PROPOSED REGULATION OF

THE STATE BOARD OF EDUCATION

LCB File No. R083-14

June 26, 2014

EXPLANATION – Matter in *italics* is new; matter in brackets **[omitted material]** is material to be omitted.

AUTHORITY: §§1 and 2, NRS 385.080, 385.110, 389.0185 and 389.0187.

A REGULATION relating to education; replacing existing standards for mathematics with the
        Common Core State Standards for mathematics developed by the Common Core State
        Standards Initiative for high school; providing for the implementation of the Common
        Core State Standards in prescribed school years; and providing other matters properly
        relating thereto.

Legislative Counsel's Digest:
        Existing law requires the State Board of Education to adopt regulations establishing
courses of study for mathematics and the grade levels for which those courses of study apply.
(NRS 385.110, 389.018, 389.0185, 389.0187) **Section 1** of this regulation adopts the Common
Core State Standards for mathematics developed for high school by the Common Core State
Standards Initiative, and **section 2** of this regulation repeals existing performance standards for
mathematics in high school. **Section 1** also provides that, by the beginning of high school, pupils
are required to know and be able to do everything required in the previous grades for courses in
mathematics offered in public schools.

    Section 1.   Chapter 389 of NAC is hereby amended by adding thereto a new section to read

as follows:

    1.   The Common Core State Standards for mathematics developed by the Common Core

State Standards Initiative for high school are hereby adopted by reference as those standards

existed on June 2, 2010. A copy of the Common Core State Standards for mathematics may be

obtained at no cost from the Common Core State Standards Initiative on the Internet at

http://www.corestandards.org.

2.   By the beginning of high school, pupils must know and be able to do everything required in the previous grades for courses in mathematics offered in public schools.

3.   For the 2014-2015 school year and each school year thereafter, instruction in mathematics in high school must be designed so that by the completion of high school, pupils meet the standards adopted pursuant to subsection 1.

Sec. 2.   NAC 389.465, 389.4675, 389.468, 389.470, 389.472, 389.474, 389.476, 389.478, 389.480, 389.482 and 389.484 are hereby repealed.

TEXT OF REPEALED SECTIONS

389.465   Mathematics: Generally. (NRS 385.080, 385.110, 389.0185, 389.019, 389.520)

1.   A local school district shall ensure that pupils, by the completion of the 12th grade, are able to comply with the content and performance standards required for mathematics adopted by the State Board of Education. In carrying out this requirement, the district shall:

(a) Develop courses which must encompass all of the content and performance standards required for mathematics by the completion of the 12th grade; and

(b) Provide to each pupil, upon enrollment in high school, a listing of the courses that encompass all of the content and performance standards required for mathematics by the completion of the 12th grade.

2. If a pupil enrolls in a mathematics course listed under NAC 389.468 to 389.484, inclusive, the school district shall notify the pupil in writing at the time of enrollment in the course that:

(a) The objectives of the mathematics course may include standards for mathematics in addition to the standards that are required to be completed by the end of 12th grade; and

(b) The mathematics courses listed under NAC 389.468 to 389.484, inclusive, are not designed to ensure that the content and performance standards for mathematics that are required to be completed by the end of 12th grade will be met by completion of a course listed under NAC 389.468 to 389.484, inclusive, unless that course is included in the listing provided pursuant to paragraph (b) of subsection 1.

389.4675   Mathematics: Performance standards. (NRS 385.080, 385.110, 389.0185, 389.520)   By the end of the 12th grade, pupils must know and be able to do everything required in the previous grades for courses in mathematics offered in public schools. Instruction in the 12th grade in mathematics must be designed so that pupils meet the following performance standards by the completion of the 12th grade:

1. For the areas of numbers, number sense and computation, to solve problems, communicate, reason and make connections within and beyond the field of mathematics, a pupil must accurately calculate and use estimation techniques, number relationships, operation rules and algorithms, and determine the reasonableness of answers and the accuracy of solutions. A pupil must demonstrate the ability to:

(a) Determine an approximate value of radical and exponential expressions using a variety of methods;

(b) Solve mathematical problems involving exponents and roots;

(c) Perform addition, subtraction and scalar multiplication on matrices; and

(d) Identify and apply real number properties to solve problems.

