

# **PreK – 12 Mathematics Framework**

**Spring, 2007**



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## **PreK - 12 Philosophical Foundations**

### **Mission**

To be successful in a global society, all students need an understanding and appreciation of mathematical concepts, including reasoning and problem solving. Students must have the opportunity to develop their mathematical confidence and abilities.

### **Beliefs**

- All students both in groups and individually, will expand their knowledge through the study and application of mathematics that is relevant to their present and future lives.
- All students need to develop mathematical confidence.
- All students need to be proficient in computation, algebra skills, logical reasoning, and problem solving.
- Success in mathematics occurs when all students are in an environment in which a variety of learning methods and approaches of solving problems are valued.
- In order to demonstrate mathematical skill and knowledge, all students should be assessed using a variety of methods.
- All students should have the opportunity to work at a level that allows them to be challenged and successful.

## National Council of Teachers of Mathematics

The National Council of Teachers of Mathematics (NCTM) *Principles and Standards for School Mathematics* (2000) outlines a common foundation of mathematics to be learned by all students. This comprehensive document defines a set of principals and standards, which guided the development of the curriculum frameworks, assessments, instructional materials and practices.

### The Six Principles (pg. 11)

- **Equity.** Excellence in mathematics education requires equity—high expectations and strong support for all students.
- **Curriculum.** A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.
- **Teaching.** Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.
- **Learning.** Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.
- **Assessment.** Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.
- **Technology.** Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.

### The Standards for School Mathematics (pg. 11)

The Standards specify the knowledge and skills that students should acquire from prekindergarten through grade 12. The Content Standards describe the content students should learn.

- Number and Operations
- Algebra
- Geometry
- Measurement
- Data Analysis and Probability

The Process Standards outline ways students should apply the content knowledge.

- Problem Solving
- Reasoning and Proof
- Communication
- Connections
- Representation

The National Council of Teachers of Mathematics *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence* (2006) provides recommendations of the most significant mathematical concepts and skills that should be taught at each grade level. In conjunction with the focal points for each grade level, connections are also made to mathematical strands where teachers will have the opportunity to bring together related topics to reinforce or extend previously taught skills. This comprehensive document offers both immediate and long-term opportunities for improving the teaching and learning of mathematics. (pg. 1)

Millard Public Schools will use this document to guide discussions as we review, refine and revise the PreK-12 mathematics curricula.

## **Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics**

### **PreKindergarten**

- Number and Operations: Developing an understanding of whole numbers, including concepts of correspondence, counting, cardinality, and comparison
- Geometry: Identifying shapes and describing spatial relationships
- Measurement: Identifying measurable attributes and comparing objects by using these attributes

### **Kindergarten**

- Number and Operations: Representing, comparing, and ordering whole numbers and joining and separating sets
- Geometry: Describing shapes and space
- Measurement: Ordering objects by measurable attributes

### **Grade One**

- Number and Operations and Algebra: Developing understandings of addition and subtraction and strategies for basic addition facts and related subtraction facts relationships, including grouping in tens and ones
- Geometry: Composing and decomposing geometric shapes

### **Grade Two**

- Number and Operations: Developing an understanding of the base-ten numeration system and place-value concepts
- Number and Operations and Algebra: Developing quick recall of addition facts and related subtraction facts and fluency with multidigit addition and subtraction
- Measurement: Developing an understanding of linear measurement and facility in measuring lengths

### **Grade Three**

- Number and Operations and Algebra: Developing understandings of multiplication and division and strategies for basic multiplication facts and related division facts

- Number and Operations: Developing an understanding of fractions and fraction equivalence
- Geometry: Describing and analyzing properties of two-dimensional shapes

#### **Grade Four**

- Number and Operations and Algebra: Developing quick recall of multiplication facts and related division facts and fluency with whole number multiplication
- Number and Operations: Developing an understanding of decimals, including the connections between fractions and decimals
- Measurement: Developing an understanding of area and determining the areas of two dimensional shapes

#### **Grade Five**

- Number and Operations and Algebra: Developing an understanding of and fluency with division of whole numbers
- Number and Operations: Developing an understanding of and fluency with addition and subtraction of fractions and decimals
- Geometry and Measurement and Algebra: Describing three-dimensional shapes and analyzing their properties, including volume and surface area

#### **Grade Six**

- Number and Operations: Developing an understanding of and fluency with multiplication and division of fractions and decimals
- Number and Operations: Connecting ratio and rate to multiplication and division
- Algebra: Writing, interpreting, and using mathematical expressions and equations

#### **Grade Seven**

- Number and Operations and Algebra and Geometry: Developing an understanding of and applying proportionality, including similarity.
- Measurement and Geometry and Algebra: Developing an understanding of and using formulas to determine surface areas and volumes of three-dimensional shapes.
- Number and Operations and Algebra: Developing an understanding of operations on all rational numbers and solving linear equations

#### **Grade Eight**

- Algebra: Analyzing and representing linear functions and solving linear equations and systems of linear equations
- Geometry and Measurement: Analyzing two- and three-dimensional space and figures by using distance and angle
- Data Analysis and Number and Operations and Algebra: Analyzing and summarizing data sets

## **Nebraska L.E.A.R.N.S. – Leading Educational Achievement through Rigorous Nebraska Standards**

The Nebraska State Standards (L.E.A.R.N.S.) were approved by the Nebraska State Board of Education in 2003, and ensure school districts develop outcomes, enablers and assessments that will reflect what students should know and be able to do at the end of 8<sup>th</sup> grade and 12<sup>th</sup> grade.

See <http://www.nde.state.ne.us/ndestandards/AcademicStandards.htm> for complete standard descriptors and grade level expectations.

In September, 2003, Millard showed alignment between the Millard Math Framework and the Nebraska State Math Standards. The “Math Standards Comparison Form” was then submitted to the state, and upon review, Millard Public School’s standards were approved as equal to or more rigorous than the Nebraska State Standards. Thus, our framework has been developed around the Millard Standards.

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Tomlinson, Carol A., & Stickland, C.A. (2005). *Differentiation in Practice: A Resource Guide for Differentiating Curriculum, Grades 9-12*. Alexandria, VA: Association for Supervision and Curriculum Development.

*Trends In Mathematics and Science Study, (TIMMS)*, 2<sup>nd</sup> Edition. (2003) U.S. Department of Education: National Center for Education Statistics.

Wiggins, Grant and Jay McTighe. (1998) *Understanding by Design*. Alexandria, VA: Association for Supervision and Curriculum Development.



<p>5 - Understand and use attributes of geometric figures and systems of measurement</p> <p>5.1 - understand geometric concepts and spatial relationships</p> <p>5.2 - use appropriate units for accurate measurement</p>	<p>5.1 – Basic concepts of geometry and spatial relationships are used to construct, draw, describe, and compare geometric models and their transformations to solve problems.</p> <p>5.2 – Customary, metric, and non-standard units are used to approximate and compute measurements and communicate.</p>	<p>Where are shapes found in the world? How can shapes be described? How are plane shapes different from solids?</p> <p>Why are objects measured? How can objects be measured? How are measuring units selected?</p>
<p>6 - Demonstrate knowledge of and use coordinate systems and algebraic concepts</p> <p>6.1 - represent and analyze mathematical situations using algebraic symbols</p> <p>6.2 - understand and use patterns and functions in mathematics</p>	<p>6.1 – Algebra skills and concepts enable us to describe real world phenomena symbolically and graphically, and to model quantitative change.</p> <p>6.2 – Patterns enable us to discover, analyze, describe, extend, and formulate concrete understandings of mathematical in the real world.</p>	<p>What symbols do we use in mathematical equations? What strategies can be used to find a missing number in an equation?</p> <p>Where are patterns found? How does finding patterns help in counting? What strategies can be used to continue a numerical number sequence?</p>
<p>7 – Select, organize, display and analyze data</p>	<p>7.1 – The type of data determines how data sets can be collected, organized, displayed, and analyzed.</p>	<p>What kinds of questions generate data? What are some ways to gather and record information? What are some ways data can be displayed to communicate information?</p>
<p>8 – Apply appropriate mathematical strategies to solve problems</p>	<p>8.1 - Mathematical problems can be solved in more than one way.</p>	<p>What strategy is used to solve which math problem? How do you know which strategy to use to solve math problems?</p>



<p>6 - Demonstrate knowledge of and use coordinate systems and algebraic concepts</p> <p>6.1 - represent and analyze mathematical situations using algebraic symbols</p> <p>6.2 - understand and use patterns and functions in mathematics</p>	<p>6.1 – Algebra skills and concepts enable us to describe real world phenomena symbolically and graphically, and to model quantitative change.</p> <p>6.2 – Patterns enable us to discover, analyze, describe, extend, and formulate concrete understandings of mathematical and real world phenomena.</p>	<p>What is the process to solve for an unknown number? What strategies can be used to find a missing number in an equation?</p> <p>How can using patterns solve math problems? What attributes are needed to create a pattern?</p>
<p>7 – Select, organize, display and analyze data</p>	<p>7.1 – The type of data determines how data sets can be collected, organized, displayed, and analyzed.</p>	<p>What are various ways to gather and record information? What questions can be answered from a graph?</p>
<p>8 – Apply appropriate mathematical strategies to solve problems</p>	<p>8.1 - Mathematical problems can be solved in more than one way.</p>	<p>What strategy is used to solve which math problems? What strategy is helpful to decide if a solution makes sense? How do you know which strategy to use to solve math problems?</p>

## **Secondary Math Enduring Understandings and Essential Questions:**

### **Enduring Understandings:**

1. The study of mathematical principles, processes, and skills help students to become logical, independent thinkers.
2. The study of mathematical principles, processes, and skills help students to become critical problem solvers and consumers of information.
3. The study of mathematical principles, processes, and skills help students model, communicate, and apply systematic reasoning.

### **Essential Question:**

How does the the study of mathematical principals, processes, and skills help students?

**Millard Standards: Math**  
**Elementary School (Assessed in Grades 2,3,4,5)**

**Millard Outcome #4. Represents numbers and relationships between numbers, compute fluently, and make reasonable estimates.**

4.1 Student will understand numbers, ways to represent numbers and relationships among numbers

4.2 Student will understand meaning of operations and how they relate to one another

**Millard Outcome #5. Understand and use attributes of geometric figures and systems of measurement.**

5.1 Student will understand geometric concepts and spatial relationships

5.2 Student will use appropriate units of accurate measurement

**Millard Outcome #6. Demonstrate knowledge of and use coordinate systems and algebraic concepts.**

6.1 Student will represent and analyze mathematical situations using algebraic symbols

6.2 Students will understand and use patterns and functions in mathematics

**Millard Outcome #7. Select, organize, display and analyze data.**

7.1 Student will select, organize, display and interpret data to draw conclusions

**Millard Outcome #8. Apply appropriate mathematical strategies to solve problems.**

8.1 Student will use mathematical strategies to solve problems

**Millard Standards: Math**  
**Middle School (Assessed in Grades 6,7,8)**

**Millard Outcome # 4. Students will represent numbers and relationships between numbers, compute fluently and make reasonable estimate.**

- 4.1 Students will represent numbers and relationships between numbers.
- 4.2 Students will compute fluently.
- 4.3 Students will make reasonable estimates.

**Millard Outcome #5. Students will understand and use attributes of geometric figures and systems of measurement.**

- 5.1 Students will understand and use attributes of geometric figures.
- 5.2 Students will understand and use systems of measurement.

**Millard Outcome #6. Students will demonstrate knowledge of and use coordinate systems and algebraic concepts.**

- 6.1 Students will demonstrate knowledge of and use coordinate systems.
- 6.2 Students will demonstrate knowledge of and use algebraic concepts.

**Millard Outcome #7. Students will select, organize, display and analyze data.**

- 7.1 Students will select, organize, display and analyze data.

**Millard Outcome #8. Students will apply appropriate mathematical strategies to solve a problem.**

- 8.1 Students will apply appropriate mathematical strategies to solve a problem.

**Millard Standards: Math**  
**High School (Assessed in Grade 10)**

**Millard Outcome # 4. Students will represent numbers and relationships between numbers, compute fluently and make reasonable estimate.**

- 4.1 Students will represent numbers and relationships between numbers.
- 4.2 Students will compute fluently.
- 4.3 Students will make reasonable estimates.

**Millard Outcome #5. Students will understand and use attributes of geometric figures and systems of measurement.**

- 5.1 Students will visualize geometric figures and/or relationships in various dimensions, analyze commonalities and differences.
- 5.2 Students will explore and apply properties of circles, triangles, right triangles and quadrilaterals.
- 5.3 Students will incorporate algebraic skills to solve problems in the geometric setting.
- 5.4 Students will understand and use systems of measurement.

**Millard Outcome #6. Students will demonstrate knowledge of and use coordinate systems and algebraic concepts.**

- 6.1 Students will apply algebraic concepts and operations to exponents and polynomials.
- 6.2 Students will apply basic operations of algebra to solve equations and inequalities.
- 6.3 Students will apply various algebraic concepts to solve quadratic, rational and radical functions.

**Millard Outcome #7. Students will select, organize, display and analyze data.**

- 7.1 Students will analyze and apply data.

**Millard Outcome #8. Students will apply appropriate mathematical strategies to solve a problem.**

- 8.1 Students will apply concepts of linear equations and inequalities to describe and analyze alternative solutions to a real-world problem or situation.
- 8.2 Students will apply deductive/inductive reasoning to arrive at valid conclusions.

# MILLARD ESSENTIAL LEARNER OUTCOMES

• CITIZENSHIP • CONSUMER ECONOMICS • FINE AND PERFORMING ARTS • HUMAN RELATIONS • LITERACY AND COMMUNICATION • MATHEMATICS • READINESS FOR WORK • READINESS FOR LIFE-LONG LEARNING • SCIENCE • SOCIAL STUDIES • TECHNOLOGY • WELLNESS

## ACADEMIC SKILLS AND APPLICATIONS

## LIFE SKILLS AND PERFORMANCES

Students will demonstrate proficiency on these twelve indicators by meeting established standards on District-wide assessments. This proficiency, along with the successful completion of 225 credits for the class of 2004 and beyond, is used for diploma granting or denial. Students in the Millard Public Schools will:

### LITERACY AND COMMUNICATION

1. Demonstrate competencies in reading to understand and evaluate a variety of texts.
2. Demonstrate competencies in writing in a variety of modes.

### MATHEMATICS

4. Represent numbers and relationships between numbers, compute fluently, and make reasonable estimates.
5. Understand and use attributes of geometric figures and systems of measurement.
6. Demonstrate knowledge of and use coordinate systems and algebraic concepts.
7. Select, organize, display and analyze data.
8. Apply appropriate mathematical strategies to solve problems.

### SCIENCE

9. Use scientific processes to understand the unifying concepts of the natural world.
10. Demonstrate understanding of life, physical, earth and space sciences.

### SOCIAL STUDIES

11. Demonstrate understanding of structure, operations and relationships among local, state, national and international governments.
12. Demonstrate practical knowledge of history, economics and geography.
13. Understand global interdependence.

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Course outcomes and assessments will determine program and building accountability in the areas of clarity (what is to be taught), competence (what is to be learned), consistency (among buildings), continuity (articulation) and communication (among teachers and with parents). The following indicators are not used for diploma-granting or denial.

### LITERACY AND COMMUNICATION

3. Demonstrate appropriate speaking and listening skills for a variety of settings.

### CONSUMER ECONOMICS

- Demonstrate skills in managing money.
- Make sound financial choices by using appropriate resources.

### HUMAN RELATIONS

- Understand ethnic and cultural differences.
- Understand human differences.

### TECHNOLOGY

- Obtain information electronically and organizes it successfully.
- Convey information using technology.
- Use a variety of technological resources to solve problems.

### FINE AND PERFORMING ARTS

- Experience and evaluate a variety of music, art, or drama.

### WELLNESS

- Understand human growth and development.
- Identify the values of good nutrition and physical activity.
- Evaluate the impact of addictive substances and behaviors.

