

# NEW MEXICO TEACHER ASSESSMENTS™

## TEST FRAMEWORK

### FIELD 24: MIDDLE LEVEL MATHEMATICS

Subarea		Range of Competencies	Test Proportion
I.	Mathematical Reasoning, Problem Solving, and Methods, Number Concepts, and the Historical Development of Mathematics	0001–0003	25%
II.	Number Systems, Number Concepts, and Number Theory	0004–0005	17%
III.	Geometry and Measurement	0006–0007	17%
IV.	Data Analysis, Statistics, and Probability	0008–0009	16%
V.	Patterns, Algebraic Relationships, and Functions	0010–0012	25%

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# NEW MEXICO TEACHER ASSESSMENTS™

## Field 24: Middle Level Mathematics

Mathematical Reasoning, Problem Solving, and Methods, Number Concepts,  
and the Historical Development of Mathematics  
Number Systems, Number Concepts, and Number Theory  
Geometry and Measurement  
Data Analysis, Statistics, and Probability  
Patterns, Algebraic Relationships, and Functions

### **SUBAREA I—MATHEMATICAL REASONING, PROBLEM SOLVING, AND METHODS, NUMBER CONCEPTS, AND THE HISTORICAL DEVELOPMENT OF MATHEMATICS**

**0001 Understand and apply problem-solving strategies, connections among different mathematical ideas, and mathematical modeling to solve application problems encountered in life.**

For example:

- analyze information to define problems appropriately
- recognize appropriate strategies (e.g., drawing a diagram, working backward, inductive reasoning, creating a simpler problem) to solve problems
- select an appropriate tool, technology, or mathematical principle to solve a given problem
- recognize connections among different mathematical concepts
- apply mathematics across the curriculum and in everyday contexts

**0002 Understand principles of mathematical reasoning and techniques for communicating mathematical ideas.**

For example:

- use appropriate mathematical terminology and symbols
- communicate mathematical ideas and concepts using a variety of numeric, symbolic, and graphic methods
- make connections among numeric, symbolic, graphic, and verbal representations of mathematical ideas and concepts
- distinguish between inductive and deductive reasoning
- draw valid conclusions from stated conditions

## FIELD 24: MIDDLE LEVEL MATHEMATICS TEST FRAMEWORK

### **0003 Understand the development of mathematical concepts, skills, and applications from their origins to current times, including the role of technology.**

For example:

- demonstrate knowledge of the historical development of major mathematical concepts, including contributions made by various cultures and individuals
- recognize appropriate applications and limitations of contemporary technologies such as computing tools and graphing calculators for defining and solving problems
- solve problems using scientific calculators and simple computer algorithms

### **SUBAREA II—NUMBER SYSTEMS, NUMBER CONCEPTS, AND NUMBER THEORY**

### **0004 Understand number systems, number theory, and ways of representing numbers.**

For example:

- analyze the role of counting, grouping, and place value in ancient and modern numeration systems
- analyze properties of prime numbers, factors, multiples, and divisibility
- use a variety of equivalent representations of numbers (e.g., fractions, decimals, percents, roots, exponents)
- use scientific notation to solve problems involving very large and very small numbers
- demonstrate an understanding of the use of manipulatives, verbal expressions, and geometric models to represent numbers and numerical operations

### **0005 Understand operations on numbers and properties of number operations.**

For example:

- apply properties of numbers and number operations, including the commutative and distributive properties, to manipulate and simplify algebraic expressions
- solve a variety of problems using number operations, including ratio and proportion problems
- demonstrate an understanding of inverse operations, identities, and algebraic operations with real numbers and variables
- estimate solutions and evaluate reasonableness of estimation strategies and solutions
- compute fluently using fractions, decimals, and integers

## FIELD 24: MIDDLE LEVEL MATHEMATICS TEST FRAMEWORK

### SUBAREA III—GEOMETRY AND MEASUREMENT

#### **0006 Apply geometric concepts and reasoning, including two- and three-dimensional coordinate geometry.**

For example:

