

The process standards of **problem solving, reasoning and proof, connections communication, and representation** are interwoven and independent with the content standards and are necessary for the comprehensive understanding of mathematics.

Strand: **M1 Numbers and Operations**

Pre-Kindergarten through Grade 12 instructional programs should enable all students to:

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

In Grade 2, all students should:

- Standards:
- M1a:** use place values to represent whole numbers through a hundred using numerals, words, and physical models;
  - M1b:** use words, numerals, and physical models to show an understanding of fractions and their relationship to a whole;
  - M1c:** identify numbers as even or odd whole numbers;
  - M1d:** show equivalent representations for whole numbers by using addition and subtraction facts;
  - M1e:** explain multiplication as repeated addition and equal groupings of objects and division as repeated subtraction and equal sharing;
  - M1f:** explain and perform addition and subtraction for two-digit numbers;
  - M1g:** use various estimating techniques and rounding of whole numbers;
  - M1h:** solve a variety of non-routine multi-step problems involving addition and subtraction.

Essential To Know: Students estimate, calculate, and develop strategies for solving addition and subtraction problems based on number relationships.

Strand: **M2 Algebra**

Pre-Kindergarten through Grade 12 instructional programs should enable all students to:

- understand patterns, relations, and functions;
- represent and analyze mathematical situations and structures using algebraic symbols;
- use mathematical models to represent and understand quantitative relationships;
- analyze change in various contexts.

In Grade 2, all students should:

- Standards:
- M2a:** create and describe patterns with multiple attributes;
  - M2b:** use patterns to make generalizations and predictions by determining the rule and/or identifying missing elements in a pattern and justifying their inclusion;
  - M2c:** use symbols to represent unknown quantities and identify values for symbols;
  - M2d:** represent equivalence and extend the concept to situations involving symbols, i.e.,  $\square + \Delta = 10$ ;
  - M2e:** solve open sentences by representing an expression in more than one way using the associative property of addition;

- M2f:** model and describe a problem situation using symbols and operations;
- M2g:** describe qualitative changes;
- M2h:** describe quantitative changes, especially those involving addition and subtraction.

Essential To Know: Students generalize a pattern to determine a rule.  
Students represent information using words, numbers, and symbols.

Strand: **M3 Geometry**

Pre-Kindergarten through Grade 12 instructional programs should enable all students 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 and other representational systems;
- apply transformations and use symmetry to analyze mathematical situations;
- uses visualization, spatial reasoning, and geometric modeling to solve problems.

In Grade 2, all students should:

- Standards:
- M3a:** predict the results of putting together and taking apart two- and three-dimensional shapes.
  - M3b:** find and name locations using simple relationships and in coordinate systems, i.e., grids, maps, etc.;
  - M3c:** use models to demonstrate slides, flips, and turns of shapes.
  - M3d:** recognize and create shapes with symmetry;
  - M3e:** predict what new shapes will be formed by combining or cutting apart existing shapes.

Essential To Know: Students identify and describe a single transformation of a simple shape.

Strand: **M4 Measurement**

Pre-Kindergarten through Grade 12 instructional programs should enable all students to:

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

In Grade 2, all students should:

- Standards:
- M4a:** tell time to the nearest one-minute interval on a digital clock and the nearest five-minute interval on an analog clock;
  - M4b:** describe and compare the relationships among units of measure, e.g., pints and quarts, hours and half hours, etc.;
  - M4c:** select the appropriate unit of measure for the attribute being measured, i.e., area, capacity, length, etc.;
  - M4d:** make and test predictions about measurements, using different units to measure the same length or volume;
  - M4e:** use repetition of a single unit to measure something larger than the unit;
  - M4f:** estimate and measure the length and weight of common objects to the nearest unit.

Essential To Know: Students make and use estimates of measurement.  
Students select and correctly use the appropriate measurement tool and unit.

Strand: **M5 Data Analysis and Probability**

Pre-Kindergarten through Grade 12 instructional programs should enable all students 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 inferences and predictions that are based on data;
- understand and apply basic concepts of probability.

In Grade 2, all students should:

- Standards:
- M5a:** develop categories for sorting a collection of materials;
  - M5b:** collect, organize, represent and interpret data using pictographs, bar graphs, and tables;
  - M5c:** generate questions, collect, and organize data to address the questions and draw conclusions;
  - M5d:** read and interpret graphs and tables to identify main ideas, draw conclusions, and make predictions;
  - M5e:** describe events that are more likely, least likely, or equally likely to happen;
  - M5f:** use physical models and pictures to represent possible arrangements of two or three objects;
  - M5g:** identify events that can have more than one outcome, e.g., predicting weather, tossing coins, etc.

Essential To Know: Students read, interpret and create graphs and tables.

Strand: **M6 Problem Solving**

- Standard:
- M6a:** 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.

Strand: **M7 Reasoning and Proof**

- Standard:
- M7a:** Instructional programs from Pre-Kindergarten through Grade 12 should enable all students to:
    - recognize reasoning and proof as fundamental aspects of mathematics;
    - make and investigate mathematical conjectures;
    - develop and evaluate mathematical arguments and proofs;
    - select and use various types of reasoning and methods of proof.

Strand: **M8 Communication**

- Standard:
- M8a:** Instructional programs from Pre-Kindergarten through Grade 12 should enable all students to:
    - organize and consolidate their mathematical thinking through communication;
    - communicate their mathematical thinking coherently and clearly to peers, teachers, and others;
    - analyze and evaluate the mathematical thinking and strategies of others;

- use the language of mathematics to express mathematical ideas precisely.

Strand:

**M9 Connections**

Standard:

**M9a:** 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.

Strand

**M10 Representation**

Standard:

**M10a:** Instructional programs from Pre-Kindergarten through Grade 12 should enable all students to:

- create and use representations to organize, record, and communicate mathematical ideas;
- select, apply, and translate among mathematical representations to solve problems;
- use representations to model and interpret physical, social, and mathematical phenomena.