

**PINER-OLIVET UNION SCHOOL  
DISTRICT ACADEMIC CONTENT  
STANDARDS**



**WITH POWER STANDARDS  
IN BOLD**

**MATHEMATICS**

for grades K - 6

Submitted to the Piner-Olivet Union School District Governing Board  
For Adoption on December 5, 2008

California Department of Education Mathematic Content Standards, 1999

# KINDERGARTEN

## Mathematics Content Standards

By the end of kindergarten, students understand the small numbers, quantities and simple shapes in their everyday environment. They count, compare, describe and sort objects, and develop a sense about properties and patterns.

### NUMBER SENSE

- 1.0 Students understand the relationship between numbers and quantities, i.e., that a set of objects has the same number of objects in different situations regardless of its position or arrangement:**
  - 1.1 Compare two or more sets of objects (up to ten objects in each group) and identify which set is equal to, more than, or less than the other.**
  - 1.2 Count, recognize, represent, name and order number of objects (up to 30).**
  - 1.3 Know that the larger numbers describe sets with more objects in them than the smaller numbers have.**
- 2.0 Students understand and describe simple addition and subtraction situations:**
  - 2.1 Use concrete objects to determine the answers to addition and subtraction problems (for two numbers that are each less than 10).**
- 3.0 Students use estimation strategies in computation and problem solving that involve numbers that use the ones and tens places:**
  - 3.1 Recognize when an estimate is reasonable.**

### ALGEBRA AND FUNCTIONS

- 1.0 Students sort and classify objects:**
  - 1.1 Identify, sort and classify objects by attribute and identify objects that do not belong to a particular grouping (e.g., all these balls are green, those are red).**

### MEASUREMENT AND GEOMETRY

- 1.0 Students understand the concept of time and units to measure it; they understand that objects have properties such as length, weight, capacity, and that comparisons may be made by using these properties:**
  - 1.1 Compare the length, weight, and capacity of objects by making direct comparisons with reference objects (e.g., note which object is shorter, longer, taller, lighter, heavier, or holds more).**

- 1.2. **Demonstrate an understanding of concepts of time (e.g., morning, afternoon, evening, today, yesterday, tomorrow, week, year) and tools that measure time (e.g., clock, calendar).**
- 1.3 **Name the days of the week.**
- 1.4 Identify the time (to the nearest hour) of everyday events (e.g., lunch time is 12 o'clock, bedtime is 8 o'clock at night).
- 2.0 **Students identify common objects in their environment and describe their geometric features:**
  - 2.1 **Identify and describe common geometric objects (e.g., circle, triangle, square, rectangle, cube, sphere, cone).**
  - 2.2 Compare familiar plane and solid objects by common attributes (e.g., position, shape, size, roundness, number of corners).

### **STATISTICS, DATA ANALYSIS and PROBABILITY**

- 1.0 **Students collect information about objects and events in their environment:**
  - 1.1 **Pose information questions; collect data; and record the results using objects, pictures, and picture graphs.**
  - 1.2 **Identify, describe, and extend simple patterns (such as circles or triangles) by referring to their shapes, sizes, or colors.**

### **MATHEMATICAL REASONING**

- 1.0 **Students make decisions about how to set up a problem:**
  - 1.1 Determine the approach, materials, and strategies to be used.
  - 1.2. **Use tools and strategies, such as manipulatives or sketches, to model problems.**
- 2.0 **Students solve problems in reasonable ways and justify their reasoning:**
  - 2.1 Explain the reasoning used with concrete objects and/or pictorial representations.
  - 2.2 Make precise calculations and check the validity of the results in the context of the problem.

# GRADE 1

## Mathematics Content Standards

By the end of first grade, students understand and use the concept of ones and tens in the place value number system. Students add and subtract small numbers with ease. They measure with simple units and locate objects in space. They describe data and analyze and solve simple problem situations.

### NUMBER SENSE

#### **1.0 Students understand and use numbers up to 100:**

**1.1 Count, read and write whole numbers to 100.**

**1.2 Compare and order whole numbers to 100 using the symbols for less than, equal to, or greater than (<, =, >).**

1.3 Represent equivalent forms of the same number through the use of physical models, diagrams and number expressions (to 20) (e.g., 8 may be represented as  $4+4$ ,  $5+3$ ,  $2+2+2+2$ ,  $10-2$ ,  $11-3$ ).

