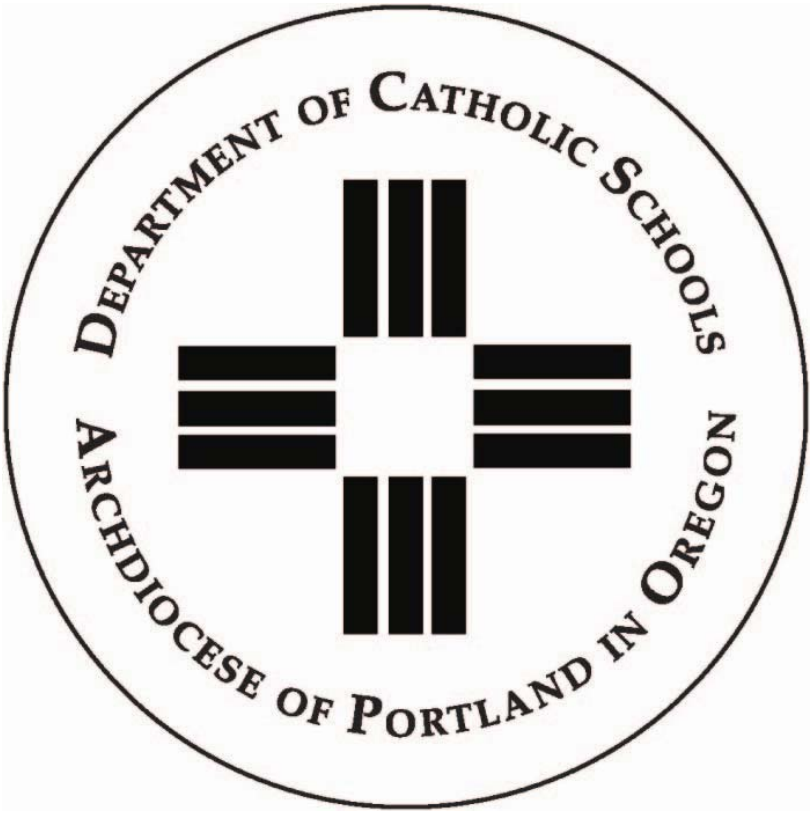
Catholic Elementary and Middle School

MATHEMATICS

Curriculum Standards



Revised: June 3, 2010

Introduction

In today's global economy, proficiency in mathematics is required for our students' future success. Recently, United States students have not performed at the high achievement level of students in many other countries in the area of mathematics. In the late 1990's, a comparison of international scores led to a curriculum analysis conducted during the 1997 Third International Mathematics and Science Study (TIMMS). Results of the study led to a now familiar description of United States mathematics curriculum as being "a mile wide and an inch deep." (Schmidt, McKnight, and Raisen, 1997) Through this study, it was noted that mathematical content and student learning outcomes in the United States vary widely across the country. In a spiral curriculum format, students have been introduced to as many as forty-one different math concepts during one school year, but mastery and deep understanding of mathematics has not always been expected or achieved at any one grade level. Consequently, curricular coherence from grade to grade has not always been successful. As a result, many students have left high school without the skills to succeed in college mathematics classes and have not been able to graduate from college with the mathematical knowledge and skills required of applicants entering today's competitive twenty-first century work world.

In response to this research about why our country's students have not been globally competitive in mathematics and science, researchers from the National Association of Teachers of Mathematics and also from the U.S. Department of Education have recommended sweeping changes in the way that we teach mathematics at the elementary school level. We are moving from a broad but often shallow and incoherent elementary school curriculum to a more rigorous, more cohesive curriculum. The number of topics covered at each grade level will be limited, but students will be expected to master the concepts, skills, and processes needed to become proficient with the grade level benchmarks set for them. Teachers should no longer need to spend significant amounts of time re-teaching and reviewing standards from prior years, and will be able to immediately build upon students' prior knowledge, thus raising the level of interest, challenge, and competence for all students.

We, in the Archdiocese of Portland, have studied the latest research, and we embrace the changes that will raise our students' mathematical performance and improve their opportunities for success in college and in the world of work. Our K-8 curriculum was based upon the new *Focal Points* standards recommended by the National Association of Teachers of Mathematics in 2006, the *Benchmarks Critical Foundations* identified by the National Mathematics Advisory Panel in their final 2008 report, and the Oregon state mathematics core standards as adopted for the 2008-09 school year. Archdiocesan preschool standards were developed using the 2006 NCTM Curriculum Focal Points and the 2008 Madison, Wisconsin early childhood education standards. Our Algebra I curriculum was written based upon NCTM standards, recommendations from universities, National College Board standards, recommendations from the Archdiocesan Catholic high schools, and the 2009 Algebra standards from the Oregon Department of Education. Although we have reviewed the development of the 2010 Common Core State Standards that were adopted on June 2, 2010, we believe that it is premature for us to incorporate them, until states have had time to study them and prepare for implementation. As of this publication date, the grade level standards in this Archdiocesan document meet and often exceed the level of the various standards mentioned above.

Teaching this new curriculum effectively will require teachers in the Archdiocese of Portland to make some changes. We will teach fewer topics at each grade level within a coherent curriculum

from preschool through Algebra I. It will be our goal that all students master the outcomes listed for their grade level, and that the processes listed at the top of each grade level page will be used by learners to deepen their mathematical understanding and increase their knowledge and proficiency.

This new mathematics curriculum was originally written by an Archdiocesan committee of math teachers and principals in January of 2009. All of our schools' teachers and principals participated in a mathematics in-service day in August of 2009 related to those new standards and their implementation. At that time, teachers asked questions and made some recommendations that resulted in an October, 2009 revision of the standards. School level in-depth studies of mathematics have been completed by our schools during the 2009-10 school year. Student performance data in mathematics was collected and analyzed; curriculum and instructional practices were examined, and every school has designed an action plan with measurable goals that will improve student learning in mathematics. A number of teachers and administrators have attended national mathematics conferences or taken classes in mathematics in 2010. An Archdiocesan textbook committee met in November of 2009, reviewed all state approved mathematics textbooks, and created a recommended adoption list and analysis for our schools. At an April, 2010 Archdiocesan Math Publishers' Fair, schools had the opportunity to dialogue with publishers and national math consultants as they reviewed those texts. Many schools are purchasing new mathematics adoptions to be used in the fall of 2010 to teach this curriculum. Rather than teach mathematics by following a textbook, teachers will use their textbook materials as resources to teach these standards. In the spring of 2010, grade level mathematics teachers met together to review the curriculum, ask questions, and make recommendations for a final revision of these Archdiocesan mathematics standards. Teachers were then able to look at the revisions and further comment, before the Archdiocesan curriculum committee made final recommendations. This June 3, 2010 revision is the one that will be fully implemented beginning in the 2010-11 school year. We believe that these new standards are research-based, rigorous, and relevant for our schools at this time.

