LCB File No. R155-06

PROPOSED REGULATION OF THE STATE BOARD OF EDUCATION

Explanation: Matter in italics is new; matter in brackets ~~[ ]~~ is material to be omitted.

MATHEMATICS

Statutory Authority: NRS 385.080 and 389.520

Section 1. Chapter 389 of NAC is hereby amended by adding thereto the provisions set forth as sections 2 to 11 inclusive, of this regulation to read as follows:

Section 2. NAC 389.236 Mathematics is hereby amended to read as follows:

NAC 389.236 Mathematics. (NRS 385.080**,** 389.520**)** Instruction in kindergarten in mathematics must be designed so that pupils meet the following performance standards by the completion of kindergarten:

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) Use concrete objects to model simple sums and differences;~~
~~(b) Count to 20;~~
~~(c) Recognize, read and write numbers from 0 through 10;~~
~~(d) Estimate the number of objects in a set with up to 10 members and verify by counting; and~~
~~(e) Use the ordinal positions from first through third.]~~

(a) Recognize, read, and write numbers from 0 – 10;
(b) Identify ordinal positions first to third;
(c) Match the number of objects in a set to the correct numeral 0 – 10;
(d) Recognize relationships of more than, less than, and equal to;
(e) Count to 20 by demonstrating one-to-one correspondence using objects; and
(f) Use concrete objects to model simple addition and subtraction.

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) Sort and describe objects by similar attributes;~~
~~(b) Recognize and replicate a pattern; and~~
~~(c) Identify and create sets of objects containing unequal numbers of items, describing them as more or less.]~~

(a) Identify attributes used to sort objects.

(b) Identify and create sets of objects with unequal amounts, describing them as greater than or less than.

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) ~~[Compare and order objects by size, communicating their similarities and differences;]~~ ***Compare, order, and describe objects by size;***

(b) Identify and sort pennies, nickels and dimes; and

(c) Recite, in order, the days of the week.

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 two-dimensional shapes such as circles, triangles and rectangles, including squares, regardless of orientation;

(b) ~~[Use position words such as "middle," "before" or "down" to place objects; and]~~ ***Demonstrate an understanding of relative position words, including before/after, far/near, and over/under, to place objects.***

(c) Identify two-dimensional figures as they appear in the environment, such as windows are shaped like rectangles;

(d) Identify three-dimensional figures in the environment;

(e) Sort and classify objects by color and shape; and

(f) Put events in a logical sequence.

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 ~~[collect and describe data.]~~ ***:***

(a) Collect, organize, and record data using objects and pictures; and

(b) Represent data in a variety of ways in response to questions posed by teachers.

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) Use efficient approaches to investigate and understand mathematical concepts;~~
~~(b) Find solutions to problems that occur in everyday situations;~~
~~(c) Select, modify, develop and apply strategies to solve a wide variety of problems;~~
~~(d) Transfer and generalize previous experience to new problem-solving situations;~~
~~(e) Demonstrate persistence in problem solving;~~
~~(f) Explain and verify results; and~~
~~(g) Use technology as a tool in problem solving.]~~

(a) Apply previous experience and knowledge to new problem solving situations;

(b) Explain and verify results with respect to the original problem;

(c) Try more than one strategy when the first strategy proves to be unproductive; and

(d) Use technology, including calculators, to develop mathematical concepts.

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 ***from the real world through reading, listening and observing in order to*** ~~[,]~~ translate the information into mathematical language and symbols, process the information mathematically, ***discuss and exchange ideas about mathematics as part of learning, read a variety of 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) Obtain information by reading, listening, observing and inquiring and use that information to solve mathematical problems;~~

~~(b) Use mathematical language and symbols to explain thinking and processes and translate ideas into everyday language;~~

~~(c) Present mathematical ideas and solutions in written, oral and visual forms;~~

~~(d) Discuss, explain, justify and evaluate mathematical ideas and solutions; and~~

~~(e) Use physical, pictorial and symbolic forms to represent mathematical ideas and relationships.]~~

(a) Use inquiry techniques to solve mathematical problems;

(b) Use physical materials, models, pictures, or writing to represent and communicate mathematical ideas;

(c) Identify and translate key words and phrases that imply mathematical operations; and

(d) Use everyday language, both orally and in writing, to communicate strategies and solutions to mathematical problems

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 ~~[significant]~~ mathematical ideas and construct his own learning in all content areas to ~~[justify and enhance his ability to think and reason logically]~~ ***reinforce and extend his logical reasoning abilities, reflect on, clarify, and justify his thinking, ask questions to extend his learning, use patterns and relationships to analyze mathematical situations, and determine relevant, irrelevant, and/or sufficient information to solve mathematical problems***. A pupil must demonstrate the ability to:

~~[(a) Construct meaning and justify thinking by investigating mathematical ideas, patterns and relationships;~~

~~(b) Reinforce and extend abilities for logical reasoning;~~

~~(c) Ask questions to reflect on, clarify and extend thinking;~~

~~(d) Review, refine, explain and justify mathematical processes, arguments and solutions using manipulatives, physical models and abstract ideas; and~~

~~(e) Determine the relevancy and sufficiency of information to solve mathematical problems.]~~

(a) Draw logical conclusions about mathematical problems;

(b) Discuss the steps used to solve a mathematical problem; and

(c) Justify and explain the solutions to problems using physical models.

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) View mathematics as an integrated whole and identify relationships between content strands;~~
~~(b) Identify practical applications of mathematical principles that can be applied to other disciplines;~~
~~(c) Use and analyze the connections within and beyond the field of mathematics in a variety of ways to solve problems;~~
~~(d) Link new concepts to prior knowledge; and~~
~~(e) Apply mathematical thinking and modeling to solve problems that arise in other disciplines and in everyday life.]~~

(a) Apply mathematical thinking and modeling to solve problems that arise in other disciplines, such as rhythm in music and motion in science; and

(b) Identify mathematics used in everyday life.

Section 3. NAC 389.2419 Mathematics is hereby amended to read as follows:

NAC 389.2419 Mathematics. (NRS 385.080**,** 389.520**)** By the end of the first grade, pupils must know and be able to do everything required in kindergarten for mathematics offered in public schools. Instruction in the first grade in mathematics must be designed so that pupils meet the following performance standards by the completion of the first 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) Identify and model basic addition facts, sums through 100 and the corresponding subtraction facts;~~
~~(b) Write, model, and describe one-step addition and subtraction problems;~~
~~(c) Use the patterns in numbers to count by 1s, 2s, 5s and 10s to 100;~~
~~(d) Read, write, order and compare numbers from 0 through 100;~~
~~(e) Estimate the number of objects in a set through 10;~~
~~(f) Read and write number words from 0 through 10;~~
~~(g) Use the ordinal positions from 1st through 10th;~~
~~(g) Use, model, and identify place value positions of 1s and 10s; and~~
(h) ~~Identify and model a whole and one half.]~~

(a) Identify, model, read, and write place value positions of 1's and 10's;

(b) Identify the value of a given digit in the 1's and 10's place;

(c) Identify and model a whole;

(d) Identify and model 1/2 as two equal parts of a whole or a set of objects;

(e) Read, write, compare, and order numbers from 0 – 100;

(f) Identify ordinal positions first to tenth;

(g) Read and write number words to 10;

(h) Create, compare, and describe sets of objects and numbers from 0 - 100 as greater than, less than, or equal to (>, <, =);

(i) Use number patterns and models to count by 2's, 5's, and 10's to 100;

(j) Identify and model basic addition facts (sums to 10) and the corresponding subtraction facts;

(k) Estimate the number of objects in a set to 10 and verify by counting;

(l) Demonstrate the joining and separating of sets with 20 or fewer objects;

(m) Model the meaning of addition and subtraction in a variety of ways including the comparison of sets using objects, pictorial representations, and symbols; and

(n) Use mathematical vocabulary and symbols to describe addition, subtraction, and equality.

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) Recognize, describe, extend and create simple repeating patterns using symbols, objects and manipulatives; ~~[and]~~

(b) ~~[Create, compare and describe sets of objects as having more, fewer or an equal number of objects.]~~ ***Recognize that unknowns in an addition or subtraction equation represent a missing value that will make the statement true; and***

(c) Create, compare, and describe sets of objects as greater than, less than, or equal to.

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) ~~[Compare and order objects by length and weight, communicating their similarities and differences]~~ ***Compare, order, describe, and represent objects by length and weight***;

(b) Compare and measure length and weight, using nonstandard units of measurement;

(c) Determine the value of any set of pennies, nickels and dimes;

(d) Recite the months of the year in order;

(e) Use a calendar to identify the days, weeks, months and year; ***and***

(f) Read time to the nearest hour ~~[and half hour; and~~

~~(g) Distinguish between day and night]~~.

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) Name, sort and sketch two-dimensional shapes such as circles, triangles and rectangles, including squares, regardless of orientation;

(b) ~~[Use position words such as "between," "left" or "near" to describe the location of objects; and~~

~~(c)]~~ Identify and replicate two-dimensional designs that contain a line of symmetry.

(c) Demonstrate an understanding of position words, including down/up, left/right, top/bottom, and between/middle, by describing the relative location of objects;

(d) Identify and name three-dimensional figures in the environment;

(e) Sort and classify objects by size or thickness; and

(f) Identify what comes next in a step-by-step story or event sequence.

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 ~~[collect and describe data.]~~***:***

(a) Collect, organize, and record data in response to questions posed by teacher and/or students; and

(b) Use tally marks to represent data.

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) Use efficient approaches to investigate and understand mathematical concepts;~~
~~(b) Find solutions to problems that occur in everyday situations;~~
~~(c) Select, modify, develop and apply strategies to solve a wide variety of problems;~~
~~(d) Transfer and generalize previous experience to new problem-solving situations;~~
~~(e) Demonstrate persistence in problem solving;~~
~~(f) Explain and verify results; and~~
~~(g) Use technology as a tool in problem solving.]~~

(a) Apply previous experience and knowledge to new problem solving situations;

(b) Explain and verify results with respect to the original problem;

(c) Try more than one strategy when the first strategy proves to be unproductive; and

(d) Use technology, including calculators, to develop mathematical concepts.

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 ***from the real world through reading, listening and observing in order to*** ~~[,]~~ translate the information into mathematical language and symbols, process the information mathematically, ***discuss and exchange ideas about mathematics as part of learning, read a variety of 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) Obtain information by reading, listening, observing and inquiring and use that information to solve mathematical problems;~~
~~(b) Use mathematical language and symbols to explain thinking and processes and translate ideas into everyday language;~~
~~(c) Present mathematical ideas and solutions in written, oral and visual forms;~~
~~(d) Discuss, explain, justify and evaluate mathematical ideas and solutions; and~~
~~(e) Use physical, pictorial and symbolic forms to represent mathematical ideas and relationships.]~~

(a) Use inquiry techniques to solve mathematical problems;

(b) Use physical materials, models, pictures, or writing to represent and communicate mathematical ideas;

(c) Identify and translate key words and phrases that imply mathematical operations; and

(d) Use everyday language, both orally and in writing, to communicate strategies and solutions to mathematical problems.

