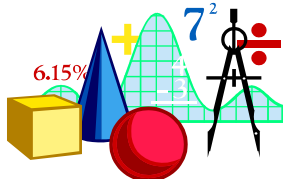




Archdiocese of Hartford



Mathematics Curriculum Standards

2011

Grades 1-12

Office of Catholic Schools

Archdiocese of Hartford

467 Bloomfield Avenue

Bloomfield, CT 06002

www.catholicschoolshartford.org



**OFFICE OF CATHOLIC SCHOOLS
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Office of the
Superintendent
of Catholic Schools

Fall 2009

Dear Colleagues in Catholic School Education:

Peace and greetings!

It is with pride and pleasure that I approve the *Mathematics Curriculum Standards 2009* for grades 1-12. The study of mathematics is one of the 21st century's most significant challenges. The study of math and its advanced courses is vital to successful high school and college experiences. Successful participation in a fast-paced, far-reaching, borderless world demands excellent training in mathematics. From concrete counting to the abstract use of formulas, mathematics gives meaning to our world, and hope for future generations.

Today, perhaps more than ever it is important to recognize that learning is a lifelong experience. Rapid, radical changes in contemporary society demand well planned, continuing efforts to assimilate new data, new insights, new modes of thinking and acting. (To Teach as Jesus Did, 1972, #43)

You, the educators, must understand that well honed skills, creative use of technology, and creative problem solving skills are vital to a successful program of mathematics' study. The use of data will be used for life altering decisions. It is an awesome responsibility of educators to appropriately instruct our students in the application of mathematics as well as the morality implicit in that decision making.

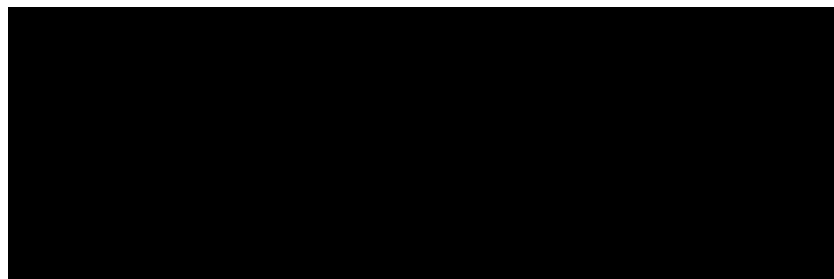
I am grateful to Mrs. Valerie Mara, Director of Curriculum Design, and her committee who so carefully and responsibly have addressed the standards, so that our students will have the finest tools and most current training in mathematics in order to make the world a better place for all who will follow.

Yours in Christ Jesus,

Dale R. Hoyt,

Superintendent of Catholic Schools
Archdiocese of Hartford

Catholic Schools - Education for a Lifetime



Purpose and Vision for Catholic School Education

Catholic Schools in the Archdiocese of Hartford welcome students of all faiths, ethnic groups and socio-economic backgrounds. The fundamental purpose of Catholic schools is to:

- Provide a safe, nurturing and secure environment in which **students encounter the living God**, who in Jesus Christ, reveals His transforming love and truth;
- Partner with parents to support students in their learning and in their **search for knowledge, meaning, and truth**;
- Create a Catholic climate that contributes to the **formation of students** as active participants in the parish community;
- Foster a **culture of educational excellence** through critical thinking skills, innovative and service;
- Promote life-long learning that advances the **development of the whole person** - mind, body, and soul; and
- Graduate students prepared to become **productive, virtuous citizens and church leaders** who will fashion a more humane and just world.

Rationale for Learning Mathematics in the Catholic Schools of the Archdiocese of Hartford

The vision statement of the Catholic schools of the Archdiocese of Hartford challenges its schools to graduate students who are productive moral citizens and critical thinkers. The discipline of mathematics is key to the achievement of that vision. The study of mathematics is the study of relationships, structure, and problem solving. Through math, students learn about patterns, chance, form, algorithms and change. They learn to observe, predict, analyze, and solve problems related to routine daily tasks.

Significant moral decisions require the techniques of problem solving learned in a strong mathematics curriculum. By its nature, mathematics promotes logical and abstract thinking. The methodical approach needed to reach conclusions fosters the self-discipline necessary to solve simple and complex exercises. Knowledge of mathematical processes and skills are the tools needed to solve problems and construct valid arguments in other disciplines. Mathematics serves as a tool in both the natural and social sciences and stands as a logical foundation for the consideration of moral and ethical issues by Catholic Christian thinkers.

Modern technology requires varying forms of mathematical thought from all who use and create it. Mathematics can be appreciated in its purest form as an abstract art with order and pattern serving to reveal the beauty of God's creation. Most significant of all, the importance of mathematics instruction and learning lies in the universality of its problem solving applications to everyday life.

Structure of the Document

This mathematics standards-based curriculum represents the completion of five years of research into current mathematics teaching practice, thoughtful consideration of teaching and assessment methods used in the Archdiocese, and collaboration and consultation with teachers and experts in the field of mathematics in developing content and student learning objectives.

The standards for mathematics instruction in the Archdiocese of Hartford are divided by grade level and then outlined sequentially by quarter. Within each grade level, with the exception of Algebra I, there are five **strands**:

- Number Theory, Estimation and Operations
- Algebra: Patterns and Functions
- Geometry
- Measurement
- Data Analysis, Statistics and Probability

The **ARCHDIOCESAN STANDARDS/GOALS** listed in each quarter are restatements of the National Council of Teachers of Mathematics Learning Standards and are aligned with the CT Frameworks. *They are the primary instructional targets that outline essential topics and skills that students must know and be able to do by the end of high school.* **Student objectives** are bold-faced in the last column and reflect broad concepts that reflect, in the standards, what students should understand and master. **Enabling outcomes** are bulleted skills that reflect what students should specifically be able to do, and demonstrate mastery of, in order to achieve the broader student objectives. Teachers are expected to integrate mathematics in all subject areas and to protect instructional time to ensure a greater depth of understanding in the area of mathematics across all grade levels.

The student objectives outlined in each quarter represent an *instructional plan* for the year. This curriculum provides guidance to teachers regarding content to be addressed at each specific grade level and in each quarter. The standards are comprehensive and cover a wide range on the curricular spectrum. Therefore, it is recommended that teachers and administrators identify essential, core curriculum content that is aligned with the provided **Benchmarks for Critical Foundations in Mathematics** and emphasizes enduring understandings, reinforces essential skills and procedures, and includes student interests. Content must be taught for depth of understanding rather than coverage of objectives. As schools meet in their **professional learning communities**, conversations should be had regarding the use the standards, the use of testing data including formative data, summative data, and standardized test data in order to effectively and efficiently inform instructional planning to meet the needs of each student, and to discuss best practices.

Daily standards-based lesson planning enables educators to align curriculum and instruction with standards, as they have been adapted by this Archdiocese, thereby keeping the goals of our students in mind. The purpose of standards-based curriculum is to empower all students to meet new, challenging standards of education and to “provide them with lifelong education...that equips them to be lifelong learners.” (Fullan, 2006)

The premise of this curriculum is based upon the NCTM Standards. Instruction should be modeled upon those standards, both in content and in style. Classrooms should incorporate a learning environment that values problem solving in real life situations and encourages the active participation of the students in the learning process. Instruction should engage students in the learning process rather than allowing them to be the passive recipients of information.

Each introduction of a new skill or concept should be developed with the idea that *knowing mathematics is doing mathematics*. Associated learning activities should arise from problem situations. Learning should include opportunities for appropriate project work, group and individual assignments alike, discussions between teachers and students, practice, and teacher exposition. In addition, students should have frequent opportunities to formulate problems and questions that arise from their own interests. Small group work can be both collaborative and cooperative, ensuring that each individual student is assessed and not the “group.” The ultimate goal of group work should be to enable the student to become a more independent thinker.

Accountable Talk in Mathematics

Instructional programs from prekindergarten through grade 12 should enable all students to--

- organize and consolidate their mathematical thinking through **communication**;
- communicate their mathematical thinking coherently and clearly to peers, teachers, and others;
- analyze and evaluate the mathematical thinking and strategies of others;
- use the language of mathematics to express mathematical ideas precisely.

Just as students are required to read, write, and speak about what they have learned in the language arts and other content areas, so should this be the practice in mathematics. As students are asked to **communicate** about the mathematics they are studying (“Accountable Talk”), they gain insights into their thinking. In order to communicate their thinking to others, students naturally reflect on their learning and organize and consolidate their thinking about mathematics. *The ability to write about mathematics* should be particularly nurtured across the grades.

By working on problems with classmates, students also have opportunities to see the perspectives and methods of others. They can learn to understand and evaluate the thinking of others and to build on those ideas. They may benefit from the insights of students who solve the problem using a visual representation. Students need to learn to weigh the strengths and limitations of different approaches, thus becoming critical thinkers about mathematics. **Differentiating instruction plays a paramount role in this determination and in planning *daily learning objectives*.**

Problem Solving

The mastery of problem solving strategies is a critical component of 21st century skills that students must advance to become productive members of a global society. As the curriculum evolves during the course of the school year, teachers are urged to note the various problem-solving strategies cultured and integrated throughout the enabling outcomes. Some of these strategies may include:

- > Draw text and electronic pictures
- > Use manipulatives
- > Write number sentences
- > Identify patterns
- > Act it out
- > Guess and check
- > Make a chart, table, graph
- > Choose a method/operation
- > Make a model
- > Solve a simpler problem
- > Use logical reasoning
- > Work backwards

Vocabulary

Each grade level has a list of vocabulary to be used by teachers and students to instruct, learn, and communicate mathematically. Students will demonstrate mastery of terms in written and oral forms. The use of correct mathematical terms is essential for consistent instruction and for mathematical applications to life situations.

Resources/Strategies/Cross Curricular Connections

Each grade level of the document ends with two or three tables. On the primary and intermediate levels, there is a resource table for reading-math connections. On all levels, there are two additional tables, one that suggests teaching and learning strategies and another that lists suggestions for cross curricular and Catholic social teachings connections. Strategies and integration activity suggestions are minimal as these sections are designed to be expounded upon by the classroom teacher.

Sequence

The Archdioceses of Hartford Mathematics Curriculum Standards is organized in sequence by quarter. Teachers and administrators should determine what is core or essential for all learners and what is supplemental or enrichment aspects of the curriculum, using the Archdiocesan Benchmarks as a guide. Each mathematics teacher should become familiar with the objectives for the preceding as well as the following grade, and have a good overall picture of the sequence of instruction throughout the twelve grades.

Grades Seven/Eight, Algebra I and Secondary

It is our goal that all students will complete Algebra I by the end of eighth grade. Completion of algebra in grade eight affords students the possibility of completing five years of secondary mathematics before college. Nurturing the expectation that all students will take Algebra I eliminates the possibility of inequality and untapped potential that may result from accelerating only a few students into Algebra. However, if a student needs a stronger foundation in standard grade 7 or grade 8 math to ensure a successful year of Algebra I in high school, that is the recommended course for that student. Benchmark assessments are encouraged to be given at the end of grade 6 to determine readiness for a grade 7 pre-algebra course. The Archdiocesan Algebra Readiness Test should be given at the end of grade 7 to determine readiness for a grade 8 algebra course. The Archdiocesan Algebra I End-of-Course Assessment should be given to students completing the 8th grade Algebra I course. The most important goal is that Catholic school students in the Archdiocese of Hartford have a rich and challenging middle school math experience; one that builds on the foundation of algebraic thinking begun and nurtured through the primary and intermediate levels.

The secondary school structure is very different from its primary, intermediate, and middle school counterparts. This section of the document, more than any other, is based on the 2005 Connecticut Mathematics Frameworks. The structure follows a more general framework to accommodate both required and elective math courses and the various ability levels offered.

Use of Technology

As in all areas of curriculum, technology can and should enhance learning of mathematics. There are countless website resources for student exploration and practice and for assisting teachers in lesson planning. Interactive white boards provide powerful opportunities for motivating and challenging students in the study of mathematics. Calculators, too, are a valuable tool in math instruction. The National Council of Teachers of Mathematics, in its position statement on the use of technology, states:

Calculators, computer software tools, and other technologies assist in the collection, recording, organization, and analysis of data. They also enhance computational power and provide convenient, accurate, and dynamic drawing, graphing, and computational tools. With such devices, students can extend the range and quality of their mathematical investigations and encounter mathematical ideas in more realistic settings.

In the context of a well-articulated mathematics program, technology increases both the scope of the mathematical content and the range of the problem situations that are within students' reach. Powerful tools for computation, construction, and visual representation offer students access to mathematical content and contexts that would otherwise be too complex for them to explore. Using the tools of technology to work in interesting problem contexts can facilitate students' achievement of a variety of higher-order learning outcomes, such as reflection, reasoning, problem posing, problem solving, and decision making. Technologies are essential tools within a balanced mathematics program. Teachers must be prepared to serve as knowledgeable decision makers in determining when and how their students can use these tools most effectively.

http://www.nctm.org/about/position_statements/position_statement

While these tools do not replace the need to compute mentally, do reasonable paper and pencil computation, and learn facts; calculators, computers, hand held data devices, etc. must be accepted as valuable tools for learning and teaching mathematics. Their effectiveness depends on the ability of students to recognize reasonable answers.

Additionally, technological tools enable students to extend their problem solving ability beyond their knowledge of paper and pencil computation. This increases their math power. These tools also free students from tedious computation and allow them to concentrate on problem solving, both the posing and the solving of problems.

Calculators in grades 5 through 8 should include the following features: square root, reciprocal, exponent, +/- keys, algebraic logic, and constants. Some use of graphing calculators in Algebra I is recommended.

All textbook publishers provide interactive websites for teachers, students, and parents. (These are listed in the Approved Programs and Texts list published by the Office of Catholic Schools.) Almost all have the availability of online texts and often have proprietary software in conjunction with their series. This support includes lesson plans for teachers, practice and challenge opportunities for students, as well as activities for parents. In addition, both web and software resources offer a variety of choices in assessment tools. Teachers should investigate, select and use these resources carefully.

Technology Integration

Highlighted areas in this document are intended to focus your attention on *Outcomes* and *Strategies* that are particularly conducive to technology integration. However, there are many other creative means of achieving this goal. *Internet Resources* are listed below and additional resources can be found at <http://ad hoc.org/07.curriculum/resources2.html> under the heading of *Technology*.

Instructional Resources

The materials needed to support math instruction **on every level** should reflect three sequential components of learning. First, the student needs multiple concrete experiences that illustrate a mathematical principle or process. Students should be given access to manipulatives (both physical and virtual) – those materials that can be organized, categorized, combined, separated, changed – that provide varied concrete experiences of mathematical thinking and processes. These materials should include, but are not limited to: unifix cubes, geoboards, spinners, coins, counters, pattern blocks, fraction pieces, algebra tiles, compasses, scales, scissors, rulers, protractors, graph paper, grid/dot paper. Samples of these are found in the teachers resources of any math text.

Once the student has recognized a general pattern, materials and instruction are provided to help the student explain, describe, and represent what has taken place. The manipulation of materials is represented as an algorithm, a written record of thinking. Finally, the student develops the ability to apply concrete experiences to new and abstract situations, often as problem solving.

Each student should have adequate resources to learn. For most schools, these resources would include a text either in print or electronic form. The text should be chosen from the Archdiocesan Approved Programs and Texts list. Additional classroom resources might include student workbooks, computer generated practice materials and games designed to develop mathematical thinking.

All schools should have a membership in the National Council of Teachers of Mathematics.

Internet Resources

Websites of publishers (Also, *Google* “free math worksheets” to get a plethora of **free** math resources for all grade levels, strands and objectives in mathematics.)

<http://www.learner.org/resources/series140.html>

http://www.math.com/students/worksheet/algebra_sp.htm

<http://mathforum.org/algebra/alg.lessons.html>

<http://homework-help.aol.com/aolalgebrareview>

<http://www.aolatschoolsearch.com/elementary/search/search.adp?query=algebra&invocationType=topsearchbox>

<http://mathforum.org/algebra/k12.algebra.html>

<http://www.sitesforteachers.com/cgi-bin/autorank/search.cgi?key=algebra>

http://seeingmath.concord.org/sms_interactives.html

<http://www.veazeys.com/math/lessons.htm>

<http://www.nctm.org/>

http://nlvm.usu.edu/en/nav/category_g_4_t_2.html

http://www.internet4classrooms.com/gateway_algebra.htm

<http://www.analyzmath.com/quadratics/quadratics.htm> (scroll down to start button)

<http://www.analyzmath.com/precalculus.html>

http://www.superkids.com/aweb/pages/reviews/math/algebra/1/sw_sum1.shtml

<http://www.educational-software-directory.net/math/algebra.html>

<http://mathforum.org/linear/linear.software.html>

ASSESSMENT

Assessment is a means of measuring performance. It illustrates how well we are accomplishing our stated mission, goals, and objectives to educate and form the whole person. Through an integrated system of standards and of multiple forms of evaluation, assessment measures:

- beliefs, attitudes and behaviors, which are expressions of our Catholic identity;
 - content knowledge
 - student achievement (individual and group) ; and the
 - learning and teaching environment
- (NCEA'S Statement on Accountability and Assessment in Catholic Education)*

Assessments of students should match the learning outcome or goal. In all classrooms, a variety of assessments, both objective and subjective, should be used to enhance learning and measure progress. Assessments are both instructional tools for students while they are learning and accountability tools to determine if learning has occurred.

Summative assessments are *MILEPOSTS* while formative assessments are *CHECKPOINTS*. *Milepost/Summative assessments* are designed initially by a teacher for each course and reflect where you want your students to be at end of unit. It is a measure OF learning designed to determine degree of mastery of each student...it judges the success of the process/product at the end.

Checkpoint/Formative assessments are designed to prepare students for the milepost assessment; they direct instruction and ensure students have the appropriate practice opportunities before the summative assessment. They are stops along the way. Results are used to direct instruction and/or to plan corrective activities.

	FORMATIVE	SUMMATIVE
PURPOSE	To monitor and guide process/product while still in progress	To judge the success of process/product at the end (however arbitrarily defined)
TIME OF ASSESSMENT	During the process or development of the product	At the end of the process or when the product is completed
TYPES OF ASSESSMENT	Informal observation, quizzes, homework, teacher questions, worksheets	Formal observation, tests, projects, term papers, exhibitions
USE OF ASSESSMENT INFORMATION	To improve or change a process/product while it is still going on or being developed	Judge the quality of a process/product; grade, rank, promote

FORMS OF ASSESSMENT:

Criterion Referenced (CRA):

(Paper/Pencil Tests/Quizzes)

- Multiple Choice
- Matching Items
- Completion Items
- Short Answer
- Essay Style
- Visual Representation
- Standardized Tests (*ITBS/CogAT –Grades 2-7*)
- Teacher/text created tests (Written or oral)
- Fluency tests
- Teacher or text generated check lists of skills

Performance Assessment (PA):

Student formal and informal presentations **across the curriculum using rubrics, checklists, rating scales, anecdotal records:**

- Recitations, reading, retellings, speeches, debates, discussions, video or audio performances
- Written work across the curriculum
- Cooperative group work (students are assessed individually, never as a group)
- Story, play, poem, paragraph(s), essay, research paper
- Spelling bees
- Poetry recitals
- Oratorical Competitions
- Classroom performance/demonstration (live or taped)
- Parent/Teacher/Student conferences
- Presentations (live or taped)
- Oral, dance, visual (photos or video)
- Seminars
- Projects
- Anecdotal records
- Application of Standard English in daily written and oral work across the curriculum (*including notebooks, journals, blogs, responses to questions*)
- Teacher observation of student activities across the curriculum
- Oral reading

- Informal and formal inventories
- Daily work
- Student spelling in written work
- Notebook checks
- Running records
- Application of skills across the curriculum
- *Portfolios

***All schools are required keep portfolios of student writing.** Each year there should be a minimum of two pieces of original writing included in the portfolio. The writing may be from any area of curriculum (religion, math, social studies, science, etc.), but **must be accompanied by the rubric used to evaluate the writing.**

Independent (IA):

- Teacher observation
- Teacher-student conference
- Student self-correction and reflection on learning and performance
- Student self-assessment of goals
- On-line programs that allow students to self-assess
- Instructional questions
- Questionnaires
- Response Journals
- Learning Logs
- Oral tests/exams

Mathematics Standards

Instructional programs from pre-kindergarten through grade twelve should enable all students to:

1. Students understand numbers, ways of representing numbers, relationships among numbers, and number systems
2. Students understand meanings of operations and how they relate to one another
3. Students compute fluently and make reasonable estimates
4. Students understand patterns, relations, and functions
5. Students represent and analyze mathematical situations and structures using algebraic symbols
6. Students use mathematical models to represent and understand quantitative relationships
7. Students analyze change in various contexts
8. Students analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships
9. Students specify locations and describe spatial relationships using coordinate geometry and other representational systems
10. Students apply transformations and use symmetry to analyze mathematical situations
11. Students use visualization, spatial reasoning, and geometric modeling to solve problems
12. Students understand measurable attributes of objects and the units, systems, and processes of measurement
13. Students apply appropriate techniques, tools, and formulas to determine measurements
14. Students formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them
15. Students select and use appropriate statistical methods to analyze data

Archdiocesan Standards

16. Students will use their study of math to make data-driven moral decisions and to promote justice in the world.

We must expect all of our students to learn mathematics well beyond what we previously expected. We need all students to be more proficient than in the past, and we need many more students to pursue careers based on mathematics and science.

