

Mathematics Content Strands

M1 Numbers and Operations

Number pervades all areas of mathematics. The other four Content Standards as well as all five Process Standards are grounded in understanding number. Central to this standard is the development of number sense, which allows students to naturally combine or decompose numbers, solve problems using the relationships among operations and knowledge of the base-ten system, and make a reasonable estimate for the answer to a problem.

Computational fluency – having and using efficient and accurate methods for computing – is essential. Students should be able to perform computations in different ways, including mental calculations, estimation, and paper-and-pencil calculations using mathematically sound algorithms. All students should use calculators at appropriate times, setting the calculator aside when the instructional focus is on developing computational algorithms.

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.

M2 Algebra

The ideas of algebra are a major component of the school mathematics curriculum and help to unify it. Mathematical investigations and discussions of arithmetic and its properties frequently include aspects of algebraic reasoning. Such experiences present rich contexts and opportunities for enhancing mathematical understanding and are an important precursor to the more formalized study of algebra in the middle and secondary grades. A strong foundation in algebra should be in place by the end of the eighth grade, and all high school students should pursue ambitious goals in 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.

M3 Geometry

Geometry and spatial sense are fundamental components of mathematics learning. They offer ways to interpret and reflect on our physical environment and can serve as tools for the study of other topics in mathematics and science. Geometry is a natural area of mathematics for the development of students' reasoning and justification skills that build across the grades.

Geometry should be learned using concrete models, drawings, and dynamic software. As the study of the relationships among shapes and their properties becomes more abstract, students should come to understand the role of definitions and theorems and be able to construct their own proofs.

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.

M4 Measurement

The study of measurement is crucial in the K-12 mathematics curriculum because of its practicality and pervasiveness in many aspects of everyday life. Measurement is possibly the area of mathematics that is most important when considering everyday applications of mathematics, and highlights connections between mathematics and areas outside of the school curriculum such as social studies, science, art, and physical education. The study of measurement helps students establish connections within mathematics and provides an opportunity for learning about and unifying ideas concerning number and operations, algebra, geometry, statistics, probability, and data analysis.

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.

Data Analysis and Probability

To analyze data and reason statistically are essential to be an informed citizen, employee, and consumer. The amount of statistical information available to help make decisions in business, politics, research, and everyday life is staggering. Through experiences with the collection and analysis of data, students can learn to make sense of and interpret information and allow them to make appropriate arguments and recognize inappropriate arguments as well.

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.

Mathematics Process Standards

The DoDEA PK-12 mathematics program includes the process standards: problem solving, reasoning and proof, communication, connections, and representation. Instruction in mathematics must focus on process standards in conjunction with all PK-12 content standards throughout the grade levels.

Problem Solving	Reasoning and Proof	Communication	Connections	Representation
<p>Instructional programs from Pre-Kindergarten through Grade 12 should enable all students to:</p> <ul style="list-style-type: none"> • 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. 	<p>Instructional programs from Pre-Kindergarten through Grade 12 should enable all students to:</p> <ul style="list-style-type: none"> • 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. 	<p>Instructional programs from Pre-Kindergarten through Grade 12 should enable all students to:</p> <ul style="list-style-type: none"> • 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. 	<p>Instructional programs from Pre-Kindergarten through Grade 12 should enable all students to:</p> <ul style="list-style-type: none"> • 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. 	<p>Instructional programs from Pre-Kindergarten through Grade 12 should enable all students to:</p> <ul style="list-style-type: none"> • 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.

DoDEA Mathematics Standards: Kindergarten

Strand: **M1** **Numbers and Operations**

Standards: In Kindergarten, all students should:

K.M.1a: identify, write, and name numbers up to 20;

Example: Using dice, child identifies number rolled.

K.M.1b: using one-to-one correspondence, count the number of objects in sets up to 20;

Example: Count a group of 12 Unifix cubes. Identify that 12 is the number for the set.

K.M.1c: position and identify the order of objects using ordinal numbers up to 10;

Example: Line up 6 children. Identify the ordinal position of each child.

K.M.1d: use objects and drawings to model, represent, and solve related addition and subtraction problems;

Example: While a story is read, use manipulatives to model the story. For example, There are 7 apples on tree. I pick one and eat it. How many apples left on the tree?

K.M.1e: estimate the number of objects in groups up to 20 and verify the results;

Example: Have each child estimate the number of seeds in a slice of watermelon by inspection. Remove and count the seeds and compare the estimate to the count.

Strand: **M2** **Algebra**

Standards: In Kindergarten, all students should:

K.M.2a: describe in their own words how objects are alike and different using one or two attributes;

Example: Describe as many attributes as you can for an object in the classroom. Choose one of the attributes and find other objects in the room that have that attribute.

- K.M.2b:** identify, sort, and classify a set of objects by color, shape, size, number, and other attributes;
Example: Find the squares in a collection of shapes. Sort these squares. Explain each grouping.
- K.M.2c:** identify, reproduce, describe, extend, and create color, rhythmic, shape, number, and letter repeating patterns with simple attributes, e.g., ABABAB, ABCABCABC;
Example: Predict and identify word patterns in familiar stories and rhymes, e.g., Bill Martin’s *Brown Bear, Brown Bear, What Do You See?*.
- K.M.2d:** model a problem situation using actual objects;
Example: Ask, “How many cubes can you grab with two hands? Now reach into the bag and grab as many as you can.” Record the number of cubes.

**Strand:
Standards:**

M3

Geometry

In Kindergarten, all students should:

- K.M.3a:** name, describe, sort, compare, and draw two-dimensional shapes;
Example: Ask children to find two-dimensional shapes in their environment, e.g., go on a “shape walk” indoors or outside to find examples.
- K.M.3b:** identify and compare three-dimensional objects;
Example: Have children bring in examples of three-dimensional objects from home.
- K.M.3c:** describe and demonstrate positions of objects and compare their relative locations and distances;
Example: Have children identify the positions of two objects, e.g., over, behind, on top; and relative distance between the objects, e.g., near, far, beside.

Strand:
Standards:

M4 Measurement

In Kindergarten, all students should:

K.M.4a: compare and order objects according to length, capacity, weight, and temperature by using descriptors, e.g., longer, taller, and heavier;

Example: Hold two books side by side and see which is shorter. Hold one in each hand to see which is heavier.

K.M.4b: order events based on time, e.g., days of the week;

Example: Today is Monday. What do we do on Monday?

K.M.4c: identify different ways to measure attributes of objects;

Example: Describe two ways a pair of rectangles are different using non-standard measurement.

K.M.4d: use non-standard measurement tools to estimate and verify results;

Example: Estimate the number of pencils that will fit across the length of the desk, using the pencil to verify results.

Strand:
Standards:

M5 Data Analysis and Probability

In Kindergarten, all students should:

K.M.5a: gather, sort, and interpret data in response to questions posed, e.g., class surveys or teacher/student questions;

Example: Determine how many students have a pet and which category of pet is the most common.

K.M.5b: organize and represent data using concrete objects, pictures, and graphs;

Example: Use connecting cubes to represent the relationship between the number of girls and number of boys in the class.

K.M.5c: ask and answer questions and make predictions based on data collected;

Example: Record the lunch count for each day of the week. Compare the results and make predictions for Monday's lunch count.