In the fall of 2010, we will continue our quest towards a high level of student achievement in mathematics by offering all of our teachers and principals a high quality workshop on assessment, preparing our instructional staff to teach to and assess for student mastery of these standards. We look forward to raising our students' content knowledge and mathematical proficiency as we begin to use these new Archdiocesan guidelines. Effective implementation of these curriculum standards will help to prepare our students to succeed and lead in the world of tomorrow.

Archdiocese of Portland in Oregon

Mathematics Curriculum Standards

Preschool through Algebra 1

The Department of Catholic Schools extends sincere appreciation to the members of the Archdiocesan Mathematics Curriculum Committee who contributed their professional expertise and invested many hours of valuable time bringing these student outcomes into reality. We also express deep gratitude to the principals for the sacrifices made in order to release teachers to do this very important work. We pray that our gratitude to all involved may be realized by the implementation of this new mathematics curriculum.

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Mathematics Prayer

In the name of the Holy Trinity, we thank you, our Father and Creator, for designing our universe in a mathematical way. We are fascinated by the complexity and design of the solar system within our universe. We find symmetry, structures, and patterns in all of nature, from the smallest snowflakes to the highest mountain peaks. We marvel at the design, beauty, and function of nature all around us, including plants, animals, and human beings. We stand in wonder as we examine the uniqueness of each product of creation, and we rejoice in exploring the similarities, congruence, and complexity of each one.

In mathematics, we see the work of a Divine mathematician. We see a glimpse of infinity in our studies of mathematics; like God, there is no beginning and end in math. God's work is all around us, waiting to be discovered and understood.

We ask your blessing that we may follow the teaching style of Jesus, Our Lord, who recognized the best in each person He encountered. May our own teaching be as patient, creative, clear, concise, and inspiring as that of Jesus, our role model.

We ask the Holy Spirit to infuse each teacher in our Archdiocese with openness to new ways of thinking about mathematics, wisdom in implementing these new guidelines, and solid mathematical knowledge and instructional practices. We hope to give our students every opportunity to deeply understand and use mathematics for the benefit of the world.

Finally, we ask you, dear God, to bless our work today and into the future. We also thank you for your many blessings bestowed upon each one of us.

In the name of the Father, and the Son, and the Holy Spirit,

Amen

Archdiocesan Mathematics Philosophy

God's mathematical wisdom is evident in the complexity and order of His creation. Mathematics is a universal language that is a gateway to equity and opportunity. We are committed to nurturing and developing the mathematical gifts of our students in partnership with their families. A strong mathematical education is vital in building a foundation of life-long success for all learners.

Archdiocesan Mathematics Goals for Teaching and Learning

As mathematics educators in the Catholic Schools of the Archdiocese of Portland, Oregon, we understand that students learn in a variety of ways, and we provide opportunities for learners to:

- **Appreciate the beauty of God's creation through the structure and application of mathematics.**
- **Develop a deep conceptual understanding of mathematical operations.**
- **Acquire computational fluency including fluent execution of procedures and fast access to number combinations.**
- **Become effective and efficient in the use of the following processes:**
  - problem-solving
  - communicating
  - reasoning
  - designing and analyzing representations
  - making connections.
- **Analyze on-going formative and summative assessment results to guide instruction and learning.**
- **Utilize technology effectively and appropriately in mathematics.**
- **Accommodate for diverse needs and learning styles.**

Archdiocesan Mathematical Focal Points

PRE-K	UNDERSTANDING OF WHOLE NUMBERS	IDENTIFICATION OF SHAPES AND DESCRIPTION OF SPATIAL RELATIONSHIPS	COMPARISON OF OBJECTS
K	COMPARISON AND ORDERING OF NUMBERS	DESCRIBING SHAPES AND SPACE	COMPARISON AND ORDERING OF OBJECTS
1	WHOLE NUMBER RELATIONSHIPS	UNDERSTANDING ADDITION AND SUBTRACTION	COMPOSITION AND DECOMPOSITION OF SHAPES
2	BASE-TEN AND PLACE VALUE	FLUENCY WITH ADDITION AND SUBTRACTION	LINEAR MEASUREMENT
3	UNDERSTANDING FRACTIONS	UNDERSTANDING MULTIPLICATION AND DIVISION	DESCRIBING AND ANALYZING TWO-DIMENSIONAL SHAPES
4	UNDERSTANDING DECIMALS	FLUENCY WITH MULTIPLICATION	AREA OF TWO-DIMENSIONAL SHAPES
5	ADDITION/SUBTRACTION OF FRACTIONS AND DECIMALS	UNDERSTANDING AND FLUENCY WITH DIVISION OF WHOLE NUMBERS	DESCRIBING AND ANALYZING THREE-DIMENSIONAL SHAPES
6	MULTIPLICATION/DIVISION OF FRACTIONS AND DECIMALS	RATIO, RATE, PERCENT AND PROBABILITY	MATH EXPRESSIONS AND EQUATIONS
7	RATIONAL NUMBERS AND LINEAR EQUATIONS	PROPORTIONS AND SIMILARITY	SURFACE AREA AND VOLUME OF THREE-DIMENSIONAL SHAPES
8	LINEAR EQUATIONS	ANALYZING AND SUMMARIZING DATA SETS	ANGLES, DISTANCE AND THE PYTHAGOREAN THEOREM
ALG. I	REAL NUMBER EXPRESSIONS AND OPERATIONS	LINEAR EQUATIONS, FUNCTIONS, INEQUALITIES, AND SYSTEMS	QUADRATIC AND EXPONENTIAL EQUATIONS AND FUNCTIONS

STUDENT OUTCOMES IN MATHEMATICS: **Preschool**

The processes of problem solving, reasoning, communication, making connections, and designing and analyzing representations must be integrated into all of these standards. *It is also essential, where appropriate, that students are able to interpret, verify, and determine the reasonableness of their results for all standards.*