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 ~~[significant]~~ mathematical ideas and construct his own learning in all content areas to ~~[justify and enhance his ability to think and reason logically]~~ ***reinforce and extend his logical reasoning abilities, reflect on, clarify, and justify his thinking, ask questions to extend his learning, use patterns and relationships to analyze mathematical situations, and determine relevant, irrelevant, and/or sufficient information to solve mathematical problems***. A pupil must demonstrate the ability to:

~~[(a) Construct meaning and justify thinking by investigating mathematical ideas, patterns and relationships;~~

~~(b) Reinforce and extend abilities for logical reasoning;~~

~~(c) Ask questions to reflect on, clarify and extend thinking;~~

~~(d) Review, refine, explain and justify mathematical processes, arguments and solutions using manipulatives, physical models and abstract ideas; and~~

~~(e) Determine the relevancy and sufficiency of information to solve mathematical problems.]~~

(a) Draw logical conclusions about mathematical problems;

(b) Discuss the steps used to solve a mathematical problem; and

(c) Justify and explain the solutions to problems using physical models.

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) View mathematics as an integrated whole and identify relationships between content strands;~~

~~(b) Identify practical applications of mathematical principles that can be applied to other disciplines;~~

~~(c) Use and analyze the connections within and beyond the field of mathematics in a variety of ways to solve problems;~~

~~(d) Link new concepts to prior knowledge; and~~

~~(e) Apply mathematical thinking and modeling to solve problems that arise in other disciplines and in everyday life.]~~

(a) Apply mathematical thinking and modeling to solve problems that arise in other disciplines, such as rhythm in music and motion in science; and

(b) Identify mathematics used in everyday life.

Section 4. NAC 389.2435 Mathematics is hereby amended to read as follows:

NAC 389.2435 Mathematics. (NRS 385.080**,** 389.520**)** By the end of the second 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 second grade in mathematics must be designed so that pupils meet the following performance standards by the completion of the second 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) Identify and model basic addition facts for sums through 18 and the corresponding subtraction facts;~~

~~(b) Immediately recall from memory addition facts for sums through 10 and the corresponding subtraction facts;~~

~~(c) Add and subtract multiplace numbers without regrouping;~~

~~(d) Generate, write and solve one-step addition and subtraction problems based on practical situations;~~

~~(e) Use decimals to show amounts of money;~~

~~(f) Use the patterns in numbers to skip count;~~

~~(g) Estimate, with reasonable results, the number of objects in a set through 20;~~

~~(h) Read and write numbers through 20 and use modeling and identifying for the 1st through 20th ordinal positions;~~

~~(i) Use modeling and identifying to place value positions of 1s, 10s and 100s; and~~

~~(j) Identify, model and label 1/2 and 1/4 as parts of a whole.]~~

(a) Identify, use, and model place value positions of 1's, 10's and 100's;

(b) Identify the value of a given digit in the 1's, 10's and 100's place;

(c) Identify equal parts of a whole;

(d) Identify and model the unit fractions 1/2 and 1/4 as equal parts of a whole or sets of objects;

(e) Read, write, compare, and order numbers from 0 – 999;

(f) Identify ordinal positions first to twentieth;

(g) Read and write number words to 20;

(h) Create, compare, and describe sets of objects and numbers from 0 - 100 as greater than, less than, or equal to (>, <, =);

(i) Use number patterns to skip count;

(j) Identify and model basic addition facts (sums to 18) and the corresponding subtraction facts;

(k) Immediately recall basic addition facts (sums to 18) and the corresponding subtraction facts;

(l) Estimate the number of objects in a set to 20 and verify by counting;

(m) Add and subtract one- and two-digit numbers without regrouping;

(n) Generate and solve one-step addition and subtraction problems based on practical situations;

(o) Model addition and subtraction in a variety of ways using pictorial representations and symbols to illustrate subtraction of sets, comparison of sets, and missing addends; and

(p) Reinforce the use of mathematical vocabulary and symbols to describe addition, subtraction, and equality.

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) Recognize, describe, extend, create and use repeating and increasing patterns, symbols, objects and manipulatives to solve problems;

(b) ~~[Use variables and open sentences to express relationships;~~

~~(c) Create, model, explain and solve problems by using addition and subtraction; and~~

~~(d) Generate and solve problems based on various numerical sentences and represent mathematical situations using numbers, symbols and words.]~~ ***Use patterns and their extensions to solve problems;***

(c) Model, explain, and identify missing operations and missing numbers in open number sentences involving number facts in addition and subtraction;

(d) Complete number sentences with the appropriate words and symbols (+, -, =); and

(e)Represent mathematical situations using numbers, symbols, and words.

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) Compare and order objects by various measurable attributes, including, without limitation, time, temperature, length, weight, capacity and area, and describe and define those various attributes;

(b) ~~[Compare objects that are greater than, less than, or equal to a given unit of measurement such as an inch, yard, centimeter and meter]~~ ***Compare objects to standard whole units to find objects that are greater than, less than, and/or equal to a given unit*** ;

(c) Determine the value of any given set of coins;

(d) ~~[Recite and use the months of the year in sequential order and use a calendar to identify days, weeks, months and years; and~~

~~(e) Read the time of day to the nearest quarter hour and distinguish between "a.m." and "p.m."]~~ ***Use decimals to show money amounts;***

(e) Recognize equivalent combinations of coins;

(f) Read time to the nearest half hour and quarter hour;

(g) Use elapsed time in one hour increments, beginning on the hour, to determine start, end, and elapsed time; and

(h)Recognize that there are 12 months in 1 year, 7 days in 1 week, and 24 hours in 1 day.

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) Describe and compare circles, triangles and rectangles, including squares, regardless of position;~~

~~(b) Describe the location of objects and place objects in position using descriptive words such as before, far, below and left;~~

~~(c) Compare the size of similar two-dimensional figures and identify shapes that are congruent;~~

~~(d) Identify symmetry in figures in the environment and create figures and designs that have a line of symmetry; and~~

~~(e) Identify, name, sort, describe, compare and contrast two-dimensional and three-dimensional figures.]~~

(a) Describe, sketch, and compare two-dimensional shapes regardless of orientation;

(b) Identify congruent and similar shapes (circles, triangles, and rectangles including squares);

(c) Identify figures with symmetry as they appear in the environment;

(d) Identify, name, sort, and describe two- and three-dimensional geometric figures and objects including circle/sphere and square/cube; and

(e) Sort and classify objects by two or more attributes.

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 ~~[collect and describe data.]~~:

(a) Collect, record, and classify data in response to questions posed by teacher and/or students;

(b) Use tables, pictographs, and bar graphs to represent data; and

(c) Use informal concepts of probability (certain and impossible) to make predictions about future events.

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) Use efficient approaches to investigate and understand mathematical concepts;~~
~~(b) Find solutions to problems that occur in everyday situations;~~
~~(c) Select, modify, develop and apply strategies to solve a wide variety of problems;~~
~~(d) Transfer and generalize previous experience to new problem-solving situations;~~
~~(e) Demonstrate persistence in problem solving;~~
~~(f) Explain and verify results; and~~
~~(g) Use technology as a tool in problem solving.]~~

(a) Apply previous experience and knowledge to new problem solving situations;

(b) Explain and verify results with respect to the original problem;

(c) Try more than one strategy when the first strategy proves to be unproductive; and

(d) Use technology, including calculators, to develop mathematical concepts.

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 ***from the real world through reading, listening and observing in order to*** ~~[,]~~ translate the information into mathematical language and symbols, process the information mathematically, ***discuss and exchange ideas about mathematics as part of learning, read a variety of 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) Obtain information by reading, listening, observing and inquiring and use that information to solve mathematical problems;~~
~~(b) Use mathematical language and symbols to explain thinking and processes and translate ideas into everyday language;~~
~~(c) Present mathematical ideas and solutions in written, oral and visual forms;~~
~~(d) Discuss, explain, justify and evaluate mathematical ideas and solutions; and~~

~~(e) Use physical, pictorial and symbolic forms to represent mathematical ideas and relationships.]~~

(a) Use inquiry techniques to solve mathematical problems;

(b) Use physical materials, models, pictures, or writing to represent and communicate mathematical ideas;

(c) Identify and translate key words and phrases that imply mathematical operations; and

(d) Use everyday language, both orally and in writing, to communicate strategies and solutions to mathematical problems.

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 ~~[significant]~~ mathematical ideas and construct his own learning in all content areas to ~~[justify and enhance his ability to think and reason logically]~~ ***reinforce and extend his logical reasoning abilities, reflect on, clarify, and justify his thinking, ask questions to extend his learning, use patterns and relationships to analyze mathematical situations, and determine relevant, irrelevant, and/or sufficient information to solve mathematical problems***. A pupil must demonstrate the ability to:

~~[(a) Construct meaning and justify thinking by investigating mathematical ideas, patterns and relationships;~~

~~(b) Reinforce and extend abilities for logical reasoning;~~

~~(c) Ask questions to reflect on, clarify and extend thinking;~~

~~(d) Review, refine, explain and justify mathematical processes, arguments and solutions using manipulatives, physical models and abstract ideas; and~~

~~(e) Determine the relevancy and sufficiency of information to solve mathematical problems.]~~

(a) Draw logical conclusions about mathematical problems;

(b) Discuss the steps used to solve a mathematical problem; and

(c) Justify and explain the solutions to problems using physical models.

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) View mathematics as an integrated whole and identify relationships between content strands;~~

~~(b) Identify practical applications of mathematical principles that can be applied to other disciplines;~~

~~(c) Use and analyze the connections within and beyond the field of mathematics in a variety of ways to solve problems;~~

~~(d) Link new concepts to prior knowledge; and~~

~~(e) Apply mathematical thinking and modeling to solve problems that arise in other disciplines and in everyday life.]~~

(a) Apply mathematical thinking and modeling to solve problems that arise in other disciplines, such as rhythm in music and motion in science; and

(b) Identify mathematics used in everyday life.