Seely, Cathy, NCTM http://www.nctm.org/news/pastpresident/2005_03president.htm

Benchmarks for Critical Foundations in Mathematics

The following **Benchmarks for Critical Foundations in Mathematics** should be used to guide classroom curricula, mathematics instruction, and assessments. They should be interpreted flexibly, to allow for the needs of students and teachers. *For our purposes, **proficient** is defined as 80-85% mastery.*

The major goals for K-8 mathematics education should be:

- Proficiency with **whole numbers**
- Proficiency with **fractions** (including decimals and percents)
- Proficiency with particular aspects of **geometry and measurement**

Fluency with Whole Numbers

1. By the end of grade 3, students should be proficient with the addition and subtraction of whole numbers.
2. By the end of grade 4, students should be proficient with multiplication and division of whole numbers.

Fluency with Fractions

1. By the end of grade 4, students should be able to identify and represent fractions and decimals, and compare them on a number line or with other common representations of fractions and decimals.
2. By the end of grade 5, students should be proficient with comparing fractions and decimals and common percents, and with the addition and subtraction of fractions and decimals.
3. By the end of grade 5, students should be proficient with multiplication and division of fractions and decimals.
4. By the end of grade 5, students should be proficient with all operations involving positive and negative integers.
5. By the end of grade 5, students should be proficient with all operations involving positive and negative fractions.
6. By the end of grade 6, students should be able to solve problems involving percent, ratio, and rate, and extend this work to proportionality.

Geometry and Measurement

1. By the end of grade 3, students should be able to solve problems involving perimeter.
2. By the end of grade 4, students should be able to solve problems involving the area of triangles and all quadrilaterals having at least one pair of parallel sides (i.e., trapezoids).
3. By the end of grade 6, students should be able to analyze the properties of two-dimensional shapes and solve problems involving perimeter and area.
4. By the end of grade 7, students should be familiar with the relationship between similar triangles and the concept of the slope of a line.
5. By the end of grade 8, students should be able to analyze the properties of three-dimensional shapes and solve problems involving surface area and volume.

GRADE 1 MATHEMATICS CURRICULUM

Grade 1: QUARTER 1

STRANDS/ADH STANDARDS	Topic	Enabling Outcome	Objective			
*MATH FACTS ARE CUMULATIVE SKILLS AND MUST BE CONSISTENTLY REINFORCED THROUGHOUT THE YEAR TO ACHIEVE MASTERY.						
<u>Number Theory, Estimation, Operations (NEO)</u>	Addition & Subtraction to 12	<ul style="list-style-type: none"> • Count, read, write, order, compare, expand and represent numbers to 100 • Count on from a given amount, orally and with models • Count back from 20 • Identify one more and one less than a number • Plot numbers to 100 on a number line • Identify and use zero 	To count by groups, add one more to groups, and compare groups. (NEO)			
<p>I. Understand numbers, ways of representing numbers, relationships among numbers, and number systems</p> <p>II. Understand meanings of operations and how they relate to one another</p> <p>III. Compute fluently and make reasonable estimates</p>			<ul style="list-style-type: none"> • Memorize addition and related subtraction facts to 12 • Check subtraction with addition • Relate the inverse relationship of addition and subtraction facts to 12 	To develop and apply fact families using inverse relationships. (NEO)		
<u>Algebra: Patterns and Functions (A)</u>	Place Value	<ul style="list-style-type: none"> • Represent addition and subtraction on a number line 	To add by counting and combining and subtract by separating, comparing, or counting on or back. (NEO)			
I. Understand patterns, relations, and functions			<ul style="list-style-type: none"> • Model real-life situations that involve addition and subtraction of whole numbers using objects, pictures, and open sentences 	To represent the result of counting, combining, and separating sets of objects using number sentences. (A)		
II. Represent and analyze mathematical situations and structures using algebraic symbols				<ul style="list-style-type: none"> • Identify, describe, extend, and create patterns • Describe how specific patterns are generated 	To examine attributes of objects and describe their relationships. (A)	
III. Use mathematical models to represent and understand quantitative relationships					<ul style="list-style-type: none"> • Identify, describe, extend, and create patterns • Describe how specific patterns are generated 	
IV. Analyze change in various contexts						
V. Use operations, properties and algebraic symbols to determine equivalence and solve problems						
<u>Grade 1: QUARTER 2</u> <u>Number Theory, Estimation, Operations (NEO)</u>		<ul style="list-style-type: none"> • Identify number words to ten • Identify ordinal position of objects first through tenth • Identify ordinal words to tenth 	To represent and order 2 digit numbers using the base ten place value			

<p>I. Understand numbers, ways of representing numbers, relationships among numbers, and number systems</p>	<ul style="list-style-type: none"> • Identify and name place values • Use place value models to identify tens and ones • Identify and name place values to hundreds place • Identify 10 more and 10 less than a number 	<p>system. (NEO)</p>
<p>II. Understand meanings of operations and how they relate to one another</p>	<ul style="list-style-type: none"> • Estimate quantity of items in a group • Estimate and describe quantity with benchmark amount such as 1, 10 and 100. 	<p>To describe quantitative relationships and develop benchmark representations. (NEO)</p>
<p>III. Compute fluently and make reasonable estimates</p>	<ul style="list-style-type: none"> • Demonstrate equivalence using models • Identify and use symbols of inequality ($<$, $>$) • Identify and apply symbol of equality ($=$) • Balance simple number sentences by finding the missing numbers 	<p>To identify and represent quantities as equivalent or non-equivalent. (A)</p>
<p>Algebra: Patterns and Functions (A)</p>		
<p>I. Understand patterns, relations, and functions</p>	<ul style="list-style-type: none"> • Skip count by 2,5,10 • Represent even and odd numbers concretely as pairs and leftover ones • Identify even and odd numbers to 100 • Describe relationships between quantities with familiar contexts using ratios: one desk has four legs, two desks, eight, etc. 	<p>To analyze change of quantity and quality using patterns. (A)</p>
<p>II. Represent and analyze mathematical situations and structures using algebraic symbols</p>	<ul style="list-style-type: none"> • Memorize addition and related subtraction facts to 20 • Identify missing addends (sums to 20) • Identify functional number relationships • Choose addition or subtraction to complete function tables 	<p>To develop and apply fact families using inverse relationships. (NEO) To understand and describe functional relationships. (A)</p>
<p>III. Use mathematical models to represent and understand quantitative relationships</p>	<p>Addition & Subtraction to 20</p>	<p>To create and solve one step story and picture problems. (NEO)</p>
<p>IV. Analyze change in various contexts</p>	<ul style="list-style-type: none"> • Choose the correct operation in a word problem (+, -) 	<p>To describe quantitative relationships and develop benchmark representations. (M)</p>
<p>V. Use operations, properties and algebraic symbols to determine equivalence and solve problems</p>	<ul style="list-style-type: none"> • Identify reasonable answers to problems that reflect real-world experience. • Select a reasonable answer to a problem reflecting a change in place value (i.e., 5, 50, 500) 	<p>To determine and compare coin values (M)</p>
<p>Grade 1: QUARTER 3</p>		
<p>Measurement (M)</p>	<p>Money</p>	<p>To determine and compare coin values (M)</p>
<p>Measurement (M)</p>	<ul style="list-style-type: none"> • Name a penny, nickel, dime, quarter and dollar bill • Identify the value of a penny, nickel, dime, quarter and dollar bill 	<p>To determine and compare coin values (M)</p>

- I. Understand measurable attributes of objects and the units, systems, and processes of measurement
- II. Apply appropriate techniques, tools and formulas to determine measurements

Time

- Use the cents sign (¢)
- Determine and compare values of sets of coins
- Trade with sets of pennies and dimes
- Count and show money to one dollar
- Use dollar sign (\$)
- Add and subtract money to 12 cents
- Tell and/or show time to the hour using both analog and digital clocks
- Tell and/or show time to the half hour using both analog and digital clocks
- Write time in standard notation
- Estimate elapsed or projected time in terms of an hour or a minute
- Identify days of the week, months of the year, current year
- Use a calendar to identify dates
- Read and write the date
- Identify the number of days in a month
- Use a calendar to identify dates and sequence events
- Describe time in terms like: today, yesterday, next week, last week, tomorrow
- Estimate and compare the length of time needed to complete tasks using terms like longer or shorter

To express monetary value in oral and written forms (M)

To recognize, identify, and trade equivalent sets of coins (M)

To express monetary value in oral and written forms (M)

To solve problems involving money (M)

To use calendars and clocks to measure and record time (M)

To plan and sequence events (M)

Measurement

- Recognize and apply nonstandard units of measure

To measure through direct comparison and repetition

Number Theory, Estimation, Operations (NEO)

- I. Understand numbers, ways of representing numbers, relationships among numbers, and number systems
- II. Understand meanings of operations and how they relate to one another
- III. Compute fluently and make reasonable estimates

- **Identify** inch and foot as standard customary unit
- **Demonstrate** approximate inch, approximate foot

- **Compare** lengths of given objects using “longer” and “shorter”

of units (M)

To use standard units to communicate measure (M)

To use concrete examples to make estimates and to determine and describe the reasonableness of answers to measurement problems (M)

To measure through direct comparison and repetition of units (M)

- **Estimate** and **measure** length and height in non-standard units

To use standard units to communicate measure (NEO)

- **Identify** centimeter as standard metric measure
- **Estimate** and **measure** length and height in inches and centimeters

To use concrete examples to make estimates and to determine and describe the reasonableness of answers to measurement problems (M)

- **Identify** cup, pint, quart and pound as standard customary units
- **Identify** liter as standard metric unit

- **Compare** capacity using “more” or “less”
- **Compare** mass of objects using a balance scale
- **Compare** volume/capacity of given containers using concrete materials, i.e., water, sand, beans, etc.

To measure through direct comparison and repetition of units (M)

- **Read** Fahrenheit and Celsius thermometers

Grade 1: QUARTER 4

Algebra (A)

- I. Understand patterns,

Geometry

- **Sort, classify, and order** objects by size, number, and other properties

To examine attributes of objects and describe their

<p>relations, and functions</p> <p>Geometry (G)</p> <p>I. Analyze characteristics and properties of two and three dimensional geometric shapes and develop mathematical arguments about relationships</p> <p>II. Specify locations and describe spatial relationships using coordinate geometry and other representational systems</p> <p>III. Apply transformations and use symmetry to analyze mathematical situations</p> <p>IV. Use visualization, spatial reasoning, and geometric modeling to solve problems</p> <p>Number Theory, Estimation, Operations (NEO)</p> <p>I. Understand numbers, ways of representing numbers, relationships among numbers, and number systems</p> <p>II. Understand meanings of operations and how they relate to one another</p>	<p>Fractions</p> <ul style="list-style-type: none"> • Identify points inside, outside, or on a figure • Use the descriptive terms: top, bottom, left, right, near, far, up, down, above, below, next to, close by • Sort and describe plane figures (square, circle, rectangle, triangle) • Identify plane figures • Identify common objects in the environment that depict plane figures • Count corners and sides of plane figures • Explore and identify solid figures (cube, cone, cylinder, sphere) • Identify figures having the same size and shape • Identify open or closed figures • Explore lines of symmetry • Create shapes and design with symmetry • Build and draw two and three dimensional shapes • Draw shapes from memory (i.e., draw a triangle) • Predict the results of putting together and taking apart two- and three-dimensional shapes • Identify equal parts of a whole • Make a whole of equal sized parts of familiar objects • Identify halves and quarters using models • Identify half of a small set of objects considered to be the whole. • Read, write, and identify $1/2$, $1/3$, $2/3$, $1/4$, $2/4$, $3/4$ • Differentiate halves, thirds and fourths from other fractional parts 	<p>relationships. (A)</p> <p>To describe, name and interpret relative direction, location, proximity, and position of objects (G)</p> <p>To classify plane figures and solids by common characteristics including examples with change of position (G)</p> <p>To describe, name and interpret relative direction, location, proximity, and position of objects (G)</p> <p>To classify plane figures and solids by common characteristics including examples with change of position(G)</p> <p>To recognize and use geometric relationships to solve problems (G)</p> <p>To identify and compare equal parts of a whole (NEO)</p> <p>To partition a set of objects into smaller groups with equal amounts. (NEO)</p> <p>To identify and compare</p>
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III. Compute fluently and make reasonable estimates

Data Analysis, Statistics, and Probability (DSP)

- I. Formulate questions that can be addressed with data; collect, organize, and display relevant data to answer them
- II. Select and use appropriate statistical methods to analyze data
- III. Develop and evaluate inferences and predictions that are based on data
- IV. Understand and apply basic concepts of probability

Data & Graphs

- Identify *fractions* on a number line
- Compare parts of a whole object and estimate whether they are closer to zero, one half or one whole
- Identify events as certain, possible or impossible
- (If a bowl is filled with red jelly beans, is it possible to pick a red jelly bean from the bowl? A green one?)
- Observe, record, graph, and describe the results of simple probability activities and games
- Read and Use data from a graph, table, glyphs (coded pictures), and/or picture
- Make and interpret a real object, picture, and bar graphs
- Make and interpret a tally chart
- Pose questions to collect data
- Conduct simple surveys to gather data
- Choose and Use various methods to organize information including lists, systematic counting, sorting, graphic organizers, and tables
- Use comparative language to describe/interpret data in tables and graphs
- The student will:
Use a Venn diagram and other graphic organizers to sort items
- Develop, describe, choose and use strategies to add and subtract one- and two-digit numbers
- Add and subtract 2 digit numbers without regrouping
- Add 1 and 2 digit numbers with three addends (column addition)
- Add and subtract 3 digit numbers without regrouping

equal parts of a whole (NEO)

To determine the likelihood of certain events through simple games and experiments (DSP)

To collect, organize, and describe data (DSP)

To analyze data in tables and graphs (DSP)

To collect, organize, and describe data (DSP)

To add by counting and combining and subtract by separating, comparing, or counting on or back. (NEO)

VOCABULARY

Number Theory

equal to; place names: ones , tens hundreds

Whole Numbers

add; addend; addition sentence ; count on; difference; doubles; fact families; minus; number sentence; plus ; related facts; subtraction sentence; sum; turn-around fact; +, -, =

Fractions	fourth ; fraction; half; part; third ; whole
Estimation	between; estimate; greater than; less than
Algebra	even; number; odd; pair; pattern; <, >, =
Geometry	angles; corners ; face; inside/outside; left and right; open and closed figures; plane figures ; sides; solid figures; symmetry; top and bottom
Measurement	length/height: centimeter; foot; inch ; longer/shorter ; metric ; standard ; Capacity: cup ; liter ; pint; quart; more/less Money: cent ¢; dime ; dollar \$; nickel ; penny; quarter Temperature; thermometer Time: half hour ; hour ; o'clock
Data Analysis, Statistics, Probability	bar graph; data; graph; greater than/less than/equal to; less/more; possible/impossible; certain; table; tally; Venn diagram; vertical

Resources for Grade One Math Literacy Connections

<i>Strand</i>	<i>Book Title</i>
Number Theory	<p><i>Over in the Meadow</i>, Langstaff and Rojankowsky. San Diego: Harcourt Brace, 1957.</p> <p><i>Hold Tight Bear</i>, Rod Maris, New York: Delacorte, 1989.</p> <p><i>Yellow Ball</i>, Molly Bang, New York: Morrow, 1991.</p> <p><i>The Enormous Turnip</i>, Kathy Parkinson.</p> <p><i>The Crickets from Mouse Soup</i>, Arnold Lobel.</p> <p><i>Maurice Goes to School</i>, B. Wiseman. <i>Band-aids</i>, Shel Silverstein.</p> <p><i>Animal Numbers</i>, Bert Kitchen, New York: Dial, 1987.</p> <p><i>The Bicycle Race</i>, Donald Crews, New York: Greenwillow, 1985.</p> <p><i>M&M Counting Book</i>, Barbara Barbieri McGrath.</p> <p><i>Bunches and Bunches of Bunnies</i>, by Louise Matthews.</p> <p><i>Eating Fractions</i>, Bruce McMillan. New York: Scholastic, 1991.</p> <p><i>The Doorbell Rang</i>, Pat Hutchins. New York: Scholastic, 1986.</p>

Algebra	<p><i>Ten in a Bed</i>, Mary Rees, Boston: Little Brown, 1988. <i>Mouse Count</i>, Ellen Stoll Walsh, San Diego: Harcourt Brace, 1990. <i>Bat Jamboree</i>, Kathi Appelt, Morrow, 1996. <i>Frog and Toad are Friends</i>, Arnold Lobel, <i>Harper Trophy</i>, 1970.</p>
Geometry	<p><i>Circles, Triangles, and Squares</i>, Tana Hoban. New York: Macmillian, 1974. <i>The Most Wonderful Eggs in the World</i>, Melme Heine. <i>The Greedy Triangle</i>, Marilyn Burns. <i>Grandfather Tangs Story</i>, Ann Tompert.</p>
Measurement	<p>"A List" from <i>Frog and Toad Together</i>, Arnold Lobel. <i>Mud for Sale</i>, Brenda Nelson. <i>If You Give a Mouse a Cookie</i>, Laura Joffe Numeroff. New York: Harper Collins 1985. <i>Inch by Inch</i>, Leo Lionni. New York: Astor-Honor, 1962. <i>Is It Larger, Is It Smaller</i>, Tana Hoban, New York: Green Willow, 1985.</p>

Suggested Teaching Strategies	Suggested Learning Strategies
<p>The teacher provides a "number-rich" environment: Numbers on display (charts, graphs, timelines, calendars) Collections of countable objects Books that tell number stories Tapes and CDs of number songs Other:</p>	<p>Teacher Directed The teacher: Creates counting and estimating experiences and activities across the curriculum Provides manipulatives for student use Other: _____</p> <p>Cooperative Students: <ul style="list-style-type: none"> • Participate in number games • Keep score in games • Work in cooperative teams or groups to collect and express data • Use flashcards Other:</p> <p>Independent Students <ul style="list-style-type: none"> • Use electronic devices to collect and illustrate data • Express specific quantities in written work across the curriculum Other: _____</p>

Suggested Cross Curricular and Catholic Social Teaching Links

Grade One

- ✚ Students measure the growth of classroom plants, record their observations and talk about taking care of God’s creation. (Science, Math, Religion, Written language)
- ✚ Students keep a graph of sunny/cloudy days and write prayers thanking God for both. (Math, Science, Religion, Language Arts)