PK 1	**NUMBER AND OPERATIONS AND ALGEBRA: Develop an understanding of whole numbers, including concepts of correspondence, counting, cardinality, and comparison.**
PK 1.1	Count with understanding and visually recognize "how many" in small sets of objects.
PK 1.2	Develop understanding of the relative position and magnitude of whole numbers and of cardinal (1, 2, 3) and ordinal (first, second, third) and numbers and their connections.
PK 1.3	Introduce number words and numerals to the quantities they represent.
PK 1.4	Use one-to-one correspondence. (Count a set of objects while saying the counting numbers correctly.)
PK 1.5	Sort, classify, and order objects by size, number, color, shape, and other properties.
PK 1.6	Recognize, describe, and extend patterns such as sequence. (eg. red, yellow, blue, red, yellow, blue)
PK 1.7	Represent data using concrete objects, pictures, and graphs.
PK 1.8	Introduce terms more than, less than, and equal.
PK 2	**GEOMETRY: Identify shapes and describe spatial relationships.**
PK 2.1	Explore two and three dimensional shapes.
PK 2.2	Describe attributes and parts of two and three dimensional shapes.
PK 2.3	Describe, name, interpret, and show direction (above, below, beside, between) and position in space.
PK 2.4	Create geometric shapes using spatial memory and spatial visualization.
PK 2.5	Recognize geometric shapes and structures in the environment and specify their location
PK 3	**MEASUREMENT AND DATA ANALYSIS: Identify measurable attributes and compare objects by using these attributes.**
PK 3.1	Introduce the attributes of length, volume, weight, area, and time.
PK 3.2	Introduce how to measure using standard and non-standard units. (eg. ruler vs. piece of string)
PK 3.3	Measure with multiple units of the same size, such as unifix cubes or blocks laid end to end.
PK 3.4	Pose questions and gather data about themselves and their surroundings.
PK 3.5	Sort and classify objects according to their attributes. (eg. smooth vs. rough, shiny vs. dull, 2 legs vs. 4 legs)
PK 3.6	Show awareness of time concepts and sequence. (eg. awareness of daily schedule, what happens next)

STUDENT OUTCOMES IN MATHEMATICS: **Kindergarten**

The processes of problem solving, reasoning, communication, making connections, and designing and analyzing representations must be integrated into all of these standards. *It is also essential, where appropriate, that students are able to interpret, verify, and determine the reasonableness of their results for all standards.*

K .1	**NUMBER AND OPERATIONS AND ALGEBRA: Represent, compare, and order whole numbers, and join and separate sets.**
K.1.1	Read whole numbers to 30 and write numbers to 10.
K.1.2	Connect numbers, including written numerals, to the quantities they represent, using various physical models and representations.
K.1.3	Count by 10's and recognize "decade" words: ten, twenty, thirty, etc.
K.1.4	Count forward by ones beginning with any number less than 30; count backward by ones beginning with any number 10 or less.
K.1.5	Recognize the number of objects in a small set (such as the arrangements of dots on a number cube) without counting.
K.1.6	Count objects in a set using one-to-one correspondence and produce sets of given sizes.
K.1.7	Compare and order sets or numerals by using both cardinal (1,2,3) and ordinal (first, second, third) meanings.
K.1.8	Model simple addition and subtraction situations and represent them with objects, pictures, and/or numerals using the terms more, less, equal to).
K.1.9	Choose, combine, and apply effective strategies for solving addition and subtraction problems. Understand that addition is "putting together to make more" and subtraction is taking apart to make smaller quantities.
K.1.10	Identify, duplicate, and extend simple number patterns and sequential and growing patterns (e.g., patterns made with shapes).
K.1.11	Collect and represent various types of data for analysis (e.g. graphs, charts, and calendar).
K .2	**GEOMETRY: Describe shapes and space.**
K.2.1	Identify, name, and describe basic two-dimensional shapes (e.g., square, circle, triangle, rectangle, regular hexagon, oval) presented in a variety of ways (e.g., with different sizes or orientations).
K.2.2	Identify, name, and describe basic three-dimensional shapes (e.g., sphere, cube, cone, and cylinder).
K.2.3	Use basic shapes and spatial reasoning to describe and model objects in their environment and to construct more complex shapes.
K .3	**MEASUREMENT: Compare and order objects by attributes.**
K.3.1	Identify the measurable attributes (e.g., length, weight) and non-measurable attributes (e.g., color) of an object.
K.3.2	Compare, sort, and order objects according to measurable (e.g., longest to shortest, lightest to heaviest) and non-measurable (e.g., color, texture) attributes.
K.3.3	Compare the lengths of two objects both directly (by comparing them with each other) and indirectly (by comparing both with a third object).

STUDENT OUTCOMES IN MATHEMATICS: **Grade 1**

The processes of problem solving, reasoning, communication, making connections, and designing and analyzing representations must be integrated into all of these standards. *It is also essential, where appropriate, that students are able to interpret, verify, and determine the reasonableness of their results for all standards.*

1.1	**NUMBER AND OPERATIONS: Develop an understanding of whole number relationships, including grouping in tens and ones.**
1.1.1	Read, write, compare and order whole numbers to 100.
1.1.2	Starting at any number, count to 100.
1.1.3	Represent whole numbers on a number line, demonstrating an understanding of the sequential order of the counting numbers and their relative magnitudes.
1.1.4	Count and group objects in hundreds, tens, and ones.
1.1.5	Identify the number of tens and ones in whole numbers between 10 and 100, especially recognizing the numbers 10 to 19 as 1 group of ten and a particular number of ones.
1.1.6	Determine the value of homogenous and mixed collections of pennies, nickels, and dimes to twenty cents.
1 .2	**NUMBER AND OPERATIONS AND ALGEBRA: Develop understandings of addition and subtraction and strategies for basic addition facts and related subtraction facts.**
1.2.1	Model "part-whole," "adding to," "taking away from," and "comparing" situations to develop an understanding of the meanings of addition and subtraction.
1.2.2	Recognize operation signs: +, -, and = as well as vocabulary: "add, subtract, sum, difference, and equals."
1.2.3	Develop and use efficient strategies for adding and subtracting whole numbers using a variety of models, including discrete objects, length-based models (e.g., lengths of connecting cubes) and number lines.
1.2.4	Apply with fluency sums to 10 and related subtraction facts. (20 per minute by the end of the year).
1.2.5	Use the concept of commutative [4 + 2 = 2 + 4], associative [(4 + 3) + 7 = 4 + (3 + 7)], and additive identity [0 + 3 = 3] properties of addition to solve problems involving basic facts.
1.2.6	Relate addition and subtraction as inverse operations. (Fact Families such as 8+ 2=10, 10-2=8, 10-8=2)
1.2.7	In a number pattern, show addition or subtraction by identifying, supplying, or extending a missing single digit number.
1.2.8	Understand the difference between odd and even numbers.
1 .3	**GEOMETRY: Compose and decompose two- and three-dimensional geometric shapes.**
1.3.1	Name and recognize the following shapes: square, circle, triangle, rectangle, rhombus, trapezoid, hexagon, sphere, cube, rectangular prism, cone, cylinder, and pyramid.
1.3.2	Identify and describe geometric attributes of plane and solid shapes (e.g., round, corners, sides) to determine how they are alike and different.
1.3.3	Recognize and create shapes that are congruent or have symmetry.
1.3.4	Compose and decompose shapes (e.g., cut a square into two right triangles and put two cubes together to make a rectangular prism), thus building an understanding of part-whole relationships as well as the properties of the original and composite shapes.
1.3.5	Recognize shapes when viewed from different perspectives and orientations.