**1.4 Count and group objects into ones and tens (e.g., three groups of 10 and 4 equals 34, or  $30 + 4$ ).**

1.5 Identify and know the value of coins and show different combinations of coins that equal the same value.

#### **2.0 Students demonstrate the meaning of addition and subtraction and use these operations to solve problems:**

**2.1 Know the addition facts (sums to 20) and the corresponding subtraction facts and commit them to memory.**

2.2 Use the inverse relationship between addition and subtraction to solve problems.

2.3 Identify one more than, one less than, 10 more than, 10 less than a given number.

2.4 Count by 2s, 5s and 10s to 100.

**2.5 Show the meaning of addition (putting together, increasing) and subtraction (taking away, comparing, finding the difference).**

2.6 Solve addition and subtraction problems with one- and two-digit numbers (e.g.,  $5 + 58 = \underline{\quad}$ ).

2.7 Find the sum of three one-digit numbers.

#### **3.0 Students use estimation strategies in computation and problem solving that involve numbers that use the ones, tens, and hundreds places:**

- 3.1 Make reasonable estimates when comparing larger or smaller numbers.**

## **ALGEBRA AND FUNCTIONS**

- 1.0 Students use number sentences with operational symbols and expressions to solve problems:**
- 1.1 Write and solve number sentences from problem situations that express relationships involving addition and subtraction.**
  - 1.2 Understand the meaning of the symbols +, -, =.**
  - 1.3 Create problem situations that could lead to given number sentences involving addition and subtraction.

## **MEASUREMENT AND GEOMETRY**

- 1.0 Students use direct comparison and nonstandard units to describe the measurements of objects:**
- 1.1 Compare the length, weight and volume of two or more objects using direct comparison or a nonstandard unit.**
  - 1.2 Tell time to the nearest half hour using and relate time to events (e.g., before/after, shorter/longer).
- 2.0 Students identify common geometric figures, classify them by common attributes, and describe their relative position or their location in space:**
- 2.1 Identify, describe, and compare triangles, rectangles, squares and circles, including the faces of three-dimensional objects.**
  - 2.2 Classify familiar plane and solid objects by common attributes such as color, position, shape, size, roundness, number of corners and explain which attributes are being used for classification.
  - 2.3 Give and follow directions about location.
  - 2.4 Arrange and describe 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 or right of).**

## **STATISTICS, DATA ANALYSIS and PROBABILITY**

- 1.0 Students organize, represent and compare data by category on simple graphs and charts:**
- 1.1 Sort objects and data by common attributes and describe the categories.
  - 1.2 Represent and compare data (e.g., largest, smallest, most often, least often) by using pictures, bar graphs, tally charts and picture graphs.**
- 2.0 Students sort objects and create and describe patterns by numbers, shapes, size,**

**rhythms, or colors:**

- 2.1 Describe, extend and explain ways to get to the next element in simple repeating patterns (e.g., rhythmic, numeric, color and shape).

**MATHEMATICAL REASONING**

**1.0 Students make decisions about how to set up a problem:**

**1.1 Determine the approach, materials and strategies to be used.**

- 1.2 Use tools, such as manipulatives or sketches, to model problems.

**2.0 Students solve problems and justify their reasoning:**

- 2.1 Explain the reasoning used and justify the procedures selected.

- 2.2 Make precise calculations and check the validity of the results from the context of the problem.

**3.0 Students note connections between one problem and another.**

# GRADE 2

## Mathematics Content Standards

By the end of second grade, students understand place value and number relationships in addition and subtraction, and they use simple concepts of multiplication. They measure quantities with appropriate units. They classify shapes and see relationships among them by paying attention to their geometric attributes. They collect and analyze data and verify answers.

### NUMBER SENSE

- 1.0 Students understand the relationship between numbers, quantities, and place value in whole numbers up to 1,000:**
  - 1.1 Count, read, and write whole numbers to 1,000 and identify the place value for each digit
  - 1.2 Use words, models, and expanded form (e.g.,  $45 = 4 \text{ tens} + 5$ ) to represent numbers (to 1,000).
  - 1.3 Order and compare whole numbers to 1,000 using the symbols  $<$ ,  $=$ ,  $>$ .
- 2.0 Students estimate, calculate, and solve problems involving addition and subtraction of two- and three-digit numbers:**
  - 2.1 Understand and use the inverse relationship between addition and subtraction (e.g., an opposite number sentence for  $8 + 6 = 14$  is  $14 - 6 = 8$ ) to solve problems and check solutions.
  - 2.2 Find the sum or difference of two whole numbers up to three digits long.
  - 2.3 Use mental arithmetic to find the sum or difference of two two-digit numbers.
- 3.0 Students model and solve simple problems involving multiplication and division:**
  - 3.1 Use repeated addition, arrays, and counting by multiples to do multiplication.
  - 3.2 Use repeated subtraction, equal sharing, and forming equal groups with remainders to do division.
  - 3.3 Know the multiplication tables of 2s, 5s and 10s (to "times 10") and commit to memory.
- 4.0 Students understand that fractions and decimals can refer to parts of a set and parts of a whole:**
  - 4.1 Recognize, name, and compare unit fractions from  $1/12$  to  $1/2$ .
  - 4.2 Recognize fractions of a whole and parts of a group (e.g., one-fourth of a pie, two-thirds of 15 balls).

