

Breakwater School
K-5 Mathematics Curriculum Overview
April 6, 2006

In Mathematics, students move between the three levels of Piaget's learning schema (Concrete, Representational, and Abstract) repeatedly with each new topic that is studied. Each concept is introduced at a Concrete level, through use of manipulative materials including place value blocks, number strips, Unifix cubes, pattern blocks, fraction tiles, and more. Once the concept is understood in a truly "hands-on" fashion, the pencil-and-paper or Representational algorithm is introduced. This strong foundation paves the way for an Abstract grasp of the concept, which is then used as the basis for introduction of the next new concept. Through this cycle, new concepts build on the groundwork laid by earlier concepts and the curriculum progresses in an ever-growing spiral.

The Standards of the National Council for Teachers of Mathematics (NCTM) highlight the need for major revisions in many of our nation's math programs. A need for children to become problem solvers, to be able to articulate their thinking and reasoning, to be able to solve spatial tasks, and to gain a deeper understanding of the processes embedded in mathematics are key components of both our program and the NCTM Standards. The goals of our program are to promote a love and understanding of mathematical concepts and an ability to apply those concepts to problems encountered in everyday life.

Kindergarten

Kindergarten mathematics focuses on hands-on exploration with real objects to reinforce concepts that help children develop an understanding of mathematic principles. Skills emphasized include:

- identification and creation of patterns
- sorting and classifying
- counting by ones, fives, and tens
- simple math problems with objects
- comparing
- graphing
- estimating
- recognition of numerals
- printing numerals

First through Fifth Grade

“Investigations in Number, Data, and Space”, a developmentally oriented, activity-based elementary school mathematics program, provides the general structure of the first through fifth grade program. Many other resources are also used to supplement this program including national and state standards in mathematics. The “Investigations” curriculum is an approach based upon years of research about how children learn mathematics. The program at each grade level consists of a set of separate units, each offering between two and eight weeks of focused study.

First and Second Grade

First and Second graders begin the year with “free exploration” as they are introduced to various math materials. This paves the way for students to use materials in more specific and directed ways to explore mathematical relationships throughout the year. During this time, children experiment with mathematical ideas at their own level of understanding.

As students become accustomed to, and skilled in, the appropriate uses of the math materials, we work with patterns, sorting and classifying, counting and comparing, grouping, estimating, graphing and place value. We ask students to find similarities and differences, then measure and compare volume, mass, and length while developing language skills. Children are encouraged to work both cooperatively and independently.

Our goal is to develop skills in:

- spatial relationships
- place value
- basic addition and subtraction
- fractions
- beginning multiplication
- problem solving
- time and money
- estimation

We also provide a foundation for: functions and relations, multiple solutions to problems, classification, quantity, arithmetic operations, logic, number sense, and the symbols used in mathematics.

Third and Fourth Grade

In addition to memorizing math facts and solidifying their knowledge of basic arithmetic, Third and Fourth graders embrace authentic problem solving, exploration of spatial relationships in our world, and the discovery of the exciting processes embedded in the study of math. The application of math to "everyday" life and the appreciation of the beauty and excitement of this discipline are stressed.

Some of the units of study in the third and fourth grade program include:

- Things That Come in Groups (X, -)
- 2 D and 3 D Geometry
- Combining and Comparing (+, -)
- Measuring and Data
- The Number System
- Fractions
- Changes

These units are presented through investigations that involve students in the exploration of major mathematical ideas.

To encourage significant mathematical learning, students are asked to:

- spend time exploring problems in depth
- find more than one solution to many of the problems they work on
- invent their own strategies and approaches, rather than relying on memorized procedures
- express their mathematical learning through drawing, writing, and talking
- choose from a variety of concrete materials and appropriate technology.

Fifth Grade

Fifth graders expand on material covered in the previous two years by exploring the following topics (as described in the NCTM Standards):

- Development of numeration. Topics include exponents, extended place value, powers of 10, expanded notation.
- Problem-solving involving expanded computation abilities. Topics include properties of multiplication, multi-digit multiplication, factorials, divisibility rules, averages, multi-digit division, calculators.
- Mathematics as a system of communication. Topics include Roman numerals, individual reports on other number systems, use of a model in mathematics, metric and English measurements.
- Mathematical theory. Topics include integers, involving positive and negative numbers; study of bases including base 2, base 3, base 5, base 10; multiples; factors; prime numbers; x/y coordinates.
- Mathematical applications. Topics include in-depth study of fractions: equivalencies, inequalities, reducing, lowest terms, least common denominator, addition, mixed numbers, improper fractions, subtraction, subtraction with borrowing in like terms, multiplication, canceling, reciprocals, division; and decimals: fraction-decimal conversions, addition, subtraction, multiplication, exchange rates, checkbook exercise including choosing and paying for a house, car, job, living expenses.
- Spatial relationships. Topics include dimensionality, perimeter, area, angles, degrees, protractors, rectangles, parallelograms, triangles, formulas.