



Mathematics Curriculum – Intermediate Level

May 2007

Introduction

Mathematics Curriculum

Each strand represents topics in a two-year cycle. Mathematics is learned through components of integrated curriculum units, as well as separate content units.

Teachers facilitate learning for understanding by:

- **Crafting, adapting and enriching solid instructional plans** which align with NCTM standards and meet individual students' needs.
- **Motivating students** to collaborate with and help one another.
- **Guiding individual students** who need expert assistance to be challenged to think more deeply or to consider a higher degree of complexity in their problem solving process, as well as students who need greater support to build understanding.
- **Presenting content and strategies** using a variety of methods acknowledging diverse learning styles and encouraging terminology, definitions, notation, concepts and skills to emerge in the learning process.
- **Designing assessment** that promotes student learning and assists teachers in making instructional decisions.
- **Providing a variety of mathematical tools** such as measuring devices, calculators, manipulatives, games, charts, reference books, etc.
- **Setting high expectations** for all students appropriate to their development, learning and experience.
- **Creating strong links between mathematical ideas** so that students' understanding and knowledge deepens and their ability to apply mathematics expands.
- **Assigning authentic mathematical tasks** to introduce important mathematical ideas and to engage and challenge students intellectually.

Students develop problem solving and critical thinking capabilities by:

- **Constructing** solutions using authentic problems that go beyond computation.
- **Communicating** using mathematical language to describe the problem solving process and to develop metacognitive thinking.
- **Investigating** open-ended, complex mathematical problems with confidence.
- **Reflecting**, refining and exploring conjecture on the basis of evidence and using a variety of reasoning and proof to confirm or disprove those conjectures.
- **Improving** from evaluation that represents a comprehensive picture of their understanding through performance on projects, tests, class work and homework, as well as from reflecting on their own processes and understanding.

- **Developing** confidence and perseverance when tackling difficult problems, demonstrating flexibility in exploring mathematical ideas, and embracing alternative solution paths.

2nd - 5th Grade Process Strands:

Concepts

Skills and Processes

Problem Solving

- Build new mathematical knowledge through problem solving
- Solve problems that arise in mathematics and other contexts
- Apply and adapt a variety of appropriate strategies to solve problems
- Monitor and reflect on the process of mathematical problem solving

Reasoning & Proof

- Recognize reasoning and proof as fundamental aspects of mathematics
- Make and investigate mathematical conjectures
- Develop and evaluate mathematical arguments and proofs
- Select and use various types of reasoning and method of proof

Communication

- 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

Connections

- Recognize and use connections among mathematical ideas
- Understand how mathematical ideas interconnect and build on one another to produce a coherent whole
- Recognize and apply mathematics in contexts outside of mathematics

Representation

- Create and use representations to organize record and communicate mathematical ideas
- Select, apply and translate among mathematical representations to solve problems
- Use representations to model and interpret physical, social and mathematical phenomena

2nd - 3rd Grade Numbers and Operations:

Concepts

Skills and Processes

Counting

- Understand pattern counting of whole numbers

Place Value

- Understand place value to one million
- Understand rounding
- Understand estimation

Fractional Reasoning

- Recognize fractions as part/whole (less than)
- Recognize fractions as parts of sets
- Explore simple equivalent fractions
- Explore decimals
- Recognize decimals to tenths

ConceptsWhole Number
Operations**Skills and Processes**

- Understand addition up to four digits
- Invent addition algorithms
- Understand addition in context of story problems
- Understand subtraction up to four digits
- Invent subtraction algorithms
- Understand subtraction in context of story problems
- Understand multiplication of facts to 12
- Relate multiplication to repeated addition
- Understand multiplication in context of story problems
- Understand symbolic representation of addition, subtraction, multiplication and division
- Understand division (less than 100)
- Understand fractional model of division
- Understand part of whole model of division
- Understand partitioning model of division
- Relate division to repeated subtraction
- Understand division in context of story problems
- Explore 2 digit by 1 digit multiplication
- Explore addition and subtraction of simple fractions
- Demonstrate automaticity with addition (1-18)
- Demonstrate automaticity with subtraction (1-18)

Quantitative Analysis

- Understand relative size numbers (greater than, less than)
- Understand ordering of whole numbers and simple fractions
- Identify operations within story problems (develop strategies)

Money

- Count money
- Make change

2nd - 3rd Grade Geometry:**Concepts**

Spatial Visualization

Skills and Processes

- Construct common 2 dimensional shapes (parallelogram...)
- Identify common 2 dimensional shapes (expand list)
- Name characteristics of common 3 dimensional shapes
- Identify parallel lines
- Explore coordinate representations
- Explore angles (types)
- Identify perpendicular lines

Transformative
Geometry

- Investigate types of symmetry
- Investigate types of asymmetry
- Explore flips, slides, and turns

2nd - 3rd Grade Measurement:

Concepts

Measurement

Skills and Processes

- Understand concept of length
- Use standard units of measure
- Investigate metric measurement
- Measure using non-standard units
- Investigate concept of mass
- Investigate concept of volume
- Explore perimeter of common polygons (including circles)
- Explore measurement of angles
- Explore areas of common polygons
- Explore congruent figures and shapes and area
- Explore proportionality of length, area, mass and volume
- Order and compare length, mass, volume, and area
- Investigate temperature
- Expand vocabulary of measurement

