TITLE 6   PRIMARY AND SECONDARY EDUCATION
CHAPTER 64   SCHOOL PERSONNEL - COMPETENCIES FOR LICENSURE
PART 4   COMPETENCIES FOR ENTRY-LEVEL MATHEMATICS TEACHERS

6.64.4.1   ISSUING AGENCY: Public Education Department (PED)
[07-15-99; 6.64.4.1 NMAC - Rn, 6 NMAC 4.7.1.3.1, 10-31-01; A, 06-30-06; A, 10-31-07]

6.64.4.2   SCOPE: Chapter 64, Part 4, governs the competencies that will be used by New Mexico
institutions of higher education to establish a curriculum for persons seeking an endorsement in mathematics to a
New Mexico educator license.
[07-15-99; 6.64.4.2 NMAC - Rn, 6 NMAC 4.7.1.3.2, 10-31-01]

6.64.4.3   STATUTORY AUTHORITY: Sections 22-2-1, 22-2-2, and 22-10A-3, NMSA 1978.
[07-15-99; 6.64.4.3 NMAC - Rn, 6 NMAC 4.7.1.3.3, 10-31-01; A, 09-30-03]

6.64.4.4   DURATION: Permanent
[07-15-99; 6.64.4.4 NMAC - Rn, 6 NMAC 4.7.1.3.4, 10-31-01]

6.64.4.5   EFFECTIVE DATE: July 15, 1999, unless a later date is cited at the end of a section or
paragraph.
[07-15-99; 6.64.4.5 NMAC - Rn, 6 NMAC 4.7.1.3.5, 10-31-01]

6.64.4.6   OBJECTIVE: This rule is adopted by the (PED) for the purpose of establishing entry-level
mathematics competencies that are based on what beginning mathematics teachers must know and be able to do to
provide effective mathematics programs in New Mexico schools. The competencies were developed to ensure
alignment with the New Mexico's content standards and benchmarks for mathematics and with the national
standards of the national council of teachers of mathematics.
[07-15-99; 6.64.4.6 NMAC - Rn, 6 NMAC 4.7.1.3.6, 10-31-01; A, 06-30-06; A, 10-31-07]

6.64.4.7   DEFINITIONS: [Reserved]

6.64.4.8   REQUIREMENTS:
         A.   Beginning teachers seeking an endorsement in mathematics to an initial level 1 New Mexico
teaching license, must satisfy all of the requirements of the license as provided in PED rule for that license, which
includes, among other requirements, 24-36 semester hours in mathematics and passage of a content area test in
mathematics.
         B.   Teachers seeking to add an endorsement in mathematics to an existing New Mexico teaching
license of any level shall meet one of the following requirements:
              (1)   pass the content knowledge test(s) of the New Mexico teacher assessments as provided in 6.60.5.8
NMAC, or predecessor New Mexico teacher licensure examination or accepted comparable licensure test(s) from
another state in mathematics; or
              (2)   successfully complete an undergraduate academic major (24-36 semester hours), or coursework
equivalent to an undergraduate major or a graduate degree in mathematics; or
              (3)   obtain certification in mathematics for the appropriate grade level of New Mexico licensure from
the national board for professional teaching standards.
[07-15-99; 6.64.4.8 NMAC - Rn, 6 NMAC 4.7.1.3.8, 10-31-01; A, 09-30-03; A, 06-30-06; A, 10-31-07]

6.64.4.9   COMPETENCIES FOR ENTRY-LEVEL MATHEMATICS TEACHERS
         A.   Teachers will understand and use mathematics in problem-solving.
              (1)   Teachers for grades K-8 will be able to:
                   (a)   use problem-solving approaches to investigate and understand mathematical content;
                   (b)   formulate and solve problems from both mathematical and everyday situations;
                   (c)   identify, select and use appropriate problem-solving strategies; as well as develop and apply
their own strategies;
                   (d)   verify and interpret solutions to problems;
                   (e)   use mathematical language and symbolism to model problem situations.

(2)   Teachers for grades 5-9 will be able to meet the standards set for K-8 teachers.

