

# Missouri Educator Gateway Assessments

## FIELD 082: MATHEMATICS TEST FRAMEWORK

December 2020

**DRAFT**

<b>Content Domain</b>	<b>Range of Competencies</b>	<b>Approximate Percentage of Test Score</b>
I. Numbers and Quantity	0001–0002	15%
II. Patterns, Algebra, and Functions	0003–0004	20%
III. Measurement and Geometry	0005–0007	20%
IV. Trigonometry and Advanced Algebraic Functions	0008–0010	25%
V. Statistics and Probability	0011–0012	20%

**Missouri Educator Gateway Assessments**  
**TEST FRAMEWORK**  
**FIELD 082: MATHEMATICS**

*A scientific calculator will be available to examinees taking the Mathematics test.*

**NUMBERS AND QUANTITY**

**0001 Understand real numbers and mathematical problem solving.**

For example:

- 1.1 Analyze the structure of the real numbers.
- 1.2 Analyze the properties of numbers and operations.
- 1.3 Solve applied and theoretical problems using the principles of basic number theory (e.g., prime factorization, divisibility, greatest common factor, least common multiple).
- 1.4 Solve applied and theoretical problems involving integers, fractions, decimals, and percents.
- 1.5 Solve applied and theoretical problems involving ratios, proportions, and average rates of change.
- 1.6 Solve applied and theoretical problems involving irrational numbers and exponents.

**0002 Understand complex numbers, vectors, and matrices.**

For example:

- 2.1 Apply properties of complex numbers to perform operations.
- 2.2 Translate between representations of vector quantities (e.g., graphic, verbal, symbolic).
- 2.3 Solve applied and theoretical problems using vector operations.
- 2.4 Apply properties of matrices to perform operations.
- 2.5 Solve applied and theoretical problems using properties of matrices.

**FIELD 082: MATHEMATICS  
TEST FRAMEWORK**

**PATTERNS, ALGEBRA, AND FUNCTIONS**

**0003 Understand relations and functions.**

For example:

- 3.1 Analyze properties of functions and relations (e.g., domain, range, one-to-one correspondence).
- 3.2 Translate between different representations of functions and relations.
- 3.3 Solve applied and theoretical problems using operations with functions, including compositions and inverses.
- 3.4 Interpret different representations (e.g., equations, graphs, tables) of functions.
- 3.5 Evaluate sequences and series (e.g., computing term, sums, recursive definitions, limits).

**0004 Understand linear, quadratic, and higher-order polynomial functions.**

For example:

- 4.1 Analyze the relationship between a linear, quadratic, or higher-order polynomial function and its graph.
- 4.2 Solve linear and quadratic equations and inequalities using a variety of methods.
- 4.3 Solve systems of linear and quadratic equations or inequalities using a variety of methods.
- 4.4 Solve higher-order polynomial equations and inequalities in one and two variables.
- 4.5 Analyze the characteristics of linear, quadratic, and higher-order polynomial functions.
- 4.6 Model and solve applied problems involving linear, quadratic, and higher-order polynomial functions.

**FIELD 082: MATHEMATICS  
TEST FRAMEWORK**

**MEASUREMENT AND GEOMETRY**

**0005 Understand measurement principles and procedures.**

For example:

- 5.1 Solve applied and theoretical problems using units and unit conversions.
- 5.2 Solve applied and theoretical problems using the concepts of similarity, scale factors, and proportional reasoning.
- 5.3 Analyze precision, error, and rounding in measurements and computed quantities.
- 5.4 Solve applied and theoretical problems using the concepts of perimeter, circumference, area, surface area, and volume.

**0006 Understand Euclidean geometry in two and three dimensions.**

For example:

- 6.1 Solve applied and theoretical problems using the characteristics of triangles (e.g., centroid, orthocenter) and of right triangles (e.g., basic trigonometric ratios).
- 6.2 Solve applied and theoretical problems using the properties of polygons and circles.
- 6.3 Solve applied and theoretical problems using the Pythagorean theorem and its converse.
- 6.4 Analyze formal and informal proofs using geometric concepts (e.g., similarity, congruence, properties of angles, applications of parallel and perpendicular lines).
- 6.5 Analyze 3D figures using 2D diagrams and representations (e.g., nets, cross sections, vertex-edge graphs).
- 6.6 Analyze methods for constructing geometric figures.

