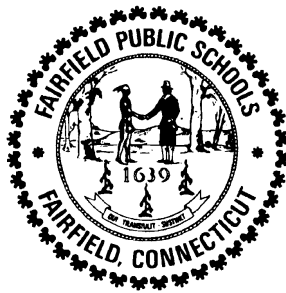# FAIRFIELD PUBLIC SCHOOLS
FAIRFIELD, CONNECTICUT

K-5
MATHEMATICS
CURRICULUM

**Approved By The Board of Education on
August 26, 2003**

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Table of Contents

SECTION 1: DISCIPLINE/CONTENT INFORMATION

SECTION 2: CURICULLUM DESCRIPTION

National Council of Teachers of Mathematics

NCTM STANDARDS

A. **LEARNING MATHEMATICS WITH UNDERSTANDING IS ESSENTIAL**

The alliance of factual knowledge, procedural proficiency, and conceptual understanding makes all three components usable in powerful ways. Mathematics makes more sense and is easier to remember and to apply when students connect new knowledge to existing knowledge in meaningful ways. Well-connected, conceptually grounded ideas are more readily accessed for use in new situations.

B. **PRINCPLES FOR MATHEMATICS IN ELEMENTARY SCHOOLS**

- ❖ Equity: Mathematics curriculum requires high expectations and strong support for all students.

- ❖ Instruction: We must know what students know and need to learn and then challenge and support them to learn it well.

- ❖ Curriculum: Mathematics curriculum must be coherent, focused on important concepts, and well articulated across the grades.

- ❖ Learning: Students will learn mathematics by actively building new knowledge from experience and prior knowledge.

- ❖ Assessment: Assessment must support the learning of important mathematics and furnish useful information to both teachers and students.

- ❖ Technology: Technology influences the mathematics that is taught and enhances students' learning.

C. **MATHEMATICAL CONTENT**

Each of the NCTM Standards applies across all grades. Each standard comprises a small number of goals that apply across all grades--a commonality that promotes a focus on the growth in students' knowledge and sophistication as they progress through the curriculum. They highlight the growth of expectations across the grades. It is not expected that every topic will be addressed each year. Rather, students will reach a certain depth of understanding of the concepts and acquire certain levels of fluency with the procedures. Further instruction can assume and build on this understanding and fluency.

Number and Operations

Historically, number has been a cornerstone of the mathematics curriculum.

All students should be able to:
- understand numbers, ways of representing numbers, relationships among numbers, and number systems;
- understand meanings of operations and how they relate to one another; and
- compute fluently and make reasonable estimates.

This standard describes deep and fundamental understandings of, and proficiency with, counting, numbers, and arithmetic, as well as an understanding of number systems and their structures. Representing numbers with various physical materials should be a major part of mathematics instruction in the elementary grades. Developing fluency requires a balance and connection between conceptual understanding and computational proficiency. Part of being able to compute fluently means making smart choices about which tools (i.e., manipulatives, pencil and paper, calculators, or computers) and when to use them.

Algebra

All students should learn algebra. This standard emphasizes relationships among quantities, including functions, ways of representing mathematical relationships, and the analysis of change. For instance, systematic experience with patterns can build up to an understanding of the idea of function and experience with numbers and their properties lays a foundation for later work with symbols and algebraic expressions.

All students should be able to:
- understand patterns, relations, and functions;
- represent and analyze mathematical situations using algebraic symbols;
- use mathematical models to represent and understand quantitative relationships; and
- Analyze change in various contexts.

Algebra is more than moving symbols around. In the elementary grades, students typically develop a notion of variable as placeholder for a specific number, as in ____+ 2 = 11 and later they learn that they can use a variable in this statement. It is hoped that the students will come to view the equal sign as a symbol of equivalence and balance.

One of the most powerful uses of mathematics is the mathematical modeling of phenomena. In the primary grades, students can use objects, pictures, and symbols to model situations that involve the addition and subtraction of whole numbers. When students arrange and rearrange counters to demonstrate an addition problem, they are modeling mathematics. In grades 3-5 students should use their models to make predictions, draw conclusions, or better understand quantitative situations.

Using graphs and tables, students can begin to notice and describe change. Understanding change is fundamental to understanding functions and to understanding the many ideas presented in the daily news.

Geometry

Spatial visualization is an important aspect of geometric thinking. Geometry should be integrated, when possible, with real-world situations and problem solving.

All students should be able to:
- analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships;
- specify locations and describe spatial relationships using coordinate geometry;
- apply symmetry and transformations to analyze mathematical situations; and
- use visualization, spatial reasoning, and geometric modeling to solve problems.

Students will learn concepts of relative position and then use rectangular grids to locate objects and measure the distance between points along vertical or horizontal lines. They will become familiar with and use a number line, grids, and arrays. They will explore motions such as slides, flips, and turns. Students need to learn to physically and mentally change the position, orientation, and size of objects in systematic ways as they develop their understandings about congruence, similarity, and transformations.

Measurement

Measurement is the assignment of a numerical value to an attribute of an object, such as the length of a book or temperature of the air. Students in the elementary grades can explore how changing an object's attributes affect certain measurements. They start by using nonstandard units. They then have opportunities to use standard units like centimeters, pounds, and hours. Choosing a convenient unit of measurement is also an important skill. Learning how to choose an appropriate unit is a major part of understanding measurement. In the United States, students should learn both customary and metric systems.

Students should be able to:
- understand measurable attributes of objects and the units, systems, and processes of measurement; and
- apply appropriate techniques, tools, and formulas to determine measurements.

Understanding that all measurements are approximations is a difficult, but important concept for students. Class discussion of their observations can bring out the ideas of precision and accuracy. Students should have opportunities to use maps and make simple scale drawings.

Data Analysis and Probability

Students should learn how to collect data, organize their own or others data, and display the data in graphs and charts that will be useful in answering their questions.

Students should be able to:
- formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them;
- select and use appropriate statistical methods to analyze data;
- develop and evaluate predictions that are based on data; and
- understand and apply basic concepts of probability.

Work in data analysis and probability offers a natural way for students to connect mathematics with other school subjects, such as science and social studies, and with experiences in their daily lives. Books, newspapers, the World Wide Web, and other media are full of displays of data. Beginning in the early grades, students should spend more time planning the data collection and evaluating how well their methods worked in getting information about their questions. They need to spend time seeing that data can be organized or ordered and that this "picture" of their data provides information about the question. Later on students can develop skills in representing their data, often using bar graphs, tables, or line plots. The emphasis should shift, eventually, from analyzing and describing one set of data to comparing two or more sets. Research shows that students in the later grades expect their own judgment to be more reliable than information obtained from data.

Probability is connected to other areas of mathematics. Young children can begin building an understanding of chance and randomness by doing experiments with concrete objects, such as choosing colored items from a paper bag. Eventually, students can consider the idea of chance through experiments using coins or spinners. The idea that individual events are not predictable in certain situations, but that a pattern of outcomes can be predicted is an important concept at the end of the elementary grades.

D.   MATHEMATICAL PROCESSES

Problem Solving

Problem solving means engaging in a task for which the solution method is not known in advance. Students should have frequent opportunities to formulate, grapple with, and solve complex problems that require a significant amount of effort and should then be encouraged to reflect on their thinking.

Students should be able to:
- build new mathematical knowledge through problem solving;
- solve problems that arise in mathematics and in other contexts;
- apply and adapt a variety of appropriate strategies to solve problems; and
- monitor and reflect on the process of mathematical problem solving.

In the early grades, problem solving will help students to think systematically about possibilities and to organize and record their thinking. Students need not wait until they can add fluently. In problem solving students can use diagrams, look for patterns, list all possibilities, try special cases, work backward, guess and check, create an equivalent problem, and create a simpler problem. Good problem solvers become aware of what they are doing and frequently monitor, or self-assess, their progress or adjust their strategies as they encounter and solve problems.

Reasoning

Reasoning mathematically is a habit of mind, and like all habits, it must be developed through consistent use in many contexts. Doing mathematics involves discovery. Conjecture—that is, informed guessing—is a major pathway to discovery. Students learn to make conjectures when teachers ask questions of them such as:
- "What do you think will happen next?"
- "What is the pattern?"
- "Is this always true?"
- "What happens when the values of this sample are doubled? Why?"

Young students will express their conjectures and describe their thinking in their own words and often explore them using concrete materials and examples.

Students should be able to:
- make and investigate mathematical informed guessing–conjectures;
- develop and evaluate mathematical arguments;
- recognize reasoning as an important fundamental part of mathematics; and
- select and use various appropriate types and methods of reasoning.

Classrooms in which students are encouraged to present their thinking and in which everyone contributes by evaluating one another provide rich environments for learning mathematical reasoning. With guidance and many opportunities to explore, students in upper grades can learn how to be systematic in their exploration, to know that they have tried all the cases, and then to create arguments using these cases.

Communication

Communication can support students' learning new mathematical concepts. Misconceptions can be identified and addressed. Reflection and communication are intertwined. Writing in mathematics can help students consolidate their thinking because it requires them to reflect on their work and clarify their thoughts about the ideas developed in the lesson.

Students should be able to:
- organize their mathematical thinking through various types of communications;
- communicate their thinking to other students, teachers, and parents;
- analyze and evaluate the mathematical thinking and strategies of others; and
- be precise in using the language of mathematics to express ideas.

One of the goals of mathematics learning is to determine what is acceptable as evidence of clear mathematical thinking and then express that thinking clearly and coherently. Through the grades this expression will become more complete, convincing, understandable, and precise. Communication in mathematics also includes oral presentations to other students and the teacher by students of their thinking and problem solving solutions.

Connections

When students can connect mathematical ideas, their understanding is deeper and more lasting. Mathematics is not a collection of separate strands or standards. Rather, mathematics is an integrated field of study.

Students should be able to:
- recognize and use connections among mathematical ideas;
- understand how mathematical ideas interconnect and build on one another to produce a coherent whole; and
- recognize and apply mathematics in contexts beyond mathematical ones.

Throughout the span of mathematics education, students should routinely ask themselves, "How is this problem that I have just worked like things that I have studied before?" and "How is this mathematical topic like something I have studied before?" As students develop a view of mathematics as a connected and integrated whole, they will have less of a tendency to view mathematical skills and concepts separately. If conceptual understandings are linked to procedures, students will not perceive mathematics as an arbitrary set of rules. Sometimes this is best done with data analysis and statistics where the data can be used to clarify issues related to their personal lives.

Representation

The ways in which mathematical ideas are represented is fundamental to how people can understand and use those ideas. Many of these representations we take for granted—such as numbers in base-ten, fractions, algebraic expressions and equations, graphs, spreadsheet displays, etc. Representations can help students organize their thinking.

Students should be able to:
- create and use mathematical symbols and expressions to organize, record, and communicate mathematical ideas;
- select, apply, and translate among mathematical representations to solve problems; and
- use these representations to model and interpret physical and mathematical phenomena.

One of the most powerful aspects of mathematics is its use of abstraction—stripping away some of the features of a problem and allowing the symbols to be operated upon more easily. When students become comfortable with this action, abstraction has been reached.

The term "model" has many different meanings. Model is used to refer to physical materials with which students work—manipulative models. The word model can also refer to a mathematical representation of the elements and relationships in a complex phenomenon, which the student might be trying to idealize. These two extremes allow us to see the wide range of the continuum where models can be utilized. Models allow a view of the real-world.

Connecticut State Department of Education

MATHEMATICS CURRICULUM FRAMEWORK

MATHEMATICS

By the end of Grade 12, students will apply proficiently a range of numerical, algebraic, geometric, and statistical concepts and skills to formulate, analyze, and solve real-world problems; to facilitate inquiry and the exploration of real-world phenomena; and to support continued development and appreciation of mathematics as a discipline.

PROGRAM GOALS

As a result of education in Grades K-12, students will:

- communicate numerical, geometric, algebraic, and statistical ideas orally and in written form with models, pictures, graphs and mathematical symbols, using paper and pencil, a variety of calculator displays, spreadsheets, graphing packages, word processing, and other related computer software;

- use inductive and deductive reasoning to make, defend, and evaluate conjectures and arguments to justify assertions and verify tentative conclusions, and to solve mathematical problems;

- use mathematical skills and concepts to make and justify decisions and predictions, to identify patterns and trends, to pose questions from data and situations, and to formulate and solve problems;

- identify and use connections within mathematics to identify interrelationships and equivalent representations, to construct mathematical models, and to investigate and appreciate mathematical structure;

- use mathematical skills and concepts to describe and analyze data and measurements from other disciplines;

- select and use appropriate approaches and tools for solving computational, geometric, and algebraic problems including estimation, mental computation, guess and test, paper and pencil, calculators and computers with software for tabulating, charting, graphing, drawing, and transforming data and images; and

- use mathematical skills and concepts with proficiency and confidence, and appreciate the power and utility of mathematics as a discipline and as a tool for solving problems.

K-12 CONTENT STANDARDS

1.	**Number Sense**	Students will use numbers to count, measure, compare, order, scale, locate and label, and use a variety of numerical representations to present, interpret, communicate, and connect various kinds of numerical information.
2.	**Operations**	Students will add, subtract, multiply, and divide with whole numbers, fractions, decimals, and integers and develop strategies for selecting the appropriate computational and operational methods for solving problems.
3.	**Estimation and Approximation**	Students will make estimates and approximations and judge the reasonableness of results.
4.	**Ratios, Proportions, and Percents**	Students will use ratios, proportions, and percents to represent relationships between quantities and measures and solve problems involving ratios, proportions, and percents.
5.	**Measurement**	Students will make and use measurements in both customary and metric units to approximate, measure, and compute length, area, volume, mass, temperature, angle, and time.
6.	**Spatial Relationships and Geometry**	Students will analyze and use spatial relationships and basic concepts of geometry to construct, draw, describe, and compare geometric models and their transformations, and use geometric relationships and patterns to solve problems.
7.	**Probability and Statistics**	Students will use basic concepts of probability and statistics to collect, organize, display and analyze data, simulate events, and test hypotheses.
8.	**Patterns**	Students will discover, analyze, describe, extend, and create patterns and use patterns to describe mathematical and other real-world phenomena.
9.	**Algebra and Functions**	Students will use algebraic skills and concepts, including functions, to describe real-world phenomena symbolically and graphically and to model quantitative change.
10.	**Discrete Mathematics**	Students will use the concepts and processes of discrete mathematics to analyze and model a variety of real-world situations that involve recurring relationships, sequences, networks, combinations, and permutations.

CONTENT STANDARD 1: Number Sense

Students will use numbers to count, measure, compare, order, scale, locate, and label and use a variety of numerical representations to present, interpret, communicate, and connect various kinds of numerical information.

K-8 PERFORMANCE STANDARDS

Educational experiences in **Grades K-4** will assure that students:

- use real-life experiences, physical materials, and technology to construct meanings for whole numbers, commonly used fractions and decimals;

- understand our numeration system by modeling, counting, grouping, and using place-value concepts;

- use numbers to count as measures, labels, and as indicators of location;

- understand and use properties of numbers including odd, even, ordinal, and cardinal; and

- develop a sense of magnitude of numbers by ordering and comparing whole numbers, commonly used fractions, decimals, and money amounts.

Educational experiences in **Grades 5-8** will assure that students:

- use real-life experiences, physical materials, and technology to construct meanings for whole numbers, commonly used fractions, decimals, and money amounts and extend these understandings to construct meanings for integers, rational numbers, percents, exponents, roots, absolute value, and scientific notation;

- model, represent, and use numbers in a variety of equivalent forms (integer, fraction, decimal, percent, exponential, and scientific notation) as they arise from real-world situations;

- use the equivalence of fractions, decimals, and percents to select appropriate and efficient ways to write, order, compare, estimate, and compute;

- develop and use a sense of order and magnitude of fractions, decimals, integers, powers, and roots; and

- develop and apply number theory concepts (primes, factors, multiples, and divisibility rules), as appropriate, in various real-world problem situations.

