

## 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 3

**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 10,000 (c)
- 1.2 Calculate and solve problems involving addition, subtraction, multiplication and division (c)
- 1.3 Understand the relationship between whole numbers, simple fractions and decimals (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 Selects appropriate symbols, operations and properties to represent, describe, simplify and solve simple number relationships (c)
- 2.2 Represent and interpret numerical and geometric patterns and simple functional relationships (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 Choose and use appropriate units and measurement tools to estimate and quantify properties and measure objects (c)
- 3.2 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 Describe and compare the attributes of plane and solid geometric figures and use understanding to show relationships and solve problems (c)
- 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 Conduct simple probability experiments by determining the number of possible outcomes, and make simple predictions
- 5.2 Analyze and draw conclusions from data (p/c)

**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
- 6.2 Choose a focus, apply a variety of strategies, skills and concepts in finding solutions (p/c)

**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, and validate justify thinking and arguments (p)
- 7.2 Communicate math ideas orally, graphically, and in writing (p)
- 7.3 Understand multiple representations of the same concept (p)
- 7.4 Move beyond a particular problem by generalizing to other situations (c/p)

**MATH STANDARDS  
LEVEL 3**

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

**1.1 Understand place value of whole numbers to 10,000 (c)**

- θ Count, read, write and compare digit whole numbers to 10,000 (c/em) - 1000 (s)
- θ Identify the place value for each digit in numbers to 10,000 (c/em)
- θ Round off numbers to 10,000 to the nearest ten, hundred (p), and thousand (c)
- θ Use expanded notation to represent numbers (e.g.,  $3,206 = 3000 + 200 + 6$ ) (c/s)
- θ Understand equivalent names for multiples of tens, hundreds, thousands (em)
- θ Count forward and back by 10's, 100's, 1000's from a given 4 digit number (em)

**1.2 Calculate and solve problems involving addition, subtraction, multiplication and division (c)**

- θ Find the sum or difference of two whole numbers between 0 and 10,000 (c); know facts to 20 without calculators (p)
- θ Regroup one place value at a time and across multiple zeroes when subtracting (p)
- θ Transfer horizontal problems into vertical form for multiplication and division (p)
- θ Begin to use 4-function calculator and begin to determine when calculator use is effective and efficient (p)
- θ Add three or more numbers (column addition) with and without regroup (p)
- θ Memorize to automaticity the multiplication table from  $2 \times 0$  to  $10 \times 10$  (c) and (em); (to  $6 \times 10$ ) (p)
- θ Use the inverse relationship of addition, subtraction (s), multiplication and division to compute and check results (c/s)
- θ Solve simple problems involving multiplication of multi-digit numbers by one digit numbers ( $3671 \times 3 = 11,013$ ) (p/c)
- θ Solve division problems in which a multi-digit number is evenly divided by a one-digit number ( $135 \div 5$ ) (c)
- θ Understand the special properties of 0 and 1 in multiplication (p) and division (c)
- θ Determine the unit cost when given the total cost and number of units (c)
- θ Understand the concept of factoring whole numbers
- θ Use a calculator for counts and multi-digit addition and subtraction (em)
- θ Use estimation to solve multi-digit addition and subtraction problems (em), and multiplication and division problems (c)

**1.3 Understand the relationship between whole numbers, simple fractions and decimals (c).**

- θ Compare fractions represented by drawings or concrete materials to show the meaning of the numerator, denominator, equivalency, and to add and subtract simple fractions in context ( $1/2$  pizza =  $2/4$  same size pizza) (c/s)
- θ Add and subtract simple fractions ( $1/8 + 3/8 = 1/2$ ) (c)
- θ Understand the place of fractions on a number line and ruler (em)
- θ Understand equivalent fractions (em/p)
- θ Express equivalent fractions of larger units (1 in =  $1/12$  foot) (em/p)
- θ Know and understand that fractions and decimals are two different representations of the same concept. (c)
- θ Begin to compare and order decimals (s/em) with different denominations (s)
- θ Understand place value in decimals (em)
- θ Read and write 1 and 2 digit decimals (em)
- θ Understand equivalent names for tenths, hundredths, thousandths (p)
- θ Solve problems involving addition, subtraction, multiplication and division of money amounts in decimal notation (s) and multiply and divide money amounts in decimal notation using whole number multipliers and divisors. (c/s/em)

**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 Select appropriate symbols, operations and properties to represent, describe, simplify and solve simple number relationships.** (c)

- θ Understand and apply the concept of an unknown (e.g.,  $6 + \square = 18$ ) (p)
- θ Represent relationships of quantities in the form of math expressions, equations, or inequalities (c)
- θ Solve problems involving numeric equations, or inequalities (c)
- θ Select appropriate operational and relational symbols to make the expressions true ( $4 \_ 3 = 12$ ) (c)
- θ Express simple unit conversions in symbolic form (-inches = #feet x 12) (c)
- θ Recognize and use the commutative and associative properties of multiplication (c) and apply the multiplicative identity (s)

**2.2 Represent and interpret numerical and geometric patterns and simple function relationships.** (c)

- θ Recognize, describe and extend geometric and numeric patterns (c/p/em)
- θ Solve simple problems involving a functional relationship (two quantities which vary together) between two quantities (e.g., find the total cost of multiple items given the per unit cost) (c)
- θ Extend and recognize a linear pattern by its rules (e.g., the numbers of legs on a given number of horses can be calculated by counting by 4's or by multiplying the number of horses by 4) (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.