Section 5. NAC 389.251 Mathematics is hereby amended to read as follows:

NAC 389.251 Mathematics. (NRS 385.080**,** 389.520**)** By the end of the third 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 third grade in mathematics must be designed so that pupils meet the following performance standards by the completion of the third 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) Immediately recall and use addition and subtraction facts and multiplication facts for products through 81;~~

~~(b) Add and subtract multiplace numbers with regrouping;~~

~~(c) Generate and solve two-step addition and subtraction problems based on practical situations by using paper and pencil, mental computation and estimation;~~

~~(d) Generate and solve one-step multiplication problems based on practical situations by using paper and pencil, mental computation and estimation;~~

~~(e) Add and subtract decimals that represent amounts of money;~~

~~(f) Use repeated addition to model and explain multiplication;~~

~~(g) Read and write numerals and words that represent numbers and compare and order numbers from 0 through 999;~~

~~(h) Determine the reasonableness of answers by rounding to the nearest 10 and 100;~~

~~(i) Use, model and identify the place value positions through 10,000;~~

~~(j) Model, sketch and label fractions with denominators through 10; and~~

~~(k) Write commonly used fractions using both numerals and words.]~~

(a) Identify, use, and model place value positions of 1's, 10's, 100's, and 1,000's;

(b) Identify the value of a given digit in the 1's, 10's, 100's, and 1,000's place;

(c) Identify and model the unit fractions 1/2, 1/3, 1/4, 1/6, and 1/8 as equal parts of a whole or sets of objects;

(d) Read and write unit fractions with numbers and words;

(e) Read, write, compare, and order numbers from 0 – 9,999;

(f) Read and write numbers words to 100;

(g) Model and explain multiplication and division as skip counting patterns;

(h) Model and explain multiplication and division as repeated addition or subtraction;

(i) Immediately recall and use addition and subtraction facts;

(j) Immediately recall multiplication facts (products to 81);

(k) Estimate the number of objects in a set using various techniques;

(l) Add and subtract two- and three-digit numbers with and without regrouping;

(m) Add and subtract decimals using money as a model;

(n) Generate and solve two-step addition and subtraction problems and one-step multiplication problems based on practical situations;

(o) Model addition, subtraction, multiplication, and division in a variety of ways; and

(p) Use mathematical vocabulary and symbols to describe multiplication and division.

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) Recognize, describe, extend and create repeating and increasing patterns by using numbers, number patterns and their extensions to solve problems; and~~

~~(b) Identify missing symbols and missing numbers in open sentences involving number facts in addition and subtraction.]~~

(a) Recognize, describe, and create patterns using objects and numbers found in tables, number charts, and charts;

(b) Record results of patterns created using manipulatives, pictures, and numeric representations and describe how they are extended;

(c) Model, explain, and solve open number sentences involving addition, subtraction, and multiplication facts;

(d) Use variables and open sentences to express relationships; and

(e) Complete number sentences with the appropriate words and symbols (+, -, >, <, =).

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) Measure to a required degree of accuracy, record the measurement, evaluate the measurement for error and describe the appropriateness of selected units of measure;~~

~~(b) Estimate measurements and use measuring devices with standard and nonstandard units to measure length, area of a region, liquid volume, capacity, temperature and weight, and communicate the concepts of more, less and equivalent;~~

~~(c) Read, write and use notations of money and determine possible combinations of coins and bills to equal given amounts; and~~

~~(d) Read the time of day to the nearest minute using analog and digital clocks and measure time that has elapsed.]~~

(a) Compare, order, and describe objects by various measurable attributes for area and volume/capacity;

(b) Select and use appropriate units of measure;

(c) Measure to a required degree of accuracy (to the nearest 1/2 unit);

(d) Determine possible combinations of coins and bills to equal given amounts;

(e) Read, write, and use money notation;

(f) Recognize equivalent relationships between and among bills and coins;

(g) Tell time to the nearest minute, using analog and digital clocks;

(h) Use elapsed time in half-hour increments, beginning on the hour or half-hour, to determine start, end, and elapsed time; and

(i) Recognize that there are 60 minutes in 1 hour.

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) Describe, sketch, compare and contrast plane geometric figures;

(b) ~~[Demonstrate and describe the transformation of a geometric figure as a slide, rotation or flip; and~~

~~(c) Sketch, model, build, compare and contrast two-dimensional and three-dimensional geometric figures.]~~ ***Demonstrate and describe the transformational motions of geometric figures (translation/slide, reflection/flip, and rotation/turn);***

(c) Create two-dimensional designs that contain a line of symmetry;

(d) Compare, contrast, sketch, model, and build two- and three-dimensional geometric figures and objects;

(e) Identify, draw, and describe horizontal, vertical, and oblique lines; and

(f) Use the quantifiers all, some, and none to describe the characteristics of a set.

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) ~~[Collect, organize, display and describe simple data using number lines, pictographs, bar graphs and frequency tables by hand and with computers, if available; and~~

~~(b)]~~ Use ***informal*** concepts of probability such as impossible, unlikely, likely and certain to make predictions about future events.

(b) Pose questions that can be used to guide data collection, organization, and representation; and

(c)Use graphical representations, including number lines, frequency tables, and pictographs to represent data.

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) Use efficient approaches to investigate and understand mathematical concepts;~~

~~(b) Find solutions to problems that occur in everyday situations;~~

~~(c) Select, modify, develop and apply strategies to solve a wide variety of problems;~~

~~(d) Transfer and generalize previous experience to new problem-solving situations;~~

~~(e) Demonstrate persistence in problem solving;~~

~~(f) Explain and verify results; and~~

~~(g) Use technology as a tool in problem solving.]~~

(a) Generalize and apply previous experiences and strategies to new problem solving situations;

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

(c) Try more than one strategy when the first strategy proves to be unproductive;

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

(e) Identify necessary and extraneous information;

(f) Check the reasonableness of a solution; and

(g) Use technology, including calculators, to develop mathematical concepts.

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 ***from the real world through reading, listening and observing in order to*** ~~[,]~~ translate the information into mathematical language and symbols, process the information mathematically, ***discuss and exchange ideas about mathematics as part of learning, read a variety of 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) Obtain information by reading, listening, observing and inquiring and use that information to solve mathematical problems;~~

~~(b) Use mathematical language and symbols to explain thinking and processes and translate those ideas into everyday language;~~

~~(c) Present mathematical ideas and solutions in written, oral and visual forms;~~

~~(d) Discuss, explain, justify and evaluate mathematical ideas and solutions;~~

~~(e) Use physical, pictorial and symbolic forms to represent mathematical ideas and relationships; and~~

~~(f) Make conjectures, present arguments and evaluate discussions concerning mathematical ideas presented in various written and oral forms.]~~

(a) Use inquiry techniques to solve mathematical problems;

(b) Use a variety of methods to represent and communicate mathematical ideas through oral, verbal, and written formats;

(c) Identify and translate key words and phrases that imply mathematical operations; and

(d) Use everyday language, both orally and in writing, to communicate strategies and solutions to mathematical problems.

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 ~~[significant]~~ mathematical ideas and construct his own learning in all content areas to ~~[justify and enhance his ability to think and reason logically]~~ ***reinforce and extend his logical reasoning abilities, reflect on, clarify, and justify his thinking, ask questions to extend his learning, use patterns and relationships to analyze mathematical situations, and determine relevant, irrelevant, and/or sufficient information to solve mathematical problems***. A pupil must demonstrate the ability to:

~~[(a) Construct meaning and justify thinking by investigating mathematical ideas, patterns and relationships;~~

~~(b) Reinforce and extend abilities for logical reasoning;~~

~~(c) Ask questions to reflect on, clarify and extend thinking;~~

~~(d) Review, refine, explain and justify mathematical processes, arguments and solutions using manipulatives, physical models and abstract ideas;~~

~~(e) Determine the relevancy and sufficiency of information to solve mathematical problems;~~

~~(f) Follow, create and defend valid logical mathematical arguments; and~~

~~(g) Recognize and apply inductive and deductive reasoning in both concrete and abstract contexts.]~~

(a) Draw logical conclusions about mathematical problems;

(b) Follow a logical argument and judge its validity;

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

(d) Justify and explain the solutions to problems using manipulatives and physical models.

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) View mathematics as an integrated whole and identify relationships between content strands;~~

~~(b) Identify practical applications of mathematical principles that can be applied to other disciplines;~~

~~(c) Use and analyze the connections within and beyond the field of mathematics in a variety of ways to solve problems;~~

~~(d) Link new concepts to prior knowledge;~~

~~(e) Explain the relationship of concepts to procedures using models; and~~

~~(f) Apply mathematical thinking and modeling to solve problems that arise in other disciplines and in everyday life.]~~

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

(b) Use physical models to explain the relationship between concepts and procedures;

(c) Apply mathematical thinking and modeling to solve problems that arise in other disciplines, such as rhythm in music and motion in science; and

(d) Identify, explain, and use mathematics in everyday life.

Section 6. NAC 389.2934 Mathematics is hereby amended to read as follows:

NAC 389.2934 Mathematics. (NRS 385.080**,** 389.520**)** By the end of the fourth 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 fourth grade in mathematics must be designed so that pupils meet the following performance standards by the completion of the fourth 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) Immediately recall and use multiplication and corresponding division facts through 12;~~

~~(b) Generate and solve two-step multiplication and division problems based on practical situations using pencil and paper, mental computation and estimation;~~

~~(c) Multiply and divide money amounts by a one-digit whole number producing a solution with no remainder;~~

~~(d) Multiply and divide multidigit numbers by one-digit numbers;~~

~~(e) Model and explain division as repeated subtraction and equal groups;~~

~~(f) Read, write, order and compare whole numbers;~~

~~(g) Use estimation to determine the reasonableness of an answer;~~

~~(h) Use and identify place value positions of whole numbers; and~~

~~(i) Identify and compare fractions with like denominators using numbers, models and drawings.]~~

(a) Identify and use place value positions of whole numbers to one million;

(b) Identify fractions and compare fractions with like denominators using models, drawings, and numbers;

(c) Read, write, compare, and order whole numbers;

(d) Read and write number words;

(e) Count by multiples of a given number;

(f) Explain relationships between skip counting, repeated addition, and multiples;

(g) Immediately recall and use multiplication and corresponding division facts (products to 144);

(h) Estimate to determine the reasonableness of an answer in mathematical and practical situations.

(i) Add and subtract multi-digit numbers;

(j) Multiply and divide multi-digit numbers by a one-digit whole number with regrouping, including monetary amounts as decimals; and

(k) Generate and solve addition, subtraction, multiplication, and division problems using whole numbers in practical situations.

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) Identify, describe and represent numeric and geometric patterns and relationships; and~~

~~(b) Find solutions to given equations from a given replacement set, such as finding the solution to 3 X 7 = ___, given the replacement set {19, 20, 21}.]~~

(a) Identify, describe, and represent patterns and relationships in the number system including arithmetic and geometric sequences;

(b) Model, explain, and solve open number sentences involving addition, subtraction, multiplication, and division;

(c) Select the solution to an equation from a given set of numbers; and

(d) Complete number sentences with the appropriate words and symbols (+, -, x, ÷, >, <, =).