4.3 Know that when all fractional parts are included, such as four-fourths, the result is equal to the whole and to one.

**5.0 Students model and solve problems by representing, adding, and subtracting amounts of money:**

5.1 Solve problems using combinations of coins and bills.

5.2 Know and use the decimal notation and the dollar and cents symbols for money.

**6.0 Students use estimation strategies in computation and problem solving that involve numbers that use the ones, tens, hundreds and thousands places.**

6.1 Recognize when an estimate is reasonable in measurements (e.g., closest inch).

**ALGEBRA AND FUNCTIONS**

**1.0 Students model, represent and interpret number relationships to create and solve problems involving addition and subtraction:**

1.1 Use the commutative and associative rules to simplify mental calculations and to check results.

1.2 Relate problem situations and number sentences involving addition and subtraction.

1.3 Solve addition and subtraction problems by using data from simple charts, picture graphs, and number sentences.

**MEASUREMENT AND GEOMETRY**

**1.0 Students understand that measurement is accomplished by identifying a unit of measure, iterating (repeating) that unit, and comparing it to the item to be measured:**

1.1 Measure the length of objects by iterating (repeating) a non-standard or standard unit.

1.2 Use different units to measure the same object and predict whether the measure will be greater or smaller when a different unit is used.

1.3 Measure the length of an object to the nearest inch and/or centimeter.

1.4 Tell time to the nearest quarter hour and know relationships of time (e.g. minutes in an hour, days in a month, weeks in a year).

1.5 Determine the duration of intervals of time in hours (e.g., 11:00 a.m. to 4:00 p.m.).

**2.0 Students identify and describe the attributes of common figures in the plane and of common objects in space:**

- 2.1 Describe and classify plane and solid geometric shapes (e.g., circle, triangle, square, rectangle, sphere, pyramid, cube, rectangular prism) according to the number and shape of faces, edges and vertices.
- 2.2 Put shapes together and take them apart to form other shapes (e.g., two congruent right triangles can form a rectangle).

## **STATISTICS, DATA ANALYSIS AND PROBABILITY**

### **1.0 Students collect numerical data and record, organize, display, and interpret the data on bar graphs and other representations:**

- 1.1 Record numerical data in systematic ways, keeping track of what has been counted.
- 1.2 Represent the same data set in more than one way (e.g., bar graphs and charts with tallies).
- 1.3 Identify features of data sets (range and mode).
- 1.4 Ask and answer simple questions related to data representations.

### **2.0 Students demonstrate an understanding of patterns and how they grow, and describe them in general ways:**

- 2.1 Recognize, describe, and extend patterns and determine a next term in linear patterns (e.g., 4, 8, 12 ...; the number of ears on one horse, two horses, three horses, four horses).
- 2.2 Solve problems involving simple number patterns.

## **MATHEMATICAL REASONING**

### **1.0 Students make decisions about how to set up a problem:**

- 1.1 Determine the approach, materials and strategies to be used.
- 1.2 Use tools such as manipulatives or sketches, to model problems.

### **2.0 Students solve problems and justify their reasoning:**

- 2.1 Defend the reasoning used and justify the procedures selected.
- 2.2 Make precise calculations and check the validity of the results from the context of the problem.

# GRADE 3

## Mathematics Content Standards

By the end of third grade, students deepen their understanding of place value and their understanding of and skill with addition, subtraction, multiplication and division of whole numbers. They estimate, measure and describe objects in space. They use patterns to help solve problems. They represent number relationships and conduct simple probability experiments.

### NUMBER SENSE

#### **1.0 Students understand place value of whole numbers:**

1.1 Count, read, and write whole numbers to 10,000.

1.2 Compare and order whole numbers to 10,000.

**1.3 Identify the place value for each digit in numbers to 10,000.**

1.4 Round off numbers to 10,000 to the nearest ten, hundred and thousand.

**1.5 Use expanded notation to represent numbers (e.g.,  $3,206 = 3,000 + 200 + 6$ ).**

#### **2.0 Students estimate, calculate and solve problems involving addition, subtraction, multiplication and division:**

**2.1 Find the sum or difference of two whole numbers between 0 and 10,000.**

**2.2 Memorize to automatically know the multiplication table for numbers between 1 and 10.**

**2.3 Use the inverse relationship of multiplication and division to compute and check results.**

**2.4 Solve simple problems involving multiplication of multi-digit numbers by one-digit numbers ( $3,671 \times 3 = \underline{\quad}$ ).**

2.5 Solve division problems in which a multi-digit number is evenly divided by a one-digit number ( $135/5 = \underline{\quad}$ ).

