A Handbook Linking the *Project WET K-12 Curriculum and Activity Guide* to the K-12 Mathematics New Hampshire Curriculum Framework

N.H. Project WET (Water Education for Teachers)
N.H. Department of Environmental Services
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NEW HAMPSHIRE DEPARTMENT OF Environmental Services

NEW HAMPSHIRE PROJECT WET Water Education for Teachers

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METHODOLOGY
2008 Mathematics Correlation

New Hampshire's curriculum standards have undergone substantial change in response to the federal No Child Left Behind Act. The former state standards were written for the end of grades three, six and ten. To meet new formalized assessment requirements, the New Hampshire Mathematics Curriculum Framework (K-12), approved in June 2006, addresses content and skills, and is divided into grade level expectations (GLEs) for grades K-8, and grade span expectations (GSEs) at the high school level.

The New Hampshire Mathematics Curriculum Framework (K-12) contains the following components:

- Strand: There are six strands that are consistent across grade levels: Number and Operations (N&O); Geometry and Measurement (G&M); Functions and Algebra (F&A); Data, Statistics, and Probability (DSP); Problem Solving, Reasoning, and Proof (PRP); and Communication, Connections, and Representations (CCR).
- Stem: These communicate the main curricular focus, or big ideas, at each grade level, and are the same or similar across grades K-12.

For each strand, the associated proficiencies were consulted to help inform the degree of correlation of the broader strand with each activity; a match of at least one proficiency was required to indicate a correlation. The following elements of each activity helped to focus the correlation process:

- The subject identifier in the sidebar determined whether the activity was correlated to the mathematics frameworks; if math is not listed, the activity was not addressed.
- The activity objectives in the sidebar and the activity description informed which curriculum and proficiency standard(s) are related to the activity.

Note: Any attempt to correlate universal curriculum standards and a single curriculum program involves subjectivity. The author applied this rigorous methodology to determine correlation. WET activities lend themselves to modification, and in so doing, would meet many more standards than indicated. N.H. Project WET chose, however, to correlate based on a strict interpretation of the activities, as they are written.

HOW TO USE THIS HANDBOOK

The purpose of this handbook is to assist educators who are reviewing and revising their mathematics curricula. The primary audience is classroom teachers, curriculum specialists, and curriculum committees. The handbook is divided into three sections, as follows:

- **PART I lists each Project WET activity from the *WET Curriculum and Activity Guide,* followed by the standards from the K-12 Mathematics New Hampshire Curriculum Framework with which it is aligned.**

  Use Part I if you have a particular WET activity in mind and want to know how it correlates with the state curriculum standards. Or, to find an appropriate activity to meet your needs, use WET's "Topic Index" to select several potential activities to supplement your unit. To determine which state standards correlate with these activities, find the name of each activity in this handbook. Select an activity based on your objectives for your unit and the degree to which the activity correlates with appropriate standards. Each WET activity is indicated by activity name and is followed by the strand and stem for each framework that is correlated to that activity.

- **PART II lists individual state curriculum standards from the K-12 Mathematics New Hampshire Curriculum Framework, followed by the WET activities that meet the individual standards.**

  Use Part II if you have a particular curriculum standard in mind and want to find an activity that meets this standard. Then read about the activities in your WET guide to determine the one most suitable for your particular situation.

  All mathematics strand and stem numbers (the big ideas in each strand) are listed. Following each standard, the WET activities aligned with that standard are identified by number and name.

- **PART III is a chart that lists each Project WET activity from the *WET Curriculum and Activity Guide* and the standards from the K-12 Mathematics New Hampshire Curriculum Framework with which each activity is aligned.**

  Note: Throughout this handbook, the strands are abbreviated as follows:

  N&O – Number and Operations
  G&M – Geometry and Measurement
  F&A – Functions and Algebra
  DSP – Data, Statistics, and Probability
  PRP – Problem Solving, Reasoning, and Proof
  CCR – Communication, Connections, and Representations

Part I:
Correlation of the *Project WET Curriculum and Activity Guide* with the K-12 Mathematics New Hampshire Curriculum Framework

Adventures in Density

NONE

AfterMath

M:N&O:7 – Makes estimates.

