North Carolina Department of Public Instruction
INSTRUCTIONAL SUPPORT TOOLS
FOR ACHIEVING NEW STANDARDS

Vertical Progression

FOR THE NC STANDARD COURSE OF STUDY IN MATHEMATICS

NC Department of Public Instruction

Table of Contents

Purpose:

This Standards Progression document provides a vertical view by domain of the *NC Standard Course of Study for Mathematics*. All standards are included from Kindergarten to Math 1, 2 and 3. The vertical progression view of the standards reveals how students' thinking about core concepts in mathematics become more sophisticated from grade to grade as they build to Career and College Readiness (CCR).

Counting and Cardinality	
Know number names and the counting sequence.	
NC.K.CC.1	Know number names and recognize patterns in the counting sequence by: • Counting to 100 by ones. • Counting to 100 by tens.
NC.K.CC.2	Count forward beginning from a given number within the known sequence, instead of having to begin at 1.
NC.K.CC.3	Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20, with 0 representing a count of no objects.
Count to tell the number of objects.	
NC.K.CC.4	Understand the relationship between numbers and quantities. • When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object (one-to-one correspondence). • Recognize that the last number named tells the number of objects counted regardless of their arrangement (cardinality). • State the number of objects in a group, of up to 5 objects, without counting the objects (perceptual subitizing).
NC.K.CC.5	Count to answer “How many?” in the following situations: • Given a number from 1–20, count out that many objects. • Given up to 20 objects, name the next successive number when an object is added, recognizing the quantity is one more/greater. • Given 20 objects arranged in a line, a rectangular array, and a circle, identify how many. • Given 10 objects in a scattered arrangement, identify how many.
Compare numbers.	
NC.K.CC.6	Identify whether the number of objects, within 10, in one group is greater than, less than, or equal to the number of objects in another group, by using matching and counting strategies.
NC.K.CC.7	Compare two numbers, within 10, presented as written numerals.

Return to Table of Contents

Operations and Algebraic Thinking	
Understand addition and subtraction.	
NC.K.OA.1	Represent addition and subtraction, within 10: • Use a variety of representations such as objects, fingers, mental images, drawings, sounds, acting out situations, verbal explanations, or expressions. • Demonstrate understanding of addition and subtraction by making connections among representations.
NC.K.OA.2	Solve addition and subtraction word problems, within 10, using objects or drawings to represent the problem, when solving: • Add to/Take From-Result Unknown • Put Together/ Take Apart (Total Unknown and Two Addends Unknown)
NC.K.OA.3	Decompose numbers less than or equal to 10 into pairs in more than one way using objects or drawings, and record each decomposition by a drawing or expression.
NC.K.OA.4	For any number from 0 to 10, find the number that makes 10 when added to the given number using objects or drawings, and record the answer with a drawing or expression.
NC.K.OA.6	Recognize and combine groups with totals up to 5 (conceptual subitizing).
NC.K.OA.5	Demonstrate fluency with addition and subtraction within 5.
Represent and solve problems.	
NC.1.OA.1	Represent and solve addition and subtraction word problems, within 20, with unknowns, by using objects, drawings, and equations with a symbol for the unknown number to represent the problem, when solving: • Add to/Take from-Change Unknown • Put together/Take Apart-Addend Unknown • Compare-Difference Unknown
NC.1.OA.2	Represent and solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, by using objects, drawings, and equations with a symbol for the unknown number.
Understand and apply the properties of operations.	
NC.1.OA.3	Apply the commutative and associative properties as strategies for solving addition problems.
NC.1.OA.4	Solve an unknown-addend problem, within 20, by using addition strategies and/or changing it to a subtraction problem.
Add and subtract within 20.	
NC.1.OA.9	Demonstrate fluency with addition and subtraction within 10.
NC.1.OA.6	Add and subtract, within 20, using strategies such as: • Counting on • Making ten • Decomposing a number leading to a ten • Using the relationship between addition and subtraction • Using a number line • Creating equivalent but simpler or known sums
Analyze addition and subtraction equations within 20.	
NC.1.OA.7	Apply understanding of the equal sign to determine if equations involving addition and subtraction are true.
NC.1.OA.8	Determine the unknown whole number in an addition or subtraction equation involving three whole numbers.

Represent and solve problems.	

NC.2.OA.1	Represent and solve addition and subtraction word problems, within 100, with unknowns in all positions, by using representations and equations with a symbol for the unknown number to represent the problem, when solving:
	• One-Step problems:
	  ○ Add to/Take from-Start Unknown
	  ○ Compare-Bigger Unknown
	  ○ Compare-Smaller Unknown
	• Two-Step problems involving single digits:
	  ○ Add to/Take from- Change Unknown
	  ○ Add to/Take From- Result Unknown

Add and subtract within 20.	
NC.2.OA.2	Demonstrate fluency with addition and subtraction, within 20, using mental strategies.
Work with equal groups.	
NC.2.OA.3	Determine whether a group of objects, within 20, has an odd or even number of members by: • Pairing objects, then counting them by 2s. • Determining whether objects can be placed into two equal groups. • Writing an equation to express an even number as a sum of two equal addends.
NC.2.OA.4	Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.
Represent and solve problems involving multiplication and division.	
NC.3.OA.1	For products of whole numbers with two factors up to and including 10: • Interpret the factors as representing the number of equal groups and the number of objects in each group. • Illustrate and explain strategies including arrays, repeated addition, decomposing a factor, and applying the commutative and associative properties.
NC.3.OA.2	For whole-number quotients of whole numbers with a one-digit divisor and a one-digit quotient: • Interpret the divisor and quotient in a division equation as representing the number of equal groups and the number of objects in each group. • Illustrate and explain strategies including arrays, repeated addition or subtraction, and decomposing a factor.
NC.3.OA.3	Represent, interpret, and solve one-step problems involving multiplication and division. • Solve multiplication word problems with factors up to and including 10. Represent the problem using arrays, pictures, and/or equations with a symbol for the unknown number to represent the problem. • Solve division word problems with a divisor and quotient up to and including 10. Represent the problem using arrays, pictures, repeated subtraction and/or equations with a symbol for the unknown number to represent the problem.
Understand properties of multiplication and the relationship between multiplication and division.	
NC.3.OA.6	Solve an unknown-factor problem, by using division strategies and/or changing it to a multiplication problem.
Multiply and divide within 100.	
NC.3.OA.7	Demonstrate fluency with multiplication and division with factors, quotients and divisors up to and including 10. • Know from memory all products with factors up to and including 10.

	• Illustrate and explain using the relationship between multiplication and division. • Determine the unknown whole number in a multiplication or division equation relating three whole numbers.
Solve two-step problems.	
NC.3.OA.8	Solve two-step word problems using addition, subtraction, and multiplication, representing problems using equations with a symbol for the unknown number.
Explore patterns of numbers.	
NC.3.OA.9	Interpret patterns of multiplication on a hundreds board and/or multiplication table.
Represent and solve problems involving multiplication and division.	
NC.4.OA.1	Interpret a multiplication equation as a comparison. Multiply or divide to solve word problems involving multiplicative comparisons using models and equations with a symbol for the unknown number. Distinguish multiplicative comparison from additive comparison.
Use the four operations with whole numbers to solve problems.	
NC.4.OA.3	Solve two-step word problems involving the four operations with whole numbers. • Use estimation strategies to assess reasonableness of answers. • Interpret remainders in word problems. • Represent problems using equations with a letter standing for the unknown quantity.
Gain familiarity with factors and multiples.	
NC.4.OA.4	Find all factor pairs for whole numbers up to and including 50 to: • Recognize that a whole number is a multiple of each of its factors. • Determine whether a given whole number is a multiple of a given one-digit number. • Determine if the number is prime or composite.
Generate and analyze patterns.	
NC.4.OA.5	Generate and analyze a number or shape pattern that follows a given rule.
Write and interpret numerical expressions.	
NC.5.OA.2	Write, explain, and evaluate numerical expressions involving the four operations to solve up to two-step problems. Include expressions involving: • Parentheses, using the order of operations. • Commutative, associative and distributive properties.
Analyze patterns and relationships.	
NC.5.OA.3	Generate two numerical patterns using two given rules. • Identify apparent relationships between corresponding terms. • Form ordered pairs consisting of corresponding terms from the two patterns. • Graph the ordered pairs on a coordinate plane.

Return to Table of Contents

Number and Operations in Base Ten	
Build foundation for place value.	
NC.K.NBT.1	Compose and decompose numbers from 11 to 19 into ten ones and some further ones by: • Using objects or drawings. • Recording each composition or decomposition by a drawing or expression. • Understanding that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.
Extend and recognize patterns in the counting sequence.	
NC.1.NBT.1	Count to 150, starting at any number less than 150.
NC.1.NBT.7	Read and write numerals, and represent a number of objects with a written numeral, to 100.
Understand place value.	
NC.1.NBT.2	Understand that the two digits of a two-digit number represent amounts of tens and ones. • Unitize by making a ten from a collection of ten ones. • Model the numbers from 11 to 19 as composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. • Demonstrate that the numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens, with 0 ones.
NC.1.NBT.3	Compare two two-digit numbers based on the value of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.
Use place value understanding and properties of operations.	
NC.1.NBT.4	Using concrete models or drawings, strategies based on place value, properties of operations, and explaining the reasoning used, add, within 100, in the following situations: • A two-digit number and a one-digit number • A two-digit number and a multiple of 10
NC.1.NBT.5	Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.
NC.1.NBT.6	Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90, explaining the reasoning, using: • Concrete models and drawings • Number lines • Strategies based on place value • Properties of operations • The relationship between addition and subtraction
Understand place value.	
NC.2.NBT.1	Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones. • Unitize by making a hundred from a collection of ten tens. • Demonstrate that the numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds, with 0 tens and 0 ones. • Compose and decompose numbers using various groupings of hundreds, tens, and ones.
NC.2.NBT.2	Count within 1,000; skip-count by 5s, 10s, and 100s.
NC.2.NBT.3	Read and write numbers, within 1,000, using base-ten numerals, number names, and expanded form.