(3)   Teachers for grades 7-12 will be able to:

    (a)   use a problem solving approach to investigate and understand mathematical concepts;

    (b)   formulate and solve problems from both mathematical and everyday experiences;

    (c)   develop their own processes and techniques for solving problems.

B.   Teachers will understand and use mathematics in communication.

(1)   Teachers for grades K-8 will be able to:

    (a)   identify and define mathematical concepts in a variety of situations;

    (b)   communicate mathematical ideas both verbally and in writing;

    (c)   use drawings, discussion, reading, and listening to learn and communicate mathematical ideas;

    (d)   use a variety of electronic media and manipulatives to explore and communicate mathematical concepts and problem solutions.

(2)   Teachers for grades 5-9 will be able to meet the standards set for K-8 teachers.

(3)   Teachers for grades 7-12 will be able to:

    (a)   develop skills in both written and oral communication of mathematical concepts;

    (b)   learn to communicate effectively at various levels of formality and with people who have differing levels of mathematical understanding.

C.   Teachers will understand and use mathematics in reasoning.

(1)   Teachers for grades K-8 will be able to:

    (a)   describe logical conclusions;

    (b)   use information sources, models and known facts to explain mathematical thinking;

    (c)   make and evaluate mathematical conjectures and validate their own mathematical thinking;

    (d)   recognize and construct logical arguments for mathematical statements, concepts, and principles;

    (e)   apply a variety of reasoning processes to include deductive and inductive reasoning.

(2)   Teachers for grades 5-9 will be able to meet the standards set for K-8 teachers.

(3)   Teachers for grades 7-12 will be able to:

    (a)   recognize patterns, make and refine conjectures and definitions, and construct both formal and heuristic proofs;

    (b)   judge the validity of mathematical arguments;

    (c)   formulate counterexamples.

D.   Teachers will understand and use mathematical connections.

(1)   Teachers for grades K-8 will be able to:

    (a)   show an understanding of the interrelationships within mathematics;

    (b)   connect mathematics to other disciplines and everyday situations.

(2)   Teachers for grades 5-9 will be able to meet the standards set for K-8 teachers.

(3)   Teachers for grades 7-12 will be able to:

    (a)   develop an understanding of the interrelationships within mathematics and an appreciation of its unity;

    (b)   understand and appreciate the power of mathematical language and symbolism in the development of mathematical concepts;

    (c)   explore the connections between mathematics and other disciplines;

    (d)   apply mathematics learned in one context to other contexts.

E.   Teachers will understand and use numbers, and their relationships, systems and theory.

(1)   Teachers for grades K-8 will be able to:

    (a)   construct number meanings through everyday experiences and the use of physical materials;

    (b)   understand prenumeration concepts.

    (c)   describe and compare ancient and modern numeration systems by relating counting, grouping, and place value concepts;

    (d)   develop number sense;

    (e)   identify different sets of numbers in the real number system;

    (f)   understand representations of numbers, including mixed numbers, fractions, decimals, and scientific notation;

    (g)   demonstrate ability to use models to explore and explain relationships among fractions, decimals, percents, ratios, and proportions;

     (h) use the relations of equality and inequality.

    (2) Teachers for grades 5-9 will be able to meet the standards set for K-8 teachers.

    (3) Teachers for grades 7-12 will be able to: Explore and discuss the properties, relations, and extensions of the real and complex numbers.

   F. Teachers will understand and use computation and estimation.

    (1) Teachers for grades K-8 will be able to:

     (a) model, explain, and develop proficiency with the basic number facts and algorithms, including addition, subtraction, multiplication and division;

     (b) recognize alternative algorithms for the four basic operations;

     (c) select and use computation techniques appropriate to specific problems and determine the reasonableness of solutions;

     (d) use estimation strategies;

     (e) recognize when estimates are appropriate.

    (2) Teachers for grades 5-9 will be able to meet the standards set for K-8 teachers.

    (3) Teachers for grades 7-12 will be able to:

     (a) understand and apply numerical computational and estimation techniques and extend them to symbolic expressions;

     (b) use estimation to assess the reasonableness of solutions.