STUDENT OUTCOMES IN MATHEMATICS: **Grade 2**

The processes of problem solving, reasoning, communication, making connections, and designing and analyzing representations must be integrated into all of these standards. *It is also essential, where appropriate, that students are able to interpret, verify, and determine the reasonableness of their results for all standards.*

2 .1	**NUMBER AND OPERATIONS: Develop an understanding of the base-ten numeration system and place-value concepts.**
2.1.1	Read, write, compare, and order whole numbers to 1000.
2.1.2	Understand and apply base-ten numeration, and count in multiples of one, two, five, ten, and one hundred.
2.1.3	Compose and decompose whole numbers less than one thousand by place value (e.g., 426 as 4 hundreds + 2 tens + 6 ones and 400 +20 + 6).
2.1.4	Use place value and properties of operations to find and use equivalent representations of numbers (such as 35 represented by 35 ones, 3 tens and 5 ones, or 2 tens and 15 ones).
2 .2	**NUMBER AND OPERATIONS AND ALGEBRA: Develop fluency with addition facts and related subtraction facts, and with multi-digit addition and subtraction.**
2.2.1	Apply, with fluency, sums to 20 and related subtraction facts.
2.2.2	Solve two and three digit whole number problems by applying various methods (e.g. doubles and counting-on) and models (e.g., combining or separating sets, using number lines, and hundreds charts) of addition and subtraction.
2.2.3	Develop fluency with efficient procedures for adding and subtracting two and three digit whole numbers and understand why the procedures work on the basis of place value and number properties.
2.2.4	Select and apply efficient methods (eg. rounding) to estimate sums and differences or calculate them mentally depending on the numbers and context involved.
2.2.5	Identify equivalency of coins and determine the value of mixed collections of coins to $1.00.
2 .3	**MEASUREMENT: Develop an understanding of linear measurement and facility in measuring.**
2.3.1	Determine length by finding the total number of equal-length units that are placed end-to-end without gaps or overlaps.
2.3.2	Apply concepts of partitioning (the mental activity of slicing the length of an object into equal-sized units) and transitivity (e.g., if object A is longer than object B and object B is longer than object C, then object A is longer than object C).
2.3.3	Demonstrate an understanding that using different measurement units will result in different numerical measurements for the same object.
2.3.4	Explain the need for equal length units and the use of standard units of measure.
2.3.5	Use rulers and other measurement tools to estimate and measure length in common units (e.g., centimeter and inch, foot and meter).
2.3.6	Use the measurement process: choose an appropriate standard and metric measurement unit, compare that unit to the object, and report the number of units. (e.g. length, volume, weight, temperature)
2.3.7	Demonstrate an understanding of time and use of time relationships (e.g., how many minutes in an hour, days in a week, months in a year and elapsed time to the hour and half hour).
2.3.8	Tell time in various increments using analog and digital clocks. (e.g. to the minute, 5 minute, quarter, half and to the hour)

STUDENT OUTCOMES IN MATHEMATICS: **Grade 3**

The processes of problem solving, reasoning, communication, making connections, and designing and analyzing representations must be integrated into all of these standards. *It is also essential, where appropriate, that students are able to interpret, verify, and determine the reasonableness of their results for all standards.*

3 .1	**NUMBER AND OPERATIONS: Develop an understanding of fractions and fraction equivalence.**
3.1.1	Represent common fractions (e.g., halves, thirds, fourths, tenths) as equal parts of a whole, parts of a set, or points or distances on a number line.
3.1.2	Recognize and demonstrate that sizes of fractional parts are relative to the size of the whole.
3.1.3	Add and subtract common fractions with like denominators.
3.1.4	Use fractions to represent numbers that are equal to, less than, or greater than one.
3.1.5	Solve problems that involve comparing and ordering fractions by using models, benchmarks (0, ½, 1), or common numerators or denominators.
3.1.6	Identify equivalent fractions using models, including the number line.
3 .2	**NUMBER AND OPERATIONS, ALGEBRA, AND DATA ANALYSIS: Develop understandings of multiplication and division, and strategies for basic multiplication facts and related division facts.**
3.2.1	Represent and apply the concept of multiplication as repeated addition.
3.2.2	Represent and apply the concept of division as repeated subtraction and forming equal groups.
3.2.3	Apply models of multiplication (e.g., equal-sized groups, arrays, area models, equal "jumps" on number lines and hundreds charts) and division (e.g., repeated subtraction, partitioning, and sharing) to solve problems.
3.2.4	Apply increasingly sophisticated strategies based on the number properties (e.g., place value, commutative, associative, distributive, identity, and zero) to solve multiplication and division problems involving basic facts.
3.2.5	Apply the inverse relationship between multiplication and division (e.g., 5 x 6 = 30, 30 ÷ 6 = 5) and the relationship between multiples and factors.
3.2.6	Represent, analyze and extend number patterns using rules that involve multiplication and/or addition (e.g., {3, 6, 9, 12}, {1, 2, 4, 8}).
3.2.7	Analyze frequency tables, bar graphs, pictographs, Venn diagrams, and line plots; and use them to solve problems involving addition, subtraction, multiplication, and division.
3.2.8	Apply with fluency multiplication and division facts through 10's.
3.2.9	Identify the operation for solving a problem. (Add, subtract, multiply, and divide.)
3.2.10	Multiply three and four digit numbers by one digit numbers.
3 .3	**GEOMETRY AND MEASUREMENT: Describe and analyze properties of two-dimensional shapes, including perimeters.**
3.3.1	Identify right angles in two-dimensional shapes and determine if angles are greater than or less than a right angle (obtuse and acute).
3.3.2	Identify, describe, compare, analyze, and informally classify triangles by their sides and angles.
3.3.3	Identify, describe, compare, analyze, and classify quadrilaterals (square, rectangle, parallelogram, rhombus, and trapezoid) by their sides and angles.
3.3.4	Identify, describe, and compare pentagons, hexagons, and octagons by the number of sides or angles.
3.3.5	Investigate and describe the results of decomposing, combining, and transforming polygons to make other polygons.
3.3.6	Build, draw, and analyze two-dimensional shapes to understand attributes and properties of two-dimensional space.
3.3.7	Determine an appropriate unit, tool, or strategy to find the perimeter of polygons.
3.3.8	Use attributes and properties of two-dimensional shapes to solve problems including applications involving parallel and perpendicular lines, congruence, symmetry, and perimeter.