NC.2.NBT.4	Compare two three-digit numbers based on the value of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons.
Use place value understanding and properties of operations.	
NC.2.NBT.5	Demonstrate fluency with addition and subtraction, within 100, by: • Flexibly using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. • Comparing addition and subtraction strategies, and explaining why they work. • Selecting an appropriate strategy in order to efficiently compute sums and differences.
NC.2.NBT.6	Add up to three two-digit numbers using strategies based on place value and properties of operations.
NC.2.NBT.7	Add and subtract, within 1,000, relating the strategy to a written method, using: • Concrete models or drawings • Strategies based on place value • Properties of operations • Relationship between addition and subtraction
NC.2.NBT.8	Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900.
Use place value to add and subtract.	
NC.3.NBT.2	Add and subtract whole numbers up to and including 1,000. • Use estimation strategies to assess reasonableness of answers. • Model and explain how the relationship between addition and subtraction can be applied to solve addition and subtraction problems. • Use expanded form to decompose numbers and then find sums and differences.
Generalize place value understanding for multi-digit numbers.	
NC.3.NBT.3	Use concrete and pictorial models, based on place value and the properties of operations, to find the product of a one-digit whole number by a multiple of 10 in the range 10–90.
Generalize place value understanding for multi-digit whole numbers.	
NC.4.NBT.1	Explain that in a multi-digit whole number, a digit in one place represents 10 times as much as it represents in the place to its right, up to 100,000.
NC.4.NBT.2	Read and write multi-digit whole numbers up to and including 100,000 using numerals, number names, and expanded form.
NC.4.NBT.7	Compare two multi-digit numbers up to and including 100,000 based on the values of the digits in each place, using >, =, and < symbols to record the results of comparisons.
Use place value understanding and properties of operations to perform multi-digit arithmetic.	
NC.4.NBT.4	Add and subtract multi-digit whole numbers up to and including 100,000 using the standard algorithm with place value understanding.
NC.4.NBT.5	Multiply a whole number of up to three digits by a one-digit whole number, and multiply up to two two-digit numbers with place value understanding using area models, partial products, and the properties of operations. Use models to make connections and develop the algorithm.
NC.4.NBT.6	Find whole-number quotients and remainders with up to three-digit dividends and one-digit divisors with place value understanding using rectangular arrays, area models, repeated subtraction, partial quotients, properties of operations, and/or the relationship between multiplication and division.
Understand the place value system.	

NC.5.NBT.1	Explain the patterns in the place value system from one million to the thousandths place. • Explain that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left. • Explain patterns in products and quotients when numbers are multiplied by 1,000, 100, 10, 0.1, and 0.01 and/or divided by 10 and 100.
NC.5.NBT.3	Read, write, and compare decimals to thousandths. • Write decimals using base-ten numerals, number names, and expanded form. • Compare two decimals to thousandths based on the value of the digits in each place, using >, =, and < symbols to record the results of comparisons.
Perform operations with multi-digit whole numbers.	
NC.5.NBT.5	Demonstrate fluency with the multiplication of two whole numbers up to a three-digit number by a two-digit number using the standard algorithm.
NC.5.NBT.6	Find quotients with remainders when dividing whole numbers with up to four-digit dividends and two-digit divisors using rectangular arrays, area models, repeated subtraction, partial quotients, and/or the relationship between multiplication and division. Use models to make connections and develop the algorithm.
Perform operations with decimals.	
NC.5.NBT.7	Compute and solve real-world problems with multi-digit whole numbers and decimal numbers. • Add and subtract decimals to thousandths using models, drawings or strategies based on place value. • Multiply decimals with a product to thousandths using models, drawings, or strategies based on place value. • Divide a whole number by a decimal and divide a decimal by a whole number, using repeated subtraction or area models. Decimals should be limited to hundredths. • Use estimation strategies to assess reasonableness of answers.

Return to Table of Contents

Number and Operations – Fractions	
Understand fractions as numbers.	
NC.3.NF.1	Interpret unit fractions with denominators of 2, 3, 4, 6, and 8 as quantities formed when a whole is partitioned into equal parts; • Explain that a unit fraction is one of those parts. • Represent and identify unit fractions using area and length models.
NC.3.NF.2	Interpret fractions with denominators of 2, 3, 4, 6, and 8 using area and length models. • Using an area model, explain that the numerator of a fraction represents the number of equal parts of the unit fraction. • Using a number line, explain that the numerator of a fraction represents the number of lengths of the unit fraction from 0.
NC.3.NF.3	Represent equivalent fractions with area and length models by: • Composing and decomposing fractions into equivalent fractions using related fractions: halves, fourths and eighths; thirds and sixths. • Explaining that a fraction with the same numerator and denominator equals one whole. • Expressing whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.
NC.3.NF.4	Compare two fractions with the same numerator or the same denominator by reasoning about their size, using area and length models, and using the >, <, and = symbols. Recognize that comparisons are valid only when the two fractions refer to the same whole with denominators: halves, fourths and eighths; thirds and sixths.
Extend understanding of fractions.	
NC.4.NF.1	Explain why a fraction is equivalent to another fraction by using area and length fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size.
NC.4.NF.2	Compare two fractions with different numerators and different denominators, using the denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions by: • Reasoning about their size and using area and length models. • Using benchmark fractions 0, ½, and a whole. • Comparing common numerator or common denominators.
Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.	
NC.4.NF.3	Understand and justify decompositions of fractions with denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 100. • Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. • Decompose a fraction into a sum of unit fractions and a sum of fractions with the same denominator in more than one way using area models, length models, and equations. • Add and subtract fractions, including mixed numbers with like denominators, by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. • Solve word problems involving addition and subtraction of fractions, including mixed numbers by writing equations from a visual representation of the problem.
Use unit fractions to understand operations of fractions.	

NC.4.NF.4	Apply and extend previous understandings of multiplication to: • Model and explain how fractions can be represented by multiplying a whole number by a unit fraction, using this understanding to multiply a whole number by any fraction less than one. • Solve word problems involving multiplication of a fraction by a whole number.
Understand decimal notation for fractions, and compare decimal fractions.	
NC.4.NF.6	Use decimal notation to represent fractions. • Express, model and explain the equivalence between fractions with denominators of 10 and 100. • Use equivalent fractions to add two fractions with denominators of 10 or 100. • Represent tenths and hundredths with models, making connections between fractions and decimals.
NC.4.NF.7	Compare two decimals to hundredths by reasoning about their size using area and length models, and recording the results of comparisons with the symbols >, =, or <. Recognize that comparisons are valid only when the two decimals refer to the same whole.
Use equivalent fractions as a strategy to add and subtract fractions.	
NC.5.NF.1	Add and subtract fractions, including mixed numbers, with unlike denominators using related fractions: halves, fourths and eighths; thirds, sixths, and twelfths; fifths, tenths, and hundredths. • Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. • Solve one- and two-step word problems in context using area and length models to develop the algorithm. Represent the word problem in an equation.
Apply and extend previous understandings of multiplication and division to multiply and divide fractions.	
NC.5.NF.3	Use fractions to model and solve division problems. • Interpret a fraction as an equal sharing context, where a quantity is divided into equal parts. • Model and interpret a fraction as the division of the numerator by the denominator. • Solve one-step word problems involving division of whole numbers leading to answers in the form of fractions and mixed numbers, with denominators of 2, 3, 4, 5, 6, 8, 10, and 12, using area, length, and set models or equations.
NC.5.NF.4	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction, including mixed numbers. • Use area and length models to multiply two fractions, with the denominators 2, 3, 4. • Explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number and when multiplying a given number by a fraction less than 1 results in a product smaller than the given number. • Solve one-step word problems involving multiplication of fractions using models to develop the algorithm.
NC.5.NF.7	Solve one-step word problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions using area and length models, and equations to represent the problem.