M:G&M:9 – Demonstrates understanding of spatial relationships and solves problems using location and position.

M:DSP:1 – Interprets a given representation to answer questions related to the data, or to analyze the data to formulate conclusions, make predictions, and/or solve problems.

M:DSP:2 – Analyzes patterns, trends, or distributions in data in a variety of contexts.

M:CCR:3 – Students will recognize, explore, and develop mathematical connections. *(See Appendix for grade-level specifics.)*

A-Maze-Ing Water

NONE

Aqua Bodies

M:N&O:1 – Demonstrates understanding of rational numbers.

M:N&O:4 – Accurately solves problems.

M:CCR:3 – Students will recognize, explore, and develop mathematical connections. *(See Appendix for grade-level specifics.)*

Aqua Notes

NONE

Back to the Future

M:N&O:4 – Accurately solves problems.

M:G&M:7 – Demonstrates understanding of measurable attributes, measures and uses units of measure appropriately and consistently, and makes accurate conversions when solving problems.

M:DSP:2 – Analyzes patterns, trends, or distributions in data in a variety of contexts.

M:DSP:3 – Organizes and displays data; identifies or describes elements of representations that best display a given set of data or situation.

M:PRP:1 – Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content. *(See Appendix for grade-level specifics.)*

M:PRP:2 – Students will use mathematical reasoning and proof. *(See Appendix for grade-level specifics.)*

M:CCR:2 – Students will create and use representations to communicate mathematical ideas and to solve problems. *(See Appendix for grade-level specifics.)*

M:CCR:3 – Students will recognize, explore, and develop mathematical connections. *(See Appendix for grade-level specifics.)*

Branching Out!

NONE

Capture, Store, and Release

NONE

The CEO

NONE

Choices and Preferences, Water Index

M:N&O:4 – Accurately solves problems.

M:DSP:2 – Analyzes patterns, trends, or distributions in data in a variety of contexts.

M:DSP:3 – Organizes and displays data; identifies or describes elements of representations that best display a given set of data or situation.

M:CCR:2 – Students will create and use representations to communicate mathematical ideas and to solve problems. *(See Appendix for grade-level specifics.)*

Cold Cash in the Icebox

M:G&M:7 – Demonstrates understanding of measurable attributes, measures and uses units of measure appropriately and consistently, and makes accurate conversions when solving problems.

Color Me A Watershed

M:N&O:4 – Accurately solves problems.

M:G&M:6 – Demonstrates understanding of one, two, and three-dimensional measurements, including length/height, radius, diameter, circumference, perimeter, area, surface area, volume, and the use of trigonometric formulas to find these measures.

M:G&M:7 – Demonstrates understanding of measurable attributes, measures and uses units of measure appropriately and consistently, and makes accurate conversions when solving problems.

M:PRP:1 – Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content. *(See Appendix for grade-level specifics.)*

Common Water

NONE

Dilemma Derby

NONE

A Drop in the Bucket

M:N&O:1 – Demonstrates understanding of rational numbers.

M:N&O:2 – Demonstrates understanding of the relative magnitude of numbers.

M:N&O:4 – Accurately solves problems.

M:N&O:7 – Makes estimates.

Dust Bowls and Failed Levees

NONE

Easy Street

M:N&O:4 – Accurately solves problems.

M:N&O:7 – Makes estimates.

M:PRP:2 – Students will use mathematical reasoning and proof. *(See Appendix for grade-level specifics.)*

Energetic Water

NONE

Every Drop Counts

M:DSP:3 – Organizes and displays data; identifies or describes elements of representations that best display a given set of data or situation.

Get the Ground Water Picture

M:N&O:4 – Accurately solves problems.

