

## **K – 12 MATHEMATICS UNIFYING STANDARDS**

- 1.0 Number Sense and Operations** – Students understand ways of representing numbers, relationships among numbers, and number systems. They understand the meaning of and relationships between operations and strategies, and they can estimate appropriately.
- 2.0 Patterns, Functions, and Algebra** – Students know and understand various types of patterns and functional relationships. They use symbolic forms and models to represent and analyze mathematical structures in both real and abstract contexts.
- 3.0 Measurement** – Students know and understand attributes, units and systems of measurement. They apply a variety of techniques, tools, and formulas for determining measurements.
- 4.0 Geometry and Spatial Sense** – Students know how to analyze characteristics and properties of two- and three- dimensional objects. They select and use different representational systems, including coordinate and graph theory. They understand the usefulness of transformations and symmetry in analyzing mathematical situations. They know how to visualize and to use spatial reasoning to solve problems that cross disciplines.
- 5.0 Data Analysis, Statistics, and Probability** – Students know how to pose questions and collect, organize, represent and interpret data in order to answer those questions. They use methods of exploratory data analysis to develop and evaluate inferences, predictions, and arguments that are based on data. They understand and know how to apply the notions of chance and probability.
- 6.0 Problem Solving** – Students know that they learn basic skills and concepts in order to use them to solve problems in and out of school. They solve routine and complex problems by drawing from a variety of strategies, including technology, while demonstrating an attitude of persistence and reflection in their approaches.
- 7.0 Processes: Reasoning, Communication, and Connections** – Students use reasoning to develop, analyze, draw conclusions, and validate conjectures and arguments. As they reason, they recognize and understand multiple representations of the same concept. They see the interconnections among math ideas, as well as in other disciplines. They know how to communicate their math thinking clearly and coherently to others, orally, graphically, and in writing, using precise language and symbols.

## MATH STANDARDS LEVEL 5

**1.0 Number Sense** – Students understand ways of representing numbers, relationships among numbers, and number systems. They understand the meaning of and relationships between operations and strategies, and they can estimate appropriately.

### Focus Goals

- 1.1 Compute with very large and very small numbers, and demonstrate the relative magnitudes of numbers
- 1.2 Calculate and solve problems involving addition, subtraction, and simple multiplication and division of fractions
- 1.3 Calculate and solve problems involving addition subtraction, and simple multiplication and division of decimals
- 1.4 Use concepts of positive and negative numbers (integers)
- 1.5 Know how to factor whole numbers (c)

**2.0 Patterns, Functions and Algebra** – Students know and understand various types of patterns and functional relationships. They use symbolic forms and models to represent and analyze mathematical structures in both real and abstract contexts.

### Focus Goals

- 2.1 Use variables in simple expressions, compute the value of the expression for specific values of the variable, and plot and interpret the results
- 2.2 Understand the properties of numbers and their operations (c/p)

**3.0 Measurement** – Students know and understand attributes, units and systems of measurement. They apply a variety of techniques, tools and formulas for determining measurements.

### Focus Goals

- 3.1 Understand and compute the volumes and areas of simple objects
- 3.2 Select and use appropriate measurement tools to estimate, quantify properties and measure objects (p/c)

**4.0 Geometry and Spatial Sense** – Students know how to analyze characteristics and properties of two- and three-dimensional objects. They select and use different representational systems, including coordinate and graph theory. They understand the usefulness of transformations and symmetry in analyzing mathematical situations. They know how to visualize and to use spatial reasoning to solve problems that cross disciplines.

### Focus Goals

- 4.1 Identify, describe, draw and classify properties of, and relationships between, plane and solid geometric figures
- 4.2 Use spatial organization to solve problems (p)

**5.0 Statistics, Data Analysis, and Probability** – Students know how to pose questions and collect, organize, represent and interpret data in order to answer those questions. They use methods of exploratory data analysis to develop and evaluate inferences, predictions, and arguments that are based on data. They understand and know how to apply notions of chance and probability.

### Focus Goals

- 5.1 Display, analyze, compare, and interpret different data sets, including data sets that are not the same size
- 5.2 Predict, perform and record results of simple probability experiments (p)

**6.0 Problem Solving** - Students know that they learn basic skills and concepts in order to use them to solve problems in and out of school. They solve routine and complex problems by drawing from a variety of strategies, including technology, and demonstrate an attitude of persistence and reflection in their approaches.

Focus Goals

- 6.1 Identify problems (p) and make decisions about how to approach (p) the problems
- 6.2 Apply a variety of strategies

**7.0 Math Process: Reasoning, Communication, and Connections** – Students use reasoning to develop, analyze, draw conclusions, and validate conjectures and arguments. As they reason, they recognize and understand that there are multiple representations of the same concept. They see the interconnections among math ideas, as well as in other disciplines. They know how to communicate their math thinking clearly and coherently to others, orally, graphically, and in writing, using precise language and symbols.