Return to Table of Contents

Measurement and Data	
Describe and compare measurable attributes.	
NC.K.MD.1	Describe measurable attributes of objects; and describe several different measurable attributes of a single object.
NC.K.MD.2	Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference.
Classify objects and count the number of objects in each category.	
NC.K.MD.3	Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.
Measure lengths.	
NC.1.MD.1	Order three objects by length; compare the lengths of two objects indirectly by using a third object.
NC.1.MD.2	Measure lengths with non-standard units. • Express the length of an object as a whole number of non-standard length units. • Measure by laying multiple copies of a shorter object (the length unit) end to end (iterating) with no gaps or overlaps.
Build understanding of time and money.	
NC.1.MD.3	Tell and write time in hours and half-hours using analog and digital clocks.
NC.1.MD.5	Identify quarters, dimes, and nickels and relate their values to pennies.
Represent and interpret data.	
NC.1.MD.4	Organize, represent, and interpret data with up to three categories. • Ask and answer questions about the total number of data points. • Ask and answer questions about how many in each category. • Ask and answer questions about how many more or less are in one category than in another.
Measure and estimate lengths.	
NC.2.MD.1	Measure the length of an object in standard units by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
NC.2.MD.2	Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.
NC.2.MD.3	Estimate lengths in using standard units of inches, feet, yards, centimeters, and meters.
NC.2.MD.4	Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.
Relate addition and subtraction to length.	
NC.2.MD.5	Use addition and subtraction, within 100, to solve word problems involving lengths that are given in the same units, using equations with a symbol for the unknown number to represent the problem.
NC.2.MD.6	Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points and represent whole-number sums and differences, within 100, on a number line.
Build understanding of time and money.	
NC.2.MD.7	Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.
NC.2.MD.8	Solve word problems involving: • Quarters, dimes, nickels, and pennies within 99¢, using ¢ symbols appropriately. • Whole dollar amounts, using the $ symbol appropriately.

Represent and interpret data.	
NC.2.MD.10	Organize, represent, and interpret data with up to four categories. • Draw a picture graph and a bar graph with a single-unit scale to represent a data set. • Solve simple put-together, take-apart, and compare problems using information presented in a picture and a bar graph.
Solve problems involving measurement.	
NC.3.MD.1	Tell and write time to the nearest minute. Solve word problems involving addition and subtraction of time intervals within the same hour.
NC.3.MD.2	Solve problems involving customary measurement. • Estimate and measure lengths in customary units to the quarter-inch and half-inch, and feet and yards to the whole unit. • Estimate and measure capacity and weight in customary units to a whole number: cups, pints, quarts, gallons, ounces, and pounds. • Add, subtract, multiply, or divide to solve one-step word problems involving whole number measurements of length, weight, and capacity in the same customary units.
Represent and interpret data.	
NC.3.MD.3	Represent and interpret scaled picture and bar graphs: • Collect data by asking a question that yields data in up to four categories. • Make a representation of data and interpret data in a frequency table, scaled picture graph, and/or scaled bar graph with axes provided. • Solve one and two-step “how many more” and “how many less” problems using information from these-graphs
Understand the concept of area.	
NC.3.MD.5	Find the area of a rectangle with whole-number side lengths by tiling without gaps or overlaps and counting unit squares.
NC.3.MD.7	Relate area to the operations of multiplication and addition. • Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. • Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving problems, and represent whole-number products as rectangular areas in mathematical reasoning. • Use tiles and/or arrays to illustrate and explain that the area of a rectangle can be found by partitioning it into two smaller rectangles, and that the area of the large rectangle is the sum of the two smaller rectangles.
Understand the concept of perimeter.	
NC.3.MD.8	Solve problems involving perimeters of polygons, including finding the perimeter given the side lengths, and finding an unknown side length.
Solve problems involving measurement.	
NC.4.MD.1	Know relative sizes of measurement units. Solve problems involving metric measurement. • Measure to solve problems involving metric units: centimeter, meter, gram, kilogram, Liter, milliliter. • Add, subtract, multiply, and divide to solve one-step word problems involving whole-number measurements of length, mass, and capacity that are given in metric units.

NC.4.MD.2	Use multiplicative reasoning to convert metric measurements from a larger unit to a smaller unit using place value understanding, two-column tables, and length models.
NC.4.MD.8	Solve word problems involving addition and subtraction of time intervals that cross the hour.
Solve problems involving area and perimeter.	
NC.4.MD.3	Solve problems with area and perimeter. • Find areas of rectilinear figures with known side lengths. • Solve problems involving a fixed area and varying perimeters and a fixed perimeter and varying areas. • Apply the area and perimeter formulas for rectangles in real world and mathematical problems.
Represent and interpret data.	
NC.4.MD.4	Represent and interpret data using whole numbers. • Collect data by asking a question that yields numerical data. • Make a representation of data and interpret data in a frequency table, scaled bar graph, and/or line plot. • Determine whether a survey question will yield categorical or numerical data.
Understand concepts of angle and measure angles.	
NC.4.MD.6	Develop an understanding of angles and angle measurement. • Understand angles as geometric shapes that are formed wherever two rays share a common endpoint, and are measured in degrees. • Measure and sketch angles in whole-number degrees using a protractor. • Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems.
Convert like measurement units within a given measurement system.	
NC.5.MD.1	Given a conversion chart, use multiplicative reasoning to solve one-step conversion problems within a given measurement system.
Represent and interpret data.	
NC.5.MD.2	Represent and interpret data. • Collect data by asking a question that yields data that changes over time. • Make and interpret a representation of data using a line graph. • Determine whether a survey question will yield categorical or numerical data, or data that changes over time.
Understand concepts of volume.	
NC.5.MD.4	Recognize volume as an attribute of solid figures and measure volume by counting unit cubes, using cubic centimeters, cubic inches, cubic feet, and improvised units.
NC.5.MD.5	Relate volume to the operations of multiplication and addition. • Find the volume of a rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths. • Build understanding of the volume formula for rectangular prisms with whole-number edge lengths in the context of solving problems. • Find volume of solid figures with one-digit dimensions composed of two non-overlapping rectangular prisms.

Return to Table of Contents

Geometry	
Identify and describe shapes.	
NC.K.G.1	Describe objects in the environment using names of shapes, and describe the relative positions of objects using positional terms.
NC.K.G.2	Correctly name squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres regardless of their orientations or overall size.
NC.K.G.3	Identify squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres as two-dimensional or three-dimensional.
Analyze, compare, create, and compose shapes.	
NC.K.G.4	Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, attributes and other properties.
NC.K.G.5	Model shapes in the world by: • Building and drawing triangles, rectangles, squares, hexagons, circles. • Building cubes, cones, spheres, and cylinders.
NC.K.G.6	Compose larger shapes from simple shapes.
Reason with shapes and their attributes.	
NC.1.G.1	Distinguish between defining and non-defining attributes and create shapes with defining attributes by: • Building and drawing triangles, rectangles, squares, trapezoids, hexagons, circles. • Building cubes, rectangular prisms, cones, spheres, and cylinders.
NC.1.G.2	Create composite shapes by: • Making a two-dimensional composite shape using rectangles, squares, trapezoids, triangles, and half-circles naming the components of the new shape. • Making a three-dimensional composite shape using cubes, rectangular prisms, cones, and cylinders, naming the components of the new shape.
NC.1.G.3	Partition circles and rectangles into two and four equal shares. • Describe the shares as halves and fourths, as half of and fourth of. • Describe the whole as two of, or four of the shares. • Explain that decomposing into more equal shares creates smaller shares.
Reason with shapes and their attributes.	
NC.2.G.1	Recognize and draw triangles, quadrilaterals, pentagons, and hexagons, having specified attributes; recognize and describe attributes of rectangular prisms and cubes.
NC.2.G.3	Partition circles and rectangles into two, three, or four equal shares. • Describe the shares using the words halves, thirds, half of, a third of, fourths, fourth of, quarter of. • Describe the whole as two halves, three thirds, four fourths. • Explain that equal shares of identical wholes need not have the same shape.
Reason with shapes and their attributes.	
NC.3.G.1	Reason with two-dimensional shapes and their attributes. • Investigate, describe, and reason about composing triangles and quadrilaterals and decomposing quadrilaterals. • Recognize and draw examples and non-examples of types of quadrilaterals including rhombuses, rectangles, squares, parallelograms, and trapezoids.

Classify shapes based on lines and angles in two-dimensional figures.

NC.4.G.1	Draw and identify points, lines, line segments, rays, angles, and perpendicular and parallel lines.
NC.4.G.2	Classify quadrilaterals and triangles based on angle measure, side lengths, and the presence or absence of parallel or perpendicular lines.
NC.4.G.3	Recognize symmetry in a two-dimensional figure, and identify and draw lines of symmetry.
Understand the coordinate plane.	
NC.5.G.1	Graph points in the first quadrant of a coordinate plane, and identify and interpret the *x* and *y* coordinates to solve problems.
Classify quadrilaterals.	
NC.5.G.3	Classify quadrilaterals into categories based on their properties. • Explain that attributes belonging to a category of quadrilaterals also belong to all subcategories of that category. • Classify quadrilaterals in a hierarchy based on properties.
Solve real-world and mathematical problems involving area, surface area, and volume.	
NC.6.G.1	Create geometric models to solve real-world and mathematical problems to: • Find the area of triangles by composing into rectangles and decomposing into right triangles. • Find the area of special quadrilaterals and polygons by decomposing into triangles or rectangles.
NC.6.G.2	Apply and extend previous understandings of the volume of a right rectangular prism to find the volume of right rectangular prisms with fractional edge lengths. Apply this understanding to the context of solving real-world and mathematical problems.
NC.6.G.3	Use the coordinate plane to solve real-world and mathematical problems by: • Drawing polygons in the coordinate plane given coordinates for the vertices. • Using coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate.
NC.6.G.4	Represent right prisms and right pyramids using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.
Draw, construct, and describe geometrical figures and describe the relationships between them.	
NC.7.G.1	Solve problems involving scale drawings of geometric figures by: • Building an understanding that angle measures remain the same and side lengths are proportional. • Using a scale factor to compute actual lengths and areas from a scale drawing. • Creating a scale drawing.
NC.7.G.2	Understand the characteristics of angles and side lengths that create a unique triangle, more than one triangle or no triangle. Build triangles from three measures of angles and/or sides.
Solve real-world and mathematical problems involving angle measure, area, surface area, and volume.	
NC.7.G.4	Understand area and circumference of a circle. • Understand the relationships between the radius, diameter, circumference, and area. • Apply the formulas for area and circumference of a circle to solve problems.
NC.7.G.5	Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve equations for an unknown angle in a figure.

