PC.T.6	Use trigonometric functions and equations to model and solve mathematical and real-world problems. a. Construct a trigonometric function to model sinusoidal phenomena given the amplitude, frequency, phase shift, and midline. Determine the amplitude, period, frequency, and phase shift of a sinusoidal function given a graphical or symbolic representation. b. Use the Law of Sines and the Law of Cosines to solve for unknown measures of sides and angles of oblique triangles that arise in mathematical and real-world problems.
Polynomial Functions, Equations, and Inequalities	**The student will:**	
	PC.P.1	Understand that polynomials are algebraically comparable to the integers in that they are closed under the operations of addition, subtraction, and multiplication. Demonstrate that the ratio of two polynomials is generally not a polynomial and identify cases in which such ratios result in polynomials.
	PC.P.2	Know the Division Algorithm for polynomials and determine the quotient and remainder when one polynomial is divided by another.
	PC.P.3	Understand and apply theorems about roots and factors of polynomials. a. Derive the Remainder Theorem from the Division Algorithm. Use the Remainder Theorem to explain the connection between the zeros of a polynomial and its linear factors. b. Know the Fundamental Theorem of Algebra and explain, using complex number arithmetic, why complex roots of polynomials with real coefficients must occur in conjugate pairs. c. Apply the Rational Roots Theorem to determine the possible rational roots of a polynomial with integer coefficients and use the Remainder Theorem to factor such a polynomial when rational roots are identified. d. Use the Binomial Theorem to factor squares, cubes, and fourth powers of binomials. Apply the Binomial Theorem to expand powers of binomials, including those with one and with two variables.
	PC.P.4	Graph polynomials identifying zeros when suitable factorizations are available and indicating end behavior. Write a polynomial function of least degree corresponding to a given graph.

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	PC.P.5	Use polynomials to model and solve real-world problems. a. Create a polynomial function that describes the relationship between two quantities and interpret key features of the function in terms of the quantities. b. Analyze polynomial functions and solve polynomial equations to draw conclusions in real-world problems and describe the results in context. c. Analyze the graphs of polynomials in order to solve polynomial inequalities.
Rational Functions, Equations, and Inequalities	**The student will:**	
	PC.R.1	Understand that rational functions are algebraically comparable to the rational numbers in that they are closed under the operations of addition, subtraction, multiplication, and division.
	PC.R.2	Write an improper rational expression as the sum of a polynomial and a proper rational expression.
	PC.R.3	Graph rational functions identifying domain, range, intercepts, end behavior, removable discontinuities, and asymptotes, including oblique asymptotes.
	PC.R.4	Create and solve rational equations and inequalities algebraically and graphically in real-world problems.
Exponential and Logarithmic Functions and Equations	**The student will:**	
	PC.EL.1	Graph exponential and logarithmic functions describing key features, including intercepts, end behavior, asymptotes, domain, and range.
	PC.EL.2	Derive the laws of logarithms for products, quotients, and powers using the definition of the logarithm and laws of exponents.
	PC.EL.3	Apply the laws of logarithms in order to write logarithmic expressions in equivalent forms.
	PC.EL.4	Create and solve exponential and logarithmic equations algebraically and graphically, identifying extraneous solutions, in real-world contexts.
Conic Sections	**The student will:**	
	PC.C.1	Use the geometric definition of a parabola to derive its equation given the focus and directrix.
	PC.C.2	Use the geometric definition of an ellipse to derive its equation given the foci and a point on the ellipse.
	PC.C.3	Use the geometric definition of a hyperbola to derive its equation given the foci and a point on the hyperbola.
	PC.C.4	Graph parabolas, ellipses, and hyperbolas and describe key features of the graphs, including center, vertex, foci, and asymptotes.

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South Carolina College- and Career-Ready (SCCCR) Calculus Overview

In South Carolina College- and Career-Ready (SCCCR) Calculus, students build on the conceptual knowledge and the problem-solving skills they learned in previous mathematics courses. This course prepares students for post-secondary mathematical study but is not designed to prepare the student for the Advanced Placement exam.