CONTENT STANDARD 2: Operations

Students will add, subtract, multiply, and divide with whole numbers, fractions, decimals, and integers and develop strategies for selecting the appropriate computational and operational methods for solving problems.

K-8 PERFORMANCE STANDARDS

Educational experiences in **Grades K-4** will assure that students:

- develop meaning for the operations by modeling, comparing, and discussing a variety of problem situations;

- develop proficiency with basic addition, subtraction, multiplication, and division facts through the use of a variety of strategies and contexts;

- use informal language, mathematical language, and symbols to relate problem situations to operations;

- recognize that any one operation can be used to represent diverse problem situations, e.g., subtraction can be used in "take away" as well as comparison situations;

- construct, use, and explain a variety of procedures for performing whole number calculations; and

- understand and use relationships among operations, e.g., multiplication is repetitive addition; multiplication is the opposite of division.

Educational experiences in **Grades 5-8** will assure that students:

- maintain proficiency with basic addition, subtraction, multiplication, and division facts through the use of a variety of strategies and contexts;

- develop, use, and explain procedures for performing calculations with whole numbers, decimals, fractions, and integers;

- understand the concepts of powers and roots and apply them in problem situations;

- select and use an appropriate method for computing from among mental math, estimation, paper and pencil, and calculator methods; and

- use relationships among operations and properties of operations (associative, commutative, and distributive) as well as order of operations and inverses to simplify computations.

CONTENT STANDARD 3: Estimation and Approximation

Students will make estimates and approximations and judge the reasonableness of results.

Educational experiences in **Grades K-4** will assure that students:

- explore, construct, and use a variety of estimation strategies;

- recognize when estimation is appropriate and understand the usefulness of an estimate as distinct from an exact answer;

- use estimation to determine the reasonableness of an answer;

- visually estimate length, area, volume, and angle using various referents; and

- apply estimation when working with quantities, measures, and problems.

Educational experiences in **Grades 5-8** will assure that students:

- develop, apply, and explain a variety of estimation strategies in problem situations involving quantities and measures;

- use estimation to predict outcomes and determine reasonableness of results;

- recognize when estimation is appropriate and understand the usefulness of an estimate as distinct from an exact answer; and

- determine whether a given estimate is an overestimate or underestimate.

CONTENT STANDARD 4: Ratios, Proportions, and Percents

Students will use ratios, proportions, and percents to represent relationships between quantities and measures and solve problems involving ratios, proportions, and percents.

K-8 PERFORMANCE STANDARDS

Educational experiences in **Grades K-4** will assure that students:

- describe simple ratios when comparing quantities.

Educational experiences in **Grades 5-8** will assure that students:

- understand and use ratios, proportions, and percents in a wide variety of situations;

- develop, apply, and explain methods for solving problems involving proportions and percents;

- use and differentiate between fractional parts and ratios when comparing quantities; and

- use dimensional analysis to identify and find equivalent rates.

CONTENT STANDARD 5: Measurement

Students will make and use measurements in both customary and metric units to approximate, measure, and compute length, area, volume, mass, temperature, angle, and time.

Educational experiences in **Grades K-4** will assure that students:

- use and describe measures of length, distance, capacity, mass, area, volume, time, temperature, and angle;

- compare and order objects according to some measurable attribute;

- develop and use personal referents, such as fingers and arm spans, as estimates for standard units of measure; and

- select and use appropriate standard and nonstandard units of measurement to solve problems.

Educational experiences in **Grades 5-8** will assure that students:

- estimate, make, and use measurements to describe and compare phenomena and explore the structure and use of systems of measurement including converting units within systems;

- select and use appropriate measurement units and tools to make measurements to the degree of accuracy required by the situation;

- solve problems involving the concept of, calculation of, and relationships among length, perimeter, area, volume, angle measure, capacity, weight, mass, and temperature; and

- develop and use formulas and procedures for solving measurement problems.

CONTENT STANDARD 6: Spatial Relationships and Geometry

Students will analyze and use spatial relationships and basic concepts of geometry to construct, draw, describe, and compare geometric models and their transformations and use geometric relationships and patterns to solve problems.

K-8 PERFORMANCE STANDARDS

Educational experiences in **Grades K-4** will assure that students:

- describe, model, draw, and classify shapes;

- investigate and predict the results of combining, subdividing, and changing shapes;

- identify and use geometric shapes in various orientations including rotations, reflections, and translations;

- use real-life experiences, concrete objects, and technology to explore and understand properties of 2- and 3-dimensional geometric shapes; and

- explore relationships among properties of shapes, such as congruence, similarity, and symmetry.

Educational experiences in **Grades 5-8** will assure that students:

- investigate, explore, and describe the geometry in nature and real-world applications;

- identify, visualize, model, describe, and compare properties of and relationships among 2- and 3-dimensional shapes;

- describe and use fundamental concepts and properties of and relationships among points, lines, planes, angles, and shapes including incidence, parallelism, perpendicularity, congruence, similarity, and the Pythagorean theorem;

- construct, analyze, and apply the effects of reflections, translations, rotations, and dilations on various shapes;

- relate 2- and 3-dimensional geometry using shadows, perspectives, projections, and maps; and

- solve real-world problems using geometric concepts.

CONTENT STANDARD 7: Probability and Statistics

Students will use basic concepts of probability and statistics to collect, organize, display and analyze data, simulate events, and test hypotheses.

Educational experiences in **Grades K-4** will assure that students:

- pose questions, make predictions, and solve problems that involve collecting, organizing, and analyzing data;

- construct, read, and interpret displays of data such as pictographs and bar and circle graphs;

- make inferences and formulate hypotheses based on data;

- generate and analyze data obtained from such chance devices as spinners and dice;

- develop intuition about the probability of various real-world events; and

- make predictions that are based on intuitive and experimental probabilities.

Educational experiences in **Grades 5-8** will assure that students:

- make conjectures; design simulations and samplings; generate, collect, organize, and analyze data; and represent the data in tables, charts, graphs, and creative data displays;

- make inferences and formulate and evaluate hypotheses and conclusions based on data from tables, charts, and graphs;

- describe the shape of the data using range, outliers, and measures of central tendency including mean, median, and mode;

- select and construct appropriate graphical representations and measures of central tendency for sets of data;

- determine the probability of simple and compound events;

- model probabilistic situations using both simulations and theoretical methods;

- make predictions that are based on experimental and theoretical probabilities; and

- draw conclusions from data and identify fallacious arguments or claims.

CONTENT STANDARD 8: Patterns

Students will discover, analyze, describe, extend, and create patterns and use patterns to describe the mathematical and other real-world phenomena.

Educational experiences in **Grades K-4** will assure that students:

- reproduce, extend, describe, and create patterns and sequences using a variety of materials and attributes;

- use tables and graphs to display pattern data and explore a variety of ways to write rules that describe patterns and relationships; and

- develop and test generalizations based on observations of patterns and relationships.

Educational experiences in **Grades 5-8** will assure that students:

- describe, analyze, create, and extend a wide variety of patterns;

- represent and describe mathematical relationships using tables, rules, simple equations, and graphs;

- use patterns and relationships to identify the nth term in a sequence;

- construct and analyze tables and graphs to identify patterns and relationships; and

- use patterns and relationships to represent and solve problems.

19

CONTENT STANDARD 9: Algebra and Functions

Students will use algebraic skills and concepts, including functions, to describe real-world phenomena symbolically and graphically, and to model quantitative change.

K-8 PERFORMANCE STANDARDS

Educational experiences in **Grades K-4** will assure that students:

- represent numerical situations using variables, expressions, equations, and inequalities; and

- write and solve number sentences that describe real-life situations.

Educational experiences in **Grades 5-8** will assure that students:

- use variables, expressions, equations, and inequalities to describe and represent numerical situations;

- use concrete materials, tables, graphs, verbal rules, and symbolic expressions to represent situations and patterns;

- analyze functional relationships to explain how a change in one quantity is associated with a change in another;

- construct and interpret data points on number lines and the coordinate plane; and

- solve simple linear equations using concrete, informal, graphical, tabular, and formal methods.

CONTENT STANDARD 10: Discrete Mathematics

Students will use the concepts and processes of discrete mathematics to analyze and model a variety of real-world situations that involve recurring relationships, sequences, networks, combinations, and permutations.

K-8 PERFORMANCE STANDARDS

Educational experiences in **Grades K-4** will assure that students:

- classify data according to attributes;

- solve simple counting problems;

- use diagrams and models of simple networks that represent everyday situations;

- identify and investigate sequences; and

- follow, devise, and describe practical algorithmic procedures.

Educational experiences in **Grades 5-8** will assure that students:

- use systemic listing and counting strategies including simple combinations and permutations;

- use recursive processes, including iteration, to explore and solve problems; and

- devise, describe, and test algorithms for solving optimization problems.

BROAD THEMES
AND
CONCEPTS K-5

Mathematical Content

Mathematics is more than arithmetic. Mathematics is a way of thinking; doing mathematics entails logical reasoning and the development of a variety of problem-solving strategies.

Every student, in every grade, explores and studies the basic concepts and skills that comprise three areas of mathematics:

- dealing with data;
- developing spatial relationships; and
- using numerical relationships.

Dealing with Data includes:

- Classification
- Patterns
- Relationships
- Algebraic Properties and Functions
- Graphs
- Probability
- Statistics

Everyone uses mathematical thinking when they deal with **Patterns, Relationships, Algebraic Properties, and Functions**.

As students search for and identify patterns they are learning to make generalizations and predictions. Describing patterns involves students in developing rules or formulas which help solve many practical problems. Patterns in numbers, shapes, and graphs make it possible for students to predict reasonable answers, compare and classify information, and deal with similarities and differences.

Probability and Statistics is a formal way of using mathematics to collect, organize, display, analyze, and summarize data.

Students organize data in charts, tables, graphs, maps, and spreadsheets to make it easier to spot patterns and trends and make predictions. Weather reports, election polls, product surveys, genetic studies, and environmental samplings are examples of how we deal with data as consumers and citizens.

Spatial Relationships include:

- Geometry
- Estimation
- Measurement (length, area, perimeter, time, angle, weight, volume)

Developing **Geometry and Measurement** involves students in the investigation of the physical world.

Examining two- and three-dimensional shapes, comparing size and position, describing the parts of a shape or solid, exploring ways that shapes and solids fit together, and identifying the relationships among shapes and their parts involves students in the study of Geometry and Measurement.

Geometry is all around us in art, nature, and the things we manufacture. Measurement uses numbers to describe the physical world so that comparisons of length, time, weight, temperature, angle, speed, force, and other phenomena are possible. Knowledge of how to use measurement tools and interpret relationships between units of measure is an important and practical way to describe the world around us.

Numerical Relationships include:

- Number Sense and Place Value
- Basic Facts
- Estimation and Mental Computation
- Computation with Whole Numbers
- Computation with Fractions, Decimals, Money, and Percents

Number Sense and Numeration involves developing and using realistic approaches to estimate, count, compare, order, and describe numerical situations.

Whole Number Concepts and Computation includes learning and using basic skills.

Students recognize that our number system is based on multiples of ten and that number patterns aid in both mental and paper and pencil computation. Students explore using number patterns to make estimations, mental computations, and to judge the reasonableness of calculations.

Fractions, Decimals, and Percents are related to each other.

They are different ways of describing a part-to-whole relationship. Students explore how a particular form may be more useful to describe a numerical relationship or handle a calculation.

K-5 MATHEMATICS OBJECTIVES

Strand: Patterns, Relationships, Algebraic Properties, Functions

1. Explore a variety of collections and sort and describe them using students' own classification rules.

2. Explore ways of sorting a collection using a given rule, including attributes such as color, size, shape, and texture. (24b)

3. Describe collections of sorted objects using real and pictorial graphs and explore simple Venn diagrams for subsets and intersections.

4. Explore and create patterns using students' own rules.

5. Recognize, copy, predict, and extend simple linear patterns using a variety of context (poetry, art, music, body movement, shape and color).

6. Recognize, describe, and translate simple linear patterns as AB, ABB, etc. from one medium to another - visual, tactile, aural.

Strand: Probability and Statistics

1. Explore different questions that might be posed and answered as students sort collections and organize and analyze information about the collections.

2. Construct, analyze, and describe real and pictorial graphs from student-organized data. (19b)

3. Informally experience situations involving probability during classroom activities.

Strand: Geometry and Measurement

1. Demonstrate and use positional terms: above, below, on, under, in, out, right, left, top, bottom, middle, beside, between.

2. Sort and name shapes (circle, square, triangle, rectangle, oval, trapezoid, rhombus, and hexagon), discuss their attributes, and identify them in the environment.

3. Sort and recognize solids (sphere, cube, cone, and cylinder), discuss their attributes, and recognize them in the environment.

4. Explore spatial relationship by constructing shapes and solids using a variety of materials. (17)

5. Connect work with shapes to estimating, comparing, classifying, graphing, daily activities, and work in other content areas.

6. Explore covering a shape with nonstandard units. Begin to make estimates of area by predicting how many of a smaller object will cover the shape.

7. Estimate and measure length with nonstandard units. (15)

8. Explore weight with a simple balance using nonstandard units.

9. Explore capacity (volume) with nonstandard units.

10. Informally develop the vocabulary of measurement using comparative terms for length, area, weight, and capacity.

Substrand: Time

1. Relate a sequence of events using vocabulary associated with the parts of the day, seasons, and calendar.

2. Identify the time to the hour, both analog and digital. (14a)

Strand: Number Sense and Numeration

1. Estimate and count to 30 with and without objects.

2. Match numerals with sets or pictures of objects, 0-10. (2a)

3. Place sets of objects in order, and match to numerals 0-10.

4. Count by rote, forward and back from 10.

5. Determine whether two sets are equal or which has more or fewer objects and identify one more/one less.

6. Form numerals using a variety of media.

7. Experience counting and skip counting beyond 30.

8. Recognize that numbers are used in various situations to give information.

Strand: Whole Number Concepts and Computation

1. Combine two sets of objects for sums to 10 and use a counting strategy to find the total.

2. Explore and describe the results of taking some objects from a set of no more than 10.

Strand: Fractions, Decimals, Percents

1. Explore and identify halves of whole objects.

2. Use the language of whole and half in daily situations.

3. Estimate half of a small collection or handful of objects.

Substrand: Money

1. Explore the idea of money as a trading material to purchase objects.

2. Use pennies to count.

3. Explore and sort a collection of coins and explain ways to sort using students' own rules.

4. Recognize by name the penny, nickel, dime, and quarter.

Strand: Patterns, Relationships, Algebraic Properties, Functions

1. Use, describe, and record students' own classification rules using attributes of a variety of collections.

2. Sort a collection using a given rule. (24b)

3. Continue to describe collections of sorted objects using real and pictorial graphs. *

4. Continue to recognize, describe, and translate simple linear patterns. *

5. Explore and extend number patterns and describe the rule for a number pattern. (22)

6. Continue to identify and classify patterns by different attributes in real and/or pictorial graph form.

7. Identify similarities and differences in patterns to help solve problems.

8. Explore, copy, name, extend, find missing piece or part, and invent patterns.

9. Connect patterning to the environment, other areas of mathematics, and other disciplines.

10. Explore and construct matrices with attribute materials and use a matrix to identify missing elements in classification problems.

11. Explore function activities, such as "function machines," input-output processes, or T-tables.

*Students deepen understanding and apply concepts to challenging problems.

Strand: Probability and Statistics

1. Construct, interpret, and describe real, pictorial, and symbolic graphs from student-collected data and make statements about the information in the graphs. (19b)

2. Look for patterns in data and make predictions before and after graphing.

3. Choose an appropriate graph or data display.

4. Informally experience situations and make predictions involving probability and chance during classroom activities.

Strand: Geometry and Measurement

1. Construct and copy shapes and solids using a variety of materials and compare their features. (17)

2. Sort and name shapes and solids, discuss their attributes, and identify them in the environment. Shapes: circle, square, triangle, rectangle, oval, rhombus, trapezoid, hexagon; solids: sphere, cube, cone, cylinder.