NC.7.G.6	Solve real-world and mathematical problems involving: • Area and perimeter of two-dimensional objects composed of triangles, quadrilaterals, and polygons. • Volume and surface area of pyramids, prisms, or three-dimensional objects composed of cubes, pyramids, and right prisms.
Understand congruence and similarity using physical models, transparencies, or geometry software.	
NC.8.G.2	Use transformations to define congruence. • Verify experimentally the properties of rotations, reflections, and translations that create congruent figures. • Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. • Given two congruent figures, describe a sequence that exhibits the congruence between them.
NC.8.G.3	Describe the effect of dilations about the origin, translations, rotations about the origin in 90 degree increments, and reflections across the x-axis and y-axis on two-dimensional figures using coordinates.
NC.8.G.4	Use transformations to define similarity. • Verify experimentally the properties of dilations that create similar figures. • Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations. • Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.
Analyze angle relationships.	
NC.8.G.5	Use informal arguments to analyze angle relationships. • Recognize relationships between interior and exterior angles of a triangle. • Recognize the relationships between the angles created when parallel lines are cut by a transversal. • Recognize the angle-angle criterion for similarity of triangles. • Solve real-world and mathematical problems involving angles.
Understand and apply the Pythagorean Theorem.	
NC.8.G.6	Explain the Pythagorean Theorem and its converse.
NC.8.G.7	Apply the Pythagorean Theorem and its converse to solve real-world and mathematical problems.
NC.8.G.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.	
NC.8.G.9	Understand how the formulas for the volumes of cones, cylinders, and spheres are related and use the relationship to solve real-world and mathematical problems.
Expressing Geometric Properties with Equations ***Use coordinates to prove simple geometric theorems algebraically.***	
NC.M1.G-GPE.4	Use coordinates to solve geometric problems involving polygons algebraically • Use coordinates to compute perimeters of polygons and areas of triangles and rectangles. • Use coordinates to verify algebraically that a given set of points produces a particular type of triangle or quadrilateral.

NC.M1.G-GPE.5	Use coordinates to prove the slope criteria for parallel and perpendicular lines and use them to solve problems. • Determine if two lines are parallel, perpendicular, or neither. • Find the equation of a line parallel or perpendicular to a given line that passes through a given point.
NC.M1.G-GPE.6	Use coordinates to find the midpoint or endpoint of a line segment.
Expressing Geometric Properties with Equations ***Translate between the geometric description and the equation for a conic section.***	
NC.M3.G-GPE.1	Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
Congruence ***Experiment with transformations in the plane.***	
NC.M2.G-CO.2	Experiment with transformations in the plane. • Represent transformations in the plane. • Compare rigid motions that preserve distance and angle measure (translations, reflections, rotations) to transformations that do not preserve both distance and angle measure (e.g. stretches, dilations). • Understand that rigid motions produce congruent figures while dilations produce similar figures.
NC.M2.G-CO.3	Given a triangle, quadrilateral, or regular polygon, describe any reflection or rotation symmetry i.e., actions that carry the figure onto itself. Identify center and angle(s) of rotation symmetry. Identify line(s) of reflection symmetry.
NC.M2.G-CO.4	Verify experimentally properties of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
NC.M2.G-CO.5	Given a geometric figure and a rigid motion, find the image of the figure. Given a geometric figure and its image, specify a rigid motion or sequence of rigid motions that will transform the pre-image to its image.
Congruence ***Understand congruence in terms of rigid motions.***	
NC.M2.G-CO.6	Determine whether two figures are congruent by specifying a rigid motion or sequence of rigid motions that will transform one figure onto the other.
NC.M2.G-CO.7	Use the properties of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
NC.M2.G-CO.8	Use congruence in terms of rigid motion. Justify the ASA, SAS, and SSS criteria for triangle congruence. Use criteria for triangle congruence (ASA, SAS, SSS, HL) to determine whether two triangles are congruent.
Congruence ***Prove geometric theorems.***	
NC.M2.G-CO.9	Prove theorems about lines and angles and use them to prove relationships in geometric figures including: • Vertical angles are congruent. • When a transversal crosses parallel lines, alternate interior angles are congruent. • When a transversal crosses parallel lines, corresponding angles are congruent. • Points are on a perpendicular bisector of a line segment if and only if they are equidistant from the endpoints of the segment.

	• Use congruent triangles to justify why the bisector of an angle is equidistant from the sides of the angle.
NC.M2.G-CO.10	Prove theorems about triangles and use them to prove relationships in geometric figures including: • The sum of the measures of the interior angles of a triangle is 180º. • An exterior angle of a triangle is equal to the sum of its remote interior angles. • The base angles of an isosceles triangle are congruent. • The segment joining the midpoints of two sides of a triangle is parallel to the third side and half the length.
NC.M3.G-CO.10	Verify experimentally properties of the centers of triangles (centroid, incenter, and circumcenter).
NC.M3.G-CO.11	Prove theorems about parallelograms. • Opposite sides of a parallelogram are congruent. • Opposite angles of a parallelogram are congruent. • Diagonals of a parallelogram bisect each other. • If the diagonals of a parallelogram are congruent, then the parallelogram is a rectangle.
NC.M3.G-CO.14	Apply properties, definitions, and theorems of two-dimensional figures to prove geometric theorems and solve problems.
Similarity, Right Triangles, and Trigonometry ***Understand similarity in terms of similarity transformations.***	
NC.M2.G-SRT.1 NC.M2.G-SRT.1a NC.M2.G-SRT.1b NC.M2.G-SRT.1c NC.M2.G-SRT.1d	Verify experimentally the properties of dilations with given center and scale factor: a. When a line segment passes through the center of dilation, the line segment and its image lie on the same line. When a line segment does not pass through the center of dilation, the line segment and its image are parallel. b. The length of the image of a line segment is equal to the length of the line segment multiplied by the scale factor. c. The distance between the center of a dilation and any point on the image is equal to the scale factor multiplied by the distance between the dilation center and the corresponding point on the pre-image. d. Dilations preserve angle measure.
NC.M2.G-SRT.2 NC.M2.G-SRT.2a NC.M2.G-SRT.2b	Understand similarity in terms of transformations. a. Determine whether two figures are similar by specifying a sequence of transformations that will transform one figure into the other. b. Use the properties of dilations to show that two triangles are similar when all corresponding pairs of sides are proportional and all corresponding pairs of angles are congruent.
NC.M2.G-SRT.3	Use transformations (rigid motions and dilations) to justify the AA criterion for triangle similarity.
Similarity, Right Triangles, and Trigonometry ***Prove theorems involving similarity.***	
NC.M2.G-SRT.4	Use similarity to solve problems and to prove theorems about triangles. Use theorems about triangles to prove relationships in geometric figures. • A line parallel to one side of a triangle divides the other two sides proportionally and its converse. • The Pythagorean Theorem
Similarity, Right Triangles, and Trigonometry	

Define trigonometric ratios and solve problems involving right triangles.	
NC.M2.G-SRT.6	Verify experimentally that the side ratios in similar right triangles are properties of the angle measures in the triangle, due to the preservation of angle measure in similarity. Use this discovery to develop definitions of the trigonometric ratios for acute angles.
NC.M2.G-SRT.8	Use trigonometric ratios and the Pythagorean Theorem to solve problems involving right triangles in terms of a context
NC.M2.G-SRT.12	Develop properties of special right triangles (45-45-90 and 30-60-90) and use them to solve problems.
Circles ***Understand and apply theorems about circles.***	
NC.M3.G-C.2	Understand and apply theorems about circles. • Understand and apply theorems about relationships with angles and circles, including central, inscribed and circumscribed angles. • Understand and apply theorems about relationships with line segments and circles including, radii, diameter, secants, tangents and chords.
NC.M3.G-C.5	Using similarity, demonstrate that the length of an arc, *s,* for a given central angle is proportional to the radius, *r,* of the circle. Define radian measure of the central angle as the ratio of the length of the arc to the radius of the circle, *s/r*. Find arc lengths and areas of sectors of circles.
Geometric Measurement & Dimension ***Explain volume formulas and use them to solve problems.***	
NC.M3.G-GMD.3	Use the volume formulas for prisms, cylinders, pyramids, cones, and spheres to solve problems.
Geometric Measurement & Dimension ***Visualize relationships between two-dimensional and three-dimensional objects.***	
NC.M3.G-GMD.4	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
Modeling with Geometry ***Apply geometric concepts in modeling situations.***	
NC.M3.G-MG.1	Apply geometric concepts in modeling situations • Use geometric and algebraic concepts to solve problems in modeling situations: • Use geometric shapes, their measures, and their properties, to model real-life objects. • Use geometric formulas and algebraic functions to model relationships. • Apply concepts of density based on area and volume. • Apply geometric concepts to solve design and optimization problems.