2.6 Understand the special properties of 0 and 1 in multiplication and division.

2.7 Determine the unit cost when given the total cost and number of units.

2.8 Solve problems which combine two or more of the skills above.

#### **3.0 Students understand the relationship between whole numbers, simple fractions and decimals:**

**3.1 Compare fractions represented by drawings or concrete materials to show equivalency and to add and subtract simple fractions in context (e.g.,  $1/2$  of a**

**pizza is the same amount as  $\frac{2}{4}$  of another pizza that is the same size; show that  $\frac{3}{8}$  is larger than  $\frac{1}{4}$ ).**

- 3.2 Add and subtract simple fractions (e.g., determine that  $\frac{1}{8} + \frac{3}{8}$  is the same as  $\frac{1}{2}$ ).**
- 3.3 Solve problems involving addition, subtraction, multiplication and division of money amounts in decimal notation (multiply and divide money amounts in decimal notation using whole number multipliers and divisors).**
- 3.4 Know and understand that fractions and decimals are two different representations of the same concept (e.g., 50 cents is  $\frac{1}{2}$  of a dollar, 75 cents is  $\frac{3}{4}$  of a dollar).

## **ALGEBRA AND FUNCTIONS**

**1.0 Students select appropriate symbols, operations, and properties to represent, describe, simplify, and solve simple number relationships:**

- 1.1 Represent relationships of quantities in the form of mathematical expressions, equations, or inequalities.**
- 1.2 Solve problems involving numeric equations or inequalities.
- 1.3 Select appropriate operational and relational symbols to make an expression true (e.g.,  $4 \_ 3 = 12$ , what operation symbol goes in the blank?)
- 1.4 Express simple unit conversions in symbolic form (e.g.,  $\_ \text{ inches} = \_ \text{ feet} \times 12$ ).
- 1.5 Recognize and use the commutative and associative properties of multiplication (e.g., if  $5 \times 7 = 35$ , then what is  $7 \times 5$ ?, and if  $5 \times 7 \times 3 = 105$ , then what is  $7 \times 3 \times 5$ ?).

**2.0 Students represent simple functional relationships:**

- 2.1 Solve simple problems involving a functional relationship between two quantities (e.g., find the total cost of multiple items given the cost per unit).**
- 2.2 Extend and recognize a linear pattern by its rules (e.g., the number of legs on a given number of horses may be calculated by counting by 4s or by multiplying the number of horses by 4).**

## **MEASUREMENT AND GEOMETRY**

**1.0 Students choose and use appropriate units and measurement tools to quantify the properties of objects:**

- 1.1 Choose the appropriate units (metric and U.S. customary) and estimate and measure length, liquid volume and weight/mass of given objects.**
- 1.2 Estimate or determine the area and volume of solid figures by covering them with squares or by counting the number of cubes that would fill them.**

- 1.3 Find the perimeter of a polygon with integer sides.**
- 1.4 Carry out simple unit conversions within a system of measurement (e.g., centimeters and meters, hours and minutes).
- 2.0 Students describe and compare the attributes of plane and solid geometric figures and use their understanding to show relationships and solve problems:**
  - 2.1 Identify, describe, and classify polygons (including pentagons, hexagons and octagons).**
  - 2.2 Identify attributes of triangles (e.g., two equal sides for the isosceles triangle, three equal sides for the equilateral triangle, right angle for the right triangle).**
  - 2.3 Identify attributes of quadrilaterals (e.g., parallel sides for the parallelogram, right angles for the rectangle, equal sides and right angles for the square).**
  - 2.4 Identify right angles in geometric figures or in appropriate objects and determine whether other angles are greater or less than a right angle.
  - 2.5 Identify, describe, and classify common three-dimensional geometric objects (e.g., cube, rectangular solid, sphere, prism, pyramid, cone, cylinder).
  - 2.6 Identify common solid objects that are the component parts needed to make a more complex solid object.

## **STATISTICS, DATA ANALYSIS and PROBABILITY**

- 1.0 Students conduct simple probability experiments by determining the number of possible outcomes and make simple predictions:**
  - 1.1 Identify whether common events are certain, likely, unlikely, or improbable.**
  - 1.2 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.**
  - 1.3 Summarize and display the results of probability experiments in a clear and organized way (e.g., use a bar graph or a line plot).**
  - 1.4 Use the results of probability experiments to predict future events (e.g., use a line plot to predict the temperature forecast for the next day).

## **MATHEMATICAL REASONING**

- 1.0 Students make decisions about how to approach problems:**
  - 1.1 Analyze problems by identifying relationships, discriminating relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.