3. Use language to describe the geometric features of shapes and solids - side, face, corner, point, angle.

4. Use language to identify spatial location - around, through, first, last, beside, between, top, bottom, next to, away from, right, left, inside, outside, close, near, far.

5. Explore, create, and identify symmetrical shapes and draw a line of symmetry.

6. Connect work with shapes and solids through estimating, comparing, classifying, graphing, daily activities, and work in other content areas.

7. Estimate and measure given objects or lengths using nonstandard and standard units (in., cm.). (15, 16a, 16b)

8. Estimate and measure area using nonstandard units.

9. Estimate and explore measuring capacity (volume) using nonstandard units.

10. Explore weight using nonstandard units.

11. Explore temperature at the comparative level.

12. Use appropriate language to describe comparisons: more, less, equal, most, least, empty, full, shorter, taller, bigger, smaller, hotter, colder, heavier, lighter.

13. Order objects using the attributes of size, length, and weight.

Substrand: Time

1. Describe a sequence of events using vocabulary such as yesterday, today, tomorrow, beginning, middle, end, morning, afternoon, evening.

2. Introduce standard time units: days, weeks, months, year, hour, half-hour.

3. Identify, show, and record a given time (hour and half-hour) using pictorial, demonstration clocks, and real clocks. (14a)

4. Estimate and compare the length of time certain tasks take (shorter, longer).

5. Solve time problems involving sequence and duration of time using the calendar.

Strand: Number Sense and Numeration

1. Estimate, count forward through 100, and skip count by 2s, 5s, and 10s using objects, pictures, and rote counting.

2. Build models and draw pictures. Match and label the pictures using numerals and number words through 10.

3. Build models and draw pictures to show different ways to represent and write about numbers.

4. Construct, label, and use a number line to locate, compare, and order numerals 0 through 10 and later through 20. (4b, 4e)

5. When given a number, explore adding a ten, and multiples of ten with models and pictures.

Strand: Whole Number Concepts and Computation

1. Use objects, draw pictures, and write addition equations to construct addition facts through 10 and solve story problems using computational strategies such as: counting on, doubles, and doubles plus or minus one. (5a)

2. Explore fact families through 10. Begin to demonstrate basic fact knowledge for sums to 10 and most of the related subtraction facts. (6a, 6b)

3. Compare two sets of objects, identify one or two more, one or two less. (4c)

4. Use objects to find the missing addend in an addition sentence through sums of 10.

5. Build sets and use manipulatives to explore subtraction such as counting back, separating sets, and writing matching subtraction sentences for differences through 10.

6. Given an addition or subtraction number sentence, create and illustrate matching story problems including authentic situations. (5c)

7. Explore strategies to solve addition problems with two-digit numbers.

8. Use objects, draw pictures, and write addition equations to solve story problems for sums with three addends. (7)

Strand: Integrated Understandings

1. Mathematical Applications - use various strategies to solve extended numerical problems. (25a)

Strand: Fractions, Decimals, Percents

1. Identify examples of line symmetry and use the term "one half."

2. Write the symbol ½ to label parts that are halves and distinguish what is not one half when wholes or collections are separated into two unequal parts or sets.

3. Explore, construct, and identify wholes cut into thirds and fourths. (2b)

4. Connect fraction concepts and language to classroom situations.

Substrand: Money

1. Continue to sort coins using students' own rules. *

2. Recognize, name, and state the value of a penny, nickel, dime, and quarter.

3. Explore purchasing items with pennies, nickels, and dimes and make change using pennies up to and including ten cents. (14b)

4. Create, write, illustrate, and solve story problems involving money.

* Students deepen understanding and apply concepts to challenging problems.

Strand: Patterns, Relationships, Algebraic Properties, Functions

1. Continue to use, describe, and record students' own classification rules using attributes of a variety of collections.*

2. Continue to sort a collection using a given rule.* (24b)

3. Continue to describe collections of sorted objects using real and picture graphs and simple Venn diagrams for subsets and intersections.*

4. Sort a collection into a specified number of groups and identify possible classification rules. (24b)

5. Create and solve matrix problems using a variety of materials and pictures.

6. Explore, copy, extend, invent, translate, describe, and classify a variety of patterns. (22)

7. Connect the use of patterns to solve problems in the environment, in areas of math, and in other subjects.

8. Use appropriate technology to enhance understanding of patterns.

9. Use the concepts of equality and inequality of numbers and number sentences.

10. Explore function activities and establish rules for functions.

11. Identify objects that are the same or different by one attribute. (24a)

*Students deepen understanding and apply concepts to challenging problems.

Strand: Probability and Statistics

1. Continue to collect, organize, display, analyze, and write about data to solve problems that involve mathematics and other subjects.* (19a)

2. Predict, discuss, and write about possible uses of data collected by the class.

3. Explore the concept of chance by conducting and analyzing probability experiments.

4. Connect probability to real-life experiences, areas of math, and other subjects.

5. Discuss and write about similarities, differences, and patterns found in data.

6. Construct and interpret bar graphs and pictographs. (19b)

Strand: Integrated Understandings

1. Mathematical Applications - use various strategies to solve extended statistical problems. (25c)

*Students deepen understanding and apply concepts to challenging problems.

Strand: Geometry and Measurement

1. Sort and name polygons and solids, discuss their attributes, and identify them in the environment. Name polygons: circle, square, triangle, rectangle, oval, diamond, trapezoid, hexagon; solids: sphere, cube, rectangular prism, cone, cylinder. (17)

2. Construct and copy polygons and solids using a variety of materials and compare their features. (17)

3. Explore regular and irregular polygons and discuss their attributes and components.

4. Locate and describe objects by position: top, bottom, left, right, north, south, east, west, closer, closest, etc.

5. Construct and identify polygons with none, one, or more than one line of symmetry and explore symmetry with solids.

6. Construct and identify congruent polygons.

7. Connect work with shapes and solids to estimating, comparing, classifying, graphing, daily activities, and work in other content areas.

8. Identify an appropriate customary or metric unit (inch, foot, meter, centimeter) for a given situation. (16b)

9. Estimate and measure length and perimeter using nonstandard and standard units (in., ft., cm., m.). Explore the concept of area. (15, 16a)

10. Estimate and explore measuring weight with nonstandard and standard units (oz., lb., g., kg.).

11. Estimate and explore measuring capacity (volume) with nonstandard and standard units.

12. Relate nonstandard ways of comparing and measuring temperature to thermometer measurement (Celsius and Fahrenheit).

13. Connect estimation and measurement to daily activities, graphs, tables, and other content areas.

14. Explore the ratio relationships among nonstandard and standard units of length.

Substrand: Time

1. Describe a sequence of events using vocabulary such as before, during, after, A.M., P.M. and use tools such as calendars and rudimentary time lines.

2. Continue to use standard time units: days, weeks, months, year, hour, half-hour, morning, afternoon, evening. Introduce standard time units: second and minute.*

3. Tell time and write time to the hour, half-hour, and quarter-hour. Use the vocabulary half-past, quarter to, quarter past and use pictorial, demonstration, and real clocks (analog and digital). Explore time to 5-minute and 1-minute time intervals. (14a)

4. Predict which tasks take longer than others and use this information to make decisions.

5. Use calendars, watches, analog and digital clocks, and time lines to plan schedules and solve time problems.

*Students deepen understanding and apply concepts to challenging problems.

Strand: Number Sense and Numeration

1. Estimate, count, compare, order, read, and write 2- and 3-digit numbers. Use place value concepts to interpret the meaning of numbers. (1c, 4a, 4b)

2. Count by 2s, 3s, 5s, and 10s to 100 and count on by 2s, 3s, 5s, and 10s to extend a number pattern.

3. Count forward beyond 100 and back from any number between 1-100 by ones.

4. Build models and describe spatial and number patterns with odd and even numbers (ex. number line, hundred chart, etc.) (4c, 4e)

5. Use ordinal numbers to locate position.

6. Build models and draw pictures of two-digit numbers and write (label) the matching expanded notation. Later, repeat with three-digit numbers. (1a, 2a)

7. Investigate ways to build models and draw pictures of two-digit numbers and write the matching expanded and regrouped forms. (1b)

8. Estimate and describe sets of objects in terms of the number of tens.

9. Develop strategies for rounding numbers. (4d)

10. Use appropriate technology to enhance development of number sense.

11. Recognize when an estimate is appropriate, as opposed to a calculated response.

12. Use standard and non-standard units for estimating measures of length, area, mass, weight, and volume.

13. Use estimations in problem solving activities.

14. Use estimation strategies to determine and justify the reasonableness of an answer. (11)

15. Solve problems involving 1 more or less and 10 more or less. (4c)

Strand: Whole Number Concepts and Computation

Substrand: Addition/Subtraction

1. Demonstrate fluency of facts and fact families through 18. (6a, 6b)

2. Connect addition to combining sets and use: missing addend, counting on, counting back, and separating sets to model subtraction.

3. Invent and use a variety of strategies to solve two-digit addition and subtraction computation problems including ways to deal with regrouping. (7)

4. Write addition and subtraction sentences to match models, pictures, and story problems. (5a, 5b, 5c)

5. Explore adding three-digit numbers using models.

6. Add 3 (or more) 1-digit addends.

7. Construct number meanings through real-world experiences, the use of physical materials such as base ten blocks and pictorial representations.

8. Solve problems that relate operations to real-world experiences, and explain how the solutions were determined. (9)

9. Develop and use a variety of mental computation strategies.

10. Use mathematical language and symbols related to operations.

11. Use appropriate technology to reinforce and enhance understanding of operations.

Substrand: Multiplication/Division

1. Build models and draw pictures to represent multiplication and division.

2. Informally explore division as equal shares.

3. Connect multiplication and division to practical situations in the classroom such as sharing, counting, and distributing.

Strand: Fractions, Decimals, and Percents

1. Create, solve, and illustrate simple story problems involving fractions.

2. Continue to explore shapes and pictures that have line symmetry and relate it to one-half. *

3. Show parts of a whole with models and pictures, identify, and label unit fractions: 1/2, 1/3, 1/4, 1/6, and 1/8. (2b)

4. Find part of a set of objects using manipulatives and describe the relationship between the part and the whole. (Introduce the terms numerator and denominator.)

5. Connect fraction concepts and language to daily situations.

Substrand: Money

1. Sort, name, and identify the value of the penny, nickel, dime, quarter, half-dollar, and dollar.

2. Use pennies, nickels, and dimes for transactions up to $1.00. Explore using quarters, half-dollars, and dollars for transactions. (14b)

3. Create, write, illustrate, and solve simple money story problems.

4. Explore different ways to write about money using "cents" and the "¢" symbol.

5. Explore making change. (Use pennies, extend to dimes as students connect to place value concepts.)

Substrand: Integrated Understandings

1. Mathematical Applications - use various strategies to solve extended numerical problems. (25a)

*Students deepen understanding and apply concepts to challenging problems.

Strand: Patterns, Relationships, Algebraic Properties, Functions

1. Identify, describe, and write about a variety of possible classification rules for sorting a given collection and sort a collection using a given attribute. (24a, 24b)

2. Describe and write about relationships among sets of objects including subsets, intersections, similarities, and differences.

3. Construct and use a matrix with two attributes to classify and to solve missing and extraneous element problems.

4. Connect classification to problem solving in the environment, mathematical areas, and other disciplines.

5. Explore, organize, record, analyze, extend, invent, and translate a variety of patterns and use patterns to solve problems.

6. Create and solve difference problems with one, two, or more attributes.

7. Identify the rule, extend, and write about number patterns. (22)

8. Identify, describe, and use patterns that connect to place value, estimation, and computation strategies.

9. Connect patterning to classification and problem solving in graphing. Look for patterns to help organize information and make predictions in the environment, mathematical areas, and other disciplines.

10. Identify, create, interpret, and draw reasonable conclusions from bar graphs, pictographs, charts, and tables. (19a, 19b)

Strand: Probability and Statistics

1. Generate questions for data investigations, decide what information is necessary, and determine how it will be collected and displayed.

2. Organize, analyze, discuss, and write about conclusions of data investigations including similarities, differences, and patterns found in data.

3. Formulate a plan and use data to solve problems.

4. Explore concepts of chance by predicting, designing, carrying out, and drawing conclusions from probability experiments. Discuss fairness of games and explore ways to quantify probabilities. (21)

5. Explore ways to find and display combinations and permutations.

Strand: Integrated Understandings

1. Mathematical Applications - use a variety of strategies to solve extended statistical problems. (25c)

Strand: Geometry and Measurement

1. Compare, label and name parts of polygons: point, line segment, angle, side, and diagonals. (17a)

2. Identify and represent figures and parts of figures: closed and open curves, intersecting, parallel, perpendicular, and congruent lines.

3. Identify, construct, and distinguish between plane and solid figures: polygon, rhombus, parallelogram, trapezoid, octagon, hexagon, cube, cone, cylinder, sphere, rectangular prism, pyramid. Sort polygons and solids, discuss their attributes, and identify them in the environment. (17b)

4. Create and describe mental images of geometric shapes and figures.

5. Relate faces and cross-sections of solids to polygons (three- to two-dimensional).

6. Identify and construct designs with line symmetry.

7. Identify and construct congruent polygons using models and pictures.

8. Recognize and extend geometric patterns involving transformations: rotations, translations, and reflections.

9. Use estimating and counting to find the perimeter and area of simple polygons.

10. Identify the right angle and compare angles to it.

11. Connect work with shapes and measurement to estimating, comparing, classifying, graphing, daily activities, and work in other content areas.

12. Continue to explore the ratio relationship between two units of length. *

13. Solve estimation and measurement problems using standard and nonstandard units to develop concepts of length, temperature, mass, weight, perimeter, area, and volume/capacity in metric and customary units. (15)

14. Read a thermometer and make comparisons of temperature (Celsius and Fahrenheit).

15. Use measurement tools such as rulers, scales, and thermometers. (16a)

16. Identify an appropriate, customary, or metric measure for a given situation. (16b)

* Students deepen understanding and apply concepts to challenging problems.

Substrand: Time

1. Continue to sequence events. *

2. Continue to use the vocabulary associated with time: sec., min., hr., year, half-past, quarter past, quarter to, minute before, after, A.M., P.M., and introduce other units, such as decade and century. * (14a)

3. Tell time to the minute and use written time notation.

4. Estimate, compare, and predict duration of time.

5. Choose and use tools such as the calendar, sand timer, clock, watch, or time line to plan events, create, and use schedules.

6. Write, solve, and discuss problems involving time, elapsed time and calendars. (14b)

Strand: Integrated Understanding

1. Mathematical Applications - use a variety of strategies to solve extended spatial problems. extended spatial problems. (25b)

* Students deepen understanding and apply concepts to challenging problems.

Strand: Number Sense and Numeration

1. Recognize cardinal and ordinal numbers.

2. Count by 2s, 5s, 10s, 50s, and 100s.

3. Count forward and back from any number 1 through 1,000.

4. Identify and classify odd and even numbers using concrete materials.

5. Count, read, and write number words to 1,000.

6. Count, read, write, compare, order, and describe the magnitude of numbers to 1,000 and identify that number on a number line. (4a, 4b, 4d)

7. Count on by 1s, 2s, or 10s from any number with and without models.

8. Identify the place value of the digits in a number to 4 places. (1d)

9. Develop strategies for rounding whole numbers to the nearest ten or hundred. (4c)

10. Continue to build models, draw pictures, and write two-digit numbers in expanded form, extend to three-digit numbers, and explore with four-digit numbers. * (1b, 2a)

11. Continue to build models, draw pictures, and write two-digit numbers in regrouped form and extend to three-digit numbers. * (1c)

*Students deepen understanding and apply concepts to challenging problems.

12. Compare numbers using concrete models, number line, describe concepts of equality and inequality using >,<, and ?, and connect to real-life situations.