2. For the areas of patterns, functions and algebra, to solve problems, communicate, reason and make connections within and beyond the field of mathematics, a pupil must use various algebraic methods to analyze, illustrate, extend and create numerous representations, including, without limitation, words, numbers, tables, and graphs of patterns, functions and algebraic relations. A pupil must demonstrate the ability to:

(a) Add, subtract, multiply and factor first and second degree polynomials connecting the algebraic process and arithmetic process;

(b) Determine the domain and the range of functions, including, without limitation, linear, quadratic and absolute value, algebraically and graphically;

(c) Solve systems of two linear equations algebraically and graphically, and verify solutions with and without the assistance of technology;

(d) Use algebraic expressions to identify and describe the nth term of a sequence;

(e) Isolate any variable in given equations, inequalities, proportions and formulas to use in mathematical and practical situations;

(f) Simplify algebraic expressions, including, without limitation, exponents and radicals;

(g) Solve absolute value equations and inequalities algebraically and graphically; and

(h) Solve, with and without the assistance of technology, mathematical and practical problems involving linear and quadratic equations with a variety of methods, including, without limitation, discrete methods.

3. For the area of measurement, to solve problems, communicate, reason and make connections within and beyond the field of mathematics, a pupil must use appropriate tools and

techniques of measurement to determine, estimate, record and verify direct and indirect measurements. A pupil must demonstrate the ability to:

(a) Estimate and convert units of measure between customary and metric systems;

(b) Select and use appropriate tools of measurement, techniques and formulas to solve problems in mathematical and practical situations;

(c) Justify, differentiate and communicate the differences between precision, error and tolerance in practical problems;

(d) Interpret and apply consumer data presented in charts, tables and graphs to make informed financial decisions related to practical applications; and

(e) Determine the measurement of unknown dimensions, angles, areas and volumes by using relationships and formulas to solve problems.

4. For the areas of spatial relationships, logic and geometry, to solve problems, communicate and make connections within and beyond the field of mathematics, a pupil must identify, represent, verify and apply spatial relationships and geometric properties. A pupil must demonstrate the ability to:

(a) Identify and apply the properties of interior and exterior angles of polygons to solve mathematical and practical problems;

(b) Use coordinate geometry to graph linear equations and find possible solutions to those equations;

(c) Use complementary and supplementary angles, congruent angles, vertical angles, angles formed when parallel lines are cut by a transversal and angles in polygons to solve problems;

(d) Apply the Pythagorean Theorem and its converse in mathematical and practical situations;

(e) Draw and construct geometric figures to solve problems and to demonstrate geometric relationships;

(f) Identify and use the parts of a circle to solve mathematical and practical problems;

(g) Apply properties of similarity using right triangle trigonometry to find missing angles and sides;

(h) Use coordinate geometry and algebraic techniques to determine the slope of a line;

(i) Identify parallel, perpendicular and intersecting lines by slope;

(j) Find possible solution sets of systems of equations whose slopes indicate parallel; and

(k) Formulate, evaluate and justify arguments using inductive and deductive reasoning in mathematical and practical situations.

5. For the area of data analysis, to solve problems, communicate, reason and make connections within and beyond the field of mathematics, a pupil must collect, organize, display, interpret and analyze data to determine statistical relationships and probability projections. A pupil must demonstrate the ability to:

(a) Organize statistical data by using tables, graphs and matrices, with and without the assistance of technology;

(b) Select and apply appropriate statistical measures in mathematical and practical situations;

(c) Distinguish between a sample and a census;

(d) Identify sources of bias and their effect on data representations and statistical conclusions;

(e) Use the shape of a normal distribution to compare and analyze data from a sample;

(f) Apply permutations and combinations to mathematical and practical situations, including, without limitation, the Fundamental Counting Principle;

(g) Determine the probability of an event, with and without replacement, using sample spaces;

(h) Design, conduct, analyze and effectively communicate the results of multistage probability experiments;

(i) Design, construct, analyze and select an appropriate type of graphical representation to communicate the results of a statistical experiment; and

(j) Formulate and justify inferences based on a valid data sample.

6.   For the area of problem solving, to develop the ability to solve problems, a pupil must engage in developmentally appropriate opportunities for problem solving in which there is a need to use various approaches to investigate and understand mathematical concepts to formulate problems, find solutions to problems, develop and apply strategies to solve problems, and integrate mathematical reasoning, communication and connections. A pupil must demonstrate the ability to:

(a) Generalize solutions and apply previous knowledge to new problem-solving situations;

(b) Determine an efficient problem-solving strategy and verify, interpret and evaluate the results with respect to the original problem;

(c) Apply problem-solving strategies until a solution is found or it is clear that no solution exists;

(d) Interpret and solve a variety of mathematical problems by paraphrasing;

(e) Identify necessary and extraneous information;

(f) Check the reasonableness of a solution;

(g) Apply technology as a tool in problem-solving situations; and

(h) Apply combinations of proven strategies and previous knowledge to solve nonroutine problems.