Return to Table of Contents

Ratio and Proportional Relationships	
Understand ratio concepts and use ratio reasoning to solve problems.	
NC.6.RP.1	Understand the concept of a ratio and use ratio language to: • Describe a ratio as a multiplicative relationship between two quantities. • Model a ratio relationship using a variety of representations.
NC.6.RP.2	Understand that ratios can be expressed as equivalent unit ratios by finding and interpreting both unit ratios in context.
NC.6.RP.3	Use ratio reasoning with equivalent whole-number ratios to solve real-world and mathematical problems by: • Creating and using a table to compare ratios. • Finding missing values in the tables. • Using a unit ratio. • Converting and manipulating measurements using given ratios. • Plotting the pairs of values on the coordinate plane.
NC.6.RP.4	Use ratio reasoning to solve real-world and mathematical problems with percents by: • Understanding and finding a percent of a quantity as a ratio per 100. • Using equivalent ratios, such as benchmark percents (50%, 25%, 10%, 5%, 1%), to determine a part of any given quantity. • Finding the whole, given a part and the percent.
Analyze proportional relationships and use them to solve real-world and mathematical problems.	
NC.7.RP.1	Compute unit rates associated with ratios of fractions to solve real-world and mathematical problems.
NC.7.RP.2	Recognize and represent proportional relationships between quantities. a. Understand that a proportion is a relationship of equality between ratios. ○ Represent proportional relationships using tables and graphs. ○ Recognize whether ratios are in a proportional relationship using tables and graphs. ○ Compare two different proportional relationships using tables, graphs, equations, and verbal descriptions. b. Identify the unit rate (constant of proportionality) within two quantities in a proportional relationship using tables, graphs, equations, and verbal descriptions. c. Create equations and graphs to represent proportional relationships. d. Use a graphical representation of a proportional relationship in context to: ○ Explain the meaning of any point (x, y). ○ Explain the meaning of (0, 0) and why it is included. ○ Understand that the y-coordinate of the ordered pair $(1, r)$ corresponds to the unit rate and explain its meaning.
NC.7.RP.3	Use scale factors and unit rates in proportional relationships to solve ratio and percent problems.

Return to Table of Contents

The Number System	
Apply and extend previous understandings of multiplication and division to divide fractions by fractions.	
NC.6.NS.1	Use visual models and common denominators to: • Interpret and compute quotients of fractions. • Solve real-world and mathematical problems involving division of fractions.
Compute fluently with multi-digit numbers and find common factors and multiples.	
NC.6.NS.2	Fluently divide using long division with a minimum of a four-digit dividend and interpret the quotient and remainder in context.
NC.6.NS.3	Apply and extend previous understandings of decimals to develop and fluently use the standard algorithms for addition, subtraction, multiplication and division of decimals.
NC.6.NS.4	Understand and use prime factorization and the relationships between factors to: • Find the unique prime factorization for a whole number. • Find the greatest common factor of two whole numbers less than or equal to 100. • Use the greatest common factor and the distributive property to rewrite the sum of two whole numbers, each less than or equal to 100. • Find the least common multiple of two whole numbers less than or equal to 12 to add and subtract fractions with unlike denominators.
Apply and extend previous understandings of numbers to the system of rational numbers.	
NC.6.NS.5	Understand and use rational numbers to: • Describe quantities having opposite directions or values. • Represent quantities in real-world contexts, explaining the meaning of 0 in each situation. • Understand the absolute value of a rational number as its distance from 0 on the number line to: ○ Interpret absolute value as magnitude for a positive or negative quantity in a real-world context. ○ Distinguish comparisons of absolute value from statements about order.
NC.6.NS.6	Understand rational numbers as points on the number line and as ordered pairs on a coordinate plane. a. On a number line: ○ Recognize opposite signs of numbers as indicating locations on opposite sides of 0 and that the opposite of the opposite of a number is the number itself. ○ Find and position rational numbers on a horizontal or vertical number line. b. On a coordinate plane: ○ Understand signs of numbers in ordered pairs as indicating locations in quadrants. ○ Recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. ○ Find and position pairs of rational numbers on a coordinate plane.

NC.6.NS.7	Understand ordering of rational numbers. a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. b. Write, interpret, and explain statements of order for rational numbers in real-world contexts.
NC.6.NS.8	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.
NC.6.NS.9	Apply and extend previous understandings of addition and subtraction. • Describe situations in which opposite quantities combine to make 0. • Understand $p + q$ as the number located a distance q from p, in the positive or negative direction depending on the sign of q. Show that a number and its additive inverse create a zero pair. • Understand subtraction of integers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two integers on the number line is the absolute value of their difference. • Use models to add and subtract integers from -20 to 20 and describe real-world contexts using sums and differences.
Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.	
NC.7.NS.1	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers, using the properties of operations, and describing real-world contexts using sums and differences.
NC.7.NS.2	Apply and extend previous understandings of multiplication and division. a. Understand that a rational number is any number that can be written as a quotient of integers with a non-zero divisor. b. Apply properties of operations as strategies, including the standard algorithms, to multiply and divide rational numbers and describe the product and quotient in real-world contexts. c. Use division and previous understandings of fractions and decimals. ○ Convert a fraction to a decimal using long division. ○ Understand that the decimal form of a rational number terminates in 0s or eventually repeats.
NC.7.NS.3	Solve real-world and mathematical problems involving numerical expressions with rational numbers using the four operations.
Know that there are numbers that are not rational, and approximate them by rational numbers.	
NC.8.NS.1	Understand that every number has a decimal expansion. Building upon the definition of a rational number, know that an irrational number is defined as a non-repeating, non-terminating decimal.
NC.8.NS.2	Use rational approximations of irrational numbers to compare the size of irrational numbers and locate them approximately on a number line. Estimate the value of expressions involving: • Square roots and cube roots to the tenths. • π to the hundredths.

Return to Table of Contents

Expressions and Equations	
Apply and extend previous understandings of arithmetic to algebraic expressions.	
NC.6.EE.1	Write and evaluate numerical expressions, with and without grouping symbols, involving whole-number exponents.
NC.6.EE.2	Write, read, and evaluate algebraic expressions. • Write expressions that record operations with numbers and with letters standing for numbers. • Identify parts of an expression using mathematical terms and view one or more of those parts as a single entity. • Evaluate expressions at specific values of their variables using expressions that arise from formulas used in real-world problems.
NC.6.EE.3	Apply the properties of operations to generate equivalent expressions without exponents.
NC.6.EE.4	Identify when two expressions are equivalent and justify with mathematical reasoning.
Reason about and solve one-variable equations.	
NC.6.EE.5	Use substitution to determine whether a given number in a specified set makes an equation true.
NC.6.EE.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem.
NC.6.EE.7	Solve real-world and mathematical problems by writing and solving equations of the form: • $x + p = q$ in which p, q and x are all nonnegative rational numbers; and, • $p \cdot x = q$ for cases in which p, q and x are all nonnegative rational numbers.
Reason about one variable inequalities.	
NC.6.EE.8	Reason about inequalities by: • Using substitution to determine whether a given number in a specified set makes an inequality true. • Writing an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. • Recognizing that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions. • Representing solutions of inequalities on number line diagrams.
Represent and analyze quantitative relationships between dependent and independent variables.	
NC.6.EE.9	Represent and analyze quantitative relationships by: • Using variables to represent two quantities in a real-world or mathematical context that change in relationship to one another. • Analyze the relationship between quantities in different representations (context, equations, tables, and graphs).
Use properties of operations to generate equivalent expressions.	
NC.7.EE.1	Apply properties of operations as strategies to: • Add, subtract, and expand linear expressions with rational coefficients. • Factor linear expression with an integer GCF.
NC.7.EE.2	Understand that equivalent expressions can reveal real-world and mathematical relationships. Interpret the meaning of the parts of each expression in context.
Solve real-world and mathematical problems using numerical and algebraic expressions, equations, and inequalities.	