STUDENT OUTCOMES IN MATHEMATICS: **Grade 4**

The processes of problem solving, reasoning, communication, making connections, and designing and analyzing representations must be integrated into all of these standards. *It is also essential, where appropriate, that students are able to interpret, verify, and determine the reasonableness of their results for all standards.*

4 .1	**NUMBER AND OPERATIONS: Develop an understanding of decimals, including the connections between fractions and decimals.**
4.1.1	Add and subtract fractions with unlike denominators.
4.1.2	Express mixed fractions as improper fractions and vice versa.
4.1.3	Use models to connect and compare equivalent fractions and decimals.
4.1.4	Extend the base-ten system to read, write, and represent decimal numbers (to the hundredths) between 0 and 1, between 1 and 2, etc.
4.1.5	Determine decimal equivalents or approximations of common fractions.
4.1.6	Simplify, compare, and order fractions and decimals.
4.1.7	Estimate decimal or fractional amounts in problem solving.
4.1.8	Represent money amounts to $20.00 in dollars and cents, and apply to situations involving purchasing ability and making change. Calculate change for $100 using decimals.
4.1.9	Use decimal models, place value, and number properties to add and subtract decimals (to the hundredths place)
4 .2	**NUMBER AND OPERATIONS AND ALGEBRA: Develop fluency with multiplication facts and related division facts, and with multi-digit whole number multiplication.**
4.2.1	Apply with fluency multiplication facts to 12 times 12 and related division facts.
4.2.2	Apply understanding of models for multiplication (e.g., equal-sized groups, arrays, area models, equal intervals on the number line), place value, and properties of operations (commutative, associative, and distributive).
4.2.3	Select and use appropriate estimation strategies for multiplication (e.g., overestimate and underestimate, round, determine reasonability) to calculate mentally based on the problem situation when computing with whole numbers.
4.2.4	Develop and use accurate, efficient, and generalizable methods to multiply multi-digit whole numbers.
4.2.5	Develop fluency with efficient procedures for multiplying multi-digit whole numbers and justify why the procedures work on the basis of place value and number properties.
4.2.6	Understand and apply order of operations for multiple step calculations.
4.2.7	Understand that an equal sign represents balanced quantities and that the answer can be placed before or after the equal sign. (100=5x20 or 5x20=100; 4x4+4=5+15)
4.2.8	Understand long division with a one-digit divisor.
4 .3	**MEASUREMENT: Develop an understanding of area and determine the areas of two-dimensional shapes.**
4.3.1	Recognize area as an attribute of two-dimensional regions.
4.3.2	Determine area by finding the total number of same-sized units of area that cover a shape without gaps or overlaps.
4.3.3	Recognize a square that is one unit on a side as the standard unit for measuring area.
4.3.4	Determine the appropriate units, strategies, and tools to solving problems that involve estimating or measuring area.

Please see the next page for additional fourth grade standards.

STUDENT OUTCOMES IN MATHEMATICS: **Grade** 4 (continued)

The processes of problem solving, reasoning, communication, making connections, and designing and analyzing representations must be integrated into all of these standards. *It is also essential, where appropriate, that students are able to interpret, verify, and determine the reasonableness of their results for all standards.*

4.3.5	Connect area measure to the area model used to represent multiplication and use this to justify the formula for the area of a rectangle.
4.3.6	Find the areas of complex shapes that can be decomposed into rectangles.
4.3.7	Solve problems involving perimeters and area of all quadrilaterals having at least one pair of parallel sides (e.g. trapezoids).
4.3.8	Recognize that rectangles with the same area can have different perimeters and that rectangles with the same perimeter can have different areas.

STUDENT OUTCOMES IN MATHEMATICS: **Grade 5**

The processes of problem solving, reasoning, communication, making connections, and designing and analyzing representations must be integrated into all of these standards. *It is also essential, where appropriate, that students are able to interpret, verify, and determine the reasonableness of their results for all standards.*

5 .1	**NUMBER AND OPERATIONS AND DATA ANALYSIS: Develop an understanding of and fluency with addition and subtraction of fractions and decimals.**
5.1.1	Use fraction models to represent the addition and subtraction of fractions with unlike denominators, applying strategies for factoring, including the use of greatest common factors (GCF) and least common multiples (LCM) as appropriate, including prime factorization.
5.1.2	Use decimal models, place value, and number properties to add and subtract decimals (to the ten thousandths).
5.1.3	Select and use appropriate strategies to estimate fraction and decimal sums and differences.
5.1.4	Develop fluency with efficient procedures for adding and subtracting fractions and decimals and justify why the procedures work.
5.1.5	Solve problems involving the addition and subtraction of fractions and decimals.
5.1.6	Compare fractions, decimals and common percents.
5.1.7	Use first quadrant ordered pairs on coordinate graphs to specify locations and describe paths.
5.1.8	Construct and analyze double bar, line, and circle graphs to solve problems involving fractions and decimals.
5.1.9	Use data including graphs to determine mean, median, mode, and range.
5 .2	**NUMBER AND OPERATIONS AND ALGEBRA: Develop an understanding of and fluency with division of whole numbers.**
5.2.1	Apply understanding of models for division (e.g., equal-sized groups, arrays, area models, equal intervals on the number line) and the relationship of division to multiplication to solve problems.
5.2.2	Apply concepts of place value and the properties of operations to solve problems involving division.
5.2.3	Select and use appropriate estimation strategies for division (e.g., overestimate, and underestimate, round, determine reasonability) to calculate mentally based on the problem situation when computing with whole numbers.
5.2.4	Develop and use accurate, efficient, and generalizable methods to find quotients for multi-digit division problems.
5.2.5	Develop fluency with efficient procedures for dividing whole numbers and justify why the procedures work on the basis of place value and number properties.
5.2.6	Determine the most appropriate form of the quotient and interpret the remainder in a problem situation.
5 .3	**GEOMETRY, MEASUREMENT, AND ALGEBRA: describe and relate two-dimensional shapes to three-dimensional shapes and analyze their properties, including volume and surface area.**
5.3.1	Identify and classify triangles by their angles (acute, right, and obtuse) and sides (scalene, isosceles, and equilateral).
5.3.2	Find and justify relationships among the formulas for the areas of triangles and parallelograms.
5.3.3	Solve problems involving perimeter and area of triangles. Measure interior and exterior angles.
5.3.4	Describe three-dimensional shapes (triangular and rectangular prisms, cube, triangular and square-based pyramids, cylinder, cone, and sphere) by the number of edges, faces, and/or vertices as well as types of faces.
5.3.5	Recognize volume as an attribute of three-dimensional space.
5.3.6	Determine volume by finding the total number of same-sized units of volume that fill a three-dimensional shape without gaps or overlaps.
5.3.7	Recognize a cube that is one unit on an edge as the standard unit for measuring volume.
5.3.8	Determine the appropriate units, strategies, and tools for solving problems that involve estimating or measuring volume.
5.3.9	Understand and apply the customary and metric systems of measurement. (Linear, mass, and volume.)