Time

- Use vocabulary of time
- Utilize the calendar
- Tell time to the minute
- Understand elapsed time

2nd - 3rd Grade Statistics and Probability:

Concepts

Gathering Data

Skills and Processes

- Collect of data
- Utilize language of data collection

Organizing Data

- Organize data using groups, sorting, tallying, attributes and tables
- Utilize the language of organizing data

Representing Data

- Represent data using bar graphs, pictographs, Venn diagram, tables and timelines
- Utilize the language of representation of data

Analyzing Data

- Formulate questions about data
- Comparison of sets of data
- Contrast sets of data
- Make predications about data sets
- Generate conclusions about data

Probability

- Investigate outcomes in situations involving chance
- Use deductive reasoning to make predictions in situations involving chance
- Investigate probability to percents (50,100%)
- Investigate concept of frequency of events occurring

2nd - 3rd Grade Patterns and Algebra:

Concepts

Skills and Processes

Number Patterns

- Investigate patterns in fact families
- Use patterns of odd and even numbers
- Apply patterns to make predictions
- Represent patterns symbolically
- Explore and discuss patterns in real life

Algebraic Reasoning

- Use objects, pictures, or symbols to determine number sentences for problem solving situations involving addition, subtraction, multiplication and division
- Verbalize situational problem solving using addition, subtraction, multiplication, and division

4th - 5th Grade Number & Operations:

Concepts

Skills and Processes

Counting

- Identify all numbers up to one billion
- Count by fractions

Place Value

- Identify place value in base ten to a billion
- Understand decimal place value to ten thousandths
- Investigate negative numbers
- Understand and apply principles for rounding numbers

Fractional Reasoning

- Apply conceptual understanding of division
- Recognize equivalent fractions
- Investigate simplification of fractions
- Apply knowledge to order fractions
- Convert fractional hundredths to decimals and common fractions
- Investigate conversion of fractions to percent
- Investigate conversion of decimals to percent
- Add and subtract like fractions
- Add and subtract unlike fractions
- Add and subtract decimals
- Multiply fractions (concentration on whole numbers multiplied by fractions)

Number Operations

- Mastery of multiplication and division facts to 12
- Mastery of one-digit multiplied by multiple digits
- Mastery of two-digit multiplied by two-digits
- Investigate factors
- Investigate multiples
- Investigate multiplication algorithms
- Investigate division algorithms
- Apply multiplication skills in context of story problems
- Apply division skills in context of story problems
- Use estimation with computation and problem solving
- Apply understanding of relationships between numbers when solving problems
- Investigate commutative and distributive properties

Concepts

Number Theories

Skills and Processes

- Investigate prime numbers
- Investigate composite numbers
- Investigate square numbers
- Investigate numbers less than zero

Quantitative Analysis

- Apply knowledge to ordering fractions, and decimals
- Identify operations within word problems

Money

- Relate decimals to monetary system

4th - 5th Grade Geometry and Measurement:**Concepts**

Spatial Visualization

Skills and Processes

- Identify and create polygons
- Identify and construct 3-dimensional shapes
- Investigate properties and characteristics of polygons (e.g. vertices, sides, etc.)
- Apply knowledge of perpendicular and parallel lines
- Investigate properties and characteristics of 3-dimensional shapes (e.g. surface, edge, etc.)
- Investigate categories of angles up to 360 degrees and practice measuring
- Use mathematical language to talk about geometric shapes and their properties
- Investigate coordinate representation (ordered pairs)
- Investigate characteristics and properties of circles
- Investigate congruent shapes

Transformational
Geometry

- Expand investigation of symmetry
- Expand investigation of asymmetry
- Investigate flips, slides and turns

Measurement

Length:

- Use U.S. customary units of measurements accurately
- Use metric units of measurement accurately
- Investigate perimeter and area of polygons
- Investigate proportionality of length in polygons

Weight:

- Expand investigation of the concept of weight
- Investigate proportionality of weight

Volume:

- Expand investigation of the concept of volume and mass
- Investigate proportionality of volume
- Expand investigation of the concept of temperature

4th - 5th Grade Statistics and Probability:**Concepts**

Gathering Data

Skills and Processes

- Collection of data
- Utilizing language of data collection

Organizing Data

- Organize data using groups, tallying, tables, and Venn Diagrams
- Utilize the language of organizing data

Concepts

Representing Data

Skills and Processes

- Represent data using bar graphs, line graphs, pie charts, pictographs, and timelines
- Utilize the language of representation of data

Analyzing Data

- Formulate questions about data
- Compare sets of data
- Contrast sets of data
- Make predictions about data sets
- Interpret data
- Generate conclusions about data
- Make inferences from data

Probability

- Investigate, demonstrate, and record outcomes in situations involving chance
- Use deductive reasoning to make predictions in situations involving chance
- Make connections among probability, fractions, and percent

4th - 5th Grade Patterns and Algebra:**Concepts**

Number Patterns

Skills and Processes

- Investigate patterns in prime numbers and composite numbers
- Investigate patterns in a 100's chart
- Investigate patterns in decimals and fractions
- Investigate patterns involved in number theories (e.g. base 2)
- Represent numbers and patterns symbolically
- Apply patterns to making predictions

Algebraic Reasoning

- Use symbols to determine number sentences for problem solving situations