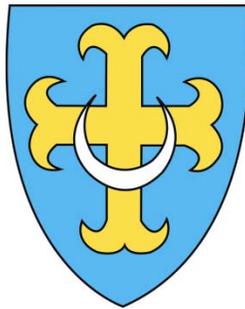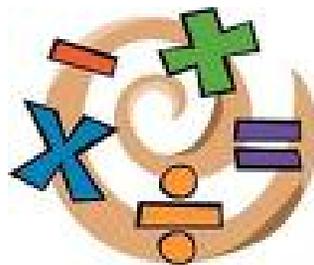# *Diocese of Trenton*

Mathematics Curriculum Guidelines

Pre-K – 8

September 2011

Acknowledgements

The members of the Diocesan Mathematics Curriculum Committee deserve our deep gratitude for sharing their curriculum expertise, spirit for mathematics achievement and commitment of so much time to bring this project to its conclusion. Each member of the mathematics committee personifies what it means to be a Catholic school teacher who desires excellence in the area of mathematics.

Near the end of the writing process, in an effort to include all our teachers who teach mathematics on the elementary and secondary level, the committee members asked mathematics teachers across the diocese to review the curriculum and comment on the topics. Thirty schools responded to the request and all of the feedback was studied and inserted into this curriculum. The feedback was very positive and the teachers who responded stated that the curriculum was easy to follow and comprehensive in the topics selected for instruction.

The members of the Office of Catholic Schools extend their appreciation to all the mathematics teachers in the diocese who shared their knowledge and expertise in mathematics and very especially to the members of the diocesan mathematics curriculum committee, including,

Madeline Dranchak - Math Teacher mdrancpjp@yahoo.com

Barbara Greiner - Math Teacher - bgreiner@stgregorythegreat.org

Karen Perna - Math Teacher - kperna@hamilton.k12.nj.us

Dorothy Rice - Math Teacher - drice@stgregorythegreat.org

Francis Sgroi - Chair of the Math Department - francis.sgroi@holycrosshighschool.org

Margaret Boland, Ed.D. - Associate Superintendent of Catholic Schools
mbolan@dioceseoftrenton.org

Vision

A comprehensive mathematics program will produce competent and confident, critical thinking problem solvers of the 21st century, who will transfer mathematics to real-life, ethical applications imbued with Catholic values.

Mission

The Diocese of Trenton elementary and secondary students will receive instruction to develop viable mathematical skills, attitudes, dispositions and Catholic ethics that will enable the students to apply the concepts of mathematical literacy in the 21st century.

Introduction

The Diocese of Trenton Mathematical Curriculum Guidelines is the culmination of work developed over a period of one to two years by the Diocesan Mathematics Curriculum Committee.

The document, *Diocese of Trenton Mathematical Curriculum Guideline, 2010* is based on the investigation and research of numerous documents:

- Common Core State Standards Initiative, *Common Core State Standards for Mathematics, 2010*
- National Council of Teachers of Mathematics, *Curriculum and Evaluation Standards for School Mathematics, 1989*
- New Jersey Department of Education, *Core Curriculum Content Standards, 2008 & 2010*
- New Jersey Council of Catholic School Superintendents, *Mathematics Curriculum Guidelines, For the Catholic Schools in the State of New Jersey, 2000*
- Diocese of Trenton, Mathematics Curriculum Committee, *Mathematics Curriculum Calendar Mapping, Grades K – 8, 2004.*

In 1989, mathematicians projected the following concepts to be developed for the 21st century:

"*Today's students will live and work in the twenty-first century, in an era dominated by computers, by world-wide communication, and by a global economy. Jobs that contribute to this economy will require workers who are prepared to absorb new ideas, to perceive patterns, and to solve unconventional problems.*

Mathematics is the key to opportunity for these jobs. Through mathematics, we learn to make sense of things around us. As technology has mathematicized the workplace, and as statistics has permeated the arena of public policy debate, the mathematical sciences have moved from being a requirement only for future scientists to being an essential ingredient in the education of all Americans." ["Teaching Mathematics for Tomorrow's World", Lynn Arthur Steen, St. Olaf College, *Educational Leadership,* 47:1 (September 1989) 18-22.]

In an article written by the president of the NCTM in 2010, he stated the following:

"To instill positive and productive attitudes toward mathematics lies within our own hands—in our teaching. No standards on earth—be they state or national—no testing or assessment procedures, no Race to the Top or mandates from above can make as much of a difference as we can every day through our own instructional practices." [It's Time to Stamp Out the Phrase "I'm Bad at Math" by NCTM President J. Michael Shaughnessy, *NCTM Summing Up,* October 2010]

Developing challenging, ambitious expectations for student learning in mathematics is imperative if we are to prepare students to compete in a global economy in the 21st Century. Preparing students and teachers in the 21st century demands that all students and teachers become immersed in the concepts of mathematics as well as connecting mathematics concepts to literacy in language, economics, communication and new technology as it emerges.

In addition to the Core Content Standards in Mathematics, contained within this document, there is also a set of Mathematical Practice Standards to incorporate the content standards and apply them to other disciplines and real life applications. These Mathematical Practice Standards are summarized as follows from the *Common Core Mathematical Standards, 2010.*

1. Make sense of problems and persevere in solving them.

- Students make conjectures about the form and meaning of the solution and plan a solution pathway.
- Students monitor and evaluate their process and change course if necessary.
- Younger students might rely on using concrete objects or pictures to help conceptualize or solve a problem.
- Older students might transform algebraic expressions to get the information they need to solve a problem.
- Students check their answers to problems, possibly using a different method, to determine if the solution makes sense.
- Students can understand the approaches of others and recognize the commonality and differences between solutions.

2. Reason abstractly and quantitatively.

- Students make sense of quantities and their relationships in problem situations.
- Students develop the ability to abstract a given situation and represent it symbolically and be able to manipulate the symbols independently of the problem.
- Students should be able to reason quantitatively creating a coherent representation of the problem, considering the units of measure necessary in the problem solution.

3. Construct viable arguments and critique the reasoning of others.

- Students understand and use stated assumptions, definitions, and previously established results in constructing arguments.
- Students make conjectures and build a logical progression of statements to explore the truth of the conjecture.
- Students should be able to analyze a solution and recognize and use counterexamples.
- Students should be able to justify conclusions and communicate them to others.
- Students should be able to compare the effectiveness of two or more plausible arguments and recognize flawed arguments and explain the flaw(s).

4. Model with mathematics.

- Students should use a variety of methods to solve problems, including
  - A. Geometry
  - B. Use of functions to describe how two quantities are related
  - C. Making assumptions and approximations
  - D. Graphing
  - E. Flowcharts
  - F. Formulas

5. Use appropriate tools strategically.

- Students should choose proper tools when solving a problem. The tools could include
  - A. Paper and pencil
  - B. Concrete models
  - C. Ruler, compass, protractor
  - D. Calculator
  - E. Spreadsheet
  - F. Computer software
  - G. Estimation

6. Attend to precision.

- Students should be able to communicate mathematical thought precisely to others
  - A. Using clear definitions
  - B. Stating the meaning of symbols used
  - C. Being careful about specifying correct units of measure
  - D. Labeling axes on a graph
  - E. Calculating accurately and efficiently with precision

7. Look for and make use of structure.

- Students should discuss patterns and structure
- Students should use commutative, associative and distributive properties
- Students should be able to see complicated tasks as a series of simpler structures

8. Look for and express regularity in repeated reasoning.

- Students should notice repetition in specific calculations
  - A. Changing fraction to a decimal (repeated decimal digit(s))
  - B. Using slope to check whether a point is on a line
  - C. Recognizing specific products in algebra
- Students should maintain oversight of a process while attending to details
- Students should recognize the reasonableness of answers as attending to detail (thinking about thinking)

The Standards of Mathematical Practice indicate ways in which students ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout their formative years. Educators should attend to the need of connecting mathematical practice with mathematical content. It is imperative that mathematical practice be developed so that students will not rely too heavily on procedural methods only. Without a flexible base from which to work students may not be able to develop alternate methods of solution or accept a comparable argument developed by others.

Technology and Instruction

As the use of technology has begun to permeate classroom instruction, the classroom teacher must develop competency in the use of such tools as integrated white boards, word processing, multi-media, IPods, the use of data bases, spread sheets and the Internet. Instruction should include teaching students how to use this technology effectively and is based on the following standards. These standards should be incorporated into lesson planning and presentation. The ISTE Standards are the foundation of the Diocesan Technology Curriculum Guidelines, 2010.

ISTE (International Society for Technology in Education) Standards
1. **Creativity and Innovation**

   Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.