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) Select and use appropriate units and tools to describe an attribute such as length, width or perimeter, measure to a required degree of accuracy and record the results;~~

~~(b) Communicate the difference between perimeter and area, and describe and determine the perimeter of polygons and the area of rectangles, including squares;~~

~~(c) Determine totals for monetary amounts in problem-solving situations;~~

~~(d) Identify equivalent periods of time, including relationships between and among seconds, minutes, hours, days, months and years, such as 60 seconds = 1 minute; and~~

~~(e) Describe the difference between perimeter and area and determine the perimeter of any polygon and the area of right triangles and rectangles, including squares.]~~

(a) Estimate and convert units of measure for length, area, and weight within the same measurement system (customary and metric);

(b) Estimate temperature in practical situations;

(c) Measure length, area, temperature, and weight to a required degree of accuracy in customary and metric systems;

(d) Define and determine the perimeter of polygons and the area of rectangles, including squares;

(e) Determine totals for monetary amounts in practical situations;

(f) Use money notation to add and subtract given monetary amounts;

(g) Use A.M. and P.M. appropriately in describing time;

(h) Use elapsed time in quarter-hour increments, beginning on the quarter-hour, to determine start, end, and elapsed time; and

(i) Recognize the number of weeks in a year, days in a year, and days in a month.

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, draw, and classify angles according to their type, either right, obtuse or acute, and by given measurements;~~

~~(b) Represent concepts of similarity, congruence and symmetry using transformational motions;~~

~~(c) Identify, describe and classify two- and three-dimensional figures by relevant properties including the number of angles, edges and shapes of faces using models; and~~

~~(d) Identify, describe and draw geometric figures including points, intersecting lines, parallel lines, line segments, rays and angles.]~~

(a) Identify, draw, and classify angles, including straight, right, obtuse, and acute;

(b) Identify shapes that are congruent, similar, and/or symmetrical using a variety of methods including transformational motions;

(c) Identify coordinates for a given point in the first quadrant;

(d) Locate points of given coordinates on a grid in the first quadrant;

(e) Identify, describe, and classify two- and three-dimensional figures by relevant properties including the number of vertices, edges, and faces using models;

(f) Identify, draw, label, and describe points, line segments, rays, and angles; and

(g) Use the connectors and, or, and not to describe the members of a set.

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) Collect, organize, display, describe and interpret simple data using lines, pictographs, bar graphs and frequency tables; and~~

~~(b) Conduct simple probability experiments using concrete materials and represent the results using fractions.]~~

(a) Pose questions that can be used to guide the collection of categorical and numerical data;

(b) Organize and represent data using a variety of graphical representations including frequency tables and line plots;

(c) Model and compute range;

(d) Model the measures of central tendency for mode and median;

(e) Interpret data and make predictions using frequency tables and line plots;

(f) Conduct simple probability experiments using concrete materials; and

(g) Represent the results of simple probability experiments as fractions to make predictions about future events.

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) Use efficient approaches to investigate and understand mathematical concepts;~~

~~(b) Find solutions to problems that occur in everyday situations;~~

~~(c) Select, modify, develop and apply strategies to solve a wide variety of problems;~~

~~(d) Transfer and generalize previous experience to new problem-solving situations;~~

~~(e) Demonstrate persistence in problem solving;~~

~~(f) Explain and verify results; and~~

~~(g) Use technology as a tool in problem solving.]~~

(a) Generalize and apply previous experiences and strategies to new problem solving situations;

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

(c) Try more than one strategy when the first strategy proves to be unproductive;

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

(e) Identify necessary and extraneous information;

(f) Check the reasonableness of a solution; and

(g) Use technology, including calculators, to develop mathematical concepts.

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 ***from the real world through reading, listening and observing in order to*** ~~[,]~~ translate the information into mathematical language and symbols, process the information mathematically, ***discuss and exchange ideas about mathematics as part of learning, read a variety of 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) Obtain information by reading, listening, observing and inquiring and use that information to solve mathematical problems;~~

~~(b) Use mathematical language and symbols to explain thinking and processes and translate those ideas into everyday language;~~

~~(c) Present mathematical ideas and solutions in written, oral and visual forms;~~

~~(d) Discuss, explain, justify and evaluate mathematical ideas and solutions;~~

~~(e) Use physical, pictorial and symbolic forms to represent mathematical ideas and relationships; and~~

~~(f) Make conjectures, present arguments and evaluate discussions concerning mathematical ideas presented in various written and oral forms.]~~

(a) Use inquiry techniques to solve mathematical problems;

(b) Use a variety of methods to represent and communicate mathematical ideas through oral, verbal, and written formats;

(c) Identify and translate key words and phrases that imply mathematical operations; and

(d) Use everyday language, both orally and in writing, to communicate strategies and solutions to mathematical problems.

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 ~~[significant]~~ mathematical ideas and construct his own learning in all content areas to ~~[justify and enhance his ability to think and reason logically]~~ ***reinforce and extend his logical reasoning abilities, reflect on, clarify, and justify his thinking, ask questions to extend his learning, use patterns and relationships to analyze mathematical situations, and determine relevant, irrelevant, and/or sufficient information to solve mathematical problems***. A pupil must demonstrate the ability to:

~~[(a) Construct meaning and justify thinking by investigating mathematical ideas, patterns and relationships;~~

~~(b) Reinforce and extend abilities for logical reasoning;~~

~~(c) Ask questions to reflect on, clarify and extend thinking;~~

~~(d) Review, refine, explain and justify mathematical processes, arguments and solutions using manipulatives, physical models and abstract ideas;~~

~~(e) Determine the relevancy and sufficiency of information to solve mathematical problems;~~

~~(f) Follow, create and defend valid logical mathematical arguments; and~~

~~(g) Recognize and apply inductive and deductive reasoning in both concrete and abstract contexts.]~~

(a) Draw logical conclusions about mathematical problems;

(b) Follow a logical argument and judge its validity;

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

(d) Justify and explain the solutions to problems using manipulatives and physical models.

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) View mathematics as an integrated whole and identify relationships between content strands;~~

~~(b) Identify practical applications of mathematical principles that can be applied to other disciplines;~~

~~(c) Use and analyze the connections within and beyond the field of mathematics in a variety of ways to solve problems;~~

~~(d) Link new concepts to prior knowledge;~~

~~(e) Explain the relationship of concepts to procedures using models; and~~

~~(f) Apply mathematical thinking and modeling to solve problems that arise in other disciplines and in everyday life.]~~

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

(b) Use physical models to explain the relationship between concepts and procedures;

(c) Apply mathematical thinking and modeling to solve problems that arise in other disciplines, such as rhythm in music and motion in science; and

(d) Identify, explain, and use mathematics in everyday life.

Section 7. NAC 389.2943 Mathematics is hereby amended to read as follows:

NAC 389.2943 Mathematics. (NRS 385.080**,** 389.520**)** By the end of the fifth 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 fifth grade in mathematics must be designed so that pupils meet the following performance standards by the completion of the fifth 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) Immediately recall and use multiplication and corresponding division facts using factors of 0 through 12;~~

~~(b) Multiply and divide multiplace numbers by two-digit numbers, including using strategies for multiplying and dividing powers of 10;~~

~~(c) Generate and solve addition, subtraction, multiplication and division problems that involve whole numbers and order of operations based on practical situations;~~

~~(d) Compare and order negative numbers based on practical situations and plot integer values on a number line;~~

~~(e) Estimate to determine the reasonableness of an answer by identifying and using the correct place value position;~~

~~(f) Model, draw, identify, compare, add and subtract decimals and fractions with like denominators to solve problems; and~~

~~(g) Add and subtract decimals and multiply and divide decimals by whole numbers in problems that represent practical situations.]~~

(a) Identify and use place value positions of whole numbers and decimals to hundredths;

(b) Add and subtract fractions with like denominators using models, drawings, and numbers;

(c) Compare fractions with unlike denominators using models and drawings, and by finding common denominators;

(d) Identify, model, and compare improper fractions and mixed numbers;

(e) Read, write, compare, and order integers in mathematical and practical situations;

(f) Use multiples of 10 to expand knowledge of basic multiplication and division facts;

(g) Estimate to determine the reasonableness of an answer in mathematical and practical situations involving decimals;

(h) Add and subtract decimals;

(i) Multiply and divide decimals by whole numbers in problems representing practical situations.

(j) Use order of operations to evaluate expressions with whole numbers; and

(k) Generate and solve addition, subtraction, multiplication, and division problems using whole numbers and decimals in practical situations.

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) Identify, describe and explain number patterns and relationships, including, without limitation, triangular numbers, perfect squares, and arithmetic and geometric sequences, using paper and pencil, concrete materials and calculators;~~

~~(b) Use variables in open sentences to describe simple functions and relationships;~~

~~(c) Solve simple whole number equations and inequalities using a variety of methods; and~~

~~(d) Generate number sequences given the first term of the sequence and any simple computation rule.]~~

(a) Identify, describe, and represent patterns and relationships in the number system, including triangular numbers and perfect squares;

(b) Find possible solutions to an inequality involving a variable using whole numbers as a replacement set;

(c) Solve equations with whole numbers using a variety of methods, including inverse operations, mental math, and guess and check; and

(d) Complete number sentences with the appropriate words and symbols including ≥, ≤ and ≠.

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 directly measure length, volume, capacity and quantity;~~

~~(b) Select and justify the use of estimation or direct measurement and weight in a given situation;~~

~~(c) Determine the total cost of purchases and the amount of change in practical situations; and~~

~~(d) Describe the difference between perimeter and area.]~~

(a) Estimate and convert units of measure for weight and volume/capacity within the same measurement system (customary and metric);

(b) Measure volume and weight to a required degree of accuracy in the customary and metric systems;

(c) Describe the difference between perimeter and area, including the difference in units of measure;

(d) Determine totals, differences, and change due for monetary amounts in practical situations; and

(e) Determine equivalent periods of time, including relationships between and among seconds, minutes, hours, days, months, and years.