**FIELD 082: MATHEMATICS  
TEST FRAMEWORK**

**0007 Understand coordinate and transformational geometry.**

For example:

- 7.1 Analyze 2D and 3D figures using coordinate systems.
- 7.2 Solve applied and theoretical problems in the coordinate plane using the concepts of distance, midpoint, and slope to classify figures.
- 7.3 Analyze conic sections, their equations, and the relationship between the equation of a conic section and its graph.
- 7.4 Determine the effects of transformations on the graph of a function or relation.
- 7.5 Analyze transformations and symmetries of figures and of the graphs of functions in the coordinate plane.
- 7.6 Analyze transformations to determine similarity and congruence of figures.

**TRIGONOMETRY AND ADVANCED ALGEBRAIC FUNCTIONS**

**0008 Understand trigonometric functions.**

For example:

- 8.1 Solve applied and theoretical problems involving distance and angles using trigonometric functions.
- 8.2 Solve problems involving the unit circle by applying trigonometric functions.
- 8.3 Manipulate trigonometric expressions and solve equations using trigonometric identities.
- 8.4 Analyze the relationship between a trigonometric function and its graph.
- 8.5 Model periodic relationships using trigonometric functions and use them to solve applied and theoretical problems.
- 8.6 Solve applied and theoretical problems using the law of sines and the law of cosines.

**0009 Understand exponential and logarithmic functions.**

For example:

- 9.1 Apply the laws of exponents and logarithms.
- 9.2 Analyze the relationship between exponential and logarithmic functions.
- 9.3 Analyze exponential and logarithmic functions and their graphs.
- 9.4 Model and solve applied and theoretical mathematical problems involving exponential and logarithmic functions.

## FIELD 082: MATHEMATICS TEST FRAMEWORK

### **0010 Understand rational, radical, absolute value, and piecewise defined functions.**

For example:

- 10.1 Simplify rational, radical, and absolute value expressions.
- 10.2 Perform operations on rational and radical expressions.
- 10.3 Analyze the relationship between a rational, radical, absolute value, or piecewise defined function and its graph.
- 10.4 Analyze rational, radical, absolute value, and piecewise defined functions in terms of domain, range, and asymptotes.
- 10.5 Model and solve applied and theoretical problems involving rational, radical, and absolute value equations and inequalities.
- 10.6 Model and solve applied and theoretical problems involving piecewise defined functions.

## **STATISTICS AND PROBABILITY**

### **0011 Understand principles and techniques of statistics.**

For example:

- 11.1 Organize and display data using appropriate formats.
- 11.2 Analyze and interpret data in a variety of representations (e.g., box plots, histograms, dot plots, scatter plots, two-way tables).
- 11.3 Calculate and analyze measures of central tendency and variability.
- 11.4 Calculate and interpret a Z-score when given a mean and a standard deviation.
- 11.5 Analyze the effects of bias and sampling techniques.
- 11.6 Analyze probability distributions (e.g., uniform, binomial, normal) and determine whether a data set is approximately normally distributed.
- 11.7 Analyze the correlation coefficient and distinguish between correlation and causation.

**FIELD 082: MATHEMATICS  
TEST FRAMEWORK**

**0012 Understand principles and techniques of probability.**

For example:

- 12.1 Apply the rules of probability to compute probabilities of simple and compound events and conditional probabilities.
- 12.2 Calculate probabilities and solve problems using counting principles (e.g., the fundamental counting principle, factorials, permutations, combinations) and set theory.
- 12.3 Calculate probabilities using a variety of graphical representations.
- 12.4 Select simulations that model data collection scenarios.
- 12.5 Calculate and interpret expected value from a discrete probability distribution.