Notes:

Textbooks / Resources:

GRADE 2 MATHEMATICS CURRICULUM

Grade 2: QUARTER 1

STRANDS/ADH STANDARDS	TOPIC	ENABLING OUTCOMES	OBJECTIVES
*MATH FACTS ARE CUMULATIVE SKILLS AND MUST BE CONSISTENTLY REINFORCED THROUGHOUT THE YEAR TO ACHIEVE MASTERY.			
<p><u>Number Theory, Estimation, and Operations (NEO)</u></p> <p>I. Understand numbers, ways of representing numbers, relationships among numbers, and number systems</p> <p>II. Understand meanings of operations and how they relate to one another</p> <p>III. Compute fluently and make reasonable estimates</p> <p>IV. Use <i>fractions</i> to draw conclusions about the fairness and equity of resources</p> <p><u>Algebra: Patterns and Functions(A)</u></p> <p>I. Understand patterns, relations, and functions</p> <p>II. Represent and analyze mathematical situations and structures using algebraic symbols</p> <p>III. Use mathematical models to represent and understand quantitative relationships</p> <p>IV. Analyze change in various contexts</p>	<p>Addition and Subtraction to 20</p>	<ul style="list-style-type: none"> • Model real-life situations that involve addition and subtraction of whole numbers, using objects, pictures and open sentences • Write related fact families for addition and subtraction • Relate the inverse relationship of addition and subtraction facts to 20 • Complete a number of fact problems within a specific time limit • Memorize addition and related subtraction facts to 20 • Describe attributes and relationships of objects • Sort, classify, and order objects and numbers based on one and two attributes and describe the rule used • Translate the same pattern from one representation (such as color) to another representation (such as shape) • Describe counting and number patterns • Explore and solve problems involving simple number patterns. • Identify objects with common • or different attributes • Identify missing objects in a pattern • Read and write number words to one hundred • Identify and use symbols of inequality (<, >) • Use concrete, pictorial, and verbal examples to demonstrate an understanding that = is a relationship that indicates equivalence • Demonstrate balance or equivalence using models • Identify and use symbols of inequality (<, >) • Identify and use symbol of inequality (\neq) • Balance simple number sentences by finding the missing numbers • Identify missing numbers to 20 in addition and subtraction sentences and justify the answer • Determine and justify the missing addition/subtraction signs in addition and subtraction sentences 	<p>To represent the result of counting, combining and separating sets of objects using number sentences (NEO)</p> <p>To develop fact families using inverse relationships (NEO)</p> <p>To identify, describe, create, and extend a number of patterns (A)</p> <p>To identify and represent quantities as equivalent or nonequivalent (NEO, A)</p> <p>To use number sentences to represent quantitative</p>

<p>Measurement (M)</p> <p>I. Understand measurable attributes of objects and the units, systems, and processes of measurement</p> <p>II. Apply appropriate techniques, tools and formulas to determine measurements</p>	<p>Place Value</p> <p>Add and Subtract 2-Digit Numbers</p>	<ul style="list-style-type: none"> • Identify and justify missing numbers in addition and subtraction sentences • Determine whether a number is even or odd using manipulatives • Skip count by 3, 4, and 100 • Identify numbers as odd or even <ul style="list-style-type: none"> • Identify number words to one hundred • Identify and name place values: hundreds, tens and ones • Identify ordinal positions to twentieth • Identify ordinal words to twentieth • Read and write numerals to 999 <ul style="list-style-type: none"> • Add and subtract 2 digit numbers with regrouping • Add 1 and 2 digit numbers with 3 addends – column addition • Choose addition or subtraction to complete functions tables • Identify missing addends with 2 digit numbers <ul style="list-style-type: none"> • Choose and justify the correct operation in a word problem (+, -) • Check subtraction with addition <ul style="list-style-type: none"> • Round numbers to the nearest 10 • Round to estimate sums of two digit numbers • Use estimation strategies that result in reasonable answers to a problem 	<p>relationships (A)</p> <p>Students will analyze change in quantity and quality using patterns. (A)</p> <p>To represent and order number concepts in verbal and written form (NEO)</p> <p>To use concepts based on patterns and place values to add and subtract (NEO)</p> <p>To identify functional number relationships (A)</p> <p>To represent the result of counting, combining and separating sets of objects using number sentences (NEO)</p> <p>Students will identify and use equivalent representations of numbers to estimate and compute. (NEO)</p>
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Grade 2: QUARTER 2

<u>STRANDS/ADH STANDARDS</u>	<u>TOPIC</u>	<u>ENABLING OUTCOMES</u>	<u>OBJECTIVES</u>
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	Roman Numerals	<ul style="list-style-type: none"> • Identify Roman numerals I, V, and X • Read and write Roman numerals to 30 	To recognize and explore Roman numerals (NEO)
<u>VOCABULARY</u>	Number Theory Whole Numbers Fractions Estimation Algebra Geometry Measurement Data Analysis, Statistics, Probability	<p>Attributes; between; compare; digit; just before; just after; number line; ordinal; pattern; roman numeral; strategy; thousands s</p> <p>Column; factor; product; regrouping</p> <p>Fourths; halves; thirds</p> <p>Estimation; number line</p> <p>Associative; balance; commutative; equivalent/non-equivalent; quantity</p> <p>Angle; area; face; flip; perimeter; plane figure; polygon; similar; symmetry; solid; turn side</p> <p>Analog; area; Celsius/ Fahrenheit; change; Degree; Digital; dollar; elapsed time; gallon; gram; half dollar; half past; kilogram; measure; meter; ounce; perimeter; pound; price; time; total; yard</p> <p>equal to; fair/unfair; greater/less than; horizontal; mode; predict; range; Venn diagram; vertical</p>	

Resources for Grade Two Math Literacy Connections

Strand	Book Title
Number Theory	<p><i>A Birthday Basket for Tia</i>, by Pat Moran <i>Ocean Parade</i>, by Patricia McCarthy <i>Numbers of Things</i>, by Helen Oxenbury <i>A Thousand Pails of Water</i>, by Ronald Roy <i>Two Hundred Rabbits</i>, by Lonzo Anderson and Adrienne Adams <i>Even Steven & Odd Todd Making Sense of Census 2000</i>, Scholastic <i>Each Orange had Eight Slices</i>, by Paul Giganti <i>Ninety-nine Pockets</i>, by Jean Myrick <i>How many Snails</i>, by Paul Giganti <i>How Many Feet in the Bed</i>, by Diane Hamry <i>One Hundred Hungry Ants</i>, by Elinor Pinczes. <i>Fractions are Parts of Things</i>, by Richard Dinnis <i>How Many Ways Can you Cut a Pie</i>, by Jane Belk Moncure</p>
Geometry	<p><i>The Village of Round and Square Houses</i>, by Ann Grifalconi <i>The Button Box</i>, by Margarete S. Reid</p>
Measurement	<p><i>How Big is a Foot</i>, by Rolf Myller <i>On a Hot, Hot Day</i>, by Nicki Weiss <i>Farmer Mack Measures his Pig</i>, by Toni <i>Bargain for Frances</i>, by Russell Hoban <i>Penelope Gets Wheels</i>, by Esther Peterson <i>Where the Sidewalk Ends</i>, by Shel Silverstein <i>Clocks and More Clocks</i>, by Pat Hutchins <i>Alexander Who Used to be Rich Last Sunday</i>, by Judith Viorst</p>

Suggested Teaching Strategies	Suggested Learning Strategies
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The teacher provides a “number-rich” environment:

Numbers on display (charts, graphs, calendars)

Collections of countable objects

Books that tell number stories

Tapes and CDs of number songs

Other: _____

Teacher Directed

The teacher:

Creates counting and estimating experiences and activities across the curriculum

Provides manipulatives for student use

Other: _____

Cooperative

Students:

- Participate in number games
- Keep score in games
- Work in cooperative teams or groups to collect and express data
- Use flashcards

Other: _____

Independent

Students

- Use electronic devices to collect and illustrate data
- Express specific quantities in written work

Other: _____

Suggested Cross Curricular and Catholic Social Teaching Links

Grade Two

- ✚ Students draw maps of their community/communities (neighborhood, parish, school yard, etc.), write address numbers in different ways (One Hundred Grant St., 100 Grant St.). (Art, Social Studies, Math) [Harcourt Math, 2004]
- ✚ Students graph ways in which people in communities help one another and ways in which they can help their communities (family, school, parish, and neighborhood)). (Religion, Social Studies, Math)
- ✚ Students make string phones with a paper cup at each end; they record and graph sounds heard at 10 ft, 20 feet, etc. (Science, Math)
 - ✚ Students plan a food drive. (Religion, Math, Health)
- ✚ Students compare pieces of string, one cut 53 inches, the length of a dinosaur's foot, the other the length of the student's foot, and write a paragraph describing their conclusions. (Science, Math)
- ✚ Students work together to plan a bus route from their homes to school and compare lengths of routes with one another. (Social Studies, Math)

Notes:

GRADE 3 MATHEMATICS CURRICULUM

Grade 3: QUARTER 1

STRANDS/ADH STANDARDS	TOPIC	ENABLING OUTCOMES	OBJECTIVES
*MATH FACTS ARE CUMULATIVE SKILLS AND MUST BE CONSISTENTLY REINFORCED THROUGHOUT THE YEAR TO ACHIEVE MASTERY.			
<p><u>Number Theory, Estimation, and operations (NEO)</u></p> <p>I. Understand numbers, ways of representing numbers, relationships among numbers, and number systems</p> <p>II. Understand meanings of operations and how they relate to one another</p> <p>III. Compute fluently and make reasonable estimates</p> <p><u>Measurement (M)</u></p> <p>I. Understand measurable attributes of objects and the units, systems, and processes of measurement</p> <p>II. Apply appropriate techniques, tools and formulas to determine measurements</p>	<p>Number Theory</p> <p>Place Value</p> <p>Addition, Subtraction</p> <p>Whole Numbers</p> <p>Money</p> <p>Addition & Subtraction</p>	<ul style="list-style-type: none"> • Read and write number words to one hundred • Identify and name place values to the thousands place • Expand numerals by identifying the value of each digit in its place • Write expanded numerals in standard form • Read and write numerals to 9999 • Count, order, compare, and expand numerals to 9999 • Identify and name place values to the hundred thousands place • Read and write numerals to 999,999 • Count, order, compare, and expand numerals to 999,999 • Add and subtract six digit numbers • Use decimal point in writing money amounts • Find equivalent sets of coins • Identify half dollars • Make change to a dollar • Add and subtract sums of money less than a dollar in columns aligning decimal points • Find a given sum of money using the least number of coins • Add amounts of money less than a dollar to sums greater than a dollar • Add and subtract 3 digit numbers with regrouping • Add three or more addends (column addition) 	<p>To represent and order number concepts in verbal and written form (NEO)</p> <p>To represent four digit numbers as groups of thousands, hundreds, tens, and ones in the base ten number system (NEO)</p> <p>To express monetary values in oral and written forms (M)</p> <p>To recognize, identify and trade sets of equivalent coins (M)</p> <p>To solve problems involving money (M)</p> <p>To represent the result of counting, combining and</p>

<u>STRANDS/ADH STANDARDS</u>	<u>TOPIC</u>	<u>ENABLING OUTCOMES</u>	<u>OBJECTIVES</u>
<p><u>Number Theory, Estimation, and operations (NEO)</u></p> <p>I. Understand numbers, ways of representing numbers, relationships among numbers, and number systems</p> <p>II. Understand meanings of operations and how they relate to one another</p> <p>III. Compute fluently and make reasonable estimates</p> <p><u>Algebra: Patterns & Functions (A)</u></p> <p>I. Understand patterns, relations, and functions</p> <p>II. Represent and analyze mathematical situations and structures using algebraic symbols</p> <p>III. Use mathematical models to represent and understand quantitative relationships</p> <p>IV. Analyze change in various contexts</p>	<p>Multiplication and Division Facts</p> <p>Multiplication and Division Concepts</p>	<ul style="list-style-type: none"> • Relate skip counting and repeated addition to multiplication • Draw arrays to model multiplication • Skip count by 3, 4, and 100 • Explore and describe multiplication fact patterns • Identify, express and apply the zero properties of multiplication • Identify, express and apply the commutative, associative and identity properties of addition and multiplication • Illustrate repeated addition and subtraction on a number line • Choose multiplication or division to complete functions tables • Memorize multiplication facts and related division facts through twelve times table • Identify and justify missing numbers in multiplication and division facts • Use mental math to multiply by 10, 100, and 1000 	<p>To use concepts based on patterns and place value to multiply and divide (NEO)</p> <p>To analyze change in quantity and quality using patterns (A)</p> <p>To use properties of whole numbers to maintain equivalence (A)</p> <p>To identify functional number relationships (A)</p> <p>To use concepts based on patterns and place value to multiply and divide (NEO)</p> <p>To identify and represent quantities that are equivalent or non-equivalent (A)</p>

Grade 3: QUARTER 3

	<p style="text-align: center;">Decimals</p>	<ul style="list-style-type: none"> • Identify and model fractional parts of a set • Find fractional parts of numbered groups • Use visual models to identify and compare <i>fractions</i> • Compare <i>fractions</i> with like denominators • Compare unit <i>fractions</i> • Compare proper <i>fractions</i> with unlike denominators • Identify mixed numbers • Add and subtract like <i>fractions</i> using models • Model and write <i>decimals</i> in tenths and hundredths • Relate money (pennies and dimes) to <i>decimals</i> • Compare and order <i>decimals</i> of tenths and hundredths • Locate <i>decimals</i> on a number line • Count by tenths and hundredths • Write <i>fractions</i> with denominators of 10 or 100 as <i>decimals</i> 	<p>(NEO)</p> <p>To use models and number lines to compare <i>fractions</i> (NEO)</p> <p>To model and identify mixed numbers (NEO)</p> <p>To construct and use models to add and subtract like <i>fractions</i> (NEO)</p> <p>To extend whole number place value patterns, models, and notations to include <i>decimals</i> (NEO)</p> <p>To express equivalent relationships between <i>decimals</i> and <i>fractions</i> whose denominator is a multiple of ten (NEO)</p>
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<p>Geometry (G)</p> <p>I. Analyze characteristics and properties of two and three dimensional geometric shapes and develop mathematical arguments about relationships</p> <p>II. Specify locations and describe spatial relationships using coordinate geometry and other representational systems</p> <p>III. Apply transformations and use symmetry to analyze mathematical situations</p> <p>IV. Use visualization, spatial reasoning, and geometric modeling to solve problems</p> <p>Number Theory, Estimation, and Operations (NEO)</p> <p>I. Understand numbers, ways of representing numbers, relationships among numbers, and number systems</p>	<p>Roman numerals (Supplemental)</p>	<p>sphere, rectangular prism, and pyramid</p> <ul style="list-style-type: none"> • Describe plane and solid figures by number of edges and/or faces • Describe the relationship between plane and solid figures • Identify and draw points, lines, line segments, and rays • Classify angles as right, acute or obtuse • Identify, compare and contrast intersecting, perpendicular and parallel lines • Identify, describe, classify and draw polygons: quadrilaterals, pentagons, hexagons, octagons and classify triangles according to sides and angles <ul style="list-style-type: none"> • Identify translations, rotations, and reflections <ul style="list-style-type: none"> • Identify congruent figures • Compute the perimeter of a polygon • Find the area of squares and rectangles by modeling and counting square units • Estimate the area of squares and rectangles • Identify similar figures • Find the volume of rectangular prisms by modeling and counting cubic units • Identify ways to tile or tessellate a region or shape using various polygons <ul style="list-style-type: none"> • Identify Roman numerals L and C • Read and write Roman numerals to 50 • Identify Roman numerals D and M • Read and write Roman numerals to 100 	<p>To classify or identify plane figures and solids by common characteristics (G)</p> <p>To identify shapes as the same where there are changes in position (G)</p> <p>To recognize and use geometric relationships to solve problems (G)</p> <p>To recognize and explore Roman Numerals (NEO)</p>
<p>VOCABULARY</p>	<p>Number Theory</p>	<p>Ordinal; expanded numeral form; greatest, least standard form, period change</p>	

	Whole Numbers	Arrays; dividend; divisor; multiple; quotient; multiplier; remainder; compatible	
	Fractions	Denominator; numerator; mixed number; unit fraction; equivalent fraction ; Decimal; tenth; hundredth; whole number; roman numeral	
	Estimation	front end estimation	
	Algebra	Grid; ordered pair	
	Geometry	angles: acute, obtuse, right; center point; degree; hexagon; intersecting line; line segment; octagon. parallel lines; pentagon; perpendicular lines; polygon; point; quadrilateral; ray; tessellate triangles: isosceles, scalene, equilateral	
	Measurement	A.M./P.M.; align; gram; mile; milliliter; seconds	
	Data Analysis, Statistics, Probability	equally/less likely; frequency; likely; median; mean; probability; survey; venn diagram	

Resources for Grade Three Math Literacy Connections

<i>Strand</i>	<i>Book List</i>
Number Theory	<p><i>How Much is a Million</i>, David M. Schwartz. New York: Morrow, 1985</p> <p><i>Anno's Mysterious Multiplying Jar</i>, Philomel Books, 1983</p> <p><i>Too Man Kangaroo Things to Do</i>, Harper Collins, 1996</p> <p><i>2X2= Boo a Set of Spooky Multiplication Stories</i>, Holiday House, 1995</p> <p><i>Charlotte's Web</i>, E.B. White</p> <p><i>The 329th Friend</i>, Marjorie Weinman Sharman, New York: Macmillian Publishers, 1992</p> <p><i>Sideways Stories from Wayside School</i>, Louis Sacher. New York: Camelot, 1985</p> <p><i>Let's Investigate Estimating</i>, Marion Smoothey, Marshall Cavendish Corporation, 1995</p> <p>Gator Pie, Louise Matthews. Dodd Mead 7 Co.</p> <p><i>Wayside School is Falling Down</i>, Louis Sacher. NY: Lothrop, Lee & Shephard, 1989</p> <p><i>Fractions are Parts of Things</i>, J. Richard Dennis. NY: Harper Collins Children's Books, 1972</p>
Algebra	<p><i>Caps for Sale</i>, Esphyr Slobodkina Scholastic</p> <p><i>The I Hate Mathematics!</i> Book by Marilyn Burns. Little, Brown and Co., 1975</p> <p><i>20,000 Baseball Cards Under the Sea</i>. John Buller & Susan Schade. NY: Random House, 1991.</p> <p><i>Goldilocks and the Three Squares</i></p>
Geometry	<p><i>A Light in the Attic</i> (Shapes, p. T1), Shel Silverstein, Harper & Row</p> <p><i>The Greedy Triangle</i>, Marilyn Burns: Scholastic, 1994</p> <p><i>Right Angles: Paper Folding Geometry</i>, Jo Phillips: Thomas Crownwell Co., 1992.</p> <p><i>Grandfather Tang's Story</i>, Ann Tompert</p>
Measurement	<p><i>\$1.00 Word Riddle Book</i>, Marilyn Burns. Cuisenaire</p> <p><i>Inch by Inch</i>, Leo Lionn: Astorhonor, 1960</p> <p><i>A Quarter from the Tooth Fairy</i>, Carne Holtzman, Scholastic</p> <p><i>How Much is that Guinea Pig in the Window?</i> By Joanne Rocklin, Scholastic Inc.</p>