13. Solve problems involving 1 more or less and 10 more or less. (1a)

14. Use appropriate technology to enhance development of number sense.

15. Solve problems that relate operations to real-world experiences and explain how the solutions were determined.

16. Use appropriate technology to reinforce and enhance understanding of rations.

Strand: Whole Number Concepts and Computation

1. Write/tell the fact families for addition and subtractions using the relationship of addends and sums and the commutative property for addition and subtraction.

2. Demonstrate that multiplication is repeated addition and that division is repeated subtraction.

3. Write/tell the fact families for multiplication and division using the relationship of factors and products and the commutative property. (9a, 9b, 5b, 5c)

4. Relate multiplication/division facts to arrays and pictures. (5a)

5. Explore the properties of 0 and 1 in the operations.

Substrand: Addition/Subtraction

1. Write the fact families for sums to 18 using the vertical form and equation form for addition and subtraction. (6a)

2. Identify all possible number combinations that represent sums and differences 0-18 including equivalent sets with two addends, and explore using more than two addends to make a sum.

3. Solve, create, illustrate, and write number sentences for story problems with or without extraneous information and vice versa. (5b, 5c, 9a, 9b)

4. Connect addition and subtraction, estimation, and the use of the calculator to practical problems in the classroom and to other content areas.

5. Use a variety of models, mental, and written strategies to estimate and add two-digit and three-digit numbers without and with regrouping. (7a, 7b)

6. Use a variety of models, mental, and written strategies to estimate and subtract two-digit numbers without and with regrouping; extend strategies to three-digit numbers. (7a, 7b)

7. Estimate reasonable answers and use the calculator to add and subtract. (11a)

8. Identify the best expression to find an estimate. (10a)

Strand: Whole Number Concepts and Computation

Substrand: Multiplication/Division

1. Continue to build models and write number sentences for repeated addition.*

2. Develop an understanding of multiplication/division by identifying, describing, and extending patterns and use patterns to generate facts 0-10.

3. Build arrays and write multiplication and division sentences for facts 0-10. Use the multiplication/division frame and the division symbol ÷ and relate to factor/product relationships.

4. Apply estimation, multiplication, and division to practical situations in the classroom, explain the process, and extend to calculator use.

5. Create story problems, build models, draw pictures, and write repeated addition, multiplication, and/or division sentences.

6. Multiply by 10s and 100s.

7. Demonstrate fluency for multiplication/division facts 0-5 and 10 and write them as fact families. (6b)

* Students deepen understanding and apply concepts to challenging problems.

Strand: Fractions, Decimals, Percents

1. Show and construct parts of a whole with models and pictures and identify and label unit fractions such as 1/2, 1/3, 1/4, 1/5, 1/6, 1/8, 1/10, 1/12. Write fraction addition sentences equal to one that match models and pictures. (2b)

2. Compare and order unit fractions such as 1/2, 1/3, 1/4, etc., and fractions with common denominators such as 1/4, 2/4, 3/4, etc.

3. Write about fraction relationships using "more than", "less than", and "equal to" and explore using the >,<, and ? symbols.

4. Continue to create, illustrate, and solve simple story problems that involve fraction situations.*

5. Find fractional parts of a set. Look for and use patterns.

6. Use the terms numerator and denominator. Build models of and draw pictures of fractions with numerators other than 1.

7. Connect fraction concepts to other math strands and other content areas.

8. Name the whole using objects, pictures, and symbols 2/2, 3/3, 4/4, etc.

9. Explore shapes and pictures that have line symmetry and relate the parts of one-half, one-fourth, and one-eighth.

Substrand: Money

1. Continue to sort, name, and identify the value of the penny, nickel, dime, quarter, half-dollar, and dollar.*

2. Make sets of coins with values to $1.00. Find and compare different ways to make a set of coins with a given value to $1.00.

3. Estimate money needed for a transaction.

4. Estimate change to be received from a transaction.

5. Create, write, and solve money story problems using dollar sign and decimal notation.

6. Skip count by 5¢, 10¢, 25¢ and 50¢ up to $2.00.

Strand: Integrated Understandings

1. Mathematical Applications - use a variety of strategies to solve extended numerical problems. (25a)

* Students deepen understanding and apply concepts to challenging problems.

Strand: Patterns, Relationships, Algebraic Properties, Functions

1. Continue to identify, describe, and write about a variety of possible classification rules for sorting a given collection.* (24)

2. Continue to sort a collection using a given rule.* (24)

3. Continue to describe and write about the relationships, similarities, and differences among sets of objects and use a comparative organizer such as a Venn diagram to show subsets and intersections.*

4. Construct and use a matrix with two or more attributes to sort and solve missing and extraneous information problems.

5. Continue to connect classification to the environment, areas of mathematics, and other disciplines.*

6. Explore, organize, record, analyze, extend, invent, and classify a variety of patterns. (22)

7. Continue to create and solve difference problems with one, two, or more attributes.*

8. Identify the rule, extend, and write simple equations for number patterns. (22)

9. Find, invent, and use patterns as a way to organize information, make predictions, and solve problems.

10. Describe, write, and connect patterns to problem solving in the environment, areas of math, and other disciplines.

*Students deepen understanding and apply concepts to challenging problems.

Strand: Probability and Statistics

1. Conduct, record, discuss, graph, and summarize results of surveys, samples, and probability experiments. (19a, 19b, 20)

2. Compare and contrast results of similar probability experiments to quantify probabilities. (19a, 19b, 21)

3. Find combinations and permutations and describe the strategy used.

4. Develop and describe strategies for playing a game.

5. Explore ways to quantify data from surveys and samples.

6. Experiment with and connect the idea of an average to real-world applications.

7. Explore concepts of range, mean, median, and mode.

Strand: Integrated Understandings

1. Mathematical Applications - use a variety of strategies to solve extended statistical problems. (25c)

Strand: Geometry and Measurement

1. Construct, draw, describe, classify, and name polygons and solids. Describe and write about the attributes of polygons and solids and identify them in the environment. (17a, 17b)

2. Determine whether two polygons are congruent.

3. Construct models, draw diagrams, and identify reflections and polygons with line symmetry.

4. Construct circles with a compass. Identify parts of a circle: center, radius, diameter, and circumference and explore the relationships among them.

5. Draw diagrams and compare characteristics of line, line segment, ray, parallel lines, intersecting lines, and perpendicular lines.

6. Identify and classify acute, obtuse, and right angles and explore rotations.

7. Connect work with polygons and solids to classifying, estimating, measuring, comparing, graphing, solving practical problems, and applications in other content areas.

8. Explore the concept of perimeter and area of polygons using manipulatives that model nonstandard and standard units. Use estimating and counting of units to find perimeter and area of simple polygons.

9. Estimate, measure, and draw length using nonstandard units and standard units: centimeters, millimeters, meter, kilometer, inch, foot, yard, mile (include real-world applications). (15, 16a)

10. Explore and describe the ratio between two different units of length including nonstandard and standard units (include real-world applications).

11. Estimate and measure area using nonstandard and standard units (include real-world applications). (15)

12. Estimate and measure weight with nonstandard and standard units including gram, kilogram, ounce, and pound (include real-world applications).

13. Estimate and measure capacity and volume in nonstandard and standard units (include real-world applications).

14. Read a thermometer (Celsius and Fahrenheit) and compare temperatures (include real-world applications).

15. Identify an appropriate customary or metric measure for a given situation. (16b)

Strand: Geometry and Measurement

Substrand: Time

1. Sequence events and use the vocabulary associated with time.

2. Choose and use tools to measure time and solve time problems. (14a)

3. Solve simple problems involving elapsed time such as an hour from now or half an hour ago. (14a)

Strand: Integrated Understanding

1. Mathematical Applications - use a variety of strategies to solve extended spatial problems. (25b)

Strand: Number Sense and Numeration

1. Write the rule and extend number patterns. Describe the strategy used to identify the rule. Write about other patterns found in a number sequence. Connect multiplication to number patterns.

2. Identify one more, one less, ten more, ten less, one hundred more, one hundred less, one thousand more, and one thousand less. Use these comparisons to develop estimation and mental computation strategies. (1a, 4b)

3. Build models, complete diagrams, and place value tables and write two-, three-, and four-digit numbers in expanded form. (1b, 1d)

4. Build models, complete diagrams, and place value tables and write two-, three-, and four-digit numbers in regrouped form. (1c, 1d)

5. Create, label, use number lines, and time lines to locate, order, compare, round, and count on. (4a, 4c, 4d)

6. Explore whole numbers to one million and connect the concept of large numbers and a million to the real world. Round whole numbers to the nearest ten, hundred, and thousand. (4b, 4c, 10)

Strand: Whole Number Concepts and Computation

1. Use the language and context of a problem to select the appropriate operation or operations for solving the problem.

2. Apply and explain the commutative property for addends and factors and use this property to identify missing numbers in fact family equations.

3. Design arrays and write multiplication and division sentences. (6c)

4. Understand the use of the inverse operation for checking answers.

Substrand: Addition/Subtractions

1. Use number patterns for adding and subtracting ten, multiples of ten, one hundred, and multiples of a hundred.

2. Write two-, three-, and four-digit numbers in expanded and regrouped forms and connect the use of the expanded and regrouped forms to the addition and subtraction algorithms and alternate strategies.

3. Add and subtract two-, three-, and four-digit numbers, without and with regrouping, using a variety of mental and written strategies. (7a)

4. Connect addition and subtraction, estimation, reasonableness of answer, and calculator usage to practical problems and to other content areas. (4c, 9c, 11)

5. Create, illustrate, and write story problems for corresponding number sentences. (5b, 9a)

6. Write number sentences for addition and subtraction story problems. (5a, 9a)

7. Solve simple story problems involving addition and subtraction with and without extraneous information and justify solution. (9b, 9c)

Strand: Whole Number Concepts and Computation

Substrand: Multiplication/Division

1. Use multiplication patterns to generate facts and extend place value connections.

2. Maintain fluency in multiplication/division fact families 0-5 and 10. Demonstrate fluency in multiplication/division fact families 6-9. (6a, 6b, 6c)

3. Use place value concepts, arrays, and distributive property to estimate and multiply two-, three-, and four-digit numbers by a one-digit number. (6c)

4. Explore 2-digit multiplication using alternative computational strategies such as the distributive property, arrays, the building of models, diagrams, and estimation.

5. Create story problems, build models, illustrate, and write multiplication and/or division sentences to match story context. Apply multiplication and division to practical situations in the classroom. (5a, 5b, 9a)

6. Use place value concepts, arrays, and the distributive property to estimate and divide two-, three-, and four-digit numbers with and without remainders. (6c)

7. Explore dividing by a two-digit divisor which is a multiple of ten.

Strand: Fractions, Decimals, Percents

1. Construct models and diagrams that have multiple line of symmetry and find the value of the design and/or its fractional parts.

2. Show parts of a whole with models and pictures, identify and label fractions such as 1/2, 1/3, 1/4, 1/5, 1/6, 1/8, 1/10, 1/12, 2/3, 3/5, etc., and write fractions sentences about parts of a whole, including identifying equivalent parts. (2a, 2b, 3)

3. Compare and order fractions using models, pictures, and number lines. Write about the relationships using <, >, ?, and = symbols. (2b, 3, 4b, 4d)

4. Find fractional parts of a set. Describe and use patterns to identify and write about fractional parts and equivalent ratios. (3, 4b)

5. Use a base ten model, pictures, and number lines to identify and write about fractional parts using common fraction and decimal notation interchangeably. (2a, 2b)

6. Write addition and subtraction number sentences using common fractions and decimal notation to describe models and pictures. Use the notation interchangeably to demonstrate equivalence of fraction and decimal forms in tenths and hundredths. (2a, 2c, 4b)

7. Use the place value flat (hundred grid) model and pictures to identify and write about fractional parts as fractions, decimals, and percents. Explore the equivalence of fraction, decimal, and percent forms in tenths and hundredths. (2a, 2c, 4b)

8. Use models and pictures to construct, label, and write mixed numbers in both improper and proper form.

9. Describe and use patterns and equivalence with common fractions, decimals, and percents to estimate and find parts of a set.

10. Create, estimate reasonable answers, and solve story problems that involve parts of a whole and parts of a set of objects.

11. Connect fraction concepts to practical situations and other content areas.

Substrand: Money

1. Find different ways to make a set of coins worth a given value.

2. Connect money notation to place value using dollar sign and decimal point.

3. Estimate and find the sum or difference of two money amounts. (7a)

4. Make change for purchases less than $10.00. (7a)

5. Explore ways to estimate and use patterns to find multiples of money amounts. (11)

6. Create and solve practical money problems. (9a)

Strand: Integrated Understandings

1. Mathematical Applications - use a variety of strategies to solve extended numerical problems. (25a)

Strand: Patterns, Relationships, Algebraic Properties, Functions

1. Identify, describe, extend, and create patterns of pictorial and numerical sequences. (22)

2. Create and extend patterns involving transformations: slides, flips, and rotations (turns).

3. Identify and use patterns in charts and tables as part of problem-solving strategies.

4. Describe relationships and roles between and among patterns orally and/or in written form. (22)

5. Interpret patterns in organized data to make predications. (24)

6. Solve problems involving the organization of data. (24)

7. Develop logical reasoning through games and activities. (24)

Substrand: Algebra

1. Identify and plot points on number lines, scales, and grids. (18c)

2. Write and solve simple equations to describe the rules for one- and two-step number patterns using a symbol or letter to represent an unknown quantity. (23)

3. Explore the order of operations and their application to computation including the use of parentheses.

4. Explore and use algebraic properties (associative, commutative, and distributive) to make decisions about efficient computational strategies.

Strand: Probability and Statistics

1. Choose an efficient way to organize data using a table, matrix, or spreadsheet.

2. Create, conduct, and summarize probability experiments which investigate the likelihood of possible outcomes. (21a)

3. Identify possible outcomes and distinguish between combinations and permutations.

4. Choose topics, conduct simple surveys, organize and summarize information, and use descriptive statistics including range, mean, mode, and median. (20b)

5. Choose an appropriate graph format, construct, read, and interpret information from the graph: pictorial, bar, line, circle. (19a, 19b)

6. Draw and justify reasonable conclusions from data in tables, graphs, and charts. (20)

Strand: Integrated Understandings

1. Math Applications - use a variety of strategies to solve extended statistical problems. (25c)

53

Strand: Geometry and Measurement

1. Identify, draw, and classify polygons and solids by the characteristics of their parts and use terms such as angle, side, face, edge, line segment, vertex, diagonal, parallel, congruent, similar, equilateral, symmetrical, intersecting, perpendicular, triangle, square, rectangle, parallelogram, quadrilateral, hexagon, rectangle, plane, and solid. (17a, 17b, 18b)

2. Identify and draw lines of symmetry on regular and nonregular shapes. (18a)

3. Develop the concept of angle measurement as a rotation, construct rays, use the protractor to measure angles in degrees, and estimate and classify angles as acute, obtuse, and right.

4. Investigate the sums of the interior angles of triangles, quadrilaterals, and other polygons.

5. Estimate and measure lengths using customary and metric units to solve practical problems (including useful fractional parts of the inch - 1/2, 1/4, 1/8, 1/16) and ratio relationships between units (such as 1/3 of a yard is 1 foot) as a way to identify a ratio and convert between units within a system. (16a, 16b)

6. Estimate and measure perimeter using uniform units and standard measurement units (customary and metric). (15, 16c)

7. Develop and use students' formulas for perimeter of polygons such as square, rectangle, and triangles and explore strategies for finding the perimeter of regular and nonregular polygons.

8. Estimate and measure area of polygons using standard units (customary and metric. (15, 16c)

9. Develop and use students' formulas for area of polygons such as square, rectangle, and triangle and explore the area of other polygons.