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) Draw and classify triangles according to their proportions;~~

~~(b) Identify and draw circles and elements of circles and describe the relationships between the various elements;~~

~~(c) Identify a transformation as translation, rotation, reflection, enlargement or reduction;~~

~~(d) Identify shapes that have congruence, similarity or symmetry using a variety of methods, including, without limitation, transformational motions and models, drawings and tools of measurement;~~

~~(e) Graph ordered pairs and identify coordinates for a given point in the first quadrant;~~

~~(f) Identify, describe, compare and classify two-dimensional and three-dimensional figures by their properties, including the number of vertices and edges and the number and shape of the faces; and~~

~~(g) Identify, describe, classify and draw one-dimensional and two-dimensional geometric figures, including lines that are intersecting, perpendicular and parallel, line segments, rays, and angles with given measurements.~~]

(a) Identify, classify, compare, and draw triangles and quadrilaterals based on their properties;

(b) Identify and draw circles and parts of circles, describing the relationships between the various parts;

(c) Represent concepts of congruency, similarity, and/or symmetry using a variety of methods including dilation (enlargement/reduction) and transformational motions;

(d) Graph coordinates representing geometric shapes in the first quadrant;

(e) Predict and describe the effects of combining, dividing, and changing shapes into other shapes;

(f) Identify, draw, label, and describe planes, parallel lines, intersecting lines, and perpendicular lines;

(g) Describe characteristics of right, acute, obtuse, scalene, equilateral, and isosceles triangles; and

(h) Represent relationships using Venn diagrams.

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) Collect, organize, read and interpret data using graphic representations, including tables, line plots, stem and leaf plots, scatter plots and histograms;~~

~~(b) Use data and graphs to formulate and explain conclusions and predictions, with and without the assistance of technology;~~

~~(c) Model and compute measures of central tendency, including mean, median and mode; and~~

~~(d) Describe the limitations of various formats of graphs, select a type of graph to accurately represent the given data and justify the selection.~~]

(a) Pose questions that can be used to guide the collection of categorical and numerical data;

(b) Organize and represent data using a variety of graphical representations including stem and leaf plots and histograms;

(c) Compute range;

(d) Model and compute the measures of central tendency for mean, median, and mode;

(e) Interpret data and make predictions using stem-and-leaf plots and histograms;

(f) Represent and solve problems involving combinations using a variety of methods;

(g) Conduct simple probability experiments using concrete materials;

(h) Represent the results of simple probability experiments as decimals to make predictions about future events; and

(i) Select an appropriate type of graph to accurately represent the data and justify the selection.

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) Use efficient approaches to investigate and understand mathematical concepts;~~

~~(b) Find solutions to problems that occur in everyday situations;~~

~~(c) Select, modify, develop and apply strategies to solve a wide variety of problems;~~

~~(d) Transfer and generalize previous experience to new problem-solving situations;~~

~~(e) Demonstrate persistence in problem solving;~~

~~(f) Explain and verify results; and~~

~~(g) Use technology as a tool in problem solving.]~~

(a) Generalize and apply previous experiences and strategies to new problem solving situations;

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

(c) Try more than one strategy when the first strategy proves to be unproductive;

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

(e) Identify necessary and extraneous information;

(f) Check the reasonableness of a solution; and

(g) Use technology, including calculators, to develop mathematical concepts.

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 ***from the real world through reading, listening and observing in order to*** ~~[,]~~ translate the information into mathematical language and symbols, process the information mathematically, ***discuss and exchange ideas about mathematics as part of learning, read a variety of 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) Obtain information by reading, listening, observing and inquiring and use that information to solve mathematical problems;~~

~~(b) Use mathematical language and symbols to explain thinking and processes and translate those ideas into everyday language;~~

~~(c) Present mathematical ideas and solutions in written, oral and visual forms;~~

~~(d) Discuss, explain, justify and evaluate mathematical ideas and solutions;~~

~~(e) Use physical, pictorial and symbolic forms to represent mathematical ideas and relationships; and~~

~~(f) Make conjectures, present arguments and evaluate discussions concerning mathematical ideas presented in various written and oral forms.]~~

(a) Use inquiry techniques to solve mathematical problems;

(b) Use a variety of methods to represent and communicate mathematical ideas through oral, verbal, and written formats;

(c) Identify and translate key words and phrases that imply mathematical operations; and

(d) Use everyday language, both orally and in writing, to communicate strategies and solutions to mathematical problems.

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 ~~[significant]~~ mathematical ideas and construct his own learning in all content areas to ~~[justify and enhance his ability to think and reason logically]~~ ***reinforce and extend his logical reasoning abilities, reflect on, clarify, and justify his thinking, ask questions to extend his learning, use patterns and relationships to analyze mathematical situations, and determine relevant, irrelevant, and/or sufficient information to solve mathematical problems***. A pupil must demonstrate the ability to:

~~[(a) Construct meaning and justify thinking by investigating mathematical ideas, patterns and relationships;~~

~~(b) Reinforce and extend abilities for logical reasoning;~~

~~(c) Ask questions to reflect on, clarify and extend thinking;~~

~~(d) Review, refine, explain and justify mathematical processes, arguments and solutions using manipulatives, physical models and abstract ideas;~~

~~(e) Determine the relevancy and sufficiency of information to solve mathematical problems;~~

~~(f) Follow, create and defend valid logical mathematical arguments; and~~

~~(g) Recognize and apply inductive and deductive reasoning in both concrete and abstract contexts.]~~

(a) Draw logical conclusions about mathematical problems;

(b) Follow a logical argument and judge its validity;

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

(d) Justify and explain the solutions to problems using manipulatives and physical models.

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) View mathematics as an integrated whole and identify relationships between content strands;~~

~~(b) Identify practical applications of mathematical principles that can be applied to other disciplines;~~

~~(c) Use and analyze the connections within and beyond the field of mathematics in a variety of ways to solve problems;~~

~~(d) Link new concepts to prior knowledge;~~

~~(e) Explain the relationship of concepts to procedures using models; and~~

~~(f) Apply mathematical thinking and modeling to solve problems that arise in other disciplines and in everyday life.]~~

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

(b) Use physical models to explain the relationship between concepts and procedures;

(c) Apply mathematical thinking and modeling to solve problems that arise in other disciplines, such as rhythm in music and motion in science; and

(d) Identify, explain, and use mathematics in everyday life.

Section 8. NAC 389.301 Mathematics is hereby amended to read as follows:

NAC 389.301 Mathematics. (NRS 385.080**,** 389.520**)** By the end of the sixth 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 sixth grade in mathematics must be designed so that pupils meet the following performance standards by the completion of the sixth 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) Read, write, add, subtract, multiply and divide using fractions, decimals and percents;~~

~~(b) Apply decimals, fractions and percents to solve mathematical and practical problems;~~

~~(c) Use the concepts of number theory, including prime and composite numbers, factors, multiples and the rules of divisibility;~~

~~(d) Compare and order groups of fractions and groups of decimals;~~

~~(e) Round to a given decimal place;~~

~~(f) Estimate using decimals, fractions and percents;~~

~~(g) Use models and drawings to identify, compare, add and subtract fractions with unlike denominators; and~~

~~(h) Use models to translate among fractions, decimals and percents.]~~

(a) Identify and use place value positions to thousandths;

(b) Add and subtract fractions with unlike denominators;

(c) Multiply and divide with fractions using models, drawings, and numbers;

(d) Use models to translate among fractions, decimals, and percents;

(e) Read, write, compare, and order groups of fractions, groups of decimals, and groups of percents;

(f) Identify equivalent expressions between and among fractions, decimals, and percents;

(g) Estimate using fractions, decimals, and percents;

(h) Use estimation strategies in mathematical and practical situations;

(i) Calculate using fractions, decimals, and percents in mathematical and practical situations;

(j) Use order of operations to evaluate expressions with integers; and

(k) Use the concepts of number theory, including prime and composite numbers, factors, multiples, and the rules of divisibility 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) Use and create tables and charts to extend a pattern to find a rule;~~
~~(b) Identify, model, describe and evaluate relationships using charts and tables, with and without technology; and~~
~~(c) Use a rule to create a table and represent the ordered pairs on a coordinate grid.]~~
(a) Use and create tables and charts to extend a pattern in order to describe a rule for input/output tables and to find missing terms in a sequence;
(b) Evaluate formulas and algebraic expressions using whole number values;
(c) Solve and graphically represent equations and simple inequalities in one variable;
(d) Write simple expressions and equations using variables to represent mathematical situations; and
(e) When given a rule relating two variables, create a table and represent the ordered pairs on a coordinate plane.

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 measurement for length, weight and capacity, within the same measurement system;~~
~~(b) Explain how the size of the unit used affects the precision;~~
~~(c) Given two measurements of the same object, select the one that is more precise;~~
~~(d) Estimate, measure to the required degree of accuracy, and derive and apply formulas to find the perimeter, circumference and area of plane figures; and~~
~~(e) Use ratios to describe and compare relationships between various objects.]~~
(a) Estimate and compare corresponding units of measure for temperature, length, and weight/mass between customary and metric systems;
(b) Given two measurements of the same object, select the one that is more precise;
(c) Explain how the size of the unit of measure used effects precision;
(d) Select, model, and apply formulas to find the perimeter, circumference, and area of plane figures.
(e) Compare and use unit cost in practical situations;
(f) Write and apply ratios in mathematical and practical problems involving measurement and monetary conversions; and
(g) Use equivalent periods of time to solve practical 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) Measure angles;~~
~~(b) Identify, describe by properties, classify, compare and draw regular and irregular quadrilaterals;~~
~~(c) Find the sum of the interior angles of triangles and quadrilaterals;~~
~~(d) Determine actual measurements represented on scale drawings;~~
~~(e) Using a coordinate grid, identify coordinates for a given point and locate points with given coordinates;~~
~~(f) Plot geometric shapes in all four quadrants;~~

~~(g) Make a model of a three-dimensional prism from a two-dimensional drawing and make a two-dimensional drawing of a three-dimensional prism;~~

~~(h) Model slope using concrete objects and practical examples;~~

~~(i) Draw complementary and supplementary angles;~~

~~(j) Identify and find measures of complementary and supplementary angles using arithmetic and geometric methods;~~

~~(k) Determine the measures of missing angles of triangles based on the Triangle Sum Theorem; and~~

~~(l) Construct circles, angles and triangles based on given measurements using a variety of methods.~~~~]~~

(a) Measure angles using a protractor;

(b) Identify, classify, compare and draw regular and irregular quadrilaterals;

(c) Identify, draw, and use central angles to represent fractions of a circle;

(d) Determine actual measurements represented on scale drawings;

(e) Convert actual measurements to scale;

(f) Using a coordinate plane, identify and locate points;

(g) Graph coordinates representing geometric shapes in all four quadrants on a coordinate plane;

(h) Make a model of a three-dimensional prism from a two-dimensional drawing;

(i) Make a two-dimensional drawing of a three-dimensional prism;

(j) Model slope (pitch, angle of inclination) using concrete objects and practical examples;

(k) Draw, identify, and find measures of complementary and supplementary angles using arithmetic and geometric methods;

(l) Determine the measure of missing angles of triangles based on the Triangle Sum Theorem;

(m) Construct circles, angles, and triangles based on given measurements using a variety of methods and tools including compass, straight edge, paper folding, and technology; and

(n) Identify counterexamples to disprove a conditional statement.