Strategies - Grade 3

Suggested Teaching Strategies	Suggested Learning Strategies
<p>The teacher provides a “number-rich” environment:</p> <p>Numbers on display (charts, graphs, calendars)</p> <p>Collections of countable objects</p> <p>Books that tell number stories</p> <p>Tapes and CDs of number songs</p> <p>Other: _____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>Teacher Directed</p> <p>The teacher:</p> <p>Creates counting and estimating experiences and activities across the curriculum</p> <p>Provides manipulatives for student use</p> <p>Other: _____</p> <p>_____</p> <p>Cooperative</p> <p>Students:</p> <ul style="list-style-type: none"> • Participate in number games • Keep score in games • Work in cooperative teams or groups to collect and express data • Use flashcards <p>Other: _____</p> <p>_____</p> <p>Independent</p> <p>Students</p> <ul style="list-style-type: none"> • Use electronic devices to collect and illustrate data • Express specific quantities in written work <p>Other: _____</p>

Suggested Cross Curricular and Catholic Social Teaching Links

Grade Three

- ✚ Students write a paragraph comparing and contrasting two solid figures using words like *face* and *edge*. (*Language Arts, Math*) [Harcourt Math, 2004]
- ✚ Students read a book like *Selina and the Bear Paw Quilt* and create artwork using patterns. (*Language Arts, Art, Math*) [Harcourt Math, 2004]
- ✚ Students create fair and unfair spinners for games and discuss the importance of honesty and justice. (*Math, Art, Religion*) [Harcourt Math, 2004]

Notes:

Text/Resources:

GRADE 4 MATHEMATICS CURRICULUM

<p>attributes of objects and the units, systems, and processes of measurement</p> <p>II. Develop and apply appropriate techniques, tools and formulas to estimate and determine measurements</p> <p>III. Apply appropriate techniques, tools and formulas to determine measurements</p> <p>IV. Use numbers and their properties to estimate measures and quantities reasonably</p> <p><u>Algebra: Patterns & Functions (A)</u></p> <p>I. Understand patterns, relations, and functions</p> <p>II. Represent and analyze mathematical situations and structures using algebraic symbols</p> <p>III. Use algebraic symbols to determine equivalence and solve problems</p> <p>IV. Use mathematical models to represent and understand quantitative relationships</p> <p>V. Analyze change in various contexts</p>	<p>Addition, Subtraction, Multiplication, Division Facts</p>	<ul style="list-style-type: none"> • Subtract amounts of money • Apply and explain a variety of estimation strategies in problem-solving situations to add and subtract money amounts less than \$10.00 and two- and three-digit numbers with and without regrouping • Make change • Add and subtract sums of money in columns aligning decimal points; • Round amounts of money to the nearest dollar • Add and subtract 6 digit numbers with and without regrouping • Use a calculator to add and subtract large numbers • Use front-end estimation • Choose and justify the correct operation in a word problem (+,-) • Identify, express and apply the zero property of multiplication • Describe the property of zero in multiplication and its implication in division • Use commutative and associative properties, to estimate, compute and to solve problems • Demonstrate equivalence with the commutative and associative properties of whole numbers • Demonstrate equivalence with the distributive property of whole numbers • Determine the proper operation to solve a problem and justify the reasoning • Identify, express and apply the commutative, and associative properties of whole numbers in addition and multiplication • Demonstrate the equivalence of both sides of an equation as the same value is added, subtracted, multiplied, or divided on each side 	<p>To solve problems involving money (M)</p> <p>To determine and compare coin values (M)</p> <p>To add and subtract whole numbers written in vertical and horizontal form, choosing appropriately between paper and pencil methods and calculators (NEO)</p> <p>To recognize and demonstrate equivalence using number properties (NEO)</p> <p>To recognize and demonstrate equivalence using number properties (A)</p>
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		<ul style="list-style-type: none"> • Find missing numbers in number sentences • Find missing symbols in number sentences ($>$), ($<$), ($=$) and (\neq) • Find missing operation symbols in number sentences • Relate multiplication and division to models with groups and rectangular arrays • Multiply and divide money using single digit multipliers/divisors. 	<p>To recognize and demonstrate equivalence using number properties (A)</p> <p>To use number patterns, basic facts, arrays, and place value models to multiply and divide whole numbers (NEO)</p>
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STRANDS/ADH STANDARDS	TOPICS	ENABLING OUTCOMES	OBJECTIVES
<p><u>Number Theory, Estimation, and Operations (NEO)</u></p> <p>I. Understand numbers, ways of representing numbers, relationships among numbers, and number systems</p> <p>II. Understand that a variety of numerical representations can be used to describe quantitative relationships</p> <p>III. Understand meanings of operations and how they relate to one another</p> <p>IV. Compute fluently and make reasonable estimates</p> <p>V. Use numbers and their properties to compute flexibly and fluently and to estimate measures and quantities reasonably</p> <p>VI. Understand and describe patterns and functional relationships</p> <p>VII. Represent and analyze quantitative relationships in a variety of ways</p> <p>VIII. Use operations and properties to determine equivalence and solve problems</p> <p><u>Algebra</u></p> <p>I. Understand patterns, relations,</p>	<p>Multiplication and Division</p> <p>Facts by 1 & 2</p> <p>Digit Numbers</p>	<ul style="list-style-type: none"> • Memorize and apply divisibility rules for 2,5, 10 • Square a whole number • Represent in pictorial form a 2x2 square • Identify the written form n^2 • Multiply two and three digit numbers by a one digit number with regrouping • Use exponents to the power of 2 • Use equations to describe the rules for number patterns • Use equations to model word problems • Use calculators to explore and create number patterns • Explore and describe multiplication fact patterns • Describe and write the rule for number, color, rhythmic and symbolic patterns • Identify and use the inverse relationships of multiplication and division to solve and check problems • Solve practical problems and extend patterns involving 10 and 100 more and less than a number • Recognize and identify prime and composite numbers to 100 • Create and extend patterns • Extend and compare arithmetic and geometric sequences • Make generalizations about patterns and relationships and test those generalizations • Multiply to find special products with multipliers that are multiples of 10, 100, 1000 • Multiply four-digit numbers by a one-digit multiplier, two and three digit numbers by a two-digit multiplier • Divide three-digit dividends by multiples of 10 	<p>To use factors to explore, represent and classify numbers (NEO)</p> <p>To write equations to express relationships between numbers (A)</p> <p>To recognize, create and extend numerical and geometric patterns, using concrete materials, number lines, symbols, tables and words (A)</p> <p>To use factors to explore, represent and classify numbers (NEO)</p> <p>To use number patterns, basic facts, arrays, and place value models to multiply and divide whole numbers (NEO)</p>

<p>and functions</p> <p>II. Represent and analyze mathematical situations and structures using algebraic symbols</p> <p>III. Use algebraic symbols to determine equivalence and solve problems</p> <p>IV. Use mathematical models to represent and understand quantitative relationships</p> <p>V. Analyze change in various contexts</p>		<ul style="list-style-type: none"> • Divide three-digit dividends by a one-digit divisor to find quotients of two or three places with zeros and remainders • Record division using an algorithm (long division) • Divide multiples of 10, 100, 1000 and 10,000 by multiples of 10 • Identify and use the inverse relationships of multiplication and division to solve and check problems • Model and interpret division with remainders <ul style="list-style-type: none"> • Use arrays and explore using the distributive property [$10 \times (4+5) = (10 \times 5) + (10 \times 4)$] to estimate, multiply and divide two and three digit numbers by one-digit factors <ul style="list-style-type: none"> • Recognize and apply the distributive property of multiplication • Use compatible numbers to make reasonable estimates <ul style="list-style-type: none"> • Estimate products and quotients and describe the method of estimation • Describe and use estimation strategies that can identify a reasonable answer to a problem when an estimate is appropriate • Use clustering to estimate sums • Determine and discuss the reasonableness of an answer and explain why a particular estimation strategy will result in an over or underestimate • Write and solve multi-step word problems involving estimation <ul style="list-style-type: none"> • Divide four-digit dividends by a one digit divisor to find three and four digit quotients with zeros and remainders • Divide two- and three-digit dividends by two-digit divisors to find one digit quotients with and without remainders 	<p>To identify whole number properties and apply them to whole number operations and algorithms (NEO)</p> <p>To use place value concepts, number patterns, and number properties to develop estimation and computation strategies (NEO)</p> <p>To use number patterns, basic facts, arrays, and place value models to multiply and divide whole numbers (NEO)</p> <p>To use factors to explore, represent and classify numbers (NEO)</p>
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| | | <ul style="list-style-type: none">• Use order of operations to evaluate arithmetic expressions with parentheses
• Draw factor trees• Identify the Least Common Multiple (LCM) given pairs of numbers less than or equal to 10• Identify the Greatest Common Factor (GCF) given pairs of numbers up to 81 | |
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STRANDS/ADH STANDARDS	TOPICS	ENABLING OUTCOMES	OBJECTIVES
<p><u>Number Theory, Estimation, and Operations (NEO)</u></p> <p>I. Understand numbers, ways of representing numbers, relationships among numbers, and number systems</p> <p>II. Understand that a variety of numerical representations can be used to describe quantitative relationships</p> <p>III. Understand meanings of operations and how they relate to one another</p> <p>IV. Compute fluently and make reasonable estimates</p> <p>V. Use numbers and their properties to compute flexibly and fluently and to estimate measures and quantities reasonably</p> <p>VI. Understand and describe patterns and functional relationships</p> <p>VII. Represent and analyze quantitative relationships in a variety of ways</p> <p>VIII. Use operations and properties to determine equivalence and solve problems</p>	<p>Fractions and Probability</p>	<ul style="list-style-type: none"> • Read, write and identify all <i>fractions</i> • Identify and model fractional parts of a set • Find fractional parts of numbered groups • Use division to find a fractional part of a set • Identify and find the simplest form of a fraction • Write <i>fractions</i> in lowest terms • Model equivalent <i>fractions</i> (using manipulatives, pictures, graphics, etc.) • Identify equivalent <i>fractions</i> • Find <i>fractions</i> that are equivalent using models • Find equivalent <i>fractions</i> using multiplication and division • Identify mixed numbers <ul style="list-style-type: none"> • Use visual/virtual models to identify and compare <i>fractions</i> • Use models to change an improper fraction to a mixed number • Locate and place <i>fractions</i> on a number line • Apply the concepts of Greatest Common Factor and Least Common Multiple to <i>fractions</i> • Use the Least Common Multiple to identify the lowest common denominator of a set of <i>fractions</i> <ul style="list-style-type: none"> • Add and subtract like <i>fractions</i> • Solve problems involving addition and subtraction of <i>fractions</i> with like denominators • Compare proper <i>fractions</i> with unlike denominators • Add and subtract <i>fractions</i> with unlike denominators • Add and subtract two <i>fractions</i> where one denominator is a multiple of the other <ul style="list-style-type: none"> • Model, read and write <i>decimals</i> in tenths and hundredths • Locate <i>decimals</i> on a number line 	<p>To model, identify, compare <i>fractions</i>, and express them in equivalent forms (NEO)</p> <p>To extend whole number place value patterns, models, and notations to include <i>decimals</i> (NEO)</p> <p>To extend place value concepts and number properties to addition and subtraction of decimal numbers (NEO)</p> <p>To compute with <i>fractions</i>(NEO)</p>

	<p>Decimals</p>	<ul style="list-style-type: none"> • Count by tenths and hundredths • Annex zeroes to create equivalent decimal numbers • Write decimal numbers to express <i>fractions</i> with denominators of 10 and 100 • Relate <i>decimals</i> in tenths to <i>fractions</i>, and mixed numbers • Compare and order <i>decimals</i> of tenths and hundredths (use symbols $<$, $>$, $=$, and \neq) • Relate money (pennies and dimes) to <i>decimals</i> • Round decimal numbers to the nearest tenth and whole number • Round decimal numbers to the nearest hundredth • Estimate decimal sums and differences using rounding • Construct and use models and pictures to add and subtract <i>decimals</i> • Add and subtract <i>decimals</i> to hundredths • Model, read and write <i>decimals</i> to thousandths place in standard form and as number words • Identify place value in decimal numbers and write <i>decimals</i> in expanded form. (EX. $61.34 = 60 + 1 + 0.3 + 0.04$) • Use models and pictures to estimate reasonable answers when adding or subtracting <i>decimals</i>, <i>fractions</i>, and mixed numbers • Write and solve multi-step word problems with <i>fractions</i>, including problems with extraneous information 	
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| | | <ul style="list-style-type: none">• Model and demonstrate ratios through the use of concrete objects and pictures using ratios• Describe the relationship between <i>decimals, fractions</i> and <i>percents</i>• Use models, pictures, and number patterns to solve simple problems involving ratio and proportions | |
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STRANDS/ADH STANDARDS	TOPICS	ENABLING OUTCOMES	OBJECTIVES
<p>Measurement (M)</p> <p>I. Understand measurable attributes of objects and the units, systems, and processes of measurement</p> <p>II. Develop and apply appropriate techniques, tools and formulas to estimate and determine measurements</p> <p>III. Apply appropriate techniques, tools and formulas to determine measurements</p> <p>IV. Use numbers and their properties to estimate measures and quantities reasonably</p>	<p>Measurement</p>	<ul style="list-style-type: none"> • Choose an appropriate unit to estimate length or distance • Estimate, draw, and measure length and height to the nearest inch, half inch, quarter inch and centimeter • Solve practical problems that involve estimation and measurement of length, perimeter, and area • Develop and explain strategies for using nonstandard and standard referents to estimate measurement of length and area • Solve practical problems that involve estimation and measurement of volume and capacity • Compare and order objects according to capacity • Identify and use the appropriate customary and metric units and tools for measuring length, area and perimeter • Identify the conversions for feet, yards and miles • Estimate and measure length and height in millimeters, decimeters, kilometers • Identify and use the appropriate customary and metric units and tools for measuring volume and capacity • Identify cup, pint, quart, gallon, liter, milliliter and apply to real life • Define, identify, use and relate benchmarks to ounce and gram • Identify pound and ounce as units of measure and relate use in real life • Identify and memorize conversion for pounds and ounces • Solve practical problems that involve estimation and measurement of weight • Name the time zones within the US • Identify and memorize conversions for cups, pints, quarts, and gallons 	<p>To determine and use various tools and units to estimate and measure (M)</p> <p>To use standard units and identify and express examples of measurement in daily life (M)</p> <p>To use measurement to</p>

<p>Geometry (G)</p> <p>I. Analyze characteristics and properties of two and three dimensional geometric shapes and develop mathematical arguments about relationships</p> <p>II. Use properties and characteristics of two-and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems</p> <p>III. Use spatial reasoning, location and geometric relationships to solve problems</p> <p>IV. Specify locations and describe spatial relationships using coordinate geometry and other representational systems</p> <p>V. Apply transformations and use symmetry to analyze mathematical situations</p> <p>VI. Use visualization, spatial reasoning, and geometric modeling to solve problems</p>	<p>Geometry</p>	<ul style="list-style-type: none"> • Identify and use the appropriate customary and metric units and tools for measuring weight / mass • Compare and order objects according to weight • Identify a liter as 1000 milliliters • Define, identify, use and relate benchmarks to millimeter • Define, identify, use and relate benchmarks to milliliter • Identify conversion factors in the metric system • Solve practical problems that involve estimation and measurement of temperature • Use estimation to predict reasonable answers to measurement problems <ul style="list-style-type: none"> • Identify and use the appropriate customary and metric units and tools for measuring temperature • Read Fahrenheit and Celsius thermometers and describe temperatures as hot, warm, or cold • Identify and use cubic units (inch, centimeter, mile, and kilometer) • Identify and use kilogram and ton <ul style="list-style-type: none"> • Build, draw, create, describe, and classify two- and three-dimensional figures • Sort polygons and solids by using characteristics such as the relationship of sides (parallel, perpendicular), kinds of angles (right, acute, obtuse), symmetry, and congruence • Describe similarities and differences of two and three dimensional shapes in the environment using physical features such as number of sides, number of angles, lengths of sides and straight and curved parts • Describe solid figures using faces, edges, and vertices <ul style="list-style-type: none"> • Identify and draw points, lines, line segments, and rays • Identify, compare and contrast intersecting, perpendicular and parallel lines • Classify angles as right, acute or obtuse • Identify translations, rotations, and reflections 	<p>determine and explain relative size of a given objects and measures (M)</p> <p>To determine and use various tools and units to estimate and measure (M)</p> <p>To describe geometric properties of plane and solid figures (G)</p> <p>To identify, draw and describe elements needed to explain spatial relationships (G)</p>
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<p>Data Analysis, Statistics, and</p>		<ul style="list-style-type: none"> • Explain the results of dividing, combining, and transforming shapes and the effects of slides, flips, and turns • Identify ways to tile or tessellate a region or shape using various polygons • Analyze two-dimensional shapes and determine lines of symmetry and congruence • Identify similar figures • Analyze shapes with more than one line of symmetry • Identify, describe and classify triangles according to sides and angles • Identify, describe, classify and draw polygons: quadrilaterals, pentagons, hexagons, octagons • Compute perimeter of a polygon using the formula • Find the area of squares and rectangles • Develop and apply the formula for finding area of squares and rectangles • Describe relationships between the lengths of sides of rectangles and their areas and perimeters; generalize the patterns as simple formulas • Find the volume of rectangular prisms by modeling and counting cubic units • Estimate the volume of rectangular prisms • Find strategies for estimating and measuring the perimeters and areas of irregular shapes • Identify and find the radius and diameter of a circle • Identify and estimate the circumference of a circle • Identify and use the appropriate tools for measuring time • Tell, write, and show time to the quarter hour, to five and 	<p>To describe geometric properties of plane and solid figures (G)</p> <p>To identify and generalize relationships between measurable attributes of plane and solid figures (G)</p> <p>To determine and use various tools and units to estimate and</p>
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<p>Algebra</p> <p>I. Understand patterns, relations, and functions</p> <p>II. Represent and analyze mathematical situations and structures using algebraic symbols</p> <p>III. Use algebraic symbols to determine equivalence and solve problems</p> <p>IV. Use mathematical models to represent and understand quantitative relationships</p> <p>V. Analyze change in various contexts</p>	<p>SUPPLEMENTAL</p> <p>Probability</p> <p>Roman Numerals</p>	<ul style="list-style-type: none"> • Locate points on a coordinate grid (Quadrant I) using ordered pairs • Use a table to explore functions and graph them on a coordinate grid (Quadrant I) • Draw and interpret simple maps using coordinate systems and shapes or pictures • Use coordinate grids to find position, distance and relative position • Use variables to represent quantities in expressions and number sentences • Choose and evaluate the number expression that matches a word phrase • Evaluate variable expressions that involve a single operation <ul style="list-style-type: none"> • Make predictions and defend conclusions based on data • Express probability in verbal and numerical terms • Conduct probability experiments and express the probability based on possible outcomes • Express probability as a fraction • Identify possible outcomes of events using combinations where order does not matter <ul style="list-style-type: none"> • Identify Roman numerals D and M • Write Roman numerals to 1000 • Read Roman numerals to the date 	<p>To represent numerical relationships on a coordinate grid (A)</p> <p>To use coordinate systems to identify and illustrate spatial location and geometric relationships (G)</p> <p>To recognize, use and simplify arithmetic and algebraic expressions (A)</p> <p>To determine the likelihood of certain events through games and simple experiments (DSP)</p> <p>To recognize and represent Roman numerals (NEO)</p>
<p>VOCABULARY</p>	<p>Algebra</p>	<p>Grid; ordered pair</p> <p>angles: acute, obtuse, right; center point; degree; hexagon;</p>	

	Geometry	intersecting line; line segment; octagon; parallel lines; pentagon; perpendicular lines; polygon; point; quadrilateral; ray; tessellate; triangles: isosceles, scalene, equilateral; volume	
	Measurement	A.M./P.M.; align; gram; mile; milliliter; seconds	
	Data Analysis	equally/less likely; frequency; likely; median; mean; mode; outliers; probability; survey; Venn diagram	