10. Construct and name the parts of the circle: radius, diameter, chord, center, circumference, and semicircle and explore the ratio relationship between the parts: radius, diameter, and circumference. (i.e. p)

11. Estimate and measure capacity, weight, and mass using standard units (customary and metric).

12. Identify appropriate metric or customary units of measure (length, capacity, mass) for a given situation. (16d)

13. Read, label, and compare temperature using Fahrenheit and Celsius scales.

14. Solve problems involving elapsed time. (14a)

15. Solve problems involving the conversion of measure of time. (14b)

Strand: Integrated Understandings

1. Mathematical Applications - use a variety of strategies to solve extended spatial problems. (25b)

Strand: Number Sense and Numeration

1. Read, write, compare, and order whole numbers up to a billion. Count by any multiples, i.e., 10s, 100s, 1000s, etc.. (1a, 4a, 4c)

2. Order and compare fractions, mixed numbers, and decimals. (4b, 4d)

3. Represent numbers using place value grouping with multiples of ten, expanded notation, and regrouping and use alternative groupings to describe amounts up to 10,000. (1b, 1c)

4. Choose an appropriate way to round a whole number, fraction, or decimal. (4e, 4f)

5. Identify the best expression, describe, justify, and use a variety of estimation strategies that draw on understandings of order, place value, alternative groupings, rounded and/or adjusted forms (including problem solving). (1d, 10a, 10b, 11a)

6. Explore the use of associative, commutative, and distributive properties and the order of operations to develop alternative computational strategies.

7. Find the factors of composite numbers using geometric models and connect patterns with factors to rules of divisibility and the concept of a prime number.

8. Explore the common denominator, greatest common factor, and least common multiple.

9. Plot points for whole and mixed numbers, fractions, and decimals on number lines and scales. (4g)

10. Explore the nature of the base ten number system by comparing other systems (Roman, etc.) and bases.

11. Relate and construct pictorial representations of fractions, mixed numbers, decimals, and percents. (2a, 2b, 2c)

Strand: Computation With Rational Numbers

1. Maintain fluency of multiplication and division facts. (6)

2. Select and use an appropriate method for computing from among mental arithmetic, paper-and-pencil, calculator, and computer methods.

3. Use a variety of techniques to estimate and add and subtract 2-, 3-, and 4-digit whole numbers, including zero in any position and more than one regrouping. (7a)

4. Add and subtract fractions and mixed numbers with like denominators. (8)

5. Use various strategies such as equivalence patterns and estimation to add and subtract fractions and mixed numbers with like denominators.

6. Use various strategies such as equivalence patterns and estimation to add and subtract decimals to 1000^{ths} including money amounts.

7. Relate the basic multiplication/division facts to factor/product relationship.

8. Use the distributive property to multiply 1-digit by 2- and 3-digit whole numbers.

9. Develop and use patterns to multiply and divide by multiples of tens and hundreds. (7b)

10. Estimate products and compute using the distributive property to multiply 2-digit whole numbers. (7c)

11. Estimate and use place value concepts to divide 2-, 3-, and 4-digit whole numbers by 1- and 2-digit divisors. (7c)

12. Use models and number patterns to demonstrate multiplication with common fractions.

13. Estimate and solve money problems that involve multiplication and division. (7c)

14. Estimate and use simple equivalent fractions (1/2, 1/4, 1/10, 3/10) to find the percent of a number (50%, 25%, 10%, 30%).

15. Select, use, and explain an appropriate operation(s), write equations and story problems, and solve practical applications and word problems. (5a, 5b, 9a, 9b, 9c)

16. Rename equivalent fractions, mixed numbers, and improper fractions (3a, 3b)

17. Recognize when estimation is appropriate and understand the usefulness of an estimate.

18. Explain why a particular strategy will result in an underestimate or overestimate.

19. Use units to identify and find equivalent ratios and rates.

Strand: Integrated Understandings

1. Mathematical applications - use various strategies to solve extended numerical problems. (25a)

K-5 MATHEMATICS STRANDS

Probability and Statistics

Kindergarten	Grade 1	Grade 2
1. Explore different questions that might be posed and answered as students sort collections and organize and analyze information about the collections.	1. Construct, interpret, and describe real, pictorial, and symbolic graphs from student-collected data and make statements about the information in the graphs. (19b)	1. Continue to collect, organize, display, analyze, and write about data to solve problems that involve mathematics and other subjects. (19a)
2. Construct, analyze, and describe real and pictorial graphs from student-organized data. (19b)	2. Look for patterns in data and make predictions before and after graphing.	2. Predict, discuss, and write about possible uses of data collected by the class.
3. Informally experience situations involving probability during classroom activities.	3. Choose an appropriate graph or data display.	3. Explore the concept of chance by conducting and analyzing probability experiments.
	4. Informally experience situations and make predictions involving probability and chance during classroom activities.	4. Connect probability to real-life experiences, areas of math, and other subjects.
		5. Discuss and write about similarities, differences, and patterns found in data.
		6. Construct and interpret bar graphs and pictographs. (19b)

Probability and Statistics

Grade 3	Grade 4	Grade 5
1. Generate questions for data investigations, decide what information is necessary, and determine how it will be collected and displayed.	1. Conduct, record, discuss, graph, and summarize results of surveys, samples, and probability experiments. (19a, 19b, 20)	1. Choose an efficient way to organize data using a table, matrix, or spreadsheet.
2. Organize, analyze, discuss, and write about conclusions of data investigations, including similarities, differences, and patterns found in data.	2. Compare and contrast results of similar probability experiments to quantify probabilities. (19a, 19b, 21)	2. Create, conduct, and summarize probability experiments which investigate the likelihood of possible outcomes. (21a)
3. Formulate a plan and use data to solve problems.	3. Find combinations and permutations and describe the strategy used.	3. Identify possible outcomes and distinguish between combinations and permutations.
4. Explore concepts of chance by predicting, designing, carrying out, and drawing conclusions from probability experiments. Discuss fairness of games and explore ways to quantify probabilities. (21)	4. Develop and describe strategies for playing a game.	4. Choose topics, conduct simple surveys, organize and summarize information, and use descriptive statistics, including range, mean, mode, and median. (20b)
5. Explore ways to find and display combinations and permutations.	5. Explore ways to quantify data from surveys and samples.	5. Choose an appropriate graph format, construct, read, and interpret information from the graph - pictorial, bar, line, and circle. (19a, 19b)
6. Integrated Understandings: solve extended statistical problems. (25b)	6. Experiment with and connect the idea of an average to real-world applications.	6. Draw and justify reasonable conclusions from data in tables, graphs, and charts. (20)
	7. Explore concepts of range, mean, median, and mode.	

Measurement

Kindergarten	Grade 1	Grade 2
7. Estimate and measure length with nonstandard units. (15)	7. Estimate and measure given objects or lengths using nonstandard and standard units (in., cm.). (15, 16a, 16b)	8. Identify an appropriate customary or metric unit (inch, foot, meter, and centimeter) for a given situation. (15b)
8. Explore weight with a simple balance using nonstandard units.	8. Estimate and measure area using nonstandard units.	9. Estimate and measure length and perimeter using nonstandard and standard units (in., ft., cm., and m.) and explore the concept of area. (15, 16a)
9. Explore capacity (volume) with nonstandard units.	9. Estimate and explore measuring capacity (volume) using nonstandard units.	
10. Informally develop the vocabulary of measurement using comparative terms for length, area, weight, and capacity.	10. Explore weight using nonstandard units.	10. Estimate and explore measuring weight with nonstandard and standard units (oz., lb., g., and kg.).
	11. Explore temperature at the comparative level.	11. Estimate and explore measuring capacity (volume) with nonstandard and standard units.
		12. Relate nonstandard ways of comparing and measuring temperature to thermometer measurement (Celsius & Fahrenheit).
		13. Connect estimation and measurement to daily activities, graphs, tables, and other content areas.

Measurement

Grade 3	Grade 4	Grade 5
12. Continue to explore the ratio relationship between two units of length.	9. Estimate, measure, and draw length using nonstandard units and standard units - centimeters, millimeters, meter, kilometer, inch, foot, yard, and mile (include real-world applications). (15, 16a)	11. Estimate and measure capacity, weight, and mass using standard units - customary and metric.
13. Solve estimation and measurement problems using standard and non-standard units to develop concepts of length, temperature, mass, weight, perimeter, area, and volume/capacity in metric and customary units. (15)	10. Explore and describe the ratio between two different units of length, including nonstandard and standard units (include real-world applications).	12. Identify appropriate metric or customary units of measure (length, capacity, and mass) for a given situation. (16d)
14. Read a thermometer and make comparisons of temperature (Celsius & Fahrenheit).	11. Estimate and measure area using nonstandard and standard units (include real-world applications). (15)	13. Read, label, and compare temperature using Fahrenheit and Celsius scales.
15. Use measurement tools such as rulers, scales, and thermometers. (16a)	12. Estimate and measure weight with nonstandard and standard units, including gram, kilogram, ounce, and pound (include real-world applications).	
16. Identify an appropriate, customary, or metric measure for a given situation. (16b)	13. Estimate and measure capacity and volume in nonstandard and standard units (include real-world applications).	
	14. Read a thermometer (Celsius and Fahrenheit) and compare temperatures (include real-world applications).	
	15. Identify an appropriate customary or metric measure for a given situation. (16b)	

62

Time

Kindergarten	Grade 1	Grade 2
1. Relate a sequence of events using vocabulary associated with the parts of the day, seasons, and calendar. 2. Identify the time to the hour, both analog and digital. (14a)	1. Describe a sequence of events using vocabulary such as yesterday, today, tomorrow, beginning, middle, end morning, afternoon, and evening. 2. Introduce standard time units: days, weeks, months, year, hour, and half-hour. 3. Identify, show, and record a given time (hour and half-hour) using pictorial, demonstration clocks, and real clocks. (14a) 4. Estimate and compare the length of time a certain task take (shorter, longer). 5. Solve time problems involving sequence and duration of time using the calendar.	1. Describe a sequence of events using vocabulary such as before, during, after, A.M., and P.M.; and use tools such as calendars and rudimentary time lines. 2. Continue to use standard time units - days, weeks, months, year, hour, half-hour, morning, afternoon, and evening; introduce standard time units – second and minute. 3. Tell time and write time to the hour, half-hour, and quarter-hour; use the vocabulary half past, quarter to, and quarter past; and use pictorial, demonstration, and real clocks (analog and digital). Explore time to 5 minute and 1 minute time intervals. (14a) 4. Predict which tasks take longer than others and use this information to make decisions. 5. Use calendars, watches, analog and digital clocks, and time lines to plan schedules and solve time problems.

Time

Grade 3	Grade 4	Grade 5
1. Continue to sequence events.	1. Sequence events and use the vocabulary associated with time.	14. Solve problems involving elapsed time. (14a)
2. Continue to use the vocabulary associated with time: sec., min., hr., year, half past, quarter past, quarter to, minute before, after, A.M., and P.M. and introduce other units, such as decade and century. (14a)	2. Choose and use tools to measure time and solve time problems. (14a)	15. Solve problems involving the conversion of measure of time. (14b)
3. Tell time to the minute and use written time notation.	3. Solve simple problems involving elapsed time, such as an hour from now or half an hour ago. (14a)	
4. Estimate, compare, and predict duration of time.		
5. Choose and use tools such as the calendar, sand timer, clock, watch, or time line to plan events, create, and use schedules.		
6. Write, solve, and discuss story problems involving time, elapsed time, and calendars. (14b)		

Basic Facts

Kindergarten

1. Combine two sets of objects for sums to 10 and use a counting strategy to find the total.

Grade 1

1. Use objects, draw pictures, and write addition equations to construct addition facts through 10 and solve story problems using computational strategies such as: counting on, doubles, and doubles plus or minus one. (5a)

2. Explore fact families through 10. Begin to demonstrate basic fact knowledge for sums to 10 and most of the related subtraction facts. (6a, 6b)

4. Use objects to find the missing addend in an addition sentence through sums of 10.

Grade 2

1. Demonstrate fluency with addition and subtraction fact families through 18.

Grade 3

1. Write fact families for sums to 18 using vertical form and equation form for addition and subtraction. (6a)

2. Develop understanding of multiplication and division by identifying, describing, and extending patterns and use patterns to generate facts, 0-10.

7. Demonstrate fluency for multiplication/division facts 0-5 and 10 and write them as fact families. (6b)

Grade 4

2. Maintain fluency in multiplication/division fact families 0-5 and 10. Demonstrate fluency in multiplication/division fact families 6-9. (6a, 6b, 6c)

Grade 5

1. Maintain fluency of multiplication and division facts (use basic facts as tools in all strands). (6)

7. Relate basic multiplication/division facts to factor/product relationship.

Estimation

Kindergarten

1. Estimate and count to 30 with and without objects. (N.S.)

3. Estimate half of a small collection or handful of objects. (G & M)

7. Estimate and measure length with nonstandard units. (G & M)

KEY

N.S.　　= Number Sense
G & M = Geometry & Measurement
T　　　= Time
M　　　= Money
C　　　= Computation

Grade 1

1. Estimate, count forward through 100, and skip count by 2s, 5s, and 10s using objects, pictures and rote counting. (N.S.)

4. Estimate and compare the length of time certain tasks take (shorter, longer). (T)

7. Estimate and measure given objects or lengths using nonstandard and standard units (in., cm.). (G & M) (15, 16a, 16b)

8. Estimate and measure area using nonstandard units. (G & M)

9. Estimate and explore measuring capacity (volume) using nonstandard units. (G & M)

Grade 2

9. Estimate and measure length and perimeter using nonstandard and standard units (in., ft., cm., and m.). Explore the concept of area. (15, 16a) (G & M)

10. Estimate and explore measuring weight with nonstandard and standard units (oz. lb., g., and kg.). (G & M)

11. Estimate and explore measuring capacity (volume) with nonstandard and standard units. (G & M)

13. Connect estimation and measurement to daily activities, graphs, tables, and other content areas. (G & M)

1. Estimate, count, compare, order, read, and write 2- and 3-digit numbers. Use place value concepts to interpret the meaning of numbers. (1c, 4a, 4b) (N.S.)

8. Estimate and describe sets of objects in terms of the number of tens. (N.S.)

13. Use estimations in problem solving activities. (N.S.)

14. Use estimation strategies to determine and justify the (N.S.) reasonableness of an answer. (11)

Estimation

Grade 3	Grade 4	Grade 4 (continued)
13. Estimate and measure using standard and nonstandard units to develop concepts of length, temperature, mass, weight, perimeter, area, and volume/capacity in metric and customary units. (15) (G & M)	9. Estimate, measure, and draw length using nonstandard units and standard units - centimeters, millimeters, meter, kilometer, inch, foot, yard, and mile (include real-world applications). (15, 16a) (G & M)	3. Estimate and find the sum or difference of two money amounts. (7a) (M)
4. Estimate, compare, and predict duration of time. (T)	11. Estimate and measure area using nonstandard and standard units (include real-world applications). (15) (G & M)	6. Use place value concepts, arrays, and the distributive property to estimate and divide 2-, 3-, and 4-digit numbers with and without remainders. (6c) (C)
3. Estimate money needed for a transaction. (M)	12. Estimate and measure weight with nonstandard and standard units, including gram, kilogram, ounce, and pound (include real-world applications). (G & M)	
4. Estimate change to be received from a transaction. (M)	13. Estimate and measure capacity and volume in nonstandard and standard units (include real-world applications).	
7. Estimate reasonable answers and use the calculator to add and subtract. (11a) (C)	2. Identify one more, one less, ten more, ten less, one hundred more, one hundred less, one thousand more, and one thousand less. Use these comparisons to develop estimation and mental computation strategies. (1a, 4b) (N.S.)	
4. Apply estimation, multiplication, and division to practical situations in the classroom; explain the process and extend to calculator use. (C)	10. Create, estimate reasonable answers, and solve story problems that involve parts of a whole and parts of a set of objects. (F)	

Grade 5

5. Estimate and measure lengths using customary and metric units to solve practical problems (including useful fractional parts of the inch - 1/2, 1/4, 1/8, 1/16) and ratio relationships between units (such as 1/3 of a yard is 1 foot) as a way to identify a ratio and convert between units within a system. (16a, 16b) (G & M)

6. Estimate and measure perimeter using uniform units and standard measurement units - customary and metric. (15, 16c) (G & M)

8. Estimate and measure area of polygons using standard units - customary and metric. (15, 16c) (G & M)

11. Estimate and measure capacity, weight, and mass using standard units - customary and metric. (G & M)

5. Identify the best expression, describe, justify, and use a variety of estimation strategies that draw on understandings of order, place value, alternative groupings, and rounded and/or adjusted forms (including problem solving). (1d, 10a, 10b, 11a) (N.S.)

