

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 4

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 Understand place value of whole numbers to millions and decimals to two decimal places (c/p/s/em)
- 1.2 Understand and solve problems involving addition, subtraction, multiplication and division of whole numbers. Understand the relationship among the operations (c)
- 1.3 Know how to factor small whole numbers (c/p/em)
- 1.4 Extend use and understanding of whole numbers to add and subtract simple decimals (c)
- 1.5 Interpret different meanings for fractions including parts of a whole, parts of a set, and division of whole numbers by whole numbers (c/em)
- 1.6 Use concepts of negative 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 and interpret variables, mathematical symbols, and properties to write and simplify expressions and sentences (c)
- 2.2 Manipulate equations (c)

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 Use two-dimensional coordinate grids to represent points and graph lines and simple figures (c)
- 3.2 Select and use appropriate measurement tools to estimate, quantify properties and measure objects (p/c/s)
- 3.3 Understand area and perimeter (c)
- 3.4 Apply concepts about time

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 Understand plane and solid geometric objects and use this knowledge to show relationships and to solve problems (c)
- 4.2 Use spatial organization (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 Organize, represent and interpret numerical and categorical data, and communicate the findings (c/p)
- 5.2 Make predictions for simple probability situations (c/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 Make decisions about how to approach problems (c/em)
- 6.2 Apply a variety of strategies, skills and concepts to solve problems (c/em)

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 Solve problems and justify reasoning (c/p/em)
- 7.2 Express math thinking orally, graphically and in writing (p/em)
- 7.3 Understand multiple representations of the same concept (p/em)
- 7.4 Move beyond a particular problem by generalizing to other situations

MATH STANDARDS LEVEL 4

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.

1.1 Understand place value of whole numbers to millions and decimals to two decimal places (c/p/s/em)

- θ Read, write, order and compare whole numbers to the millions (c/p/em)
- θ Round whole numbers through millions to the nearest ten, hundred, thousand, ten thousand, or hundred thousand (c/em/s)
- θ Decide when a rounded solution is called for and explain why this is the case (c/em)
- θ Represent whole numbers on a number line (c/em/s)
- θ Identify expanded form of whole numbers to millions (s)
- θ Recognize correct word names for numbers in the range from .001 to 10,000 (s)

1.2 Understand and solve problems involving addition, subtraction, multiplication and division of whole numbers. Understand the relationship among the operations. (c)

- θ Maintain knowledge of addition and subtracting facts for 1 to 20.
- θ Multiplication and division facts to 18. (s)
- θ Add and subtract multi-digit numbers using the standard algorithm and other successful strategies (c/s)*
- θ Multiply a multi-digit number by a two-digit number and divide a multi-digit by a one-digit number (c), with and without remainders (p), using the standard algorithms (c) and other successful strategies. (c)*
- θ Solve story problems and relate answers in multiple ways (with picture, number line, equations) (c).
- θ Use relationships between operations to simplify computations and check results. (c)

1.3 Know how to factor small whole numbers. (c/p/em)

- θ Understand that many whole numbers breakdown in different ways (e.g., $12 = 4 \times 3 = 2 \times 6 = 2 \times 2 \times 3$). (c/em)
- θ Know that numbers such as 2,3,5,7,11 do not have any factors except one and themselves, and that such numbers are called prime numbers. (c/em)
- θ Begin to use divisibility rules for 2,5,10, e.g., all even numbers are divisible by 2. (p)
- θ Identify multiples of numbers, e.g., the multiples of 8 are 0, 8, 16, 24...(p)

1.4 Extend use and understanding of whole numbers to add and subtract simple decimals. (c)

- θ Estimate and compute the sum or difference of whole numbers and positive decimals to two places. (c/p/em)
- θ Round two-place decimals to the nearest whole number, and use rounding to judge reasonableness of an answer. (c/p/em)
- θ Understand decimal values of money and make change. (p)
- θ Solve addition and subtraction decimal problems, including those with money amounts. (s)

1.5 Interpret different meanings for fractions including parts of a whole, parts of a set, and division of whole numbers by whole numbers. (c/em)