GRADE 4 - Resources for the Grade Four Math Literacy Connections

<i>Strand</i>	<i>Book List</i>
Number Theory	Math Blaster (software) <i>Remainder of One</i> , Elinor J. Pinczes, Scholastic, 1993 <i>Math Curse</i> , Jim Scieszka & Lane Smith. Viking, 1995, (The Penquin Group) <i>Anne's Hat Trick</i> , Philomel Books, 1984 <i>The Science Book of Numbers</i> , Jack Challoner, Gulliver Books, 1992 <i>A Million Fish, More or Less</i> , Patricia McKissack. Alfred A. Knopf, New York, 1992 <i>If You Made a Million</i> , David Schwartz, 1989 <i>More for me</i> , Software: Fraction Factory <i>Gator Pie</i> , Louise Mathews. Dodd Mead, 1979
Algebra	Game: Battleship, Milton Bradley
Geometry	Math Blaster 2 – Creature Creator Tangrams
Measurements	<i>How Big Is a Foot?</i>
Probability, Statistics & Graphing	Microsoft Works / Excel graph survey results

STRATEGIES - GRADE 4

Suggested Teaching Strategies	Suggested Learning Strategies
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The teacher provides a “number-rich” environment:

Numbers on display (charts, graphs, timelines, calendars)

Collections of countable objects

Books that tell number stories

Tapes and CDs of number songs

Other: _____

Teacher Directed

The teacher:

Provides manipulatives for student use (tangrams)

Other: _____

Cooperative

Students:

- Participate in number games
- Keep score in games
- Work in cooperative teams or groups to collect and express data
- Use flashcards

Other: _____

Independent

Students

- Use electronic devices to collect and illustrate data
- Express specific quantities in written work

Other: _____

Suggested Cross Curricular and Catholic Social Teaching Links

Grade Four

- ✚ Students take their heart beats and create equations based on how often their heart beats in a minute, five minutes, etc. (Science, Math)
- ✚ Students organize a fund raising event for charity setting a goal; they measure their progress toward that goal on a graph in terms of *percents*. (Religion, Math)

Notes:

Text/Resources:

GRADE 5 MATHEMATICS CURRICULUM

Grade 5: QUARTER 1

<u>STRANDS/ADH STANDARDS</u>	<u>TOPICS</u>	<u>ENABLING OUTCOMES</u>	<u>OBJECTIVES</u>
*MATH FACTS ARE CUMULATIVE SKILLS AND MUST BE CONSISTENTLY REINFORCED THROUGHOUT THE YEAR TO ACHIEVE MASTERY.			
Number Theory, Estimation, and Operations (NEO) I. Understand numbers, ways of representing numbers, relationships among numbers, and number systems II. Understand that a variety of numerical representations can be used to describe quantitative relationships III. Understand meanings of operations and how they relate to one another IV. Compute fluently and make reasonable estimates V. Use numbers and their properties to compute flexibly and fluently VI. Understand and describe patterns and functional relationships VII. Represent and analyze quantitative relationships in a variety of ways VIII. Use operations and properties to determine equivalence and solve problems	Whole Numbers & Place Value	<ul style="list-style-type: none"> • Identify and name place values to the hundred billions place • Build place value models, draw diagrams and show equivalent representations for whole numbers in expanded and regrouped form • Use place value models, diagrams, number patterns and number lines to identify, order, round, and compare whole numbers to one billion • Read, write, count, skip count, order, compare, and expand numerals to one billion • Write expanded numerals in standard form • Round whole numbers to all place values 	To represent numbers in expanded and regrouped forms in the base ten place value system (NEO)
	Place Value with Decimals	<ul style="list-style-type: none"> • Build models and describe tenths and hundredths using equivalent ratio, fraction and decimal notation • Read and write <i>decimals</i> to thousandths place in standard form as number words • Identify place value in decimal numbers and write <i>decimals</i> in expanded form (EX. $61.34 = 60 + 1 + 0.3 + 0.04$) • Use models to extend whole number place value concepts and patterns to <i>decimals</i> • Compare and order <i>decimals</i> to thousandths place from greatest to least and from least to greatest (use symbols $>$, $<$, $=$ and \neq) • Read and write <i>decimals</i> to ten thousandths place in standard form as number words • Use (greater than or equal, less than or equal) symbols (\geq, \leq) 	To extend whole number place value concepts to include decimal numbers that are also represented as <i>fractions</i> whose denominators are multiples of ten (NEO)

	<p>Estimation</p> <p>Integers</p> <p>Whole Numbers with Decimals</p>	<ul style="list-style-type: none"> • Round decimal numbers to the nearest hundredths, tenths, and whole number • Express <i>fractions</i> with denominators of 10 and 100 as <i>decimals</i> • Annex zeroes to create equivalent <i>decimals</i> • Relate <i>decimals</i> in tenths and hundredths to <i>fractions</i>, mixed numbers, and number words • Round <i>fractions</i> to nearest half or whole to estimate answers to problems. • Estimate decimal sums, differences, products, and quotients using rounding • Use benchmarks to understand the relative magnitude of numbers • Select and apply the most suitable estimation strategy: rounding, clustering, front end (with adjustment, compatible numbers, and compensation • Determine and discuss the reasonableness of an answer and explain why a particular estimation strategy will result in an over or underestimate • Estimate decimal quotients using compatible numbers • Use a number line to compare and order integers • Solve problems involving finding 10,000, and 1000 more or less than a number • Add and subtract whole numbers (up to 9 digits) presented in both horizontal and vertical form, including column addition. • Add and subtract <i>decimals</i> to the ten thousandths place • Develop strategies, using place value relationships, inverse operations, and the commutative, associative, and distributive properties to simplify computation with two-, three-, and four-digit numbers and money amounts • Identify and use the inverse relationships of multiplication and division to solve and check problems 	<p>To use place value concepts, number patterns, and number properties to develop and apply estimation and computation strategies (NEO)</p> <p>To explore numbers less than zero and extend the number line to illustrate integers (NEO)</p> <p>To use place value concepts and the commutative and associative properties to add and subtract flexibly and fluently (NEO)</p>
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STRANDS/ADH STANDARDS	TOPICS	ENABLING OUTCOMES	OBJECTIVES
<p><u>Number Theory, Estimation, and Operations (NEO)</u></p> <p>I. Understand numbers, ways of representing numbers, relationships among numbers, and number systems</p> <p>II. Understand that a variety of numerical representations can be used to describe quantitative relationships</p> <p>III. Understand meanings of operations and how they relate to one another</p> <p>IV. Compute fluently and make reasonable estimates</p> <p>V. Use numbers and their properties to compute flexibly and fluently</p> <p>VI. Understand and describe patterns and functional relationships</p> <p>VII. Represent and analyze quantitative relationships in a variety of ways</p> <p>VIII. Use operations and properties to determine equivalence and solve problems</p>	<p>Divisibility Rules</p> <p>Prime and Composite Numbers</p> <p>Prime Factorization</p> <p>GCF & LCM</p> <p>Squaring Numbers</p> <p>Fractions</p>	<ul style="list-style-type: none"> • Memorize and apply divisibility rules for 2,3,5,6,9 and 10 • Recognize and identify prime and composite numbers to 100 • Use rectangular arrays to identify factor pairs and to classify numbers as prime, composite, and perfect squares • Draw and use factor trees to determine all the factors of a number • Draw and use factor trees to find all prime factors and write prime factorization of numbers • Represent numbers by using exponents • Change exponent form to standard numeral, write as repeated factors and vice versa • Use order of operations including exponents • Identify the Greatest Common Factor (GCF) given pairs of numbers up to 81 • Identify the Least Common Multiple (LCM) given pairs of numbers less than or equal to 10 • Draw and use factor trees to determine all the factors of a number • Identify the written form n^2 • Represent in pictorial form a 2x2 square • Square a whole number • Use exponents to the power of 2 • Memorize the perfect squares of numbers from 1 to 15 • Express a perfect square in exponent form • Identify and find equivalent <i>fractions</i> • Locate and place <i>fractions</i> and mixed numbers on a number line • Identify and find the simplest form of a fraction • Write <i>fractions</i> in lowest terms • Use models to change an improper fraction to a mixed number • Find fractional parts of numbered groups 	<p>To use factors to explore, represent and classify numbers (NEO)</p> <p>To model, identify, and express equivalent forms of numbers expressed as whole numbers, <i>fractions</i> and mixed numbers (NEO)</p>

	<p>Operations with Fractions and Mixed Numbers</p>	<ul style="list-style-type: none"> • Construct and use models to add and subtract like and unlike <i>fractions</i> and mixed numbers • Use equivalence and substitution with common denominators when adding and subtracting • Add and subtract like and unlike <i>fractions</i> and mixed numbers expressing answers in simplest form • Use models and pictures to estimate reasonable answers when adding or subtracting <i>decimals, fractions,</i> and mixed numbers • Use models to change an improper fraction to a mixed number • Recognize that multiplication by a unit fraction is equivalent to dividing by the fraction’s denominator <ul style="list-style-type: none"> • Construct and use models and pictorial representations to multiply common <i>fractions</i> and mixed numbers • Use models to divide whole numbers by <i>fractions</i> and <i>fractions</i> by whole numbers • Model and describe when products or quotients with <i>fractions</i> and <i>decimals</i> can yield a larger or smaller result than either factor • Multiply and divide <i>fractions,</i> whole numbers and mixed numbers • Subtract mixed numbers with renaming 	<p>To add and subtract <i>fractions</i> and mixed numbers using models, pictures and number sentences (NEO)</p> <p>To use models and pictorial representations to develop concepts and methods by which to multiply and divide <i>fractions</i> and mixed numbers (NEO)</p>
	<p>Fractions and Reciprocals</p>	<ul style="list-style-type: none"> • Recognize that multiplication by a unit fraction is equivalent to dividing by the fraction’s denominator • Identify reciprocal numbers • Apply reciprocal numbers to division of a whole number by a fraction • Write whole number division problems in fraction form and round the fraction form to estimate an answer to a division problem • Multiply and divide <i>fractions,</i> whole numbers and mixed numbers • Use cancellation in multiplication of <i>fractions</i> 	

STRANDS/ADH STANDARDS	TOPICS	ENABLING OUTCOMES	OBJECTIVES
<p>Algebra (A)</p> <p>I. Understand patterns, relations, and functions</p> <p>II. Represent and analyze mathematical situations and structures using algebraic symbols</p> <p>III. Use algebraic symbols to determine equivalence and solve problems</p> <p>IV. Use mathematical models to represent and understand quantitative relationships</p> <p>V. Analyze change in various contexts</p>	<p>Simplifying and Evaluating Expressions</p> <p>Integers and Absolute Value</p> <p>Writing and Solving Equations</p> <p>Integers and</p>	<ul style="list-style-type: none"> • Evaluate variable expressions that involve a single operation • Use order of operations to evaluate single variable algebraic expressions with parentheses • Explain the difference between algebraic and arithmetic expressions • Use variables to represent quantities in expressions and number sentences • Write and evaluate algebraic expressions with two variables • Use a number line to compare and order integers • Identify the absolute value of an integer • Identify opposite integers • Use a model to add and subtract integers • Identify, express and apply the commutative and associative properties of whole numbers and identify properties of addition and multiplication • Use commutative and associative properties to solve problems, estimate, and compute • Demonstrate equivalence with the commutative, distributive and associative properties of whole numbers • Demonstrate the equivalence of both sides of an equation as the same value is added, subtracted, multiplied, or divided on each side • Model and solve one step equations using materials that model equivalence • Represent mathematical relationships using variables in expressions, equations and inequalities • Describe how a change in one variable relates to a change in a second variable in a practical situation • Determine the nature of changes in linear relationships using graphs, tables, and equations 	<p>To recognize, use and simplify arithmetic and algebraic expressions (A)</p> <p>To explore numbers less than zero and extend the number line to illustrate integers (NEO)</p> <p>To recognize and demonstrate equivalence using number properties (A)</p> <p>To write expressions, equations and inequalities to express relationships between numbers (A)</p> <p>To represent numerical relationships on a coordinate</p>

<p>Data Analysis, Statistics, and Probability (DSP)</p> <p>I. Formulate questions that can be addressed with data; collect, organize, and display relevant data to answer them</p> <p>II. Collect, organize and display data using appropriate statistical and graphical methods.</p> <p>III. Select and use appropriate statistical methods to analyze data</p> <p>IV. Analyze data sets to form hypotheses and make predictions</p> <p>V. Understand and apply basic concepts of probability</p> <p>VI. Develop and evaluate inferences and predictions that are based on data</p> <p>VII. Understand and apply basic concepts of probability</p>	<p>Functions Graphing and Equations</p> <p>Measurements of Central Tendency</p> <p>Ratios- Percents</p>	<ul style="list-style-type: none"> • Use a table to explore functions and graph them • Compute the mean of a set of data • Use range, mean, median, and mode to explain data • Describe how a change in an outlier can change the measures of central tendency • Locate points on a four quadrant coordinate grid by using ordered pairs • Generate a table of equal ratios and graph the ordered pairs • Choose and use benchmarks to approximate locations on number lines and coordinate grids • Read, write, and illustrate ratios using three standard forms • Use a table to generate equal ratios, write equal ratios, and tell if two ratios form a proportion • Use cross products, multiplication and division to find equivalent ratios • Generate a table of equal ratios and graph the ordered pairs • Read and write rates, and change a rate to a unit rate • Illustrate and describe the relationship between <i>decimals, fractions and percents</i> • Represent a rational number in its equivalent fraction, decimal, ratio and percent forms with models, number patterns and common factors • Write <i>fractions</i> with a denominator of 100 as percent • Write <i>percents as decimals</i> and <i>decimals as percents</i> • Write <i>percents as fractions</i> in simplest form • Illustrate and describe the relationship between <i>decimals, fractions and percents</i> • Represent a rational number in its equivalent fraction, decimal, ratio and percent forms with models, number patterns and common factors 	<p>grid (A)</p> <p>To describe features of a data set (DSP)</p> <p>To model, identify, compare, and relate rational numbers (NEO)</p> <p>To compare quantities and solve problems using ratios, rates and percents. (NEO)</p>
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	<p>Circumference</p> <p>Area of Circle</p> <p>Volume</p> <p>Transformations</p>	<p>perimeters and areas of irregular shapes</p> <ul style="list-style-type: none"> • Identify and measure the parts of a circle (radius, diameter, chord, central angle) • Identify the meaning of pi • Find the circumference of a circle using a formula • Find the area of a circle • Develop strategies to determine the formula for the volume of rectangular solids • Identify line and rotational symmetry • Identify translations, rotations, and reflections • Explain the results of dividing, combining, and transforming shapes and the effects of slides, flips, and turns • Draw and interpret simple maps using coordinate systems and shapes or pictures • Plot points on the rectangular coordinate system and estimate and determine the distance between points 	<p>To identify, draw and describe elements needed to explain spatial relationships (G)</p> <p>To use coordinate systems to identify and illustrate spatial location and geometric relationships (G)</p>
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GRADE 5 VOCABULARY TERMS

Number Theory	Algebra	Geometry	Measurement	Data Analysis, Statistics, Probability
absolute value associate property benchmarks clustering compatible numbers compensation composite numbers commutative property distributive property divisibility rules exponents front end estimation greater than or equal to (\geq) Less than or equal to (\leq) integer prime numbers product proportion quotient ratio reciprocal numbers repeated factors relative magnitude rounding short division algorithm simplest form	four quadrant grid geometric sequences ordered pair	angles: acute obtuse right center point chord degree diameter hexagon intersecting line line segment net octagon parallel lines pentagon perpendicular lines polygon point quadrilateral radius ray symmetry (line & rotational) tessellate triangles: isosceles scalene equilateral	customary units decimeters kilometers mass millimeters weight	broken line graph data set equally/less likely fairness frequency likely median mean mode outliers probability spreadsheets survey Venn diagram

Resources for the Grade Five Math Literacy Connections

Strand	Book Titles
Number Theory	<p><i>Is a Blue Whale the Biggest Thing There Is?</i> By Robert Wells, Whitman & Company, 1993</p> <p><i>Fractions</i>, by David Steinecker. Benchmark Books, 1996</p> <p><i>Locks, Crocs & Skeeters</i>, by Nancy Winslow Parker. Greenwillow Books, 1996</p> <p><i>Accidents May Happen</i>, by Charlotte Fultz Jones. Delacorte Press, 1996</p> <p><i>The Librarian Who Measured the Earth</i>, by Kathryn Lasky. Little, Brown & Co., 1994</p>
Algebra	Logical reasoning puzzle books
Geometry	Pentominoes Tangrams Geoboards
Whole Numbers	<p><i>Let's Investigate Estimating</i> by Marion Smoothey. Marshall Cavendish Corporation, 1995</p> <p><i>Larson Leapfrog Math</i>, Meridian Creative Group (software)</p>
Measurements	<p><i>Spaghetti and Meatballs for All!</i> By Marilyn Burns. Scholastic, 1997. Geoboards</p>
Probability, Statistics & Graph	Microsoft Works or Excel (graph survey results)

Suggested Teaching Strategies	Suggested Learning Strategies
<p>The teacher provides a “number-rich” environment:</p> <p>Numbers on display (charts, graphs, calendars)</p> <p>Collections of countable objects</p> <p>Books that tell number stories</p> <p>Tapes and CDs of number songs</p> <p>Other: _____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>Teacher Directed</p> <p>The teacher:</p> <p>Creates counting and estimating experiences and activities across the curriculum</p> <p>Provides manipulatives for student use (tangrams)</p> <p>Other: _____</p> <p>Cooperative</p> <p>Students:</p> <ul style="list-style-type: none"> • Participate in number games • Keep score in games • Work in cooperative teams or groups to collect and express data • Use flashcards <p>Other: _____</p> <p>Independent</p> <p>Students</p> <ul style="list-style-type: none"> • Use electronic devices to collect and illustrate data • Express specific quantities in written work <p>Other: _____</p>

Suggested Cross Curricular and Catholic Social Teaching Links

Grade Five

- ✚ Students create equations based on the calories found in different kinds of food and create menus that are nutritious. (Math, Health)
- ✚ Students will create and measure the effects of plans to conserve energy, reflecting an understanding of the call to be stewards of this earth. (Science, Math, Religion)

Notes:

Text/Resources:

	<p>Whole Numbers and Decimals</p> <p>Number Theory</p> <p>Fractions</p>	<p>numbers</p> <ul style="list-style-type: none"> • Use place value concepts, number patterns, the number line and the commutative, associative, and distributive properties to develop estimation and computation strategies • Select and apply the most suitable estimation strategy: rounding, clustering, front end (with adjustment), compatible numbers, compensation • Recognize place value patterns when multiplying and dividing <i>decimals</i> by powers of 10 • Use the distributive property [$10 \times (4+5) = (10 \times 5) + (10 \times 4)$] to estimate, multiply and divide multi-digit numbers by one-digit factors • Identify and use the inverse relationships of multiplication and division to solve and check problems Determine the proper operation to solve a problem and justify the reasoning • Locate, order and compare <i>decimals</i> on number lines, scales and the coordinate grid Multiply and divide <i>decimals</i> by <i>decimals</i> • Find all prime factors and write prime factorization of numbers • Represent numbers by using exponents • Change exponent form to standard numeral, write as repeated factors and vice versa • Use factors of composite numbers, powers of ten and divisibility rules to find products and missing factors • Memorize and apply the divisibility rules for 2, 3, 4, 5, 6, 8, 9, and 10 • Explain orally and in writing when a situation requires an exact answer or when an estimate is sufficient 	<p>To apply place value concepts and number properties to the addition, subtraction, multiplication and division of multi-digit numbers (NEO)</p> <p>To use factors to explore, represent and classify numbers (NEO)</p> <p>To model , identify and express equivalent forms of numbers expressed as whole numbers,</p>
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		<ul style="list-style-type: none"> • Locate, order and compare <i>fractions</i> on number lines, scales and the coordinate grid • Determine the decimal equivalents of <i>fractions</i> • Convert <i>fractions</i> to <i>decimals</i>, <i>decimals</i> to <i>fractions</i>, and <i>fractions</i> to <i>percents</i> • Change a fraction to a decimal using division • Write <i>fractions</i> as terminating and repeating <i>decimals</i> • Convert repeating <i>decimals</i> to <i>fractions</i> • Add and subtract <i>fractions</i>, whole numbers and mixed numbers using a variety of computational strategies • Subtract mixed numbers with renaming • Identify reciprocal numbers • Apply reciprocal numbers to division of a whole number by a fraction • Use models to divide whole numbers by <i>fractions</i> and <i>fractions</i> by whole numbers • Multiply and divide <i>fractions</i>, whole numbers and mixed numbers using a variety of computational strategies • Use cancellation in multiplication of <i>fractions</i> • Model and describe when products or quotients with <i>fractions</i> and <i>decimals</i> can yield a larger or smaller result than either factor • Write whole number division problems in fraction form and round the fraction form to estimate an answer to a division problem • Write division problems in fraction form • Express remainders in division as <i>fractions</i> 	<p><i>fractions</i> and mixed numbers (NEO)</p> <p>To use models, number lines, scales and a coordinate grid to represent and illustrate decimal numbers and to express them in equivalent forms (NEO)</p> <p>To add and subtract <i>fractions</i> and mixed numbers using models, pictures and number sentences (NEO)</p> <p>To use models and pictorial representations to develop concepts and methods by which to multiply and divide <i>fractions</i> and mixed numbers (NEO)</p>
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<p><u>Data Analysis, Statistics, and Probability (DSP)</u></p> <ul style="list-style-type: none"> I. Formulate questions that can be addressed with data; collect, organize, and display relevant data to answer them II. Collect, organize and display data using appropriate statistical and graphical methods. III. Select and use appropriate statistical methods to analyze data IV. Analyze data sets to form hypotheses and make predictions V. Understand and apply basic concepts of probability VI. Develop and evaluate inferences and predictions that are based on data VII. Understand and apply basic concepts of probability 			
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GRADE 6 VOCABULARY TERMS