M:G&M:7 – Demonstrates understanding of measurable attributes, measures and uses units of measure appropriately and consistently, and makes accurate conversions when solving problems.

Geyser Guts

NONE

A Grave Mistake

NONE

The Great Stony Book

NONE

Great Water Journeys

NONE

H_2Olympics

M:G&M:6 – Demonstrates understanding of one, two, and three-dimensional measurements, including length/height, radius, diameter, circumference, perimeter, area, surface area, volume, and the use of trigonometric formulas to find these measures.

M:G&M:7 – Demonstrates understanding of measurable attributes, measures and uses units of measure appropriately and consistently, and makes accurate conversions when solving problems.

Hangin' Together

NONE

Hot Water

NONE

A House of Seasons

NONE

Humpty Dumpty

NONE

Imagine!

NONE

The Incredible Journey

NONE

Irrigation Interpretation

NONE

Is There Water on Zork?

NONE

Just Passing Through

NONE

Let's Even Things Out

NONE

The Life Box

NONE

Life in the Fast Lane

NONE

The Long Haul

M:N&O:7 – Makes estimates.

M:G&M:6 – Demonstrates understanding of one, two, and three-dimensional measurements, including length/height, radius, diameter, circumference, perimeter, area, surface area, volume, and the use of trigonometric formulas to find these measures.

Macroinvertebrate Mayhem

M:DSP:1 – Interprets a given representation to answer questions related to the data, or to analyze the data to formulate conclusions, make predictions, and/or solve problems.

Molecules in Motion

NONE

Money Down the Drain

M:N&O:4 – Accurately solves problems.

M:N&O:7 – Makes estimates.

M:CCR:3 – Students will recognize, explore, and develop mathematical connections. *(See Appendix for grade-level specifics.)*

Nature Rules!

NONE

No Bellyachers

NONE

Old Water

M:N&O:2 – Demonstrates understanding of the relative magnitude of numbers.

Pass the Jug

NONE

People of the Bog

NONE

Perspectives

NONE

Piece It Together

NONE

Poetic Precipitation

NONE

Poison Pump

NONE

The Price is Right

M:N&O:4 – Accurately solves problems.

M:G&M:7 – Demonstrates understanding of measurable attributes, measures and uses units of measure appropriately and consistently, and makes accurate conversions when solving problems.

M:G&M:10 – Demonstrates conceptual understanding of spatial reasoning and visualization.

M:PRP:2 – Students will use mathematical reasoning and proof. *(See Appendix for grade-level specifics.)*

M:CCR:3 – Students will recognize, explore, and develop mathematical connections. *(See Appendix for grade-level specifics.)*

The Pucker Effect

NONE

Raining Cats and Dogs

NONE

The Rainstick

NONE

Rainy-Day Hike

NONE

Reaching Your Limits

M:N&O:1 – Demonstrates understanding of rational numbers.

M:N&O:2 – Demonstrates understanding of the relative magnitude of numbers.

M:G&M:7 – Demonstrates understanding of measurable attributes, measures and uses units of measure appropriately and consistently, and makes accurate conversions when solving problems.

Salt Marsh Players

NONE

Sparkling Water

NONE

Stream Sense

NONE

Sum of the Parts

NONE

Super Bowl Surge

NONE

Super Sleuths

NONE

Thirsty Plants

M:N&O:4 – Accurately solves problems.

M:N&O:7 – Makes estimates.

M:G&M:7 – Demonstrates understanding of measurable attributes, measures and uses units of measure appropriately and consistently, and makes accurate conversions when solving problems.

The Thunderstorm

NONE

Water: Read All About It

NONE

Water Address

NONE

Water Bill of Rights

NONE

Water Celebration

NONE

Water Concentration

NONE

Water Court

NONE

Water Crossings

NONE

Water in Motion

NONE

Water Match

NONE

Water Messages in Stone

NONE

Water Meter

M:G&M:7 – Demonstrates understanding of measurable attributes, measures and uses units of measure appropriately and consistently, and makes accurate conversions when solving problems.