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) Interpret data using various formats including circle graphs;

~~(b) Conduct simple probability experiments using concrete materials and represent the results using decimals, percents and ratios;~~

~~(c) Solve probability problems using a variety of methods including constructing sample spaces and tree diagrams;~~

~~(d) Analyze the effect a change of format will have on interpretation of statistical charts and graphs; and~~

~~(e) Analyze data in a variety of formats to draw conclusions and make predictions.~~~~]~~

(a) Pose questions that guide the collection of data;

(b) Organize and represent data using a variety of graphical representations including circle graphs and scatter plots;

(c) Select and apply the measures of central tendency to describe data;

(d) Analyze the effect a change of graph type has on the interpretation of a set of data;

(e) Interpret data and make predications using circle graphs and scatter plots;

(f) Find the number of outcomes for a specific event by constructing sample spaces and tree diagrams;

(g) Find experimental probability using concrete materials;

(h) Represent the results of simple probability experiments as fractions, decimals, percents, and ratios to make predictions about future events;

(i) Analyze various representations of a set of data to draw conclusions and make predictions; and

(j) Describe the limitations of various graphical representations.

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) Use efficient approaches to investigate and understand mathematical concepts;~~
~~(b) Find solutions to problems that occur in everyday situations;~~
~~(c) Select, modify, develop and apply strategies to solve a wide variety of problems;~~
~~(d) Transfer and generalize previous experience to new problem-solving situations;~~
~~(e) Demonstrate persistence in problem solving;~~
~~(f) Explain and verify results; and~~
~~(g) Use technology as a tool in problem solving.]~~

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

(b) Determine an efficient strategy, 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; and

(g) Apply technology as a tool in problem solving situations.

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 ***from the real world through reading, listening and observing in order to*** ~~[,]~~ translate the information into mathematical language and symbols, process the information mathematically, ***discuss and exchange ideas about mathematics as part of learning, read a variety of 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) Obtain information by reading, listening, observing and inquiring and use that information to solve mathematical problems;~~
~~(b) Use mathematical language and symbols to explain thinking and processes and translate those ideas into everyday language;~~
~~(c) Present mathematical ideas and solutions in written, oral and visual forms;~~
~~(d) Discuss, explain, justify and evaluate mathematical ideas and solutions;~~
~~(e) Use physical, pictorial and symbolic forms to represent mathematical ideas and relationships; and~~

~~(f) Make conjectures, present arguments and evaluate discussions concerning mathematical ideas presented in various written and oral forms.]~~

(a) Use formulas, algorithms, inquiry, and other techniques to solve mathematical problems;

(b) Evaluate written and oral presentations in mathematics;

(c) Identify and translate key words and phrases that imply mathematical operations;

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

(e) Use everyday language, both orally and in writing, to communicate strategies and solutions to mathematical problems.

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 ~~[significant]~~ mathematical ideas and construct his own learning in all content areas to ~~[justify and enhance his ability to think and reason logically]~~ ***reinforce and extend his logical reasoning abilities, reflect on, clarify, and justify his thinking, ask questions to extend his learning, use patterns and relationships to analyze mathematical situations, and determine relevant, irrelevant, and/or sufficient information to solve mathematical problems***. A pupil must demonstrate the ability to:

~~[(a) Construct meaning and justify thinking by investigating mathematical ideas, patterns and relationships;~~

~~(b) Reinforce and extend abilities for logical reasoning;~~

~~(c) Ask questions to reflect on, clarify and extend thinking;~~

~~(d) Review, refine, explain and justify mathematical processes, arguments and solutions using manipulatives, physical models and abstract ideas;~~

~~(e) Determine the relevancy and sufficiency of information to solve mathematical problems;~~

~~(f) Follow, create and defend valid logical mathematical arguments; and~~

~~(g) Recognize and apply inductive and deductive reasoning in both concrete and abstract contexts.]~~

(a) Recognize and apply deductive and inductive reasoning;

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

(c) Justify answers and the steps taken to solve problems with and without manipulatives and physical models.

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) View mathematics as an integrated whole and identify relationships between content strands;~~

~~(b) Identify practical applications of mathematical principles that can be applied to other disciplines;~~

~~(c) Use the connections within and beyond the field of mathematics in a variety of ways to solve problems;~~

~~(d) Link new concepts to prior knowledge;~~

~~(e) Explain the relationship of concepts to procedures by using models; and~~

~~(f) Apply mathematical thinking and modeling to solve problems that arise in other disciplines and in everyday life.]~~

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

(b) Use manipulatives and physical models to explain the relationships 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, such as rhythm in music and motion in science; and

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

Section 9. NAC 389.323 Mathematics is hereby amended to read as follows:

NAC 389.323 Mathematics. (NRS 385.080**,** 389.520**)** By the end of the seventh 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 seventh grade in mathematics must be designed so that pupils meet the following performance standards by the completion of the seventh 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) Read, write and find ratios and proportions;~~

~~(b) Read, write, add, subtract, multiply and divide positive and negative numbers;~~

~~(c) Apply positive and negative numbers, ratios and proportions to solve mathematical and practical problems;~~

~~(d) Use absolute value and the properties of real numbers including distributive, commutative and associative to solve problems;~~

~~(e) Compare and order groups containing a mix of fractions, percents and decimals;~~

~~(f) Select and use the appropriate significant digit in problem situations;~~

~~(g) Compare and describe a variety of estimation strategies; and~~

(h) ~~Translate among fractions, decimals and percents.]~~

(a) Identify and use place value in mathematical and practical situations;

(b) Write, identify, and use powers of 10 from 10-3 through 106;

(c) Translate among fractions, decimals, and percents, including fractional percents;

(d) Compare and order a combination of rational numbers, including fractions, decimals, percents, and integers in mathematical and practical situations;

(e) Identify absolute values of integers;

(f) Generate a reasonable estimate for a computation using a variety of methods;

(g) Select and round to the appropriate significant digit;

(h) Calculate with integers and other rational numbers to solve mathematical and practical situations;

(i) Use order of operations to evaluate expressions and solve one-step equations (containing rational numbers); and

(j) Identify and apply the distributive, commutative, and associative properties of rational numbers 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) Use and create coordinate graphs to represent or interpret patterns and relationships, with and without calculators;~~

~~(b) Identify, model, describe and evaluate relationships using graphs, with and without technology;~~

~~(c) Evaluate formulas and algebraic expressions for given values of a variable;~~

~~(d) Represent mathematical situations using algebraic language and symbols;~~

~~(e) Combine like terms in variable expressions;~~

~~(f) Model, identify and solve linear equations and inequalities using concrete and informal methods, and relate this process to the order of operations; and~~

~~(g) Generate and graph a set of ordered pairs that represent a linear equation.]~~

(a) Use and create tables, charts, and graphs to extend a pattern in order to describe a linear rule, including integer values;

(b) Evaluate formulas and algebraic expressions for given integer values;

(c) Solve and graphically represent equations and inequalities in one variable with integer solutions;

(d) Simplify algebraic expressions by combining like terms;

(e) Generate and graph a set of ordered pairs to represent a linear equation;

(f) Identify linear equations and inequalities; and

(g) Model and solve equations using concrete and visual representations.

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 measurement for mass and volume, within the same measurement system;~~

~~(b) Compare, convert and estimate units of measure of capacity, mass and volume within the same measurement system;~~

~~(c) Compare corresponding units in the metric and customary systems;~~

~~(d) Given a measurement, determine the greatest possible error;~~

~~(e) Estimate, measure to the required degree of accuracy, derive and apply standard formulas to find the volume and surface area of solid figures;~~

~~(f) Write, solve and apply proportions; and]~~

(a) Estimate and compare corresponding units of measure for area and volume/capacity between customary and metric systems;

(b) Given a measurement, identify the greatest possible error;

(c) Select, model, and apply formulas to find the volume and surface area of solid figures;

(d) Calculate simple interest in monetary problems;

(e) Write and apply proportions to solve mathematical and practical problems involving measurement and monetary conversions; and

(f) ~~[(g)]~~ ***(f) Use elapsed time to solve practical 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, describe by properties, classify compare, and draw regular and irregular polygons;~~

~~(b) Find the sum of the interior angles of polygons;~~

~~(c) Use ratio and proportions to create scale drawings;~~

~~(d) Use coordinate geometry and models to demonstrate geometric transformation, including rotate and turn, translate and slide, and reflect and flip by finding the ordered pairs that describe the location of the original and the transformed figures;~~

~~(e) Make a model of a three-dimensional figure from a two-dimensional drawing and make a two-dimensional drawing of a three-dimensional object;~~

~~(f) Use coordinate geometry to represent slope, midpoint, and horizontal and vertical distance;~~

~~(g) Describe the properties of geometric relationships, including parallel lines, perpendicular lines, bisectors, triangles and quadrilaterals, such as the properties of angles formed by a transversal of parallel lines;~~

~~(h) Model the Pythagorean Theorem;~~

~~(i) Solve for the hypotenuse using the Pythagorean Theorem; and~~

~~(j) Construct and verify congruent angles and parallel and perpendicular lines using hand tools.]~~

(a) Identify, classify, compare, and draw regular and irregular polygons;

(b) Find and verify the sum of the measures of interior angles of triangles and quadrilaterals.

(c) Make scale drawings using ratios and proportions;

(d) Demonstrate translation, reflection, and rotation using coordinate geometry and models;

(e) Describe the location of the original figure and its transformation on a coordinate plane.

(f) Make a model of a three-dimensional figure from a two-dimensional drawing;

(g) Make a two-dimensional drawing of a three-dimensional figure;

(h) Determine slope of a line, midpoint of a segment, and the horizontal and vertical distance between two points using coordinate geometry;

(i) Describe the geometric relationships of parallel lines, perpendicular lines, triangles, quadrilaterals and bisectors;

(j) Model the Pythagorean Theorem and solve for the hypotenuse;

(k) Construct and identify congruent angles, parallel lines, and perpendicular lines; and

(l) Make and test conjectures to explain observed mathematical relationships and to develop logical arguments to justify conclusions.

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, display, read and analyze data, with and without technology, using a variety of displays including frequency distributions and circle graphs; and~~

~~(b) Select, use and graph, when possible, measures of variability including range, distribution and possible outliers.]~~

(a) Formulate questions that guide the collection of data;

(b) Organize, display, and read data using the appropriate graphical representations (with and without technology);

(c) Interpret graphical representations of data to describe patterns, trends, and data distribution;

(d) Analyze the effect a change of scale will have on statistical charts and graphs;

(e) Find the number of permutations possible for an event in mathematical and practical situations;

(f) Find the theoretical probability of an event using different counting methods including sample spaces and compare that probability with experimental results;

(g) Represent the probability of an event as a number between 0 and 1; and

(h) Interpolate and extrapolate from data to make predications for a given set of data.