Number Theory, Patterns, Estimation & Operations	Algebra	Geometry & Measurement	Data Analysis, Statistics, Probability
coordinate grid standard form scientific notation prime factorization exponent square root, squares radical ($\sqrt{\quad}$) properties rounding clustering front end estimation compatible numbers compensation powers of ten distributive property inverse algorithm equivalent <i>fractions</i> terminating/repeating <i>decimals</i> scales reciprocal rational numbers <i>percents</i> ratio proportion cross products ordered pairs rate unit rate integers, absolute value	arithmetic and geometric sequences linear variable function relation constants quadrant	polygons regular & irregular polygons quadrilateral pentagon hexagon octagon congruence radius diameter chord central angle nets protractor pi pyramids cylinders prism dilations intersecting center point line ray right angle line segment volume point degree angle perpendicular lines parallel lines triangles: isosceles, scalene, equilateral	Venn diagram frequency stem and leaf scatter plots outcomes outliers misleading data likely equally likely less likely probability survey mean median

STRATEGIES - GRADE 6

Suggested Teaching Strategies	Suggested Learning Strategies
<p>The teacher provides a “number-rich” environment:</p> <p>Numbers on display (charts, graphs, timelines)</p> <p>Books and activities that encourage mathematical thinking (<i>Sudoku, Sir Circumference series, Grandfather Tang, A Grain of Rice, The Librarian Who Measured the Earth, Anno</i>)</p> <p>Other: _____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>Teacher Directed</p> <p>The teacher:</p> <p>Creates counting and estimating experiences and activities across the curriculum (virtual or real shopping field trips that provide opportunities for students to apply math concepts to life experiences)</p> <p>Provides manipulatives for student use (<i>Two Color Counters, Hands on Equations, etc.</i>)</p> <p>Other: _____</p> <p>Cooperative</p> <p>Students:</p> <ul style="list-style-type: none"> • Create and participate in number games • Keep score in games • Work in cooperative teams or groups to collect and express data • Use flashcards • Math Fairs <p>Other: _____</p> <p>Independent</p> <p>Students</p> <ul style="list-style-type: none"> • Use electronic devices to collect and illustrate data • Express specific quantities in written work <p>Other: _____</p>

Suggested Cross Curricular and Catholic Social Teaching Links

Grade Six

- ✚ Students read *From the Mixed-Up Files of Mrs. Basil E. Frankweiler* and create proportions that measure the difference in the cost of subway fare, food, etc. described in the book with current day costs and make generalizations about the increase in the cost of living from the 1960's to the present. Online resources should be used. (Math, Language Arts)
- ✚ Students create a budget for a service project, such as providing a meal for a local soup kitchen. (Religion, Math)

Notes:

Text/Resources:

<p><u>Data Analysis, Statistics, and Probability (DSP)</u></p> <p>I. Formulate questions that can be addressed with data; collect, organize, and display relevant data to answer them</p> <p>II. Collect, organize and display data using appropriate statistical and graphical methods.</p> <p>III. Select and use appropriate statistical methods to analyze data</p> <p>IV. Analyze data sets to form hypotheses and make predictions</p> <p>V. Understand and apply basic concepts of probability</p> <p>VI. Develop and evaluate inferences and predictions that are based on data</p> <p>VII. Understand and apply basic concepts of probability</p>	<p>Stem-leaf & Box, Whisker Plots</p> <p>Estimation</p>	<ul style="list-style-type: none"> • Recognize that changes in a data set can affect the mode, median, mean, and range • Compare two sets of data based on their distributions and measures of central tendency • Analyze and interpret data using descriptive statistics, including range, mode, median, quartiles, outliers, and mean • Make predictions from scatter plots using or estimating a line-of-best-fit • Collect , organize, display, compare, and analyze large data sets • Construct a variety of data displays including box and whisker plots • Identify where measures of central tendency and dispersion are found in graphical displays • Develop, describe, and use a variety of ways to estimate and calculate with very large and very small numbers and connect the strategies to powers of ten • Use place value concepts, number patterns, the number line and the commutative, associative, and distributive properties to develop estimation and computation strategies • Estimate to predict outcomes and determine reasonableness of results and to describe whether an estimate is an over- or underestimate 	<p>conclusions (DSP)</p> <p>To collect and construct appropriate representations of data (DSP)</p> <p>To use place value concepts, number patterns and properties to develop and apply estimation and computation strategies to include negative numbers (NEO)</p>
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		<p>relationships</p> <ul style="list-style-type: none"> • Identify the x and y intercepts • Describe what a line will look like before it is graphed, i.e. if the line is in a positive or negative direction, and how steep the line should be by analyzing the slope • Solve linear equations for “y” given the linear equation in any other form • Determine the solutions of linear equations (0, 1, or an infinite number) • Identify and write the equation for a line in point-slope, slope-intercept and standard forms 	<p>To identify relationships that are linear and nonlinear and compare and contrast their properties using tables, graphs, equations and verbal descriptions (A)</p>
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<p>statistical and graphical methods.</p> <p>III. Select and use appropriate statistical methods to analyze data</p> <p>IV. Analyze data sets to form hypotheses and make predictions</p> <p>V. Understand and apply basic concepts of probability</p> <p>VI. Develop and evaluate inferences and predictions that are based on data</p> <p>VII. Understand and apply basic concepts of probability</p> <p>Algebra (A)</p> <p>I. Understand patterns, relations, and functions</p> <p>II. Represent and analyze mathematical situations and structures using algebraic symbols</p> <p>III. Represent and analyze quantifiable relationships in a variety of ways</p> <p>IV. Use algebraic symbols to determine equivalence and solve problems</p> <p>V. Use mathematical models to represent and understand quantitative relationships</p> <p>VI. Analyze change in various contexts</p>	<p>Graphs and Data Analysis</p>	<p>conclusions with evidence</p> <ul style="list-style-type: none"> • Identify trends and justify conclusions • Describe the role of random sampling, random number generation, and the effects of sample size on statistical claims <ul style="list-style-type: none"> • Distinguish between combinations and permutations as ways to predict possible outcomes in certain situations • Use combinations and permutations, trees, and networks (counting strategies) in a variety of contexts • Identify when order is irrelevant in determining a solution <ul style="list-style-type: none"> • Determine the nature of changes in linear relationships using graphs, tables, and equations • Describe in context how a change in one variable relates to a change in a second variable • Identify the independent and dependent variables in a given situation <ul style="list-style-type: none"> • Formulate questions, design surveys and samplings • Organize and analyze gathered data and defend the analysis • Organize and display data using graphical representations • Make and defend predictions based on patterns and trends • Use a matrix to organize and describe data 	<p>of a data set and justify conclusions (DSP)</p> <p>To analyze physical phenomena and patterns to identify relationships and make generalizations (A)</p> <p>To collect and construct appropriate representations of data (DSP)</p>
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Grades 7&8: QUARTER 4

STRANDS/ADH STANDARDS	TOPICS	ENABLING OUTCOMES	OBJECTIVES
<p>Geometry & Measurement (GM)</p> <p>I. Analyze characteristics and properties of two and three dimensional geometric shapes and develop mathematical arguments about relationships</p> <p>II. Use properties and characteristics of two-and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems</p> <p>III. Use spatial reasoning, location and geometric relationships to solve problems</p> <p>IV. Specify locations and describe spatial relationships using coordinate geometry and other representational systems</p> <p>V. Apply transformations and use symmetry to analyze mathematical situations</p> <p>VI. Use visualization, spatial reasoning, and geometric modeling to solve problems</p> <p>VII. Understand measurable attributes of objects and the units, systems, and processes of measurement</p> <p>VIII. Develop and apply appropriate techniques, tools and formulas to estimate and determine measurements</p> <p>IX. Apply appropriate techniques, tools and formulas to</p>	<p>Geometry</p>	<ul style="list-style-type: none"> • Identify which classes of polygons have line and/or rotational symmetry • Identify and classify angles as complementary or supplementary • Develop and use formulas to determine the volume of pyramids and cylinders • Calculate the surface area of a rectangular prism • Describe the effect of scale factors on the length, area, and volume ratios of similar polygons, circles, and solids • Make and test conjectures about the relationships among angles, sides, perimeters, and areas of congruent and similar polygons (Include the Pythagorean Theorem) • Verify the Pythagorean Theorem, using diagrams, concrete materials, and measurement • Apply the Pythagorean Theorem to find the missing length of a side of a right triangle when given the lengths of the other two sides • Draw and interpret nets, cross-sections, and front, side, and top views of various solids • Use rectangular grids to represent polygons and perform transformations (translations, rotations, reflections, and dilations) • Describe the effect of transformations on polygons with line and/or rotational symmetry • Construct similar polygons on coordinate grids • Describe the similarity of polygons as a result of dilations (reductions or enlargements) and their effects on measurements • Use spatial reasoning, location, and geometric relationships to solve problems • Apply transformations (rotate or turn, reflect or flip, 	<p>To describe and develop relationships between geometric properties of plane and solid figures (GM)</p> <p>To identify and generalize relationships between measurable attributes of plane and solid figures (GM)</p> <p>To identify, draw, and describe elements needed to explain spatial relationships (GM)</p>

<p>determine measurements</p> <p>X. Use numbers and their properties to estimate measures and quantities reasonably</p> <p>Algebra (A)</p> <p>I. Understand patterns, relations, and functions</p> <p>II. Represent and analyze mathematical situations and structures using algebraic symbols</p> <p>III. Represent and analyze quantifiable relationships in a variety of ways</p> <p>IV. Use algebraic symbols to determine equivalence and solve problems</p> <p>V. Use mathematical models to represent and understand quantitative relationships</p> <p>Analyze change in various contexts</p>	<p>Algebra</p>	<p>translate or slide, and dilate or scale) to geometric figures represented on a graph</p> <ul style="list-style-type: none"> • Identify applications of transformations, such as tiling, fabric design, art, and scaling • Develop and use formulas to determine the surface area of three-dimensional objects • Add and subtract polynomials • Multiply and divide monomials • Multiply a polynomial by a monomial • Multiply binomials • Simplify expressions involving powers of monomials and products and quotients of monomials • Determine the nature of changes in linear relationships using graphs, tables, and equations • Describe, analyze, and extend numeric, geometric and statistical patterns • Make generalizations about patterns and relationships and test those generalizations • Represent, extend, and compare geometric and numeric patterns using words, tables, graphs and equations • Analyze patterns and data to make predictions • Write recursive and explicit functions to generalize patterns • Recognize and solve problems of direct variation 	<p>To identify and generalize relationships between measurable attributes of plane and solid figures (GM)</p> <p>To solve problems using a variety of algebraic representations (A)</p> <p>To use tables, graphs, rules and words to investigate, describe, and analyze functional relationships in a variety of patterns (A)</p>
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Grades 7&8 Vocabulary

Number Theory	Algebra	Geometry	Data Analysis
absolute value exponential compatible numbers counting numbers equivalent fraction integers irrational numbers monomials negative exponents negative integers opposite integers percent of increase/decrease positive integers prime factors radical ($\sqrt{\quad}$) rational expressions rational numbers real numbers scientific notation similar figures square root terminating/repeating <i>decimals</i> unit fraction whole numbers	binomials constants direct variation domain equation/inequality expression explicit functions formulas functions functional notation grid independent/dependent variables inverse operations ordered pair patterns point slope polynomials properties: Commutative, Distributive, Associative range recursive functions relations rise over run ($\Delta y/\Delta x$) slope slope intercept system of equations variable xy-axis x and y intercepts	angles: acute, right, obtuse congruent diameter degree perpendicular lines parallel lines rotational symmetry triangle: isosceles, scalene, equilateral pentagon polygon Pythagorean Theorem quadrilateral radius protractor compass chord pi circumference	histograms stem and leaf plots Scatter plots outlier Venn diagram
Suggested Teaching Strategies		Suggested Learning Strategies	

<p>The teacher provides a “number-rich” environment:</p> <p>Numbers on display (charts, graphs, timelines)</p> <p>Books and activities that encourage mathematical thinking <i>(Sudoku, Sir Cumference series, Grandfather Tang, A Grain of Rice, The Librarian Who Measured the Earth, Anno, The Number Devil, The Tortoise and the Hare)</i></p> <p>Other: <hr/> <hr/> <hr/> <hr/></p>	<p>Teacher Directed</p> <p>The teacher:</p> <ul style="list-style-type: none"> • Creates counting and estimating experiences and activities across the curriculum • Uses student interest in sports, movies, music to develop math concepts and skills • Provides manipulatives for student use (<i>Two Color Counters, Hands on Equations, etc.</i>) <p>Other: _____</p> <p>Cooperative</p> <p>Students:</p> <ul style="list-style-type: none"> • Create and participate in number games • Keep score in games • Work in cooperative teams or groups to collect and express data • Use flashcards • Participate in math Fairs <p>Other: _____</p> <p>Independent</p> <p>Students</p> <ul style="list-style-type: none"> • Use electronic devices to collect and illustrate data • Express specific quantities in written work <p>Other: _____</p>
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Suggested Cross Curricular and Catholic Social Teaching Links

Grade Seven/Eight

- ✚ Students write about and calculate the cost of war, natural disasters, unemployment, etc., expressing an understanding that, as Catholic Christians, we are called to work globally and locally for justice. (Math, Social Studies, Science)
- ✚ Students create graphs describing the inequality of the consumption of the world's resources and design service projects that address local and global injustice. (Math, Religion, Science)

Notes:

Text/Resources:

ALGEBRA CURRICULUM

This one-year algebra course is designed to meet the requirements of the Archdiocese of Hartford high school Algebra I course. This traditional Algebra I course meets the expectations of the standards outlined by the National Mathematics Advisory Panel of the United States Department of Education and the National Council of Teachers of Mathematics. Based on the Archdiocesan Algebra I Placement Benchmark Assessment, students may be eligible to take this course during their eighth grade year.

The Archdiocesan Algebra I End-of-Course Assessment will be administered to all algebra students. Eighth grade students from any Archdiocesan middle school taking the Algebra I End-of-Course Assessment must pass the assessment with 85% proficiency, and achieve a class performance average of a B or higher in order to satisfy the Algebra I requirement in any of the four Archdiocese of Hartford high schools. This does not exempt students from taking the high school math placement test as this will best place the student in the appropriate level high school math course. Students who do not meet the proficiency requirement may be required to take an additional Algebra I course as a freshman to assure mastery of basic algebra skills. Students who take this course as a freshman in an Archdiocesan high school must meet the standards of passing as outlined in their respective high school.

This course is the culmination of an eight year mathematics program. It directly follows a rigorous pre-algebra course. It is expected that students who enter this course come with a strong conceptual foundation in fractions, ratios and proportional relationships, as well as an understanding in certain aspects of measurement and geometry. Mastery of real number operations and integer exponents and roots is required. Therefore, to ensure optimal student success in this course, a benchmark placement assessment will be administered to all end-of-year seventh graders as well as meet other established *criteria to determine eligibility for the eighth grade Algebra I course.

Technology is expected to be integrated in all traditional course work. This includes but is not limited to employing technological tools to assist in student formation of algebraic understandings and skills, as well as in assessing conjectures, creating graphs and data displays, and determining lines of fit for data. Testing with and without technological tools is recommended.