1.2 Determine when and how to break a problem into simpler parts.

**2.0 Students use strategies, skills, and concepts in finding solutions:**

2.1 Use estimation to verify the reasonableness of calculated results.

2.2 Apply strategies and results from simpler problems to more complex problems.

2.3 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.

2.4 Express the solution clearly and logically using appropriate mathematical notation and terms and clear language, and support solutions with evidence, in both verbal and symbolic work.

2.5 Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.

2.6 Make precise calculations and check the validity of the results from the context of the problem.

**3.0 Students move beyond a particular problem by generalizing to other situations:**

3.1 Evaluate the reasonableness of the solution in the context of the original situation.

3.2 Note the method of deriving the solution and demonstrate conceptual understanding of the derivation by solving similar problems.

3.3 Develop generalizations of the results obtained and extend them to other circumstances.

# GRADE 4

## Mathematics Content Standards

By the end of fourth grade, students understand large numbers and addition, subtraction, multiplication and division of whole numbers. They describe and compare simple fractions and decimals. They understand the properties of and the relationships between plane geometric figures. They collect, represent and analyze data to answer questions.

### NUMBER SENSE

**1.0 Students understand place value of whole numbers and decimals to two decimal places, how these relate to simple fractions, and use concepts of negative numbers:**

- 1.1 Read and write whole numbers in the millions.
- 1.2 **Order and compare whole numbers and decimals to two decimal places.**
- 1.3 **Round whole numbers through the millions to the nearest ten, hundred, thousand, ten thousand, or hundred thousand.**
- 1.4 Decide when a rounded solution is called for and explain such a solution may be appropriate.
- 1.5 **Explain different interpretations of fractions including parts of a whole, parts of a set, and division of whole numbers by whole numbers; explain equivalence of fractions (see Standard 4.0).**
- 1.6 Write tenths and hundredths in decimal and fraction notations and know the fraction and decimal equivalents for halves and fourths (e.g.,  $1/2 = 0.5$  or  $.50$ ;  $7/4 = 1\ 3/4 = 1.75$ ).
- 1.7 Write the fraction represented by a drawing of parts of a figure; represent a given fraction by using drawings; and relate a fraction to a simple decimal on a number line.
- 1.8 **Use concepts of negative numbers (e.g., on a number line, in counting, in temperature, "owing").**
- 1.9 Identify on a number line the relative of position fractions, mixed numbers, and positive decimals to two decimal places.

**2.0 Students extend their use and understanding of whole numbers to the addition and subtraction of simple decimals:**

- 2.1 Estimate and compute the sum or difference of whole numbers and positive decimals to two places.
- 2.2 Round two-place decimals to one decimal or the nearest whole number and judge

the reasonableness of the rounded answer.

**3.0 Students solve problems involving addition, subtraction, multiplication, and division of whole numbers and understand the relationships among the operations:**

**3.1 Demonstrate an understanding of, and the ability to use, standard algorithms for addition and subtraction of multi-digit numbers.**

**3.2 Demonstrate understanding of, and ability to use standard algorithms for multiplying a multi-digit number by a two-digit number and for dividing a multi-digit number by a one-digit number; use relationships between them to simplify computations and to check results.**

3.3. Solve problems involving multiplication of multi-digit numbers by two-digit numbers.

3.4. Solve problems involving division of multi-digit numbers by one-digit numbers.

**4.0 Students know how to factor small whole numbers.**

4.1 Understand that many whole numbers can be factored in different ways (e.g.,  $12 = 4 \times 3 = 2 \times 6 = 2 \times 2 \times 3$ ).

**4.2 Know that numbers such as 2, 3, 5, 7, and 11 do not have any factors except 1 and themselves and that such numbers are called prime numbers.**

**ALGEBRA AND FUNCTIONS**

**1.0 Students use and interpret variables, mathematical symbols and properties to write and simplify expressions and sentences:**

1.1 Use letters, boxes, or other symbols to stand for any number in simple expressions or equations (e.g., demonstrate an understanding and use of a concept of a variable).

1.2 Interpret and evaluate mathematical expressions that use parentheses.

**1.3 Use parentheses to indicate which operation to perform first when writing expressions containing more than two terms and different operations.**

**1.4 Use and interpret formulas (e.g., area = length x width or  $A = lw$ ) to answer questions about quantities and their relationships.**

1.5 Understand that an equation such as  $y = 3x + 5$  is a formula for determining a second number when a first number is given.