NC.7.EE.3	Solve multi-step real-world and mathematical problems posed with rational numbers in algebraic expressions. • Apply properties of operations to calculate with positive and negative numbers in any form. • Convert between different forms of a number and equivalent forms of the expression as appropriate.
NC.7.EE.4	Use variables to represent quantities to solve real-world or mathematical problems. a. Construct equations to solve problems by reasoning about the quantities. ○ Fluently solve multistep equations with the variable on one side, including those generated by word problems. ○ Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. ○ Interpret the solution in context. b. Construct inequalities to solve problems by reasoning about the quantities. ○ Fluently solve multi-step inequalities with the variable on one side, including those generated by word problems. ○ Compare an algebraic solution process for equations and an algebraic solution process for inequalities. ○ Graph the solution set of the inequality and interpret in context.
Work with radicals and integer exponents.	
NC.8.EE.1	Develop and apply the properties of integer exponents to generate equivalent numerical expressions.
NC.8.EE.2	Use square root and cube root symbols to: • Represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. • Evaluate square roots of perfect squares and cube roots of perfect cubes for positive numbers less than or equal to 400.
NC.8.EE.3	Use numbers expressed in scientific notation to estimate very large or very small quantities and to express how many times as much one is than the other.
NC.8.EE.4	Perform multiplication and division with numbers expressed in scientific notation to solve real-world problems, including problems where both decimal and scientific notation are used.
Analyze and solve linear equations and inequalities.	
NC.8.EE.7	Solve real-world and mathematical problems by writing and solving equations and inequalities in one variable. • Recognize linear equations in one variable as having one solution, infinitely many solutions, or no solutions. • Solve linear equations and inequalities including multi-step equations and inequalities with the same variable on both sides.
Analyze and solve pairs of simultaneous linear equations.	
NC.8.EE.8	Analyze and solve a system of two linear equations in two variables in slope-intercept form. • Understand that solutions to a system of two linear equations correspond to the points of intersection of their graphs because the point of intersection satisfies both equations simultaneously. • Solve real-world and mathematical problems leading to systems of linear equations by graphing the equations. Solve simple cases by inspection.

Return to Table of Contents

Statistics and Probability	
Develop understanding of statistical variability.	
NC.6.SP.1	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.
NC.6.SP.2	Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
NC.6.SP.3	Understand that both a measure of center and a description of variability should be considered when describing a numerical data set. a. Determine the measure of center of a data set and understand that it is a single number that summarizes all the values of that data set. ○ Understand that a mean is a measure of center that represents a balance point or fair share of a data set and can be influenced by the presence of extreme values within the data set. ○ Understand the median as a measure of center that is the numerical middle of an ordered data set. b. Understand that describing the variability of a data set is needed to distinguish between data sets in the same scale, by comparing graphical representations of different data sets in the same scale that have similar measures of center, but different spreads.
Summarize and describe distributions.	
NC.6.SP.4	Display numerical data in plots on a number line. • Use dot plots, histograms, and box plots to represent data. • Compare the attributes of different representations of the same data.
NC.6.SP.5	Summarize numerical data sets in relation to their context. a. Describe the collected data by: ○ Reporting the number of observations in dot plots and histograms. ○ Communicating the nature of the attribute under investigation, how it was measured, and the units of measurement. b. Analyze center and variability by: ○ Giving quantitative measures of center, describing variability, and any overall pattern, and noting any striking deviations. ○ Justifying the appropriate choice of measures of center using the shape of the data distribution.
Use random sampling to draw inferences about a population.	
NC.7.SP.1	Understand that statistics can be used to gain information about a population by: • Recognizing that generalizations about a population from a sample are valid only if the sample is representative of that population. • Using random sampling to produce representative samples to support valid inferences.
NC.7.SP.2	Generate multiple random samples (or simulated samples) of the same size to gauge the variation in estimates or predictions, and use this data to draw inferences about a population with an unknown characteristic of interest.
Make informal inferences to compare two populations.	
NC.7.SP.3	Recognize the role of variability when comparing two populations. a. Calculate the measure of variability of a data set and understand that it describes how the values of the data set vary with a single number. ○ Understand the mean absolute deviation of a data set is a measure of variability that describes the average distance that points within a data set are from the mean of the data set. ○ Understand that the range describes the spread of the entire data set.

	○ Understand that the interquartile range describes the spread of the middle 50% of the data. b. Informally assess the difference between two data sets by examining the overlap and separation between the graphical representations of two data sets.
NC.7.SP.4	Use measures of center and measures of variability for numerical data from random samples to draw comparative inferences about two populations.
Investigate chance processes and develop, use, and evaluate probability models.	
NC.7.SP.5	Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring.
NC.7.SP.6	Collect data to calculate the experimental probability of a chance event, observing its long-run relative frequency. Use this experimental probability to predict the approximate relative frequency.
NC.7.SP.7	Develop a probability model and use it to find probabilities of simple events. a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. b. Develop a probability model (which may not be uniform) by repeatedly performing a chance process and observing frequencies in the data generated. c. Compare theoretical and experimental probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
NC.7.SP.8	Determine probabilities of compound events using organized lists, tables, tree diagrams, and simulation. a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. b. For an event described in everyday language, identify the outcomes in the sample space which compose the event, when the sample space is represented using organized lists, tables, and tree diagrams. c. Design and use a simulation to generate frequencies for compound events.
Investigate patterns of association in bivariate data.	
NC.8.SP.1	Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Investigate and describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
NC.8.SP.2	Model the relationship between bivariate quantitative data to: • Informally fit a straight line for a scatter plot that suggests a linear association. • Informally assess the model fit by judging the closeness of the data points to the line.
NC.8.SP.3	Use the equation of a linear model to solve problems in the context of bivariate quantitative data, interpreting the slope and y-intercept.
NC.8.SP.4	Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. • Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. • Use relative frequencies calculated for rows or columns to describe possible association between the two variables.

Interpreting Categorical and Quantitative Data ***Summarize, represent, and interpret data on a single count or measurement variable.***	
NC.M1.S-ID.1	Use technology to represent data with plots on the real number line (histograms, and box plots).
NC.M1.S-ID.2	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. Interpret differences in shape, center, and spread in the context of the data sets.
NC.M1.S-ID.3	Examine the effects of extreme data points (outliers) on shape, center, and/or spread.
Interpreting Categorical and Quantitative Data ***Summarize, represent, and interpret data on two categorical and quantitative variables.***	
NC.M1.S-ID.6 NC.M1.S-ID.6a NC.M1.S-ID.6b NC.M1.S-ID.6c	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a least squares regression line to linear data using technology. Use the fitted function to solve problems. b. Assess the fit of a linear function by analyzing residuals. c. Fit a function to exponential data using technology. Use the fitted function to solve problems.
Interpreting Categorical and Quantitative Data ***Interpret linear models.***	
NC.M1.S-ID.7	Interpret in context the rate of change and the intercept of a linear model. Use the linear model to interpolate and extrapolate predicted values. Assess the validity of a predicted value.
NC.M1.S-ID.8	Analyze patterns and describe relationships between two variables in context. Using technology, determine the correlation coefficient of bivariate data and interpret it as a measure of the strength and direction of a linear relationship. Use a scatter plot, correlation coefficient, and a residual plot to determine the appropriateness of using a linear function to model a relationship between two variables.
NC.M1.S-ID.9	Distinguish between association and causation.
Making Inference and Justifying Conclusions ***Understand and evaluate random processes underlying statistical experiments.***	
NC.M2.S-IC.2	Use simulation to determine whether the experimental probability generated by sample data is consistent with the theoretical probability based on known information about the population.
NC.M3.S-IC.1	Understand the process of making inferences about a population based on a random sample from that population.
Making Inference and Justifying Conclusions ***Make inferences and justify conclusions from sample surveys, experiments, and observational studies.***	
NC.M3.S-IC.3	Recognize the purposes of and differences between sample surveys, experiments, and observational studies and understand how randomization should be used in each.
NC.M3.S-IC.4	Use simulation to understand how samples can be used to estimate a population mean or proportion and how to determine a margin of error for the estimate.
NC.M3.S-IC.5	Use simulation to determine whether observed differences between samples from two distinct populations indicate that the two populations are actually different in terms of a parameter of interest.
NC.M3.S-IC.6	Evaluate articles and websites that report data by identifying the source of the data, the design of the study, and the way the data are graphically displayed.

Conditional Probability and the Rules for Probability ***Understand independence and conditional probability and use them to interpret data.***	
NC.M2.S-CP.1	Describe events as subsets of the outcomes in a sample space using characteristics of the outcomes or as unions, intersections and complements of other events.
NC.M2.S-CP.3 NC.M2.S-CP.3a NC.M2.S-CP.3b	Develop and understand independence and conditional probability. a. Use a 2-way table to develop understanding of the conditional probability of A given B (written P(A|B)) as the likelihood that A will occur given that B has occurred. That is, P(A|B) is the fraction of event B's outcomes that also belong to event A. b. Understand that event A is independent from event B if the probability of event A does not change in response to the occurrence of event B. That is P(A|B)=P(A).
NC.M2.S-CP.4	Represent data on two categorical variables by constructing a two-way frequency table of data. Interpret the two-way table as a sample space to calculate conditional, joint and marginal probabilities. Use the table to decide if events are independent.
NC.M2.S-CP.5	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.
Conditional Probability and the Rules for Probability ***Use the rules of probability to compute probabilities of compound events in a uniform probability model.***	
NC.M2.S-CP.6	Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in context.
NC.M2.S-CP.7	Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in context.
NC.M2.S-CP.8	Apply the general Multiplication Rule P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in context. Include the case where A and B are independent: P(A and B) = P(A) P(B).