M:DSP:3 – Organizes and displays data; identifies or describes elements of representations that best display a given set of data or situation.

Water Models

NONE

Water Works

NONE

Water Write

NONE

Wet Vacation

NONE

Wet-Work Shuffle

NONE

Wetland Soils in Living Color

NONE

What's Happening?

M:DSP:6 – Decides the most effective method to collect the data necessary to answer a question or hypothesis; collects, organizes and appropriately displays the data to draw conclusions, and when appropriate makes predictions, asks new questions, and makes connections to real-world situations.

M:CCR:1 – Students will communicate their understanding of mathematics. *(See Appendix for grade-level specifics.)*

M:CCR:2 – Students will create and use representations to communicate mathematical ideas and to solve problems. *(See Appendix for grade-level specifics.)*

What's the Solution?

NONE

Where Are the Frogs?

NONE

Whose Problem Is It?

NONE

Wish Book

NONE

Part II:
Correlation of K-12 Mathematics New Hampshire Curriculum Framework with the *Project WET Curriculum and Activity Guide*

Number and Operations

M:N&O:1 – Demonstrates understanding of rational numbers.

Related WET Activities

- Aqua Bodies
- A Drop in the Bucket
- Reaching Your Limits

M:N&O:2 – Demonstrates understanding of the relative magnitude of numbers.

Related WET Activities

- A Drop in the Bucket
- Old Water
- Reaching Your Limits

M:N&O:3 – Demonstrates understanding of mathematical operations.

Related WET Activities

- *None*

M:N&O:4 – Accurately solves problems.

Related WET Activities

- Aqua Bodies
- Back to the Future
- Choices and Preferences, Water Index
- Color Me a Watershed
- A Drop in the Bucket
- Easy Street
- Get the Ground Water Picture
- Money Down the Drain
- The Price is Right
- Thirsty Plants

M:N&O:5 – Demonstrates understanding of monetary value.

Related WET Activities

- *None*

M:N&O:6 – Uses a variety of mental computation strategies to solve problems and determine the reasonableness of answers.

Related WET Activities

- *None*

M:N&O:7 – Makes estimates.

Related WET Activities

- A Drop in the Bucket
- AfterMath
- Easy Street
- The Long Haul
- Money Down the Drain
- Thirsty Plants

M:N&O:8 – Applies properties of numbers and field properties to solve problems and simplify computations.

Related WET Activities

- *None*

Geometry and Measurement

M:G&M:1 – Uses properties or attributes to identify, describe, classify, or distinguish among polygons and circles.

Related WET Activities

- *None*

M:G&M:2 – Applies theorems or relationships to solve problems.

Related WET Activities

- *None*

M:G&M:3 – Uses properties or attributes to identify, compare, or describe three-dimensional shapes.

Related WET Activities

- *None*

M:G&M:4 – Demonstrates understanding and applies concepts of congruency.

Related WET Activities

- *None*

M:G&M:5 – Demonstrates understanding and applies concepts of similarity.

Related WET Activities

- *None*

M:G&M:6 – Demonstrates understanding of one, two, and three-dimensional measurements, including length/height, radius, diameter, circumference, perimeter, area, surface area, volume, and the use of trigonometric formulas to find these measures.

Related WET Activities

- Color Me a Watershed
- H_2Olympics
- The Long Haul

M:G&M:7 – Demonstrates understanding of measurable attributes, measures and uses units of measure appropriately and consistently, and makes accurate conversions when solving problems.

Related WET Activities

- Back to the Future
- Cold Cash in the Icebox
- Color Me a Watershed
- Get the Ground Water Picture
- H_2Olympics
- The Price is Right
- Reaching Your Limits
- Thirsty Plants
- Water Meter

M:G&M:8 – Determines elapsed and accrued time.