2. **Communication and Collaboration**

   Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

3. **Research and Information Fluency**

   Students apply digital tools to gather, evaluate, and use information.

4. **Critical Thinking, Problem Solving, and Decision Making**

   Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

5. **Digital Citizenship**

   Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.

6. **Technology Operations and Concepts**

   Students demonstrate a sound understanding of technology concepts, systems, and operations.

The Mathematics Curriculum Guidelines are a set of "expectations" for understanding specific topics in the study of mathematics as developed over time. These topics must become a coherent body of knowledge that can be applied when used in conjunction with mathematical practice.

Diocesan Curriculum Goals in the Teaching of Mathematics are the following:

Students will:

- experience a rigorous mathematical education that teaches them to develop into reflective, creative, collaborative and global citizens that reflect the values and concepts of the Catholic Faith.
- learn Catholic ethics that influence analyzing and comparing mathematical statistics
- become mathematical problem solvers and critical thinkers, confident in their understanding and abilities in mathematics.
- become problem solvers, transferring mathematical content to real-life applications.
- be able to communicate mathematic concepts, verbally and with written expression.
- demonstrate mathematical applications in various disciplines.
- use appropriate forms of technology to demonstrate and communicate application of mathematical concepts.
- be assessed and evaluated in diverse ways so that each student will achieve their potential in mathematical education.
- develop an <u>in depth</u> comprehension of the mathematical concept that is being taught.

Financial Literacy

Adhering to the 21st Century curriculum goals this curriculum has included concepts of Financial Literacy. It is incorporated throughout the curriculum Pre-K – 8, using the designation *Concept Development (Financial Literacy).*

History of Mathematics

Understanding the development of mathematics throughout history is an integral component in the study of Mathematics. Mathematical discoveries support the teaching of concepts and skills from the simple to the complex. Studying the affective side of Mathematics opens the door to comprehending the aesthetic beauty and humanity of mathematics. It is explicit in the 6th to 8th grade curriculum but can be incorporated at any level.

Concept Development:

This term is found throughout these guidelines. It refers to specific mathematical concepts that should be taught to the students. Concept Development is ongoing and additional concepts can be added at any time in the teaching/learning process.

The following key symbols are found throughout the Math Curriculum:

Key Symbols for Standards:

DTM – Diocese of Trenton Mathematics

CC – Counting and Cardinality

NO – Number Operations

G – Geometry

OA – Operations and Algebra

MD – Measurement and Data

SP – Statistics and Probability

CCSSM- Common Core State Standards in Mathwmatics

CCESM – Common Core Educational Standards in Mathematics (indicated in purple throughout the curriculum)

* - Enrichment (Pre-K through Grade 8)
N.B. For seventh and eighth grade teachers: if graphing calculators are not available for students, access Microsoft Mathematics (free software) on the internet as a substitute for the graphing utility.
www.microsoftmathematics.com/download

Enrichment topics will be added as the guidelines are implemented throughout this school year.

The following websites are helpful in providing additional information for the teaching / learning of mathematics. Currently, on the Internet there are about 3, 390,000 different websites that refer to mathematics education.

www.nctm.org

www.pbskids.org

www.corecommonstandards.org

www.njcccs.org

www.ascd.org

www.ask.org

http://school.discoveryeducation.com/schrockguide/

Elementary teacher's websites... They contain teaching strategies and lesson plans:
http://www.davidsongifted.org/EdGuild/?gclid=CJ2r3-KsjKsCFc9n5QodeFcG8Q

http://www.proteacher.com/100030.shtml

http://kapalama.ksbe.edu/elementary/resource/mproblemsolvingstrategies.html

http://www.cited.org/index.aspx?page_id=151 (manipulatives)

http://www.ct4me.net/math_manipulatives.htm

 Middle school teacher's websites.
http://msteacher.org/epubs/math/math11/math.aspx

http://archives.math.utk.edu/k12.html (For K-12)

http://www.nctm.org/profdev/content.aspx?id=23587

http://www.doe.virginia.gov/instruction/mathematics/middle/online_strategies/index.shtml

PRE – KINDERGARTEN

Success in the teaching and learning of mathematics is built on the cumulative understanding of the concepts of fluency and continuity from grade level to grade level.

Instructional time should focus on **numeracy understanding** in two critical areas: (1) representing and comparing whole numbers, initially with sets of objects; (2) describing shapes and space. (CCS + DTM)

STANDARD:
- Counting and Cardinality (PRE-K CC + DTM)
- Numbers and Operations in Base Ten (PRE-K NO + DTM)

Essential Questions:
- Where would we use numbers?
- How would we use numbers?

CONCEPTS	CONTENT
Counting and Cardinality	Numbers are used for counting, ordering, grouping, comparing and identifying objects
	Ordering; first and last
	Counting 1 - 10
	Recognize single digit numbers compared to other symbols
	Recognize the number of objects (up to 4) without counting in groups
Number and Operations in Base 10	Using a manipulative for combining and/or removing objects
	Recognizing "more" or "less"

STANDARD:
- Geometry (PRE-K G + DTM)
- Measurement and Data (PRE-K MD + DTM)

Essential Questions:
- Where can geometric shapes be found in our surroundings?

CONCEPTS	CONTENT
Geometry	Recognize and manipulate basic shapes: circle, square, triangle and rectangle
	Draw basic shapes: circle, square, triangle and rectangle
	Ordering shapes by pattern or size
	Explore three-dimensional objects through use of building blocks or other materials
	Compare sizes: Larger or smaller; longer or shorter
Concept Development (Financial Literacy)	*Recognize coin denominations (penny, nickel, dime, quarter)*

STANDARD:
- Operations and Algebraic Thinking (PRE-K OA + DTM)

Essential Questions:
- Where do you see patterns?
- How do things repeat?

CONCEPTS	CONTENT
Operations and Algebraic Thinking	Recognizing patterns in nature, shapes, numbers
	Continuing given patterns
	Creating patterns using manipulatives and numbers
	Identifying the missing object or number in a pattern

STANDARD:
- Statistics and Probability (PRE-K SP + DTM)

Essential Questions:
- What is your favorite? (Movie, food, game, holiday…)
- How can objects be grouped?

CONCEPTS	CONTENT
Statistics and Probability	Begin to recognize data in drawings and pictures
	Making predictions based on previous events
	Sort objects into groups by similar traits
	Describe an object by characteristics it does/doesn't possess
	Describe categories

KINDERGARTEN

Success in the teaching and learning of mathematics is built on the cumulative understanding of the concepts of fluency and continuity from grade level to grade level.

Instructional time should focus on ***numeracy concepts and understanding*** in two critical areas: (1) representing and comparing whole numbers, initially with sets of objects; (2) describing shapes and space. More mathematical learning time in Kindergarten should be devoted to numeracy concepts. It is imperative that all kindergarten students develop a strong foundation in numeracy as they advance to the first grade.

STANDARDS:
- Counting and Cardinality (K CC + DTM)
- Numbers and Operations in Base Ten (K NO + DTM)

Essential Questions:
- Where would you use numbers?
- How would you use numbers?
- In what ways can items be grouped?
- How can numbers be expressed, ordered, and compared?

CONCEPT	CONTENT
Counting and Cardinality	Recognize symbols: numbers 1 to 100
	Discuss 0
Concept Development	****Identify the quantity of 0***
Concept Development	*Order and write numbers clearly 0 to 50*
Concept Development	*Count down from 10*
Concept Development	*Identify groups of 10*
Concept Development	*Construct groups to 10*
Concept Development	*Order first through tenth*
Concept Development	*Recognize and identify fractions (equal parts, half and whole)*
Number and Operations in Base 10	Identify missing numbers on a number line to 10
	Understand the concept of addition and subtraction (more or less)

STANDARD:
- Geometry (K G + DTM)
- Measurement and Data (K MD + DTM)

Essential Questions:

- What shapes do we find in our classroom, playground, at home?
- In what ways can we group objects?
- How do we use a calendar?
- How many ways can you use coins?

CONCEPT	CONTENT
Geometry	Explore, identify and draw the 4 basic shapes (circle, square, triangle, rectangle)
	Describe and locate objects inside, outside, on
	Explore and identify geometric solids (sphere- ball, rectangular solid- box, cone, cylinder)
	Create shapes from parts
Concept Development	***Explore and recognize congruence, similarity, symmetry, and translations.***
	Identify and construct open and closed paths
Measurement and Data	Compare with bigger, smaller, longer, shorter
	Describe different ways of measuring objects
Concept Development (Financial Literacy)	***Create monetary denominations using pennies, nickels, and dimes(*quarters)***
	Compare objects using size and weight with standard and non-standard units of measure
	Identify time on a digital clock and analog clock to the hour
	Use a calendar: day, week ,month, year

STANDARD:
- Operations and Algebraic Thinking (K OA + DTM)

Essential Questions:
- Can you find the missing information?
- Where do patterns appear at home, the classroom, and the playground?