STUDENT OUTCOMES IN MATHEMATICS: **Grade 6**

The processes of problem solving, reasoning, communication, making connections, and designing and analyzing representations must be integrated into all of these standards. *It is also essential, where appropriate, that students are able to interpret, verify, and determine the reasonableness of their results for all standards.*

6 .1	**NUMBER AND OPERATIONS: Develop an understanding of and fluency with multiplication, and division of fractions and decimals.**
6.1.1	Select and use appropriate strategies to estimate fraction and decimal products and quotients.
6.1.2	Use and analyze a variety of strategies, including models, for solving problems with multiplication and division of fractions.
6.1.3	Use and analyze a variety of strategies, including models, for solving problems with multiplication and division of decimals.
6.1.4	Develop fluency with efficient procedures for multiplying and dividing fractions and decimals and justify why procedures work.
6.1.5	Apply the inverse relationship between multiplication and division to make sense of procedures for multiplying and dividing fractions and justify why they work.
6.1.6	Apply the properties of operations to simplify calculations.
6.1.7	Use the relationship between common decimals and fractions to solve problems including problems involving measurement.
6 .2	**NUMBER AND OPERATIONS AND PROBABILITY: Connect ratio, rate, and percent to multiplication and division.**
6.2.1	Develop, analyze, and apply the meaning of ratio, rate, and percent to solve problems.
6.2.2	Determine decimal and percent equivalents for common fractions, including approximations.
6.2.3	Understand the meaning of probability and represent probabilities as ratios, decimals, and percents.
6.2.4	Determine simple probabilities, both experimental and theoretical.
6 .3	**ALGEBRA: Write, interpret, and use mathematical expressions and equations.**
6.3.1	Use order of operations to simplify expressions that may include exponents and grouping symbols.
6.3.2	Develop the meanings and uses of variables.
6.3.3	Write, evaluate, and use expressions and formulas to solve problems.
6.3.4	Identify and represent equivalent expressions (e.g., different ways to see a pattern).
6.3.5	Represent, analyze, and determine relationships and patterns using tables, graphs, words, and when possible, symbols.
6.3.6	Recognize that the solutions of an equation are the values of the variables that make the equation true.
6.3.7	Solve one-step equations by using number sense, properties of operations, and the idea of maintaining equality on both sides of an equation.
6.3.8	Identify, graph, compare, and order integers.

STUDENT OUTCOMES IN MATHEMATICS: **Grade 7**

The processes of problem solving, reasoning, communication, making connections, and designing and analyzing representations must be integrated into all of these standards. *It is also essential, where appropriate, that students are able to interpret, verify, and determine the reasonableness of their results for all standards.*

7 .1	**NUMBER AND OPERATIONS AND ALGEBRA: Develop an understanding of operations on all rational numbers and solving linear equations and inequalities.**
7.1.1	Develop, analyze and apply models (including everyday contexts), strategies, and procedures to compute with integers, with an emphasis on negative integers. Identify, graph, compare, and order negative integers. Recognize the difference between a negative integer and a minus sign.
7.1.2	Extend knowledge of integers and positive rational numbers to solve problems involving negative rational numbers.
7.1.3	Develop and use strategies to estimate the result of rational number computations and justify the reasonableness of results.
7.1.4	Apply properties of rational numbers and algebra to write and solve linear equations and inequalities in one variable.
7 .2	**NUMBER AND OPERATIONS, ALGEBRA AND GEOMETRY: Develop an understanding of and apply proportionality, including similarity.**
7.2.1	Represent proportional relationships with coordinate graphs and tables, and identify unit rate as the slope of the related line.
7.2.2	Apply ratio and proportionality to solve problems, including percent and simple probability.
7.2.3	Use coordinate graphs, tables, and equations to distinguish proportional relationships from other relationships, including inverse proportionality. Become fluent in graphing ordered pairs.
7.2.4	Develop and use scale factors and proportional relationships to solve problems, including similarity and congruence.
7.2.5	Convert among different units of measurement to solve problems, including rates.
7.2.6	Apply scale factor to analyze how the change in one measure (e.g., length, area, volume) affects another.
7 .3	**MEASUREMENT AND GEOMETRY: Develop an understanding of and use formulas to determine surface area and volume.**
7.3.1	Use models to explain the reasonableness of formulas for the circumference and area of circles.
7.3.2	Develop the concept of pi as the ratio of the circumference of a circle to its diameter.
7.3.3	Know common estimates of pi and use these values to estimate and calculate the circumference and area of a circle.
7.3.4	Solve problems involving areas and circumferences of circles.
7.3.5	Decompose three-dimensional shapes and find surface areas and volumes of triangular and rectangular prisms.
7.3.6	Identify and measure necessary attributes of shapes to use area, surface area, and volume formulas to solve problems (e.g., to find which of two gift boxes needs the most wrapping paper or has the greater volume).
7.3.7	Use models to explain the reasonableness of formulas for the surface area of pyramids and cylinders, and volume of pyramids, cylinders, and cones.
7.3.8	Find and justify relationships among the formulas for the areas of different polygons when determining surface area.
7.3.9	Solve problems involving surface areas of pyramids and cylinders and volumes of pyramids, cylinders, and cones.
7.3.10	Estimate and compute the area and volume of complex or irregular shapes by dividing them into basic shapes.