**2.0 Students know how to manipulate equations.**

2.1 Know and understand that equals added to equals are equal.

2.2 Know and understand that equals multiplied by equals are equal.

## MEASUREMENT AND GEOMETRY

### **1.0 Students understand perimeter and area:**

- 1.1 Measure the area of rectangular shapes by using appropriate units, such as square centimeter ( $\text{cm}^2$ ), square meter ( $\text{m}^2$ ), square kilometer ( $\text{km}^2$ ), square inches ( $\text{in}^2$ ), square yard ( $\text{yd}^2$ ).
- 1.2 Recognize that rectangles that have the same area can have different perimeters.
- 1.3 Understand that rectangles that have the same perimeter can have different areas.
- 1.4 Understand and use formulas to solve problems involving perimeters and areas of rectangles and squares. Use these formulas to find the areas of more complex figures by dividing the figures into basic shapes.**

### **2.0 Students use two-dimensional coordinate grids to represent points and graph lines and simple figures:**

- 2.1 Draw the points corresponding to linear relationships on graph paper (e.g., draw 10 points on the graph of the equation  $y = 3x$  and connect them by using a straight line).**
- 2.2 Understand that the length of a horizontal line segment equals the difference of the x-coordinates.
- 2.3 Understand that the length of a vertical line segment equals the difference of the y-coordinates.

### **3.0 Students demonstrate an understanding of plane and solid geometric objects and use this knowledge to show relationships and solve problems:**

- 3.1 Identify lines that are parallel and perpendicular.**
- 3.2 Identify the radius and diameter of a circle.**
- 3.3 Identify congruent figures.**
- 3.4 identify figures that have bilateral and rotational symmetry.
- 3.5 know the definitions of right angle, acute angle and obtuse angle. understand that 90, 180, 270, and 360 degrees are, associated, respectively, with  $1/4$ ,  $1/2$ ,  $3/4$  and full turns.**
- 3.6 Visualize, describe, 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 cut and folded, will make a model of the solid.
- 3.7 Know the definitions of different triangles (e.g., equilateral, isosceles, scalene) and identify their features.

- 3.8 Know the definition of different quadrilaterals (e.g., rhombus, square, rectangle, parallelogram, trapezoid).

## **STATISTICS, DATA ANALYSIS and PROBABILITY**

### **1.0 Students organize, represent, and interpret numerical and categorical data and clearly communicate their findings:**

- 1.1 **Formulate survey questions; systematically collect and represent data on a number line; and coordinate graphs, tables and charts.**
- 1.2 **Identify the mode(s) for sets of categorical data and the mode(s), median, and any apparent outliers for numerical data sets.**
- 1.3 Interpret one- and two-variable data graphs to answer questions about a situation.

### **2.0 Students make predictions for simple probability situations:**

- 2.1 Represent all possible outcomes for a simple probability situation in an organized way (e.g., tables, grids, tree diagrams).
- 2.2 **Express outcomes of experimental probability situations verbally and numerically (e.g., 3 out of 4;  $3/4$ )**

## **MATHEMATICAL REASONING**

### **1.0 Students make decisions about how to approach problems:**

- 1.1 **Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.**
- 1.2 Determine when and how to break a problem into simpler parts.

### **2.0 Students use strategies, skills and concepts in finding solutions:**

- 2.1 **Use estimation to verify the reasonableness of calculated results.**
- 2.2 Apply strategies and results from simpler problems to more complex problems.
- 2.3 **Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.**
- 2.4 **Express the solution clearly and logically using appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.**
- 2.5 Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- 2.6 Make precise calculations and check the validity of the results from the context of the problem.

**3.0 Students move beyond a particular problem by generalizing to other situations:**

- 3.1 Evaluate the reasonableness of the solution in the context of the original situation.**
- 3.2 Note method of deriving the solution and demonstrate conceptual understanding of the derivation by solving similar problems.
- 3.3 Develop generalizations of the results obtained and apply them to other circumstances.

# GRADE 5

## Mathematics Content Standards

By the end of fifth grade, students increase their facility with the four basic arithmetic operations applied to fractions and decimals and learn to add and subtract positive and negative numbers. They know and use common measuring units to determine length and area; they know and use formulas to determine the volume of simple geometric figures. Students know the concept of angle measurement and use a protractor and compass in solving problems. They use grids, tables, graphs, and charts to record and analyze data.