CONCEPT	CONTENT
Operations and Algebraic Thinking	Describe patterns using objects and numbers
	Sort, copy, and continue patterns
	Create simple patterns
	Identify missing numbers on a number line
	*skip counting
	Solve open sentences

STANDARD:
- Statistics and Probability (K SP + DTM)

Essential Questions:
- Why would we arrange objects in groups?
- What is the most popular response?
- What objects appear most in a group?
- What is the difference between estimating and guessing?

Concepts	Content
Statistics and Probability	Collect objects to arrange or create a graph
	Draw conclusions based on data displayed on a graph (bar, picture)
	Perform a simple probability activity and record outcomes.
	Make predictions based on real life experiences.
Concept Development	***Begin to differentiate between guessing and estimation***

GRADE 1

Success in the teaching and learning of mathematics is built on the cumulative understanding of the concepts of fluency and continuity from grade level to grade level.

Instructional time should focus on *numeracy concepts and understanding* in four critical areas: (1) developing understanding of addition and subtraction and strategies of addition and subtraction within 20; (2) developing understanding of whole number relationships and place value including grouping in tens and ones; (3) developing understanding of linear measurement and measuring lengths as iterating length units; (4) reasoning about attributes of and composing and decomposing geometric shapes.

STANDARDS:
- Numbers and Operations in Base Ten (1NO + DTM)

Essential Questions:
- How can numbers be expressed, ordered or compared?
- What are different ways to count?

CONCEPT	CONTENT
Numbers and Operations in Base Ten	Read, clearly write and order numbers 0 to 100 (*"and beyond"- google, googleplex and infinity)
	Know place value tens and ones (*Know place values to 100s) Base ten numeration
	Recognize and utilize ordinals numbers to 20th
	Count forward and backward to and from 20
	Know the difference between even and odd numbers
Concept Development	*Recognize and match number words zero through 20*
Concept Development	*Understand the quantity of 0*
	Recognize numbers up to 3 more or 3 less from starting number
	Recognize and identify fractions (equal parts, quarters, halves and whole) *Recognize and identify fractions (thirds and eighths)
	Recognize and use the symbols greater than, less than and equal to **(CCSSM)**
	Memorize addition and subtraction facts through 12 (* to 20)
	Addition and subtraction facts through 20 **(CCSSM)**
	Addition of 3 single digit numbers **(CCSSM)**
	Identify missing numbers on a number line to 20
	Use both horizontal and vertical formats in addition and subtraction
	Add with and without regrouping to 100 and subtract multiples of 10 **(CCSSM)**
	Recognize fact families

STANDARDS:
- Geometry (1G + DTM)
- Measurement and Data (1MD + DTM)

Essential Questions:

- How can different types of shapes be described?
- How many different ways can you represent 50 cents?
- Why is it important to comprehend the difference between symmetry, congruence and similarity?

CONCEPT	CONTENT
Geometry	Compare size and position of objects
	Complete a shape to show symmetry or congruence
	Explore and identify 2 and 3 dimensional figures and their attributes **(CCSSM)**
Concept Development	*Combine shapes to create a new shape (tangrams)* *Compose and decompose shapes (2- and 3-D)* **(CCSSM)**
	Identify shape and quantity of faces and corners (vertices) of 3 dimensional figures
	Introduce flips (reflections), slides (translations) and turns (rotations)
	Identify and explore the differences between congruent and similar figures
Measurement and Data	Estimate length, width, height, area and volume using non-standard objects of measurement
	Compare size and position of numbers on a number line
	Relate length, area and volume to concrete objects
	*Estimate measure of lengths in inches and centimeters
Concept Development (Financial Literacy)	*Count and make change to a dollar*
Financial Literacy	*Identify the difference between credit or debit*
Financial Literacy	*Create complex patterns using multiple coins*
	Recognize and differentiate between a pint, quart and gallon
	Identify time on analog clock to the hour, half and quarter
	Write the date (month, day, year)
	Transitivity Principle for indirect measurement
	Measure lengths indirectly and by iterating length units

STANDARD:
- Operations and Algebraic Thinking (1OA + DTM)

Essential Questions:
- Where are patterns in nature, architecture, music, words and numbers?
- What strategies can be used in continuing sequences?
- What algebraic concepts are used in determining missing addends and subtrahends?

CONCEPT	CONTENT
Operations and Algebraic Thinking	Distinguish between equivalent and non-equivalent groups
Concept Development	*Use proper vocabulary when explaining patterns*
	Identify missing numbers in a sequence up to 100
	Introduce commutative property through fact families
	Skip counting (2's, 5's and 10's) *(3's)
	Find missing addends and subtrahends up to 12 (* up to 18)
	Insert correct operation sign (addition, subtraction) in vertical or horizontal problem
	Equations using variable symbols **(CCSSM)**

STANDARD:
- Statistics and Probability (1SP + DTM)

Essential Questions:
- How can information be gathered, recorded, analyzed and organized?
- How is the probability of an event determined?

CONCEPT	CONTENT
Statistics and Probability	Construct, read and interpret displays of data
	Collect and organize data through use of tally marks and record on a graph
	Make a prediction based on a simple probability activity (roll a die, spin a spinner, flip a coin)
	Use real life situations to make predictions and conclusions based on experience
	Introduce Venn diagrams

GRADE 2

Success in the teaching and learning of mathematics is built on the cumulative understanding of the concepts of fluency and continuity from grade level to grade level.

Instructional time should focus on four critical areas; (1) extending understanding of base-ten notation; (2) building fluency with addition and subtraction; (3) using standard units of measure; and (4) describing and analyzing shapes.

STANDARD:
- Numbers and Operations in Base Ten (2NO + DTM)

Essential Questions:
- How can grouping be used to count, measure and estimate?
- Why is place value based on ten?

CONCEPT	CONTENT
Numbers and Operations in Base Ten	Read, clearly write and order numbers 0 to 1000
Concept Development	***Know place values to thousands* (*millions)**
	Recognize and utilize ordinals numbers to 50th
Concept Development	*Count forward and backward to and from 50*
Concept Development	*Recognize odd and even numbers (CCSSM)*
Concept Development	*Count using even or odd number patterns*
	Recognize, write and match number words zero through 50
	Recognize numbers up to 5 more or 5 less from starting number
	Recognize, identify and use fractions (equal parts, quarters, thirds, halves and whole) *Recognize, identify and use fractions (sixths and eighths)
	Recognize and use the symbols greater than, less than and equal to (CCSS)
	Write numbers in expanded notation up to 999
	Round numbers to the nearest ten and hundred
	Memorize addition and subtraction facts through 18
	*Memorize addition and subtraction facts through 30
	Identify missing numbers on a number line to 50
	Use both horizontal and vertical formats in addition and subtraction
	Explore addition and subtraction of two digits numbers with and without regrouping using concrete objects or models.
Concept Development	*Add and subtract up to three digit numbers (CCSSM)*
	Skip counting (2's, 3's, 5's and 10's) *(4's, 6's) And connect to multiplication facts to 2 and 5
	Use commutative property of addition
	Use inverse relationships of addition and subtraction in fact families
	Understand when to use addition or subtraction in word problems

STANDARDS:
- Geometry (2G + DTM)
- Measurement and Data (2MD + DTM)

Essential Questions:
-
- What is elapsed time on a calendar?
- How can you measure distance, weight or capacity?

CONCEPT	CONTENT
Geometry	Compare size and position of objects
	Recognize symmetrical figures; identify and draw lines of symmetry
Concept Development	*Create congruent and similar figures*
	Draw a diagonal in a rectangle to form two triangles
	Match and qualify solid (3-dimensional) figures
	Identify shape and quantity of faces and corners (vertices) of 3-dimensional figures
	Describe and analyze two and three-dimensional shapes by their sides and angles
	Use flips (reflections), slides (translations) and turns (rotations)
Measurement and Data	Estimate length, width, height, weight, perimeter, area and volume using metric and customary units of measurement to nearest centimeter, meter, inch, foot, kilogram, pound, liter, cup (*nearest kilometer, yard, mile, pint, gallon, gram, ounce, ton)
	Relate addition and subtraction to length (CCSS)
	*Measurement of perimeter and area
	Measure length of objects in different units (CCSS)
	Represent and interpret data
	*Compare temperatures on a thermometer in Celsius and Fahrenheit degrees
Concept Development (*Financial Literacy)*	*Count and make change to a dollar*
Financial Literacy	*Recognize the value of a dollar in relation to other coins*
Financial Literacy	*Identify and use dollar and cent sign*
Financial Literacy	**Identify the difference between credit or debit*
	Identify time on analog and digital clock to the hour, half, quarter and five minute intervals
	Elapsed time on a calendar

STANDARD:
- Operations and Algebraic Thinking (2OA + DTM)

Essential Questions:
- What does "n" represent in the equation 6 + n = 10?
- What patterns can be used to continue a sequence?