Grade 5 (continued)

3. Use a variety of techniques to estimate and add and subtract 2-, 3-, and 4-digit whole numbers, including zero in any position and more than one regrouping. (7a) (C)

5. Use various strategies such as equivalence patterns and estimation to add and subtract fractions and mixed numbers with like denominators. (C)

6. Use various strategies such as equivalence patterns and estimation to add and subtract decimals to 1000^{ths} including money amounts. (C)

10. Estimate products and compute using the distributive property to multiply 2-digit whole numbers. (7c) (C)

11. Estimate and use place value concepts to divide 2-, 3-, and 4-digit whole numbers by 1- and 2-digit divisors. (7c) (C)

13. Estimate and solve money problems that involve multiplication and division. (7c) (C)

14. Estimate and use simple equivalent fractions (1/2, 1/4, 1/10, 3/10) to find the percent of a number (50 %, 25 %, 10%, 30 %). (C)

Fractions, Decimals, and Percents

Kindergarten	Grade 1	Grade 2
1. Explore and identify halves of whole objects.	1. Identify examples of line symmetry and use the term "one half."	1. Create, solve, and illustrate simple story problems involving fractions.
2. Use the language of whole and half in daily situations.	2. Write the symbol 1/2 to label parts that are halves and distinguish what is not one half when wholes or collections are separated into two unequal parts or sets.	2. Continue to explore shapes and pictures that have line symmetry and relate it to one half.
3. Estimate half of a small collection or handful of objects.	3. Explore, construct, and identify wholes cut into thirds and fourths. (2b)	3. Show parts of a whole with models and pictures and identify and label unit fractions: 1/2, 1/3, 1/4, 1/6, and 1/8. (2b)
	4. Connect fraction concepts and language to classroom situations.	4. Find part of a set of objects using manipulatives and describe the relationship between the part and the whole. (Introduce the terms numerator and denominator.)
		5. Connect fraction concepts and language to daily situations.

Fractions, Decimals, and Percents

Grade 3

1. Show and construct parts of a whole with models and pictures and identify and label unit fractions, such as 1/2, 1/3, 1/4, 1/5, 1/6, 1/8, 1/10, and 1/12; and write fraction addition sentences equal to one that match models and pictures. (2b)

2. Compare and order unit fractions such as 1/2, 1/3, 1/4, etc., and fractions with common denominators, such as 1/4, 2/4, 3/4, etc.

3. Write about fraction relationships using "more than", "less than" and "equal to," and explore using the >, <, and ≠ symbols.

4. Continue to create, illustrate, and solve simple story problems that involve fraction situations.

5. Find fractional parts of a set; look for and use patterns.

6. Use the terms numerator and denominator. Build models of and draw pictures of fractions with numerators other than 1.

7. Connect fraction concepts to other math strands and other content areas.

Grade 3 (continued)

8. Name the whole using objects and pictures and symbols 2/2, 3/3, 4/4, etc.

9. Explore shapes and pictures that have line symmetry and relate the parts of 1/2, 1/4, and 1/8.

Grade 4

1. Construct models and diagrams that have multiple lines of symmetry and find the value of the design and/or its fractional parts.

2. Show parts of a whole with models and pictures and identify and label fractions such as 1/2, 1/3, 1/4, 1/5, 1/6, 1/8, 1/10, 1/12, 2/3, 3/5, etc., and write fractions sentences about parts of a whole including identifying equivalent parts. (2a, 2b, 3)

3. Compare and order fractions using models, pictures, and number lines. Write about the relationships using <, >, ≠, and = symbols. (2b, 3, 4b, 4d)

4. Find fractional parts of a set. Describe and use patterns to identify and write about fractional parts and equivalent ratios. (3, 4b)

5. Use a base-ten model, pictures, and number lines to identify and write about fractional parts using common fraction and decimal notation interchangeably. (2a, 2b)

6. Write addition and subtraction number sentences using common fractions and decimal notation to describe models and pictures. Use the notation interchangeably to demonstrate equivalence of fraction and decimal forms in 10ths and 100ths. (2a, 2c, 4b)

Fractions, Decimals, and Percents

Grade 4 (continued)

7. Use the place value flat (hundred grid) model and pictures to identify and write about fractional parts as fractions, decimals, and percents. Explore the equivalence of fraction, decimal, and percent forms in 10^{ths} and 100^{ths}. (2a, 2c, 4b)

8. Use models and pictures to construct, label, and write mixed numbers in both improper and proper form.

9. Describe and use patterns and equivalence with common fractions, decimals, and percents to estimate and find parts of a set.

10. Create, estimate reasonable answers, and solve story problems that involve parts of a whole and parts of a set of objects.

11. Connect fraction concepts to practical situations and other content areas.

Grade 5

4. Add and subtract fractions and mixed numbers with like denominators. (8)

5. Use various strategies such as equivalence patterns and estimation to add and subtract fractions and mixed numbers with like denominators.

12. Use models and number patterns to demonstrate multiplication with common fractions.

14. Estimate and use simple equivalent fractions (1/2, 1/4, 1/10, 3/10, etc.) to find the percent of a number (50%, 25%, 10%, 30%, etc.).

Money

Kindergarten	Grade 1	Grade 2
1. Explore the idea of money as a trading material to purchase objects. 2. Use pennies to count. 3. Explore and sort a collection of coins and explain ways to sort using students' own rules. 4. Recognize by name the penny, nickel, dime, and quarter.	1. Continue to sort coins using students' own rules. 2. Recognize, name, and state the value of a penny, nickel, dime, and quarter. 3. Explore purchasing items with pennies, nickels, and dimes and make change using pennies up to and including ten cents. (14b) 4. Create, write, illustrate, and solve story problems involving money.	1. Sort, name, and identify the value of the penny, nickel, dime, quarter, half-dollar, and dollar. 2. Use pennies, nickels, and dimes for transactions up to $1.00. Explore using quarters, half-dollars, and dollars for transactions. (14B) 3. Create, write, illustrate, and solve simple money story problems. 4. Explore different ways to write about money using "cents" and the "¢" symbol. 5. Explore making change (use pennies, extend to dimes as students connect to place value concepts).

Money

Grade 3	Grade 4	Grade 5
1. Continue to sort, name, and identify the value of the penny, nickel, dime, quarter, half-dollar, and dollar.	1. Find different ways to make a set of coins worth a given value.	13. Estimate and solve money problems that involve multiplication and division. (7c)
2. Make sets of coins with values to $1.00; find and compare different ways to make a set of coins with a given value up to $1.00.	2. Connect money notation to place value using dollar sign and decimal point.	
3. Estimate money needed for a transaction.	3. Estimate and find the sum or difference of two money amounts. (7a)	
4. Estimate change to be received from a transaction.	4. Make change for purchases less than $10.00. (7a)	
5. Create, write, and solve money story problems; use dollar sign and decimal notation.	5. Explore ways to estimate and use patterns to find multiples of money amounts. (11)	
6. Skip count by 5¢, 10¢, 25¢, and 50¢ up to $2.00.	6. Create and solve practical money problems. (9a)	

Fairfield Public Schools

MATHEMATICS ASSESSMENTS

Assessment is an information gathering process. Assessment information can be useful in many ways. Three of the ways are:

- Diagnostic
- Instructional Feedback
- Grading

Formative assessment takes place before, during, and after instruction. Formative assessment is ongoing. Data from formative assessments are used in summative evaluations. Information allows us to see whether objectives have been met with mastery and fluency. Assessments reflect the mathematics that all students need to know.

Students also learn mathematics while they are being assessed. Demonstrated mastery or fluency of objectives may be evidenced by:

- Observations
- Collections of Student Work
- Open-ended Tasks and Projects
- Interviews and Questions
- Pre and Post Tests
- Variety of Student Products

Assessment that enhances mathematics learning needs to become a routine part of ongoing classroom activity. It is not an interruption of those activities. Assessments communicate to all involved what is valued.

There are four levels of Mathematical Assessment in the Fairfield Public Schools:

- Skill - where students demonstrate what they can do;
- Concepts - where students explain what they understand about a concept;
- Application - where students use the skills and concepts in a new situation; and
- Inquiry - where students are extended to learn more and show more about a concept.

When reviewing the scores of our students on Fairfield Curriculum Based Assessments (see pages 82 - 94 for some sample assessments), the data seems to indicate that our assessments are good predictors for success on the corresponding CMT Strands.

- For example, in a Grade 3 classroom where students achieved mastery on Fairfield Assessments at the 100% level, some data indicates that in the next school year this same group of students scored at the 97% level on the aligned CMT objective.

- In many classrooms, at all grade levels, a few students do not reach mastery on the first try with an assessment. These students receive reteaching and then are retested. There is nearly 100% success in moving these students from a 0 or a 1 (non mastery) to a 2 or a 3 (mastery).

A similar phenomena occurs at other grade levels:

- We can expect that Fairfield students will score high on our assessments (85% or higher) and then score at that level or better on corresponding CMT Strands.

- On the other hand, there are situations in the district where students score higher (97%) on the CMT than on the in-house assessments (91-95%).

Regardless which way it goes, most of the Fairfield Curriculum Based Assessments are aligned well with the CMT test items thereby assisting our students in their achievement.

SAMPLE MATHEMATICS ASSESSMENTS

Fairfield Public Schools
Grade 3 Assessment A

Fairfield Mastery Objectives:

Strand: Whole Number Concepts

   2. Demonstrate that multiplication is repeated addition and that division is repeated subtraction.
   3. Write/tell the fact families for multiplication and division using the relationship of factors and products and the commutative property.
   4. Relate multiplication/division facts to arrays and pictures.

Strand: Number Sense and Numeration

   2. Count by 2s, 5s, 10s, 50s, and 100s.

CMT Objective 5: Models for Operations

   5a. Relate multiplication and division facts to rectangular arrays and pictures.

Grade 3 Assessment Task A
Rubric: Whole Number Concepts/Number Sense and Numeration

3   Task is completed using and appropriate strategy. All parts of the task are correct. May contain one minor flaw such as: one number wrong in the fact family on example #4 **or** on #5 one array could contain a minor mistake.

2   Each part of the task is essentially correct, but may contain more than one minor flaw (see score 3) **or** successfully completes 5-7 parts (question #5 is divided into 4 sections).

1   Begins work on at least part of the task, but successfully completes 1-4 parts. Ability to describe thinking is weak.

0   No attempt **or** totally incorrect approach.

Fairfield Public Schools
Grade 3 Assessment C

Fairfield Mastery Objectives:

Strand: Geometry and Measurement

2. Identify and represent figures and parts of figures: closed and open curves, intersecting, parallel, perpendicular, and congruent lines.
3. Identify and distinguish between plane and solid figures: polygon, rhombus, parallelogram, trapezoid, octagon, hexagon, cube, cone, cylinder, sphere, rectangular prism, and pyramid. Sort polygons and solids, discuss their attributes, and identify them in the environment.
5. Relate faces and cross-sections of solids to polygons (three- to two-dimensional).
10. Identify the right angle and compare angles to it.

CMT Objective 17: Geometric Shapes and Properties

17b. Draw geometric shapes and figures.

Grade 3 Assessment Task C
Rubric: Geometry and Measurement

3   Task is completed using an appropriate strategy. For example, #2 description of steps, strategies, and/or mathematical ideas is clear and complete. There must be at least two differences and two similarities. For example, #1 may contain one minor flaw such as one shape named or identified incorrectly.

2   Task is essentially completed, but may contain minor flaws such as two or three shapes named incorrectly and for inappropriate or missing usage of some terms. Description of mathematical thinking or strategies is adequate.

1   Begins work on at least part of the task, but successfully completes only one part. Ability to describe thinking is weak.

0   No attempt **or** totally incorrect approach.

Fairfield Public Schools
Grade 3 Assessment E

Fairfield Mastery Objectives:

Strand: Patterns, Relationships, Algebraic Properties, and Functions

1. Identify, describe, and write about a variety of possible classification rules for sorting and given collections and sort a collection using a given attribute.
2. Describe and write about relationships among sets of objects including subsets, intersections, similarities, and differences.
3. Construct and use a matrix with two attributes to classify and to solve missing and extraneous element problems.

CMT Objective 22: Patterns

22a. Extend or complete patterns involving whole numbers and attributes and identify or state rules for given patterns.

CMT Objective 25: Mathematical Applications

25a. Solve extended numerical problems.
25b. Solve extended statistical problems.

Grade 3 Assessment Task E
Rubric: Patterns, Relationships, Algebraic Properties, and Functions

3   Task is completed using and appropriate strategy. All parts of the task are correct. Description of steps, strategies, and/or mathematical ideas is clear and complete. In #1 explanation must include specific shape and color.

2   Task is essentially completed, but may contain minor flaws such as one mislabeled drawing and/or vaguely worded rule. Description of mathematical thinking or strategies is adequate.

1   Begins work on at least part of the task, but does not successfully complete it. Ability to describe thinking is weak.

0   No attempt **or** totally incorrect approach.

Fairfield Public Schools
Grade 3 Assessment F

Fairfield Mastery Objectives:

Strand: Fractions, Decimals, and Percents

1. Show and construct parts of a whole with models and pictures and identify and label unit fractions such as 1/2, 1/3, 1/4, 1/5, 1/6, 1/8, 1/10, and 1/12. Write fraction addition sentences equal to one that match models and pictures.
2. Compare and order unit fractions such as 1/2, 1/3, 1/4, etc., and fractions with common denominators such as 1/4, 2/4, 3/4, etc.
3. Write about fraction relationships using "more than", "less than", and "equal to" and explore using the >, <, and = symbols.
7. Use the terms numerator and denominator. Build models of and draw pictures of fractions with numerators other than 1.

CMT Objective 2: Pictorial Representations of Numbers

2b. Identify, label, or shade fractional parts of regions and sets.

Grade 3 Assessment Task F
Rubric: Fractions, Decimals, and Percents

3   Task is completed using and appropriate strategy. All parts of the task are correct. In example #2, student must include a statement about the equivalency between their new fraction and 2/4. Description of steps, strategies, and/or mathematical ideas is clear and complete.

2   Task is essentially completed. Completes three parts correctly. Description of mathematical thinking or strategies is adequate.

1   Begins work on the task, but successfully completes only two parts. Ability to describe thinking is weak.

0   No attempt **or** totally incorrect approach.

Fairfield Public Schools
Grade 5 Assessment C

Fairfield Mastery Objectives:

Strand: Geometry and Measurement

    1. Classify polygons and solids by the characteristics of their parts and use terms such as angle, side, face, edge, line, segment, vertex, diagonal, parallel, congruent, similar, equilateral, symmetrical, intersecting, perpendicular, triangle, square, rectangle, parallelogram, quadrilateral, hexagon, rectangle, plane, and solid.

CMT Objective 17: Geometric Shapes and Properties

    17a. Identify, and draw geometric shapes and figures.
    17b. Describe and classify geometric shapes and figures.

CMT Objective 18: Spatial Relationships

    18b. Identify congruent figures.

Grade 5 Assessment Task C
Rubric: Geometry and Measurement

3   Task is completed and results are correct. All parts of the drawings and all table entries are correct. Description of mathematical ideas is clear and complete. Identifies three or more ways that the solids are different or are the same. Fifteen correct entries in the table are given.

2   Task is essentially completed, but may contain minor flaws such as the description of mathematical thinking is adequate.

1   Begins work on the problem, but does not successfully complete it. For example, does not draw four <u>different</u> quadrilaterals in #1, may label some incorrectly, and has less than 12 correct entries in the table. Ability to describe thinking is weak. Generally provides only one piece of information to describe similarities and differences.

