

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 3, all students should:

- Standards:
- M1a:** use place values to read, model, and interpret whole numbers through thousands and decimals through hundredths; explain the values of the digits;
  - M1b:** explain the relationship of commonly used fractions to their equivalent forms, and explain their relationship to a whole;
  - M1c:** identify and describe numbers according to their characteristics such as even, odd, multiples, and/or factors;
  - M1d:** use mathematical language and symbols to compare and order numbers and objects;
  - M1e:** explain and use addition, subtraction, multiplication, and division to show equivalent whole numbers;
  - M1f:** explain the relationship between multiplication and division as inverse operations.
  - M1g:** use properties of operations on whole numbers, i.e., commutativity and associativity;
  - M1h:** explain and perform addition and subtraction for two- and three-digit numbers and multiplication of one- and two-digit numbers;
  - M1i:** model and explain multiplication and division using appropriate symbols and strategies;
  - M1j:** develop and use strategies to estimate the results of whole number computations and judge the reasonableness of the computed results;
  - M1k:** solve non-routine multi-step problems using appropriate tools and strategies involving addition, subtraction, and multiplication.

Essential To Know: Students select, explain the meaning of, and use a variety of models to demonstrate multiplication and division of whole numbers.  
Students explain and represent with models that fractions are parts of a whole or parts of set.

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 3, all students should:

- Standards:
- M2a:** identify, describe, and extend the rules of multiplicative and growing patterns;
  - M2b:** make predictions, identify relationships, and solve problems by using the concept of patterns;
  - M2c:** express mathematical relationships as equations or inequalities with appropriate symbols;
  - M2d:** solve open sentences by representing an expression in more than one way using the commutative and associative properties for multiplication;
  - M2e:** organize and order data in labeled tables to discover patterns and rules;
  - M2f:** represent mathematical situations to solve problems using equations or inequalities;
  - M2g:** recognize patterns and make predictions based on collected data;
  - M2h:** describe the difference between qualitative and quantitative changes.

Essential To Know: Students describe, extend, and make generalizations about patterns involving multiplicative and growing patterns.  
Students use algebraic properties to identify numeric relationships.

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 3, all students should:

- Standards:
- M3a:** describe properties of two- and three-dimensional shapes using mathematical terminology;
  - M3b:** identify and describe the relative size of angles with right angles as a reference;
  - M3c:** use coordinate systems to specify locations and describe paths;
  - M3d:** verify symmetry by drawing lines of symmetry in shapes and objects;
  - M3e:** build and draw geometric shapes.

Essential To Know: Students identify and compare the structure of two- and three- 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 Grade 3, all students should:

- Standards:
- M4a:** explain the need for using standard units when making measurements;
  - M4b:** explore standard units within the customary and metric systems and describe the relationship of units within each system;

- M4c:** use accurate vocabulary to describe measurement, i.e., meters for length, degrees for temperature, minutes to hours, etc.;
- M4d:** use counting techniques to explain how to find the area and perimeter of regular shapes;
- M4e:** estimate measurements using a personal reference;
- M4f:** uses appropriate measurement tools and techniques to construct a figure;
- M4g:** select and apply appropriate standard units and tools to compare the measurable attributes of a variety of objects;
- M4h:** develop strategies for estimating the perimeter of irregular shapes;
- M4i:** read thermometers accurately;
- M4j:** use models to estimate perimeter and area;
- M4k:** calculate the area and perimeter of regular shapes;
- M4l:** tell time to the nearest minute and measure elapsed time using a clock or calendar.

Essential to Know: Students estimate and find area and perimeter using diagrams, models, grids or by standard-unit measuring.

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 3, all students should:

- Standards:
- M5a:** develop and implement a plan to collect and organize data to address a given question;
  - M5b:** translate information from one data representation to another, i.e., graph to table;
  - M5c:** support a conclusion or a prediction with evidence from data;
  - M5d:** organize and graphically display data using a variety of categories and intervals;
  - M5e:** describe the characteristics of graphically represented data, i.e., identify the mode;
  - M5f:** examine graphs and tables that display the same set of data to identify what each representation contributes to the interpretation of data and conclusions drawn;
  - M5g:** select a question for study, predict possible outcomes, conduct simple experiments, and compare results to predictions.

Essential To Know: Students translate one form of data representation to another and evaluate the different aspects of information offered by each form.

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.