CONCEPT	CONTENT
Operations and Algebraic Thinking	Classify equivalent and non-equivalent groups by more than one attribute
	Use proper vocabulary when explaining patterns
	Identify missing numbers in a sequence up to 1000
	Work with equal groups of objects to gain foundations for multiplication
	Find missing addends and subtrahends up to 18 (* up to 30)
	Insert correct operation sign (addition, subtraction) in vertical or horizontal problem

STANDARD:
- Statistics and Probability (2SP + DTM)

Essential Questions:
- How can information be gathered, recorded, analyzed and organized?
- How do the survey results influence the type of graph drawn?
- How will your outcomes change if you change your sample size?

CONCEPT	CONTENT
Statistics and Probability	Take a survey using real life situations, tally and graph the results.
	Interpret and compile pictographs, line plots *(CCSSM),* horizontal and vertical bar graphs.
	Perform simple probability activities
	Investigate outcomes of various experiments
	Utilize Venn Diagrams

GRADE 3

Success in the teaching and learning of mathematics is built on the cumulative understanding of the concepts of fluency and continuity from grade level to grade level.

Instruction time should focus on four critical areas; (1) developing understanding of multiplication and division and strategies for multiplication and division within 100; (2) developing understanding of fractions, especially unit fractions (fractions with numerator 1); (3) developing understanding of the structure of rectangular arrays and of area; and (4) describing and analyzing two-dimensional shapes.

STANDARD:
- Numbers and Operations (Base Ten and Fractions) (3NO + DTM)

Essential Questions:
- Why multiplication is considered repeated addition?
- Why is division considered repeated subtraction?

CONCEPT	CONTENT
Numbers and Operations (Base 10 and Fractions)	Read, clearly write and order numbers 0 to 1,000,000
	Know place values to thousands (*to millions)
	Read and write ordinal numbers to 50th
Concept Development	*Count forward and backward to and from 100*
	Skip count with numbers 2, 3, 4, 5, 10, 25, 50, 100 (*6, 7, 8, 9) connect to all intervals of multiplication
	Recognize, write and match number words zero through 100
	* Recognize decimals; tenths, hundredths, thousandths
	Recognize and identify fractions as a part of a whole using concrete material. (equal parts, quarters, thirds, halves and whole) *Recognize and identify fractions (sixths and eighths)
	Identify proper and improper fractions and mixed numbers
Concept Development	*Compare numbers using symbols: greater than, less than and equal to ; identify equivalent fractions (CCSSM)*
	Write numbers in expanded notation up to 1,000,000
	Round numbers to the nearest tens, hundreds, thousands (*ten thousands)
	Memorize addition and subtraction facts through 30
	Identify missing numbers on a number line to 100
	Identify proper fractions on a number line (CCSS)
	Use horizontal and vertical formats when adding or subtracting three digit numbers with and without regrouping
	Use commutative and associative properties of addition

	Use inverse relationships of addition and subtraction in fact families
	Understand when to use each operation in word problems
	Memorize multiplication (CCSS) and division facts 2 through 12 (*multiply a two digit number by a one digit number without regrouping)
	*Recognize and indentify square numbers as applied to geometry
	Explore division with one digit quotients and one digit divisors with or without remainders using objects (*understand division as repeated subtraction)
	Discover and explore what happens in multiplication when one or zero is a factor
	Write various number sentences using any of the four operations

STANDARDS:
- Geometry (3G + DTM)
- Measurement and Data (3MD + DTM)

Essential Questions:
- How can you get from one location to another on a grid?
- How can you measure distance, weight or capacity?

CONCEPT	CONTENT
Geometry	Recognize and describe attributes based on color, shape, direction and size
	Recognize symmetrical figures; identify and draw lines of symmetry
	Create congruent and similar figures
	Identify and draw commonly used polygons and regular polygon
	Identify solid figures (3-dimensional)
	Identify shape and quantity of faces, edges and corners (vertices) of 3-dimensional figures
	Use flips (reflections), slides (translations) and turns (rotations)
	Identify parallel and intersecting lines
	Compare angles to a right angle
Measurement	Estimate and measure length, width, height, weight, area and volume using metric and customary units of measurement to nearest centimeter, meter, inch, foot, kilogram, pound, liter, cup (*nearest kilometer, yard, mile, pint, gallon, gram, ounce, ton)
	Find area (counting squares on graph paper) and using multiplication and perimeter (using addition) of rectangles, squares

	Find volume using cubic units (blocks)
	Compare temperatures on a thermometer in Celsius and Fahrenheit degrees
	Introduce coordinate geometry with Quadrant I
Concept Development (Financial Literacy)	***Count and make change to five dollars***
Financial Literacy	***Round to the nearest dollar***
Financial Literacy	***Recognize the value of a dollar in relation to other coins***
Financial Literacy	***Identify and use dollar and cent sign***
Financial Literacy	***Identify the difference between credit or debit***
	Identify time*(CCSSM)* on analog and digital clock to the nearest minute
	Estimate elapsed time (clock, calendar)

STANDARD:
- Operations and Algebraic Thinking (3OA + DTM)

Essential Questions:
- What does "n" represent in the equation $6 * n = 18$?
- What patterns can be used to continue a sequence?

CONCEPT	CONTENT
Operations and Algebraic Thinking	Classify equivalent and non-equivalent groups by more than one attribute
	Understand properties of multiplication and the relationship between multiplication and division
Concept Development	***Use proper vocabulary when explaining patterns that repeat or grow***
	Discover patterns with one operation (adding, subtracting, multiplication, division)
	Identify missing numbers in a sequence up to 1000
	Skip counting (2's, 3's, 4's, 5's, 6's and 10's) *(7's, 8's, 9's)
	Find missing addends, subtrahends, factors, divisors
	Insert correct operation sign (addition, subtraction, multiplication, division) in vertical or horizontal problem
Concept Development	Represent unknown quantities with a symbol
	Explore substituting a number value for letters
	Explore input/output table

- Statistics and Probability (3SP + DTM)

Essential Questions:
- How can you use information to predict an outcome?
- What is the difference between a certain outcome and an impossible outcome?

CONCEPT	CONTENT
Statistics and Probability	Take a survey using real life situations, tally and graph the results.
	Create and interpret pictographs, horizontal and vertical bar graphs, line graphs and tables
	Predict and perform simple probability outcomes through experiments
	Identify likely, unlikely, certain or impossible events
	Utilize Venn Diagrams using 3 classifications

GRADE 4

Success in the teaching and learning of mathematics is built on the cumulative understanding of the concepts of fluency and continuity from grade level to grade level.

Instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole number; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

STANDARD:
- Numbers and Operations (Base Ten and Fractions) (4NO + DTM)

Essential Questions:
- Can you read the year that your favorite movie was made?
- What do zeros mean in a quotient?
- How are place value patterns repeated in numbers?

CONCEPT	CONTENT
Numbers and Operations (Base Ten and Fractions)	Read, clearly write and order numbers 0 to 1,000,000
	Read and write numbers to the thousands place using place value charts (*hundred thousands)
	Compare and order decimals through hundred thousandths
	Round decimals to nearest tenths and hundredths (*thousandths)
	Read and write numbers in standard, word and expanded form
	Represent four digit numbers using words, numerals, diagrams and concrete models
	Classify prime and composite numbers
	Understand place values to millions
	Read and write ordinal numbers to thousandths
	Recognize and identify fractions as a part of a whole using concrete material. (equal parts, quarters, thirds, sixths, eighths, halves and whole)
	Identify proper and improper fractions and mixed numbers
	Identify and define numerator and denominator
	*Identify percent
	Write fractional part of a region or group
	Write a fraction for the whole number 1
	Rename improper fractions as mixed numbers and rename mixed numbers as improper fractions
	Apply mixed numbers to real life situations