The **Algebra Curriculum** that follows provides the scope and sequence for the Algebra I course. Enabling Outcomes and Objectives are listed in sequential order and reflect the Archdiocesan Mathematics Curriculum Standards for Algebra I. Each skill should be taught using a variety of methods and applications so that students attain a deep understanding of these concepts. Every opportunity must be taken to integrate and connect the concepts of Algebra I to those learned in middle school mathematics and to other disciplines. The integration of real-world problem solving applications is an unstated requirement that infuses this curriculum to ensure quality and depth of understanding. *Students should be encouraged to be creative and innovative in their approach to problems, to be productive and persistent in seeking solutions, and to use multiple means to communicate their insights and understandings.* (Achieve, Inc., May, 2008)

ALGEBRA I

<u>STRANDS/ADH STANDARDS</u>	<u>TOPICS</u>	<u>ENABLING OUTCOMES</u>	<u>OBJECTIVES</u>
<p>I. Understand and describe patterns and functional relationships</p> <p>II. Represent and analyze quantitative relationships in a variety of ways</p> <p>III. Use operations, properties and algebraic symbols to determine equivalence and solve problems</p> <p>IV. Use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas, and solve problems</p> <p>V. Use spatial reasoning, location, and geometric relationships to solve problems</p> <p>VI. Develop and apply units, systems, formulas and appropriate tools to estimate and measure</p>	<p>I. FOUNDATIONS OF FUNCTIONS</p>	<p>The students will...</p> <ol style="list-style-type: none"> 1. Solve algebraic equations graphically, tabularly, and verbally 2. Recognize and use the properties of identity and equality 3. Use the Distributive, Commutative and Associative properties to evaluate and simplify expressions 4. Describe relationships and make generalizations about patterns and functions 5. Identify the characteristics of functions and relations, including domain and range 6. Make and justify predictions based on patterns 7. Use tables and graphs to measure and describe changes 8. Graph functions from ordered pairs 9. Determine whether a relation is a function 10. Find function values 11. Interpret and draw graphs of functions, e.g. scatter plots 12. Use functional notation to express algebraic relationships 13. Simplify expressions using order of operations 14. Write, evaluate, and simplify algebraic expressions and solve open sentences in a single variable (equations and inequalities) 15. Solve literal equations (e.g., Solve $P = 2L + 2W$ for "L") 	<p>To understand that a function represents a dependence of one quantity on another;</p> <p>To use properties and attributes of functions;</p> <p>To understand how algebra can be used to express generalizations, and to recognize the power of algebraic symbols to represent situations;</p> <p>To use necessary algebraic skills to simplify algebraic expressions, solve equations, and inequalities in problem situations.</p>

		<p>16. Use tables, graphs, and equations to represent mathematical relationships and solve real-world problems</p> <p>17. Solve absolute value equations and inequalities (also look at the graph)</p> <p>18. Multiply monomials</p> <p>19. Simplify expressions involving powers of monomials and products and quotients of monomials</p> <p>20. Introduce expressions containing zero and negative exponents (numbers, not variables)</p>	
<p>I. Understand and describe patterns and functional relationships</p> <p>II. Represent and analyze quantitative relationships in a variety of ways</p> <p>III. Use operations, properties and algebraic symbols to determine equivalence and solve problems</p> <p>IV. Use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas, and solve problems</p> <p>V. Use spatial reasoning, location, and geometric relationships to solve problems</p> <p>VI. Develop and apply units, systems, formulas and appropriate tools to estimate and measure</p>	<p>II. LINEAR FUNCTIONS</p>	<p>The students will...</p> <ol style="list-style-type: none"> 1. Solve compound inequalities and graph their solutions 2. Graph linear equations on an xy-axis 3. Describe the correlation, slope, and y-intercept of a given linear equation 4. Transform linear equations into slope-intercept form 5. Solve real world problems using linear equations 6. Determine the constant rate of change in a linear relationship and recognize this as the slope of a line 7. Compare and contrast the graphs of lines with the same slope versus those with different slopes 8. Use slope as the change in “y” over the change in “x” 	<p>To understand and interpret linear function graphically, analytically, tabularly, and verbally</p>

		<ol style="list-style-type: none"> 9. Interpret slope and y-intercepts from contextual situations, graphs, and linear equations 10. Write a linear equation from two points 11. Write equations of parallel and perpendicular lines 12. Recognize and solve problems of direct variation, including the use of tables and graphs to measure and describe changes 13. Write and use ratios, rates, and unit rates 14. Write and solve proportions, including percent problems 15. Graph absolute value equations 16. Interpret points on a scatter plot 17. Write lines of fit 	
	<p>III. SYSTEMS OF EQUATIONS</p>	<p>The students will:</p> <ol style="list-style-type: none"> 1. Determine the number of solutions of a system of linear equations (0, 1, or an infinite) 2. Find the solution to a system of two linear equations by using graphing, substitution and elimination 3. Solve real world problems involving systems of equations and inequalities 	<p>To write and interpret systems of linear equations in two variables</p>

	IV. QUADRATIC FUNCTIONS	<p>The students will...</p> <ol style="list-style-type: none"> 1. Use tables and graphs to measure and describe changes 2. Multiply polynomials 3. Factor polynomials using the Distributive Property (GCF) 4. Factor trinomials and perfect square trinomials 5. Solve quadratic equations by graphing, factoring, and using the quadratic formula (use calculator for irrational square roots) 6. Simplify, add, subtract and multiply radicals (revisit the quadratic formula and now simplify irrational square roots) 7. Solve simple radical equations 8. Solve problems that involve using the Pythagorean Theorem and distance formula 	<p>To understand and interpret quadratic function graphically, analytically, verbally, and numerically</p>
	V. OTHER NON-LINEAR FUNCTIONS	<p>The students will...</p> <ol style="list-style-type: none"> 1. Simplify expressions and solve equations involving exponents (revisit negative and zero exponent, now with variables) 2. Solve problems involving exponential growth or decay 3. Identify and interpret data with exponential behavior 4. Recognize, solve, and graph problems of indirect variation 5. Add, subtract, multiply, and divide simple rational expressions, including polynomials 6. Solve simple rational equations 	<p>To understand and apply laws of integral exponents</p> <p>To develop a basic understanding of rational functions</p>

<p>SUPPLEMENTAL</p>	<p>SUPPLEMENTAL GEOMETRY</p>	<p>The students will...</p> <ol style="list-style-type: none"> 1. Explore the effect of scale factors on the length, area and volume ratios of similar polygons, circles and solids and state these using variables and algebraic expressions 2. Make and test conjectures about the relationships among angles, sides, perimeters and areas of congruent and similar polygons including the Pythagorean Theorem 3. Determine whether a triangle is a right triangle 4. Determine whether two triangles are similar 5. Transform figures by using reflections, translations dilations and rotations 6. Transform figures on a coordinate plane using reflections, translations, dilations, and rotations 7. Recognize and extend geometric sequences 8. Use the Pythagorean Theorem to solve indirect measurement problems 9. Find unknown measures of sides of similar triangles 10. Define sine, cosine, and tangent ratios 11. Use trigonometric ratios to solve right triangles 	<p>To explore the relationships among sides, angles, perimeters, areas, surface areas and volumes of congruent and similar polygons and solids;</p> <p>To solve problems involving measurement through the use of appropriate tools, techniques, and strategies.</p>
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Nine - Twelve
Numerical and Proportional Reasoning
Number Theory, Estimation, and Operations

ARCHDIOCESAN STANDARDS/GOALS
<p>The students will:</p> <ul style="list-style-type: none"> I. Understand numbers, ways of representing numbers, relationships among numbers, and number systems II. Understand that a variety of numerical representations can be used to describe quantitative relationships III. Understand meanings of operations and how they relate to one another IV. Compute fluently and make reasonable estimates V. Use numbers and their properties to compute flexibly and fluently VI. Understand and describe patterns and functional relationships VII. Represent and analyze quantitative relationships in a variety of ways VIII. Use operations and properties to determine equivalence and solve problems <p>NCTM, 2000</p> <p>Connecticut Mathematics Curriculum Framework, 2005</p>

Student Objectives	Assessment/Content Notes
A. To represent numbers in expanded and regrouped forms in the base ten place value system and extend their understanding of numbers to include integers, rational numbers, real numbers and the set of complex numbers	<i>In this column relate student objectives to the resources you use (Text, websites, supplemental materials) and/or record notes about student performance.</i>
Enabling Outcomes	
<p>Core</p> <p>The student will:</p> <p>1. Locate, order, label and compare real numbers on number lines, scales, coordinate grids, and measurement tools</p>	Number Theory

<p>2. Select and use an appropriate form of a number (integer, fraction, decimal, ratio, percent, exponential, scientific notation, irrational) to solve practical problems involving order, magnitude, measures, labels, locations, and scales</p>	
<p>B. To interpret and represent large sets of numbers with the aid of technologies</p>	
<p>Core</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Develop, describe and use a variety of methods to estimate and calculate with very large numbers 2. Use technological tools such as spreadsheets, probes, computer algebra systems, and graphing utilities to organize and analyze large amounts of numerical information 	
<p>C. To use develop strategies for computation and estimation using properties of number systems to solve problems and investigate mathematical properties and operations related to objects that are not numbers</p>	
<p>Core</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Select and use appropriate methods for computing to solve problems in a variety of contexts 2. Solve problems involving scientific notation and absolute value 3. Develop and use a variety of strategies: <ul style="list-style-type: none"> o to estimate values of formulas, functions, and roots o to recognize the limitations of estimation o to judge the implications of the results <p>Extended</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Identify vectors and matrices as systems that have some of the properties of real numbers 2. Perform operations with complex numbers, matrices, determinants, and logarithms 	<p>Estimation</p> <p>Operations</p> <p>Proportion</p>
<p>D. To solve proportional reasoning problems</p>	
<p>Extended</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Use dimensional analysis to determine equivalent rates 2. Solve problems using direct and inverse variation 	

**Grades Nine - Twelve
Algebraic Reasoning
Patterns and Functions**

ARCHDIOCESAN STANDARDS/GOALS
<p>The students will:</p> <ul style="list-style-type: none"> I. Understand patterns, relations, and functions II. Represent and analyze mathematical situations and structures using algebraic symbols III. Represent and analyze quantifiable relationships in a variety of ways IV. Use algebraic symbols to determine equivalence and solve problems V. Use mathematical models to represent and understand quantitative relationships VI. Analyze change in various contexts <p>NCTM, 2000</p> <p>Connecticut Mathematics Curriculum Framework, 2005</p>

Student Objectives	Assessment/ContentNotes
A. To analyze physical phenomena, functions, and patterns to identify and describe relationships and make generalizations about patterns and functions.	
Enabling Outcomes	
<p>Core</p> <p>The student will:</p> <ul style="list-style-type: none"> 1. Write recursive and explicit functions to generalize patterns 2. Use a table, graph, or spreadsheet to evaluate algebraic expressions 3. Recognize and use the properties of identity and equality 4. Use the Distributive, Commutative and Associative properties to evaluate and simplify expressions and solve linear problems 5. Describe relationships and make generalizations about patterns and functions 	Patterns, Functions & Operations

<p>6. Identify the characteristics of functions and relations, including domain and range</p> <p>7. Describe and compare properties and classes of linear, quadratic, and exponential functions</p> <p>Extended</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Describe and compare properties and classes of functions, including exponential, polynomial, rational, logarithmic and trigonometric 2. Analyze relations in a problem to determine possible functions that could model the situation 3. Explore conic sections and their applications graphically and symbolically 4. Use optimization strategies, including linear programming 5. Apply the concepts of limits to sequences and asymptotic behavior of functions 	
<p>B. To generalize mathematical situations and patterns with algebraic expressions, equations and inequalities</p>	
<p>Core</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Solve compound inequalities and graph their solutions 2. Evaluate expressions with exponents 3. Evaluate expressions with square roots 4. Find squares of sums and differences 5. Solve absolute value equations and inequalities 6. Identify, describe, create and generalize numeric, geometric and statistical patterns with tables, graphs, words and symbolic rules 7. Make and justify predictions based on patterns 8. Write an equation given some of the solutions 	
<p>C. To identify relationships that are linear and nonlinear and compare and contrast their properties using tables, graphs, equations and verbal descriptions</p>	
<ol style="list-style-type: none"> 1. Use tables and graphs to measure and describe changes 2. Graph linear equations on an xy-axis 	

<ol style="list-style-type: none"> 3. Graph functions from ordered pairs 4. Determine whether a relation is a function 5. Find function values 6. Interpret and draw graphs of functions 7. Describe what a line will look like before it is graphed, i.e. if the line is in a positive or negative direction, and how steep the line should be by analyzing the slope 8. Solve linear equations for “y” given the linear equation in any other form 9. Determine the solutions of linear equations (0, 1, or an infinite number) 10. Use functional notation to express algebraic relationships 	
<p>D. To describe the effects of characteristics of linear relationships on the way the relationships are represented verbally and in tables, graphs and equations</p>	
<p>Core</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Use a spreadsheet to generate number sequences 2. Recognize, extend and write formulas for arithmetic sequences 3. Simplify expressions using order of operations 4. Classify numbers within the real number system 5. Use algebra tiles to solve linear equations 6. Graph exponential functions 7. Graph quadratic functions 	
<p>E. To solve problems using various algebraic methods, formulas, and properties</p>	
<p>Core</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Write and evaluate algebraic expressions and solve open sentences 2. Solve real world problems using linear equations 3. Solve quadratic equations 4. Solve equations involving perfect squares 	

<ol style="list-style-type: none"> 5. Solve problems with exponential growth or decay 6. Solve problems using the Pythagorean Theorem 7. Solve quadratic equations by graphing, finding the square root, completing the square 8. Solve quadratic equations by using the quadratic formula 9. Eliminate extraneous solutions 10. Use dimensional analysis with multiplication and division 11. Recognize and solve problems of direct variation 12. Solve problems of inverse variation <p>Extended</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Identify, create, and solve practical problems involving inverse variation and a combination of direct and inverse variations 	
<p>F. To develop numerical representations to describe quantitative relationships using the appropriate symbolic form</p>	
<p>Core</p> <p>The student will:</p> <ol style="list-style-type: none"> 2. Graph rational numbers on a number line 3. Find absolute values of rational numbers 4. Simplify rational expressions 5. Multiply and divide rational expressions 6. Add and subtract rational expressions with like and unlike denominators 7. Solve rational equations 8. Simplify mixed expressions and complex <i>fractions</i> 9. Find prime factorizations of integers and monomials 10. Find GCF of integers and monomials 11. Factor polynomials using the Distributive Property 12. Factor trinomials and perfect square trinomials 13. Simplify radical expressions using the Product Property of Square Roots and the Quotient Property of Square Roots 14. Add, subtract, and multiply radical expressions 15. Solve radical equations 	<p>Numerical and Algebraic Reasoning And Quantitative Relationships</p>

G. To represent and analyze linear and non-linear functions and relations symbolically and with tables and graphs	
<p>Core</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Determine the constant rate of change in a linear relationship and recognize this as the slope of a line 2. Compare and contrast the graphs of lines with the same slope versus those with different slopes 3. Use slope as rise over run 4. Interpret slope and y-intercepts from contextual situations, graphs, and linear equations 5. Given two linear relationships in context, identify a common solution 6. Find the inverse of a relation 7. Use an equation to determine the range for a given domain 8. Graph inverse variation 9. Identify an appropriate symbolic representation for a function or relation displayed graphically or verbally 10. Evaluate and interpret the graphs of linear, exponential and polynomial functions 11. Represent functions and relations on the coordinate plane 	
H. To relate the behavior of functions and relations to specific parameters and determine functions to model practical situations	
<p>Extended</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Relate the graphical representations of a function to its function family and find equations, intercepts, maximum or minimum values, asymptotes and line of symmetry for that function 2. Recognize the effect of changes in parameters on the graphs of functions or relations 3. Recognize that the slope of the tangent line to a curve represents the rate of change 4. Represent functions and relations with polar coordinates and in the complex plane 	
I. To manipulate equations, inequalities and functions to solve problems	

<p>the student will:</p> <ol style="list-style-type: none"> 1. Solve equations in one variable that contain absolute value expressions 2. Determine equivalent representations of an algebraic equations or inequality to simplify and solve problems 3. Solve multi-step equations using algebraic properties 4. Solve systems of inequalities by graphing 5. Write, graph and solve problems as variation equations 6. Graph inequalities on the coordinate plane 7. Find the difference between two points on the coordinate plane 8. Solve real world problems involving linear inequalities 9. Solve systems of equations by using elimination with addition, subtraction, and multiplication 10. Solve systems of equations by graphing 11. Solve real world systems of equations problems 12. Use a graphing calculator to investigate graphs of inequalities 13. Use tables, graphs, and equations to represent mathematical relationships and solve real-world problems 14. Multiply monomials 15. Simplify expressions involving powers of monomials and quotients of monomials 16. Simplify expressions containing negative exponents 17. Express numbers in scientific and standard notation 18. Multiply and divide numbers expressed in scientific notation 19. Solve problems involving polynomials, binomials, and monomials 20. Solve equations involving polynomials 21. Multiply polynomials and binomials 	<p>Operations, Properties, And Algebraic Symbols</p>
<p>J. To use and extend algebraic concepts to include real and complex numbers, vectors and matrices</p>	
<p>Extended</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Determine equivalent representations of an algebraic equation or inequality to simplify and solve problems 2. Combine, compose and invert functions 3. Use logarithms, vectors and matrices to solve problems 	

**Grades Nine – Twelve
Geometry and Measurement**

ARCHDIOCESAN STANDARDS/GOALS

The students will:

- I. Analyze characteristics and properties of two and three dimensional geometric shapes and develop mathematical arguments about relationships
- II. Use properties and characteristics of two-and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems
- III. Use spatial reasoning, location and geometric relationships to solve problems
- IV. Specify locations and describe spatial relationships using coordinate geometry and other representational systems
- V. Apply transformations and use symmetry to analyze mathematical situations
- VI. Use visualization, spatial reasoning, and geometric modeling to solve problems
- VII. Understand measurable attributes of objects and the units, systems, and processes of measurement
- VIII. Develop and apply appropriate techniques, tools and formulas to estimate and determine measurements
- IX. Apply appropriate techniques, tools and formulas to determine measurements
- X. Use numbers and their properties to estimate measures and quantities reasonably

NCTM, 2000

Connecticut Mathematics Curriculum Framework, 2005

Student Objectives	Assessment/Content Notes
A. To describe and develop relationships between plane and solid geometric figures using geometric models, constructions, and tools	
Enabling Outcomes	
<p>Core</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Use models and constructions to make, test and summarize conjectures involving properties of geometric figures 2. Use geometric properties to solve problems in two and three dimensions 	Plane and Solid Figures

<p>3. Determine and compare properties of classes of polygons</p>	
<p>B. To develop and evaluate mathematical arguments using reasoning (deductive and inductive) and proof, and make, test, and validate geometric conjectures.</p>	
<p>Core</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Recognize the validity of an argument 2. Create logical arguments to solve problems and determine geometric relationships <p>Extended</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Recognize the relationships between a conditional statement and its converse, inverse, and contrapositive 2. Test the validity of logical arguments 3. Use deductive arguments, including direct and indirect proofs, to develop an understanding of an axiomatic approach to geometry 	
<p>C. To explore non-Euclidean geometries</p>	
<p>Extended</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Recognize that the familiar geometry of Euclid is based on a particular set of axioms and that a different set of axioms would lead to a different geometry 	
<p>D. To use algebra and a variety of coordinate systems and transformations to verify geometric relationships and to solve geometric problems in two- and three-dimensions using appropriate tools and technologies</p>	

<p>Core</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Interpret geometric relationships using algebraic equations and inequalities, and vice versa 2. Describe how a change in measurement of one of more parts of a polygon or solid may affect its perimeter, area, surface area and volume and make generalizations for similar figures. 3. Apply transformations to plane figures to determine congruence, similarity, symmetry, and tessellations <p>Extended</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Visualize three-dimensional objects from different perspectives and analyze cross-sections, surface area and volume 2. Use Cartesian, navigational, polar, and spherical systems to represent, analyze and solve geometric and measurement problems 3. Represent translations, reflections, rotations, and dilations of plane figures using sketches, coordinates, vectors, function notation, and matrices to examine the effect of transformation and their composites and to solve related geometric problems 	<p>Spatial Reasoning, Location, and Geometric Relationships</p>
<p>E. To solve a variety of problems involving one-, two-, and three-dimensional measurements using geometric relationships and trigonometric ratios</p>	
<p>Core</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Select appropriate units, scales, degree of precision, and strategies to determine length, angle measure, perimeter, circumference and area of plane geometric figures 2. Use indirect methods, including the Pythagorean Theorem, trigonometric ratios and proportions in similar figures, to solve a variety of measurement problems 3. Judge the reasonableness of answers to direct and indirect measurement problems 4. Use two-dimensional representations and formal and informal methods to solve surface area and volume problems 	<p>Units Systems Formulas Tools</p>

<p>F. To approximate measurements that cannot be directly determined with some degree of precision using appropriate tools, techniques, and strategies</p>	
<p><i>Extended</i></p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Use successive approximation, upper and lower bound, and limits to solve measurement problems 2. Use properties of similarity and techniques of trigonometry to make indirect measurements of lengths and angles to solve a variety of problems 	

**Grades Nine – Twelve
Data Analysis, Statistics, and Probability**

ARCHDIOCESAN STANDARDS/GOALS

The students will:

- I. Formulate questions that can be addressed with data; collect, organize, and display relevant data to answer them
- II. Collect, organize and display data using appropriate statistical and graphical methods.
- III. Select and use appropriate statistical methods to analyze data
- IV. Analyze data sets to form hypotheses and make predictions
- V. Understand and apply basic concepts of probability
- VI. Develop and evaluate inferences and predictions that are based on data
- VII. Understand and apply basic concepts of probability

NCTM, 2000

Connecticut Mathematics Curriculum Framework, 2005

Student Objectives	Assessment/Content Notes
A. To collect and construct appropriate visual or graphical representations of real data using appropriate tools, technology, and strategies.	
Enabling Outcomes	
<p>Core</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Collect real data and create meaningful graphical representations of the data 2. Develop, use and explain applications and limitations of linear and nonlinear models and regression in a variety of contexts 	Graphs and Data Analysis

<p>Extended</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Investigate and solve relevant problems by designing statistical experiments and collecting, organizing, displaying and analyzing data in tabular, graphical, and symbolic forms. 2. Apply and defend regression models for bivariate data and use them to formulate predictions 3. Recognize the limitations of mathematical models based on sample data as representations of real life situations 	
<p>B. To analyze real world problems using statistical techniques and describe and analyze sets of data using statistical models</p>	
<p>Core</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Estimate an unknown value between data points on a graph (interpolation) and make predictions of extending the graph (extrapolation) 2. Use data from samples to make inferences about a population and determine whether claims are reasonable or false 3. Determine and use measures of spread and central tendency to describe and compare sets of data <p>Extended</p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Determine statistical measures to describe univariate data 2. Describe characteristics of sampling methods and analyze the effects of random versus biased samplings 	
<p>C. To understand and apply the principles of probability in a variety of situations</p>	
<p>Core</p> <p>The student will :</p>	<p>Probability</p>