Return to Table of Contents

Functions	
Define, evaluate, and compare functions.	
NC.8.F.1	Understand that a function is a rule that assigns to each input exactly one output. • Recognize functions when graphed as the set of ordered pairs consisting of an input and exactly one corresponding output. • Recognize functions given a table of values or a set of ordered pairs.
NC.8.F.2	Compare properties of two linear functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
NC.8.F.3	Identify linear functions from tables, equations, and graphs.
Use functions to model relationships between quantities.	
NC.8.F.4	Analyze functions that model linear relationships. • Understand that a linear relationship can be generalized by $y = mx + b$. • Write an equation in slope-intercept form to model a linear relationship by determining the rate of change and the initial value, given at least two (x, y) values or a graph. • Construct a graph of a linear relationship given an equation in slope-intercept form. • Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of the slope and y-intercept of its graph or a table of values.
NC.8.F.5	Qualitatively analyze the functional relationship between two quantities. • Analyze a graph determining where the function is increasing or decreasing; linear or non-linear. • Sketch a graph that exhibits the qualitative features of a real-world function.
Interpreting Functions ***Understand the concept of a function and use function notation.***	
NC.M1.F-IF.1	Build an understanding that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range by recognizing that: • if *f* is a function and *x* is an element of its domain, then $f(x)$ denotes the output of *f* corresponding to the input *x.* • the graph of f is the graph of the equation $y = f(x)$.
NC.M2.F-IF.1	Extend the concept of a function to include geometric transformations in the plane by recognizing that: • the domain and range of a transformation function *f* are sets of points in the plane; • the image of a transformation is a function of its pre-image.
NC.M3.F-IF.1	Extend the concept of a function by recognizing that trigonometric ratios are functions of angle measure.
NC.M1.F-IF.2	Use function notation to evaluate linear, quadratic, and exponential functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
NC.M2.F-IF.2	Extend the use of function notation to express the image of a geometric figure in the plane resulting from a translation, rotation by multiples of 90 degrees about the origin, reflection across an axis, or dilation as a function of its pre-image.
NC.M3.F-IF.2	Use function notation to evaluate piecewise defined functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
NC.MI.F-IF.3	Recognize that recursively and explicitly defined sequences are functions whose domain is a subset of the integers, the terms of an arithmetic sequence are a subset of the range of a linear function, and the terms of a geometric sequence are a subset of the range of an exponential function.

Interpreting Functions ***Interpret functions that arise in applications in terms of the context.***	
NC.M1.F-IF.4	Interpret key features of graphs, tables, and verbal descriptions in context to describe functions that arise in applications relating two quantities, including: intercepts; intervals where the function is increasing, decreasing, positive, or negative; and maximums and minimums.
NC.M2.F-IF.4	Interpret key features of graphs, tables, and verbal descriptions in context to describe functions that arise in applications relating two quantities, including: domain and range, rate of change, symmetries, and end behavior.
NC.M3.F-IF.4	Interpret key features of graphs, tables, and verbal descriptions in context to describe functions that arise in applications relating two quantities to include periodicity and discontinuities.
NC.M1.F-IF.5	Interpret a function in terms of the context by relating its domain and range to its graph and, where applicable, to the quantitative relationship it describes.
NC.M1.F-IF.6	Calculate and interpret the average rate of change over a specified interval for a function presented numerically, graphically, and/or symbolically.
Interpreting Functions ***Analyze functions using different representations.***	
NC.M1.F-IF.7	Analyze linear, exponential, and quadratic functions by generating different representations, by hand in simple cases and using technology for more complicated cases, to show key features, including: domain and range; rate of change; intercepts; intervals where the function is increasing, decreasing, positive, or negative; maximums and minimums; and end behavior.
NC.M2.F-IF.7	Analyze quadratic, square root, and inverse variation functions by generating different representations, by hand in simple cases and using technology for more complicated cases, to show key features, including: domain and range; intercepts; intervals where the function is increasing, decreasing, positive, or negative; rate of change; maximums and minimums; symmetries; and end behavior.
NC.M3.F-IF.7	Analyze piecewise, absolute value, polynomials, exponential, rational, and trigonometric functions (sine and cosine) using different representations to show key features of the graph, by hand in simple cases and using technology for more complicated cases, including: domain and range; intercepts; intervals where the function is increasing, decreasing, positive, or negative; rate of change; relative maximums and minimums; symmetries; end behavior; period; and discontinuities.
NC.M1.F-IF.8 NC.M1.F-IF.8a NC.M1.F-IF.8b	Use equivalent expressions to reveal and explain different properties of a function. a. Rewrite a quadratic function to reveal and explain different key features of the function b. Interpret and explain growth and decay rates for an exponential function.
NC.M2.F-IF.8	Use equivalent expressions to reveal and explain different properties of a function by developing and using the process of completing the square to identify the zeros, extreme values, and symmetry in graphs and tables representing quadratic functions, and interpret these in terms of a context.
NC.M1.F-IF.9	Compare key features of two functions (linear, quadratic, or exponential) each with a different representation (symbolically, graphically, numerically in tables, or by verbal descriptions).
NC.M2.F-IF.9	Compare key features of two functions (linear, quadratic, square root, or inverse variation functions) each with a different representation (symbolically, graphically, numerically in tables, or by verbal descriptions).
NC.M3.F-IF.9	Compare key features of two functions using different representations by comparing properties of two different functions, each with a different representation (symbolically, graphically, numerically in tables, or by verbal descriptions).

Building Functions ***Build a function that models a relationship between two quantities.***	
NC.M1.F-BF.1 NC.M1.F-BF.1a NC.M1.F-BF.1b	Write a function that describes a relationship between two quantities. a. Build linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two ordered pairs (include reading these from a table). b. Build a function that models a relationship between two quantities by combining linear, exponential, or quadratic functions with addition and subtraction or two linear functions with multiplication.
NC.M2.F-BF.1	Write a function that describes a relationship between two quantities by building quadratic functions with real solution(s) and inverse variation functions given a graph, a description of a relationship, or ordered pairs (include reading these from a table).
NC.M3.F-BF.1 NC.M3.F-BF.1a NC.M3.F-BF.1b	Write a function that describes a relationship between two quantities. a. Build polynomial and exponential functions with real solution(s) given a graph, a description of a relationship, or ordered pairs (include reading these from a table). b. Build a new function, in terms of a context, by combining standard function types using arithmetic operations.
NC.M1.F-BF.2	Translate between explicit and recursive forms of arithmetic and geometric sequences and use both to model situations.
Building Functions ***Build new functions from existing functions.***	
NC.M2.F-BF.3	Understand the effects of the graphical and tabular representations of a linear, quadratic, square root, and inverse variation function *f* with $k \cdot f(x)$, $f(x) + k$, $f(x + k)$ for specific values of k (both positive and negative).
NC.M3.F-BF.3	Extend an understanding of the effects on the graphical and tabular representations of a function when replacing $f(x)$ with $k \cdot f(x)$, $f(x) + k$, $f(x + k)$ to include $f(k \cdot x)$ for specific values of k (both positive and negative).
NC.M3.F-BF.4 NC.M3.F-BF.4a NC.M3.F-BF.4b NC.M3.F-BF.4c	Find an inverse function. a. Understand the inverse relationship between exponential and logarithmic, quadratic and square root, and linear to linear functions and use this relationship to solve problems using tables, graphs, and equations. b. Determine if an inverse function exists by analyzing tables, graphs, and equations. c. If an inverse function exists for a linear, quadratic and/or exponential function, *f*, represent the inverse function, f^{-1}, with a table, graph, or equation and use it to solve problems in terms of a context.
Linear, Quadratic, and Exponential Models ***Construct and compare linear and exponential models and solve problems.***	
NC.M1.F-LE.1	Identify situations that can be modeled with linear and exponential functions, and justify the most appropriate model for a situation based on the rate of change over equal intervals.
NC.M1.F-LE.3	Compare the end behavior of linear, exponential, and quadratic functions using graphs and tables to show that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically.
NC.M3.F-LE.3	Compare the end behavior of functions using their rates of change over intervals of the same length to show that a quantity increasing exponentially eventually exceeds a quantity increasing as a polynomial function.
NC.M3.F-LE.4	Use logarithms to express the solution to $ab^{ct} = d$ where a, b, c, and d are numbers and evaluate the logarithm using technology.

Linear, Quadratic, and Exponential Models ***Interpret expressions for functions in terms of the situation they model.***	
NC.M1.F-LE.5	Interpret the parameters a and b in a linear function $f(x) = ax + b$ or an exponential function $g(x) = ab^x$ in terms of a context.
Trigonometric Functions ***Extend the domain of trigonometric functions using the unit circle.***	
NC.M3.F-TF.1	Understand radian measure of an angle as: • The ratio of the length of an arc on a circle subtended by the angle to its radius. • A dimensionless measure of length defined by the quotient of arc length and radius that is a real number. • The domain for trigonometric functions.
NC.M3.F-TF.2 NC.M3.F-TF.2a NC.M3.F-TF.2b	Build an understanding of trigonometric functions by using tables, graphs and technology to represent the cosine and sine functions. a. Interpret the sine function as the relationship between the radian measure of an angle formed by the horizontal axis and a terminal ray on the unit circle and its *y* coordinate. b. Interpret the cosine function as the relationship between the radian measure of an angle formed by the horizontal axis and a terminal ray on the unit circle and its *x* coordinate.
Trigonometric Functions ***Model periodic phenomena with trigonometric functions.***	
NC.M3.F-TF.5	Use technology to investigate the parameters, a, b, and h of a sine function, $f(x) = a \cdot sin(b \cdot x) + h$, to represent periodic phenomena and interpret key features in terms of a context.

