MATHEMATICS

Test Framework

	Content Domain	Range of Competencies	Approximate Percentage of Test Score
I.	Mathematical Processes and Number Sense	0001–0003	19%
II.	Patterns, Algebra, and Functions	0004–0007	24%
III.	Measurement and Geometry	0008–0010	19%
IV.	Trigonometry and Calculus	0011–0013	19%
V.	Statistics, Probability, and Discrete Mathematics	0014–0016	19%

I. MATHEMATICAL PROCESSES AND NUMBER SENSE

0001   Understand mathematical problem solving.

▶ Identify an appropriate problem-solving strategy for a particular problem.

▶ Analyze the use of estimation in a variety of situations (e.g., rounding, area, plausibility).

▶ Solve mathematical and real-world problems involving integers, fractions, decimals, and percents.

▶ Solve mathematical and real-world problems involving ratios, proportions, and average rates of change.

0002   Understand mathematical communication, connections, and reasoning.

▶ Translate between representations (e.g., graphic, verbal, symbolic).

▶ Recognize connections between mathematical concepts.

▶ Analyze inductive and deductive reasoning.

▶ Apply principles of logic to solve problems.

▶ Demonstrate knowledge of the historical development of major mathematical concepts, including contributions from diverse cultures.

0003   Understand number theory.

▶ Analyze the group structure of the real numbers.

▶ Use complex numbers and their operations.

▶ Analyze the properties of numbers and operations.

▶ Apply the principles of basic number theory (e.g., prime factorization, greatest common factor, least common multiple).

II. PATTERNS, ALGEBRA, AND FUNCTIONS

0004   **Understand relations and functions.**

▶ Demonstrate knowledge of relations and functions and their applications.

▶ Perform operations with functions, including compositions and inverses.

▶ Analyze characteristics of functions.

▶ Interpret different representations of functions.

0005   **Understand linear, quadratic, and higher-order polynomial functions.**

▶ Analyze the relationship between a linear, quadratic, or higher-order polynomial function and its graph.

▶ Solve linear and quadratic equations and inequalities using a variety of methods.

▶ Solve systems of linear equations or inequalities using a variety of methods.

▶ Solve higher-order polynomial equations and inequalities in one and two variables.

▶ Analyze the characteristics of linear, quadratic, and higher-order polynomial equations.

▶ Analyze real-world problems involving linear, quadratic, and higher-order polynomial functions.

0006   **Understand exponential and logarithmic functions.**

▶ Apply the laws of exponents and logarithms.

▶ Analyze the relationship between exponential and logarithmic functions.

▶ Analyze exponential and logarithmic functions and their graphs.

▶ Analyze real-world problems involving exponential and logarithmic functions.

0007   **Understand rational, radical, absolute value, and piece-wise defined functions.**

▶ Manipulate rational, radical, and absolute value expressions, equations, and inequalities.

▶ Analyze the relationship between a rational, radical, absolute value, or piece-wise defined function and its graph.

▶ Analyze rational, radical, absolute value, and piece-wise defined functions in terms of domain, range, and asymptotes.

▶ Analyze real-world problems involving rational, radical, absolute value, and piece-wise defined functions.

III. MEASUREMENT AND GEOMETRY

0008   Understand measurement principles and procedures.

▶ Analyze the use of various units and unit conversions within the customary and metric systems.

▶ Apply the concepts of similarity, scale factors, and proportional reasoning to solve measurement problems.

▶ Analyze precision, error, and rounding in measurements and computed quantities.

▶ Apply the concepts of perimeter, circumference, area, surface area, and volume to solve real-world problems.

0009   Understand Euclidean geometry in two and three dimensions.

▶ Demonstrate knowledge of axiomatic systems and of the axioms of non-Euclidean geometries.

▶ Use the properties of polygons and circles to solve problems.

▶ Apply the Pythagorean theorem and its converse.

▶ Analyze formal and informal geometric proofs, including the use of similarity and congruence.

▶ Use nets and cross sections to analyze three-dimensional figures.

0010   Understand coordinate and transformational geometry.

▶ Analyze two- and three-dimensional figures using coordinate systems.

▶ Apply concepts of distance, midpoint, and slope to classify figures and solve problems in the coordinate plane.

▶ Analyze conic sections.

▶ Determine the effects of geometric transformations on the graph of a function or relation.

▶ Analyze transformations and symmetries of figures in the coordinate plane.

IV. TRIGONOMETRY AND CALCULUS

0011   Understand trigonometric functions.

▶ Apply trigonometric functions to solve problems involving distance and angles.

▶ Apply trigonometric functions to solve problems involving the unit circle.

▶ Manipulate trigonometric expressions and equations using techniques such as trigonometric identities.

▶ Analyze the relationship between a trigonometric function and its graph.

▶ Use trigonometric functions to model periodic relationships.

0012   Understand differential calculus.

▶ Evaluate limits.

▶ Demonstrate knowledge of continuity.

▶ Analyze the derivative as the slope of a tangent line and as the limit of the difference quotient.

▶ Calculate the derivatives of functions (e.g., polynomial, exponential, logarithmic).

▶ Apply differentiation to analyze the graphs of functions.

▶ Apply differentiation to solve real-world problems involving rates of change and optimization.

0013   Understand integral calculus.

▶ Analyze the integral as the area under a curve and as the limit of the Riemann sum.

▶ Calculate the integrals of functions (e.g., polynomial, exponential, logarithmic).

▶ Apply integration to analyze the graphs of functions.

▶ Apply integration to solve real-world problems.

V. Statistics, Probability, and Discrete Mathematics

0014   Understand principles and techniques of statistics.

▶ Use appropriate formats for organizing and displaying data.

▶ Analyze data in a variety of representations.

▶ Analyze the use of measures of central tendency and variability.

▶ Analyze the effects of bias and sampling techniques.

0015   Understand principles and techniques of probability.

▶ Determine probabilities of simple and compound events and conditional probabilities.

▶ Use counting principles to calculate probabilities.

▶ Use a variety of graphical representations to calculate probabilities.

▶ Select simulations that model real-world events.

▶ Analyze uniform, binomial, and normal probability distributions.

0016   Understand principles of discrete mathematics.

▶ Apply concepts of permutations and combinations to solve problems.

▶ Analyze sequences and series including limits and recursive definitions.

▶ Perform operations on matrices and vectors.

▶ Apply set theory to solve problems.