	Write fractions and mixed numbers in standard and word form
	Find equivalent fractions using modeling and multiplication
	Use multiplication to find common denominators
	Compare fractions with common and unlike denominators
	Write equivalent fractions for the whole number one
	Identify a mixed number for a model
	Rename mixed numbers for improper fractions and vice versa
	Add and subtract fractions with like *(CCSSM)* and unlike denominators
	Multiply a fraction by a whole number *(CCSSM)* * multiply a fraction by a fraction
Concept Development	*Write a fraction or mixed number as a decimal or a decimal as a fraction or mixed number(CCSSM)*
	Compare numbers using symbols: greater than, less than and equal to (*fractions)
	Write numbers in expanded notation up to 1,000,000
	Round numbers to the nearest tens, hundreds, thousands, ten thousands and millions
	Identify Roman Numerals, 1 – 1000
	Identify missing numbers on a number line to 100
	Use horizontal and vertical formats when adding or subtracting up to six digit numbers with and without regrouping
Concept Development	*Use commutative and associative properties of addition and multiplication*
	Use inverse relationships of addition and subtraction in fact families
	Understand when to use each operation in word problems
	Understand meanings of factor and multiple **(CCSSM)**
	Multiply a three or four digit number by a one digit number **(CCSSM)**
	Multiply two and three digit numbers by a two digit number**(CCSSM)** (*by a three digit number)
	Divide two, three or four digit numbers by a one or two digit divisor with and without a remainder (e.g. short division)
	Multiply and divide by 10, 100 or 1000

26

	Write various number sentences using any of the four operations
	Determine when estimation is appropriate and understand the usefulness of an estimate as distinct from an exact answer
	Use estimation in all operations and problem solving

STANDARDS:
- Geometry (4G + DTM)
- Measurement and Data (4MD + DTM)

Essential Questions:
- What is a real life example of metric measurements?
- How can you decide whether to measure distance, weight or capacity?

CONCEPT	CONTENT
Geometry	Define terms: symmetry, congruence, similarity
	Recognize symmetrical figures; identify and draw lines of symmetry
Concept Development	*Identify, name and draw points, lines and line segments, angles, rays, right angles, perpendicular, parallel and intersecting lines*
	Use proper symbols to identify lines, rays, segments and angles
	Create congruent and similar figures
	Identify and draw commonly used polygons and regular polygons from 3 through 8 sides
	Identify and classify all quadrilaterals
	Identify solid figures (3-dimensional)
	Identify shape and quantity of faces, edges and corners (vertices) of 3-dimensional figures
	Use flips (reflections), slides (translations) and turns (rotations)
	Measure angles (CCSS)
	Compare angles to a right angle
Measurement and Data	*Estimate and measure length, width, height, weight, area and volume using metric and customary units of measurement to nearest centimeter, meter, inch, foot, kilogram, pound, liter, cup (*nearest kilometer, yard, mile, pint, gallon, gram, ounce, ton)*
	Find area (counting squares on graph paper) and perimeter (using addition) of rectangles, squares (*Explore Pythagorean Theorem Puzzle, examples found at the Franklin Institute, Philadelphia)
	Measure and compute volume using centimeter and inch cubic units (blocks) Measure and compute whole square unit areas of objects and regions enclosed by geometric figures which can be decomposed into rectangles **(CCSS)**

	Compare temperatures on a thermometer in Celsius and Fahrenheit degrees
	Measure and compute area, length, width of a rectangle (*triangle) using ruler or yardstick, 1 inch squares or 1 centimeter squares
	Convert larger units to smaller units (CCSS)
	Find the missing value given area and length of a rectangle or area and width of a rectangle
	Utilize coordinate geometry within Quadrant I
Concept Development (Financial Literacy)	*Count and make change for fractional dollar amounts*
Financial Literacy	*Identify the difference between credit and debit, (*deposit and withdrawal)*
	Identify time on analog and digital clock to the nearest minute
	Estimate elapsed time (clock, calendar)

STANDARD:
- Operations and Algebraic Thinking (4OA + DTM)

Essential Questions:
- Compare the process of composition with decomposition?
- How does area relate to putting together a jigsaw puzzle?

CONCEPT	CONTENT
Operations and Algebraic Thinking	Investigate, describe and create compound patterns (e.g., addition with multiplication)
Concept Development	*Use proper vocabulary when explaining patterns that repeat, grow or compress*
	Identify missing numbers in a sequence up to 100,000
	Investigate and describe patterns that continue infinitely
	Find missing addends, subtrahends, factors, divisors
	Insert correct operation sign (addition, subtraction, multiplication, division) in vertical or horizontal problem
Concept Development	*Represent unknown quantities with variables in number sentences (CCSSM)*
	Explore substituting a number value for letters
	Explore and create input/output table and rewrite tables as ordered pairs (see coordinate geometry above)

STANDARD:
- Statistics and Probability (4SP + DTM)

Essential Questions:
- How do you determine which area of central tendency should be implemented?
- How can you use a Venn Diagram to classify quadrilaterals?

CONCEPT	CONTENT
Statistics and Probability	Take a survey using real life situations, tally and graph the results using frequency distribution tables
Concept Development	*Compute measures of central tendency (mean, median, mode and range)*
	Create and interpret pictographs, horizontal and vertical bar graphs, line graphs and tables (*stem and leaf plots)
	Predict and perform simple probability outcomes through experiments
	Discuss low or high probability and possibility of various events using real life situations
	Utilize Venn Diagrams using multiple classifications (e.g., classifying quadrilaterals)

GRADE 5

Success in the teaching and learning of mathematics is built on the cumulative understanding of the concepts of fluency and continuity from grade level to grade level.

Instructional time should focus on three critical areas; (1) developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions); (2) extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths and developing fluency with whole number and decimal operations and (3) developing understanding of volume.

<u>STANDARD:</u>
- Numbers and Operations (Base Ten and Fractions) (5NO + DTM)

Essential Questions:
- What is the difference between a prime and composite number?
- When do you use grouping symbols?

CONCEPT	CONTENT
Numbers and Operations (Base Ten and Fractions)	Read, clearly write and order numbers through 100,000,000
	Read and write numbers to the hundred millions place
	Compare and order decimals through hundred thousandths
	Round decimals to nearest tenths through and thousandths
	Use and order proper and improper fractions and mixed numbers
	Write a decimal as a fraction in simplest form and write fractions or mixed numbers as decimal numbers
Concept Development	*Rename improper fractions as mixed numbers and rename mixed numbers as improper fractions*
Concept Development	*Apply mixed numbers to real life situations*
	Write fractions and mixed numbers in standard and word form
	Find equivalent fractions using multiplication and division
	Express ratios in two forms (e.g., 2/3, 2:3)
	Use multiplication to find common denominators
	Compare fractions with common and unlike denominators
	Rename mixed numbers for improper fractions and rename improper fractions as mixed numbers
	Find the GCF and LCM (LCD) of two numbers
	Write a fraction or mixed number as a decimal or a decimal as a fraction or mixed number

	Compare rational numbers using symbols: greater than, less than and equal to
	Write numbers in expanded notation up to 1,000,000
	Round numbers to the nearest tens, hundreds, thousands, ten thousands and millions
Concept Development	***Apply and utilize Roman Numerals***
	Divisibility rules 2, 5 and 10 (*3, 6)
	List factors of composite numbers
	Use horizontal and vertical formats when adding or subtracting up to six digit numbers with and without regrouping
	Use commutative and associative properties of addition [*distributive, identity and multiplicative inverse (reciprocal) properties]
	Introduce grouping symbols; e.g. Parenthesis, brackets, braces (**CCSSM)**
	Introduce Order of Operations; introduce concept of exponents for powers of ten **(CCSSM)**
	Use inverse relationships of addition-subtraction and multiplication-division
	Add and subtract fractions with like and unlike denominators
	Multiply fractions and mixed numbers (**CCSSM)** (*2 and 3 digit denominator)
	Multiplication as scaling; e.g. using maps **(CCSSM)**
	Divide by unit fractions**(CCSSM)** (*divide by proper fractions)
Concept Development	***Understand the fraction bar as another representation of division***
	Understand when to use each operation in word problems
	Multiply two and three digit numbers by a two or three digit number
	Divide two, three or four digit numbers by a one or two digit divisor with and without a remainder
	Multiply and divide by 10, 100 or 1000
	Write various number sentences using any of the four operations
Concept Development	***Determine when estimation is appropriate and understand the usefulness of an estimate as distinct from an exact answer***
	Use estimation in all operations and problem solving

STANDARDS:
- Geometry (5G + DTM)
- Measurement and Data (5MD + DTM)

Essential Questions:
- How can you decide whether to measure distance, weight or capacity?

