MIDDLE GRADES MATHEMATICS

Test Framework

	Content Domain	Range of Competencies	Approximate Percentage of Test Score
I.	Number Sense and Operations	0001–0002	17%
II.	Algebra and Functions	0003–0006	33%
III.	Measurement and Geometry	0007–0009	25%
IV.	Statistics, Probability, and Discrete Mathematics	0010–0012	25%

I. Number Sense and Operations

0001 Understand numbers.

- Analyze the relationships between the subsets of the real numbers.
- Analyze the role of place value in any number system.
- Analyze the use of estimation in a variety of situations.
- Translate between different representations of numbers.
- Apply number-theory concepts (e.g., divisibility rules, prime factorization, greatest common factors) in problem-solving situations.

0002 Understand operations.

- Analyze relational and operational properties.
- Analyze a variety of conventional and alternative algorithms.
- Solve a variety of problems involving integers, fractions, and decimals.
- Solve a variety of problems involving ratios, proportions, and percents.

II. Algebra and Functions

0003 Understand patterns, relations, and functions.

- Analyze a variety of patterns.
- Analyze the properties of relations and functions in multiple representations (e.g., tables, graphs, equations, words).
- Analyze direct and inverse proportional relationships.
- Determine the effects of transformations on the graph of a function or relation.

0004 Understand algebraic techniques and applications.

- Manipulate algebraic expressions, equations, and inequalities (e.g., simplify, transform, factor).
- Solve linear and nonlinear equations and inequalities.
- Connect appropriate algebraic notation to phrases and sentences.

0005 Understand linear relations and applications.

- Analyze the relationship between a linear equation or inequality and its representations.
- Solve systems of linear inequalities or equations with a variety of methods.
- Interpret the meaning of the slope and the *y*-intercept in various contexts.
- Analyze a variety of real-world problems involving linear equations, systems, and inequalities.

0006 Understand nonlinear relations and concepts of calculus.

- Analyze relationships between multiple representations of a nonlinear equation or inequality.
- Solve a variety of real-world problems involving nonlinear equations and inequalities.
- Analyze function behavior in terms of limits, continuity, and rates of change.
- Apply concepts of calculus to solve problems in real-world situations.

III. Measurement and Geometry

0007 Understand measurement principles, procedures, and applications.

- Analyze the use of various units and unit conversions within the customary and metric systems.
- Calculate or estimate measures of lengths, areas, and volumes.
- Apply the concepts of similarity, scale factors, and proportional reasoning to solve indirect measurement problems.
- Analyze precision, accuracy, and rounding in measurements and computed quantities.

0008 Understand Euclidean geometry in two and three dimensions.

- Analyze properties of points, lines, planes, and angles.
- Use the properties of triangles, quadrilaterals, and other polygons and circles to solve problems.
- Apply principles of similarity and congruence.
- Apply the Pythagorean theorem and its converse.
- Use nets, cross sections, and projections to analyze three-dimensional figures.
- Analyze geometric arguments using deductive reasoning.

0009 Understand coordinate and transformational geometry.

- Analyze two- and three-dimensional figures using coordinate systems.
- Connect algebra and geometry by applying concepts of distance, midpoint, and slope to classify figures and solve problems in the coordinate plane.
- Analyze transformations of figures in the coordinate plane.
- Analyze figures in terms of symmetry, and tessellations of the plane.

IV. Statistics, Probability, and Discrete Mathematics

0010 Understand principles and techniques of statistics.

- Analyze the effects of bias and sampling techniques.
- Use appropriate formats for organizing and displaying data.
- Analyze univariate and bivariate data in a variety of representations.
- Make predictions from data presented in a variety of representations.
- Analyze the use of measures of central tendency and spread.

0011 Understand principles of probability and techniques for determining probability.

- Determine probabilities of simple and compound events.
- Use counting principles to calculate probabilities.
- Use a variety of visual representations to calculate probabilities.
- Demonstrate knowledge of methods for simulating probabilities.

0012 Understand principles of discrete mathematics.

- Apply concepts of permutations and combinations to solve problems.
- Analyze sequences and series, including limits and recursive definitions.
- Use finite graphs and trees to represent problem situations.
- Apply set theory to solve problems.
- Apply principles of logic to solve problems (e.g., conditional and biconditional statements, conjunctions, negations).