   G. Teachers will have a foundation in geometric concepts.

    (1) Teachers for grades K-8 will be able to:

     (a) describe, model, draw and classify geometric figures;

     (b) investigate, predict, and describe the results of combining, subdividing and changing shapes;

     (c) develop spatial sense and relationships;

     (d) relate geometric and measurement ideas;

     (e) use geometric concepts and relationships to describe and model mathematical ideas and relationships to the world;

     (f) solve simple problems in two- and three-dimensional geometry involving parallelism, perpendicularity, congruence, similarity, translation, reflection, rotation, symmetry, and incidence.

    (2) Teachers for grades 5-9 will be able to meet the standards set for K-8 teachers.

    (3) Teachers for grades 7-12 will be able to:

     (a) understand the role of axiomatic systems in geometry;

     (b) develop both synthetic and algebraic geometric concepts using coordinates and vectors;

     (c) use geometry as a source of mathematical models for a variety of applications;

     (d) employ geometric reasoning as a problem solving strategy;

     (e) model features of the real world using different geometries.

   H. Teachers will understand and use measurement.

    (1) Teachers for grades K-8 will be able to:

     (a) determine what needs to be measured, select an appropriate unit of measurement, and then select an appropriate tool with which to measure;

     (b) use standard and nonstandard units for measurement to an appropriate degree of accuracy;

     (c) use estimation, informal procedures, and formulas to solve problems involving linear measures, area, volume, mass, and temperature by using both traditional and metric systems.

    (2) Teachers for grades 5-9 will be able to meet the standards set for K-8 teachers.

    (3) Teachers for grades 7-12 will be able to:

     (a) identify and use the appropriate units, tools of measurement, and degree of accuracy required in particular problems, making calculations of relative error as necessary;

     (b) apply measurement as a tool in other disciplines.

   I. Teachers will understand and use statistics and probability.

    (1) Teachers for grades K-8 will be able to:

     (a) collect data from real world experiences or surveys, organize and display data using various charts/graphs manually and by using appropriate technology, analyze and interpret the data, and write convincing arguments based on the data;

     (b) solve elementary statistical problems relating to measures of central tendency, measures of dispersion, regression equations, and non-linear regression;

     (c) critically examine and analyze data for reliability and validity;

   (d) demonstrate an understanding of randomness by conducting sampling experiments;

   (e) find experimental and theoretical discrete probabilities using sample spaces, tree diagrams, and other representations;

   (f) plan and conduct simulations to determine experimental probabilities;

   (g) compute the mathematical expectation of simple games and lotteries;

   (h) solve simple problems involving probability, inference, and the testing of hypotheses;

   (i) use simple combinations and permutations to solve counting problems.

  (2) Teachers for grades 5-9 will be able to meet the standards set for K-8 teachers.

  (3) Teachers for grades 7-12 will be able to:

   (a) understand measures of central tendency, variability, and correlation;

   (b) collect, display, analyze, and interpret sample data in a variety of situations;

   (c) investigate the role of estimation and probability in statistical analysis;

   (d) use experimental and theoretical probabilities to formulate and solve problems;

   (e) develop strategies for reasoning and making decisions based on uncertainty;

   (f) explore the probabilistic nature of statistical analyses including hypothesis testing, correlation, analysis of variance, and nonparametric methods.

 J. Teachers will understand and use patterns and functions.

  (1) Teachers for grades K-8 will be able to:

   (a) recognize, describe, extend, and create a wide variety of patterns;

   (b) represent relationships with manipulatives, tables, graphs, verbal and written statements, and formulas;

   (c) describe what a function means both intuitively and using formal mathematical language;

   (d) demonstrate a basic understanding of classes of functions and their properties; e.g. linear, exponential, polynomial, and periodic.

  (2) Teachers for grades 5-9 will be able to meet the standards set for K-8 teachers.

  (3) Teachers for grades 7-12 will be able to:

   (a) use multiple representations of functions, including symbolic expressions, verbal descriptions, tables, and graphs, and relate one representation to another;

   (b) use the language of functions to describe and model change;

   (c) use the concept of function in the study of mathematics and other disciplines.

 K. Teachers will understand and apply algebraic concepts.

  (1) Teachers for grades K-8 will be able to:

   (a) explore and use variables and open sentences to express mathematical relationships;

   (b) solve real world problems involving linear and quadratic equations and inequalities by using traditional techniques and graphing methods that use technology.