CONCEPT	CONTENT
Geometry	Identify and complete symmetrical figures on a grid using ordered pairs
	Identify and compare two and three dimensional figures using spatial visualization and visual perception
Concept Development	*Define and draw or construct points, lines and line segments, angles, rays, right angles, perpendicular, parallel and intersecting lines and acute, obtuse, straight and right angles (*complementary and supplementary angles)*
	Use proper symbols to identify lines, rays, segments and angles
	Construct angles and two dimensional figures using straight edge, protractor and compass
	Identify corresponding parts of congruent and similar figures
	Identify and draw commonly used polygons and regular polygons
	Classify all quadrilaterals
	Classify solid figures (3-dimensional)
	Identify shape and quantity of faces, edges and vertices of 3-dimensional figures
	Use geometric transformations (rotations, reflections and translations)
	Identify a tessellation
	Identify fractals as occurring in nature
Measurement and Data	Estimate and measure length, width, height, weight, area and volume using metric and customary units of measurement to nearest centimeter, meter, inch, foot, kilogram, pound, liter, cup, nearest kilometer, yard, mile, pint, gallon, gram, ounce, ton
Concept Development	*Find area and perimeter of rectangles and squares*
	Measure and compute volume using centimeter and inch cubic units (blocks) Measure and compute whole square unit areas of objects and regions enclosed by geometric figures which can be decomposed into rectangles **(CCSSM)**
	Compare temperatures on a thermometer in Celsius and Fahrenheit degrees
	Measure and compute area, length, width of a rectangle, square or triangle using ruler or yardstick, 1 inch squares or 1 centimeter squares

	Find the missing value given area and length of a rectangle or area and width of a rectangle
	Utilize coordinate geometry in Quadrant I
Concept Development (Financial Literacy)	***Count and make change for fractional dollar amounts***
Financial Literacy	***Identify the difference between credit and debit, deposit and withdrawal (*profit and loss)***
	Choose appropriate units of measurement; measure and make appropriate conversions: • time (hour, minute, second); • customary units of length (inch, foot, yard, mile) • Metric units of length (millimeter, centimeter, meter, kilometer) • Customary capacity (cup, pint, quart, gallon) • Metric capacity (milliliter, liter, kiloliter) • Weight (ounce, pound, ton) • Mass (gram, kilogram)

STANDARD:
- Operations and Algebraic Thinking (5OA + DTM)

Essential Questions:
- What is a variable used for?
- What is the purpose of using ordered pairs in a grid?

CONCEPT	CONTENT
Operations and Algebraic Thinking	Investigate, describe and create compound patterns (e.g., addition with multiplication)
Concept Development	***Use proper vocabulary when explaining patterns that repeat, grow or compress***
	Use number patterns to add, subtract, multiply and divide mentally
	Recognize patterns in sums, differences and products of even and odd numbers
	Describe, analyze and complete patterns involving fractions
	Find missing addends, subtrahends, factors, divisors (without use of a calculator)
Concept Development	***Represent unknown quantities with a symbol***
	Describe arithmetic operations as functions, including combining operations and inverse operations
	Explore substituting a number value for a variable
	Explore and create input/output table and rewrite tables as ordered pairs (see coordinate geometry above)

STANDARD:
- Statistics and Probability (5SP + DTM)

Essential Questions:
- How do you determine which area of central tendency should be implemented?
- How does type of data determine choice of data display?

CONCEPT	CONTENT
Statistics and Probability	Take a survey using real life situations, tally and graph the results using frequency distribution tables; discuss outcomes and draw conclusions from the data
	Compute measures of central tendency (mean, median, mode and range)
	Create and interpret pictographs, horizontal and vertical bar graphs, line plot (fractional measures) **(CCSSM),** tree diagrams, stem and leaf plots and tables (use available technology to create data displays)
	Perform simple probability experiments of simulations, record results and make predictions
	Discuss low or high probability and possibility of various events using real life situations
Concept Development	*Express probability in fraction form using concrete and semi-concrete activities*
	Utilize Venn Diagrams using multiple classifications (e.g., classifying quadrilaterals)

SIXTH GRADE

Success in the teaching and learning of mathematics is built on the cumulative understanding of the concepts of fluency and continuity from grade level to grade level.

Instructional time should focus on four critical areas; (1) developing fluency with fractions, decimals and percents, including applications both algebraically, geometrically and statistically; (2) extending division to fractions and decimals; (3) developing the terminology of functions, including independent and dependent variables, equations and inequalities and (4) introducing and applying methods of statistical thinking. Examples of these four critical areas are implied in the essential questions, enduring understandings, and found in the content standards.

Standard :
- Number operations (6NO + DTM)

Essential Questions:
- Describe situations in which you would choose the use of fractions over decimals and vice-versa.
- What is a real life application of a negative number?

CONCEPT	CONTENT
Number Sense	Read, write and order numbers through 1,000,000,000 in standard and exponential forms
Concept Development	*Use exponents to represent powers of ten*
	Recognize and use whole number exponents (*CCSSM)*
	Compare, order and round whole numbers, decimals and fractions
	Use and order proper and improper fractions and mixed numbers
	Write a decimal as a fraction in simplest form and write fractions or mixed numbers as decimal numbers
	Rename improper fractions as mixed numbers and rename mixed numbers as improper fractions
Concept Development	*Write fractions and mixed numbers in standard and word form*
	Find equivalent fractions using multiplication and division
	Find the GCF and LCM (LCD) of two numbers *(CCSSM)*
	Define rational and irrational numbers. Distinguish between terminating and repeating decimals
	Define and apply ratios, unit rates and percents *(CCSSM)*

	Write numbers in expanded notation up to 1,000,000
	Divisibility rules 2, 3, 4, 5, 6, 8, 9 and 10
	Express composite numbers as products of prime numbers (e.g., factor tree)
	Order fractions on a number line
	Introduce integers on a number line
	Introduce absolute value **(CCSSM)**
Numerical Operations	Use commutative and associative properties of addition, distributive, identity (additive and multiplicative), multiplicative inverse (reciprocal) zero product properties
	Use Order of Operations to simplify expressions (*error analysis to spot mistakes in computation)
	Use inverse relationships of addition-subtraction and multiplication-division
	Add and subtract fractions with like and unlike denominators
Concept Development	*Multiply and divide fractions, decimals and mixed numbers (CCSSM)*
	Understand when to use each operation in word problems
	Convert fractions, decimals and percents(also apply to geometry)
	Find percent of a given number
Concept Development (Financial Literacy)	*Find Simple Interest, sales tax, tips*
Concept Development	*Write various number sentences using any of the four operations*
	Determine when estimation is appropriate and understand the usefulness of an estimate as distinct from an exact answer
	Use estimation in all operations and problem solving

Standard:
- Geometry (6G + DTM)
- Measurement and Data(6MD + DTM)

Essential Questions:
- In architecture describe which shapes are commonly used and give the rational?
- How can you decide whether to measure distance, weight or capacity?

CONCEPT	CONTENT
Geometry	Identify and complete symmetrical figures on a grid using ordered pairs
	Identify and compare two and three dimensional figures using spatial visualization and visual perception

Concept Development	*Define and draw or construct points, lines and line segments, angles, rays, right angles, perpendicular, parallel and intersecting lines and acute, obtuse, straight and right angles (*complementary and supplementary angles)*
	Use proper symbols to identify lines, rays, segments and angles
	Construct angles and two dimensional figures using straight edge, protractor and compass
	Identify corresponding parts of congruent and similar figures
	Identify and draw commonly used polygons and regular polygons
	Identify and define parts of a circle
Concept Development	*Define pi verbally and in written form*
	Classify all quadrilaterals
	Classify solid figures (3-dimensional)
	Identify shape and quantity of faces, edges and vertices of 3-dimensional figures
	Use geometric transformations (rotations, reflections and translations)
	Identify a tessellation
	Identify fractals as occurring in nature
	*Pythagorean theorem
Measurement	Estimate and measure length, width, height, weight, area and volume using metric and customary units of measurement to nearest centimeter, meter, inch, foot, kilogram, pound, liter, cup, nearest kilometer, yard, mile, pint, gallon, gram, ounce, ton (*apply scale factor to map measurements)
	Find area and perimeter of rectangles, squares, triangles, parallelograms and trapezoids
	Find area and circumference of a circle
	Measure and compute volume using centimeter and inch cubic units (blocks) Measure and compute(whole square unit areas) surface area of objects and regions enclosed by geometric figures which can be decomposed into rectangles *(CCSSM)*
	Compare temperatures on a thermometer in Celsius and Fahrenheit degrees
	Measure and compute area, length, width of a rectangle, square or (*triangle) using ruler or yardstick, 1 inch squares or 1 centimeter squares
	Find the missing value given area and length of a rectangle or area and width of a rectangle
	Utilize coordinate geometry within Quadrant I
Concept Development (Financial Literacy)	*Count and make change for fractional dollar amounts*
Financial Literacy	*Identify the difference between credit and debit, deposit and withdrawal (*profit and loss)*

Concept Development	Choose appropriate units of measurement; measure and make appropriate conversions:
	• _time (hour, minute, second);_ • _customary units of length (inch, foot, yard, mile)_ • _Metric units of length (millimeter, centimeter, meter, kilometer)_ • _Customary capacity (cup, pint, quart, gallon)_ • _Metric capacity (milliliter, liter, kiloliter)_ • _Weight (ounce, pound, ton)_ • _Mass (gram, kilogram)_

Standard:

- Operations and Algebra (6OA+DTM)

Essential Questions:
- When are variables used in real life situations?
- How are ordered pairs on a grid applied in various situations outside of the classroom?