STUDENT OUTCOMES IN MATHEMATICS: **Grade 8**

The processes of problem solving, reasoning, communication, making connections, and designing and analyzing representations must be integrated into all of these standards. *It is also essential, where appropriate, that students are able to interpret, verify, and determine the reasonableness of their results for all standards.*

8 .1	**ALGEBRA: Analyze and represent linear functions, and solve linear equations and systems of linear equations.**
8.1.1	Translate among contextual, verbal, tabular, graphical, and algebraic representations of linear functions.
8.1.2	Determine the slope of a line and understand that it is a constant rate of change.
8.1.3	Identify and interpret the properties (i.e. slope, intercepts, continuity, and discreteness) of linear relationships as they are shown in the different representations and recognize proportional relationships ($y/x = k$ or $y = kx$) as a special case.
8.1.4	Use linear functions and equations to represent, analyze and solve problems, and to make predictions and inferences.
8.1.5	Relate systems of two linear equations in two variables and their solutions to pairs of lines that are intersecting, parallel, or the same line.
8.1.6	Use informal strategies (e.g., graphs or tables) to solve problems involving systems of linear equations in two variables.
8 .2	**DATA ANALYSIS AND ALGEBRA: Analyze and summarize data sets.**
8.2.1	Organize and display data (e.g., histograms, box-and-whisker plots, stem and leaf, scatter plots) to pose and answer questions, and justify the reasonableness of the choice of display.
8.2.2	Use the mean, mode, median, and range to summarize and compare data sets.
8.2.3	Interpret and analyze displays of data and descriptive statistics.
8.2.4	Compare descriptive statistics and evaluate how changes in data affect those statistics.
8.2.5	Describe the strengths and limitations of a particular statistical measure, and justify or critique its use in a given situation.
8.2.6	Use sample data to make predictions regarding a population.
8.2.7	Identify claims based on statistical data and evaluate the reasonableness of those claims.
8.2.8	Use data to estimate the likelihood of future events and evaluate the reasonableness of predictions.
8 .3	**GEOMETRY AND MEASUREMENT: Analyze two- and three-dimensional spaces and figures by using distance and angle.**
8.3.1	Use properties of parallel lines, transversals, and angles to find missing sides and angles, and to solve problems including determining similarity or congruence of triangles.
8.3.2	Use models to show that the sum of the angles of any triangle is 180 degrees and apply this fact to find unknown angles.
8.3.3	Use models and logical arguments to show that the sum of the angles of any quadrilateral is 360 degrees, and apply this fact to find unknown angles.
8.3.4	Use scientific notation and exponents to represent very large and very small numbers in operations and applications.
8.3.5	Use models and referents to explore and estimate square roots.
8.3.6	Use models to explore the validity of the Pythagorean Theorem, and use it to find missing lengths.
8.3.7	Apply the Pythagorean Theorem to find distances in a variety of 2- and 3-dimensional contexts, including distances on coordinate graphs.

Middle School
Advanced Mathematics Curriculum

(If Algebra is offered in eighth grade)

An accelerated course of mathematics is not required in our Catholic elementary schools. However, schools with staffing and scheduling resources may choose to accelerate students who demonstrate proficiency, fluency, and deep understanding of mathematics once they reach the sixth grade. For developmental reasons, we do not recommend offering accelerated mathematics classes before sixth grade. Our new Archdiocesan 2010 preschool through grade eight curriculum standards meet and exceed current national and Oregon state standards. It is very rigorous, requiring mastery of student mathematical outcomes at each grade level. Not all students can or should go beyond this high level of PK-8 mathematics into an accelerated program.

We do not recommend that schools skip curriculum outcomes in mathematics in order to make time for eighth grade Algebra I. Elementary schools choosing to offer Algebra I should follow the curriculum below, so that all topics from sixth through eighth grade can be covered and mastered by students before undertaking Algebra.

Although some public school districts offer high school geometry to eight graders, we do not recommend teaching high school geometry in our Catholic elementary schools. We believe that mathematically talented students who complete a rigorous course of Algebra I will be well-prepared to succeed and accelerate into honors classes at the high school level. Catholic elementary students wishing to complete high school honors Geometry before entering high school may take this class during the summer prior to ninth grade at some of our Catholic high schools or possibly through their local school districts or at a community college.

On the following page, we have listed the course of study we would recommend for Catholic elementary students who qualify for an accelerated mathematics program.

Recommended Accelerated Program for Middle School Mathematics

ACCELERATED SIXTH GRADE COURSE OF STUDY:

6 .1	NUMBER AND OPERATIONS: Develop an understanding of and fluency with addition, subtraction, multiplication, and division of fractions and decimals.
6 .2	NUMBER AND OPERATIONS AND PROBABILITY: Connect ratio, rate, and percent to multiplication and division.
6 .3	ALGEBRA: Write, interpret, and use mathematical expressions and equations.
7 .1	NUMBER AND OPERATIONS AND ALGEBRA: Develop an understanding of operations on all rational numbers and solving linear equations and inequalities.
7 .3	MEASUREMENT AND GEOMETRY: Develop an understanding of and use formulas to determine surface area and volume.

ACCELERATED SEVENTH GRADE COURSE OF STUDY:

7 .2	NUMBER AND OPERATIONS, ALGEBRA AND GEOMETRY: Develop an understanding of and apply proportionality, including similarity.
8 .2	DATA ANALYSIS AND ALGEBRA: Analyze and summarize data sets.
8 .3	GEOMETRY AND MEASUREMENT: Analyze two- and three-dimensional spaces and figures by using distance and angle.
8.1	LINEAR EQUATIONS: Representations, slope, and properties.

ACCELERATED EIGHTH GRADE COURSE OF STUDY:

A.1	ALGEBRA AND NUMERACY: Develop understanding of real numbers and algebraic symbols.
A.2	LINEAR EQUATIONS AND INEQUALITIES: Use linear equations and functions to represent relationships and solve linear equations and inequalities and systems of linear equations and inequalities.
A .3	QUADRATIC AND EXPONENTIAL EQUATIONS AND FUNCTIONS: Use quadratic and exponential equations and functions to represent relationships.