- θ Begin to understand, order, and compare proper, improper, and equivalent fractions (concretely and symbolically) and represent in lowest terms (s)
- θ Write tenths and hundredths in decimals and fraction notation and know fraction/decimal equivalents for halves and fourths (e.g., $\frac{1}{2} = 0.5$ or $.50$ or $\frac{7}{4} = 1 \frac{3}{4} = 1.75$) (c/em/s)
- θ Write the fraction represented by a drawing of parts of a figure, including $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$; represent a given fraction using drawings and relate the fraction to a decimal on a number line (c/s/em)
- θ Begin to add and subtract like and unlike (s) denominators both concretely and symbolically (p)
- θ Identify the relative position of positive fractions, positive mixed numbers and positive decimals to two decimal places on the number line. (c/em/s)

P=PUSD c=California s=SAT-9 *=Inclusion by committee

1.6 Use concepts of negative numbers (c)

- θ Identify and determine the position of negative numbers on a number line in counting, temperature and in owing money.
- θ Begin to add and subtract signed numbers*

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 and interpret variables, mathematical symbols, and properties to write and simplify expressions and sentences. (c)

- θ Use letters, boxes or symbols (variables) to stand for any number in simple expressions or equations (p/c)
- θ Interpret and evaluate mathematical expressions that use parentheses. (c)
- θ Use parentheses to indicate which operation to perform first when writing expressions containing two or more terms and different operations. (c/em)
- θ Use and interpret formulas (e.g., Area = length times width or $A=lw$) to answer questions about quantities and their relationships. (c)
- θ Use the commutative and associative properties of addition, subtraction and multiplication. (p/c)
- θ Understand that an equation such as $y = 3x + 5$ is a prescription for determining a second number when a first number is given. (c)

2.2 Manipulate equations. (c)

- θ Know and understand that equals added to equals are equal.(c)
- θ Know and understand that equals multiplied by equals are equal. (c)
- θ Identify and apply the inverse operations between addition and subtraction and between multiplication and division, and use the concept to check work. (p/s)

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 Use two-dimensional coordinate grids to represent points and graph lines and simple figures. (c)

- θ Draw the points corresponding to linear relationships on graph paper (e.g., draw the first ten points for the equation $y = 3x$ and connect them using a straight line). (c)*
- θ Understand the length of a horizontal line segment equals the difference of the x-coordinates. (c)*.
- θ Understand that the length of a vertical line segment equals the difference of the y-coordinates. (c)*

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

- θ Use metric and customary systems. (p/s)
- θ Select and use appropriate measurement tools accurately, e.g., clock, ruler, meter stick, thermometer, scales, gauges.(p)
- θ Apply estimation in working with quantities, problem solving and measurement (including length, temperature, volume, mass and money amounts). (s)

3.3 Understand area and perimeter. (c)

- θ Measure and compare the area and perimeter of rectangular shapes, using appropriate units; centimeter squared, meter squared, square inches, square mile, and square yard. (c/s)
- θ Recognize that rectangles that have the same area can have different perimeters. (c).
- θ Recognize that rectangles that have the same perimeter can have different areas. (c)
- θ Understand and use formulas to solve problems involving perimeter and areas of rectangles and squares, and area of more complex figures by dividing the figures into basic shapes. (c)

3.4 Apply concepts about time.

- θ Compute time before and after a given time.(p).
- θ Calculate the amount of time which has elapsed between two given times (s).

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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 Understand plane and solid geometric objects and use this knowledge to show relationships and to solve problems. (c)

- θ Identify lines that are parallel and perpendicular. (c/p/em)
- θ Identify the radius and diameter of a circle. (c/em)
- θ Identify congruent and similar figures (p/em)
- θ Know the definitions of right, acute and obtuse angles and compare and classify angles according to their measurement (c/p/s). Understand that 90° , 180° , 270° and 360° are, respectively, associated with $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and full turns. (c)
- θ Visualize, describe, identify and represent geometric solids (e.g., prisms, pyramids, etc.) in terms of the number and shape of faces, edges and vertices; interpret two-dimensional representations of three-dimensional objects; and draw patterns (of faces) for a solid that when folded will make a model of the solid. (c/em/s)
- θ Identify figures that have bilateral and rotational symmetry, (c/p/em) and reflections of geometric figures (s).
- θ Understand the concepts of points, lines, segments and rays. (c/p/em)
- θ Understand the concepts of spatial dimension related to linear, square and cubic units. (p)
- θ Identify, describe, compare, construct and classify simple geometric figures. (c/p/em)
- θ Define different triangles (e.g., equilateral, isosceles, scalene) and identify their features. (c/em)
- θ Define different quadrilaterals. (e.g., rhombus, square, rectangle, parallelogram, trapezoid). (c/em)