Related WET Activities

- *None*

M:G&M:9 – Demonstrates understanding of spatial relationships and solves problems using location and position.

Related WET Activities

- AfterMath

M:G&M:10 – Demonstrates conceptual understanding of spatial reasoning and visualization.

Related WET Activities

- The Price is Right

Functions and Algebra

M:F&A:1 – Identifies, generalizes, and extends to specific cases a variety of patterns and/or sequences.

Related WET Activities

- *None*

M:F&A:2 – Demonstrates understanding of linear and nonlinear relationships and functions.

Related WET Activities

- *None*

M:F&A:3 – Demonstrates understanding of algebraic expressions.

Related WET Activities

- *None*

M:F&A:4 – Demonstrates conceptual understanding of equality.

Related WET Activities

- *None*

Data, Statistics, and Probability

M:DSP:1 – Interprets a given representation to answer questions related to the data, or to analyze the data to formulate conclusions, make predictions, and/or solve problems.

Related WET Activities

- AfterMath
- Macroinvertebrate Mayhem

M:DSP:2 – Analyzes patterns, trends, or distributions in data in a variety of contexts.

Related WET Activities

- AfterMath
- Back to the Future
- Choices and Preferences, Water Index

M:DSP:3 – Organizes and displays data; identifies or describes elements of representations that best display a given set of data or situation.

Related WET Activities

- Back to the Future
- Choices and Preferences, Water Index
- Every Drop Counts
- Water Meter

M:DSP:4 – Uses counting techniques to solve problems.

Related WET Activities

- *None*

M:DSP:5 – Solves problems to determine the experimental or theoretical probability of an event.

Related WET Activities

- *None*

M:DSP:6 – Decides the most effective method to collect the data necessary to answer a question or hypothesis; collects, organizes and appropriately displays the data; analyzes the data to draw conclusions, and when appropriate makes predictions, asks new questions, and makes connections to real-world situations.

Related WET Activities

- What's Happening?

Problem Solving, Reasoning, and Proof

M:PRP:1 – Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content. *(See Appendix for grade-level specifics.)*

Related WET Activities

- Back to the Future
- Color Me a Watershed

M:PRP:2 – Students will use mathematical reasoning and proof. *(See Appendix for grade-level specifics.)*

Related WET Activities

- Back to the Future
- Easy Street
- The Price is Right

Communication, Connections, and Representations

M:CCR:1 – Students will communicate their understanding of mathematics. *(See Appendix for grade-level specifics.)*

Related WET Activities

- What's Happening?

M:CCR:2 – Students will create and use representations to communicate mathematical ideas and to solve problems. *(See Appendix for grade-level specifics.)*

Related WET Activities

- Back to the Future
- Choices and Preferences, Water Index
- What's Happening?

M:CCR:3 – Students will recognize, explore, and develop mathematical connections. *(See Appendix for grade-level specifics.)*

Related WET Activities

- AfterMath
- Aqua Bodies
- Back to the Future
- Money Down the Drain
- The Price is Right

Part III:
Chart Correlating the *Project WET Curriculum and Activity Guide* with the K-12 Mathematics New Hampshire Curriculum Framework

	N&O								G&M										F&A				DSP						PRP		CCR		
WET Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**1**	**2**	**3**
Adventures in Density																																	
AfterMath							♦										♦						♦	♦									♦
A-Maze-Ing Water																																	
Aqua Bodies	♦			♦																													♦
Aqua Notes																																	
Back to the Future				♦											♦									♦	♦				♦	♦		♦	♦
Branching Out!																																	
Capture, Store & Release																																	
The CEO																																	
Choices and Preferences				♦																				♦	♦							♦	
Cold Cash in The Icebox															♦																		
Color Me a Watershed				♦										♦	♦														♦				
Common Water																																	
Dilemma Derby																																	
A Drop in The Bucket	♦	♦		♦			♦																										
Dust Bowls & Levees																																	
Easy Street				♦			♦																							♦			
Energetic Water																																	
Every Drop Counts																									♦								
Get the GW Picture				♦											♦																		
Geyser Guts																																	
A Grave Mistake																																	
The Great Stony Brook																																	
Great Water Journeys																																	
H_2Olympics														♦	♦																		
Hangin' Together																																	
Hot Water																																	
A House of Seasons																																	
Humpty Dumpty																																	
Imagine!																																	