CONCEPT	CONTENT
Patterns	Investigate, describe and create compound patterns (eg, addition with multiplication)
Concept Development	_Use proper vocabulary when explaining patterns that repeat, grow or compress_
	Use number patterns to add, subtract, multiply and divide mentally
	Recognize patterns in sums, differences and products of even and odd numbers
	Describe, analyze and complete patterns involving fractions
Algebra	Find missing addends, subtrahends, factors, divisors (without use of a calculator)
Concept Development	_Represent unknown quantities with a symbol; learn the importance of x and y as algebraic symbols_
	Describe arithmetic operations as functions, including combining operations and inverse operations
	Solve inequality equations _(CCSSM)_
	Explore substituting a number value for a variable
	Explore and create input/output table and rewrite tables as ordered pairs (see coordinate geometry above)
	Define and apply dependent and independent variables _(CCSSM)_

Standard:

- Statistics and Probability (6SP+DTM)

Essential Questions:

- How do you determine which area of central tendency should be implemented?
- How does type of data determine choice of data display?

CONCEPT	CONTENT
Data Analysis	Take a survey using real life situations, tally and graph the results using frequency distribution tables; discuss outcomes and draw conclusions from the data and ask statistical questions *(CCSSM)*
	Compute measures of central tendency (mean, median, mode and range)
	Create and interpret pictographs, horizontal and vertical bar graphs(single and double), line graphs, tree diagrams, stem and leaf plots, and tables {use available technology to create data displays}
	Create and interpret box plots including inter-quartile range **(CCSSM)**
Concept Development	*Standard Deviation (Absolute mean deviation)(CCSSM)*
Probability	Perform simple probability experiments of simulations, record results and make predictions
Concept Development	*Discuss low or high probability and possibility of various events using real life situations*
	Express probability in fraction form using concrete and semi-concrete activities
Discrete Math	Utilize Venn Diagrams using multiple classifications (e.g., classifying quadrilaterals)
Mathematical History	Research the mathematical discoveries during the Renaissance Era (e.g. DeVinci, Michaelangelo)

SEVENTH GRADE

Success in the teaching and learning of mathematics is built on the cumulative understanding of the concepts of fluency and continuity from grade level to grade level.

Instructional time should focus on three critical areas; (1) developing fluency with ratios, proportions, problem solving applications, and properties of real numbers, (2) comparing geometric figures, understanding relationships with an emphasis on regular polygons and quadrilaterals, and (3) continued emphasis on statistics and probability for problem solving, including the measures of central tendency.

Standard:
- Numbers and Operations (7NO +DTM)

Essential Questions:
- How does Order of Operations relate to solving multi-step equations?
- How can you determine the gratuity on your dinner bill?
- How are the numbers 6.001 and 1.006 alike? How are they different?
- When is it appropriate to have an integer as a solution? Or rational number?

CONCEPT	CONTENT
Number Sense	Read, write and order numbers through *trillions* in standard, expanded and exponential forms
	Define, compare, order and use integers and rational numbers on a number line
	Write a decimal as a fraction in simplest form and write fractions or mixed numbers as decimal numbers
Concept Development	*Understand the implied operation of mixed numbers*
	Rename improper fractions as mixed numbers and rename mixed numbers as improper fractions
	Write fractions and mixed numbers in standard and word form
	Find equivalent fractions using multiplication and division
	Find the GCF and LCM (LCD) of two numbers
	Define, compare and use rational and irrational numbers
	Use base, exponent and exponential form
	Express that for all numbers a not equal to 0, $a^0 = 1$ and $a^1 = a$ (0^0 is indeterminate)
	*Apply rules for exponents by multiplying and dividing with same base (Multiplication Property of Exponents)
	Express a square or cubed number in standard, factored and exponential form
	Determine square root of a perfect square, make appropriate estimations of a non-perfect square up to 99

	Apply divisibility rules
	Define and apply scientific notation to place value (*negative exponents)
	Recognize and apply concept of significant digits
	Express composite numbers as products of prime numbers (e.g., factor tree, Fundamental Theorem of Arithmetic)
Numerical Operations	Define and use commutative and associative properties of addition, distributive, identity (additive and multiplicative), multiplicative inverse (reciprocal) zero product properties using algebraic notation
	Use Order of Operations to simplify expressions
	Use inverse relationships of addition-subtraction and multiplication-division
	Use all operations with rational numbers (with multiple representation)
Concept Development	***Convert fractions, decimals and percents***
	Find percent of a given number
	Introduce the percent of increase and decrease
Concept Development (Financial Literacy)	***Apply ratio, direct proportion and percents in real life situations (consumer applications)***
	Use estimation in all operations and problem solving
	Introduce integer operations on a number line
	Define absolute value as distance from zero

Standard:
- Geometry (7G + DTM)
- Measurement and Data (7MD + DTM)

Essential Questions:
- How does the area of a rectangle change as its perimeter remains constant?
- Why is classification of different geometric figures necessary?

CONCEPT	CONTENT
Geometry	Identify and complete symmetrical figures on a grid using ordered pairs
	Plot ordered pairs in all four quadrants
	Identify and compare two and three dimensional figures using spatial visualization and visual perception
	Define, draw or construct points, lines and line segments, rays, perpendicular, parallel, intersecting and transversals
	Define, draw or construct various types of angles (right, acute, obtuse, straight, complementary, supplementary, corresponding and vertical,*alternate interior/exterior)

	Construct angles, segments and triangles using straight edge and compass
	Apply ratio and proportion to congruent and similar figures
	Angle relationships in special quadrilaterals
	Classify all quadrilaterals and triangles (by angles and sides)
	Classify solid figures (3-dimensional)
	Identify shape and quantity of faces, edges and vertices of 3-dimensional figures
	Use geometric transformations (rotations, reflections and translations, *dilations) on a grid
	Construct a tessellation
	Identify fractals as occurring in nature
Measurement	Estimate and measure length, width, height, weight, area and volume using metric and customary units of measurement to nearest centimeter, meter, inch, foot, kilogram, pound, liter, cup, nearest kilometer, yard, mile, pint, gallon, gram, ounce, ton
	Find area and perimeter of a rectangle, square, triangle, trapezoid, rhombus, parallelogram (*kite) and find missing sides
	Find area and circumference of a circle(N.B.: the sum of the length of 2 radii is equivalent to the Length of the diameter)
	Find area and perimeter of irregular shapes
	Apply and use Pythagorean Theorem to find missing sides of a right triangle
	Measure and compute volume and surface area of rectangular prisms and cylinders (*triangular prisms, cones and pyramids)
	Utilize 4 quadrant coordinate geometry
	Define and identify quadrants, origin and axes
	Choose appropriate units of measurement; measure and make appropriate conversions: - time (hour, minute, second); - customary units of length (inch, foot, yard, mile) - Metric units of length (millimeter, centimeter, meter, kilometer) - Customary capacity (cup, pint, quart, gallon) - Metric capacity (milliliter, liter, kiloliter) - Weight (ounce, pound, ton) - Mass (gram, kilogram)
	Use scale factor in ratio and proportion

Standard:
- Operations and Algebra (7OA + DTM)

Essential Questions:
- How do you write appropriate inequalities to represent situations involving number quantifiers?
- How are algebraic expressions and equations similar and different?

CONCEPT	CONTENT
Patterns	Investigate, describe and create compound patterns (e.g., arithmetic and geometric, Fibonacci, *Pascal's Triangle)
	Use proper vocabulary when explaining patterns that repeat, grow or compress
	Use number patterns to add, subtract, multiply and divide mentally
Algebra	Translate phrases into algebraic expressions
	Simplify expressions using order of operations including like terms
	Solve one and two step equations (*multi step)
	Describe arithmetic operations as functions, including combining operations and inverse operations
	Substitute a number value for a variable
	Use input/output table to graph linear equations using ordered pairs
Concept Development	*Solve one and two step inequalities and graph solutions on a number line*

Standard:
- Statistics and Probability (7 SP + DTM)

Essential Questions:
- How do you determine which measure of central tendency should be implemented?
- How can an outlier affect a measure of central tendency?
- How does type of data determine choice of data display?