Within the school setting, students in the Millard Schools will:

### READINESS FOR WORK

- Demonstrate the ability to manage time.
- Demonstrate the ability to follow directions.
- Solve problems by processing available information pertinent to a given situation, making decisions as appropriate.
- Develop ability to work with others to accomplish tasks/goals.
- Demonstrate essential knowledge of good work habits.
- Demonstrate responsibility.

### READINESS FOR LIFE-LONG LEARNING

- Demonstrate ability to set and pursue short term and long term goals.
- Obtain, organize and evaluate information successfully.
- Develop the attributes of:
  - integrity,
  - self-discipline,
  - positive attitude,
  - perseverance.

### CITIZENSHIP

- Participate in community and/or school organization.
- Respect diversity.
- Respect the rights of others.
- Treat others in a considerate and non-demeaning manner.

Revised: Strategic Planning  
December 5, 1996

T-Chart Approved: Millard Board of  
Education  
January 13, 1997

Rule Adopted: May 3, 1999

Revised: June 18, 2001; July 21, 2003; December 4,  
2006

Millard Public Schools  
Omaha, NE

# PreK-5 Mathematics Framework



## Elementary Participants

The following people participated in developing the PK-5 Math Framework:

### Core Committee:

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 Mary Ritzdorf  
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 Barb Wilson  
 Kelly Pugh  
 Candy Spurzem  
 Jaci Goldhorn

## Projected Timeline for Millard Education Program for Elementary

Phase	Task	Year
Phase I	Initial Meeting <ul style="list-style-type: none"> <li>• Review Philosophy, District Outcomes, Standards &amp; Beliefs</li> <li>• Critical Issues</li> <li>• Formation of Research Groups</li> </ul>	September 2004
	Conducting Research	
	Sharing Research Findings Develop Evaluation Form	November 2004
	Vendor Presentations <ul style="list-style-type: none"> <li>• Complete Evaluation Forms</li> <li>• Selection of Field Study Programs</li> <li>• Identification of Field Study Participants</li> </ul>	March 2005  May 2005
Phase II 2005-06	Staff Development for Field Study Participants	August 2005
	Field Study Update <ul style="list-style-type: none"> <li>• Teacher usability</li> <li>• Student use</li> <li>• Evaluation responses</li> <li>• Student assessment data</li> </ul>	October 2005
	Field Study Update	February 2006
	Other Data Reviewed <ul style="list-style-type: none"> <li>• Alignment to grade 6</li> <li>• Vendor staff development plans</li> <li>• Software applications and feasibility</li> <li>• Cost projections</li> <li>• Responsiveness of vendors</li> </ul>	August 2005-2006
	Decision to continue Field Study, see notes on page 22 *	April 2006
Phase II 2006-07	Training for Field Study participants <ul style="list-style-type: none"> <li>• In-depth training for Real Math teachers</li> <li>• Training for Harcourt Think Math and Scott Foresman Investigations</li> <li>• Technology training day for Real Math</li> </ul>	October 2006
	Follow Up Day for Think Math	January 2007
	Selection of program *Scott Foresman Addison Wesley Mathematics 2008 & Investigations 2008	February 22, 2007
Phase III	<ul style="list-style-type: none"> <li>• Implement new curriculum, purchase new resources</li> <li>• Staff Development on new instructional practices &amp; resources</li> </ul>	2007-2008
Phase IV	<ul style="list-style-type: none"> <li>• Monitor, collect student &amp; program assessment data</li> </ul>	2008-2009 2009-2010 2010-2011 2011-2012
Phase I	<ul style="list-style-type: none"> <li>• Establish core committee</li> <li>• Research by staff</li> <li>• Develop mission</li> </ul>	2012-2013

\*Decision to continue Field Study – April 3, 2006

- The Elementary Math Task Force met on April 3, 2006 with the purpose of making a decision related to the elementary math field study and selection of a program for implementation.

After discussion about new programs to be implemented during the 06-07 school year: elementary science, elementary goal setting, elementary gradebook and building staff development related to Millard Instructional Model (MIM), PLC, building focus; the following recommendations were made:

- Eliminate Everyday Math and Macmillan programs from the field study as they did not meet the mathematical instructional needs of students and staff.
- After a great deal of discussion based on tasks impacting teachers for the 2006-07 school year, the recommendation was made to extend the field study for another year and have it remain in Phase II for a second year.
- Harcourt Math and Scott Foresman Math programs are comparable to each other and a recommendation of one program over the other was not evident.
- The Real Math program appears to provide many components that would meet district staff and student needs and requires further consideration. Program was added to field study.

## Elementary Instructional Strategies

Increased understanding of mathematics will be essential for today's students. To be successful in tomorrow's job market they will need more than computational competence. They will be required to apply their mathematical knowledge to solve problems. Today's students need to learn new concepts and skills. They need to see mathematics as a tool they can use every day to be successful. By using the following instructional approaches in their classrooms the students of today can learn the new concepts and skills needed to be successful in today's and tomorrow's society.

- Applying mathematical skills to daily life
- Implementing Differentiated instructional practices
- Focusing on thinking and problem solving rather than rote memorization
- Employing Socratic Inquiry/Open-Ended Questioning
- Using manipulatives to provide concrete representations of ideas
- Engaging students in thoughtful reflection
- Mathematics teachers will also continue to use strategies that address learning styles, multiple intelligences, cultural and ethnic differences, and physical and intellectual abilities.

### Scientific Research Base for Mathematics Instruction

The findings of the National Research Council identified a framework for integrating the five strands of mathematical proficiency:

1. Understanding mathematics
2. Computing fluently
3. Applying concepts to solve problems
4. Reasoning logically
5. Engaging with mathematics

### Instructional Strategies:

1. Using a lesson design that involves these phases: 1) interaction of teacher and student to activate prior knowledge and to guide instruction; 2) transition toward independent student work; and 3) application of concept, skill, or strategy to exercises and problems, followed by assessment

2. Developing students' conceptual understanding by using a variety of manipulatives and by transitioning to visual representations.
3. Using a variety of instructional techniques to develop vocabulary.
4. Connecting mathematical terms to images and imagery-building activities
5. Developing problem solving abilities through teaching specific problem solving skills and through teaching students to create representations
6. Developing reading comprehension by overtly teaching reading strategies for problem solving.
7. Incorporating ongoing and structured review of prerequisite and prior-taught skills on a regular basis.
8. Structuring lessons to provide daily, weekly and monthly review
9. Using closure at appropriate places within lessons to clarify students' understanding and to assess students' progress.
10. Offering students opportunities to actively reflect on a lesson through oral, written, and graphic summaries of their learning.
11. Providing graphic organizers to help student model nonlinguistically the action in the word problems.

## **Elementary Assessment Strategies and Assessment Types**

### **Assessment Strategies:**

1. Assessing students' levels of understanding and skill competency through frequent prerequisite skills assessments to individualize instruction
2. Providing a variety of assessment instruments to allow teachers to frequently diagnose students needs and effectively monitor progress.
3. Providing planning and assessment software that can be customized to meet district standards.

### **PreK-5 Mathematics Outcome Assessments**

Assessment and instruction are interwoven strands in mathematics education. The primary purpose of assessment is to promote learning. Various instructional methods are used to provide informal and formal feedback and formative and summative information.

### **Assessments Include:**

1. Written assessments to assess students' mastery of important concepts and skills
  - Diagnosing Readiness
  - Chapter Tests
  - Cumulative Tests
  - Teacher developed classroom-based assessments
2. Journal Writing that encourages students to use mathematical language as they reflect on what they are learning. It provides the teacher with insight as to how the student approaches problem solving.
3. Portfolio Assessment provides a way of tracking a student's growth and progress over time. A portfolio should include many types of assessment.
4. Performance Assessment gives a way to assess the student's qualities of imagination, creativity, and perseverance. Teachers can evaluate how a student reasons through problems, makes and tests conjectures, uses number sense to predict reasonable answers, and utilizes alternative strategies.
5. Basic-Fact Timed Tests provide students with the opportunity to review and practice basic facts.
6. Item Bank of Assessment Questions that teachers can use to develop assessments for specific groups of children or for the development of grade level common assessments.
7. District Essential Learner Outcome Assessments that assess all students at a specific grade level. These results are also used for Nebraska Department of Education STARS Assessments and Federal No Child Left Behind Assessments.
8. District Terra Nova Nationally Norm Achievement Test

## PreK Math

**Description:** PreK math focuses on Number and Operations: Developing an understanding of whole numbers, including concepts of correspondence, counting, cardinality, and comparison; Geometry: Identifying shapes and describing spatial relationships; Measurement: Identifying measurable attributes and comparing objects by using these attributes; and Connections to the Focal Points - Data Analysis, Number and Operations, Algebra

### **Primary Resource:**

Scott Foresman Addison-Wesley Mathematics

### **Quarter 1 Outcomes:**

#### **Objectives**

#### **4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Using cardinal and ordinal number words.
- Using counting to represent existing sets of objects and to construct sets.
- Using 1-to-1 correspondence to compare and match sets numerically.
- Counting, reading, writing numbers to 10.
- Using concrete, pictorial and number-line models for numbers to 10
- Using more, less or the same when comparing 2 sets.

#### **Outcome 1 Assessment:**

Observation checklist for Quarter 1 Outcomes

### **Quarter 2 Outcomes**

#### **Objectives**

#### **4.2 Students will understand meanings of operations and how they relate to one another by:**

- Using counting and 1-to-1 correspondence to solve arithmetic problems – add, subtract, divide.
- Separating a set of objects into subsets and then combine them to reform original set.

#### **5.1 Students will understand geometric concepts and spatial relationships by:**

- Matching, naming and constructing 2-D shapes – triangle, square, rectangle, circle.
- Identifying, naming, and drawing 3-D shapes.

#### **Outcome 2 Assessment:**

Observation checklist for Quarters 1-2 Outcomes

### **Quarter 3 Outcomes:**

#### **Objectives**

#### **4.2 Students will understand meanings of operations and how they relate to one another by:**

- Separating a set of objects into subsets and then combine them to reform original set.

#### **5.1 Students will understand geometric concepts and spatial relationships by:**

- Using mental imagery to recognize shapes in different orientations.
- Identifying sides, corners, faces, edges.
- Using relative position words to describe object location – above, below, right, left, column, row.

#### **6.2 Students will understand and use patterns and functions in mathematics by:**

- Identifying next object in a pattern.
- Sorting by color, size, shape.

#### **Outcome 3 Assessment:**

Observation checklist for Quarters 1-3 Outcomes

### **Quarter 4 Outcomes:**

#### **Objectives**

#### **5.2 Students will use appropriate units for accurate measurement by:**

- Comparing and describing the lengths, weights, and capacities of objects.
- Measuring length with nonstandard units.

#### **7.1 Students will select, organize, display and interpret data to draw conclusions by:**

- Using real objects to make graphs.
- Identifying which group has more or fewer based on real objects in a graph.

#### **Outcome 4 Assessment:**

Observation checklist for Quarters 1-4 Outcomes

## Kindergarten Math

**Description:** Kindergarten math focuses on Number and Operations: Representing, comparing, and ordering whole numbers and joining and separating sets; Geometry: Describing shapes and space; Measurement: Ordering objects by measurable attributes; and Connections to the Focal Points – Data Analysis, Geometry, Algebra

### **Primary Resource:**

\*Scott Foresman Addison Wesley Mathematics 2008 & Investigations 2008

### **Quarter 1 Outcomes:**

#### **Objectives:**

#### **4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Counting the quantities, 1, 2, 3.
- Recognizing the numerals that describe the quantities 4, 5.0.
- Using one-to-one correspondence and counting to determine which group has more or fewer.
- Ordering numbers from 0 to 5 in sequence.

#### **5.1 Students will understand geometric concepts and spatial relationships by:**

- Using the word *inside/under/middle* to describe the position of an object.

#### **6.2 Students will understand and use patterns and functions in mathematics by:**

- Sorting objects by one attribute, such as color.
- Extending shape patterns.
- Comparing patterns to find how they are alike or different

#### **7.1 Students will select, organize, display and interpret data to draw conclusions by:**

- Using a bar graph to answer a question.

#### **8.1 Students will use mathematical strategies to solve problems by:**

- Solving problems by determining the sorting rule for groups of sorted objects.

#### **Quarter 1 Assessment:**

Assessment that includes Quarter 1 Outcomes and Objectives

## **Quarter 2 Outcomes:**

### **Objectives**

#### **4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Using one-to-one correspondence and counting to determine which group has fewer.
- Using the words first through fifth to identify ordinal position.
- Giving a number from 1 through 10, tell whether it is more than 5 but less than 10.
- Using a number line to order numbers from 0 through 10.
- Estimating the quantity in a group.
- Finding and identifying numbers through 31.

#### **5.2 Students will use appropriate units for accurate measurement by:**

- Comparing objects by height.
- Comparing containers by their capacity.
- Comparing objects by weight.

#### **6.2 Students will understand and use patterns and functions in mathematics by:**

- Extending shape patterns.
- Using objects to skip count by 2s.

#### **8.1 Students will use mathematical strategies to solve problems by:**

- Solving problems by determining the sorting rule for groups of sorted objects.

### **Quarter 2 Assessment:**

Assessment that includes Quarters 1-2 Outcomes and Objectives

## **Quarter 3 Outcomes:**

### **Objectives**

#### **4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Using one-to-one correspondence and counting to determine which group has fewer.
- Using the word first through seventh to identify an ordinal position.
- Identifying number through 31.
- Finding the value of a nickel and some pennies.
- Identifying fourths of a whole.
- Representing 10 in different ways.

#### **4.2 Students will understand meanings of operations and how they relate to one another by:**

- Solving problems involving equal shares.

- Finding the number that is more or fewer than a given number.

**5.1 Students will understand geometric concepts and spatial relationships by:**

- Identifying 3-D shapes.

**5.1 Students will use appropriate units for accurate measurement by:**

- Estimating the length of an object in nonstandard units.
- Identifying tomorrow.
- Telling time to the hour.

**8.1 Students will use mathematical strategies to solve problems by:**

- Solving problems by determining the sorting rule for groups of sorted objects.

**Quarter 3 Assessment:**

Assessment that includes Quarters 1-3 Outcomes and Objectives

**Quarter 4 Outcomes:**

**Objectives**

**4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Using the words first through tenth to identify an ordinal position.
- Identifying halves of a whole.
- Adding coins and using cent sign.
- Counting groups by 2s and 10s.

**4.2 Students will understand meanings of operations and how they relate to one another by:**

- Interpreting illustrations that show joining groups.
- Determining how many are left when some objects in a group are taken away.
- Comparing two groups to find how many fewer.

**5.2 Students will use appropriate units for accurate measurement by:**

- Comparing containers by their capacity.
- Telling time to the hour.

**6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Using the plus sign to represent joining groups when recording addition.
- Writing and solving addition sentences to represent joining situations.

**Quarter 4 Assessment:**

Assessment that includes Quarters 1-4 Outcomes and Objectives

## Grade 1 Math

**Description:** Grade 1 math focuses on Number and Operations and Algebra: Developing understandings of addition and subtraction and strategies for basic addition facts and related subtraction facts relationships, including grouping in tens and ones; Geometry: Composing and decomposing geometric shapes; and Connections to the Focal Points – Number and Operations and Algebra, Measurement and Data Analysis, Algebra

**Primary Resource:**

\*Scott Foresman Addison Wesley Mathematics 2008 & Investigations 2008

**Quarter 1 Outcomes:**

**Objectives**

**4.2 Students will understand meanings of operations and how they relate to one another by:**

- Finding the number that is 2 more than a given number.
- Finding the number that is 2 fewer than a given number.
- Solving problems by choosing addition or subtraction.

**6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Comparing and ordering numbers through 12.
- Comparing two groups to find out how many fewer.
- Writing addition sentences to find the sum in a joining situation.
- Writing the differences for horizontal and vertical forms of subtraction.
- Writing subtraction sentences to compare and tell how many more.
- Identifying fact families through 10.
- Using the commutative property to find sums.

