

MATHEMATICS ESSENTIAL STANDARDS GRADE 3

By the end of third grade, students deepen their understanding of place value, money, and their understanding of and skill with addition, subtraction, multiplication and division of whole numbers. They estimate, measure and describe objects in space. They use patterns and mental math strategies to help solve problems. They represent number relationships and conduct simple probability experiments.

NUMBER SENSE

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 and use place value of whole numbers up to 10,000.**
 - Count, read, and write numbers to 10,000.
 - Compare and order whole numbers to 10,000.
 - Identify the place value for each digit in numbers to 10,000.
 - **Round off numbers to 10,000 to the nearest ten, hundred and thousand.**
 - Use expanded notation to represent numbers (e.g., $3,206 = 3,000 + 200 + 6$).
 - Identify the relative position of a decimal to the 10ths place on the number line.

- Students calculate and solve problems involving addition, subtraction, multiplication and division.
 - **Find the sum or difference of two whole numbers between 0 and 10,000 with regrouping.**
 - Find the sum of three or more whole numbers containing three or more digits
 - **Memorize to automaticity the multiplication table for numbers between 1 and 12.**
 - **Use the inverse relationship of multiplication and division to compute and check results.**
 - **Introduce a variety of strategies for solving simple problems involving multiplication and division using one-digit multipliers and divisors.**
 - Solve division problems in which a multi-digit number is evenly divided by a one-digit number using concrete materials and/or other strategies.
 - **Understand the special properties of 0 and 1 in multiplication and division.**
 - Determine the unit cost when given the total cost and number of units.
 - Solve problems which combine two or more of the skills above.

- **Students understand the relationship between and solve problems using whole numbers, simple fractions, and decimals.**
 - Compare fractions represented by drawings or concrete materials to show equivalency, and to add and subtract simple fractions in context
 - Add and subtract simple fractions in context.
 - Solve problems involving addition, subtraction, multiplication and division of money amounts in decimal notation, and multiply and divide money amounts in decimal notation using whole number multipliers and divisors.
 - Know and understand that fractions and decimals are two different representations of the same concept

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

ALGEBRA AND FUNCTIONS

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 select appropriate symbols, operations and properties to represent, describe, simplify and solve simple number relationships.
 - **Represent relationships of quantities in the form of mathematical expressions, equations, or inequalities.**
 - Solve problems involving numeric equations or inequalities.
 - Select appropriate operational and relational symbols to make an expression true.
 - Express simple unit conversions in symbolic form.
 - Recognize and use the commutative and associative properties of multiplication
- Students represent simple functional relationships.
 - **Solve simple problems involving a functional relationship between two quantities.**
 - Extend and recognize a linear pattern by its rules.

MEASUREMENT AND GEOMETRY

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 choose and use appropriate units and measurement tools to quantify the properties of objects.
 - **Choose appropriate units (metric and U.S. customary) and tools, and estimate and measure length (to the nearest eighth of an inch and to the nearest mm), liquid volume and weight/mass.**
 - **Estimate or determine the area and volume of solid figures by covering them with squares or by counting the number of cubes that would fill them.**
 - **Find the perimeter of a polygon with integer sides.**
 - Carry out simple unit conversions within a system of measurement (e.g., centimeters and meters, hours and minutes).
- **Students describe and compare the attributes of plane and solid geometric figures and use their understanding to show relationships and solve problems.**
 - Identify, describe and classify polygons (including pentagons, hexagons and octagons).
 - Identify attributes of triangles (e.g., two equal sides for the isosceles triangle, three equal sides for the equilateral triangle, right angle for the right triangle).
 - Identify attributes of quadrilaterals (e.g., parallel sides for the parallelogram, right angles for the rectangle, equal sides and right angles for the square).
 - Identify right angles in geometric figures or in appropriate objects and determine whether other angles are greater or less than a right angle.
 - Identify, describe, classify, and compare common three-dimensional geometric objects (e.g., cube, rectangular solid, sphere, prism, pyramid, cone, cylinder).
 - Identify the common solid objects that are the component parts needed to make a more complex solid object.

STATISTICS, DATA ANALYSIS, AND PROBABILITY

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 conduct simple probability experiments by determining the number of possible outcomes, making simple predictions and collecting and recording data.**
 - Identify whether common events are certain, likely, unlikely, or improbable.
 - Record the possible outcomes for a simple event (e.g., tossing a coin) and systematically keep track of the outcomes when the event is repeated many times.
 - Summarize and display the results of probability experiments in a clear and organized way.
 - Use the results of probability experiments to predict future events. (e.g., use a line plot to predict the temperature forecast for the next day).

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 don't 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 solve problems using a 4-step process:

- **Students make decisions about how to approach problems.**
 - Clarify the information given in the problem and the question to be solved.
 - Identify missing information.
 - Look for connections and think ahead:
 - “Have I done something like this before?”
 - “What do I think I’m going to have to do?”
 - “What type of answer am I expecting?”
 - “I have an idea about the mathematical steps I need to take”
 - “How am I going to overcome the obstacles?”
- **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.
 - Create and solve new problems similar to the original by either changing the story while keeping the numbers the same, or by changing the numbers while keeping the story the same.