

MATHEMATICS CONTENT STANDARDS KINDERGARTEN

By the end of kindergarten, students understand the consistency of small numbers, quantities and simple shapes in their everyday environment. They count, compare, describe and sort objects, and develop a sense about properties and patterns.

NUMBER SENSE STANDARDS

Numbers determine and define quantities and relationships. They are used to make comparisons, interpret information, solve problems, and make decisions. Number sense is an understanding of number relationships. Students use estimation to make good judgments about the reasonableness of results and make sense of the many ways in which numbers are used. Number sense offers rich opportunities for investigating real-life applications and developing mathematical concepts and connections through problem solving. The number system has power that is deeper than counting, collecting and computing. Through exploration, usage and reflective thought, students construct number meaning and interpret the multiple uses encountered in the real world.

As students work with each new family of numbers (whole numbers, fractions, decimals, percents, integers, real numbers) they engage in three major tasks. First, they must develop a conceptual understanding of the number family and its relationships to other sets of numbers previously studied. Then, students develop meaning for the operations of addition, subtraction, multiplication and division for each family of numbers. Finally, after building a strong conceptual foundation, students must work to acquire fluency and facility with both numbers and their operations.

The acquisition of proficiency with basic facts must be encouraged and mastered, because it allows students to work confidently as they progress in their mathematical studies. However, brain research shows that rote rehearsal may not be the best method of developing this kind of proficiency. Teachers are encouraged to use a wide variety of experiences and tasks to develop this fluency with number, while maintaining student interest and enthusiasm.

In addition, it is important for students to experience meaningful computational algorithms. Many of our standard algorithms are not consistent with the mathematical principles of place value. Students need to develop meaning during their early experiences with addition, subtraction, multiplication and division algorithms. Over time, many students will adopt the standard algorithms for convenience and efficiency. However, students using non-standard algorithms that they understand will remember and be able to use them much more effectively than students using standard algorithms that they have simply memorized. The understanding of multiplication, for example, should not be confused with fluency in using a multiplication algorithm.

Finally, while computation is a powerful part of mathematics, we need to recognize the importance of all five strands. All students must have opportunities to grow in all areas of mathematics as they continue to become proficient in computational skills.

- Students understand the relationship between numbers and quantities, i.e., that a set of objects has the same number of members in different situations, regardless of its position or arrangement.
 - **Compare two or more sets (up to 10 objects in each group), and identify which set is equal to, more than, or less than the other.**
 - **Count, recognize, represent, name, and order numbers (to 30) using objects.**
 - Count by tens to 100.
 - Know that the larger numbers describe sets with more objects in them than smaller numbers.

- Students understand and describe simple addition and subtraction situations
 - Use concrete objects to determine the answers to addition and subtraction problems (for two numbers each less than 10).
 - Know the addition facts (sums to 5) and commit them to memory.
 - **Identify coins**

- Students use estimation strategies in computation and problem solving that involve numbers that use the ones and tens places.
 - Recognize when an estimate is reasonable.

- Students explore and use a variety of strategies to compute mentally.

ALGEBRA AND FUNCTIONS STANDARDS

Algebra is the language of all mathematics and science, and a tool for solving problems. It is the language of operation, symbol manipulation, and variables. It describes and interprets relationships among quantities. Algebra is generalized arithmetic interwoven through all strands, and is closely connected to functions. A function is a relationship among quantities and can be represented using tables, graphs and algebraic symbols. Functions often represent a way of generalizing a numerical pattern. When there is a functional relationship between two quantities, the value of the first quantity determines the corresponding value of the second. The study of functions enables students to see relationships and to make predictions based on those relationships.

- Students sort and classify objects.
 - **Identify, sort, and classify objects by attribute, and identify objects that do not belong to a particular grouping (e.g., all these balls are green, those are red).**
 - **Identify, describe, and extend simple patterns involving shape, size, or color or two or more of these attributes.**

MEASUREMENT AND GEOMETRY STANDARDS

Through the study of geometry, students link mathematics to space and form in the world around them and in the abstract. In this strand, the students are exposed to and investigate one-dimensional, two-dimensional and three-dimensional space by exploring shape, area, and volume; studying lines, angles, points and surfaces; and engaging in other visual and concrete experiences.

- **Students understand that there are properties such as length, weight, capacity and time, and that comparisons can be made by using these properties.**
 - Compare the length, weight and capacity of objects by making direct comparisons or using reference objects (e.g., shorter/longer/taller, lighter/heavier, which holds more?).

- ☐ Demonstrate understanding of concepts of time (e.g., morning, afternoon, evening, day, yesterday, tomorrow, week, year) including tools that measure time (e.g., clock, calendar).
 - ☐ Name the days of the week.
 - ☐ Estimate and identify the time (to the nearest hour) of everyday events (e.g., lunch time is 12 o'clock, bed time is 8 o'clock at night).
- **Students identify common geometric objects in their environment and describe their features.**
 - ☐ Identify and describe two-dimensional and three-dimensional common geometric objects (e.g., circle, triangle, square, rectangle, cube, sphere, cone).
 - ☐ Compare familiar plane and solid objects by common attributes (e.g., position, shape, size, roundness, number of corners).

STATISTICS, DATA ANALYSIS, AND PROBABILITY STANDARDS

The study of statistics helps students learn to collect and organize information in a variety of graphs, charts, and tables to make the data easier for the students and others to understand. Students learn to interpret data and to make decisions based on their interpretations. Students learn probability, the study of chance, so that numerical data can be used to predict future events and outcomes.

- Students collect, record, and analyze information about objects and events in their environment.
 - ☐ **Pose information questions, collect data and record and analyze the results using objects, pictures and picture graphs.**
 - ☐ Discuss the information collected from graphs and reach conclusions.

MATHEMATICAL REASONING, PROBLEM SOLVING, AND COMMUNICATION STANDARDS

The study of mathematics is much more than following procedures to determine answers to math computations and word problems. The student of mathematics is learning how to think clearly while solving problems that do not necessarily have predetermined single solutions. This skill is not only essential across all academic subject areas, but extends into virtually every career and job. More often than not, this thinking clearly must be done while working with and getting along with others, sharing information, expertise, and ideas. Frequently, reasoning has to be communicated to others, formally and informally, in writing and orally. Mathematical Reasoning is the study of thinking clearly.

- Students make decisions about how to set up a problem.
 - ☐ Decide the approach, materials and strategies to use.
- **Students use strategies, skills and concepts in finding solutions.**
 - ☐ Predict outcomes and make reasonable estimates.
 - ☐ Use tools and strategies such as manipulatives or sketches to model problems.
 - ☐ Make precise calculations and check the validity of the results from the context of the problem.
- **Students communicate results by explaining their process and solution.**
 - ☐ Explain the reasoning used with concrete objects and pictorial representations.
- Students determine a solution is complete and make connections to similar problems.
 - ☐ Evaluate the reasonableness of the solution in the context of the original situation.
 - ☐ Discuss similarities and differences with other problems.