**6.2 Students will understand and use patterns and functions in mathematics by:**

- Identifying the pattern unit in a repeating pattern, and extend the pattern.
- Using number line to count on 2.

**8.1 Students will use mathematical strategies to solve problems by:**

- Solving problems by using objects to act them out.
- Solving problems by writing addition sentences.
- Solving problems by identifying unnecessary information and writing number sentences.

**Quarter 1 Assessment:**

Assessment that includes Quarter 1 Outcomes and Objectives

## **Quarter 2 Outcomes:**

### **Objectives**

#### **4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Using a number line to count back 1 or 2.

#### **4.2 Students will understand meanings of operations and how they relate to one another by:**

- Finding differences by using known addition facts.

#### **5.1 Students will understand geometric concepts and spatial relationships by:**

- Identifying and naming standard geometric solids and plane shapes.
- Counting the number of flat surfaces on geometric solids.
- Matching a geometric solid to an outline of one of its flat surfaces.
- Identifying objects that show symmetry.
- Identifying fourths of a region .

#### **5.2 Students will use appropriate units for accurate measurement by:**

- Determining if an event takes more or less than 1 minute.
- Telling and writing time to the hour and half hour.
- Naming the days of the week.

#### **6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Writing the addition and subtraction sentences that make up a fact family.
- Writing an addition sentence to find the sum in a joining situation.
- Writing the sums for horizontal and vertical forms of addition and subtraction.
- Writing subtraction sentences to compare and tell how many more.

#### **6.2 Students will understand and use patterns and functions in mathematics by:**

- Identifying the pattern unit in a repeating pattern, and extend the pattern.

#### **7.1 Students will select, organize, display and interpret data to draw conclusions by:**

- Solving problems by reading and using the information in a schedule.

#### **8.1 Students will use mathematical strategies to solve problems by:**

- Solving problems by choosing addition or subtraction.

### **Quarter 2 Assessment:**

Assessment that includes Quarters 1-2 Outcomes and Objectives

## **Quarter 3 Outcomes:**

### **Objectives**

#### **4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Counting and writing numbers to 100.
- Counting sets that are grouped in 10s and leftover ones.
- Counting 10s to find how many there are in all.
- Writing a three-digit number for a given model of hundreds, tens, and ones.
- Giving three two-digit numbers, ordering them from least to greatest.
- Counting collections of coins including a quarter, dimes, nickels, and pennies up to amounts of \$1.00.

#### **4.2 Students will understand meanings of operations and how they relate to one another by:**

- Finding the number that is 2 more than a given number.
- Solving problems by choosing addition or subtraction.

#### **5.1 Students will understand geometric concepts and spatial relationships by:**

- Counting the number of flat surfaces on geometric figure.
- Identifying fourths of a region.

#### **5.2 Students will use appropriate units for accurate measurement by:**

- Telling time to the hour.

#### **6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Comparing two groups to find out how many fewer.
- Writing the addition and subtraction sentences that make up a fact family.

#### **6.2 Students will understand and use patterns and functions in mathematics by:**

- Using hundred chart to skip count by 5s.
- Skipping count to find the total number of items arranged in sets of 2s.

#### **7.1 Students will select, organize, display and interpret data to draw conclusions by:**

- Determining whether an event takes place in the morning, afternoon, or night.

### **Quarter 3 Assessment:**

Assessment that includes Quarters 1-3 Outcomes and Objectives

## **Quarter 4 Outcomes:**

### **Objectives**

#### **4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Counting tens to find how many there are in all.
- Identifying the value of a group of dimes, nickels, and pennies through 99 cents.

#### **4.2 Students will understand meanings of operations and how they relate to one another by:**

- Solving problems by choosing addition or subtraction.
- Writing related addition and subtraction facts.
- Using models to add a one-digit quantity to a two-digit quantity with regrouping.

#### **5.1 Students will understand geometric concepts and spatial relationships by:**

- Counting the number of flat surfaces on geometric solids.

#### **5.2 Students will use appropriate units for accurate measurement by:**

- Telling time to the hour.
- Measuring the lengths of objects to the nearest inch using a ruler.
- Estimating the length of objects to the nearest foot.
- Estimating the length of objects in centimeters using a ruler.
- Estimating and compare the capacities of containers.
- Selecting the appropriate unit for measuring, given the choice of grams or kilograms.

#### **6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Identifying fact families to 10.
- Using the commutative property to find sums.
- Using the associate property to find sums of three numbers.

### **Quarter 4 Assessment:**

Assessment that includes Quarters 1-4 Outcomes and Objectives

## Grade 2 Math

**Description:** Grade 2 math focuses on Number and Operations: Developing an understanding of the base-ten numeration system and place-value concepts; Number and Operations and Algebra: Developing quick recall of addition facts and related subtraction facts and fluency with multi-digit addition and subtraction; Measurement: Developing an understanding of linear measurement and facility in measuring lengths; and Connections to the Focal Points – Number and Operations, Geometry and Measurement, Algebra

**Primary Resource:**

\*Scott Foresman Addison Wesley Mathematics 2008 & Investigations 2008

**Quarter 1 Outcomes:**

**Objectives**

**4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Comparing two groups to find out how many more.
- Reading number words for given numbers.
- Using a number line to determine the closets ten.
- Using ordinals through twentieth to identify position.
- Counting collections of coins that include half-dollars, dimes, and pennies.

**4.2 Students will understand meanings of operations and how they relate to one another by:**

- Joining two groups together to find how many in all.
- Taking away a number to find how many are left.
- Solving problems by choosing addition or subtraction.
- Finding the sum of three addends.
- Finding a difference by using known addition facts.
- Counting on from the price of an object to the greater amount paid in order to make change.

**6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Finding the missing addend in an addition sentence.
- Solving problems by writing number sentences.
- Using data in pictures to help find missing numbers in number sentences.
- Comparing numbers using greater-than and less-than symbols.
- Using the commutative property facts to find sums.
- Writing the addition and subtraction sentences that make up a family fact.

**7.1 Students will select, organize, display and interpret data to draw conclusions by:**

- Solving a problem by using clues and data from a chart.

**8.1 Students will use mathematical strategies to solve problems by:**

- Solving a story problem by writing an addition sentence.

**Quarter 1 Assessment:**

Assessment that includes Quarter 1 Outcomes and Objectives

**Quarter 2 Outcomes:**

**Objectives**

**4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Recognizing facts that have sums to 10.
- Reading number words for given numbers.
- Counting collections of coins that include quarters, dimes, nickels, and pennies.

**4.2 Students will understand meanings of operations and how they relate to one another by:**

- Writing the addition and subtraction sentences that make up a fact family.
- Adding a two-digit number to a two-digit number using models or mental math.
- Subtracting a multiple of 10 from a two-digit number using models or mental math.
- Adding a one-digit number to a two-digit number, regroup, and record the process in the vertical format.
- Using the standard algorithm to add 2 two-digit numbers with regrouping.
- Adding two money amounts less than \$1.00 using paper and pencil.
- Adding 3 two-digit numbers with paper and pencil.
- Estimating a sum.
- Recognizing and using different ways to add two-digit numbers.
- Regrouping 1 ten as 10 ones when subtracting.
- Using the standard subtraction algorithm to subtract a two-digit number from another two-digit number.
- Subtracting amounts of money less than \$1.00 with regrouping.

**6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Solving problems by writing number sentences.
- Comparing numbers using greater-than and less-than symbols.
- Solving a problem by finding two pairs of numbers, the sums of which are a given multiple of 10.
- Using the standard subtraction algorithm symbolically to subtract a two-digit number from another two-digit number.

**8.1 Students will use mathematical strategies to solve problems by:**

- Solving problems eliminating extra information

**Quarter 2 Assessment:**

Assessment that includes Quarters 1-2 Outcomes and Objectives

**Quarter3 Outcomes:**

**Objectives**

**4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Counting collections of coins that include quarter, dimes, nickels, and pennies.
- Identifying and showing fractions of a set of objects.

**4.2 Students will understand meanings of operations and how they relate to one another by:**

- Subtracting amounts of money less than \$1.00 with regrouping.

**5.1 Students will understand geometric concepts and spatial relationships by:**

- Matching a geometric solid to an outline of one of its flat surfaces and match that flat surface to a plane shape.
- Performing a turn on an object and identifying the resulting orientation.
- Identifying and showing a unit fraction of a region.
- Solving problems involving perimeter by acting them out.
- Counting the number of cubes needed to build or fill a rectangular prism.
- Analyzing line plots.

**5.2 Students will use appropriate units for accurate measurement by:**

- Telling time to five-minute intervals.
- Telling time before the hour.
- Determining the ending time when given the elapsed time.
- Measuring the length of an object in inches using a ruler.
- Reading and writing temperatures shown on Fahrenheit and Celsius thermometers.

**6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Finding the missing addend in an addition sentence
- Comparing numbers by using greater-than and less-than symbols

**7.1 Students will Select, organize, display and interpret data to draw conclusions**

- Analyzing data that have been gathered using a survey
- Analyzing data collected from performing an experiment

**Quarter 3 Assessment:**

Assessment that includes Quarters 1-3 Outcomes and Objectives

## **Quarter 4 Outcomes:**

### **Objectives**

#### **4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Counting collections of coins that include quarters, nickels, and pennies.
- Identifying and showing fractions of a set of objects.
- Counting by hundreds to 1,000.
- Finding the total number of objects in equal groups.
- Dividing a set of objects into a given number of equal parts.

#### **4.2 Students will understand meanings of operations and how they relate to one another by:**

- Writing the addition and subtraction sentences that make up a fact family.
- Addign 3 two-digit numbers with paper and pencil.
- Addign three-digit numbers mentally, without regrouping.
- Using estimation to select two numbers that have a given difference.
- Subtracting three-digit numbers written in horizontal form.

#### **5.1 Students will understand geometric concepts and spatial relationships by:**

- Performing a slide on an object and identify the resulting orientation.
- Locating and naming points on a coordinate grid.

#### **5.2 Students will use appropriate units for accurate measurement by:**

- Telling time to five-minute intervals.

#### **6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Comparing numbers using greater-than and less-than symbols.
- Comparing three-digit numbers using the symbols  $<$ ,  $>$ , and  $=$ .
- Giving a quantity and one of its parts, find the missing part by counting on or counting back.
- Choosing a number sentence to represent a problem situation.
- Ordering three-digit numbers from least to greatest.

#### **6.2 Students will understand and use patterns and functions in mathematics by:**

- Building an array to model a multiplication situation.

#### **7.1 Students will select, organize, display and interpret data to draw conclusions by:**

- Analyzing data collected from performing an experiment.

### **Quarter 4 Assessment:**

Assessment that includes Quarters 1-4 Outcomes and Objectives

## Grade 3 Math

**Description:** Grade 3 math focuses on Number and Operations and Algebra: Developing understandings of multiplication and division and strategies for basic multiplication facts and related division facts; Number and Operations: Developing an understanding of fractions and fraction equivalence; Geometry: Describing and analyzing properties of two-dimensional shapes; and Connections to the Focal Points – Algebra, Measurement, Data Analysis, Number and Operations

**Primary Resource:**

\*Scott Foresman Addison Wesley Mathematics 2008 & Investigations 2008

**Quarter1 Outcomes:**

**Objectives**

**4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Using ordinal numbers to show positions.
- Reading and writing numbers in hundreds, thousands, and hundred thousands.
- Rounding numbers to the nearest ten or hundred.
- Estimating sums and differences using rounding.
- Determining whether an estimate is an overestimate or an underestimate.
- Finding the value of money and make change by counting on.

**4.2 Students will understand meanings of operations and how they relate to one another by:**

- Using addition properties to find sums.
- Using the inverse relationship between addition and subtraction to write related sentences.
- Adding three-digit numbers using paper/pencil methods.
- Adding 3 two- and three-digit numbers.
- Subtracting three-digit numbers with regrouping.
- Adding and subtracting money.

**6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Writing number sentences for word problems.
- Comparing expressions using relationship symbols.
- Comparing and ordering whole numbers to 10,00.

**6.2 Students will understand and use patterns and functions in mathematics by:**

- Continuing number patterns.

**8.1 Students will use mathematical strategies to solve problems by:**

- Giving appropriate strategies for solving word problems.

- Drawing pictures that represent the information given in problems.

**Quarter 1 Assessment:**

Assessment that includes Quarter 1 Outcomes and Objectives

**Quarter 2 Outcomes:**

**Objectives**

**4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Reading, writing, ordering whole numbers to 10,000.
- Making change by counting on.
- Estimating differences using rounding.
- Using known facts to find products involving factors of 3.

**4.2 Students will understand meanings of operations and how they relate to one another by:**

- Adding and subtracting money.
- Adding and subtracting three-digit numbers.
- Multiplying three numbers.

**5.2 Students will use appropriate units for accurate measurement by:**

- Telling time to nearest quarter hour.

**6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Solving problems with missing numbers.

**6.2 Students will understand and use patterns and functions in mathematics by:**

- Give missing numbers in a pattern.
- Use arrays to find multiplication facts.

**7.1 Students will select, organize, display and interpret data to draw conclusions by:**

- Find the range for the data in a line plot.
- Read and interpret a bar graph.
- Locate and graph ordered pairs on a coordinate grid.
- 

**8.1 Students will use mathematical strategies to solve problems by:**

- Make tables and use them to solve word problems.
- Solve multiple-step word problems.
- Use multiplication facts to solve problems.

**Quarter 2 Assessment:**

Assessment that includes Quarters 1-2 Outcomes and Objectives

## **Quarter3 Outcome:**

### **Objectives**

#### **4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Reading and writing numbers in the hundred thousands.
- Finding the value of money.
- Giving facts in multiplication/division fact families.
- Finding equivalent fractions using models.
- Finding the number of objects in a fractional part of a set when the numerator is 1.
- Reading and writing mixed numbers.

#### **4.2 Students will understand meanings of operations and how they relate to one another by:**

- Adding 3 two- and three-digit numbers.
- Subtracting three-digit number .
- Multiplying three number.
- 

#### **5.1 Students will understand geometric concepts and spatial relationships by:**

- Identifying solid figures by name.
- Classifying space figures and identify the faces of certain space figures.
- Identifying line segments.
- Identifying and classifying polygons.
- Finding the perimeter of polygons using standard units of length.
- Finding the area of figures in square units.
- Identifying regions that have been divided into equal-sized parts.
- Identifying fractional parts of regions.

#### **5.2 Students will use appropriate units for accurate measurement by:**

- Measuring lengths to the nearest  $\frac{1}{4}$  inch.
- Choose the best unit of measure for a given situation.

#### **6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Writing number expressions for phrases.

#### **7.1 Students will select, organize, display and interpret data to draw conclusions by:**

- Reading and interpreting a bar graph.

#### **8.1 Students will use mathematical strategies to solve problems by:**

- Using the strategy Try, Check, and Revise.

### **Quarter 3 Assessment:**

Assessment that includes Quarters 1-3 Outcomes and Objectives

## **Quarter 4 Outcomes:**

### **Objectives**

#### **4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Reading and writing numbers in the hundred thousands.
- Giving quotients for division facts.
- Identifying fractional parts of sets or groups.
- Writing fractions and decimals in tenths.
- Comparing decimals to hundredths.
- Estimating products by using rounding.

#### **4.2 Students will understand meanings of operations and how they relate to one another by:**

- Subtracting three-digit numbers.
- Adding and subtracting money.
- Finding remainders for simple division problems.
- Adding decimals in tenths and hundredths.
- Using traditional algorithm to multiply a one-digit and a two-digit number.

#### **5.1 Students will understand geometric concepts and spatial relationships by:**

- Identifying congruent figures.

#### **5.2 Students will use appropriate units for accurate measurement by:**

- Estimating and measuring lengths in centimeters.
- Choosing the best unit of metric measurement.
- Changing between milliliters and liters.
- Changing between pounds and ounces for a given weight.
- Reading temperatures above zero on Fahrenheit and Celsius thermometers.