0   No attempt **or** totally incorrect approach.

Fairfield Public Schools
Grade 5 Assessment F

Fairfield Mastery Objectives:

Strand: Number Sense and Numeration

1. Read, write, compare, and order whole numbers up to a billion; count by any multiples.
3. Represent numbers using place value groupings with multiples of ten, expanded notation, regrouping, and use alternative groupings to describe an amount.

CMT Objective 1: Place Value

1a. Solve problems involving 100 and 1,000 more or less.
1b. Identify alternative forms of expressing whole numbers <10,000 using expanded notation.
1c. Identify alternative forms of expressing whole numbers <10,000 using regrouping.

CMT Objective 4: Order, Magnitude, and Rounding of Numbers

4a. Order whole numbers less than 100,000.
4c. Describe the magnitude of whole numbers less than 100,000.

Grade 5 Assessment Task F
Rubric: Number Sense and Numeration

3   Task is completed using an appropriate strategy. The results are correct. Description of steps, strategies, and/or mathematical ideas is clear and complete.

2   Task is essentially completed, but may contain minor flaws, for example, two problems may not be completed correctly. Description of   mathematical thinking or strategies is adequate.

1   Begins work on at least part of the overall task, but does not successfully complete it. Three problems or more are incorrect. Ability to describe thinking is weak.

0   No attempt **or** totally incorrect approach.

Fairfield Public Schools
Grade 2 Assessment J

Fairfield Mastery Objectives:

Strand: Geometry and Measurement

5. Construct and identify congruent polygons.
6. Construct and identify polygons with none, one, or more than one line of symmetry and explore symmetry with solids.

CMT Objective 18: Spatial Relationships

18a. Identify or draw lines of symmetry.
18b. Identify congruent figures.

Materials: crayons

Grade 2 Assessment Task J
Rubric: Geometry and Measurement

3   Task is completed using an appropriate strategy. The result is correct.
      More than one line of symmetry is drawn.

2   Task is essentially completed, but may contain minor flaws such as: only one line of symmetry is drawn on the hexagon **or** on #4 one figure is not congruent **or** only one polygon was identified in #1.

1   Begins work on at least part of the problems, but does not successfully complete them.

0   No attempt **or** totally incorrect approach.

Name _____ Date _____

1. Put a **red X** on any polygon below that has **<u>only 1 line</u>** of symmetry.

2. Put a **blue X** on any polygon below that has **<u>no lines</u>** of symmetry.
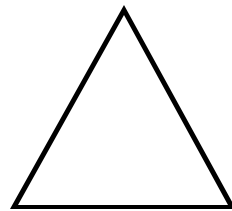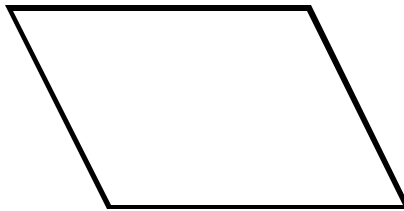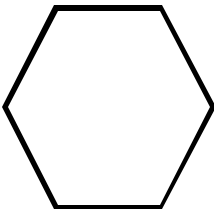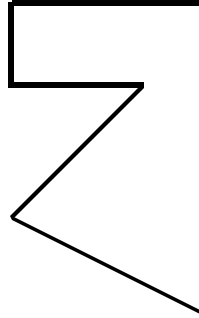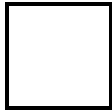
3. Draw lines of symmetry on the hexagon below.
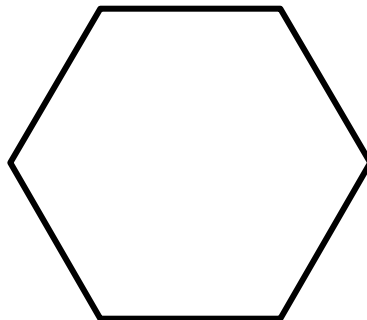
Name _____   Date _____

4. For each polygon below **draw** a **congruent** figure on the grid **next** to it.
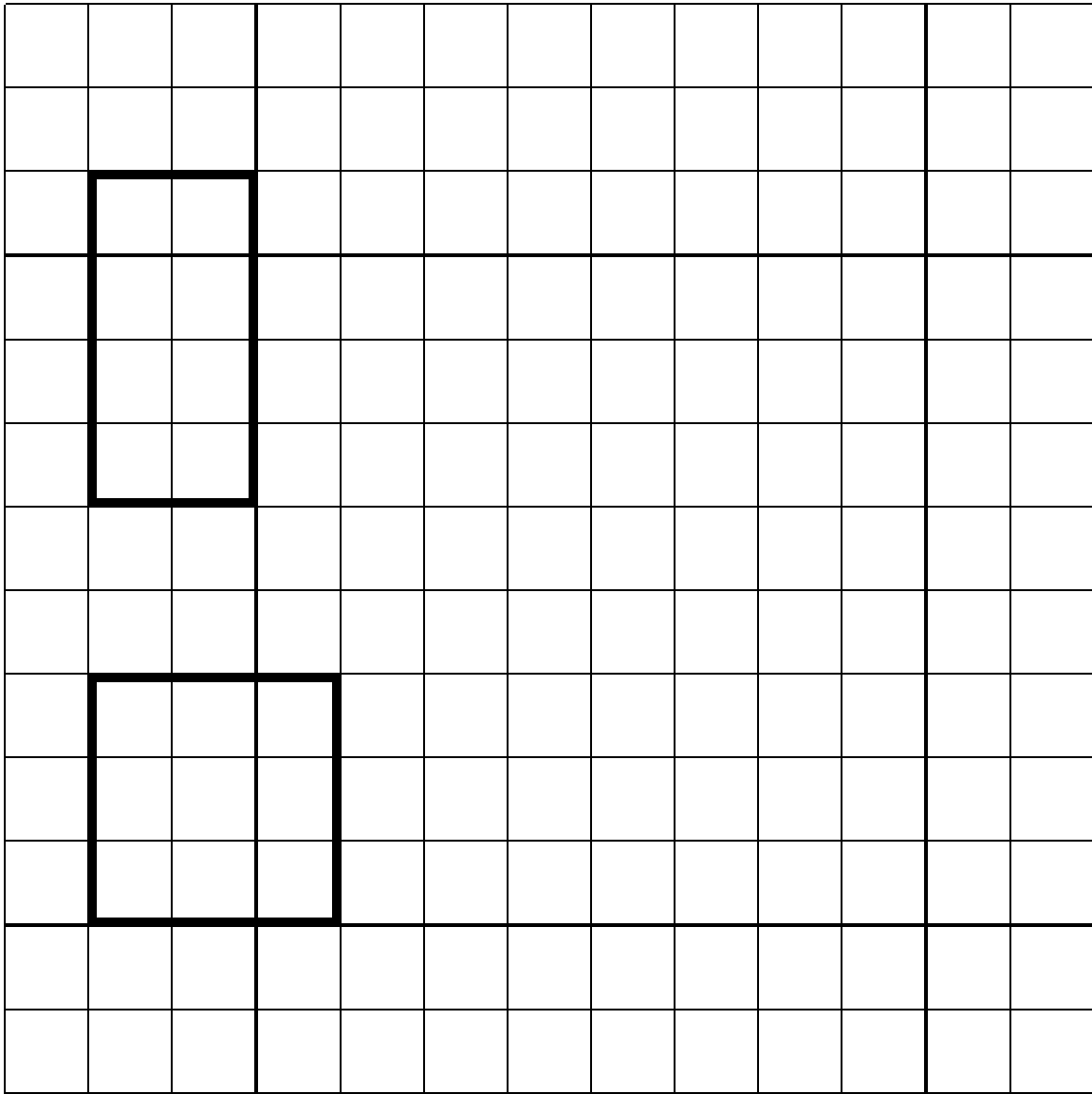
Fairfield Public Schools
Grade 2 Assessment N

Fairfield Mastery Objectives:

Strand: Patterns

   6. Explore, copy, extend, invent, translate, describe, and classify a variety of patterns.

Strand: Probability/Statistics

   1. Continue to collect, organize, display, analyze, and write about data to <u>solve</u> problems that involve mathematics and other subjects.
   2. Predict, discuss, and write about possible uses of data collected by the class.

CMT Objective 19: Tables, Charts, and Graphs

   19a. Identify correct information from graphs, tables, and charts.

CMT Objective 22: Patterns

   22a. Extend or complete patterns involving whole numbers and attributes and identify or state rules for given patterns.

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Grade 2 Assessment Task N:
Rubric Patterns, Probability/Statistics

3   Task is completed using an appropriate strategy. The result is correct.   May contain one minor flaw. * Description of steps, strategies, and/or mathematical ideas is clear and complete.

2   Task is essentially completed, but may contain minor flaws. No more than, and including four minor flaws. * Description of mathematical thinking or strategies is adequate.

1   Begins work on at least part of the problem, but does not successfully complete it. Ability to describe thinking is weak.

0   No attempt **or** totally incorrect approach

*Minor flaws may include: ? any incorrect number in either or both tables
                              ? any other incorrect number responses

</div>

Name _____ Date _____

1. Complete the number pattern table. Cost of one toy is 5¢

Number of Toys	1	2	3	4	5
Cost	5¢				

2. Use the above table to help you solve this problem.

How many toys can you buy if you have 21¢?   _____ toys

I chose my answer because
_____
....
_____

_____
....
_____

3. Explain the pattern in the above table.

The pattern is
_____
....
_____

_____
....
_____

Name _____   Date _____

4. Six (6) dogs are in a dog show.

- They each have 3 tags on their collar.
- Pick something on the dog from the list below.

  ➢ paws
  ➢ ears
  ➢ dog tags

- Your choice is _____

- Complete the table below using your choice.

Number of Dogs	1	2	3	4	5	6
_____ (your choice)						

6 dogs have _____
                          Number

           _____
                          Your Choice

Name _____   Date _____

Extension Question (Inquiry)

Pretend you are the teacher. What question would you ask your students about your table in problem 4?

The question I would ask is …

_____

_____

_____

_____

_____

_____

_____

Fairfield Public Schools
Mathematics Summative Assessment
Recording Sheet

Kindergarten Rubric Scores – 2000 Revised

Student _____**Year** _____

Task	Objective/Strand	Rubric Score	Date	Anecdotal Information
A	Number Sense/Numeration #4	A-1 _____ A-2 _____		
B	Number Sense/Numeration #5	B-1 _____ B-2 _____		
C	Geometry/Measurement #1, 2, & 4	C-1 _____ C-2 _____ C-3 _____		
D	Patterns/Relationships/Algebraic Properties/Functions #5 & 6			
E	Patterns/Relationships/Algebraic Properties/Functions #1 & 3 and Probability/Statistics #2			
F	Fractions/Decimals/Percents #1, 2, & 3	F-1 _____ F-2 _____		
G	Number Sense/Numeration #8 and Geometry/Measurement #9 & 10			
H	Geometry/Measurement #7 & 10			
I	Number Sense/Numeration #1 and Money #3 & 4	I-1 _____ I-2 _____ I-3 _____		
J	Time #1			
K	Whole Number Concepts/Computation #1, Number Sense/Numeration #2 & 8, and Money #2			
L	Time #2			
M	Number Sense/Numeration #2, 3, & 6			

Fairfield Public Schools
Mathematics Summative Assessment
Recording Sheet

Grade 1 Rubric Scores – 2000 Revised

Student _____ **Year** _____

Task	Objective/Strand	Rubric Score	Date	Anecdotal Information
A	Patterns/Relationships/Algebraic Properties/Functions #1, 2, 3, & 4 and Money #1			
B	Geometry/Measurement #1, 2, & 5			
C	Geometry/Measurement #1, 2, 3, & 4			
D	Patterns/Relationships/Algebraic Properties/Functions #6, 7, & 9, Number Sense/Numeration #1, and Probability/Statistics #2			
E	Whole Number Concepts/Computation #4, Fractions/Decimals/Percents #2 & 4, and Number Sense/Numeration #1 & 2			
F	Geometry/Measurement #7, 12, & 13			
G	Patterns/Relationships/Algebraic Properties/Functions #5 & 8 and Money #2			
H	Geometry/Measurement #8			
I	Geometry/Measurement #9			
J	Time #1, 2, & 3			
K	Whole Number Concepts/ Computation #1 & 8 and Number Sense/Numeration # 3 & 4			
L	Money #4 and Whole Number Concepts/ Computation #3 & 6			
M	Fractions/Decimals/Percents #1 & 3			

Fairfield Public Schools
Mathematics Summative Assessment
Recording Sheet

Grade 2 Rubric Scores – 2000 Revised

Student _____ **Year** _____

Task	Objective/Strand	Rubric Score	Date	Anecdotal Information
A	Geometry/Measurement #1 and Patterns/Relationships/Algebraic Properties/Functions #1			
B	Patterns/Relationships/Algebraic Properties/Functions #1, 2, 3, & 4			
C	Geometry/Measurement #2			
D	Addition/Subtraction #2 & 4 and Number Sense/Numeration #2 & 3			
E	Geometry/Measurement #4			
F	Money #1 & 2			
G	Number Sense/Numeration #1, 3, 4, & 5			
H	Time #1			
I	Addition/Subtraction #1 & 3			
J	Geometry/Measurement #5 & 6			
K	Patterns/Relationships/Algebraic Properties/Functions #5 and Time #2 & 4			
L	Probability/Statistics #5, Patterns/Relationships/Algebraic Properties/Functions #7, and Money #3			
M	Multiplication/Division #1 & 3			
N	Patterns/Relationships/Algebraic Properties/Functions #6 and Probability/Statistics #1 & 2			
O	Geometry/Measurement # 9 & 12			

Fairfield Public Schools
Mathematics Summative Assessment
Recording Sheet

Grade 3 Rubric Scores – 2000 Revised

Student _____ **Year** _____

Task	Objective/Strand	Rubric Score	Date	Anecdotal Information
A	Whole Number Concepts/Computation #2, 3, & 4 and Number Sense/Numeration #2			
B	Multiplication/Division # 3 & 4			
C	Geometry/Measurement #2, 3, 5, & 10			
D	Money #1, Number Sense/Numeration #2, and Whole Number Concepts/Computation #2			
E	Patterns/Relationships/Algebraic Properties/Functions #1, 2, & 3			
F	Fractions/Decimals/Percents #1, 2, 3, & 6			
G	Geometry/Measurement #6			
H	Number Sense/Numeration #2, 3, & 4 and Addition/Subtraction #7			
I	Addition/Subtraction #2 and Multiplication/Division #4			
J	Patterns/Relationships/Algebraic Properties/Functions #7, Money #6, and Addition/Subtraction #1			
K	Number Sense/Numeration #5, 6, 8, & 9			
L	Geometry/Measurement #9 & 13			
M	Geometry/Measurement #1			
N	Number Sense/Numeration #1 and Time #1			
O	Fractions/Decimals/Percents #5, 8, & 9, Geometry/Measurement #7, and Patterns/Relationships/Algebraic Properties/Functions #5 & 6			
P	Number Sense/Numeration #12, Multiplication/Division #1, and Money #2, 3, 4, & 5			

Fairfield Public Schools
Mathematics Summative Assessment
Recording Sheet

Grade 4 Rubric Scores – 2000 Revised

Student _____ **Year** _____

Task	Objective/Strand	Rubric Score	Date	Anecdotal Information
A	Geometry/Measurement #1 and Patterns/Relationships/Algebraic Properties/Functions #3			
B	Geometry/Measurement #5			
C	Probability/Statistics #6, Time #1 & 2, and Number Sense/Numeration #4			
D	Patterns/Relationships/Algebraic Properties/Functions #1 & 2			
E	Whole Number Concepts/Computation #2, 3, & 4			
F	Geometry/Measurement #2 & 3 and Fractions/Decimals/Percents #1 & 4			
G	Fractions/Decimals/Percents # 2 & 3			
H	Patterns/Relationships/Algebraic Properties/Functions #4 & 7 and Money #1			
I	Geometry/Measurement #8, 9, & 11			
J	Probability/Statistics #2, 3, & 4			
K	Patterns/Relationships/Algebraic Properties/Functions #6, 8, 9, & 10 and Probability/Statistics #1			