**3.1 Choose and use appropriate units and measurement tools to estimate and quantify properties and measure objects.** (c)

- θ Begin to use metric system, e.g., meter, centimeter, gram, kilogram (em), liter (p), dm, km, (em)\*
- θ Begin to use customary system, e.g., yard, foot, inches, miles (em)\* pounds, ounces (em)\*, gallons, quarts, pints, cups (p)
- θ Choose appropriate units and tools, (clock, ruler, meter stick, scales (p)) to estimate and compare (s) and measure length (s), liquid volume and weight/mass of objects (c/s/em)
- θ Carry out simple unit conversions (equivalencies) within a system of measurement (e.g., centimeters and meters) (c/em)
- θ Estimate or determine the surface area and volume of solid figures (s/em)
- θ Find the perimeter and area (p/c) of a polygon and distinguish between the two measures (c/s)
- θ Understand negative numbers on a Celsius thermometer (em) and record temperatures(s)

**3.2 Apply concepts about time**

- θ Tell and write time to the minute using analog clock (p)
- θ Convert hours and minutes (c/em)
- θ Estimate temperature (s)
- θ Calculate amount of time elapsed between two given times (s)

**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 Describe and compare the attributes of plane and solid geometric figures and use understanding to show relationships and solve problems.** (c)

- θ Understand and use basic geometric terminology and concepts: points, lines, segments, rays, symmetry, congruence, area and perimeter, regular polygons, symmetry (em/p/s)
- θ Identify, describe, classify and construct polygons (including pentagons, hexagons and octagons) (c/p/s/em)
- θ Identify attributes of triangles (e.g., two equal sides for the isosceles triangle, three equal sides for the equilateral triangle, right angle for the equilateral triangle, right angle for the right triangle) (c)
- θ Identify attributes of quadrilaterals (e.g., parallel sides for the parallelogram, right angles for the rectangle, equal sides and right angles for the square) (c)
- θ Identify right angles (square corners) in geometric figures and objects in the environment and determine whether other angles are greater or less than a right angle-order a set of angles by size (em)

- θ Visualize, identify, name, describe, classify, compare and/or construct common three-dimensional geometric objects (e.g., cube, rectangular solid, sphere, prism, pyramid, cone, cylinder) (p/c)
- θ Identify the common solid objects that are the component parts of a more complex solid object and combine and take apart object to construct new objects (c)

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

- θ Begin to use geometric representations, like area and perimeter; to model problems (em/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 arts of solids (p)
- θ Identify a reflector and a rotation of a geometric figure (s)

**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 notion of chance and probability.

**5.1 Conduct simple probability experiments by determining the number of possible outcomes, and make simple predictions.**

- θ Identify whether common events are certain, likely, unlikely or improbable (c)
- θ Record the possible outcomes for a simple event; (e.g., tossing a coin) and systematically keep track of the outcomes when the event is repeated many times (c), using manipulatives, e.g., spinners, dice, tiles, unifix cubes, etc. (c/p)
- θ Summarize and display the results of probability experiments in a clear and organized way (e.g., use a bar graph, pictograph table, or line plot) (c/p/s)

**5.2 Analyze and draw conclusions from data. (p/c)**

- θ Interpret (p) and use the results of probability experiments to predict future events (e.g., use data from a line plot to predict the temperature forecast for the next day (c) lists, tables, charts and schedules (p)
- θ Find mean, and begin to find median for a data set (em)

**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.

**6.1 Make decisions about how to approach problems.**

- θ Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns (p/c)
- θ Determine when and how to break a problem into simpler parts (p/c), to solve related problems, to work backwards, to model the problem by acting it out or making a physical representation (p)

**6.2 Choose a focus, apply a variety of strategies, skills and concepts in finding solutions. (p/c)**

- θ Organize information
- θ Apply strategies and results from simpler problems to complex problems
- θ Use estimation to verify the reasonableness of calculated results
- θ Use memory keys on a calculator (em) and other technology to solve problems
- θ Use technology to solve math problems and practice skills (p)

**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 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.

- 7.1 Use math reasoning to develop, analyze, validate, and justify thinking and arguments.** (p)
- θ Identify, evaluate (c) and present (p) reasonable conclusions and justify the solution processes (p) in the context of the original situation (c)
  - θ Begin to locate a flaw in a math argument (p)
  - θ Determine when an exact solution is an advantage over an approximate solution (c)
  - θ Make precise calculations and check the validity of the results from the context of the problem
- 7.2 Communicate math ideas orally, graphically, and in writing.** (p)
- θ Restate or summarize the problem (p)
  - θ Express solutions clearly and logically using appropriate notation, terms, and clear language, and support solutions with evidence in verbal and symbolic work (p/c)
- 7.3 Understand multiple representations of the same concept.** (p)
- θ Read and understand math in written forms (text, word problems, peer solutions) (p)
  - θ Translate written problems into symbols, and symbols into written English (p)
  - θ Translate data from one representation to another (i.e., table to graph) (p)
  - θ Recognize the relationship between concrete models and math symbols (p)
  - θ Understand the relationship between basic math operations (p)
- 7.4 Move beyond a particular problem by generalizing to other situations.** (c/p)
- θ Note patterns and methods when deriving a solution and demonstrate conceptual understanding by solving similar problems (p/c)
  - θ Develop generalizations of the results obtained and extend them to other circumstances (p/c)
  - θ Understand the connections between math skills in other situations and curriculum areas (p/c)