#### **6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Writing number sentences for word problems.

#### **7.1 Students will select, organize, display and interpret data to draw conclusions by:**

- Reading and interpreting a pictograph.
- Using a fraction to express the probability of an event.

#### **8.1 Students will use mathematical strategies to solve problems by:**

- Deciding how to use the quotient and remainder to answer a division problem.

### **Quarter 4 Assessment:**

Assessment that includes Quarters 1-4 Outcomes and Objectives

## Grade 4 Math

**Description:** Grade 4 focuses on Number and Operations and Algebra: Developing quick recall of multiplication facts and related division facts and fluency with whole number multiplication; Number and Operations: Developing an understanding of decimals, including the connections between fractions and decimals; Measurement: Developing an understanding of area and determining the areas of two dimensional shapes; and Connections to the Focal Points – Algebra, Geometry, Measurement, Data Analysis, Number and Operations

**Primary Resource:**

\*Scott Foresman Addison Wesley Mathematics 2008 & Investigations 2008

**Quarter 1 Outcomes:**

**Objectives**

**4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Using place value ideas to read and writing multiples of 100 and 1,000 in different ways.
- Reading, writing, comparing, and ordering numbers through 999,999,999.
- Rounding whole numbers through millions.
- Reading and writing tenths and hundredths expressed as decimals.
- Estimating for large numbers.
- Giving money amounts in dollars, dimes, and pennies, and in ones, tenths, and hundredths.
- Finding the value of a given assortment of bills and coins.
- Making change.

**4.2 Students will understand meanings of operations and how they relate to one another by:**

- Adding whole numbers.
- Finding the sums of three or more whole numbers.
- Using standard algorithm to find difference using money amounts.
- Dividing using a related multiplication fact.

**6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Choosing the number expression that matches a word phrase.
- Evaluating variable expressions that involve a single operation for subtraction.
- Finding the solution to an equation informally by substituting values for the variable.
- Evaluating variable expressions that involve a single operation of multiplication.
- Finding the solution to an equation by testing a set of values for the variable.

**6.2 Students will understand and use patterns and functions in mathematics by:**

- Giving missing numbers in a pattern.
- Identifying patterns in multiplying by 5, 10.

**8.1 Students will use mathematical strategies to solve problems by:**

- Making a table to solve problems.
- Solving multiple-step word problems.

**Quarter 1 Assessment:**

Assessment that includes Quarter 1 Outcomes and Objectives

**Quarter 2 Outcomes:**

**Objectives**

**4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Using place value ideas to write multiples of 100 and 1,000 in different ways.
- Comparing and ordering numbers through 999,999,999.
- Rounding whole numbers through millions.
- Finding the value of a given assortment of bills and coins.
- Using known multiplication facts to find the products for other facts.
- Multiplying any number by 10, 100, 1,000.
- Using rounding to estimate products of larger numbers.

**4.2 Students will understand meanings of operations and how they relate to one another by:**

- Adding money amounts to five-digits.
- Using standard algorithm to find differences using whole number amounts.
- Dividing using a related multiplication fact.
- Using standard algorithm to multiply three-digit numbers by one-digit numbers.
- Using standard algorithm to multiply two-digit numbers by three-digit numbers.
- Using the Commutative and Associative Properties to simplify multiplication with three factors.

**5.2 Students will use appropriate units for accurate measurement by:**

- Telling time to nearest 1 minute and 5 minutes.
- Comparing measurements of time.

**6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Finding the solution to an equation informally by substituting values for the variable.

**6.2 Students will understand and use patterns and functions in mathematics by:**

- Making number arrays.

**7.1 Students will select, organize, display and interpret data to draw conclusions by:**

- Reading and interpreting pictographs and bar graphs.
- Finding the median and mode for a given set of data.

**8.1 Students will use mathematical strategies to solve problems by:**

- Making an organized list to represent information in a problem.

**Quarter 2 Assessment:**

Assessment that includes Quarters 1-2 Outcomes and Objectives

**Quarter 3 Outcomes:**

**Objectives**

**4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Using place value ideas to write multiples of 100, 1,000 and 10,000 in different ways.
- Finding the value of a given assortment of bills and coins.
- Estimating quotients.
- Identifying fractional parts of sets.
- Identifying fractions that are equivalent.
- Expressing fractions in simplest form.

**4.2 Students will understand meanings of operations and how they relate to one another by:**

- Using the standard algorithm to find difference using money amounts.
- Using the standard algorithm to multiply two-digit numbers by three-digit numbers.
- Using the standard algorithm to divide 2-digit numbers by 1-digit numbers.
- Computing quotients involving money amounts.

**5.1 Students will understand geometric concepts and spatial relationships by:**

- Identifying and classifying polygons.
- Identifying important geometric terms relating to angles.
- Identifying geometric terms relating to circles.
- Identifying congruent figures and determine the slide of a figure.
- Finding the perimeter of a polygon by adding the lengths of the sides.
- Finding the area of rectangles by using a formula.
- Finding the volume of rectangular prisms by using a formula.
- Identify fractional parts of a region.

**6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Comparing fractions using  $>$ ,  $<$ , and  $=$ .

- Using the Commutative and Associative Properties to simplify multiplication with three factors.

- 

**7.1 Students will select, organize, display and interpret data to draw conclusions by:**

- Reading, interpreting, and making pictographs.
- Finding the mean of a set of numbers.
- Reading a circle graph to find information needed to solve problems.

**8.1 Students will use mathematical strategies to solve problems by:**

- Solving problems using the Try, Check, and Revise strategy.
- Deciding how to use the quotient and remainder to answer the question in a division problem.

**Quarter 3 Assessment:**

Assessment that includes Quarters 1-3 Outcomes and Objectives

**Quarter 4 Outcomes:**

**Objectives**

**4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Comparing and ordering numbers through 999,999,999.
- Estimating quotients.
- Estimating sums of fractions.
- Relating decimals to common fraction benchmarks.
- Writing decimals in tenths and hundredths.
- Rounding decimals to the nearest tenth.
- Estimating sums involving decimals.
- Using a fraction to express the probability of an event.

**4.2 Students will understand meanings of operations and how they relate to one another by:**

- Using the standard algorithm to multiply three-digit numbers by one-digit numbers.
- Using standard algorithm to divide 3-digit numbers by 1-digit numbers.
- Adding fractions with like and unlike denominators.
- Subtracting fractions with like and unlike denominators.
- Adding and subtracting with decimals in tenths and hundredths.

**5.1 Students will understand geometric concepts and spatial relationships by:**

- Identifying and classifying polygon.

**5.2 Students will use appropriate units for accurate measurement by:**

- Choosing the most appropriate customary unit of length for a given object.
- Choose the most appropriate customary unit of weight for a given object.

- Changing units of weight to equivalent units.
- Choosing the most appropriate metric unit of length for an object or distance.

**6.1 Students will Represent and analyze mathematical situations using algebraic symbols by:**

- Finding the solution to an equation informally by substituting values for the variable.
- Solving an inequality by graphing the inequality on a number line.
- Writing equations for word sentences.
- Finding ordered pairs on the graph of an equation

**7.1 Students will select, organize, display and interpret data to draw conclusions by:**

- Reading and interpreting pictographs.
- Reading a circle graph to find information needed to solve problems.

**Quarter 4 Assessment:**

Assessment that includes Quarters 1-4 Outcomes and Objectives

## Grade 5 Math

**Description:** Grade 5 math focuses on Number and Operations and Algebra: Developing an understanding of and fluency with division of whole numbers; Number and Operations: Developing an understanding of and fluency with addition and subtraction of fractions and decimals; Geometry and Measurement and Algebra: Describing three-dimensional shapes and analyzing their properties, including volume and surface area; and Connections to the Focal Points – Algebra, Measurement, Data Analysis, Number and Operations

**Primary Resource:**

\*Scott Foresman Addison Wesley Mathematics 2008 & Investigations 2008

**Quarter 1 Outcomes:**

**Objectives**

**4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Writing the standard form and expanded form of whole numbers to billions.
- Comparing whole numbers through millions.
- Writing decimals in standard form through thousandths.
- Identifying the value of digits in decimal numbers.
- Comparing decimals through thousandths.
- Rounding decimals through thousandths.
- Identifying numbers as prime or composite.

**4.2 Students will understand meanings of operations and how they relate to one another by:**

- Computing differences of two whole numbers greater than 10,000.
- Computing sums and differences of decimals involving tenths and hundredths.
- Using rounding to estimate products of whole numbers.
- Using standard algorithm to multiply numbers by two-digit numbers.
- Multiplying any decimal by a power of ten, mentally.
- Using grid models to find products of decimals.
- Dividing three-digit whole numbers by one-digit divisors.
- Finding quotients of money amounts divided by one-digit divisors.
- Interpreting remainders by giving total amounts needed to include remainders.

**6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Using variables to write algebraic expressions.
- Writing number expressions for phrases.
- Evaluating expressions with three or more numbers and two or more operations.

**6.2 Students will understand and use patterns and functions in mathematics by:**

- Identifying patterns and find a rule for patterns.
- Giving missing numbers or figures in a pattern.

**7.1 Students will select, organize, display and interpret data to draw conclusions by:**

- Plotting points for ordered pairs, on a coordinate grid.
- Using a table of values and a rule to give the output for an input.

**8.1 Students will use mathematical strategies to solve problems by:**

- Giving appropriate strategies and alternate strategies for solving word problems.
- Using organized lists to solve word problems.

**Quarter 1 Assessment:**

Assessment that includes Quarter 1 Outcomes and Objectives

**Quarter 2 Outcomes:**

**Objectives**

**4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Writing the standard form of whole numbers to billions.
- Identifying the value of digits in decimal numbers.
- Rounding decimals through thousandths.
- Using rounding and compatible numbers to estimate products of whole numbers and decimal numbers.
- Using fractions to represent the probabilities of events.

**4.2 Students will understand meanings of operations and how they relate to one another by:**

- Computing differences of decimals involving tenths and hundredths.
- Interpreting remainders by giving total amounts and amounts leftover.
- Dividing three-digit numbers by two-digit divisors.
- Dividing decimals by 10, 100, and 1,000.
- Finding quotients of money amounts divided by two-digit divisors.
- Finding the quotient of three-digit decimal numbers divided by two-digit divisors.

**5.1 Students will understand geometric concepts and spatial relationships by:**

- Identifying important geometric terms relating to lines.
- Classifying angles according to their measures.
- Identifying relationships between parts of a circle such as radius and diameter.
- Identifying and classifying triangles, quadrilaterals.
- Identifying similar figures.

- Determining whether a pair of congruent figures are related by a flip/reflection or a turn/rotation.
- Identifying and drawing lines of symmetry.

**6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Writing number expressions for phrases.
- Identifying a statement as fact or opinion.

**7.1 Students will select, organize, display and interpret data to draw conclusions by:**

- Identifying ordered pairs for plotted points, on a coordinate grid.
- Reading double bar graphs to interpret data.
- Finding the median and range of a set of data.
- Interpreting given circle graphs.
- Choosing the most appropriate type of graph to represent a given set of data.

**8.1 Students will use mathematical strategies to solve problems by:**

- Solving problems using the Try, Check, and Revise strategy.
- Solving multiple-step word problems.
- Solving complex problems by breaking them apart or changing them into smaller parts.

**Quarter 2 Assessment:**

Assessment that includes Quarters 1-2 Outcomes and Objectives

**Quarter 3 Outcomes:**

**Objectives**

**4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Writing the standard form of whole numbers to billions.
- Identifying numbers as prime or composite.
- Identifying fractional parts of regions and sets.
- Expressing fractions greater than 1 as mixed numbers or improper fractions.
- Estimating fractional parts of regions.
- Determining the greatest common factor of numbers.
- Identifying fractions that are in simplest form.
- Comparing mixed numbers.
- Labeling points on a number line using fractions and decimals.
- Finding a common denominator for two fractions.
- Estimating sums of mixed numbers.

**4.2 Students will understand meanings of operations and how they relate to one another by:**

- Computing differences of decimals involving tenths and hundredths

- Adding fractions with like denominators
- Subtracting fractions with unlike denominators
- Adding mixed numbers
- Multiplying fractions

**5.1 Students will understand geometric concepts and spatial relationships by:**

- Identifying and classify triangles.
- Identifying lines of symmetry.
- Finding the perimeters of polygons.
- Finding the circumference of a circle by using a formula.
- Finding areas of rectangles, parallelograms, and triangles by using formulas.

**5.2 Students will use appropriate units for accurate measurement by:**

- Changing between one customary unit of length and another.
- Choosing the most appropriate metric unit of length.
- Reading temperatures in degrees Fahrenheit and in Celsius.

**6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Writing number expressions for phrases.

**6.2 Students will understand and use patterns and functions in mathematics by:**

- Giving missing figures in a pattern.

**7.1 Students will select, organize, display and interpret data to draw conclusions by:**

- Making and interpreting stem-and-leaf plots.
- Interpreting given circle graph.

**8.1 Students will use mathematical strategies to solve problems by:**

- Solving problems using the Try, Check, and Revise strategy.
- Solving multiple-step word problems.
- Using the information given in the problem to make conclusions.

**Quarter 3 Assessment:**

Assessment that includes Quarters 1-3 Outcomes and Objectives

**Quarter 4 Outcomes:**

**Objectives**

**4.1 Students will understand numbers, ways to represent numbers and relationships among numbers by:**

- Identifying the value of digits in decimal numbers.
- Using fractions to represent the probabilities of events.
- Identifying and locating fractions and mixed numbers on a number line.

- Comparing and ordering integers

**4.2 Students will understand meanings of operations and how they relate to one another by:**

- Multiplying numbers by one- and two-digit numbers.
- Finding quotients of money amounts divided by one-digit divisors.
- Interpreting remainders by giving amounts leftover.
- Subtracting mixed numbers.
- Adding and subtracting integers using a number line.

**5.1 Students will understand geometric concepts and spatial relationships by:**

- Determining whether a pair of congruent figures are related by a flip/reflection and a turn/rotation.
- Finding the circumference of a circle by using a formula.
- Using features to identify polyhedra and other solids.
- Using a formula to find the surface area and volume of rectangular prisms.

**5.2 Students will use appropriate units for accurate measurement by:**

- Adding customary units of capacity.
- Changing milliliters to liters.

**6.1 Students will represent and analyze mathematical situations using algebraic symbols by:**

- Solving equations involving subtraction and multiplication.
- Making a table of x- and y-values for an equation and then graph the equation.

**7.1 Students will select, organize, display and interpret data to draw conclusions by:**

- Finding the median of a set of data.
- Identifying and graphing points on a coordinate plane

**Quarter 4 Assessment:**

Assessment that includes Quarters 1-4 Outcomes and Objectives



# Secondary Mathematics Framework



## Secondary Participants

The following people participated in developing the Secondary Math Framework:

### **Core Committee:**

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## Projected Timeline for Millard Education Program for Secondary Mathematics

<b>Phase</b>	<b>Task</b>	<b>Year</b>
Phase I	<ul style="list-style-type: none"> <li>• Establish core committee</li> <li>• Research by staff</li> <li>• Develop mission</li> </ul>	Summer, 2006
Phase II	<ul style="list-style-type: none"> <li>• Create scope &amp; Sequence for curriculum alignment</li> <li>• Write course outcomes, objectives &amp; assessments</li> <li>• Select instructional materials</li> <li>• Approve framework</li> <li>• Create curriculum guides</li> </ul>	2006-2007  Fall, 2007
Phase III	<ul style="list-style-type: none"> <li>• Implement new curriculum, purchase new resources</li> <li>• Staff Development on new instructional practices &amp; resources</li> </ul>	2007-2008; 2008-2009
Phase IV	<ul style="list-style-type: none"> <li>• Monitor, collect student &amp; program assessment data</li> </ul>	2008-2009 2009-2010 2010-2011 2011-2012
Phase I	<ul style="list-style-type: none"> <li>• Establish core committee</li> <li>• Research by staff</li> <li>• Develop mission</li> </ul>	2012-2013

## **Secondary Instructional Strategies**

Mathematics instruction has evolved from teaching mastery of facts through rote drill to helping students understand and apply mathematical concepts in real life situations. Thus, innovative instructional strategies are required. Interactive whiteboards can be an integral part of a learning environment which will allow students and teachers to:

- Apply mathematical skills to daily life
- Implement differentiated instructional practices
- Employ peer tutoring, “study buddies,” or math discussion groups
- Focus on thinking and problem solving rather than rote memorization
- Employ Socratic Inquiry/Open-Ended Questioning
- Use manipulatives to provide concrete representations of ideas
- Engage students in thoughtful reflection
- Empower students to evaluate and use the appropriate technology tools for specific situations
- Engage the students in interactive, dynamic learning experiences through the use of technology, software and internet applications
- Allow electronic access to instructional notes, lessons, and simulations

Mathematics teachers will continue to use strategies that address learning styles, multiple intelligences, cultural and ethnic differences, and physical and intellectual abilities.