STUDENT OUTCOMES IN MATHEMATICS: **ALGEBRA I**

The processes of problem solving, reasoning, communication, making connections, and designing and analyzing representations must be integrated into all of these standards. *It is also essential, where appropriate, that students are able to interpret, verify, and determine the reasonableness of their results for all standards.*

A.1	**ALGEBRA AND NUMERACY: Demonstrate an understanding of real numbers and algebraic symbols, including their expressions and operations.**
A.1.1	Compare, order, and locate real numbers on a number line.
A.1.2	Compare, order, and compute using all forms of rational and irrational numbers.
A.1.3	Evaluate, simplify using correct order of operations, and perform arithmetic operations on algebraic expressions that include absolute value, square roots, *pi*, exponential expressions, and scientific notation.
A.1.4	Express square roots in simplified radical form and their decimal approximations when appropriate.
A.1.5	Perform basic operations with radicals.
A.1.6	Apply algebraic properties and laws of exponents to simplify and evaluate polynomials, including the combination of like terms, the distributive property, and the multiplication of two binomials.
A.1.7	Add, subtract, multiply, and divide complex rational expressions.
A.1.8	Factor, solve, and graph simple quadratic expressions, limited to factoring common monomial terms, perfect square trinomials, differences of squares, and quadratics of the form $ax^2 + bx + c$ that factor over the integers.
A.2	**LINEAR EQUATIONS AND INEQUALITIES: Use linear equations and functions to represent and solve linear equations, linear inequalities, and systems of linear equations and inequalities.**
A.2.1	Identify, construct, extend, and analyze linear patterns and functional relationships that are expressed contextually, numerically, algebraically, graphically, in tables or using geometric figures.
A.2.2	Given a rule, a context, two points, a table of values, a graph, or a linear equation in either slope intercept or standard form, identify the slope, determine the x and y intercept(s) and interpret the meaning for a given context.
A.2.3	Write an equation of a line given any of the following information: Two points on the line, its slope and one point on the line, or its graph. Also determine an equation of a new line parallel or perpendicular to a given line, though a given point.
A.2.4	Convert fluently among representations of linear relationships given in the form of a graph of a line, a table of values, or an equation of a line in slope-intercept or standard form.
A.2.5	Given the linear function, identify and analyze the relationship between the independent and dependent variables and solve for x given $f(x)$ or solve for $f(x)$ given x.
A.2.6	Analyze the effect of changing the parameters in transforming the graph of $f(x)=mx + b$.
A.2.7	Write, use, and solve linear equations and inequalities using graphical and symbolic methods, and represent solutions on a coordinate graph or number line.
A.2.8	Solve systems of two linear equations graphically and algebraically and solve systems of two linear inequalities graphically.
A.2.9	Recognize and solve problems that can be modeled using linear equations in one variable, such as time/rate/distance problems, percentage increase or decrease problems and ratio and proportion problems.
A.2.10	Use and apply the distance and midpoint formulas.

Algebra I standards continue on the next page.

STUDENT OUTCOMES IN MATHEMATICS: **ALGEBRA I**
(continued)

The processes of problem solving, reasoning, communication, making connections, and designing and analyzing representations must be integrated into all of these standards. *It is also essential, where appropriate, that students are able to interpret, verify, and determine the reasonableness of their results for all standards.*

A.2.11	When given sufficient information, find the corresponding linear function, equation, or inequality in slope-intercept form and graph it on a coordinate plane.
A .3	**QUADRATIC AND EXPONENTIAL EQUATIONS AND FUNCTIONS: Use quadratic and exponential equations and functions to represent relationships.**
A.3.1	Write and expand exponential and quadratic patterns and functional relationships on a table or a graph.
A.3.2	Given a table or a graph that represents a quadratic or exponential function, extend the pattern and make predictions.
A.3.3	Compare the characteristics of and distinguish among linear, quadratic, and exponential functions that are expressed in a table of values, a sequence, a context, algebraically or graphically, and interpret the domain and range of each function.
A.3.4	Given the quadratic or exponential function, determine the domain and range, identify the independent and dependent variables, and evaluate the function for specific values of x.
A.3.5	Represent a given quadratic or exponential function as a table of values and as a graph and identify the key characteristics of each.
A.3.6	Given a quadratic of the form $y = x^2 + bx + c$ (or $f(x) = x^2 + bx = c$) with integer roots, determine and interpret the roots, vertex, and the equation for the axis of symmetry graphically and algebraically.
A.3.7	Solve quadratic equations using factoring, graphing, completing the square, and using the quadratic formula.

Credits and References

We have based our grade level student outcomes on the *Curriculum Focal Points* listed in the NCTM 2006 *Focal Points* document and on the Oregon Department of Education Mathematics Content Standards. Our preschool standards also included material from the 2008 preschool curriculum of the Madison, Wisconsin schools. Although these standards were used as a baseline, and often printed exactly as worded from the above documents, we have rewritten, revised, and in some cases, raised the level of expectation of some of these standards. We used the following resources in crafting this Archdiocesan Mathematics Curriculum document:

Achieve, Inc. *Model Three-Year Traditional Plus Course Sequence.* Washington, D.C. May, 2008.

Archdiocese of Portland in Oregon Department of Catholic Schools: *Mathematics Curriculum Guidelines.* Portland, OR. November, 2004

Ballweg, Judy and Rita Kehl. *Launching into Literacy and Math: Supporting the Math Standards (ages 3-5).* Madison, Wisconsin School District. Madison, Wisconsin: October 22, 2008 http://www.madison.k12.wi.us/tnl/lilm/early_math/preschool/math_standards.html.

College Board. *College Board Standards for College Success: Mathematics and Statistics.* New York, NY. 2006

Benson, Heather S. *Glossary of Math Terms. National Association for the Education of Young Children.* Washington, D.C. 2003. http://www.journal.naeyc.org/btj/200301/MathGlossary.pdf.

Common Core State Standards for Mathematics: June 2, 2010 http://www.corestandards.org/assets/CCSSI_Math%20Standards.pdf

National Council of Teachers of Mathematics. *Algebra Standard for Grades 9-12.* Reston, VA. 2000-2004. http://standards.nctm.org/document/chapter7/alg.htm.

National Council of Teachers of Mathematics. *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence.* Reston, VA. 2006

Newman, Dr. Stephen E. (Professor of Mathematics) *The Algebra Problem.* Northern Kentucky University: Highland Heights, KY. January, 2008.

Newman, Dr. Stephen E. (Professor of Mathematics) *The Arithmetic Problem: Comments on K-8 Mathematics Curriculum and Assessment.* Northern Kentucky University: Highland Heights, KY. September, 2008.

Newman, Dr. Stephen E. (Professor of Mathematics) *The Mathematics Reform Problem.* Northern Kentucky University: Highland Heights, KY. January, 2009.

Newman, Dr. Stephen E. (Professor of Mathematics) *Thoughts on Developing a Task Force Report.* (For members of the Mathematics Task Force). Northern Kentucky University: Highland Heights, KY. March, 2008.

Oregon Department of Education. 2009 *Oregon Mathematics Standards:* *http://www.ode.state.or.us/teachlearn/real/standards/searchablestandards.aspx*

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U.S. Department of Education. *Foundations for Success: The Final Report of the National Mathematics Advisory Panel* (NMAP). Washington, D.C. March, 2008.

U.S. Department of Education. *Foundations for Success: The Final Report of the National Mathematics Advisory Panel: Benchmarks for the Critical Foundations, pg. 20.* Washington, D.C. March, 2008.