  (2) Teachers for grades 5-9 will be able to meet the standards set for K-8 teachers.

  (3) Teachers for grades 7-12 will be able to:

   (a) understand and apply the major concepts of linear and abstract algebra;

   (b) use theoretical results to understand tangible situations.

 L. Teachers will understand and apply concepts of calculus.

  (1) Not required of teachers for grades K-8.

  (2) Teachers for grade 5-9 will be able to:

   (a) recognize particular types of change such as linear, quadratic and exponential;

   (b) use graphs, diagrams, charts, physical models, and graphing technology to explore the notions of limit, differentiation, and integration, and interpret the relationships among them;

   (c) construct infinite sequences and series, relating them to non-terminating decimals and the approximation of functions;

   (d) solve real world problems involving average and instantaneous rates of change, area, volume, and curve length, and relate those to differentiation and integration.

  (3) Teachers for grades 7-12 will be able to:

   (a) investigate the phenomenon of change as a limiting process;

   (b) explore intuitively and in depth the concepts of limit, continuity, differentiation, and integration;

   (c) demonstrate an understanding of the underlying theory of analysis;

   (d) use properties and techniques of calculus to model phenomena in diverse settings.

 M. Teachers will understand and apply discrete processes.

    (1) not required of teachers for grades K-8;

    (2) not required of teachers for grades 5-9;

    (3) teachers for grades 7-12 will be able to: understand concepts and applications of discrete mathematics, such as graph theory, recurrence relations, linear programming, difference equations, and combinatorics.

    N. Teachers will understand the use of technology.

    (1) Teachers for grades K-8 will be able to:

     (a) use calculators and computers to represent mathematical ideas and construct different representations of mathematical concepts;

     (b) use calculators and computers to develop and use alternate strategies for solving problems;

     (c) use networking and information technologies to solve problems and broaden the scope of inquiry.

    (2) Teachers for grades 5-9 will be able to meet the standards set for K-8 teachers.

    (3) Teachers for grades 7-12 will be able to:

     (a) engender a broad array of mathematical modes of thinking through the use of powerful computing tools (including function graphers, curve fitters, symbolic manipulators, dynamic geometric software, and programming languages);

     (b) use calculators, spreadsheets, and statistical packages to solve problems;

     (c) use technology to explore probabilities through simulations;

     (d) use graphing calculators and computer algebra systems in the study and application of the calculus.

    O. Teachers will develop perspectives on mathematics as a human endeavor.

    (1) Teachers for grades K-8 will be able to:

     (a) understand the dynamic nature of mathematics and its increasingly significant role in social, cultural, and economic development;

     (b) develop an appreciation for the contributions made by various cultures to the growth and development of mathematical ideas;

     (c) investigate the contributions made by individuals, both female and male, and from a variety of cultures, in the development of ancient, modern, and current mathematical topics;

     (d) gain an understanding of the historical development of major school mathematics concepts.

    (2) Teachers for grades 5-9 will be able to meet the standards set for K-8 teachers.

    (3) Teachers for grades 7-12 will be able to:

     (a) explore the dynamic nature of mathematics and its increasingly significant role in social, cultural, and economic development;

     (b) gain an understanding of the historical development of major school mathematics concepts;

     (c) understand the historical development of non-Euclidean geometries and the questions relating to the parallel postulate involved in this development;

     (d) develop an appreciation of the contributions made by the various cultures to the growth and development of mathematical ideas;

     (e) investigate the contributions made by individuals, both female and male, and from a variety of cultures, in the development of ancient, modern, and current mathematical topics.

[07-15-99; 6.64.4.9 NMAC - Rn, 6 NMAC 4.7.1.3.9, 10-31-01]

6.64.4.10   **IMPLEMENTATION:** Institutions of higher education that prepare teachers shall deliver the competencies in a PED approved endorsement program within a range of twenty-four (24) to thirty-six (36) semester hours of credit twelve (12) semester hours of which must be upper division credit.

[07-15-99; 6.64.4.10 NMAC - Rn, 6 NMAC 4.7.1.3.10, 10-31-01; A, 06-30-06]

HISTORY OF 6.64.4 NMAC: [RESERVED]