Focus Goals

- 7.1 Use math reasoning to develop, analyze, validate and justify thinking and arguments (p)
- 7.2 Communicate math thinking orally, graphically and in writing
- 7.3 Understand multiple representations of the same concept and the interconnections among topics and their applications (p)
- 7.4 Make and apply generalizations (p)



**2.0 Patterns, Functions, and Algebra** – Students know and understand various types of patterns and functional relationships. They use symbolic forms and models to represent and analyze mathematical structures in both real and abstract contexts.

**2.1 Use variables in simple expressions, compute the value of the expression for specific values of the variable, and plot and interpret the results.**

- θ Use information taken from a graph or equation to answer questions about a problem situation. (c/p/em)
- θ Use a letter to represent an unknown number (c/em)
- θ Write and evaluate simple algebraic expressions in one variable by substitution. (c)
- θ Identify and graph ordered pairs in the four quadrants of the coordinate plane (c)
- θ Solve problems involving linear functions with integer values; write the equation and graph the resulting ordered pairs of integers on a grid (c)
- θ Relate knowledge of patterns to number sequences, verbalize the rule, and extend the sequence (p)

**2.2 Understand the properties of numbers and their operations (c/p):**

- θ Apply the distributive property in equations and expressions with variables(c)
- θ Apply the commutative property  $(2+3) + 4 = (3+2) + 4$  (p)
- θ Apply the associative property  $(2+3) + 4 = 2 + (3+4)$  (p)
- θ Apply the concept of inverse operations (p)

**3.0 Measurement** – Students know and understand attributes, units and systems of measurement. They apply a variety of techniques, tools and formulas for determining measurements.

**3.1 Understand and compute the volumes and areas of simple objects.**

- θ Derive and use the formula for the area of triangles and of parallelograms by comparing it with the area of rectangles (i.e., two of the same triangles make a rectangle with twice the area; a parallelogram is compared to a rectangle with the same area found by cutting and pasting a right triangle) (c)
- θ Construct a cube and a rectangular box from two-dimensional patterns and use this to compute the surface area for these objects (c)
- θ Understand the concept of volume and use the appropriate units in common measuring systems (cubic centimeters, cubic meter, cubic inches cubic yard) to compute the volume of rectangular solids (c)
- θ Differentiate between, and use appropriate units of measure for, two and three-dimensional objects—find perimeter, area and volume (c)
- θ Use formulas to find the area of rectangles, parallelograms and triangles and volume of a prism. (em)\*

**3.2 Select and use appropriate measurement tools to estimate, quantify properties and measure objects (p/c).**

- θ Use a clock, ruler, meter stick, protractor, thermometer, scales and gauges (p)
- θ Use metric units appropriately: meter, centimeter, gram, liter, millimeter, milliliter, etc. (c)
- θ Use customary units appropriately: yard, foot, inches, pounds, ounces, gallons, quarts, pints, cups, etc (p)

**4.0 Geometry and Spatial Sense** – Students know how to analyze characteristics and properties of two- and three-dimensional objects. They select and use different representational systems, including coordinate and graph theory. They understand the usefulness of transformations and symmetry in analyzing mathematical situations. They know how to visualize and to use spatial reasoning to solve problems that cross disciplines.

**4.1 Identify, describe, draw and classify properties of, and relationships between, plane and solid geometric figures.**

- θ Understand and use basic geometric terminology and concepts: points, lines, segments, rays, angles, vertices, perpendicular, parallel, congruence, similarity, area, perimeter, volume, regular polygons, symmetry (p)
- θ Understand the characteristics of quadrilaterals; square, rectangle, parallelogram, rhombus, trapezoid (p)
- θ Understand the characteristics of triangles: equilateral, isosceles, and scalene, right, obtuse, and acute (p/cm)
- θ Understand the characteristics of circles: radius, circumference, diameter (p), degrees (c/em)?

p=PUSD c=California s=SAT-9 \*=inclusion by committee

- θ Measure, identify, and draw angles, perpendicular and parallel lines, rectangles and triangles, using appropriate tools (straight edge, ruler, compass, protractor and drawing software) (p/c/em)
- θ Know that the sum of the angles of any triangle is  $180^\circ$  and the sum of the angles of any quadrilateral is  $360^\circ$  and apply this information to solve problems (c)
- θ Visualize and draw two-dimensional views of three-dimensional objects made from rectangular solids (c)

#### 4.2 Use spatial organization to solve problems. (p)

- θ Use geometric representations (e.g., area, perimeter, volume) or makes a model to solve problems
- θ Understand spatial dimension related to linear, square, and cubic units? (p)
- θ Investigate and predict results of combining subdividing, and changing shapes e.g., pattern blocks, paper folding, dissecting, tiling, rearranging parts of solids

**5.0 Data Analysis, Statistics and Probability** – Students know how to pose questions and collect, organize, represent and interpret data in order to answer those questions. They use methods of exploratory data analysis to develop and evaluate inferences, predictions, and arguments that are based on data. They understand and know how to apply the notions of chance and probability.

