PUBLIC SCHOOLS OF NORTH CAROLINA
State Board of Education | Department of Public Instruction

North Carolina Standard Course of Study
Sixth Grade Mathematics

Standards for Mathematical Practice	
1. Make sense of problems and persevere in solving them.	5. Use appropriate tools strategically.
2. Reason abstractly and quantitatively.	6. Attend to precision.
3. Construct viable arguments and critique the reasoning of others.	7. Look for and make use of structure.
4. Model with mathematics.	8. Look for and express regularity in repeated reasoning.

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.

6-8 Mathematics

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: o Interpret absolute value as magnitude for a positive or negative quantity in a real-world context. o 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: o 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. o Find and position rational numbers on a horizontal or vertical number line. b. On a coordinate plane: o Understand signs of numbers in ordered pairs as indicating locations in quadrants. o Recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. o 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.

6-8 Mathematics

The Number System	
	• 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.

6-8 Mathematics

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).

6-8 Mathematics

Geometry	
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.

6-8 Mathematics

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. o 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. o 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: o Reporting the number of observations in dot plots and histograms. o Communicating the nature of the attribute under investigation, how it was measured, and the units of measurement. b. Analyze center and variability by: o Giving quantitative measures of center, describing variability, and any overall pattern, and noting any striking deviations. o Justifying the appropriate choice of measures of center using the shape of the data distribution.

PUBLIC SCHOOLS OF NORTH CAROLINA
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North Carolina Standard Course of Study
Seventh Grade Mathematics

Standards for Mathematical Practice	
1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics.	5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Ratio and Proportional Relationships	
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. o Represent proportional relationships using tables and graphs. o Recognize whether ratios are in a proportional relationship using tables and graphs. o 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: o Explain the meaning of any point (x, y). o Explain the meaning of (0, 0) and why it is included. o 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.

6-8 Mathematics

The Number System	
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. o Convert a fraction to a decimal using long division. o 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.

Expressions and Equations	
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. o Fluently solve multistep equations with the variable on one side, including those generated by word problems. o Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. o Interpret the solution in context. b. Construct inequalities to solve problems by reasoning about the quantities. o Fluently solve multi-step inequalities with the variable on one side, including those generated by word problems. o Compare an algebraic solution process for equations and an algebraic solution process for inequalities. o Graph the solution set of the inequality and interpret in context.

6-8 Mathematics

Geometry	
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.

6-8 Mathematics

Statistics and Probability	
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. o 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. o Understand that the range describes the spread of the entire data set. o 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.

North Carolina Standard Course of Study
Eight Grade Mathematics

Standards for Mathematical Practice	
1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics.	5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

The Number System	
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.

6-8 Mathematics

Expressions and Equations	
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.

6-8 Mathematics

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.

6-8 Mathematics

Geometry	
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.

6-8 Mathematics

Statistics and Probability	
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.