	N&O								G&M										F&A				DSP						PRP		CCR		
WET Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**1**	**2**	**3**
Incredible Journey																																	
Irrigation Interpretation																																	
Is There Water on Zork?																																	
Just Passing Through																																	
Let's Even Things Out																																	
The Life Box																																	
Life in the Fast Lane																																	
The Long Haul							♦							♦																			
Macroinvertebrate Mayhem																							♦										
Molecules in Motion																																	
Money Down the Drain				♦			♦																										♦
Nature Rules!																																	
No Bellyachers																																	
Old Water		♦																															
Pass the Jug																																	
People of the Bog																																	
Perspectives																																	
Piece It Together																																	
Poetic Precipitation																																	
Poison Pump																																	
The Price Is Right				♦											♦			♦												♦			♦
The Pucker Effect																																	
Raining Cats and Dogs																																	
The Rainstick																																	
Rainy-Day Hike																																	
Reaching Your Limits	♦	♦													♦																		
Salt Marsh Players																																	
Sparkling Water																																	
Stream Sense																																	
Sum of the Parts																																	

	N&O								G&M										F&A				DSP						PRP		CCR		
WET Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**1**	**2**	**3**
Super Bowl Surge																																	
Super Sleuths																																	
Thirsty Plants				●			●								●																		
The Thunderstorm																																	
Water: Read All About It																																	
Water Address																																	
Water Bill of Rights																																	
Water Celebration																																	
Water Concentration																																	
Water Court																																	
Water Crossings																																	
Water In Motion																																	
Water Match																																	
Water Messages in Stone																																	
Water Meter															●										●								
Water Models																																	
Water Works																																	
Water Write																																	
Wet Vacation																																	
Wet-Work Shuffle																																	
Wetland Soils in Color																																	
What's Happening?																												●			●	●	
What's The Solution?																																	
Where Are The Frogs?																																	
Whose Problem Is It?																																	
Wish Book																																	

APPENDIX:
Summarized K-12 Mathematics New Hampshire Curriculum Framework

Number and Operations

M:N&O:1 – Demonstrates understanding of rational numbers.

M:N&O:2 – Demonstrates understanding of the relative magnitude of numbers.

M:N&O:3 – Demonstrates understanding of mathematical operations.

M:N&O:4 – Accurately solves problems.

M:N&O:5 – Demonstrates understanding of monetary value.

M:N&O:6 – Uses a variety of mental computation strategies to solve problems and determine the reasonableness of answers.

M:N&O:7 – Makes estimates.

M:N&O:8 – Applies properties of numbers and field properties to solve problems and simplify computations.

Geometry and Measurement

M:G&M:1 – Uses properties or attributes to identify, describe, classify, or distinguish among polygons and circles.

M:G&M:2 – Applies theorems or relationships to solve problems.

M:G&M:3 – Uses properties or attributes to identify, compare, or describe three-dimensional shapes.

M:G&M:4 – Demonstrates understanding and applies concepts of congruency.

M:G&M:5 – Demonstrates understanding and applies concepts of similarity.

M:G&M:6 – Demonstrates understanding of one, two, and three-dimensional measurements, including length/height, radius, diameter, circumference, perimeter, area, surface area, volume, and the use of trigonometric formulas to find these measures.

M:G&M:7 – Demonstrates understanding of measurable attributes, measures and uses units of measure appropriately and consistently, and makes accurate conversions when solving problems.

M:G&M:8 – Determines elapsed and accrued time.

M:G&M:9 – Demonstrates understanding of spatial relationships and solves problems using location and position.

