

Arizona Educator Proficiency Assessments™ (AEPA™)

**FIELD 37: MIDDLE GRADES MATHEMATICS
TEST OBJECTIVES**

Subarea	Range of Objectives	Approximate Test Proportions*
I. Number Sense and Operations	1–3	20%
II. Data Analysis, Probability, and Discrete Mathematics	4–6	20%
III. Patterns, Algebra, and Functions	7–9	20%
IV. Geometry and Measurement	10–12	20%
V. Mathematical Processes and Reasoning	13–15	20%

*May not add to 100% due to rounding.

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**Arizona Educator Proficiency Assessments™ (AEPA™)
Subject Knowledge Test**

**Test Objectives
Field 37: Middle Grades Mathematics**

Subareas:

Number Sense and Operations
Data Analysis, Probability, and Discrete Mathematics
Patterns, Algebra, and Functions
Geometry and Measurement
Mathematical Processes and Reasoning

NUMBER SENSE AND OPERATIONS

0001 Understand the structure of numeration systems and ways of representing numbers.

For example: classifying real numbers as natural, whole, integer, rational, or irrational; determining equivalency between and among fractions, decimals, and percents in contextual situations; using different representations of numbers (e.g., powers, roots, scientific notation); and solving problems involving integers, fractions, decimals, percents, ratios, and proportions.

0002 Understand numerical operations and properties of the real number system.

For example: simplifying expressions using order of operations; identifying and applying properties of the real number system (e.g., distributive, associative); analyzing numerical operations and their inverses; solving word problems using numerical operations; and using appropriate techniques of estimation to solve number problems.

0003 Understand the principles of number theory.

For example: demonstrating an understanding of concepts from number theory (e.g., greatest common factor, least common multiple); analyzing properties of prime and composite numbers; determining prime factorization of numbers; and solving problems using basic concepts from number theory.

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DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS

0004 Understand methods of collecting, organizing, and displaying data.

For example: demonstrating knowledge of ways to formulate questions to collect data in contextual situations; analyzing and using appropriate sampling techniques; using and interpreting charts and graphs (e.g., circle graphs, line graphs, stem-and-leaf plots, box plots, scatter plots) to organize and display data; and identifying a linear function that best represents a set of data.

0005 Understand methods of describing and analyzing data.

For example: determining and interpreting measures of central tendency (i.e., mean, median, mode) and dispersion (e.g., range, standard deviation); recognizing the effects of data transformations on measures of central tendency and dispersion; making appropriate inferences, interpolations, and extrapolations from a set of data; and interpreting percentiles and correlation.

0006 Understand the fundamental principles of probability, probability distributions, and discrete mathematics.

For example: computing probabilities involving dependent, independent, and mutually exclusive events; computing conditional probabilities; applying properties of uniform and normal distributions; creating and using probability models to describe real-world situations; and solving counting problems using tables, tree diagrams, permutations, and combinations.

PATTERNS, ALGEBRA, AND FUNCTIONS

0007 Understand patterns, relations, algebraic functions, and expressions.

For example: analyzing and extending iterative and recursive patterns using symbols or numbers; manipulating and simplifying algebraic expressions; analyzing characteristics of algebraic functions (e.g., domain, range, dependent versus independent variables); using qualitative graphing; and analyzing relationships among tabular, graphic, and algebraic representations of functions.

0008 Understand and use linear functions to model and solve problems.

For example: demonstrating knowledge of linear functions using various representations (e.g., tabular, graphical, symbolic, verbal); determining the equation of a line in a variety of situations; analyzing the relationship between linear models and rates of change; and modeling and solving problems involving linear equations, inequalities, and systems using a variety of methods (e.g., algebraic, graphical).

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0009 Understand and use nonlinear functions and relations to model and solve problems.

For example: distinguishing between relations and functions; solving quadratic equations using a variety of methods (e.g., factoring, quadratic formula); solving quadratic inequalities using different methods (e.g., graphing); analyzing properties and graphs of polynomial, radical, rational, absolute value, and exponential functions; and modeling and solving problems involving nonlinear functions.

GEOMETRY AND MEASUREMENT

0010 Understand principles and procedures related to measurement.

For example: selecting and using appropriate units of measurement for a contextual situation; using and converting within and between different measurement systems; solving problems involving length, perimeter, area, volume, mass, angles, time, temperature, and speed; and determining the effects of changing linear dimensions on measures of perimeter, area, and volume.

0011 Understand principles of Euclidean geometry and properties of two- and three-dimensional figures.

For example: applying concepts and properties of points, lines, angles, and planes; applying geometric concepts (e.g., similarity, congruence, parallelism); analyzing and solving problems involving two- and three-dimensional figures (e.g., polygons, circles, prisms, cylinders, cones); and demonstrating knowledge of cross sections and nets of three-dimensional figures.

0012 Understand principles of coordinate and transformational geometry.

For example: representing geometric figures in the coordinate plane; applying geometric concepts (e.g., distance, midpoint, slope, parallel and perpendicular lines) to classify and analyze figures; applying transformations (e.g., translations, rotations, reflections, dilations); and using coordinate and transformational geometry to model and solve problems.

MATHEMATICAL PROCESSES AND REASONING

0013 Understand principles of problem solving.

For example: distinguishing between necessary and unnecessary information in word problems; demonstrating knowledge of developing formulas to calculate areas and volumes of simple geometric figures; applying appropriate reasoning to solve mathematical problems in contextual situations; and analyzing algorithms and formulas to determine their purpose or validity.

TEST OBJECTIVES
FIELD 37: MIDDLE GRADES MATHEMATICS

0014 Understand principles of mathematical reasoning.

For example: using counterexamples and principles of logic to evaluate arguments; understanding inductive and deductive reasoning; understanding the components of a formal argument (e.g., if...then statements); and demonstrating knowledge of evaluating the validity of an argument.

0015 Understand the techniques for communicating mathematical information and connections within and outside the domains of mathematics.

For example: using a variety of mathematical representations (e.g., graphic, symbolic, verbal) to communicate mathematical ideas and concepts; recognizing and analyzing connections among different mathematical concepts (e.g., geometry and algebra); and applying mathematics to solve problems in other disciplines and in everyday situations.