



North Carolina Essential Standards High School Math BC

Note on Numbering: **N**–Number and Operations, **A**–Algebra, **G**–Geometry, **M**–Measurement, **S**–Statistics and Probability and **D**–Discrete Mathematics

Note:

The mathematics writing committee recommends that a single set of standards spanning three mathematics levels be used for both the Algebra I/Geometry/Algebra II sequence and the Integrated I/II/III sequence. In the 2003 North Carolina Standard course of Study for Mathematics 9-12, there are two separate paths for high school mathematics that differ somewhat in content. In this new model, the content for both paths is the same, but the sequencing is different (i.e. the AlgI/Geo/Alg II sequence will continue to generally isolate geometric standards and algebraic standards). Schools will be able to choose their preferred sequencing, but the expectations for a student after completing both paths will be the same. The team believes this is a better way to ensure equity of opportunity as well as reduce the number of assessments that need to be developed and administered. It is important to note that this is a choice for school districts. Both sequences will lead to the same rigorous end.

Number and Operations

	Essential Standard	Clarifying Objectives	
MBC.N.1	Represent expressions involving rational exponents in various forms.	MBC.N.1.1	Translate numbers with rational exponents, limited to exponents in the form $1/n$, into expressions with n th roots.
		MBC.N.1.2	Represent algebraic expressions with exponents in their simplest forms.
MBC.N.2	Use arithmetic operations on matrices.	MBC.N.2.1	Represent numerical and relational data characterized with two or more variables using matrices.
		MBC.N.2.2	Use addition, subtraction and scalar multiplication of matrices.
		MBC.N.2.3	Use the properties of matrix multiplication and multiply matrices to solve problems in context.

Algebra

	Essential Standard	Clarifying Objectives	
MBC.A.1	Represent functions as mathematical models of real-world phenomena.	MBC.A.1.1	Represent absolute value, step and piecewise linear functions, and quadratic functions using models.
		MBC.A.1.2	Use graphs, symbols and tables to represent functions.
MBC.A.2	Use strategies to solve systems of equations and inequalities and interpret their solutions.	MBC.A.2.1	Use matrices to solve systems of linear equations, interpreting their solutions.
		MBC.A.2.2	Use appropriate strategies to solve systems of combinations of equations or inequalities, interpreting their solutions.
MBC.A.3	Represent transformations of families of functions.	MBC.A.3.1	Represent transformations of absolute value, quadratic and exponential functions in a coordinate plane.
		MBC.A.3.2	Illustrate translations, reflections and dilations.
MBC.A.4	Use arithmetic operations with rational expressions and to simplify rational expressions.	MBC.A.4.1	Use arithmetic operations to combine rational expressions.
		MBC.A.4.2	Use arithmetic algorithms to simplify rational expressions.
MBC.A.5	Understand the relationship between functions and their inverses.	MBC.A.5.1	Use function notation to find the sum, difference, product and quotient of two or more functions.
		MBC.A.5.2	Use tables, graphs and symbols to find the inverse of a function.
		MBC.A.5.3	Explain how the composition of a function and its inverse returns the identity function, $f(f^{-1}(x)) = x$
		MBC.A.5.4	Illustrate the relationship between exponential and logarithmic functions.
MBC.A.6	Use properties of logarithms to simplify and solve problems.	MBC.A.6.1	Use properties to convert between exponential and logarithmic form for positive integer-base logarithms.
		MBC.A.6.2	Use logarithmic properties to simplify logarithms.
MBC.A.7	Use appropriate properties and strategies to solve linear, quadratic, exponential, logarithmic and rational equations.	MBC.A.7.1	Use graphs, tables, factoring and the quadratic formula to solve quadratic equations with real number coefficients, interpreting the solutions.
		MBC.A.7.2	Represent rational equations with linear and quadratic denominators, in their simplest forms, identifying restrictions.
		MBC.A.7.3	Use graphs, tables and appropriate properties to solve rational equations with linear and quadratic denominators.
		MBC.A.7.3.4	Use appropriate properties to solve exponential and logarithmic equations symbolically, numerically and graphically.

	Essential Standard	Clarifying Objectives	
MBC.A.8	Analyze the characteristics of power, polynomial, rational, exponential, radical and periodic functions.	MBC.A.8.1	Determine the theoretical and practical domain and range.
		MBC.A.8.2	Determine the zeros, extremes and intercepts.
		MBC.A.8.3	Identify intervals for which the function is continuous and/or discontinuous, increasing and/or decreasing.
		MBC.A.8.4	Determine end behavior.
		MBC.A.8.5	Analyze connections among functions represented in numeric, symbolic, graphical and verbal forms.
MBC.A.9	Represent problems involving repeated motion with models and graphs.	MBC.A.9.1	Represent problems involving repeated motion as a function of time with models and graphs
		MBC.A.9.2	Represent varying parameters of starting point, distance, rate and repetitions when modeling.
		MBC.A.9.3	Represent periodic functions (sine and cosine) using the unit circle and angles from special triangles.
		MBC.A.9.4	Interpret periodic functions (sine and cosine) with varying parameters (amplitude, vertical shift and period).
MBC.A.10	Analyze function transformations.	MBC.A.10.1	Compare different types of functions.
		MBC.A.10.2	Determine horizontal and vertical shifts as well as the stretching and shrinking of a function in comparison to the parent function

Geometry

	Essential Standard	Clarifying Objectives	
MBC.G.1	Infer geometric relationships within an axiomatic system.	MBC.G.1.1	Construct a simple logical truth table for conjunction, disjunction, negation and conditional relations.
		MBC.G.1.2	Infer conclusions from given information.
		MBC.G.1.3	Evaluate the validity of conclusions drawn from the validity of conditionals, converses, inverses, contrapositives and biconditionals.
		MBC.G.1.4	Summarize the structure and relationships between undefined terms, defined terms, axioms/postulates, methods of reasoning and theorems.