CONCEPT	CONTENT
Data Analysis	Collect, organize and interpret data to solve non-routine problems involving world situations
	Compute measures of central tendency (mean, median, mode and range) with or without a calculator [*graphing calculator, geogebra.com (free on-line), TI Smart View (must purchase)]
	Create and interpret stem and leaf plots, box and whisker plots, horizontal and vertical bar graphs, line graphs, tree diagrams, frequency distribution, histograms, circle graphs and tables (use available technology to create data displays)

	Draw inferences and construct convincing arguments based on data analysis
Probability	Perform simple probability experiments of simulations, record results and make predictions
	Discuss low or high probability and possibility of various events using real life situations
	Express probability in fraction form using concrete and semi-concrete activities
Concept Development	***Understand that the probability of an event must be between zero and one, inclusive(can be written as fraction, decimal or percent)***
	Find permutations, factorials and combinations
Discrete Math	Utilize Venn Diagrams using multiple classifications (e.g., classifying quadrilaterals)
	Introduce logical reasoning problems
Mathematical History	Research how the explorers found America without using a *GPS* or a map, include Mathematical concepts

EIGHTH GRADE

Success in the teaching and learning of mathematics is built on the cumulative understanding of the concepts of fluency and continuity from grade level to grade level.

Instructional time should focus on three critical areas; (1) developing fluency with rational and irrational numbers and properties of exponents applied to solving equations; understanding the concept of a function and its applications; (2) comparing and contrasting 2-D and 3-D figures using spatial visualization techniques, including transformations, and (3) applying probability and statistics using bivariant data, illustrated with various graphing techniques.

Standard:
- Number Operations (8NO + DTM)

Essential Questions:

- What is the difference between compound interest and simple interest?
- What is the importance of scientific notation?

CONCEPT	CONTENT
Number Sense	Change numbers between standard form and scientific notation
	Define and apply scientific notation to place value with positive and negative exponents
Concept Development	*Multiply and divide numbers in scientific notation*
	Write a decimal as a fraction in simplest form and write fractions or mixed numbers as decimal numbers
	Find the GCF and LCM of two or more numbers and monomials
Concept Development	*Define, compare and use rational and irrational numbers (between any two rational number there is at least one irrational number)*
	Determine and explain rational, whether to overestimate or underestimate in problem solving
	Use base, exponent and exponential form
Concept Development	*Express that for all numbers a is not equal to 0, $a^0 = 1$ and $a^1 = a$ (0^0 is indeterminate)*
	Apply rules for exponents by multiplying and dividing with same base (Multiplication Property of Exponents)
	Express a square or cubed number in standard, factored and exponential form
	Know perfect squares up to 15 (*25) and perfect cubes up to 10
	Apply divisibility rules
	Recognize and apply concept of significant digits

	Express composite numbers as products of prime numbers (e.g., factor tree, Fundamental Theorem of Arithmetic)
Numerical Operations	Define and use commutative and associative properties of addition, distributive, identity (additive and multiplicative), multiplicative inverse (reciprocal) zero product properties using algebraic notation
	Use Order of Operations to simplify expressions
	Use inverse relationships of addition-subtraction and multiplication-division
	Use all operations with rational numbers
	Convert fractions, decimals and percents
	Find percent of a given number (percent equation and proportion)
	Find the percent of increase and decrease
Concept Development (Financial Literacy)	***Apply ratio, rate, unit rate, direct proportion and percents in real life situations (consumer applications)***
	Use estimation in all operations and problem solving
	Apply rational number operations
Concept Development	***Define absolute value as distance from zero (*absolute value of variables, e.g. lxl = 9)***
	Using absolute value in adding and subtracting
Financial Literacy	***Simple interest (*Compound interest)***

Standard:
- Geometry (8 G + DTM)
- Measurement and Data (8MD + DTM)

Essential Questions:
- Can you find the area of a triangle without knowing its height?
- How does the area of a triangle change as its side lengths increase or decrease?

CONCEPT	CONTENT
Geometry	Identify and complete symmetrical figures on a grid using ordered pairs
	Identify and compare two and three dimensional figures using spatial visualization and visual perception
	Define, draw or construct points, lines and line segments, rays, perpendicular, parallel, intersecting and transversals using correct symbolic notation
	Construct angle and segment bisectors
	Define, draw or construct various types of angles (right, acute, obtuse, straight, complementary, supplementary, corresponding and vertical, alternate interior/exterior)

Concept Development	*Finding interior and exterior angles in regular polygons (*irregular polygons)*
	Construct angles, segments and triangles using straight edge and compass
	Apply ratio and proportion to congruent and similar figures
	Classify all quadrilaterals and triangles (by angles and sides)
Concept Development	*Properties of special quadrilaterals*
	Classify solid figures (3-dimensional)
	Identify shape and quantity of faces, edges and vertices of 3-dimensional figures
	Use geometric transformations (rotations, reflections and translations, dilations) on a grid
	Construct a tessellation
	Identify fractals as occurring in nature
Measurement	Estimate and measure length, width, height, weight, area and volume using metric and customary units of measurement to nearest centimeter, meter, inch, foot, kilogram, pound, liter, cup, nearest kilometer, yard, mile, pint, gallon, gram, ounce, ton
	Find area and perimeter of a rectangle, square, triangle, trapezoid, rhombus, parallelogram and kite and find missing sides (*find area of a triangle using only side lengths, Heron's Formula)
	Find area and perimeter of irregular shapes and common shaded/unshaded regions
	Apply and use Pythagorean Theorem to find missing sides of a right triangle
	Use Trigonometric ratios to find sides of a right triangle (SOHCAHTOA) (*find missing angles)
	Measure and compute volume and surface area of prisms, cylinders and cones (*spheres)
	Utilize 4 quadrant coordinate geometry
	Choose appropriate units of measurement; measure and make appropriate conversions: • time (hour, minute, second); • customary units of length (inch, foot, yard, mile) • Metric units of length (millimeter, centimeter, meter, kilometer) • Customary capacity (cup, pint, quart, gallon) • Metric capacity (milliliter, liter, kiloliter) • Weight (ounce, pound, ton) • Mass (gram, kilogram)

Standard:

- Operations and Algebra (8 OA + DTM)

Essential Questions:

- Why doesn't a graph always start at zero?
- Why does the shape of some graphs repeat?

CONCEPT	CONTENT
Patterns	Describe and create compound patterns (e.g., arithmetic and geometric, Fibonacci, Pascal's Triangle)
Concept Development	*Use proper vocabulary when explaining patterns that repeat, grow or compress*
	Evaluate infinite sequences (*converging and diverging)
Concept Development	*Represent, analyze and predict relations between quantities, especially quantities changing over time?*
Algebra	Translate phrases into algebraic expressions and equations
	Simplify expressions using order of operations including like terms
	Solve multi step equations and inequalities using rational numbers
Concept Development	*Describe arithmetic operations as functions, including combining operations and inverse operations*
	Substitute a number value for a variable
	Find the slope of a line given two points
Concept Development	*Express slope as a rate of change*
	Define and determine x- and y-intercepts
	Use input/output table, x- and y- intercepts, and slope-intercept formula (*point-slope form) to find and graph linear functions or linear inequalities
	Solve multi step inequalities and graph solutions on a number line
	Identify polynomials according to the number of terms (in standard form)
	Add and subtract polynomials
	Use FOIL method or distributive property to find products of binomials

Standard:
- Statistics and Probability (8SP + DTM)

Essential Questions:
- What is the difference between a permutation and a combination?
- How is the outcome of an experiment affected by using replacement?

CONCEPT	CONTENT
Data Analysis	Collect, organize and interpret data to solve non-routine problems involving world situations(e.g. random sampling)
	Compute measures of central tendency (mean, median, mode and range) with or without a calculator [*graphing calculator, geogebra.com (free on-line), TI Smart View (must purchase)]
	Create, interpret and make inferences based on stem and leaf plots, box and whisker plots, horizontal and vertical bar graphs, line graphs, tree diagrams, frequency distribution, histograms, circle graphs and tables (use available technology to create data displays)
	Draw inferences and construct convincing arguments based on data analysis
Probability	Perform compound probability experiments of simulations, record results and make predictions
	Discuss low or high probability and possibility of various events using real life situations
Concept Development	*Express probability in fraction form using concrete and semi-concrete activities*
	Find permutations and combinations using factorial notation
Discrete Math	Utilize Venn Diagrams using multiple classifications (e.g., classifying quadrilaterals)
	Overlapping and disjoint events
	Logic problems
Mathematical History	Research the importance of Mathematical discoveries for the twentieth century in the United States