4.2 Use spatial organization (p)

- θ Use geometric representations (e.g., area, perimeter, volume). (p)
- θ Use Venn diagrams for sorting and classifying (p)
- θ Investigate and predict results of combining, subdividing, and changing shapes, e.g., use pattern blocks, fold paper, dissect, tile, rearrange parts of solids. (p)

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 at all unifying levels notion of chance and probability.

5.1 Organize, represent, and interpret numerical and categorical data, and communicate the findings. (c/p)

- θ Formulate survey questions, systematically collect, compare and represent data using number lines, coordinate graphs, charts, tallies, and tables. (c/em/s)
- θ Identify the mode(s) for sets of categorical data, and the mode(s), median and any apparent outliers for numerical sets of data. (c/em)
- θ Interpret one and two variable data graphs to answer questions about a situation. (c/em)
- θ Begin to identify faulty arguments or misleading presentations of data. (p)

5.2 Make predictions for simple probability situations. (c/p)

- θ Predict, perform, and record results of simple probability experiments with manipulatives, e.g., spinners, dice, tiles, unifix cubes, etc. (p)
- θ Represent all possible outcomes for a simple probability situation in an organized way. (e.g., tables, grids, tree diagrams and surveys (s)). (c/em)
- θ Express outcomes of experimental probability situation verbally and numerically (e.g., 3 out of 4; $\frac{3}{4}$) (c)
- θ Order events by their likelihood of occurrence (s)

6.0 Problem Solving - Students know that they learn basic skills and concepts in order to use them and 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 Make decisions about how to approach problems. (c/em)

- θ Analyze problems by identifying relationships, discriminating relevant from irrelevant information, (s) sequencing and prioritizing information, and observing patterns, (p/c)
- θ Determine when and how to break a problem into simpler parts (p/c)

6.2 Apply a variety of strategies, skills and concepts to solve problems (c/em)

- θ Organize information-eliminate possibilities, guess and check, develop a matrix, create mathematical models or systematic lists, write number sentences, look for key words. (p)
- θ Choose a focus solve related problems, divide into smaller parts, model by acting out, use manipulatives, work backwards, guess and check. (p)
- θ Use a four-function calculator and determine when the use of a calculator is effective and efficient. (p)
- θ Use technology to solve math problems and to practice skills. (p)
- θ Use estimation to verify the reasonableness of calculated results. (c/p/s/em)
- θ Solve problems that require multiple steps (s)

7.0 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 Solve problems and justify reasoning (c/p/em)

- θ Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy. (c)
- θ Make precise calculations (c) and interpret (p) the validity of the results from the context of the problem (c)
- θ Locate a flaw in a mathematical argument. (p)

7.2 Express math thinking orally, graphically and in writing (p/em)

- θ Restate or summarize the problem
- θ Use a variety of methods such as words, numbers, symbols, charts, graphs, tables, diagrams and models to explain mathematical reasoning. (c/p)
- θ Express reasonable solutions clearly and logically using appropriate mathematical notation and terms, and support solutions with evidence, in both verbal and symbolic work. (c/p)

7.3 Understand multiple representations of the same concept (p/em)

- θ Recognize the relationship between concrete models and math symbols. (p)
- θ Translate written problems into math symbols, and math symbols into written English. (p)
- θ Translate data from one representation to another, (e.g., table to a graph). (p)
- θ Understand the relationship between basic math operations. (p)
- θ Use math in other curriculum areas. (p)

7.4 Move beyond a particular problem by generalizing to other situations

- θ Develop generalizations of the results obtained and extend them to other circumstances. (c)
- θ Note method of deriving the solution and demonstrate conceptual understanding of the derivation by solving similar problems. (c)
- θ Understand the connections between math skills, solutions, concepts and other curriculum areas.