<ol style="list-style-type: none"> 1. Determine outcomes and solve problems involving the probabilities of events 2. Explore the concepts of conditional probability in real life contexts 3. Apply theoretical and experimental probabilities appropriately to solve problems and predict experimental results 	
<p>D. To solve problems using the methods of discrete mathematics</p>	
<p><i>Extended</i></p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Understand and use permutations, combinations, recursion, and mathematical induction to solve problems 2. Solve problems using finite graphs 	
<p>E. To make statistical inferences through the use of probability</p>	
<p><i>Extended</i></p> <p>The student will:</p> <ol style="list-style-type: none"> 1. Explore the characteristics and applications of the normal distribution and standardized scores 2. Construct and interpret confidence intervals 3. Explore a variety of statistical tests, such as chi-squares and t-tests and explain the meaning of hypothesis testing 4. Use relative frequency and expected values to represent and solve problems involving uncertainty 	

Grade Nine-Twelve Vocabulary

The student will use correct math terms in core level activities. These terms should include, but are not limited to:


Numerical & Proportional Reasoning	Algebraic Reasoning	Geometry and Measurement	Data Analysis, Statistics, Probability
absolute value	absolute value	axiom	biased sampling
coordinate grid	axis	Cartesian	central tendency
complex numbers	axis of symmetry	congruence	combinations
direct and inverse	base	conditional, converse, inverse, and contrapositive	extrapolation
exponential	binomial	statements	finite graphs
formulas	coefficient	cross-section	interpolation
functions	composite	deductive and inductive reasoning	linear
irrational number	congruent	deductive and inductive reasoning	mathematical induction
logarithm	constant	navigational	nonlinear
magnitude	difference of squares	polar	permutations
matrices	decay	Pythagorean Theorem	random samplings
order	degree	similarity	recursion
probe	direct and indirect variables	spherical	regression models
scientific notation	discriminate	symmetry	spread
spreadsheet	domain	surface area	
	exponent	tessellation	
	exponential growth	transformations	
	evaluate	trigonometric ratios and proportions	

	<p>function</p> <p>independent variable</p> <p>intercept</p> <p>inverse</p> <p>inverse operations</p> <p>irrational numbers</p> <p>rational numbers</p> <p>like/unlike terms</p> <p>linear</p> <p>maximum</p> <p>minimum</p> <p>monomial</p> <p>numerical expression</p> <p>order of operations</p> <p>ordered pairs</p> <p>polynomial</p> <p>prime factorization</p> <p>Pythagorean Theorem</p> <p>quadratic equation</p> <p>quadratic formula</p> <p>range</p> <p>radical</p>	<p>volume</p>	
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	radical expressions rational expression real numbers root/solution simplify slope square of a sum standard form of a line variable vertex trinomial		
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Suggested Cross Curricular and Catholic Social Teaching Links

Grade Nine - Twelve


 Students create graphs describing the inequality of the consumption of the world's resources and design service projects that address local and global injustice. (Math, Religion, Science)

Notes

Text/Resources

LESSON STRUCTURE SAMPLE

5 - 10 minutes	<u>Connections to Prior Knowledge</u> Review previous objective Mental math/Mixed computational review (oral or written) Homework assignment correction (not necessary to do every example; not scored for formal grade)
15-20 minutes	<u>Concept/Skill Development</u> Introduce daily objective Keep the class active Use discovery where possible Relate to problem solving application/authentic application
10 - 15 minutes	<u>Flexible Grouping</u> Differentiated assignments are given* Allow students assigned practice or enrichment to begin on their own Work with the small group of students who need re-teaching or remediation**
5 minutes	<u>Closing</u> Review daily objective Assign homework if applicable

* Use the worksheets provided in the teacher resource kit for practice, enrichment, and re-teaching. Students are each challenged at their own ability level. ** The identification of students for flex grouping is accomplished during the lesson by observation of student responses and written work.

Table I
Roman Numerals



I	II	III	IV	V	VI	VII	VIII	IX	X
1	2	3	4	5	6	7	8	9	10
V	X	XV	XX	XXV	XXX	XXXV	XL	XLV	L
5	10	15	20	25	30	35	40	45	50
X	XX	XXX	XL	L	LX	LXX	LXXX	XC	C
10	20	30	40	50	60	70	80	90	100
C	CC	CCC	CD	D	DC	DCC	DCCC	CM	M
100	200	300	400	500	600	700	800	900	1000

To find the Roman numeral:

ADD:

* if the letter is repeated

$$II = 1 + 1 = 2$$

$$XXX = 10 + 10 + 10 = 300$$

* if a letter with a smaller value comes *after* a letter

with a larger value

$$XVI = 10 + 5 + 1 = 16$$

$$DCV = 500 + 100 + 5 = 605$$

SUBTRACT:

* if a letter with a smaller value comes *before* a letter

with a larger value

$$XC = 100 - 10 = 90$$

$$CM = 1000 - 100 = 900$$

A LETTER IS NEVER REPEATED MORE THAN THREE TIMES.

Sometimes you must both add and subtract: $CMXCIV = (1000 - 100) + (100 - 10) + (5 - 1) = 994$

Table II

OPERATIONS WITH INTEGERS

Addition of Integers

Like signs

find the sum

use the sum of the addends

$$^{-}5 + ^{-}10 = ^{-}15$$

Unlike signs

Find the difference

Use the sign of the addend having the greater absolute value

$$^{+}10 + ^{-}7 = ^{+}3$$

Subtraction of Integers

The same as adding the opposite of the subtrahend

$$^{+}5 - ^{+}10 = ^{+}5 + ^{-}10 = ^{-}5$$

Multiplication of Integers

Like signs

Product is positive

$$^{-}7 \times ^{-}5 = ^{+}35$$

Unlike signs

Product is negative

$$^{+}4 \times ^{-}6 = ^{-}24$$

Division of Integers

Like signs

Quotient is positive

$$+20 / +4 = +5$$

Unlike signs

$$-45 / +5 = -9$$

Table III

Properties of Integers**Property****Algebraic Example****Opposites:**

$$x + (-x) = 0$$

The sum of any number and its opposite is zero.

Zero Property of Addition:

$$x + 0 = x$$

The sum of any number and zero is equal to the number.

One Property:

$$(x) (+1) = x$$

The product of any number and one is equal to the number.

Commutative Property:

$$x + y = y + x$$

Changing the order of the addends or factors does not change the sum or product.

Associative Property:

$$(x+y) + z = x + (y+z)$$

Changing the grouping of addends
or factors, does not change the
sum or product.

Distributive Property:

$$x(y + z) = xy + xz$$

Multiplying a sum by a number is
the same as multiplying each addend
by the number and then adding.

Table IV

COMMON PERCENT EQUIVALENTS



$25\% = 1/4$

$12\ 1/2\% = 1/8$

$50\% = 1/2$

$37\ 1/2\% = 3/8$

$75\% = 3/4$

$62\ 1/2\% = 5/8$

$10\% = 1/10$

$87\ 1/2\% = 7/8$

$20\% = 1/5$

$16\ 2/3\% = 1/6$

$30\% = 3/10$

$33\ 1/3\% = 1/3$

$40\% = 2/5$

$66\ 2/3\% = 2/3$

$80\% = 4/5$

$83\ 1/3\% = 5/6$

$60\% = 3/5$

$9\ 1/11\% = 1/11$

$15\% = 3/20$

$11\ 1/9\% = 1/9$

$5\% = 1/20$

$14\ 2/7\% = 1/7$

$1\% = 1/100$

$6\ 1/4\% = 1/16$

$1/2\% = 1/200$

$8\ 1/3\% = 1/12\ 2\% = 1/50$

$4\% = 1/25$

Table V

Common Measures

Time

60 seconds (s) = 1 minute (min)	52 weeks = 1 year
60 minutes = 1 hour (h)	365 days = 1 year
24 hours = 1 day (d)	366 days = 1 leap year
7 days = 1 week (wk)	100 years = 1 century (cent.)
12 months (mo) = 1 year (y)	

Metric Units

Length

1000 millimeters (mm) = 1 meter (m)
100 centimeters (cm) = 1 meter
10 decimeters (dm) = 1 meter
10 meters = 1 dekameter (dam)
100 meters = 1 hectometer (hm)
1000 meters = 1 kilometer (km)

Capacity

1000 milliliters (mL) = 1 liter (L)
100 centiliters (cL) = 1 liter
10 deciliters (dL) = 1 liter
10 liters = 1 dekaliter (daL)
100 liters = 1 hectoliter (hL)
1000 liters = 1 kiloliter (kL)

Mass

1000 milligrams (mg) = 1 gram (g)	10 grams = 1 dekagram (dag)
100 centigrams (cg) = 1 gram	100 grams = 1 hectogram (hg)
10 decigrams (dg) = 1 gram	1000 grams = 1 kilogram (kg)
1000 kg = 1 metric ton (t)	

Customary Units

Length

12 inches (in.) = 1 foot (ft)
3 feet = 1 yard (yd)
36 inches = 1 yard
5280 feet = 1 mile (mi)
1760 yards = 1 mile

Capacity

8 fluid ounces (fl oz) = 1 cup (c)
2 cups = 1 pint (pt)
2 pints = 1 quart (qt)
4 quarts = 1 gallon (gal)

Weight

16 ounces (oz) = 1 pound (lb)	2000 pounds = 1 ton (T)
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Table VI

Mathematical Symbols

=	is equal to	\overleftrightarrow{AB}	line AB
\neq	is not equal to	\overline{AB}	segment AB
<	is less than	\overrightarrow{AB}	ray AB
>	is greater than	$\angle ABC$	angle ABC
\approx	is approximately equal to	ABC	plane ABC
...	continues without end	\sim	is similar to
+	plus	\cong	is congruent to
-	minus	\parallel	is parallel to
\times	times	\perp	is perpendicular to
\div	divided by	π	pi
\$	dollars	cm^2	square centimeter
¢	cents	in.^3	cubic inch
%	percent	$^\circ$	degree
$0.\overline{3}$	$0.333\dots$ (repeating decimals)	$2 : 3$	two to three (ratio)
(3, 4)	ordered pair	$P(E)$	probability of an event
.	decimal point		

Glossary of Terminology

Standard	Primary instructional target that identifies what a student should know and be able to do by graduation of high school. Archdiocesan standards are aligned directly National Standards and cross-referenced with the CT Framework.
Strand	A discrete concept unit of teaching. These are not necessarily arranged in a sequential teaching order.
Student Objective	Primary tasks stated in student learning terms that are measured by means of a summative assessment, and should be mastered by students as a result of instruction of enabling outcomes. These are specifically aligned with Archdiocesan standards and are subsets of each strand.
Enabling Outcome	Specific skill that supports mastery of student objectives. These are suggestions for lesson planning that describe how a daily learning objective will be taught. They measured formatively on a daily basis.
Daily Learning Objective	Teacher developed daily objectives that outline what a student is to be taught on a given day on a given subject.
Core	An essential student learning objective that is to be newly introduced. It implies an ability to recognize and work with the skill or concept.
Extended/Mastery	A student learning objective that builds upon the same concept or skills introduced in a preceding grade. Extended implies an ability to recognize, gain a clear understanding of, work successfully with, and apply the skill or concept with few errors. Not every student in a class will achieve mastery for each objective.

Sharing Catholic Social Teaching Selected Resources
Background for Teachers and Reading
Materials for Older Students

- Compendium of the Social Doctrine of the Church (Pontifical Council for Justice and Peace; Order through USCCB, 1/800-235-8722). Provides a complete and systematic overview of the Church’s social teaching with an extensive index for easy reference on almost any topic.
- A Place at the Table: A Catholic Recommitment to Overcome Poverty and to Protect the Dignity of All God’s Children (USCCB, 1/800-235-8722). The U.S. bishops remind us that central to our identity as disciples of Jesus Christ is our concern for those who are poor or suffering.
- Faithful Citizenship: A Catholic Call to Political Responsibility (USCCB, 1/800/235-8722) The 2003 bishops’ statement includes Church teaching about civic participation, as well as the Church’s position on a range of issues.
- The Challenge of Faithful Citizenship (USCCB, 1/800/235-8722) This two-color brochure summarizes the bishops’ statement, Faithful Citizenship: A Catholic Call to Political Responsibility and includes “Question for the Campaign” for voters and candidates.
- Sharing Catholic Social Teaching: Challenges and Directions (USCCB, 800/235-8722) A statement of the U.S. bishops urging that Catholic social teaching be incorporated into every Catholic educational program. Identifies seven key themes of Catholic social teaching.
- A Leader’s Guide to Sharing Catholic Social Teaching (USCCB, 800/235-8722) Step-by-step process to help catechetical leaders and other adults explore Catholic social teaching. Includes camera-ready handouts.
- Leaven for the Modern World: Catholic Social Teaching and Catholic Education (National Catholic Education Association, 202/337-6232) A resource designed to help educators at the secondary level deepen their understanding of Catholic social teaching and explore ways to share it with young people.
- Everyday Christianity: To Hunger and Thirst for Justice (USCCB, 202/835-8722) The most important way lay Catholics work for justice and peace is through their choices and actions every day.
- Brothers and Sisters to Us/Nuestros Hermanos y Hermanas (USCCB, 800/235-8722) The U.S. bishops promote discussion and action against racism.
- The Challenge of Peace (USCCB, 800/235-8722) U.S. bishops’ landmark pastoral on nuclear weapons and the arms race.

- Living the Gospel of Life: A Challenge to American Catholics (USCCB, 800/235-8722) Calls U.S. Catholics to recover their identity as followers of Jesus Christ and to be leaders in the renewal of U.S. respect for the sanctity of life.
- Sharing the Light of Faith: An Official Commentary (USCCB, Department of Education, 800/235-8722) Chapter VII explores Catholic social teaching and guidelines on catechesis for social ministry.
- Confronting a Culture of Violence: A Catholic Framework for Action (USCCB, 800/235-9722) This statement recognizes programs in dioceses, parishes and schools across the country.
- Economic Justice for All: Pastoral Letter on Catholic Social Teaching and the U.S. Economy by the U.S. bishops (USCCB, 800/235-8722) Resources such as posters and suggestions for using the pastoral letters in the classroom.
- Renewing the Earth (National Catholic Rural Life Conference, 515/270-2634) Study guides for children, teens and adults on the bishops' environment statement. Materials for Classroom and Small Groups
- In the Footsteps of Jesus: Resource Manual on Catholic Social Teaching (USCCB, 800/253-8722) Provides background reading, lesson plans for all ages, camera-ready resource, and other tools. Designed to be used with the video, *In the Footsteps of Jesus*.
- From the Ground Up: Teaching Catholic Social Principles in Elementary Schools (National Catholic Education Association, 202/337-6232) A faculty preparation guide that includes a process for faculty development and sample activities for sharing the seven key themes of Catholic social in grades K through 8.
- Excerpts from Sharing Catholic Social Teaching (USCCB, 800/253-8722) An easy to distribute card summarizing the seven themes of Catholic social teaching. Also available as a poster.
- Making a Place at the Table (USCCB, 1/800235-8722) A brief, compelling, four-panel brochure summarizing the bishops' statement on poverty.

- That's Not Fair! (Tom Turner, Bishop Sullivan Center, 816-231-0984) A complete kit with exercises and handouts to teach middle school students about Catholic social doctrine, culminating in an advocacy/lobbying project on a social justice issue.
- Lesson Plans on Poverty (www.povertyusa.org). Lesson plans for grades K-12 and adults developed by the Catholic Campaign for Human Development.
- A Catholic Framework for Economic Life (USCCB, 800/235-8722) A card containing ten key principles of Catholic social teaching on economic life.
- Catholic Call to Justice: An Activity Book for Raising Awareness of Social Justice Issues (www.usccb.org/CCHD) A lesson plan designed for ages 14-22 to experience through an obstacle course the major themes of Catholic social teaching.
- Teaching Resources on Sweatshops & Child Labor (Archdiocese of Newark, 973-497-4000) A complete kit including video, background materials, and classroom exercises and handouts to help educators teach about sweatshops and child labor.
- Integrating Catholic Social Teaching in the High School Curriculum: English and Religion (University of St. Thomas, 651-962-5712) A curriculum resource developed by Catholic high school educators.
- Building God's Kingdom: Implementing Catholic Social Teaching—Resources and Activities for Grades K – 12 (Religious Education Dept., Diocese of Toledo, 419/244-6711) Resources for schools and religious education programs.
- A Good Friday Appeal to End the Death Penalty (USCCB, 800/235-8722) A brochure containing the U.S. bishops' 1999 statement urging abolition of the death penalty.
- Sharing the Tradition, Shaping the Future (Catholic Campaign for Human Development, 800/541-3212). A small group workbook on seven themes of Catholic social teaching.
- Educating for Peace and Justice: Religious Dimensions, Grades 7-12 and Grades K-6 by James McGinnis (Institutes for Peace and Justice, 314/533-4445)
- Food Fast (Catholic Relief Services, 800/222-0025) Free materials include a detailed coordinator's manual with an outline for a 24-hour fast and activities that can be used in a classroom setting to explore issues of hunger and poverty.

- Math for a Change/Math for a World that Rocks (Mathematical Teachers' Association, 847/827-1361) Two booklets that use situations of injustice to apply or illustrate mathematics for grades 8-12.
- Offering of Letters Kit and other resources (Bread for the World, 301/608-2400)
- Operation Rice Bowl (Catholic Relief Services, 800/222-0025) Lenten program of fasting, education, almsgiving and prayer. The free materials include a video and religious educator's guide.
- Videos *In the Footsteps of Jesus* (USCCB, 800/235-8722) Part I (9 minutes): A compelling overview of seven key themes of Catholic social teaching. Part II (19 minutes): A more in-depth illustration of the seven themes highlighting people who have lived them.
- Faithful Citizenship (USCCB, 800/235-8722) Great for small groups and classes, an appealing video message about the Catholic tradition of political responsibility.
- Global Solidarity (USCCB, 800/235-8722) The U.S. bishops' message of solidarity with our brothers and sisters throughout the world.
- Sisters and Brothers Among Us (Catholic Campaign for Human Development, 202/541-3212) A 16-minute video that tells the story of poverty through the faces and voices of the poor.

Web Sites –

- www.usccb.org/sdwp -- The USCCB Department of Social Development and World Peace website—background information and action alerts on a variety of domestic and international issues, as well as general information on educating for justice and political responsibility.
- www.usccb.org/faithfulcitizenship --Provides statements from the U.S. bishops and a wide range of resources, including lesson plans for all ages on Faithful Citizenship, Solidarity, Human Dignity, and the Option for the Poor.
- www.catholicrelief.org/what/advocacy--Up-to-date information on international public policy issues and how you and your students can act.
- www.catholiccharitiesusa.org/programs/advocacy ---Up-to date information on domestic public policy issues and how you and your students can act. Includes a special section for children/youth and for teachers and catechists.
- www.povertyusa.org --Extensive information on poverty in the United States, including lesson plans.
- www.educationforjustice.org --The Center of Concern offers a wide range of educational materials on issues of justice and peace. Membership fee required.
- www.osjspm.org --The Office for Social Justice of the Archdiocese of St. Paul/Minneapolis offers a variety of first rate resources for justice education, including an annotated bibliography and information on models and ideas from their Catholic Justice Educator’s Network.
- www.stthomas.edu/cathstudies/cst/educ -- The University of St. Thomas in St. Paul, MN offers a clearinghouse of resources and models for weaving Catholic social teaching into education programs at all levels.