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) Use efficient approaches to investigate and understand mathematical concepts;~~

~~(b) Find solutions to problems that occur in everyday situations;~~

~~(c) Select, modify, develop and apply strategies to solve a wide variety of problems;~~

~~(d) Transfer and generalize previous experience to new problem-solving situations;~~

~~(e) Demonstrate persistence in problem solving;~~

~~(f) Explain and verify results; and~~

~~(g) Use technology as a tool in problem solving.]~~

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

(b) Determine an efficient strategy, 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; and

(g) Apply technology as a tool in problem solving situations.

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 ***from the real world through reading, listening and observing in order to*** ~~[,]~~ translate the information into mathematical language and symbols, process the information mathematically, ***discuss and exchange ideas about mathematics as part of learning, read a variety of 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) Obtain information by reading, listening, observing and inquiring and use that information to solve mathematical problems;~~

~~(b) Use mathematical language and symbols to explain thinking and processes and translate those ideas into everyday language;~~

~~(c) Present mathematical ideas and solutions in written, oral and visual forms;~~

~~(d) Discuss, explain, justify and evaluate mathematical ideas and solutions;~~

~~(e) Use physical, pictorial and symbolic forms to represent mathematical ideas and relationships; and~~

~~(f) Make conjectures, present arguments and evaluate discussions concerning mathematical ideas presented in various written and oral forms.]~~

(a) Use formulas, algorithms, inquiry, and other techniques to solve mathematical problems;

(b) Evaluate written and oral presentations in mathematics;

(c) Identify and translate key words and phrases that imply mathematical operations;

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

(e) Use everyday language, both orally and in writing, to communicate strategies and solutions to mathematical problems.

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 ~~[significant]~~ mathematical ideas and construct his own learning in all content areas to ~~[justify and enhance his ability to think and reason logically]~~ ***reinforce and extend his logical reasoning abilities, reflect on, clarify, and justify his thinking, ask questions to extend his learning, use patterns and relationships to analyze mathematical situations, and determine relevant, irrelevant, and/or sufficient information to solve mathematical problems***. A pupil must demonstrate the ability to:

~~[(a) Construct meaning and justify thinking by investigating mathematical ideas, patterns and relationships;~~

~~(b) Reinforce and extend abilities for logical reasoning;~~

~~(c) Ask questions to reflect on, clarify and extend thinking;~~

~~(d) Review, refine, explain and justify mathematical processes, arguments and solutions using manipulatives, physical models and abstract ideas;~~

~~(e) Determine the relevancy and sufficiency of information to solve mathematical problems;~~

~~(f) Follow, create and defend valid logical mathematical arguments; and~~

~~(g) Recognize and apply inductive and deductive reasoning in both concrete and abstract contexts.]~~

(a) Recognize and apply deductive and inductive reasoning;

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

(c) Justify answers and the steps taken to solve problems with and without manipulatives and physical models.

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) View mathematics as an integrated whole and identify relationships between content strands;~~

~~(b) Identify practical applications of mathematical principles that can be applied to other disciplines;~~

~~(c) Use the connections within and beyond the field of mathematics in a variety of ways to solve problems;~~

~~(d) Link new concepts to prior knowledge;~~

~~(e) Explain the relationship of concepts to procedures by using models; and~~

~~(f) Apply mathematical thinking and modeling to solve problems that arise in other disciplines and in everyday life.]~~

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

(b) Use manipulatives and physical models to explain the relationships 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, such as rhythm in music and motion in science; and

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

Section 10. NAC 389.406 Mathematics is hereby amended to read as follows:

NAC 389.406 Mathematics. (NRS 385.080**,** 389.520**)** By the end of the eighth 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 eighth grade in mathematics must be designed so that pupils meet the following performance standards by the completion of the eighth 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) Read, write, apply and compute with real numbers in various forms, including, without limitation, radicals, exponentials and scientific notations;~~

~~(b) Compare and order rational numbers;~~

~~(c) Estimate in problem-solving situations and practical applications to determine the reasonableness of answers and verify the results;~~

~~(d) Explain the relationship among fractions, decimals and percents and translate among representations; and~~

~~(e) Explain and use concepts of:~~

~~(1) Number theory such as factors and multiples;~~

~~(2) Properties of real numbers such as the commutative, associative and distributive; and~~

~~(3) Order of operations,~~

~~to solve problems.]~~

(a) Represent numbers using scientific notation in mathematical and practical situations;

(b) Translate among fractions, decimals, and percents, including percents greater than 100 and percents less than 1;

(c) Explain and use the relationship among equivalent representations of rational numbers in mathematical and practical situations;

(d) Compare and order real numbers, including powers of whole numbers in mathematical and practical situations;

(e) Identify perfect squares to 225 and their corresponding square roots;

(f) Use estimation strategies to determine the reasonableness of an answer in mathematical and practical situations;

(g) Calculate with real numbers to solve mathematical and practical situations;

(h) Use order of operations to solve equations in the real number system; and

(i) Identify and apply the identity property, inverse property, and the absolute value of real numbers 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) Use inductive reasoning to find a missing term in numeric, arithmetic and geometric sequences and generalize basic patterns to the nth term, with and without the assistance of calculators;~~

~~(b) Identify, describe, model and evaluate relationships, including, without limitation, patterns, sequences and functions using oral, written and symbolic language, with and without the assistance of technology;~~

~~(c) Solve an equation or a formula for any variable;~~

~~(d) Describe how a change in one variable of a mathematical relationship affects the remaining variables by using various tools and methods;~~

~~(e) Model, identify and solve simple linear equations and inequalities and relate that process to the order of operations;~~

~~(f) Add and subtract binomials and describe the connection between the algebraic process and the arithmetic process; and~~

~~(g) Translate among verbal descriptions, graphic, tabular and algebraic representations of mathematical situations.]~~

(a) Find the missing term in a numerical sequence or a pictorial representation of a sequence;

(b) Evaluate formulas and algebraic expressions using rational numbers (with and without technology);

(c) Solve and graphically represent equations and inequalities in one variable, including absolute value;

(d) Add and subtract binomials;

(e) Identify, model, describe, and evaluate functions (with and without technology);

(f) Translate among verbal descriptions, graphic, tabular, and algebraic representations of mathematical situations (with and without technology);

(g) Solve linear equations and represent the solution graphically;

(h) Solve inequalities and represent the solution on a number line; and

(i) Describe how changes in the value of one variable affect the values of the remaining variables in a relation.

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) Identify the range of precision, error of measure and tolerance in measurement when using the appropriate tool of measurement and measure to the required degree of accuracy;~~

~~(b) Estimate and measure length, weight, mass and volume to the required degree of accuracy;~~

~~(c) Select and apply formulas to identify the relationship between changes in area and volume and changes in linear measures of figures;~~

~~(d) Evaluate formulas and algebraic expressions for given values of a variable; and~~

~~(e) Apply ratio and proportion to calculate rates and as a method of indirect measure.]~~

(a) Estimate and convert units of measure for mass and capacity within the same measurement system (customary and metric);

(b) Demonstrate an understanding of precision, error, and tolerance when using appropriate measurement tools;

(c) Identify how changes in a dimension of a figure effect changes in its perimeter, area and volume.

(d) Calculate percents in monetary problems; and

(e) Apply ratios and proportions to calculate rates and solve mathematical and practical problems using indirect measure.

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) Apply the properties of equality and proportionality to solve problems that involve congruent or similar shapes;~~

~~(b) Use coordinate geometry and models to illustrate change in scale;~~

~~(c) Represent and interpret relationships defined by equations and formulas, including distance, midpoint and slope, on a coordinate plane, with and without the assistance of technology;~~

~~(d) Form generalizations and validate conclusions about properties of geometric shapes including those associated with parallel lines, perpendicular lines, bisectors, triangles and quadrilaterals;~~

~~(e) Verify, explain and use the Pythagorean Theorem to determine missing sides and angles of triangles; and~~

~~(f) Construct, draw and sketch geometric figures, bisected angles and lines and line segments with given specifications by using hand tools and technology.]~~

(a) Find and use the sum of the measures of interior angles of polygons;

(b) Apply the properties of equality and proportionality to congruent or similar shapes;

(c) Demonstrate dilation using coordinate geometry and models;

(d) Describe the relationship between an original figure and its transformation or dilation;

(e) Calculate slope, midpoint, and distance using equations and formulas (with and without technology);

(f) Determine the x- and y- intercepts of a line;

(g) Form generalizations and validate conclusions about geometric figures and their properties;

(h) Verify and explain the Pythagorean Theorem using a variety of methods;

(i) Determine the measure of the missing side of a right triangle;

(j) Construct geometric figures using a variety of tools; and

(k) Represent logical relationships using conditional statements.

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, display, read and analyze data, with and without the assistance of technology, by using a variety of displays, including box and whisker plots;~~

~~(b) Determine the theoretical probability of a simple or independent event using different counting methods, including tree diagrams, sample spaces and organized lists, and compare those results with the results of conducting an experiment;~~

~~(c) Differentiate between the probability of an event and the odds of an event;~~

~~(d) Identify the number of combinations possible in given situations by using a variety of counting methods;~~

~~(e) Evaluate the accuracy and validity of arguments based on data analysis and analyze the effect that a change of scale or a change of format has on statistical charts and graphs; and~~

~~(f) Formulate inferences and projections based on interpolations and extrapolations of data to solve problems.]~~

(a) Formulate questions and design a study that guides the collection of data;

(b) Organize, display, and read data including box and whisker plots (with and without technology);

(c) Select and apply appropriate measures of data distribution, using interquartile range and central tendency;

(d) Evaluate statistical arguments that are based on data analysis for accuracy and validity;

(e) Find the number of combinations possible in mathematical and practical situations;

(f) Distinguish between permutations and combinations;

(g) Differentiate between the probability of an event and the odds of an event; and

(h) Formulate reasonable inferences and predictions through interpolation and extrapolation of data to solve practical problems.

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) Use efficient approaches to investigate and understand mathematical concepts;~~

~~(b) Find solutions to problems that occur in everyday situations;~~

~~(c) Select, modify, develop and apply strategies to solve a wide variety of problems;~~

~~(d) Transfer and generalize previous experience to new problem-solving situations;~~

~~(e) Demonstrate persistence in problem solving;~~

~~(f) Explain and verify results; and~~

~~(g) Use technology as a tool in problem solving.]~~

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

(b) Determine an efficient strategy, 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; and

(g) Apply technology as a tool in problem solving situations.

