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 6, all students should:

Standards:

M1a: decompose and recompose whole numbers using factors and exponents;

M1b: find and use prime factorization of composite numbers;

M1c: use simple expressions involving integers to represent and solve problems;

M1d: compare and order positive and negative decimals and fractions and find their locations on a number line;

M1e: interpret and use ratios in different contexts to show relative sizes of two quantities, using appropriate notations, i.e., a/b, a to b, a:b;

M1f: use order of operations, including the use of exponents, decimals, rational numbers, to simplify numerical expressions;

M1g: explain the meaning and effects of arithmetic operations with positive numbers to include fractions, decimals, and percents;

M1h: perform fraction and decimal computations and justify the solutions;

M1i: estimate reasonableness of solutions to problems involving fractions and decimals;

M1j: select and use appropriate methods and tools for computing with fractions and decimals.

Essential To Know: Students select and use a combination of appropriate arithmetic operations to solve problems that use rational numbers.
Students apply and explain number theory concepts to solve problems.

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 6, all students should:

Standards:

M2a: recognize and generate equivalent forms of algebraic expressions.

M2b: explain how the commutative, associative and distributive properties generate equivalent forms;

M2c: solve simple linear equations and inequalities;

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M2d: use symbolic algebra to represent situations, i.e., relationships found in geometry;

M2e: evaluate simple expressions by replacing variables with given values, and use formulas in problem-solving situations;

M2f: create and interpret tables and graphs to draw conclusions and make predictions;

M2g: create and compare representations that display constant and varying rates of change.

Essential to Know: Students should represent, analyze, and generalize patterns and relations with tables, graphs, and words.

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 Grade 6, all students should:

Standards:

M3a: describe and classify two- and three-dimensional shapes using their defining properties;

M3b: identify and plot points on a coordinate plane in all quadrants;

M3c: describe sizes, positions, orientations of shapes, after rotations, reflections, and translations;

M3d: recognize, explain, and perform up to two transformations on two-dimensional shapes;

M3e: draw and identify two-dimensional geometric figures with specific side length or angle measure;

M3f: describe and use properties of similarity and congruency with two-dimensional figures to solve problems.

Essential To Know: Students predict, describe, and perform transformations on two-dimensional shapes.
Students identify relationships among points, lines, and planes.

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 6, all students should:

Standards:

M4a: explain the relationship between area and perimeter of a rectangle when one attribute is changed and the other remains constant;

M4b: investigate the precision of measurement required for tasks as well as the capability/accuracy of the instruments;

M4c: develop and use formulas to find the perimeters and areas of triangles and quadrilaterals and to find the area and circumference of circles;

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M4e: find the perimeter and area of irregular polygons;

M4f: identify rate as a form of measurement based on time, i.e., mph, rpm, cc/min.

Essential to Know: Students explain the relationships between perimeter and area and circumference and area of a circle.
Students use formulas to find perimeter, circumference and area.
Students identify rate as a form of measurement.

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 6, all students should:

Standards:

M5a: read and use graphical representations to make predictions and/or draw conclusions;

M5b: formulate questions, design a study, and evaluate the data to reach a conclusion about characteristics shared by two populations or different characteristics that exist within a population;

M5c: identify the measures of central tendency and spread of a data set to describe what it indicates about the data set;

M5d: explain the effects of scale and/or interval changes in graphs that lead to misunderstandings;

M5e: select, construct, interpret, and justify the appropriate graphical representation of data;

M5f: use 0, 1, and ratios between 0 and 1 to represent the probability of outcomes for an event;

M5g: describe and model all possible outcomes of simple events using tree diagrams, organized lists, etc.;

M5h: explain why the sum of the probabilities of all possible outcomes of a particular event is one.

Essential to Know: Students select, create, interpret, and justify the appropriate graphical representation of data.
Students understand and apply the fundamental concepts of probability.

Strand: **M6 Problem Solving**

Standard:

M6a: Pre-Kindergarten through Grade 12 instructional programs 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.

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Strand: **M7 Reasoning and Proof**

Standard: **M7a:** Pre-Kindergarten through Grade 12 instructional programs 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:** Pre-Kindergarten through Grade 12 instructional programs 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:** Pre-Kindergarten through Grade 12 instructional programs 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:** Pre-Kindergarten through Grade 12 instructional programs 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.

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