	Essential Standard	Clarifying Objectives	
		MBC.G.1.5	Use paper-folding techniques, compasses and straight edges and dynamic geometric software to make connections among geometric relationships.
MBC.G.2	Generate conjectures in order to test and validate geometric relationships.	MBC.G.2.1	Generate conjectures which can be verified by informal arguments or reject by counterexample
		MBC.G.2.2	Generate direct and indirect arguments and identify inconsistencies.
		MBC.G.2.3	Explain the relationships among angles formed by perpendicular lines and transversals of parallel lines.
		MBC.G.2.4	Use available information and geometric principles to prove similarity and congruence among triangles, noting that congruence is a special case of similarity.
MBC.G.3	Use the concepts of similarity and congruence to solve problems.	MBC.G.3.1	Use properties of similarity and congruency to determine or calculate the measures of corresponding parts of similar figures.
		MBC.G.3.2	Identify the conditions that are sufficient to guarantee similarity of polygons with more than three sides.
		MBC.G.3.3	Apply properties of similarity and congruency to other polygons.
MBC.G.4	Represent geometric transformations algebraically using matrices.	MBC.G.4.1	Use matrix operations to model translations, reflections, origin-centered dilations and origin-centered rotations (90° , 180° , and 270°).
		MBC.G.4.2	Understand the relationship of rigidity to congruence and that of dilations to similarity.
MBC.G.5	Represent circles as equations and graphs in the coordinate plane.	MBC.G.5.1	Represent circles as equations based on the center and the radius, the center and a point on the circle and the endpoints of the diameter.
MBC.G.6	Construct arguments to prove geometric conjectures and theorems.	MBC.G.6.1	Construct arguments that prove conjectures and theorems or disprove conjectures related to: a. angle bisectors b. medians c. isosceles triangles d. perpendicular bisectors e. altitudes f. geometric mean
		MBC.G.6.2	Construct arguments to prove the Pythagorean Theorem and its converse in multiple ways.
		MBC.G.6.3	Construct arguments to prove properties of special quadrilaterals.
MBC.G.7	Use properties to determine measures within circles.	MBC.G.7.1	Calculate the measure of central angles, inscribed angles and circumscribed angles.
		MBC.G.7.2	Calculate arc measure and arc length within a circle.

	Essential Standard	Clarifying Objectives	
MBC.G.8	Use the Pythagorean Theorem, trigonometric ratios, properties of special right triangles and the concept of similarity, individually and in combination to solve problems.	MBC.G.8.1	Use the Pythagorean Theorem to solve problems in two- and three-dimensional settings.
		MBC.G.8.2	Use sines, cosines and tangents to determine side lengths and angle measures in right triangles.
		MBC.G.8.3	Use properties of special right triangles to solve problems.
MBC.G.9	Analyze three-dimensional figures in terms of their volumes, surface areas and cross-sectional shapes.	MBC.G.9.1	Use formulas and strategies to solve problems involving volume and surface area of cones, spheres and composite figures.
		MBC.G.9.2	Use the 3:2:1 relationship among volumes of circular cylinders, hemispheres and cones with the same height and circular base and 3:1 relationship between the volume of a prism and pyramid with the same base area and height.

Statistics and Probability

	Essential Standard	Clarifying Objectives	
MBC.S.1	Use geometric models to solve probability problems.	MBC.S.1.1	Use the sizes of partitioned regions within regular geometric figures to solve probability problems.
MBC.S.2	Apply statistical concepts and principles to develop linear models.	MBC.S.2.1	Generate linear models using least-squares regression lines.
		MBC.S.2.2	Evaluate the strength of relationship for bivariate numerical data both informally and by using the correlation coefficient.
		MBC.S.2.3	Evaluate the fit and appropriateness of a linear model by calculating the Sum of the Squared Errors or the Mean Absolute Deviation from the least-squares regression lines.
		MBC.S.2.4	Infer trends in bivariate data displayed in scatter plots, and best fit lines.
MBC.S.3	Apply probability concepts and principles to multistage probability experiments.	MBC.S.3.1	Analyze two-stage experiments in terms of sample spaces.

	Essential Standard	Clarifying Objectives	
		MBC.S.3.2	Use diagrams and the multiplication rule for probability to calculate probabilities.
		MBC.S.3.3	Compare independent and dependent compound events in terms of their probabilities.

Discrete

	Essential Standard	Clarifying Objectives	
MBC.D.1	Use weighted vertex-edge graphs, critical path analysis and weighted digraphs to solve problems dealing with optimization.	MBC.D.1.1	Use weighted vertex-edge graphs and minimum spanning trees to solve problems.
		MBC.D.1.2	Use critical path analysis and weighted digraphs to optimally schedule large projects that are comprised of many smaller tasks.
MBC.D.2	Understand the role that linear programming plays in optimization.	MBC.D.2.1	Use linear functions to optimize situations that arise within a system with linear constraints on the variables. (linear programming)