Return to Table of Contents

Number and Quantity	
The Real Number System ***Extend the properties of exponents to rational exponents.***	
NC.M1.N-RN.2	Rewrite algebraic expressions with integer exponents using the properties of exponents.
NC.M2.N-RN.1	Explain how expressions with rational exponents can be rewritten as radical expressions.
NC.M2.N-RN.2	Rewrite expressions with radicals and rational exponents into equivalent expressions using the properties of exponents.
The Real Number System ***Use properties of rational and irrational numbers.***	
NC.M2.N-RN.3	Use the properties of rational and irrational numbers to explain why: • the sum or product of two rational numbers is rational; • the sum of a rational number and an irrational number is irrational; • the product of a nonzero rational number and an irrational number is irrational.
The Complex Number System ***Defining complex numbers.***	
NC.M2.N-CN.1	Know there is a complex number *i* such that $i^2 = -1$, and every complex number has the form $a + bi$ where a and b are real numbers.
The Complex Number System ***Use complex numbers in polynomial identities and equations.***	
NC.M3.N-CN.9	Use the Fundamental Theorem of Algebra to determine the number and potential types of solutions for polynomial functions.

Return to Table of Contents

Algebra	
Seeing Structure in Expressions ***Interpret the structure of expressions.***	
NC.M1.A-SSE.1 NC.M1.A-SSE.1a NC.M1.A-SSE.1b	Interpret expressions that represent a quantity in terms of its context. a. Identify and interpret parts of a linear, exponential, or quadratic expression, including terms, factors, coefficients, and exponents. b. Interpret a linear, exponential, or quadratic expression made of multiple parts as a combination of entities to give meaning to an expression.
NC.M2.A-SSE.1 NC.M2.A-SSE.1a NC.M2.A-SSE.1b	Interpret expressions that represent a quantity in terms of its context. a. Identify and interpret parts of a quadratic, square root, inverse variation, or right triangle trigonometric expression, including terms, factors, coefficients, radicands, and exponents. b. Interpret quadratic and square root expressions made of multiple parts as a combination of single entities to give meaning in terms of a context.
NC.M3.A-SSE.1 NC.M3.A-SSE.1a NC.M3.A-SSE.1b	Interpret expressions that represent a quantity in terms of its context. a. Identify and interpret parts of a piecewise, absolute value, polynomial, exponential and rational expressions including terms, factors, coefficients, and exponents. b. Interpret expressions composed of multiple parts by viewing one or more of their parts as a single entity to give meaning in terms of a context.
NC.M3.A-SSE.2	Use the structure of an expression to identify ways to write equivalent expressions.
NC.M2.A-SSE.3	Write an equivalent form of a quadratic expression by completing the square, where a is an integer of a quadratic expression, $ax^2 + bx + c$, to reveal the maximum or minimum value of the function the expression defines.
Seeing Structure in Expressions ***Write expressions in equivalent forms to solve problems.***	
NC.M1.A-SSE.3	Write an equivalent form of a quadratic expression $ax^2 + bx + c$, where *a* is an integer, by factoring to reveal the solutions of the equation or the zeros of the function the expression defines.
NC.M3.A-SSE.3	Write an equivalent form of an exponential expression by using the properties of exponents to transform expressions to reveal rates based on different intervals of the domain.
Arithmetic with Polynomial Expressions ***Perform arithmetic operations on polynomials.***	
NC.M1.A-APR.1	Build an understanding that operations with polynomials are comparable to operations with integers by adding and subtracting quadratic expressions and by adding, subtracting, and multiplying linear expressions.
NC.M2.A-APR.1	Extend the understanding that operations with polynomials are comparable to operations with integers by adding, subtracting, and multiplying polynomials.
Arithmetic with Polynomial Expressions ***Understand the relationship between zeros and factors of polynomials.***	

NC.M1.A-APR.3	Understand the relationships among the factors of a quadratic expression, the solutions of a quadratic equation, and the zeros of a quadratic function.
Arithmetic with Polynomial and Rational Expressions ***Understand the relationship between zeros and factors of polynomials.***	
NC.M3.A-APR.2	Understand and apply the Remainder Theorem.
NC.M3.A-APR.3	Understand the relationship among factors of a polynomial expression, the solutions of a polynomial equation and the zeros of a polynomial function.
Arithmetic with Polynomial and Rational Expressions ***Rewrite rational expressions.***	
NC.M3.A-APR.6	Rewrite simple rational expressions in different forms; write $\frac{a(x)}{b(x)}$ in the form $q(x) + \frac{r(x)}{b(x)}$, where $a(x), b(x), q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$.
NC.M3.A-APR.7 NC.M3.A-APR.7a NC.M3.A-APR.7b	Understand the similarities between arithmetic with rational expressions and arithmetic with rational numbers. a. Add and subtract two rational expressions, $a(x)$ and $b(x)$, where the denominators of both $a(x)$ and $b(x)$ are linear expressions. b. Multiply and divide two rational expressions.
Creating Equations ***Create equations that describe numbers or relationships.***	
NC.M1.A-CED.1	Create equations and inequalities in one variable that represent linear, exponential, and quadratic relationships and use them to solve problems.
NC.M2.A-CED.1	Create equations and inequalities in one variable that represent quadratic, square root, inverse variation, and right triangle trigonometric relationships and use them to solve problems.
NC.M3.A-CED.1	Create equations and inequalities in one variable that represent absolute value, polynomial, exponential, and rational relationships and use them to solve problems algebraically and graphically.
NC.M1.A-CED.2	Create and graph equations in two variables to represent linear, exponential, and quadratic relationships between quantities.
NC.M2.A-CED.2	Create and graph equations in two variables to represent quadratic, square root and inverse variation relationships between quantities.
NC.M3.A-CED.2	Create and graph equations in two variables to represent absolute value, polynomial, exponential and rational relationships between quantities.
NC.M1.A-CED.3	Create systems of linear equations and inequalities to model situations in context.
NC.M2.A-CED.3	Create systems of linear, quadratic, square root, and inverse variation equations to model situations in context.
NC.M3.A-CED.3	Create systems of equations and/or inequalities to model situations in context.

NC.M1.A-CED.4	Solve for a quantity of interest in formulas used in science and mathematics using the same reasoning as in solving equations.
Reasoning with Equations and Inequalities ***Understand solving equations as a process of reasoning and explain the reasoning.***	
NC.M1.A-REI.1	Justify a chosen solution method and each step of the solving process for linear and quadratic equations using mathematical reasoning.
NC.M2.A-REI.1	Justify a chosen solution method and each step of the solving process for quadratic, square root and inverse variation equations using mathematical reasoning.
NC.M3.A-REI.1	Justify a solution method for equations and explain each step of the solving process using mathematical reasoning.
NC.M2.A-REI.2	Solve and interpret one variable inverse variation and square root equations arising from a context, and explain how extraneous solutions may be produced.
NC.M3.A-REI.2	Solve and interpret one variable rational equations arising from a context, and explain how extraneous solutions may be produced.
Reasoning with Equations and Inequalities ***Solve equations and inequalities in one variable.***	
NC.M1.A-REI.3	Solve linear equations and inequalities in one variable.
NC.M1.A-REI.4	Solve for the real solutions of quadratic equations in one variable by taking square roots and factoring.
NC.M2.A-REI.4 NC.M2.A-REI.4a NC.M2.A-REI.4b	Solve for all solutions of quadratic equations in one variable. a. Understand that the quadratic formula is the generalization of solving $ax^2 + bx + c$ by using the process of completing the square. b. Explain when quadratic equations will have non-real solutions and express complex solutions as $a \pm bi$ for real numbers a and b.
Reasoning with Equations and Inequalities ***Solve systems of equations.***	
NC.M1.A-REI.5	Explain why replacing one equation in a system of linear equations by the sum of that equation and a multiple of the other produces a system with the same solutions.
NC.M1.A-REI.6	Use tables, graphs, or algebraic methods (substitution and elimination) to find approximate or exact solutions to systems of linear equations and interpret solutions in terms of a context.
NC.M2.A-REI.7	Use tables, graphs, and algebraic methods to approximate or find exact solutions of systems of linear and quadratic equations, and interpret the solutions in terms of a context.
Reasoning with Equations and Inequalities ***Represent and solve equations and inequalities graphically***	
NC.M1.A-REI.10	Understand that the graph of a two variable equation represents the set of all solutions to the equation.

NC.M1.A-REI.11	Build an understanding of why the *x*-coordinates of the points where the graphs of two linear, exponential, and/or quadratic equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$ and approximate solutions using graphing technology or successive approximations with a table of values.
NC.M2.A-REI.11	Extend the understanding that the x-coordinates of the points where the graphs of two square root and/or inverse variation equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$ and approximate solutions using graphing technology or successive approximations with a table of values.
NC.M3.A-REI.11	Extend an understanding that the x-coordinates of the points where the graphs of two equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$ and approximate solutions using a graphing technology or successive approximations with a table of values.
NC.M1.A-REI.12	Represent the solutions of a linear inequality or a system of linear inequalities graphically as a region of the plane.

Return to Table of Contents