

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 Pre-Kindergarten, all students should:

- Standards:
- M1a:** recognize and differentiate written numbers from other symbols;
  - M1b:** count in a sequence forward from one;
  - M1c:** identify and name numerals from 0 to 9;
  - M1d:** construct sets with more, fewer, or the same number of objects than a given set;
  - M1e:** compare the number of things in two sets using comparative language, i.e., more, fewer, same number.

Essential To Know: Students use numbers to represent quantity.

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 Pre-Kindergarten, all students should:

- Standards:
- M2a:** sort, classify, and order objects by one attribute;
  - M2b:** identify, copy, extend, and create simple patterns or patterns of sounds, shapes, and motions;
  - M2c:** recognize simple patterns in sets of objects;
  - M2d:** sort and compare groups of objects having equal or different numbers of objects, i.e. more than, less than, or equal;
  - M2e:** recognize and identify a change in common objects, sounds, or movements.

Essential To Know: Students sort objects by an attribute.

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;

- use visualization, spatial reasoning, and geometric modeling to solve problems.

In Pre-Kindergarten, all students should:

Standards:                   **M3a:** identify, name, describe, and create common two-dimensional shapes;  
                                  **M3b:** identify, name, and describe three-dimensional shapes;  
                                  **M3c:** describe and demonstrate location and physical proximity, i.e., above, below, etc.

Essential To Know:       Students name and describe two-dimensional shapes.

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 Pre-Kindergarten, all students should:

Standards:                   **M4a:** describe everyday events in logical order;  
                                  **M4b:** recognize the passage of time and identify devices that measure time, i.e., clocks, timers, etc.;  
                                  **M4c:** describe people and objects using measurement terms, i.e., taller than, biggest, longest, etc.;  
                                  **M4d:** identify differences in temperature by using descriptors, i.e., warm, cold, hot, etc.;  
                                  **M4e:** recognize and name measurable attributes of objects, i.e., long, short, and heavy, etc.;  
                                  **M4f:** explore nonstandard measurements to measure attributes of length, height and weight, e.g., a paper clip as a unit measure of length;  
                                  **M4g:** order a like set of objects according to a measurable attribute, i.e. length, thickness of crayons, etc.

Essential To Know:       Students identify measurable attributes and use these to make comparisons among objects, events, etc.

Strand                       **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 Pre-Kindergarten, all students should:

Standards:                   **M5a:** sort and organize concrete data by similarities and differences  
                                  **M5b:** answer and ask questions using data displayed with objects, pictographs, and/or tables.

Essential To Know:       Students recognize data by sorting objects according to one attribute.

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.