

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 1

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.

Focus Goals

- 1.1 Understand and use numbers to 100 (c/em)
- 1.2 Understand the meaning of addition and subtraction and use operations to solve problems (c/p/em)
- 1.3 Understand fractions as equal parts of a unit or of some whole (s/em)
- 1.4 Use estimation strategies in computation and problem solving that involve numbers that use the ones, tens, and hundreds place (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 number sentences with operational symbols and expressions to solve problems (c)
- 2.2 Identify, describe and extend patterns (c/p/s/em)

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 direct comparison and non-standard units to measure and describe objects (c/s)
- 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 Identify common geometric figures, classify them by attributes and describe their relative position/or location in space (c)
- 4.2 Use spatial organization (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 the notions of chance and probability.

Focus Goals

5.1 Organize, represent and compare data by category on simple graphs and charts (c)

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.

Focus Goals

6.1 Make decisions about how to set up a problem (c)

6.2 Apply a variety of strategies to solve problems (s/em)

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.

Focus Goals

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

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

7.3 Understand multiple representations of the same concept (p)

7.4 Recognize connections between one problem and another (c/p)

MATH STANDARDS LEVEL 1

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 and use numbers up to 100 (c/em):

- θ Count, read, and write whole numbers to 100 (c/p/s/em)
- θ Compare and order whole numbers to 100 using symbols for less than (<), equal to (=), or greater than (>) (c/em)
- θ Match sets with numerals from 0 to 100 (p/s)
- θ Match word names with numbers up to 1000
- θ Read and represent equivalent forms of the same number through the use of physical models, diagrams and number expressions (relations/em) to 20 (e.g., 8 can be represented as 4+4, 5+3, 2+2+2+2, 10-2, 11-3) (c/em)
- θ Count and group objects into ones and tens (e.g. 3 groups of ten and 4 more is 34 or 30+4) (c/s/em)
- θ Begin to identify place value in 3-digit numbers (s/em)
- θ Begin to count 10's forward and back from any 3-digit number (s/em)
- θ Count by 2's, 5's and 10's with numbers to 100 (c/p), with and without a calculator (s/em)
- θ Begin to rename 2-3 digit numbers in terms of 100's, 10's and 1's (em)
- θ Make the largest and smallest numbers using 2 or 3 digits (em)*
- θ Begin to use ordinal numbers from 1-10 (first through tenth) (p/s)
- θ Name even and odd numbers (em)
- θ Identify and know the value of coins and show different combinations of coins that equal the same value (c/p) (penny, nickel, dime, quarter, and dollar bill) (p/s/em)
- θ Begin to understand the concept of making change (em)

1.2 Understand the meaning of addition and subtraction and use the operations to solve problems (c/p/em)

- θ Show the meaning of addition (putting together, increasing) and subtraction (taking away, comparing, finding the difference) (c/em)
- θ Know addition facts and corresponding subtraction facts to 20, and commit them to memory (c)*
- θ Construct addition and subtraction fact families (em)
- θ Solve addition and subtraction problems with one and two digit numbers (e.g. $5+58=\square$) (c/s)
- θ Find the sum of three one-digit numbers (c/p)
- θ Begin to add and subtract two-digit numbers without regrouping (p)
- θ Add and subtract 10 and multiples of 10 (em)*
- θ Begin to understand the unique property of zero (p/s)
- θ Use the inverse relationship between addition and subtraction to solve problems (c/em)
- θ Identify one more than, one less than, ten more than, ten less than a given number (c/s)

1.3 Understand fractions as equal parts of a unit or of some whole (s/em)

- θ Recognize wholes, halves, and fourths using concrete objects and begin to relate symbols for whole, half, and fourth (p/s)
- θ Begin to understand equivalent fractions (s/em)

1.4 Use estimation strategies in computation and problem solving that involve numbers that use the ones, tens, and hundreds place (c)

- θ Determine whether an answer is reasonable (p)
- θ Make reasonable estimates when comparing larger or smaller numbers (c/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 Use number sentences with operational symbols and expressions to solve problems (c)