#### 5.1 Display, analyze, compare, and interpret different data sets, including data sets that are not the same size.

- θ Know the concepts and uses correct vocabulary for mean, median, and mode(p/c); compute and compare them in simple examples and notice that they can differ (em)
- θ Collect, organize, display, and interpret (p/c) single-variable data in appropriate graphs and representation (histogram, circle graphs (c), pictographs, bar graphs, line graphs (p) and explain which types of graphs are appropriate for different kinds of data sets (c/em)
- θ Use fractions and percentages to compare data sets of different size (c/em)
- θ Identify ordered pairs of data from a graph and interpret the meaning of the data in terms of the situation depicted by the graph. (c/em)
- θ Know how to write ordered pairs correctly (c/em)
- θ Compute averages (p)

#### 5.2 Predict, perform and record results of simple probability experiments. (p)

- θ Use manipulatives (spinners, dice, tiles, unifix cubes, etc.) to approach and solve problems (em)
- θ Begin to identify faulty arguments or misleading presentations of data (p/em)

**6.0 Problem Solving** - Students know that they learn basic math skills and concepts in order to use them to solve problems in and out of school. They solve routine and complex problems by drawing from a variety of strategies, including technology, and demonstrate an attitude of persistence and reflection in their approaches.

#### 6.1 Identify problems (p) and make decisions about how to approach (p) the problems.

- θ Analyze problems by identifying relationships, discriminating relevant from irrelevant information, (p/c), sequencing and prioritizing and observing patterns (em)
- θ Formulate and justify math conjectures based upon a general description of the math question or problem posed (c/em)
- θ Determine when and how to break a problem into simpler parts (c/p)

#### 6.2 Apply a variety of strategies

- θ Determine a focus: solve related problems, divide into smaller parts, work backwards, model by acting out, use manipulatives, guess and check (p)
- θ Organize information: eliminate possibilities, look for patterns, develop a matrix, create a model, equation, or systematic list, write a number sentence, look for key words (p/em)
- θ Use estimation to verify the reasonableness of calculated results (p/c/em)
- θ Solve simpler problems and apply the results to more complex problems (c/p)
- θ Use a four-function calculator (em)
- θ Determine when it is effective and efficient to use a calculator (p/em)
- θ Use computers to solve math problems and practice

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**7.0 Math Processes: Reasoning, Communication, and Connections** – Students use reasoning to develop, analyze, draw conclusions, and validate conjectures and arguments. As they reason, they recognize and understand multiple representations of the same concept. They see the interconnections among math ideas as well as in other disciplines. They know how to communicate their math thinking clearly and coherently to others, orally, graphically, and in writing, using precise language and symbols.

**7.1 Use math reasoning to develop, analyze, validate and justify thinking and arguments. (p)**

- θ Locate a flaw in a math argument (p)
- θ Distinguish between relevant and irrelevant information (c/p/em)
- θ Identify, evaluate (c) and present (p) reasonable conclusions and justify the solution processes (p) in the context of the original situation (c/em)
- θ Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy (em)
- θ Make precise calculations (c) and interpret (p) the validity of the results from the context of the problem (c/em)
- θ Use estimation to verify correctness of result (c/p/em)

**7.2 Communicate math thinking orally, graphically, and in writing.**

- θ Restate or summarize the problem (p/em)
- θ Use correct terminology (p/em)
- θ Ask clarifying and extending questions (p/em)
- θ Use a variety of methods such as words, numbers, symbols, charts, graphs, tables, diagrams, and models to explain math reasoning and use of processes (p/c)
- θ Express and present (p) solutions clearly and logically using appropriate math notation, terms, clear language, and supportive evidence, in both verbal and symbolic work (c/p/em)

**7.3 Understand multiple representations of the same concept and the interconnections among topics and their applications. (p)**

- θ Read and understand math in written form (p/em)
- θ Translate written problems into math symbols, and math symbols into written English (p/em)
- θ Translate data from one representation to another (i.e., table to graph) (p/em)
- θ Recognize the relationship between concrete models and math symbols (p/em)
- θ Understand the connection between math skills and real-world situations
- θ Apply math skills in new situations (p/em)
- θ Begin to recognize the relationship between ratio, fraction, decimal, and percent (p/em)
- θ Use math in other curriculum areas (p/em)

**7.4 Make and apply generalizations (p)?**

- θ Extend patterns (p/em)
- θ Use specific and related examples to make generalizations (p/em)
- θ Classify and sort by similarities and differences (p)
- θ Note method of deriving the solution and demonstrate conceptual understanding of the derivation by solving similar problems (c/em)
- θ Develop generalizations of results and extend them to new problem situations (c/em)