7.   For the area of mathematical communication, to develop the ability to communicate mathematically, a pupil must solve problems in which there is a need to obtain information in everyday life by reading, listening and observing to translate information into mathematical language and symbols, process information mathematically, discuss and exchange ideas about mathematics as part of learning, read various fiction and nonfiction texts to learn about mathematics and present the results in written, oral and visual formats. A pupil must demonstrate the ability to:

(a) Use a variety of techniques to solve mathematical problems;

(b) Evaluate written and oral presentations in mathematics;

(c) Model and explain mathematical relationships using oral, written, graphic and algebraic methods;

(d) Communicate and evaluate mathematical thinking based on the use of definitions, properties, rules and symbols in problem solving; and

(e) Communicate strategies and solutions to mathematical problems using oral and written expression of everyday language.

8.   For the area of mathematical reasoning, to develop the ability to reason mathematically, a pupil must solve problems in which there is a need to investigate mathematical ideas and construct the pupil's own learning in all content areas to reinforce and extend his or her ability to reason logically, reflect on, clarify and justify his or her thinking, ask questions to extend his or her learning, use patterns and relationships to analyze mathematical situations, and determine

relevant, irrelevant and sufficient information to solve mathematical problems. A pupil must demonstrate the ability to:

(a) Construct a valid argument;

(b) Recognize and apply inductive and deductive reasoning;

(c) Review and refine the assumptions and steps used to derive conclusions in mathematical arguments;

(d) Make and test conjectures about algebraic and geometric properties based on mathematical principles; and

(e) Justify the validity of an argument.

9.   For the area of mathematical connections, to develop the ability to make mathematical connections, a pupil must solve problems in which there is a need to view mathematics as an integrated whole, including linking new concepts to prior knowledge, identifying relationships between content strands and integrating mathematics with other disciplines, thereby allowing the flexibility to approach problems in a variety of ways within and beyond the field of mathematics. A pupil must demonstrate the ability to:

(a) Use mathematical ideas from one area of mathematics to explain an idea from another area of mathematics;

(b) Explain the relationship between concepts and procedures;

(c) Use the connections among mathematical topics to develop multiple approaches to problems;

(d) Apply mathematical thinking and modeling to solve problems that arise in other disciplines, including, without limitation, rhythm in music and motion in science; and

(e) Identify, explain and apply mathematics in everyday life.

389.468 Prealgebra. (NRS 385.080, 385.110)   A course of study in prealgebra must include instruction designed to teach the pupil to do the following:

1.   Demonstrate strategies for solving problems, including the use of sets, Venn diagrams, sketching diagrams and techniques of estimation.

2.   Solve and graph equations and inequalities of the first degree.

3.   Demonstrate an understanding of exponents.

4.   Evaluate algebraic expressions and algebraic formulas by using the correct order of operations.

5.   Perform basic monomial operations.

6.   Add and subtract polynomials.

7.   Formulate and solve problems in everyday life by using ratio, proportion and percentages.

8.   Formulate and solve problems in everyday life by using the basic techniques of algebra.

389.470 Algebra I. (NRS 385.080, 385.110)   A course of study in Algebra I must include instruction designed to teach the pupil to do the following:

1.   Formulate and solve problems in everyday life by using the basic techniques of algebra.

2.   Solve and graph linear equations and linear inequalities.

3.   Perform algebraic operations with polynomials.

4.   Solve quadratic equations by algebraic methods.

5.   Depict and represent problems or phenomena in everyday life by using algebra.

6.   Depict and represent problems in everyday life by using matrices.

7.   Solve linear equations by using algebraic methods.

8.   Solve problems by using the basic laws of exponents and radicals.

9.   Justify the logic of algebraic procedures by using field properties.

10.   Formulate predictions based on collections of data points.

389.472   Geometry. (NRS 385.080, 385.110)   A course of study in geometry must include instruction designed to teach the pupil to do the following:

1.   Investigate and compare the different geometric systems to develop an understanding of an axiomatic system.

2.   Compare and contrast properties of geometric figures on a plane.

3.   Investigate and draw three-dimensional objects.

4.   Create and validate formulas for two-dimensional figures and three-dimensional objects.

5.   Construct proofs for mathematical assertions, including indirect proofs and paragraph proofs.

6.   Analyze and solve problems by using inductive reasoning and deductive reasoning.

7.   Construct figures to discover and validate mathematical assertions.

8.   Apply coordinate geometry to validate properties of geometric figures.

9.   Investigate and solve problems by using relationships of the right triangle.

10.   Formulate and solve problems in everyday life by using geometric models.

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389.474 Algebra II. (NRS 385.080, 385.110) A course of study in Algebra II must include instruction designed to teach the pupil to do the following:

1. Analyze the effect of changing parameters on graphs of functions.

2. Formulate and solve problems in everyday life by using matrices.

3. Investigate transformations on different classes of algebraic functions by using technology.

4. Solve linear and quadratic equations and inequalities by using algebraic methods and apply these skills to solving problems in everyday life.