- θ Understand the meaning of symbols +, −, =, (c/s/em)
- θ Write and solve number sentences from problem situations involving addition and subtraction (c/em)
- θ Begin to find replacements for unknowns that make simple number sentences true, e.g., $1 + \square = 3$ (p)
- θ Create problems that might lead to given number sentences involving addition and subtraction (c/em)

2.2 Identify, describe and extend patterns (c/p/s/em)

- θ Explain how to get the next element in repeating patterns involving shape, size, color, rhythm and number (c)
- θ Complete simple patterns in a sequence (c/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 direct comparison and non-standard units to measure and describe objects (c/s)

- θ Compare the length, weight and volume (p/c) of two or more objects (em)
- θ Order objects by weight from lightest to heaviest (em)*
- θ Begin to use inches and centimeters to measure (s/em)*
- θ Read and compare temperatures on a thermometer (em)*

3.2 Apply concepts about time

- θ Know the days of the week and months of the year, and begin to use the calendar to answer specific questions (p/s)
- θ Tell time to the nearest half-hour (p/c) using an analog clock (p), and compare time related to events (before/after, shorter/longer) (c/s/em)

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 common geometric figures, classify them by attributes and describe their relative position/or location in space (c)

- θ Identify, describe, (construct (p)) and compare triangles, rectangles, square and circles, (polygons (em))
- θ Classify familiar plane and solid objects by common attributes: color, position, shape, size, roundness, number of corners, number of faces, (number of line segments, sides, vertices, angles) (em) and explain which attributes are being used for classification (c/s)
- θ Describe and arrange objects in space in terms of proximity, position and direction (e.g., near, far, below, above, up, down, behind, in front of, next to, left/right) (em)
- θ Give and follow directions about location (c/em)

4.2 Use spatial organization (p)

- θ Begin to use geometric representations to visualize and solve simple problems (e.g., number line, pattern blocks, unifix cubes, color tiles, etc.) (em)
- θ Understand number lines (em)
- θ Begin to use Venn diagrams for sorting and classifying (p)
- θ Investigate and predict results of combining, subdividing, and changing shapes, (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 the notions of chance and probability.

5.1 Organize, represent and compare categorical data on simple graphs and charts (c)

- θ Sort and classify objects and data by common attributes and describe the categories (c/p)
- θ Interpret data (e.g., largest, smallest, most often, least often), using pictures, bar graphs, tally charts, (s) and picture graphs. (c/p/em)
- θ Classify and sort by similarities and differences (p)
- θ Order events by the likelihood of their occurrence (s)

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 set up a problem (c)

- θ Identify and understand the problem, decide how to set it up to form a solution (p)
- θ Determine approach, materials and strategies to use (c)
- θ Write addition and subtraction stories about number sentences (em)

6.2 Apply a variety of strategies to solve problems (s/em)

- θ Organize information—begin to eliminate possibilities, guess and check, look for patterns, classify by attribute, write a number sentence, look for key words (p)
- θ Choose a focus—solve related problems, divide into smaller parts, model by acting out or use manipulatives (p)
- θ Apply knowledge of patterns, number sense, probability (likely and unlikely), and statistics (comparing quantities) (p)
- θ Use the concept of unknowns with real objects when necessary (p)
- θ Use tools such as technology, manipulatives or sketches (pictures) (p) to model problems (p/c)
- θ Use technology to solve math problems and practice skills (p)

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 (p/c/em)

- θ Present reasonable conclusions (p), explain the reasoning used and justify the procedures selected (c)
- θ Make precise calculations and check the validity of the results from the context of the problem

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

- θ Restate or summarize the problem (p)
- θ Explain thinking used to arrive at an answer using correct terminology (p/em)

7.3 Understand multiple representations of the same concept (p)

- θ Begin to translate math symbols into written English (c)
- θ Begin to read and understand math in written form (text presentation, word problems, peer solutions)
- θ Begin to translate data from one representation to another (e.g., table to graph, horizontal to vertical number sentences) (p/s)
- θ Recognize the relationship between concrete models and math symbols.
- θ Understand the relationship between basic math operations (+, -)
- θ Begin to write number sentences horizontally and vertically related to concrete representations (p)

7.4 Recognize connections between one problem and another (c/p)

- θ Begin to make generalizations from related examples (p)
- θ Use math skills in other situations and curriculum areas (p)