The Key Concepts in this course are listed below.

- Limits and Continuity (C.LC)
- Derivatives (C.D)
- Integrals (C.I)

SCCCR Calculus focuses on a conceptual understanding of calculus as well as computational competency. The standards promote a multi-representational approach to calculus with concepts, results, and problems being expressed graphically, numerically, analytically, and verbally. These representations facilitate an understanding of the connections among limits, derivatives, and integrals.

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. Modeling involves choosing or 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.

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South Carolina College- and Career-Ready (SCCCR) Calculus

Key Concepts	Standards
Limits and Continuity	**The student will:**
	C.LC.1 Understand the concept of a limit graphically, numerically, analytically, and verbally. a. Estimate and verify limits using tables, graphs of functions, and technology. b. Calculate limits, including one-sided limits, algebraically using substitution, simplification, rationalization, and the limit laws for constant multiples, sums, differences, products, and quotients. c. Calculate infinite limits and limits at infinity. Understand that infinite limits and limits at infinity provide information regarding the asymptotes of certain functions, including rational, exponential and logarithmic functions.
	C.LC.2 Understand the definition and graphical interpretation of continuity of a function. a. Apply the definition of continuity of a function at a point to solve problems. b. Classify discontinuities as removable, jump, or infinite. Justify that classification using the definition of continuity. c. Understand the Intermediate Value Theorem and apply the theorem to prove the existence of solutions of equations arising in mathematical and real-world problems.
Derivatives	**The student will:**
	C.D.1 Understand the concept of the derivative of a function geometrically, numerically, analytically, and verbally. a. Interpret the value of the derivative of a function as the slope of the corresponding tangent line. b. Interpret the value of the derivative as an instantaneous rate of change in a variety of real-world contexts, such as velocity and population growth. c. Approximate the derivative graphically by finding the slope of the tangent line drawn to a curve at a given point and numerically by using the difference quotient. d. Understand graphically and analytically the relationship between differentiability and continuity. e. Explain graphically and analytically the relationship between the average rate of change and the instantaneous rate of change. f. Understand the definition of the derivative and use this definition to determine the derivatives of various functions.
	C.D.2 Apply the rules of differentiation to functions. a. Know the derivatives of constant, power, trigonometric, inverse trigonometric, exponential, and logarithmic functions. b. Use the constant multiple, sum, difference, product, quotient, and chain rules to find the derivatives of functions. c. Understand and apply the methods of implicit and logarithmic differentiation.

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	C.D.3	Apply theorems and rules of differentiation to solve mathematical and real-world problems. a. Explain geometrically and verbally the mathematical and real-world meanings of the Extreme Value Theorem and the Mean Value Theorem. b. Write an equation of a line tangent to the graph of a function at a point. c. Understand the relationship between the increasing/decreasing behavior of f and the signs of f'. Use the relationship to generate a graph of f given the graph of f', and vice versa, and to identify relative and absolute extrema of f. d. Understand the relationships among the concavity of the graph of f, the increasing/decreasing behavior of f' and the signs of f''. Use those relationships to generate graphs of f, f', and f'' given any one of them and identify the points of inflection of f. e. Solve a variety of real-world problems involving related rates, optimization, linear approximation, and rates of change.
Integrals	**The student will:**	
	C.I.1	Understand the concept of the integral of a function geometrically, numerically, analytically, and verbally. a. Understand that the definite integral is used to solve area problems. b. Approximate definite integrals by calculating Riemann sums using left, right, and mid-point evaluations, and using trapezoidal sums. c. Interpret the definite integral as a limit of Riemann sums. d. Understand the relationship between the integral and derivative as expressed in both parts of the Fundamental Theorem of Calculus. Interpret the relationship in terms of rates of change.
	C.I.2	Apply theorems and rules of integration to solve mathematical and real-world problems. a. Apply the Fundamental Theorem of Calculus to solve mathematical and real-world problems. b. Explain graphically and verbally the properties of the definite integral. Apply these properties to evaluate basic definite integrals. c. Evaluate integrals using substitution.

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