## **Secondary Assessment Strategies and Assessment Types**

### **Assessment Strategies:**

1. Assess students’ levels of understanding and skill competency through frequent prerequisite skills assessments to individualize instruction
2. Provide a variety of assessment instruments to allow teachers to frequently diagnose students needs and effectively monitor progress.
3. Provide planning and assessment software that can be customized to meet district standards.

## **6-12 Mathematics Outcome Assessments**

Assessment and instruction are interwoven strands in mathematics education. The primary purpose of assessment is to promote learning. Various instructional methods are used to provide informal and formal feedback and formative and summative information.

Brief outlines are provided in the framework for each course assessment. More specific course assessment descriptions will be formulated, implemented, and revised as needed in curriculum cycle phases III and IV.

### **Local outcome, district, and national assessments may include:**

1. Written assessments to assess students' mastery of important concepts and skills
  - Diagnosing Readiness
  - Chapter Tests
  - Cumulative Tests
  - Teacher developed classroom-based assessments
2. Journal Writing that encourages students to use mathematical language as they reflect on what they are learning. It provides the teacher with insight as to how the student approaches problem solving.
3. Portfolio Assessment provides a way of tracking a student's growth and progress over time. A portfolio should include many types of assessment.
4. Performance Assessment gives a way to assess the student's qualities of imagination, creativity, and perseverance. Teachers can evaluate how a student reasons through problems, makes and tests conjectures, uses number sense to predict reasonable answers, and utilizes alternative strategies.
5. Basic-Fact Tests provide students with the opportunity to review and practice basic facts.
6. Item Bank of Assessment Questions that teachers can use to develop assessments for specific groups of students or for the development of common assessments.
7. District Essential Learner Outcome Assessments that assess all students at a specific grade level. These results are also used for Nebraska Department of Education STARS Assessments and Federal No Child Left Behind Assessments.
8. District Terra Nova Nationally Norm Achievement Test
9. National exams including: ACT, SAT, PLAN, AP, IB, and Montessori's GAT-Grade Level Achievement Test

## Secondary Math Articulation Chart:

Math Placement is based on testing and teacher recommendation

6 <sup>th</sup> Grade	7 <sup>th</sup> Grade	8 <sup>th</sup> Grade	9 <sup>th</sup> Grade	10 <sup>th</sup> Grade	11 <sup>th</sup> Grade	12 <sup>th</sup> Grade
Essentials of Math 6	Essentials of Math 7	Essentials of Pre-Algebra	Essentials of Intro to Algebra OR Essentials of Algebra Foundations I	Essentials of Algebra Foundations I OR Essentials of Algebra Foundations II	Essentials of Algebra Foundations II OR Essentials of Geometry	Essentials of Consumers Math I OR Essentials of Consumers Math II
Math 6	Math 7	Pre-Algebra	Algebra Foundations I	Algebra Foundations II	Practical Geometry	Consumers Math
Math 6	Math 7	Pre-Algebra	Algebra Foundations I	Algebra	Geometry	Algebra II
Math 6	Math 7	Pre-Algebra	Algebra	Geometry OR Honors Geometry	Algebra II OR Honors Algebra II	Precalculus OR Honors Precalculus OR College Prep Mathematics OR AP Statistics
Challenge Math	Pre-Algebra	Algebra	Geometry OR Honors Geometry	Algebra II OR Honors Algebra II	<i>Students choose one of the following groups:</i>  <u>GROUP A:</u> Precalculus OR Honors Precalculus  <u>GROUP B:</u> College Prep Mathematics  <u>GROUP C:</u> AP Statistics	<i>Keep in the same group as previously selected:</i>  <u>GROUP A:</u> AP Calculus AB OR AP Calculus BC  <u>GROUP B:</u> AP Statistics  <u>GROUP C:</u> Precalculus OR Honors Precalculus OR College Prep Mathematics
Pre-Algebra	Algebra	Geometry	Algebra II OR Honors Algebra II	<i>Students choose one of the following groups:</i>  <u>GROUP A:</u> AP Statistics  <u>GROUP B:</u> Precalculus OR Honors Precalculus	<i>Keep in the same group as previously selected:</i>  <u>GROUP A:</u> Precalculus OR Honors Precalculus  <u>GROUP B:</u> AP Calculus AB OR AP Calculus BC OR AP Statistics	<i>Keep in the same group as previously selected:</i>  <u>GROUP A:</u> AP Calculus AB OR AP Calculus BC  <u>GROUP B:</u> AP Statistics OR AP Calculus AB OR AP Calculus BC

## Math 6

Math 6

6

Year

### **Description:**

In Math 6, students will learn addition, subtraction, multiplication and division of rational numbers. They will also use one-step equation solving, problem solving, statistics, ratios and two-dimensional (2-D) geometry. This course consolidates the arithmetic of previous grades and prepares students for Math 7.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

### **Primary Resource:**

*McDougal Littell Math Course 1* (2007)

### **Course Outcome 1 – Numeration/Computation**

Students will represent numbers and relationships between numbers and compute fluently.

#### **Course Outcome 1 Objectives:**

Students will:

1. Read and write numbers through billions and ten-thousandths.
2. Compare and order whole numbers, decimals and fractions.
3. Add, subtract, multiply and divide whole numbers, decimals and fractions.
4. Convert between fractions and decimals.
5. Use order of operations to solve expressions.
6. Use divisibility patterns, prime factorization, greatest common factor and least common multiple to solve problems.
7. Understand and be able to use a variety of problem solving strategies.
8. Use simple reasoning about multiplication and division to solve ratio and rate problems.

#### **Course Outcome 1 Assessment:**

Paper/pencil test

### **Outcome 2 - Geometry**

Students will understand and use attributes of geometric figures and systems of measurement.

#### **Course Outcome 2 Objectives:**

Students will:

1. Identify and measure units of length in the metric and customary systems.
2. Identify units of mass and capacity in the metric system and customary system.
3. Find perimeter of figures.
4. Find area of squares, rectangles, and parallelograms.

5. Understand and use geometric vocabulary including point, line, ray, angle, plane and polygon.

**Course Outcome 2 Assessment:**

Paper/pencil test

**Course Outcome 3 – Data and Statistics**

Students will collect, organize, display and analyze data.

**Course Outcome 3 Objectives:**

Students will:

1. Make and use a bar graph and a line graph.
2. Read and interpret circle, bar and line graphs.
3. Find the mean, median, mode and range for a set of data.

**Course Outcome 3 Assessment:**

Pencil paper and or project test

**Course Outcome 4 – Algebraic Concepts**

Students will demonstrate knowledge of and use of coordinate systems and algebraic concepts.

**Course Outcome 4 Objectives:**

Students will:

1. Order numbers on a number line.
2. Graph ordered pairs on a coordinate plane.
3. Solve one-step equations using whole numbers.

**Course Outcome 4 Assessment:**

Paper/pencil test

## Challenge Math 6

Challenge Math 6

6

Year

### **Description:**

Students will learn addition, subtraction, multiplication, and division of rational numbers. They will also use algebraic equation solving, problem solving, statistics, ratio, proportions, percents, and two-dimension (2-D) and three-dimensional (3-D) geometry. This course consolidates the arithmetic practiced in previous grades and prepares students for Pre-Algebra.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

### **Primary Resource:**

*McDougal Littell Math Course 2 (2007)*

### **Course Outcome 1 – Numeration / Computation / Estimation**

Students will represent numbers and relationships between numbers using computation and estimation.

#### **Course Outcome 1 Objectives:**

Students will:

1. Compare and order rational numbers.
2. Use appropriate estimation strategies.
3. Add, subtract, multiply, and divide rational numbers.
4. Convert between fractions, decimals, and percents.
5. Use powers and exponents in expressions.
6. Convert between scientific notation and standard form.
7. Learn and apply a variety of problem solving strategies.

#### **Course Outcome 1 Assessment:**

Paper/pencil test

### **Course Outcome 2 – Measurement / Geometry**

Students will understand and use attributes of geometric figures and systems of measurement.

#### **Course Outcome 2 Objectives:**

Students will:

1. Identify and measure units of length, mass, and capacity in the metric system and customary system.
2. Convert within the metric system.
3. Identify symmetrical, congruent, and similar figures.
4. Use transformations of reflection, translation, and rotation.

5. Measure and draw angles.
6. Find circumference.
7. Find area of squares, rectangles, parallelograms, triangles, trapezoids, and circles.
8. Use problem-solving strategies to find the area of irregular shaped figures.
9. Identify 3-D shapes.
10. Find the volume of rectangular prisms.

**Course Outcome 2 Assessment:**

Paper/pencil test

**Course Outcome 3 – Data**

Students will collect, organize, display, and analyze data

**Course Outcome 3 Objectives:**

Students will:

1. Make and use frequency tables, double bar graphs, double line graphs, stem-and-leaf plots, circle graphs and histograms.
2. Read, interpret, and make predictions from circle, bar, and line graphs.
3. Select an appropriate measure of central tendency, based on data with and without outliers.
4. Predict or find simple probability of an event.

**Course Outcome 3 Assessment:**

Pencil paper and or project test

**Course Outcome 4**

Students will demonstrate knowledge of algebraic concepts

**Course Outcome 4 Objectives:**

Students will:

1. Solve one-step and two-step equations involving integers.
2. Use order of operations to evaluate algebraic expressions.
3. Recognize and apply associative and commutative properties.

**Course Outcome 4 Assessment:**

Paper/pencil test

## Math 7

Math 7

7

Year

### **Description:**

Students will learn addition, subtraction, multiplication, and division of rational numbers. They will also study algebraic equation solving, problem solving, statistics, ratio, proportions, percents, and two-dimension (2-D) and three-dimensional (3-D) geometry. This course consolidates the arithmetic practiced in previous grades and prepares students for Pre-Algebra.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

### **Primary Resource:**

*McDougal Littell Math Course 2 (2007)*

### **Course Outcome 1 – Numeration / Computation / Estimation**

Students will represent numbers and relationships between numbers using computation and estimation.

#### **Course Outcome 1 Objectives:**

Students will:

1. Compare and order rational numbers.
2. Use appropriate estimation strategies.
3. Add, subtract, multiply, and divide rational numbers.
4. Convert between fractions, decimals, and percents.
5. Use powers and exponents in expressions.
6. Convert between scientific notation and standard form.
7. Learn and apply a variety of problem solving strategies.

#### **Course Outcome 1 Assessment:**

Paper/pencil test

### **Course Outcome 2 – Measurement / Geometry**

Students will understand and use attributes of geometric figures and systems of measurement.

#### **Course Outcome 2 Objectives:**

Students will:

1. Identify and measure units of length, mass, and capacity in the metric system and customary system.
2. Convert within the metric system.
3. Identify symmetrical, congruent, and similar figures.
4. Use transformations of reflection, translation, and rotation.

5. Measure and draw angles.
6. Find circumference.
7. Find area of squares, rectangles, parallelograms, triangles, trapezoids, and circles.
8. Use problem-solving strategies to find the area of irregular shaped figures.
9. Identify 3-D shapes.
10. Find the volume of rectangular prisms.

**Course Outcome 2 Assessment:**

Paper/pencil test

**Course Outcome 3 – Data**

Students will collect, organize, display, and analyze data

**Course Outcome 3 Objectives:**

Students will:

1. Make and use frequency tables, double bar graphs, double line graphs, stem-and-leaf plots, circle graphs and histograms.
2. Read, interpret, and make predictions from circle, bar, and line graphs.
3. Select an appropriate measure of central tendency, based on data with and without outliers.
4. Predict or find simple probability of an event.

**Course Outcome 3 Assessment:**

Paper/pencil test and/or project

**Course Outcome 4**

Students will demonstrate knowledge of algebraic concepts

**Course Outcome 4 Objectives:**

Students will:

1. Solve one-step and two-step equations involving integers.
2. Use order of operations to evaluate algebraic expressions.
3. Recognize and apply associative and commutative properties.

**Course Outcome 4 Assessment:**

Paper/pencil test

## Pre-Algebra

Pre-Algebra

6,7,8

Year

### **Description:**

Students will study number theory, operations with rational numbers, scientific notation, solving and graphing one-step and multi-step equations and inequalities, with a course emphasis on linear equations and inequalities. Other topics covered are ratio, proportion, percent, and geometry. This course prepares students for Algebra.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

### **Primary Resource:**

*McDougal Littell Math Course 3 (2007)*

### **Course Outcome 1 – Data Analysis and Number Operations:**

Students will analyze and summarize data sets.

### **Course Outcome 1 Objectives:**

Students will:

1. Determine the probability of independent and dependent events.
2. Determine the odds of an event.
3. Evaluate and compare theoretical and experimental probability.
4. Compare and contrast combinations and permutations.
5. Convert between scientific notation and standard form including the use of negative exponents.
6. Construct and interpret box and whisker plots.
7. Understand and be able to use a variety of problem solving strategies.

### **Course Outcome 1 Assessment:**

Written pencil and paper examinations, which may include short answer, graphing, and interpretation of graphs. *(May use two or three separate assessments)*

### **Course Outcome 2 – Geometry and Measurement**

Students will understand and use attributes of geometric figures and systems of measurements.

### **Course Outcome 2 Objectives:**

Student will:

1. Use measurements in customary and metric systems.
2. Convert within customary and metric systems.

3. Use the area of two-dimensional figures to develop and apply formulas for surface area and volume.
4. Use proportions to find missing sides of similar figures.
5. Use geometric representations to solve problems and describe the physical world.

**Course Outcome 2 Assessment:**

Written pencil and paper examinations, which may include short answer, graphing, and interpretation of graphs.

**Course Outcome 3 -- Algebra**

Students will analyze and represent linear functions and solve linear equations and systems of linear equations. Solve linear inequalities and systems of linear inequalities.

**Course Outcome 3 Objectives:**

Students will:

1. Translate words to algebraic expressions and apply them to real-life situations.
2. Simplify algebraic expressions using the Distributive Property and combining like terms.
3. Simplify algebraic expressions using the properties of exponents.
4. Evaluate algebraic expressions with exponents.
5. Use and apply the properties (Associative, Commutative, Distributive, Identity, Inverse, and Zero) to solve equations.
6. Solve multi-step equations and inequalities involving rational numbers.
7. Graph solutions to equations and inequalities on a number line.
8. Solve equations using proportions and percents.
9. Graph two variable equations using a table of ordered pairs and slope-intercept form.
10. Determine the rate of change from the slope of a line.
11. Graph linear inequalities.
12. Solve linear systems of equations and inequalities graphically.

**Course Outcome 3 Assessment:**

Written pencil and paper examinations, which may include short answer, graphing, and interpretation of graphs.

# Algebra Foundations I

Algebra Foundations I

9,10,11,12

Year

## **Description:**

Algebra Foundations is year one of a two-year sequence designed for those students who need reinforcement in basic skills in order to successfully master algebra concepts. Students will develop the ability to solve linear equations and inequalities and analyze solutions. Students who successfully complete both Algebra Foundations I and Algebra Foundations II will have satisfied the Algebra graduation requirement.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

## **Primary Resource:**

To Be Determined 2007-08

## **Course Outcome 1**

Students will apply basic operations of algebra to solve equations and inequalities.