5. Solve systems of equations and inequalities and apply these skills to solving problems in everyday life.

6. Solve algebraic problems by using absolute value, exponential functions and logarithmic functions.

7. Prove algebraic assertions by using field properties.

8. Organize data to aid in the interpretation of data and to make predictions on the basis of such data.

9. Represent and solve problems by using linear programming and difference equations.

10. Develop the complex system of numbers.

11. Investigate series and sequences.

12. Investigate different principles of counting and their use in probability.

389.476 Trigonometry. (NRS 385.080, 385.110) A course of study in trigonometry must include instruction designed to teach the pupil to do the following:

1. Solve problems in everyday life by using transformations, coordinates and vectors.

2. Validate mathematical assertions by using techniques of trigonometry.

3. Demonstrate how phenomena occur in everyday life by using trigonometric and circular functions.

4. Investigate the connections between trigonometric functions, polar coordinates, series and complex numbers.

5. Investigate transformations on trigonometric functions by using technology.

389.478 Analytic geometry. (NRS 385.080, 385.110) A course of study in analytic geometry must include instruction designed to teach the pupil to do the following:

1. Demonstrate an understanding of coordinate geometry.

2. Recognize the equations of conic sections in both polar and rectangular forms.

3. Recognize the three-dimensional conic sections generated by the revolution of a locus of points.

4. Use and sketch the graphs of the polynomial functions and the rational functions.

5. Demonstrate the translation and rotation of axes in a two-dimensional system.

6. Demonstrate an understanding of the operation on a vector and the properties of vectors.

7. Write vectors and parametric equations to solve problems.

8. Demonstrate the translation and rotation of axes in a three-dimensional system.

389.480 Precalculus. (NRS 385.080, 385.110)   A course of study in precalculus must include instruction designed to teach the pupil to do the following:

1.   Analyze the graphs of polynomial, rational, radical and transcendental functions by using technology.

2.   Determine the maximum and minimum points of a graph and interpret the results in situations involving problems in everyday life.

3.   Investigate limits by examining infinite sequences and series and areas under curves.

4.   Investigate different techniques available to solve problems in everyday life.

5.   Solve problems in everyday life by using complex numbers and vectors.

6.   Investigate the relationship between vectors and complex numbers.

7.   Investigate and describe functions and their inverses by using techniques to sketch curves.

8.   Investigate and describe the general properties and behavior of classes of functions.

9.   Validate mathematical assertions by using mathematical induction.

10.   Solve problems in everyday life by applying the techniques of elementary probability and statistics.

389.482 Calculus. (NRS 385.080, 385.110)   A course of study in calculus must include instruction designed to teach the pupil to do the following:

1.   Interpret limits geometrically and evaluate them.

2.   Differentiate between continuous functions and noncontinuous functions.

3.   Analyze domains of functions.

4.   Differentiate rational, transcendental and implicitly defined functions.

5.   Investigate the upper and lower sums of a function by using technology.

6. Analyze the graphs of functions by using technology.

7. Integrate elementary functions.

8. Solve problems in everyday life by using the techniques of calculus.

389.484 Probability and statistics. (NRS 385.080, 385.110) A course of study in probability and statistics must include instruction designed to teach the pupil to do the following:

1. Analyze the effects of transformations of data on measures of central tendency and variability.

2. Design a statistical experiment to study a problem occurring in everyday life, interpret and communicate the outcomes, and test the hypothesis by using the appropriate statistics.

3. Analyze sets of data assumed to be distributed normally by using the properties of a normal curve.

4. Demonstrate an understanding of notations for combinations and permutations.

5. Apply the concept of a random variable to generate and interpret probability distributions including binomial, uniform, normal and chi square.

6. Solve problems in everyday life by using the techniques of statistical analysis.

7. Solve problems in everyday life by using conditional probability.

8. Formulate and solve problems in the physical world by using techniques in statistical analysis.