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 ***from the real world through reading, listening and observing in order to*** ~~[,]~~ translate the information into mathematical language and symbols, process the information mathematically, ***discuss and exchange ideas about mathematics as part of learning, read a variety of 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) Obtain information by reading, listening, observing and inquiring and use that information to solve mathematical problems;~~

~~(b) Use mathematical language and symbols to explain thinking and processes and translate those ideas into everyday language;~~

~~(c) Present mathematical ideas and solutions in written, oral and visual forms;~~

~~(d) Discuss, explain, justify and evaluate mathematical ideas and solutions;~~

~~(e) Use physical, pictorial and symbolic forms to represent mathematical ideas and relationships; and~~

~~(f) Make conjectures, present arguments and evaluate discussions concerning mathematical ideas presented in various written and oral forms.]~~

(a) Use formulas, algorithms, inquiry, and other techniques to solve mathematical problems;

(b) Evaluate written and oral presentations in mathematics;

(c) Identify and translate key words and phrases that imply mathematical operations;

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

(e) Use everyday language, both orally and in writing, to communicate strategies and solutions to mathematical problems.

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 ~~[significant]~~ mathematical ideas and construct his own learning in all content areas to ~~[justify and enhance his ability to think and reason logically]~~ ***reinforce and extend his logical reasoning abilities, reflect on, clarify, and justify his thinking, ask questions to extend his learning, use patterns and relationships to analyze mathematical situations, and determine relevant, irrelevant, and/or sufficient information to solve mathematical problems***. A pupil must demonstrate the ability to:

~~[(a) Construct meaning and justify thinking by investigating mathematical ideas, patterns and relationships;~~

~~(b) Reinforce and extend abilities for logical reasoning;~~

~~(c) Ask questions to reflect on, clarify and extend thinking;~~

~~(d) Review, refine, explain and justify mathematical processes, arguments and solutions using manipulatives, physical models and abstract ideas;~~

~~(e) Determine the relevancy and sufficiency of information to solve mathematical problems;~~

~~(f) Follow, create and defend valid logical mathematical arguments; and~~

~~(g) Recognize and apply inductive and deductive reasoning in both concrete and abstract contexts.~~**]**

(a) Recognize and apply deductive and inductive reasoning;

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

(c) Justify answers and the steps taken to solve problems with and without manipulatives and physical models.

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) View mathematics as an integrated whole and identify relationships between content strands;~~

~~(b) Identify practical applications of mathematical principles that can be applied to other disciplines;~~

~~(c) Use the connections within and beyond the field of mathematics in a variety of ways to solve problems;~~

~~(d) Link new concepts to prior knowledge;~~

~~(e) Explain the relationship of concepts to procedures by using models; and~~

~~(f) Apply mathematical thinking and modeling to solve problems that arise in other disciplines and in everyday life.~~**]**

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

(b) Use manipulatives and physical models to explain the relationships 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, such as rhythm in music and motion in science; and

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

Section 11. NAC 389.4675 Mathematics is hereby amended to read as follows:

NAC 389.4675 Mathematics: Performance standards. (NRS 385.080**,** 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 the reasonableness of answers and the accuracy of solutions;~~

~~(b) Calculate and estimate sums, differences, products, quotients, powers and roots, and apply formulas and algorithms;~~

~~(c) Apply the laws of exponents to perform operations on expressions with integral exponents and scientific notation;~~

~~(d) Apply properties and theories of the real number system to practical situations; and~~

~~(e) Add, subtract and scalar multiplying matrices.]~~

(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) Represent, analyze and solve problem situations using discrete models, including, without limitation, graphs and matrices, with and without the assistance of technology;~~

~~(b) Create and use different forms of a variety of equations, proportions and formulas, solving for the needed variable as necessary in given situations;~~

~~(c) Add, subtract and multiply polynomials, factor first and second degree polynomials and describe the process and connection between the algebraic process and arithmetic process;~~

~~(d) Use simple quadratic equations with integer roots to solve practical and mathematical problems;~~

~~(e) Model practical situations mathematically and translate a practical problem into a variety of mathematical forms, including, without limitation, matrices, tabular, symbolic and graphical representations of functions, with and without the assistance of technology;~~

~~(f) Determine the domain and the range of linear relations given a graph or a set of ordered pairs and explain the importance of the domain and range in problem-solving situations; and~~

~~(g) Solve systems of two linear equations algebraically and graphically, using graphing calculators as a primary tool to solve problems and verify solutions found by other methods.]~~

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

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

(c) Add, subtract, multiply, and factor 1st and 2nd degree polynomials connecting the arithmetic and algebraic processes;

(d) Simplify algebraic expressions, including exponents and radicals;

(e) Determine the domain and range of functions, including linear, quadratic, and absolute value, algebraically and graphically;

(f) Solve absolute value equations and inequalities both algebraically and graphically;

(g) Solve systems of two linear equations algebraically and graphically and verify solutions (with and without technology); and

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

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) Distinguish, differentiate and convert units of measure among and between customary and metric systems and between monetary systems;~~

~~(b) Select and use tools of measurement, techniques and formulas to calculate and compare rates, costs, distances, interests, temperatures, weights and masses;~~

~~(c) Justify and communicate the differences between accuracy, precision, error of measure and tolerance in measurement and describe how each of these can affect solutions found in problem situations;~~

~~(d) Use and interpret consumer data such as amortization tables, tax tables and compound interest charts to make informed financial decisions related to practical applications; and~~

~~(e) Use relationships and formulas to determine the measurement of unknown dimensions, angles, areas and volumes to solve problems.]~~

(a) Estimate and convert between customary and metric systems;

(b) Justify, communicate, and differentiate between precision, error, and tolerance in practical problems;

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

(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 measure of unknown dimensions, angles, areas, and volumes using relationships and formulas to solve problems.

4. or 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 use the properties of polygons, determine measures of interior and exterior angles and elements of circles to solve practical problems;~~

~~(b) Use coordinate geometry to graph linear equations, determine slopes of lines, identify parallel and perpendicular lines and find possible solutions to sets of linear equations;~~

~~(c) Use algebraic techniques to solve problems involving geometric relationships;~~

~~(d) 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 practical problems;~~

~~(e) Apply the Pythagorean Theorem and its converse, properties of special right triangles, and right triangle trigonometry, sine, cosine and tangent to solve practical problems;~~

~~(f) Use tools, technology and models to sketch, draw and construct geometric figures to solve problems and to demonstrate the properties of geometric figures; and~~

~~(g) Construct, justify and defend mathematical conclusions using logical, sequential and deductive reasoning supported by established mathematical principles.]~~

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

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

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

(d) Determine the slope of lines using coordinate geometry and algebraic techniques;

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

(f) Graph linear equations and find possible solutions to those equations using coordinate geometry;

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

(h) Solve problems using complementary and supplementary angles, congruent angles, vertical angles, angles formed when parallel lines are cut by a transversal and angles in polygons;

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

(j) Solve problems by drawing and/or constructing geometric figures to demonstrate geometric relationships; 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) Use calculators and computers to create and manipulate tables, graphs and matrices to communicate statistical information;~~

~~(b) Use the shape of graphs of normal distributions to compare and analyze information;~~

~~(c) Design, conduct, analyze and communicate the results of multistage probability and statistical experiments;~~

~~(d) Identify a probability situation as a permutation or a combination and find the number of possible outcomes, with and without the assistance of graphing calculators;~~

~~(e) Select and use the measures of central tendency such as mean, median and mode that are appropriate for given situations;~~

~~(f) Select and use measures of dispersion including range, distribution and possible outliers that are appropriate for given situations; and~~

~~(g) Analyze the validity of statistical conclusions and note various sources of bias and misuse and abuse of data caused by a variety of factors.]~~

(a) Organize statistical data through the use of tables, graphs, and matrices (with and without 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 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 multi-stage probability experiments;

(i) Design, construct, analyze, and select an appropriate type of graphical representations 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) Use efficient approaches to investigate and understand mathematical concepts;~~
~~(b) Find solutions to problems that occur in everyday situations;~~
~~(c) Select, modify, develop and apply strategies to solve a wide variety of problems;~~
~~(d) Transfer and generalize previous experience to new problem-solving situations;~~
~~(e) Demonstrate persistence in problem solving;~~
~~(f) Explain and verify results; and~~
~~(g) Use technology as a tool in problem solving.]~~

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

(b) Determine an efficient strategy, 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 non-routine 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 ***from the real world through reading, listening and observing in order to*** ~~[,]~~ translate the information into mathematical language and symbols, process the information mathematically, ***discuss and exchange ideas about mathematics as part of learning, read a variety of 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) Obtain information by reading, listening, observing and inquiring and using that information to solve mathematical problems;~~
~~(b) Use mathematical language and symbols to explain thinking and processes and translate those ideas into everyday language;~~
~~(c) Present mathematical ideas and solutions in written, oral and visual forms;~~
~~(d) Discuss, explain, justify and evaluate mathematical ideas and solutions;~~
~~(e) Use physical, pictorial and symbolic forms to represent mathematical ideas and relationships; and~~

~~(f) Make conjectures, present arguments and evaluate discussions concerning mathematical ideas presented in various written and oral forms.]~~

(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) Use everyday language, both orally and in writing, communicate strategies and solutions to problems using appropriate mathematical 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 ~~[significant]~~ mathematical ideas and construct his own learning in all content areas to ~~[justify and enhance his ability to think and reason logically]~~ ***reinforce and extend his logical reasoning abilities, reflect on, clarify, and justify his thinking, ask questions to extend his learning, use patterns and relationships to analyze mathematical situations, and determine relevant, irrelevant, and/or sufficient information to solve mathematical problems***. A pupil must demonstrate the ability to:

(a) Construct meaning and justify thinking by investigating mathematical ideas, patterns and relationships;

~~[(b) Reinforce and extend abilities for logical reasoning;~~

~~(c) Ask questions to reflect on, clarify and extend thinking;~~

~~(d) Review, refine, explain and justify mathematical processes, arguments and solutions by using manipulatives, physical models and abstract ideas;~~

~~(e) Determine the relevancy and sufficiency of information to solve mathematical problems;~~

~~(f) Follow, create and defend valid logical mathematical arguments; and~~

~~(g) Recognize and apply inductive and deductive reasoning in both concrete and abstract contexts.]~~

(a) Recognize and apply deductive and inductive reasoning;

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

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

(d) Justify the validity of an argument; and

(e) Construct a valid 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) View mathematics as an integrated whole and identify relationships between content strands;~~

~~(b) Identify practical applications of mathematical principles that can be applied to other disciplines;~~

~~(c) Use and analyze the connections within and beyond the field of mathematics in a variety of ways to solve problems;~~

~~(d) Link new concepts to prior knowledge;~~

~~(e) Explain the relationship of concepts to procedures by using models; and~~

~~(f) Apply mathematical thinking and modeling to solve problems that arise in other disciplines and in everyday life.~~~~]~~

(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, such as rhythm in music and motion in science; and

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