### **Course Outcome 1 Objectives:**

Students will:

1. Maintain performance of operations using real numbers, adding like terms, and the use of the distributive property.
2. Solve equations and inequalities and graph solutions on a number line.
3. Solve and use formulas and equations with more than one variable.
4. Translate words to algebraic expressions and apply to real world situations.
5. Solve absolute value equations and inequalities.
6. Solve problems using ratios, proportions, and percents.

### **Course Outcome 1 Assessment:**

Written response / short answer document

## **Course Outcome 2**

Students will apply concepts of linear equations and inequalities to describe and analyze solutions.

### **Course Outcome 2 Objectives:**

Students will:

1. Define, apply, and graph coordinates, intercepts, and slope.
2. Write linear equations in standard, point-slope, and slope intercept form.

3. Graph linear equations and inequalities using standard, point-slope, and slope-intercept form.
4. Apply slopes to write and graph parallel and perpendicular lines.
5. Write the equation of a line from a given graph.
6. Calculate a line of best fit and make predictions given a set of data.

**Course Outcome 2 Assessment:**

Short answer and multiple choice assessment

## Algebra Foundations II

**Algebra Foundations II**

**9,10,11,12**

**Year**

### **Description:**

Algebra Foundations is year two of a two-year sequence designed for those students who need reinforcement in basic skills in order to successfully master algebra concepts. In Algebra Foundations II, the topics covered will include systems of equations, polynomials, exponential equations, and quadratics. Students who successfully complete both Algebra Foundations I and Algebra Foundations II will have satisfied the Algebra graduation requirement.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

### **Primary Resource:**

To Be Determined 2007-08

### **Course Outcome 1**

Students will apply algebraic concepts and operations to systems of equations, exponents and polynomials.

### **Course Outcome 1 Objectives:**

Student will:

1. Use graphing, substitution, and elimination (linear combination) to solve systems.
2. Apply and interpret a system of equations for a real-life situation.
3. Understand and apply exponential properties.
4. Identify and classify polynomial functions.
5. Perform algebraic operations with polynomials.
6. Convert numbers between standard and scientific notation to model real-life situations.
7. Recognize patterns of exponential growth and decay and apply to real-life situations.

### **Course Outcome 1 Assessment:**

Short answer assessment

### **Course Outcome 2**

Students will apply various algebraic concepts to solve quadratic, rational, and radical functions

### **Course Outcome 2 Objectives:**

Student will:

1. Solve quadratic equations by factoring, extracting the square root, and the quadratic formula.
2. Identify the vertex, axis of symmetry, and roots of a quadratic equation.
3. Graph quadratic equations using tables of values and properties of quadratics.
4. Simplify radical expressions.

5. Use Pythagorean theorem to solve problems.
6. Simplify rational expressions and solve rational equations.

**Course Outcome 2 Assessment:**

Solve a variety of quadratic problems using various applications

## Algebra I

Algebra I

7,8,9,10,11,12

Year

### **Description:**

Algebra I is the study of linear, quadratic, and exponential equations. It is a course designed for those students who have *mastered* the basics of arithmetic and pre-algebra, and who understand mathematics in a more abstract form. This first-year algebra course is the appropriate mathematics course for most college-bound freshmen.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

### **Primary Resource:**

*McDougal Littell Algebra 1* (2007)

### **Course Outcome 1**

Students will apply linear algebra to describe, solve, and analyze real-life situations.

#### **Course Outcome 1 Objectives:**

Students will:

1. Solve and graph absolute value and multi-step equations and inequalities.
2. Solve and use formulas and equations with more than one variable.
3. Define, apply, and graph coordinates, intercepts, and slope.
4. Write linear equations in standard, point-slope, and slope-intercept form.
5. Graph linear equations and inequalities using standard, point-slope, and slope-intercept form.
6. Apply slopes to write and graph parallel and perpendicular lines.
7. Given a set of data, calculate a line of best fit and make predictions.
8. Use graphing, substitution, and elimination (linear combination) to solve systems.
9. Use graphing to solve systems of linear inequalities.
10. Apply and interpret systems of equations for real-life situations.

#### **Course Outcome 1 Assessment:**

Written response/short answer assessment

### **Course Outcome 2**

Students will apply algebraic concepts and operations to exponents and polynomials.

#### **Course Outcome 2 Objectives:**

Students will:

1. Understand and apply exponential properties.
2. Identify and classify polynomial functions.

3. Add, subtract, multiply, divide, and factor polynomials.
4. Convert numbers between standard and scientific notation to model real-life situations.
5. Recognize patterns of exponential growth and decay and apply to real-life situations.

**Course Outcome 2 Assessment:**

Short answer and multiple choice assessments

**Course Outcome 3**

Students will apply various algebraic concepts to solve quadratic, rational, and radical functions.

**Course Outcome 3 Objectives:**

Students will:

1. Solve quadratic equations by factoring, extracting the square root, and the quadratic formula.
2. Identify the vertex, axis of symmetry, and roots of a quadratic equation.
3. Graph quadratic equations using tables of values and properties of quadratics.
4. Simplify radical expressions and solve radical equations.
5. Use Pythagorean Theorem to solve problems.
6. Simplify rational expressions and solve rational equations.

**Course Outcome 3 Assessment:**

Solve a variety of quadratic problems using various applications

# Geometry

Geometry

9,10,11,12

Year

## **Description:**

This course is designed for the student who has successfully mastered Algebra I and has the ability to apply those skills to geometric problems and the ability to build upon previously learned mathematical concepts. This is the next course in the sequence following Algebra I for most college-bound students.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

## **Primary Resource:**

To Be Determined 2007-08

## **Course Outcome 1**

Students will visualize geometric figures and/or relationships in various dimensions; analyze similarities and differences.

### **Course Outcome 1 Objectives:**

Students will:

1. Use geometric definitions, properties, and relationships to describe the physical world.
2. Apply concepts of transformational geometry.
3. Use measurement and attributes of geometric shapes to calculate area, perimeter, surface area, and volume.

### **Course Outcome 1 Assessment:**

Paper/pencil short answer and/or multiple choice assesment

## **Course Outcome 2**

Students will apply deductive/inductive reasoning to arrive at valid conclusions.

### **Course Outcome 2 Objectives:**

Students will

1. Use definitions, postulates, and theorems to write informal/formal proofs.
2. Look for patterns to draw valid conclusions.
3. Use various construction methods to discover geometric concepts by using tools such as a compass, protractor, straight edge, and assessable technology.
4. Use coordinate geometry to recognize attributes of geometric figures in the coordinate plane.

### **Course Outcome 2 Assessment:**

Short answer and/or multiple choice assesment

### **Course Outcome 3**

Students will apply algebraic skills to solve geometric problems.

#### **Course Outcome 3 Objectives:**

Students will:

1. Calculate distance, midpoint, and slope.
2. Use squares, square roots, and quadratic equations to analyze relationships in right triangles.
3. Solve algebraic equations to determine angle measures, lengths, and other fundamental geometric relationships.
4. Use ratios and proportions to analyze similarities in two-dimensional (2-D) figures.

#### **Course Outcome 3 Assessment:**

Short answer and/or multiple choice assesment

### **Course Outcome 4**

Students will explore and apply properties of triangles, quadrilaterals, right triangles, and circles.

#### **Course Outcome 4 Objectives:**

Students will:

1. Classify triangles by sides and angles and use information to prove that triangles are congruent.
2. Use the hierarchy of quadrilaterals and understand the properties of the quadrilaterals and be able to apply them to solve problems.
3. Use the Pythagorean Theorem, properties of Right Triangle Trigonometry, and properties of special right triangles to solve problems.
4. Understand the properties of a circle to be able to calculate relationships between arcs and angles.
5. Write equations of circles.

#### **Course Outcome 4 Assessment:**

Short answer and/or multiple choice assesment

## Honors Geometry

Honors Geometry

8,9,10,11,12

Year

### **Description:**

This course is designed for the student who has successfully mastered Algebra I and has the ability to apply those skills to geometric problems and the ability to build upon previously learned mathematical concepts. This is the next course in the sequence following Algebra I for most college-bound students and will move at a quicker pace and cover topics in greater detail than the regular Geometry class.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

### **Primary Resource:**

To Be Determined 2007-08

### **Course Outcome 1**

Students will visualize geometric figures and/or relationships in various dimensions; analyze similarities and differences.

#### **Course Outcome 1 Objectives:**

Students will:

1. Use geometric definitions, properties, and relationships to describe the physical world.
2. Apply concepts of transformational geometry.
3. Use measurement and attributes of geometric shapes to calculate area, perimeter, surface area, and volume.
4. Use properties and operations of vectors to describe the physical world.

#### **Course Outcome 1 Assessment:**

Short answer and/or multiple choice assessment

### **Course Outcome 2**

Students will apply deductive/inductive reasoning to arrive at valid conclusions.

#### **Course Outcome 2 Objectives:**

Students will:

1. Use definitions, postulates, and theorems to write informal/formal proofs.
2. Look for patterns to draw valid conclusions.
3. Use various construction methods to discover geometric concepts by using tools such as a compass, protractor, straight edge, and assessable technology.
4. Use coordinate geometry to recognize attributes of geometric figures in the coordinate plane.
5. Use definitions, postulates, and theorems to write coordinate proofs.

**Course Outcome 2 Assessment:**

Short answer and/or multiple choice assesment

**Course Outcome 3**

Students will apply algebraic skills to solve geometric problems.

**Course Outcome 3 Objectives:**

Students will:

1. Calculate distance, midpoint, and slope.
2. Use squares, square roots, and quadratic equations to analyze relationships in right triangles.
3. Solve algebraic equations to determine angle measures, lengths, and other fundamental geometric relationships.
4. Use ratios and proportions to analyze similarities in two-dimensional (2-D) figures.
5. Use ratios and proportions to analyze similarities in three-dimensional (3-D) figures.
6. Find geometric probabilities from given conditions.

**Course Outcome 3 Assessment:**

Short answer and/or multiple choice assesment

**Course Outcome 4**

Students will explore and apply properties of triangles, quadrilaterals, right triangles, and circles.

**Course Outcome 4 Objectives:**

Students will:

1. Classify triangles by sides and angles and use information to prove that triangles are congruent.
2. Use the hierarchy of quadrilaterals and understand the properties of the quadrilaterals and be able to apply them to solve problems.
3. Use the Pythagorean Theorem, properties of right triangle trigonometry, and properties of special right triangles to solve problems.
4. Understand the properties of a circle to be able to calculate relationships between arcs and angles.
5. Apply properties of chords, tangent segments, and secant segments within a circle to solve problems.
6. Write equations of circles.

**Course Outcome 4 Assessment:**

Short answer and/or multiple choice assesment

## Practical Geometry

Practical Geometry

11,12

Year

### **Description:**

Practical Geometry is a year-long, project-based course designed for the student who has successfully completed Algebra Foundations II. Students will develop the ability to apply geometric concepts to real-world situations. Topics covered will include triangles, quadrilaterals, cubes, spheres, cylinders, and other two- and three-dimensional shapes. Because four-year institutions do not accept this course for math credit, it is not recommended for college bound students. Students who intend to take Algebra II must enroll in Geometry or Honors Geometry.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

### **Primary Resource:**

To Be Determined 2007-08

### **Course Outcome 1**

Students will recognize and manipulate two- and three-dimensional geometric shapes.

#### **Course Outcome 1 Objectives:**

Students will:

1. Use geometric definitions, properties, and relationships to describe the physical world.
2. Apply concepts of transformational geometry, including reflections, rotations, translations and dilations.
3. Understand and apply properties of parallel and perpendicular lines, as they apply to geometric figures.

#### **Course Outcome 1 Assessment:**

Performance Assessment

### **Course Outcome 2**

Students will measure aspects and understand properties of triangles, quadrilaterals, right triangles, circles, cubes, spheres, and cylinders.

#### **Course Outcome 2 Objectives:**

Students will:

1. Classify triangles by sides and angles and use information to show that triangles are congruent.

2. Understand the properties of the quadrilaterals and be able to apply them to solve problems.
3. Use the Pythagorean Theorem, properties of Right Triangle Trigonometry, and properties of special right triangles to solve problems.
4. Understand the properties of a circle, including radius, diameter, circumference and area.
5. Use measurement and attributes of two-dimensional (2-D) and three-dimensional (3-D) geometric shapes to calculate area, perimeter, surface area, and volume.

**Course Outcome 2 Assessment:**  
Performance Assessment

## Algebra II

Algebra II

9,10,11,12

Year

### **Description:**

Concepts from Algebra I are expanded and used to further develop a variety of advanced algebraic topics. This course integrates topics such as systems of equations and inequalities, higher-ordered polynomials, advanced functions and discrete math topics. Algebra II completes the three-year mathematics sequence required by many colleges.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

### **Primary Resource:**

To Be Determined 2007-08

### **Course Outcome 1**

Students will solve systems of linear equations and inequalities using a variety of techniques.

#### **Course Outcome 1 Objectives:**

Students will:

1. Solve systems of equations algebraically, graphically and with matrices.
2. Solve systems of linear inequalities using linear programming.
3. Solve systems of equations in three variables.
4. Use a graphing calculator to solve a system.

#### **Course Outcome 1 Assessment:**

Short answer and/or multiple choice assessment

### **Course Outcome 2**

Students will analyze, evaluate, graph, and solve polynomial and radical equations.

#### **Course Outcome 2 Objectives:**

Students will:

1. Perform basic operations with polynomials.
2. Factor polynomials.
3. Simplify radical expressions.
4. Solve and graph radical equations.
5. Simplify expressions with rational exponents
6. solve quadratic equations by graphing, factoring, completing the square, and the quadratic formula.
7. Find roots of polynomial functions algebraically and on graphing calculator.
8. Perform operations and find inverses of functions.

9. Perform operations with complex numbers.
10. Solve equations with complex numbers.

**Course Outcome 2 Assessment:**

Short answer and/or multiple choice assessment

**Course Outcome 3**

Students will analyze, evaluate, solve and graph advanced functions.

**Course Outcome 3 Objectives:**

Students will:

1. Perform operations with rational expressions.
2. Solve rational equations.
3. Write and solve equations using direct, inverse and joint variation.
4. Analyze and graph exponential equations.
5. Solve logarithmic and exponential equations.
6. Use properties of common and natural logarithms to solve equations.
7. Solve exponential growth and decay problems.
8. Evaluate and graph piecewise, step and absolute value functions.

**Course Outcome 3 Assessment:**

Short answer and/or multiple choice assessment

**Course Outcome 4**

Students will interpret and analyze discrete math topics such as sequences, series, probability and statistics.

**Course Outcome 4 Objectives:**

Students will:

1. Use formulas for arithmetic sequences and series.
2. Use formulas for geometric sequences and series.
3. Determine possible outcomes using counting principles, permutations, and combinations.
4. Expand polynomials using either Pascal's triangle or the binomial theorem.

**Course Outcome 4 Assessment:**

Short answer and/or multiple choice assessment

## Honors Algebra II

Honors Algebra II

9,10,11,12

Year

### **Description:**

In Honors Algebra II, concepts from Algebra I are expanded and used to further develop a variety of advanced algebraic topics. The course integrates topics such as systems of equations and inequalities, higher-ordered polynomials, advanced functions and discrete math topics. This class will move at a quicker pace and will cover topics in greater detail than the regular Algebra II class, and is recommended for all students who plan to pursue Advanced Placement<sup>®</sup> or International Baccalaureate<sup>®</sup> math classes.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

### **Primary Resource:**

To Be Determined 2007-08

### **Course Outcome 1**

Students will solve systems of linear equations and inequalities using a variety of techniques.

### **Course Outcome 1 Objectives:**

Students will:

1. Solve systems of equations algebraically, graphically and with matrices.
2. Solve systems of linear inequalities using linear programming.
3. Solve systems of equations in three variables.
4. Use a graphing calculator to solve a system using inverses or Gauss-Jordan Elimination (RREF).