M:G&M:10 – Demonstrates conceptual understanding of spatial reasoning and visualization.

Functions and Algebra

M:F&A:1 – Identifies, generalizes, and extends to specific cases a variety of patterns and/or sequences.

M:F&A:2 – Demonstrates understanding of linear and nonlinear relationships and functions.

M:F&A:3 – Demonstrates understanding of algebraic expressions.

M:F&A:4 – Demonstrates conceptual understanding of equality.

Data, Statistics, and Probability

M:DSP:1 – Interprets a given representation to answer questions related to the data, or to analyze the data to formulate conclusions, make predictions, and/or solve problems.

M:DSP:2 – Analyzes patterns, trends, or distributions in data in a variety of contexts.

M:DSP:3 – Organizes and displays data; identifies or describes elements of representations that best display a given set of data or situation.

M:DSP:4 – Uses counting techniques to solve problems.

M:DSP:5 – Solves problems to determine the experimental or theoretical probability of an event.

M:DSP:6 – Decides the most effective method to collect the data necessary to answer a question or hypothesis; collects, organizes and appropriately displays the data; analyzes the data to draw conclusions, and when appropriate makes predictions, asks new questions, and makes connections to real-world situations.

Problem Solving, Reasoning, and Proof

M:PRP:1 – Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content and be able to:

Grades K-2:

- Formulate and solve multi-step problems from everyday and mathematical situations.
- Solve problems using a variety of strategies.
- Verify and interpret results with respect to the original problem.
- Determine if the solution to a problem is reasonable.
- Solve problems using manipulatives, graphs, charts, diagrams, and calculators.

- Demonstrate that a problem may be solved in more than one way.
- Exhibit confidence in their ability to solve problems independently and in groups.
- Display increasing perseverance and persistence in problem solving.

Grades 3-5:

- Determine the reasonableness of solutions to real-world problems.
- Generalize solutions and apply strategies to new problem situations.
- Add to the repertoire of problem-solving strategies, and use those strategies in more sophisticated ways.
- Solve problems with multiple solutions, recognize when a problem has no solution, and recognize problems where more information is needed.
- Translate results of a computation into results that fit the real-world problem.

Grades 6-8:

- Use problem-solving strategies appropriately and effectively for a given situation.
- Determine, collect and organize the relevant information needed to solve real-world problems.
- Apply integrated problem-solving strategies to solve problems in the physical, natural, and social sciences and in pure mathematics.
- Use technology when appropriate to solve problems.
- Reflect on situations and the problem-solving process for a given situation and refine strategies as needed.

High School:

- Expand the repertoire of problem-solving strategies and use those strategies in more sophisticated ways.
- Use technology whenever appropriate to solve real-world problems.
- Formulate and redefine problem situations as needed to arrive at appropriate conclusions.

M:PRP:2 – Students will use mathematical reasoning and proof and be able to:

Grades K-2:

- Use models, known facts, properties, and relationships to explain their thinking.
- Justify solution processes and answers.
- Draw conclusions using inductive reasoning.
- Identify the missing information needed to find a solution to a given story problem.
- Use patterns and relationships to analyze mathematical situations.

Grades 3-5:

- Draw conclusions and solve problems using elementary deductive reasoning and reasoning by analogy.
- Make and defend conjectures and generalizations.

- Use models, known facts, properties, and relationships to explain thinking and to justify answers and solution processes.
- Recognize the pervasive use and power of reasoning as a part of mathematics.

Grades 6-8:

- Draw logical conclusions and make generalizations using deductive and inductive reasoning.
- Formulate, test, and justify mathematical conjectures and arguments.
- Construct and determine the validity of a mathematical argument or a solution.
- Apply mathematical reasoning skills in other disciplines.