Fairfield Public Schools
Mathematics Summative Assessment
Recording Sheet

Grade 5 Rubric Scores – 2000 Revised

Student _____ **Year** _____

Task	Objective/Strand	Rubric Score	Date	Anecdotal Information
A	Patterns/Relationships/Algebraic Properties/Functions #1 & 2 and Computation w/ Rational Numbers #9			
B	Computation w/ Rational Numbers #5			
C	Geometry/Measurement #1			
D	Computation w/ Rational Numbers #8, 10, 11 & 13	D-1 _____ D-2 _____		
E	Computation w/ Rational Numbers #3, 6, & 15			
F	Number Sense/Numeration #1 & 3			
G	Number Sense/Numeration #7			
H	Geometry/Measurement #13, Probability/Statistics #5, and Algebra #1			
I	Computation w/ Rational Numbers #5 & 6			
J	Computation w/ Rational Numbers #1			
K	Patterns/Relationships/Algebraic Properties/Functions #2			
L	Number Sense/Numeration #5			

APPENDICES

Connecticut Mastery Test – 3rd Generation

Grade 3 Off-level Test Mathematics Content

Content Standards and Strands	Concepts and Skills Assessed
Number Sense	
1. Place Value	1a. Identify alternative forms of expressing whole numbers (less than 100) using expanded notation 1b. Identify alternative forms of expressing whole numbers (less than 100) by regrouping using pictures of bean sticks or base ten materials 1c. Use place value concepts to interpret the meaning of numbers
2. Pictorial Representations of Numbers	2a. Identify numbers (less than 100) from pictures of bean sticks or base ten materials and vice versa 2b. Match unit fractions with pictorial representations of unit fractions (1/2, 1/3, 1/4, 1/6)
3. Equivalent Fractions, Decimals, and Percents	Not tested at Grade 3
4. Order, Magnitude, and Rounding of Numbers	4a. Identify a number larger or smaller than a given set of numbers less than 100 4b. Order whole numbers less than 100 4c. Solve problems involving one or two more or less than a given number 4d. Round whole numbers less than 100 in a context 4e. Identify points representing whole numbers on a number line and vice versa
Operations	
5. Models for Operations	5a. Match addition or subtraction number fact sentences with pictures 5b. Identify or write the appropriate operation or number sentence to solve a story problem 5c. Write a story problem that matches a given addition or subtraction number sentence
6. Basic Facts	6a. Use objects to find addition facts to 18 6b. Use objects to find subtraction facts to 18
7. Computation with Whole Numbers and Decimals	7a. Use bean sticks or other base ten materials to add one- and two-digit numbers with and without regrouping

8. Computation with Fractions	Not tested at Grade 3
9. Solve Word Problems	9a. Solve simple story problems involving addition and subtraction facts using counters or other objects
Estimation and Approximation	
10. Numerical Estimation Strategies	Not tested at Grade 3
11. Estimating Solutions to Problems	11a. Estimate a reasonable answer to a problem
Ratio, Proportion, and Percent	
12. Ratios and Proportions	Not tested at Grade 3
13. Computation with Percents	Not tested at Grade 3
Measurement	
14. Time and Money	14a. Tell time to the nearest hour and half-hour using analog and digital clocks 14b. Determine the value of a set of coins less than $1 (pennies, nickels, and dimes)
15. Approximating Measures	15a. Estimate lengths using nonstandard units
16. Customary and Metric Measures	16a. Measure lengths using nonstandard units 16b. Identify an appropriate customary or metric unit (inch, foot, meter, and centimeter) for a given situation
Spatial Relationships and Geometry	
17. Geometric Shapes and Properties	17a. Identify and draw simple geometric figures (circle, square, triangle, and rectangle)
18. Spatial Relationships	Not tested at Grade 3
Probability and Statistics	
19. Tables, Graphs, and Charts	19a. Identify correct information from graphs, tables, and charts 19b. Create simple bar graphs and pictographs from data in tables and charts
20. Statistics and Data Analysis	Not tested at Grade 3
21. Probability	Not tested at Grade 3

Patterns	
22. Patterns	22a. Extend or complete patterns involving whole numbers and attributes and identify or state rules for given patterns
Algebra and Functions	
23. Algebraic Concepts	Not tested at Grade 3
Discrete Mathematics	
24. Classification and Logical Reasoning	24a. Identify objects that are the same or different by one attribute 24b. Sort objects into two groups by a common attribute
Integrated Understandings	
25. Mathematical Applications	25a. Solve extended numerical problems 25b. Solve extended statistical problems

NOTE: All students will have a supply of 20 counters and 10 paper clips available to them. In addition, students will have a set of bean sticks or other base ten materials available.

Connecticut Mastery Test – 3rd Generation

Grade 4 Mathematics Content

Content Standards and Strands	Concepts and Skills Assessed
Number Sense	
1. Place Value	1a. Solve problems involving 1 and 10 more or less 1b. Identify alternative forms of expressing whole numbers using expanded notation 1c. Identify alternative forms of expressing whole numbers using regrouping 1d. Use place value concepts to interpret the meaning of numbers
2. Pictorial Representations of Numbers	2a. Relate pictorial representations using base ten blocks to whole numbers and vice versa 2b. Identify, label, or shade fractional parts of regions and sets
3. Equivalent Fractions, Decimals, and Percents	Not tested at Grade 4
4. Order, Magnitude and Rounding of Numbers	4a. Order whole numbers 4b. Describe the magnitude of whole numbers 4c. Round whole numbers in a context 4d. Identify points representing whole numbers on a number line and vice versa
Operations	
5. Models for Operations	5a. Relate multiplication and division facts to rectangular arrays and pictures 5b. Identify or write the appropriate operation or number sentence to solve a story problem 5c. Write story problems from addition and subtraction number sentences
6. Basic Facts	6a. Add and subtract facts to 18 6b. Multiply and divide by 2, 5, and 10
7. Computation with Whole Numbers and Decimals	7a. Add and subtract 1- and 2-digit numbers without regrouping 7b. Add 1- and 2-digit numbers with regrouping
8. Computation with Fractions	Not tested at Grade 4

9. Solve Word Problems	9a. Solve simple story problems involving addition and subtraction
	9b. Solve simple story problems involving addition and subtraction with extraneous information
Estimation and Approximation	
10. Numerical Estimation Strategies	10a. Identify the best expression to find an estimate
11. Estimating Solutions to Problems	11a. Estimate a reasonable answer to a problem
Ratio, Proportion, and Percent	
12. Ratios and Proportions	Not tested at Grade 4
13. Computation with Percents	Not tested at Grade 4
Measurement	
14. Time	14a. Tell time to the nearest hour, half-hour, and quarter-hour using analog and digital clocks
	14b. Solve problems involving time, elapsed time, and calendars
15. Approximating Measures	15a. Estimate lengths and areas
16. Customary and Metric Measures	16a. Measure or draw lengths to the nearest inch or centimeter
	16b. Identify an appropriate customary or metric measure for a given situation
Spatial Relationships and Geometry	
17. Geometric Shapes and Properties	17a. Identify geometric shapes and figures including the number of angles and sides of polygons
	17b. Draw geometric shapes and figures
18. Spatial Relationships	Not tested at Grade 4
Probability and Statistics	
19. Tables, Graphs, and Charts	19a. Identify correct information from graphs, tables, and charts
	19b. Create bar graphs and pictographs from data in tables and charts
20. Statistics and Data Analysis	Not tested at Grade 4
21. Probability	21a. Solve problems involving elementary notions of probability
Patterns	
22. Patterns	22a. Extend or complete patterns involving whole numbers and attributes and identify or state rules for given patterns

Algebra and Functions	
23. Algebraic Concepts	Not tested at Grade 4
Discrete Mathematics	
24. Classification and Logical Reasoning	24a. Identify objects that are the same or different by one attribute 24b. Sort objects into two groups by a common attribute
Integrated Understandings	
25. Mathematical Applications	25a. Solve extended numerical problems 25b. Solve extended statistical problems

Summary: 18 Reporting Strands
94 Items
76 Multiple-choice
18 Open-ended

Connecticut Mastery Test – 3rd Generation

Grade 5 Off-level Test Mathematics Content

Content Standards and Strands	Concepts and Skills Assessed
Number Sense	
1. Place Value	1a. Solve problems involving 10 and 100 more or less 1b. Identify alternative forms of expressing whole numbers <1,000 using expanded notation 1c. Identify alternative forms of expressing whole numbers <1,000 using regrouping 1d. Use place value concepts to interpret the meaning of numbers
2. Pictorial Representations of Numbers	2a. Construct pictorial representations of fractions, decimals (tenths), and mixed numbers 2b. Relate fractions and mixed numbers to pictorial representations and vice versa 2c. Relate decimals (0.1 - 2.9) to pictorial representations and vice versa
3. Equivalent Fractions, Decimals, and Percents	3a. Relate equivalent fractions (using pictorial representations)
4. Order, Magnitude, and Rounding of Numbers	4a. Order whole numbers less than 10,000 4b. Describe the magnitude of whole numbers, fractions, mixed numbers, and decimals (tenths) 4c. Round whole numbers in a context 4d. Identify points representing whole numbers, fractions, and decimals on a number line
Operations	
5. Models for Operations	5a. Identify or write the appropriate operation or number sentence to solve a story problem 5b. Write a story problem that matches a given addition, subtraction, division, or multiplication number sentence
6. Basic Facts	6a. Find multiplication facts where one factor is 2, 3, 4, 5, or 10 6b. Find division facts where one factor is 2, 3, 4, 5, or 10 6c. Identify members of multiplication and division fact families from arrays

7. Computation with Whole Numbers and Decimals	7a. Add and subtract 2- and 3-digit whole numbers and money amounts less than $10
8. Computation with Fractions	Not tested at Grade 5
9. Solve Word Problems	9a. Solve 1-step problems involving whole numbers and money amounts (all four operations) 9b. Solve simple story problems involving addition and subtraction with extraneous information 9c. Solve 1-step problems and explain how the solution was determined
Estimation and Approximation	
10. Numerical Estimation Strategies	10a. Identify the best expression to find an estimate
11.Estimating Solutions to Problems	11a. Estimate a reasonable answer to a problem, including estimating change from $1, $5, and $10
Ratio, Proportion, and Percent	
12. Ratios and Proportions	Not tested at Grade 5
13. Computation with Percents	Not tested at Grade 5
Measurement	
14. Time	14a. Solve problems involving time and elapsed time
15. Approximating Measures	15a. Estimate lengths and areas
16. Customary and Metric Measures	16a. Measure or draw lengths to nearest inch, half-inch, or centimeter 16b. Identify an appropriate customary or metric measure for a given situation
Spatial Relationships and Geometry	
17. Geometric Shapes and Properties	17a. Identify and draw geometric shapes and figures 17b. Describe geometric shapes and figures
18.Spatial Relationships	Not tested at Grade 5
Probability and Statistics	
19. Tables, Graphs, and Charts	19a. Identify correct information from graphs, tables, and charts 19b. Create bar graphs and pictographs from data in tables and charts
20. Statistics and Data Analysis	20a. Draw and justify reasonable conclusions from graphs, tables, and charts

21. Probability	21a. Solve problems involving elementary notions of probability
Patterns	
22. Patterns	22a. Extend or complete patterns involving whole numbers and attributes and identify or state rules for given patterns
Algebra and Functions	
23. Algebraic Concepts	Not tested at Grade 5
Discrete Mathematics	
24. Classification and Logical Reasoning	24a. Solve problems involving the organization of data, including sorting objects by common attributes
Integrated Understandings	
25. Mathematical Applications	25a. Solve extended numerical problems 25b. Solve extended spatial problems 25c. Solve extended statistical problems

Connecticut Mastery Test – 3rd Generation

Grade 6 Mathematics Content

Content Standards and Strands	Concepts and Skills Assessed
Number Sense	
1. Place Value	1a. Solve problems involving 100 and 1,000 more or less 1b. Identify alternative forms of expressing whole numbers <10,000 using expanded notation 1c. Identify alternative forms of expressing whole numbers <10,000 using regrouping 1d. Use place value concepts to interpret the meaning of numbers
2. Pictorial Representations of Numbers	2a. Relate decimals (0.01 - 2.99) to pictorial representations and vice versa 2b. Relate fractions and mixed numbers to pictures and vice versa 2c. Construct pictorial representations of fractions, mixed numbers, and decimals
3. Equivalent Fractions, Decimals, and Percents	3a. Rename equivalent fractions 3b. Rename equivalent mixed numbers and improper fractions
4. Order, Magnitude, and Rounding of Numbers	4a. Order whole numbers less than 100,000 4b. Order fractions, mixed numbers, and decimals 4c. Describe the magnitude of whole numbers less than 100,000 4d. Describe the magnitude of fractions, mixed numbers, and decimals 4e. Round whole numbers in a context 4f. Round decimals in a context 4g. Locate points on number lines and scales
Operations	
5. Models for Operations	5a. Identify the appropriate operation or number sentence to solve a story problem 5b. Write story problems from multiplication and division number sentences
6. Basic Facts	6a. Multiply and divide facts

7. Computation with Whole Numbers and Decimals	7a. Add and subtract 2-, 3-, and 4-digit whole numbers and money amounts less than $100
	7b. Multiply and divide multiples of 10 and 100 by 10 and 100
	7c. Multiply and divide 2- and 3-digit whole numbers and money amounts less than $10 by 1-digit numbers
8. Computation with Fractions	8a. Add and subtract fractions and mixed numbers with like denominators
9. Solve Word Problems	9a. Solve 1-step problems involving whole numbers and money amounts
	9b. Solve 2-step problems involving whole numbers and money amounts
	9c. Solve 2-step problems and explain how the solution was determined
Estimation and Approximation	
10. Numerical Estimation Strategies	10a. Identify the best expression to find an estimate
	10b. Identify whether and why a particular strategy will result in an overestimate or an underestimate
11.Estimating Solutions to Problems	11a. Estimate a reasonable answer to a problem
Ratio, Proportion, and Percent	
12. Ratios and Proportions	Not tested at Grade 6
13. Computation with Percents	Not tested at Grade 6
Measurement	
14. Time	14a. Solve problems involving elapsed time
	14b. Solve problems involving the conversion of measures of time
15. Approximating Measures	15a. Estimate lengths and areas
16. Customary and Metric Measures	16a. Solve problems involving the conversion of measures of length
	16b. Measure lengths to the metric or customary unit specified
	16c. Measure/determine perimeter, area, and volume
	16d. Identify appropriate customary or metric units of measure (length, capacity, and mass) for a given situation

Spatial Relationships and Geometry	
17. Geometric Shapes and Properties	17a. Identify and draw geometric shapes and figures
	17b. Describe and classify geometric shapes and figures
18.Spatial Relationships	18a. Identify or draw lines of symmetry
	18b. Identify congruent figures
	18c. Locate points on grids
Probability and Statistics	
19. Tables, Graphs, and Charts	19a. Identify correct information from graphs, tables, and charts
	19b. Create bar graphs and pictographs from data in tables and charts
20. Statistics and Data Analysis	20a. Draw and justify reasonable conclusions from graphs, tables, and charts
21. Probability	21a. Solve problems involving elementary notions of probability and fairness, including justifying answers
Patterns	
22. Patterns	22a. Extend or complete patterns involving numbers and attributes, and identify or state rules for given patterns
Algebra and Functions	
23. Algebraic Concepts	23a. Solve simple 1-step algebraic equations
Integrated Understandings	
25. Mathematical Applications	25a. Solve extended numerical problems
	25b. Solve extended spatial problems
	25c. Solve extended statistical problems

Summary: 23 Reporting Strands
                116 Items
                        80 Multiple-choice
                        23 Open-ended
                        13 Grid

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