### NUMBER SENSE

- 1.0 Students compute with very large and very small numbers, positive and negative numbers, decimals and fractions and understand the relationship between decimals, fractions and percents. They understand the relative magnitudes of numbers.**
- 1.1 Estimate, round, and manipulate very large (e.g., millions) and very small (e.g., thousandths) numbers.
  - 1.2 Interpret percents as part of a hundred; find decimal and percent equivalents for common fractions and explain why they represent the same value; compute a given percent of a whole number.**
  - 1.3 Understand and compute positive integer powers of non-negative integers; compute examples as repeated multiplication.
  - 1.4 Determine the prime factors of all numbers through 50 and write numbers as the product of their prime factors using exponents to show multiples of a factor (e.g.,  $24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3$ ).**
  - 1.5 Identify and represent positive and negative integers, decimals, fractions and mixed numbers on a number line.**
- 2.0 Students perform calculations and solve problems involving addition, subtraction, and simple multiplication and division of fractions and decimals:**
- 2.1 Add, subtract, multiply and divide with decimals; add with negative integers; subtract positive integers from negative integers; and verify the reasonableness of the results.**
  - 2.2 Demonstrate proficiency with division, including division with positive decimals and long division with multi-digit divisors.**
  - 2.3 Solve simple problems, including ones arising in concrete situations, involving the addition and subtraction of fractions and mixed numbers (like and unlike denominators of 20 or less), and express answers in simplest form.**

- 2.4 Understand the concept of multiplication and division of fractions.
- 2.5 Compute and perform simple multiplication and division of fractions and apply these procedures to solving problems.

## **ALGEBRA AND FUNCTIONS**

### **1.0 Students use variables in simple expressions, compute the value of the expression for specific values of the variable, and plot and interpret the results:**

- 1.1 Use information taken from a graph or equation to answer questions about a problem situation.
- 1.2 **Use a letter to represent an unknown number; write and evaluate simple algebraic expressions in one variable by substitution.**
- 1.3 Know and use the distributive property in equations and expressions with variables.
- 1.4 **Identify and graph ordered pairs in the four quadrants of the coordinate plane.**
- 1.5 **Solve problems involving linear functions with integer values; write the equation; and graph the resulting ordered pairs of integers on a grid.**

## **MEASUREMENT AND GEOMETRY**

### **1.0 Students understand and compute volumes and areas of simple objects:**

- 1.1 **Derive and use the formula for the area of a triangle and parallelogram by comparing each with the formula for the area of a rectangle (e.g., two of the same triangles make a parallelogram with twice the area; a parallelogram is compared to a rectangle of the same area found by cutting and pasting a right triangle on the parallelogram).**
- 1.2 Construct cube and rectangular box from two-dimensional patterns and use these patterns to compute the surface area for these objects.
- 1.3 **Understand the concept of volume and use the appropriate units in common measuring systems (e.g., cubic centimeter, [cm<sup>3</sup>]; cubic meter, [m<sup>3</sup>]; cubic inch, [in<sup>3</sup>]; cubic yard) [yd<sup>3</sup>]; to compute the volume of rectangular solids.**
- 1.4 Differentiate between, and use appropriate units of measures for, two- and three-dimensional objects (i.e. perimeter, area and volume)

### **2.0 Students identify, describe, draw and classify properties of, and relationships between, plane and solid geometric figures**

- 2.1 **Measure, identify, and draw angles, perpendicular and parallel lines, rectangles, and triangles, using appropriate tools (e.g., straight edge, ruler, compass, protractor and drawing software).**

- 2.2 **Know that the sum of the angles of any triangle is 180 degrees and the sum of any quadrilateral is 360 degrees and use this information to solve problems.**
- 2.3 Visualize and draw two-dimensional views of three-dimensional objects made from rectangular solids.

## **STATISTICS, DATA ANALYSIS and PROBABILITY**

- 1.0 **Students display, analyze, compare and interpret different data sets, including data sets of different sizes:**
  - 1.1 Know the concepts of mean, median, and mode; compute and compare simple examples to show that they may differ.
  - 1.2 Organize and display single-variable data in appropriate graphs and representations (e.g., histogram, circle graphs) and explain which types of graphs are appropriate for various data sets.
  - 1.3 Use fractions and percentages to compare data sets of different size.
  - 1.4 **Identify ordered pairs of data from a graph and interpret the meaning of the data in terms of the situation depicted by the graph.**
  - 1.5 **Know how to write ordered pairs correctly; for example (e.g., (x, y).**

## **MATHEMATICAL REASONING**

- 1.0 **Students make decisions about how to approach problems.**
  - 1.1 **Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.**
  - 1.2 **Determine when and how to break a problem into simpler parts.**
- 2.0 **Students use strategies, skills and concepts in finding solutions.**
  - 2.1. **Use estimation to verify the reasonableness of calculated results.**
  - 2.2. Apply strategies and results from simpler problems to more complex problems.
  - 2.3. **Use a variety of methods such as words, numbers, symbols, charts, graphs, tables, diagrams and models to explain mathematical reasoning**
  - 2.4. **Express the solution clearly and logically by using appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.**
  - 2.5. Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy
  - 2.6. Make precise calculations and check the validity of the results from the context of the problem.