High School:

- Expand the repertoire of proof techniques and use those techniques in more sophisticated ways.
- Use formal and informal reasoning and proof to explain and justify conclusions.
- Formalize mathematical arguments through the use of deductive reasoning.
- Use the principal of mathematical induction.
- Use reasoning and proof throughout classroom discussions independent of the mathematical topic being studied.
- Recognize how reasoning and proof influence the structure of mathematics.

Communication, Connections, and Representations

M:CCR:1 – Students will communicate their understanding of mathematics and be able to:

Grades K-2:

- Demonstrate mathematical communication through discussion, reading, writing, listening, and responding, individually and in groups.
- Discuss relationships between everyday language and mathematical language symbols.
- Explain conclusions, thought processes, and strategies in problem-solving situations.
- Discuss, illustrate, and write about mathematical concepts and relationships.
- Draw pictures and use objects to illustrate mathematical concepts.

Grades 3-5:

- Discuss mathematical ideas and write convincing arguments.
- Understand, explain, analyze, and evaluate mathematical arguments and conclusions presented by others.
- Ask clarifying and extending questions related to mathematics they have heard or read about.
- Understand and appreciate the economy and power of mathematical symbolism and its role in the development of mathematics.
- Demonstrate an understanding of mathematical concepts and relationships through a variety of methods.

- Use a variety of technologies to represent and communicate mathematical ideas.

Grades 6-8

- Articulate ideas clearly and logically in both written and oral form.
- Present, share, explain, and justify thinking with others and build upon the ideas of others to solve problems.
- Use mathematical symbols and notation.
- Formulate questions, conjectures, definitions, and generalizations about data, information, and problem situations.

High School:

- Explain and justify their thinking and develop increasingly sophisticated questions for given problem-situations.
- Critique and follow the logic of arguments presented within mathematics and across disciplines.

M:CCR:2 – Students will create and use representations to communicate mathematical ideas and to solve problems and be able to:

Grades K-2:

- Create and use age level appropriate representations to organize, record, and communicate mathematical ideas.
- Select, apply, and translate among mathematical representations to solve problems.
- Link different representations.
- Use representations to model and interpret physical, social, and mathematical phenomena.
- Use conventional and self-generated representations and connect them.
- Realize that any representation is subject to multiple interpretations.

Grades 3-5:

- Use physical models and diagrams to represent important mathematical ideas.
- Use appropriate representations to solve problems or to portray, clarify, or extend a mathematical idea.
- Recognize equivalent representations of concepts and procedures and translate among them as appropriate.

Grades 6-8:

- Use models and technology to develop equivalent representations of the same mathematical concept.
- Use and create representations to solve problems and organize their thoughts and ideas.
- Convert between representations.

High School:

- Choose appropriate representations and mathematical language to present ideas clearly and logically for a given situation.
- See a common structure in mathematical phenomena that come from very different contexts.
- Find representations that model essential features of a mathematical situation.
- Use representations as a primary means for expressing and understanding more abstract mathematical concepts.

M:CCR:3 – Students will recognize, explore, and develop mathematical connections and be able to:

Grades K-2:

- Link conceptual and procedural knowledge.
- Recognize and use mathematics in other curriculum areas.
- Recognize and use mathematics in their daily lives.
- Identify mathematical situations occurring in literature for children.
- Identify examples of geometry in nature, art, and architecture.

Grades 3-5:

- See mathematics as an integrated whole.
- Recognize relationships among different topics in mathematics.
- Recognize and use mathematics in other curriculum areas and in their daily lives.
- Link concepts and procedures.
- Use mathematical skills, concepts, and applications in other disciplines.

Grades 6-8:

- Connect new mathematical ideas to those already studied and build upon them.
- Understand that many real-world applications require an understanding of mathematical concepts.
- Explain in oral and written form the relationships between a real-world problem and an appropriate mathematical model.
- Explain in oral and written form the relationships among various mathematical concepts.

High School:

- Explain in oral or written form how mathematics connects to other disciplines, to daily life, careers, and society.
- Explain multiple approaches that lead to equivalent results when solving problems.