Key Skills: Basic Number Concepts

Meets the following National Standards:

NCTM National Council of Teachers of Mathematics Standards and Focal Points:

Principles and Standards for School Mathematics

GRADES PRE-K - 2

Number and Operations

- Understand numbers, ways of representing numbers, relationships among numbers, and number systems
  - count with understanding and recognize "how many" in sets of objects;
  - use multiple models to develop initial understandings of place value and the base-ten number system;
  - develop understanding of the relative position and magnitude of whole numbers and of ordinal and cardinal numbers and their connections;
  - develop a sense of whole numbers and represent and use them in flexible ways, including relating, composing, and decomposing numbers;
  - connect number words and numerals to the quantities they represent, using various physical models and representations;
  - understand and represent commonly used fractions, such as 1/4, 1/3, and 1/2;
- Understand meanings of operations and how they relate to one another
  - understand various meanings of addition and subtraction of whole numbers and the relationship between the two operations;
  - understand the effects of adding and subtracting whole numbers;
- Compute fluently and make reasonable estimates
  - develop and use strategies for whole-number computations, with a focus on addition and subtraction;
  - develop fluency with basic number combinations for addition and subtraction;
  - use a variety of methods and tools to compute, including objects, mental computation, estimation, paper and pencil, and calculators;

Algebra

- Understand patterns, relations, and functions
  - sort, classify, and order objects by size, number, and other properties;

Measurement

- Understand measurable attributes of objects and the units, systems, and processes of measurement
  - recognize the attributes of length, volume, weight, area, and time;
  - compare and order objects according to these attributes;
  - understand how to measure using nonstandard and standard units;

GRADES PRE-K - 12

Problem Solving

- Instructional programs from pre-kindergarten through grade 12 should enable all students 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;
  - monitor and reflect on the process of mathematical problem solving;

Communication

- Instructional programs from pre-kindergarten through grade 12 should enable all students to—
  - use the language of mathematics to express mathematical ideas precisely.

Connections

- Instructional programs from pre-kindergarten through grade 12 should enable all students to—
  - recognize and use connections among mathematical ideas;
  - understand how mathematical ideas interconnect and build on one another to produce a coherent whole;
  - recognize and apply mathematics in contexts outside of mathematics;

Key Skills: Basic Number Concepts Meets the following National Standards:

NCTM National Council of Teachers of Mathematics Standards and Focal Points:

Curriculum Focal Points

KINDERGARTEN

Number and Operations: Representing, comparing, and ordering whole numbers and joining and separating sets

Children use numbers, including written numerals, to represent quantities and to solve quantitative problems, such as counting objects in a set, creating a set with a given number of objects, comparing and ordering sets or numerals by using both cardinal and ordinal meanings, and modeling simple joining and separating situations with objects. They choose, combine, and apply effective strategies for answering quantitative questions, including quickly recognizing the number in a small set, counting and producing sets of given sizes, counting the number in combined sets, and counting backward.

GRADE 1

Number and Operations and Algebra: Developing understandings of addition and subtraction and strategies for basic addition facts and related subtraction facts.

Children develop strategies for adding and subtracting whole numbers on the basis of their earlier work with small numbers. They use a variety of models, including discrete objects, length-based models (e.g., lengths of connecting cubes), and number lines, to model "part-whole," "adding to," "taking away from," and "comparing" situations to develop an understanding of the meanings of addition and subtraction and strategies to solve such arithmetic problems. Children understand the connections between counting and the operations of addition and subtraction (e.g., adding two is the same as "counting on" two). They use properties of addition (commutativity and associativity) to add whole numbers, and they create and use increasingly sophisticated strategies based on these properties (e.g., "making tens") to solve addition and subtraction problems involving basic facts. By comparing a variety of solution strategies, children relate addition and subtraction as inverse operations.

Number and Operations: Developing an understanding of whole number relationships, including grouping in tens and ones.

Children compare and order whole numbers (at least to 100) to develop an understanding of and solve problems involving the relative sizes of these numbers. They think of whole numbers between 10 and 100 in terms of groups of tens and ones (especially recognizing the numbers 11 to 19 as 1 group of ten and particular numbers of ones). They understand the sequential order of the counting numbers and their relative magnitudes and represent numbers on a number line.

GRADE 2

Number and Operations: Developing an understanding of the base-ten numeration system and place-value concepts.

Children develop an understanding of the base-ten numeration system and place-value concepts (at least to 1000). Their understanding of base-ten numeration includes ideas of counting in units and multiples of hundreds, tens, and ones, as well as a grasp of number relationships, which they demonstrate in a variety of ways, including comparing and ordering numbers. They understand multidigit numbers in terms of place value, recognizing that place-value notation is a shorthand for the sums of multiples of powers of 10 (e.g., 853 as 8 hundreds + 5 tens + 3 ones).

Number and Operations and Algebra: Developing quick recall of addition facts and related subtraction facts and fluency with multidigit addition and subtraction.

Children use their understanding of addition to develop quick recall of basic addition facts and related subtraction facts. They solve arithmetic problems by applying their understanding of models of addition and subtraction (such as combining or separating sets or using number lines), relationships and properties of number (such as place value), and properties of addition (commutativity and associativity). Children develop, discuss, and use efficient, accurate, and generalizable methods to add and subtract multidigit whole numbers. They select and apply appropriate methods to estimate sums and differences or calculate them mentally, depending on the context and numbers involved. They develop fluency with efficient procedures, including standard algorithms, for adding and subtracting whole numbers, understand why the procedures work (on the basis of place value and properties of operations), and use them to solve problems.

Measurement: Developing an understanding of linear measurement and facility in measuring lengths.

Children develop an understanding of the meaning and processes of measurement, including such underlying concepts as partitioning (the mental activity of slicing the length of an object into equal-sized units) and transitivity (e.g., if object A is longer than object B and object B is longer than object C, then object A is longer than object C). They understand linear measure as an iteration of units and use rulers and other measurement tools with that understanding. They understand the need for equal-length units, the use of standard units of measure (centimeter and inch), and the inverse relationship between the size of a unit and the number of units used in a particular measurement (i.e., children recognize that the smaller the unit, the more iterations they need to cover a given length).

Key Skills: Basic Number Concepts Meets the following National Standards:

ISTE National Educational Technology Standards for Students (NETS)

TECHNOLOGY FOUNDATION STANDARDS FOR STUDENTS

1. Basic operations and concepts
   - Students demonstrate a sound understanding of the nature and operation of technology systems.
   - Students are proficient in the use of technology.
2. Social, ethical, and human issues
   - Students practice responsible use of technology systems, information, and software.
   - Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
3. Technology productivity tools
   - Students use technology tools to enhance learning, increase productivity, and promote creativity.

PERFORMANCE INDICATORS FOR TECHNOLOGY—LITERATE STUDENTS

Prior to completion of Grade 2, students will:

1. Use input devices (e.g., mouse, keyboard, remote control) and output devices (e.g., monitor, printer) to successfully operate computers, VCRs, audiotapes, and other technologies. (1)
2. Use a variety of media and technology resources for directed and independent learning activities. (1, 3)
4. Use developmentally appropriate multimedia resources (e.g., interactive books, educational software, elementary multimedia encyclopedias) to support learning. (1)
5. Work cooperatively and collaboratively with peers, family members, and others when using technology in the classroom. (2)
7. Practice responsible use of technology systems and software. (2)
9. Use technology resources (e.g., puzzles, logical thinking programs, writing tools, digital cameras, drawing tools) for problem solving, communication, and illustration of thoughts, ideas, and stories. (3, 4, 5, 6)