- compare and analyze shapes and formally establish the relationships among them (e.g., congruence, similarity)
- solve problems involving parallelism, perpendicularity, congruence, similarity, translation, reflection, rotation, dilation, tessellation, and symmetry on a plane
- apply the Pythagorean theorem to solve problems
- understand and apply coordinate geometry formulas and concepts, including slope, distance formula, midpoint formula, and parallel and perpendicular lines
- understand properties of geometric shapes, including circles and polygons, and solve problems involving these properties

#### **0007 Understand and use measurement.**

For example:

- solve problems using appropriate units of measurement for angles (e.g., degree, radian), length, area, volume, mass, temperature, time, density, pressure, and rates of change
- use standard and nonstandard units of measurement to an appropriate degree of accuracy
- identify appropriate tools for performing measurements
- convert measurements within and between traditional and metric measuring systems
- derive and apply formulas for the perimeter, area, surface area, or volume of two- and three-dimensional composite figures
- solve problems using right triangle trigonometry (e.g., problems involving indirect measurements)

## FIELD 24: MIDDLE LEVEL MATHEMATICS TEST FRAMEWORK

### SUBAREA IV—DATA ANALYSIS, STATISTICS, AND PROBABILITY

#### **0008 Understand methods of collecting, organizing, displaying, describing, and analyzing data.**

For example:

- formulate questions and collect data from life experiences using appropriate techniques in a variety of situations
- analyze and interpret data and formulate statistical conclusions based on the data
- use and interpret a variety of charts and graphs to organize and display data (e.g., pie charts, box plots, stem-and-leaf plots, scatter plots, frequency histograms) appropriately
- apply and interpret measures of central tendency (e.g., mean, median, mode) and spread (e.g., range, standard deviation)

#### **0009 Understand the theory of probability and probability distributions.**

For example:

- enumerate the sample space of an event and determine simple and compound probabilities
- find the probability of dependent and independent events and determine conditional probabilities
- use simulations and sampling to determine experimental probabilities
- solve problems using geometric probability (e.g., ratio of two areas)
- solve simple problems involving probability, inference, and the testing of hypotheses
- use simple combinations and permutations to solve counting problems

### SUBAREA V—PATTERNS, ALGEBRAIC RELATIONSHIPS, AND FUNCTIONS

#### **0010 Describe, analyze, and generalize mathematical patterns.**

For example:

- recognize, describe, and extend a variety of numerical and geometric patterns
- represent and record patterns using manipulatives, tables, graphs, and matrices
- analyze and generalize sequences and series (e.g., Fibonacci, geometric) and use them to solve problems
- recognize and extend recursive patterns and use them to solve problems
- use patterns and relationships to make inferences, predictions, and decisions

## **FIELD 24: MIDDLE LEVEL MATHEMATICS TEST FRAMEWORK**

**0011 Use variables and symbolic expressions to describe and analyze patterns of change, functions, and relationships among variables.**

For example:

- represent situations using variables, expressions, and open sentences
- manipulate and simplify symbolic expressions
- explore patterns of change characteristic of families of functions (e.g., linear, quadratic, exponential)
- analyze functions in terms of range, domain, intercepts, operations, compositions, and inverses
- analyze the graphs of functions

**0012 Understand properties and applications of linear, quadratic, exponential, and trigonometric functions and solve related equations and inequalities.**

For example:

- analyze the relationship between a linear equation and its graph, including its slope and intercepts
- predict or interpolate values using a linear model
- model and solve problems using linear equations, inequalities, and systems of linear equations
- analyze the roots and properties of a quadratic equation
- solve quadratic equations, inequalities, and systems
- analyze polynomial functions and their graphs and use them to solve problems (e.g., zeros, minima and maxima, symmetry)
- model and solve problems involving exponential functions
- examine the relationship between the trigonometric functions and their inverses and between the trigonometric and circular functions