### **Course Outcome 1 Assessment:**

Short answer and/or multiple choice assessment

### **Course Outcome 2**

Students will analyze, evaluate, graph, and solve polynomial and radical equations.

### **Course Outcome 2 Objectives:**

Students will:

1. Perform basic operations with polynomials.
2. Factor polynomials.
3. Simplify radical expressions.
4. Solve and graph radical equations and inequalities.
5. Simplify expressions with rational exponents

6. Solve quadratic equations by graphing, factoring, completing the square, and the quadratic formula.
7. Find roots of polynomial functions algebraically and on graphing calculator.
8. Perform operations and find inverses of functions.
9. Perform operations with complex numbers.
10. Solve equations with complex numbers.
11. Analyze the discriminant to understand the nature and type of roots of a quadratic equation.

**Course Outcome 2 Assessment:**

Short answer and/or multiple choice assessment

**Course Outcome 3**

Students will analyze, evaluate, solve and graph advanced functions.

**Course Outcome 3 Objectives:**

Students will:

1. Perform operations with rational expressions.
2. Solve rational equations.
3. Write and solve equations using direct, inverse and joint variation.
4. Analyze and graph exponential equations.
5. Solve logarithmic and exponential equations.
6. Use properties of common and natural logarithms to solve equations.
7. Solve exponential growth and decay problems.
8. Evaluate and graph piecewise, step and absolute value functions.
9. Use a graphing calculator to solve rational inequalities.

**Course Outcome 3 Assessment:**

Short answer and/or multiple choice assessment

**Course Outcome 4**

Students will interpret and analyze discrete math topics such as sequences, series, probability and statistics.

**Course Outcome 4 Objectives:**

Students will:

1. Use formulas for arithmetic sequences and series.
2. Use formulas for geometric sequences and series.
3. Use formula to find the sum of an infinite geometric series.
4. Determine possible outcomes using counting principles, permutations, and combinations.
5. Expand polynomials using either Pascal's triangle or the binomial theorem.

**Course Outcome 4 Assessment:**

Short answer and/or multiple choice assessment

## Pre-Calculus

Pre-Calculus

10,11,12

Year

**Description:** Precalculus is the study of functions, conic sections, and trigonometry that foreshadows the important concepts of Calculus. The relationship between functions and the behavior of functions is developed through an algebraic, analytical, numerical, and graphical approach, including mathematical modeling for real-world application.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

**Primary Resource:**

To Be Determined 2007-08

**Course Outcome 1**

Students will analyze, interpret, graph, and evaluate advanced functions and equations.

**Course Outcome 1 Objectives:**

Students will:

1. Graph, transform, evaluate, analyze, and solve polynomial, rational, exponential, logarithmic, logistic, parametric and polar functions.
2. Evaluate the sum, difference, product, quotient, inverse and the composition of functions.
3. Find, apply, and approximate the zeros, both real and complex, of a polynomial function.
4. Solve and graph polynomial and absolute value inequalities.
5. Solve parametric equations in a real world setting.

**Course Outcome 1 Assessment:**

Performance assessment or student demonstration using technology

**Course Outcome 2**

Students will analyze, interpret, graph, and evaluate trigonometric functions.

**Course Outcome 2 Objectives:**

Students will:

1. Define, evaluate, utilize, and apply the six trigonometric ratios.
2. Develop, utilize, and apply the unit circle and reference angles using radian and degree measure.
3. Analyze and graph the six standard trigonometric functions and their transformations.
4. Develop an equation from a trigonometric graph or from given specific characteristics of a graph.
5. Recognize, evaluate, and utilize the inverse trigonometric functions.

**Course Outcome 2 Assessment:**

Performance assessment or student demonstration using technology

**Course Outcome 3**

Students will identify, analyze, interpret, and evaluate analytical trigonometric functions.

**Course Outcome 3 Objectives:**

Students will:

1. Identify and apply the fundamental trigonometric identities.
2. Verify trigonometric identities.
3. Utilize the trigonometric identities to solve trigonometric equations.
4. Utilize the trigonometric formulas (Sum & Difference, Double Angle and Power Reducing).
5. Identify and utilize the Law of Sines and Law of Cosines to solve oblique triangles.
6. Use the trigonometric formulas to find the area of oblique triangles.

**Course Outcome 3 Assessment:**

Performance assessment or student demonstration using technology

**Course Outcome 4**

Students will analyze, interpret, graph, and evaluate conic sections.

**Course Outcome 4 Objectives:**

Students will:

1. Define each conic section.
2. Write an equation and graph standard and translated conic sections.
3. Identify important characteristics and real world application of each conic section.

**Course Outcome 4 Assessment:**

Performance assessment or student demonstration using technology

## Honors Pre-Calculus

Honors Pre-Calculus

10,11,12

Year

**Description:** Precalculus is the study of functions, conic sections, and trigonometry that foreshadows the important concepts of Calculus. The relationship between functions and the behavior of functions is developed through an algebraic, analytical, numerical, and graphical approach, including mathematical modeling for real-world application. This class will move at a quicker pace and will cover topics in greater detail than the regular Precalculus class. It is recommended for all students who plan to pursue Advanced Placement<sup>®</sup> or International Baccalaureate<sup>®</sup> math classes.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

**Primary Resource:**

To Be Determined 2007-08

**Course Outcome 1**

Students will analyze, interpret, graph, and evaluate advanced functions and equations.

**Course Outcome 1 Objectives:**

Students will:

1. Graph, transform, evaluate, analyze, and solve polynomial, rational, exponential, logarithmic, logistic, parametric and polar functions.
2. Evaluate the sum, difference, product, quotient, inverse and the composition of functions.
3. Find, apply, and approximate the zeros, both real and complex, of a polynomial function.
4. Solve and graph polynomial and absolute value inequalities.
5. Solve parametric equations in a real world setting.
6. Find partial fraction decomposition.
7. Analyze and derive formulas for arithmetic and geometric sequences and series.
8. Analyze and derive formulas for infinite geometric series.

**Course Outcome 1 Assessment:**

Performance assessment or student demonstration using technology

**Course Outcome 2**

Students will analyze, interpret, graph, and evaluate trigonometric functions.

**Course Outcome 2 Objectives:**

Students will:

1. Define, evaluate, utilize, and apply the six trigonometric ratios.

2. Develop, utilize, and apply the unit circle and reference angles using radian and degree measure.
3. Analyze and graph the six standard trigonometric functions and their transformations.
4. Develop an equation from a trigonometric graph or from given specific characteristics of a graph.
5. Recognize, evaluate, and utilize the inverse trigonometric functions.

**Course Outcome 2 Assessment:**

Performance assessment or student demonstration using technology

**Course Outcome 3**

Students will identify, analyze, interpret, and evaluate analytical trigonometric functions.

**Course Outcome 3 Objectives:**

Students will:

1. Identify and apply the fundamental trigonometric identities.
2. Verify trigonometric identities.
3. Utilize the trigonometric identities to solve trigonometric equations.
4. Utilize the trigonometric formulas (Sum & Difference, Double Angle and Power Reducing).
5. Identify and utilize the Law of Sines and Law of Cosines to solve oblique triangles.
6. Use the trigonometric formulas to find the area of oblique triangles.

**Course Outcome 3 Assessment:**

Performance assessment or student demonstration using technology

**Course Outcome 4**

Students will analyze, interpret, graph, and evaluate conic sections.

**Course Outcome 4 Objectives:**

Students will:

1. Define each conic section.
2. Write an equation and graph standard and translated conic sections.
3. Identify important characteristics and real world application of each conic section.

**Course Outcome 4 Assessment:**

Performance assessment or student demonstration using technology

## Consumers Math

Consumers Math

12

Year

### **Description:**

In Consumers Math, students will gain the foundation necessary for the continual exploration of personal finance and consumer issues throughout their adult lives. Because four-year institutions do not accept this course for math credit, it is not recommended for college bound students.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

### **Primary Resource:**

To Be Determined 2007-08

### **Course Outcome 1**

Students will calculate and analyze total wages earned

#### **Course Outcome 1 Objectives:**

Students will:

1. Calculate a worker's gross pay under hourly, salaried, commissioned pay schemes.
2. Calculate Social Security, Medicare, income tax and other personal deductions.
3. Calculate net pay by combining both of the above enabling objectives.

#### **Course Outcome 1 Assessment:**

Performance assessment or student demonstration using technology

### **Course Outcome 2**

Students will prepare personal income tax forms using traditional forms and web sites.

#### **Course Outcome 2 Objectives:**

Students will:

1. Prepare a 1040EZ federal form and 1040NS state form.
2. Prepare a 1040A federal form and accompanying schedule, along with 1040N state form.
3. Study itemized deductions and their applications to federal form 1040.
4. Analyze the use of the appropriate forms for given situations.

#### **Course Outcome 2 Assessment:**

Performance assessment or student demonstration using technology

### **Course Outcome 3**

Students will analyze real-life situations and calculate costs of consumer issues related to everyday living expenses.

#### **Course Outcome 3 Objectives:**

Students will:

1. Perform calculations related to discounted sales prices and sales tax.
2. Calculate and interpret unit pricing to determine the better buy.
3. Calculate and analyze items pertaining to varied modes of transportation, including air, train and bus travel.
4. Calculate bills for house utilities and property taxes.
5. Calculate monthly payments and closing costs for a mortgage.
6. Calculate and interpret area and volume as related to home improvement projects and their costs.

#### **Course Outcome 3 Assessment:**

Performance assessment or student demonstration using technology

### **Course Outcome 4**

Students will calculate costs and returns pertaining to personal finance.

#### **Course Outcome 4 Objectives:**

Students will:

1. Calculate premiums for automotive and life insurance policies.
2. Determine the appropriate amounts to be paid by an insured individual when an insurance claim is submitted.
3. Calculate the total amount to be repaid on a loan and any appropriate finance charges.
4. Calculate and analyze the future value of investments.
5. Perform calculations related to the buying and selling of stocks and bonds.
6. Demonstrate ability to use and maintain a checking and savings account.

#### **Course Outcome 4 Assessment:**

Performance assessment or student demonstration using technology

## College Prep Mathematics

College Prep Mathematics

11,12

Year

### **Description:**

This course is designed for those students who are college-bound, non-math majors. It will expand on the college level math topics of linear equations, advanced functions, conic sections, probability, series and sequences, and basic trigonometry. This course would fulfill the four-year math requirement for most universities, and prepare students for introductory college mathematics courses. Students who will need Trigonometry or Calculus in college should enroll in Precalculus. Those who will need a background in statistics may also take AP<sup>®</sup> Statistics.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

### **Primary Resource:**

To Be Determined 2007-08

### **Course Outcome 1**

Students will solve and analyze linear equations and inequalities using a variety of techniques.

#### **Course Outcome 1 Objectives:**

Students will:

1. Solve, graph, evaluate, write, and transform linear equations.
2. Solve and graph linear inequalities.
3. Solve absolute value equations.
4. Solve compound and absolute value inequalities.
5. Determine linear regression equations from data to predict future and past results.
6. Solve systems of equations graphically, algebraically, and with matrices.
7. Solve and interpret systems of inequalities using linear programming.

#### **Course Outcome 1 Assessment:**

Performance assessment using technology

### **Course Outcome 2**

Students will analyze, interpret, graph, and evaluate advanced functions.

#### **Course Outcome 2 Objectives:**

Students will:

1. Graph, transform, evaluate, analyze, and solve polynomial, rational, radical, logarithmic, and exponential equations.
2. Evaluate sum, difference, product, quotient, inverse and the composition of functions.
3. Find, apply, and approximate the zeros, both real and complex, of a polynomial

function.

4. Solve and graph polynomial inequalities.
5. Solve and graph rational and radical inequalities.
6. Solve and graph absolute value equations and inequalities.
7. Solve exponential and logarithmic equations in a real world setting.

**Course Outcome 2 Assessment:**

Performance assessment or student demonstration using technology

**Course Outcome 3**

Students will analyze and interpret graphs of conic sections.

**Course Outcome 3 Objectives:**

Students will:

1. Define each conic section.
2. Write an equation and graph standard and translated conic sections.
3. Identify characteristics and real world applications of each conic section.

**Course Outcome 3 Assessment:**

Performance assessment or student demonstration using technology

**Course Outcome 4**

Students will analyze and interpret series, sequences, probabilities, statistics, and basic trigonometry.

**Course Outcome 4 Objectives:**

Students will:

1. Analyze and derive formulas for arithmetic and geometric sequences and series.
2. Analyze and derive formulas for infinite geometric series.
3. Determine possible outcomes using counting principles, permutations, and combinations.
4. Apply theoretical probability to represent problems and make decisions.
5. Expand polynomials using the binomial theorem.
6. Interpret data represented by the normal distribution and formulate conclusions.
7. Calculate basic right triangle trigonometry.

**Course Outcome 4 Assessment:**

Performance assessment or student demonstration using technology

## AP<sup>®</sup> Calculus AB

AP<sup>®</sup> Calculus AB

11,12

Year

**Description:** Advanced Placement<sup>®</sup> Calculus AB is a course in single variable calculus that includes techniques and applications of the derivative, techniques and applications of the definite integral, and the Fundamental Theorem of Calculus. Algebraic, numerical, and graphical representations are emphasized throughout the course. It is equivalent to at least a semester of calculus at most colleges and universities. Completion of this course will prepare students to take the College Board AP<sup>®</sup> Calculus AB exam.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

**Primary Resource:**

To Be Determined 2007-08

**Course Outcome 1 - Functions, Graphs, and Limits**

Students will analyze an assortment of functions by describing their asymptotic behavior, continuity, and limits at various functional values.

**Course Outcome 1 Objectives:**

Students will:

1. Analyze graphs. With the aid of technology, graphs of functions are often easy to produce. The emphasis is on the interplay between the geometric and analytic information and on the use of calculus both to predict and to explain the observed local and global behavior of a function.
2. Analyze the limits of functions (including one-sided limits)
  - a. Have an intuitive understanding of the limiting process.
  - b. Calculate limits using algebra.
  - c. Estimate limits from graphs or tables of data.
3. Analyze asymptotic and unbounded behavior.
  - a. Understand asymptotes in terms of graphical behavior.
  - b. Describe asymptotic behavior in terms of limits involving infinity.
  - c. Compare relative magnitudes of functions and their rates of change.  
(Contrasting exponential growth, polynomial growth, and logarithmic growth)
4. Interpret continuity as a property of functions.
  - a. Possess an intuitive understanding of continuity. (Close values of the domain lead to close values of the range.)
  - b. Understand continuity in terms of limits.
  - c. Possess a geometric understanding of graphs of continuous functions  
(Intermediate Value Theorem and Extreme Value Theorem).

### **Course Outcome 1 Assessment:**

Written response, short answer, and/or multiple choice assessment

### **Course Outcome 2 - Derivatives**

Students will demonstrate relationships between functions and their derivatives.

### **Course Outcome 2 Objectives:**

Students will:

1. Understand the theoretical concept of the derivative.
  - a. Use and apply derivatives that are presented graphically, numerically, and analytically.
  - b. Understand the derivative interpreted as an instantaneous rate of change.
  - c. Understand the derivative defined as the limit of the difference quotient.
  - d. Understand the relationship between differentiability and continuity.
2. Analyze and evaluate derivatives at a point.
  - a. Have knowledge of the slope of a curve at a point. Examples are emphasized, including points at which there are vertical tangents and points at which there are no tangents.
  - b. Have an intuitive understanding of the tangent line to a curve at a point and local linear approximation.
  - c. Be able to understand instantaneous rate of change as the limit of average rate of change.
  - d. Approximate rate of change from graphs and tables of values.
3. Analyze and interpret the derivative as a function.
  - a. Understand corresponding characteristics of graphs of  $f$  and  $f'$ .
  - b. Recognize relationships between the increasing and decreasing behavior of  $f$  and the sign of  $f'$ .
  - c. Understand the Mean Value Theorem and its geometric consequences.
  - d. Solve equations involving derivatives. Verbal descriptions are translated into equations involving derivatives and vice versa.
4. Analyze and interpret the second derivative.
  - a. Understand corresponding characteristics of graphs of  $f$ ,  $f'$ , and  $f''$ .
  - b. Understand the relationship between the concavity of  $f$  and the sign of  $f''$ .
  - c. Understand points of inflection as places where concavity changes.
5. Analyze and interpret applications of derivatives.
  - a. Analyze curves, including the notions of monotonicity and concavity.
  - b. Analyze planar curves given in parametric form, polar form, and vector form, including velocity and acceleration.
  - c. Optimize both absolute (global) and relative (local) extrema.
  - d. Model rates of change, including related rates problems.
  - e. Use implicit differentiation to find the derivative of an inverse function.
  - f. Interpret the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration.

- g. Understand geometric interpretation of differential equations via slope fields and the relationship between slope fields and solution curves for differential equations.
- 6. Compute derivatives algebraically.
  - a. Know derivatives of basic functions, including power, exponential, logarithmic, trigonometric, and inverse trigonometric functions.
  - b. Use and understand basic rules for the derivative of sums, products, and quotients of functions.
  - c. Apply the chain rule and implicit differentiation.

**Course Outcome 2 Assessment:**

Written response, short answer, and/or multiple choice assessment

**Course Outcome 3 - Integrals**

Students will calculate, interpret, and apply Riemann sums to the definite integral.

**Course Outcome 3 Objectives:**

Students will:

1. Interpret and use properties of definite integrals.
  - a. Use a definite integral as a limit of Riemann sums.
  - b. Use a definite integral as the rate of change of a quantity over an interval interpreted as the change of the quantity over interval.
 
$$\int_a^b f'(x)dx = f(b) - f(a)$$
  - c. Understand and apply basic properties of definite integrals (Ex. Additivity and linearity)
2. Apply integrals
  - a. Appropriate integrals are used in a variety of applications to model physical, biological, or economic situations. Although only a sampling of applications can be included in any specific course, students should be able to adapt their knowledge and techniques to solve other similar application problems. Whatever applications are chosen, the emphasis is on using the integral of a rate of change to give accumulated change or using the method of setting up an approximating Riemann sum and representing its limit as a definite integral. To provide a common foundation, specific applications should include finding the area of a value of a function, the distance traveled by a particle along a line.
3. Apply and understand the Fundamental Theorem of Calculus
  - a. Use the Fundamental Theorem to evaluate definite integrals.
  - b. Use the Fundamental Theorem to represent a particular antiderivative, and the analytical and graphical analysis of functions so defined.
4. Apply techniques of antidifferentiation.
  - a. Compute antiderivatives that follow directly from derivatives of basic functions.
  - b. Compute antiderivatives by substitution of variables (including change of limits for definite integrals)
5. Analyze and interpret applications of antidifferentiation.

- a. Find specific antiderivatives using initial conditions, including applications to motion along a line.
  - b. Solve separable differential equations and use them in modeling. (In particular, studying the equation  $y' = ky$  and exponential growth.)
6. Calculate numerical approximations to definite integrals.
- a. Use Riemann (using left, right, & midpoint evaluation points) and trapezoidal sums to approximate definite integrals of functions represented algebraically, graphically, and by tables of values.

**Course Outcome 3 Assessment:**

Written response, short answer, and/or multiple choice assessment

## AP<sup>®</sup> Calculus BC

AP<sup>®</sup> Calculus BC

11,12

Year

**Description:** Advanced Placement<sup>®</sup> Calculus BC is a course in single variable calculus that includes all the topics of Advanced Placement<sup>®</sup> Calculus AB plus additional topics in differential and integral calculus (including parametric, polar, and vector functions) and series. Algebraic, numerical, and graphical representations are emphasized throughout the course. It is equivalent to at least a year of calculus at most colleges and universities. Completion of this course will prepare students to take the College Board AP<sup>®</sup> Calculus BC exam.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

**Primary Resource:**

To Be Determined 2007-08

**Outcome 1 - Functions, Graphs, and Limits**

Students will analyze an assortment of functions by describing their asymptotic behavior, continuity, and limits at various functional values.

**Course Outcome 1 Objectives:**

Students will:

1. Analyze graphs. With the aid of technology, graphs of functions are often easy to produce. The emphasis is on the interplay between the geometric and analytic information and on the use of calculus both to predict and to explain the observed local and global behavior of a function.
2. Analyze the limits of functions (including one-sided limits)
  - a. Have an intuitive understanding of the limiting process.
  - b. Calculate limits using algebra.
  - c. Estimate limits from graphs or tables of data.
3. Analyze asymptotic and unbounded behavior.
  - a. Understand asymptotes in terms of graphical behavior.
  - b. Describe asymptotic behavior in terms of limits involving infinity.
  - c. Compare relative magnitudes of functions and their rates of change. (For example, contrasting exponential growth, polynomial growth, and logarithmic growth)
4. Interpret continuity as a property of functions.
  - a. Possess an intuitive understanding of continuity. (Close values of the domain lead to close values of the range.)
  - b. Understand continuity in terms of limits.
  - c. Possess a geometric understanding of graphs of continuous functions (Intermediate Value Theorem and Extreme Value Theorem).
5. Analyze parametric, polar, and vector functions.

### **Course Outcome 1 Assessment:**

Written response, short answer, and/or multiple choice assessment

### **Course Outcome 2 - Derivatives**

Students will demonstrate relationships between functions and their derivatives.

### **Course Outcome 2 Objectives:**

Students will:

1. Understand the theoretical concept of the derivative.
  - a. Use and apply derivatives that are presented graphically, numerically, and analytically.
  - b. Understand the derivative interpreted as an instantaneous rate of change.
  - c. Understand the derivative defined as the limit of the difference quotient.
  - d. Understand the relationship between differentiability and continuity.
2. Analyze and evaluate derivatives at a point.
  - a. Have knowledge of the slope of a curve at a point. Examples are emphasized, including points at which there are vertical tangents and points at which there are no tangents.
  - b. Have an intuitive understanding of the tangent line to a curve at a point and local linear approximation.
  - c. Be able to understand instantaneous rate of change as the limit of average rate of change.
  - d. Approximate rate of change from graphs and tables of values.
3. Analyze and interpret the derivative as a function.
  - a. Understand corresponding characteristics of graphs of  $f$  and  $f'$ .
  - b. Recognize relationships between the increasing and decreasing behavior of  $f$  and the sign of  $f'$ .
  - c. Understand the Mean Value Theorem and its geometric consequences.
  - d. Solve equations involving derivatives. Verbal descriptions are translated into equations involving derivatives and vice versa.
4. Analyze and interpret the second derivative.
  - a. Understand corresponding characteristics of graphs of  $f$ ,  $f'$ , and  $f''$ .
  - b. Understand the relationship between the concavity of  $f$  and the sign of  $f''$ .
  - c. Understand points of inflection as places where concavity changes.
5. Analyze and interpret applications of derivatives.
  - a. Analyze curves, including the notions of monotonicity and concavity.
  - b. Analyze planar curves given in parametric form, polar form, and vector form, including velocity and acceleration.
  - c. Optimize both absolute (global) and relative (local) extrema.
  - d. Model rates of change, including related rates problems.
  - e. Use implicit differentiation to find the derivative of an inverse function.
  - f. Interpret the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration.

- g. Understand geometric interpretation of differential equations via slope fields and the relationship between slope fields and solution curves for differential equations.
  - h. Find the numerical solution of differential equations using Euler's method.
  - i. Apply L'Hopital's Rule, including its use in determining limits and convergence of improper integrals and series.
6. Compute derivatives algebraically.
- a. Know derivatives of basic functions, including power, exponential, logarithmic, trigonometric, and inverse trigonometric functions.
  - b. Use and understand basic rules for the derivative of sums, products, and quotients of functions.
  - c. Apply the chain rule and implicit differentiation.
  - d. Calculate derivatives of parametric, polar, and vector functions.

**Course Outcome 2 Assessment:**

Written response, short answer, and/or multiple choice assessment

**Course Outcome 3 - Integrals**

Students will calculate, interpret, and apply Riemann sums to the definite integral.

**Course Outcome 3 Objectives:**

Students will:

1. Interpret and use properties of definite integrals.
  - a. Use a definite integral as a limit of Riemann sums.
  - b. Use a definite integral as the rate of change of a quantity over an interval interpreted as the change of the quantity over interval.
 
$$\int_a^b f'(x)dx = f(b) - f(a)$$
  - c. Understand and apply basic properties of definite integrals. (Examples include additivity and linearity.)
2. Apply integrals
  - a. Appropriate integrals are used in a variety of applications to model physical, biological, or economic situations. Although only a sampling of applications can be included in any specific course, students should be able to adapt their knowledge and techniques to solve other similar application problems. Whatever applications are chosen, the emphasis is on using the integral of a rate of change to give accumulated change or using the method of setting up an approximating Riemann sum and representing its limit as a definite integral. To provide a common foundation, specific applications should include finding the area of a region (including a region bounded by polar curves), the volume of a solid with known cross sections, the average value of a function, the distance traveled by a particle along a line, and the length of a curve (including a curve given in parametric form).
3. Apply and understand the Fundamental Theorem of Calculus
  - a. Use the Fundamental Theorem to evaluate definite integrals.

- b. Use the Fundamental Theorem to represent a particular antiderivative, and the analytical and graphical analysis of functions so defined.
- 4. Apply techniques of antidifferentiation.
  - a. Compute antiderivatives that follow directly from derivatives of basic functions.
  - b. Compute antiderivatives by substitution of variables (including change of limits for definite integrals), parts, and simple partial fractions (nonrepeating linear factors only).
  - c. Compute improper integrals (as limits of definite integrals).
- 5. Analyze and interpret applications of antidifferentiation.
  - a. Find specific antiderivatives using initial conditions, including applications to motion along a line.
  - b. Solve separable differential equations and use them in modeling. (In particular, studying the equation  $y' = ky$  and exponential growth.)
  - c. Solve logistic differential equations and use them in modeling.
- 6. Calculate numerical approximations to definite integrals.
  - a. Use Riemann (using left, right, & midpoint evaluation points) and trapezoidal sums to approximate definite integrals of functions represented algebraically, graphically, and by tables of values.

**Course Outcome 3 Assessment:**

Written response, short answer, and/or multiple choice assessment

**Outcome 4 - Polynomial Approximations and Series**

Students will interpret the convergence and divergence of series.

**Course Outcome 4 Objectives:**

Students will:

1. Understand the concept of series.
  - a. A series is defined as a sequence of partial sums, and convergence is defined in terms of the limit of the sequence of partial sums. Technology can be used to explore convergence or divergence.
2. Understand series of constants.
  - a. Explore motivating examples, including decimal expansion.
  - b. Recognize and interpret geometric series with applications.
  - c. Recognize and interpret harmonic series.
  - d. Interpret the terms of a series as areas of rectangles and their relationship to improper integrals, including the integral test and its use in the convergence of p-series.
  - e. Apply the ratio test for convergence and divergence.
  - f. Compare series to test for convergence or divergence.
3. Interpret and apply Taylor series.
  - a. Use Taylor polynomial approximation with graphical demonstration of convergence (for example, viewing graphs of various Taylor polynomials of the sine function approximating the sine curve).
  - b. Calculate the Maclaurin series and the general Taylor series centered at  $x = a$ .

- c. Learn the Maclaurin series for the functions  $e^x$ ,  $\sin(x)$ ,  $\cos(x)$ , and  $\frac{1}{1-x}$ .
- d. Manipulate Taylor series using shortcuts to compute new Taylor series, including substitution, differentiation, antidifferentiation, and the formation of new series from known series.
- e. Derive functions defined by power series.
- f. Find the radius and interval of convergence of power series.
- g. Use the Lagrange error bound for Taylor polynomials.

**Course Outcome 4 Assessment:**

Written response, short answer, and/or multiple choice assessment

## AP® Statistics

AP® Statistics

10,11,12

Year

### **Description:**

Advanced Placement® Statistics is designed to prepare students for the Advanced Placement® statistics exam. The content will consist of the statistical concepts tested on the exam including exploring data, sampling and experimentation, anticipating patterns, and statistical inference. Students who successfully complete the Advanced Placement® examination may receive credit and/or advanced placement for a one-semester introductory college statistics course at many colleges and universities. Completion of this course will prepare students to take the College Board AP® Statistics exam.

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

### **Primary Resource:**

To Be Determined 2007-08

### **Course Outcome 1**

Students will use graphical and numerical techniques to study patterns and departures from patterns, with emphasis on interpreting graphical and numerical displays and summaries.

### **Course Outcome 1 Objectives:**

Students will:

1. Interpret graphical displays of distribution of univariate data (dot plot, stem plot, histogram, and cumulative frequency plot).
2. Summarize distributions of univariate data.
3. Compare distributions of univariate data (dot plots, back-to-back stem plots, and parallel box plots).
4. Explore bivariate data.
5. Explore categorical data: frequency tables.

### **Course Outcome 1 Assessment:**

Teacher developed or textbook generated tests, quizzes and/or projects using technology. May include free response/critical thinking type questions.

### **Course Outcome 2**

Students will collect data according to a well-developed plan, deciding upon a method of data collection and analysis.

**Course Outcome 2 Objectives:**

Students will:

1. Apply different methods of data collection.
2. Plan and conduct surveys.
3. Plan and conduct an experiment.
4. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys

**Course Outcome 2 Assessment:**

Teacher developed or textbook generated tests, quizzes and/or projects using technology. May include free response/critical thinking type questions.

**Course Outcome 3**

Students will use probability as a tool for anticipating what the distribution of data should look like under a given model

**Course Outcome 3 Objectives:**

Student will:

1. Express probability as relative frequency.
2. Apply probability rules.
3. Combine independent random variables.
4. Use the normal distribution as a model for measurements.
5. Simulate and interpret discrete probability and continuous sampling distributions.

**Course Outcome 3 Assessment:**

Teacher developed or textbook generated tests, quizzes and/or projects using technology. May include free response/critical thinking type questions.

**Course Outcome 4**

Students will apply statistical inference for selecting models and drawing conclusions for the data.

**Course Outcome 4 Objectives:**

Student will:

1. Estimate population parameters using properties of point estimators.
2. Create confidence intervals for various population parameters.
3. Perform tests of significance.

**Course Outcome 4 Assessment:**

Teacher developed or textbook generated tests, quizzes and/or projects using technology. May include free response/critical thinking type questions.

## Math Reteaching

Math Reteaching

11,12

Year

### **Description:**

This course is designed for the student who has not been successful on the district's 10<sup>th</sup> grade Math ELO. The mission of re-teaching is to ensure that all students have the opportunity to learn the knowledge and skills necessary to meet the cut scores on the Millard Public Schools Essential Learner Outcome assessments. The math reteaching course will highlight instruction from Pre-Algebra, Algebra I, and Geometry and align to our Table of Specifications which is developed alongside the Math 10 Essential Learner Outcome (ELO) test.

We believe ELO re-teaching will:

- Be a cooperative effort between school, student and parents
- Include re-testing at the point of re-teaching instruction

**Millard Standards:** See secondary Millard Standards listed on pages 16-18.

### **Primary Resources:**

*McDougal Littell Math Course 3 (2007)*

*McDougal Littell Algebra 1 (2007)*

Geometry resource to be determined in 2007-08

### **Course Outcome 1**

Student will demonstrate competency in math, science, and/or social studies by meeting or exceeding the cut score on the respective Essential Learner Outcome Assessment.

### **Course Outcome 1 Objectives:**

Students will:

1. Acquire knowledge and skills in areas of deficiency as indicated by the Individualized Learning Plan (ILP)
2. Apply test taking strategies to respective discipline

### **Course Outcome 1 Assessment:**

Strand Demonstrations (Prescribed strand demonstrations may be retained for use as a demonstration of proficiency for graduation requirements.)

ELO assessment