**3.0 Students move beyond a particular problem by generalizing to other situations:**

**3.1 Evaluate the reasonableness of the solution in the context of the original situation.**

3.2 Note method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.

3.3 Develop generalizations of the results obtained and extend them to other circumstances.

# GRADE 6

## Mathematics Content Standards

By the end of sixth grade, students have mastered the four arithmetic operations with positive and negative numbers, whole numbers, fractions and decimals; they accurately compute and solve problems. They apply their knowledge to statistics and probability. Students understand the concept of and how to calculate the range, mean, median and mode of data sets. They analyze data and sampling processes for possible bias and misleading conclusions, and they use addition and multiplication of fractions routinely to calculate probabilities for compound events. Students conceptually understand and work with ratios and proportions; they compute percentages (e.g., tax, tips, interest). Students know about  $\pi$  and the formulas for the circumference and area of a circle. They use letters for numbers in formulas involving geometric shapes and in representing an unknown part of a ratio. They solve 1-step linear equations.

### NUMBER SENSE

- 1.0 Students compare and order fractions, decimals, and mixed numbers. They solve problems involving fractions, ratios, proportions, and percentages:**
- 1.1 Compare and order positive and negative fractions, decimals, and mixed numbers and place them on a number line.
  - 1.2 **Interpret and use ratios in different contexts (e.g., batting averages, miles per hour) to show the relative sizes of two quantities, using appropriate notations (a/b, a to b, a:b).**
  - 1.3 **Use proportions to solve problems (e.g., determine the value of N if  $4/7 = N/21$ , find the length of a side of a polygon similar to a known polygon). Use cross-multiplication as a method for solving such problems, understanding it as multiplication of both sides of an equation by a multiplicative inverse.**
  - 1.4 **Calculate given percentages of quantities and solve problems involving discounts at sales, interest earned, and tips.**
- 2.0 Students calculate and solve problems involving addition, subtraction, multiplication and division of rational numbers:**
- 2.1 Solve problems involving addition, subtraction, multiplication and division of fractions and explain why a particular operation was used for a given situation.
  - 2.2 Explain the meaning of multiplication and division of fractions and perform the calculations (e.g.,  $5/8$  divided by  $15/16 = 5/8 \times 16/15 = 2/3$ ).
  - 2.3 **Solve addition, subtraction, multiplication and division problems, including those arising in concrete situations that use positive and negative numbers and combinations of these operations.**
  - 2.4 **Determine the least common multiple and greatest common divisor of whole**

numbers; use them to solve problems with fractions (e.g., to find a common denominator to add two fractions or to find the reduced form for a fraction).

## **ALGEBRA AND FUNCTIONS**

**1.0 Students write verbal expressions and sentences as algebraic expressions and equations; they evaluate algebraic expressions, solve simple linear equations and graph and interpret their results:**

**1.1 Write and solve one-step linear equations in one variable.**

1.2 Write and evaluate an algebraic expression for a given situation using up to three variables.

**1.3 Apply algebraic order of operations and the commutative, associative and distributive properties to evaluate expressions and justify each step in the process.**

1.4 Solve problems using correct order of operations manually and by using a scientific calculator.

**2.0 Students analyze and use tables, graphs and rules to solve problems involving rates and proportions:**

2.1 Convert from one unit of measurement to another (e.g., from feet to miles, from centimeters to inches).

**2.2 Demonstrate understanding that rate is a measure of one quantity per unit value of another quantity.**

2.3 Solve problems involving rates, average speed, distance and time.

**3.0 Students investigate geometric patterns and describe them algebraically:**

3.1 Use variables in expressions describing geometric quantities (e.g.,  $P = 2w + 2l$ ,  $A = 1/2 bh$ ,  $C = \pi d$ , which give the perimeter of a rectangle, area of a triangle, and circumference of a circle, respectively).

3.2 Express in symbolic form simple relationships arising from geometry.

## **MEASUREMENT AND GEOMETRY**

**1.0 Students deepen their understanding of measurement of plane and solid shapes and use this understanding to solve problems:**

**1.1 Understand the concept of a constant number like  $\pi$ . Know the formula for the circumference and area of a circle.**

1.2 Know common estimates of  $\pi$  (3.14;  $22/7$ ) and use these values to estimate and calculate the circumference and the area of circles; compare with actual measurements.

- 1.3 Know and use the formulas for the volume of triangular prisms and cylinders (area of base x height); compare and explain the similarity between these formulas and the formula for the volume of a rectangular solid.

**2.0 Students identify and describe the properties of two-dimensional figures:**

- 2.1 Identify angles as vertical, adjacent, complementary, or supplementary and provide descriptions of these terms.
- 2.2 **Use the properties of complimentary and supplementary angles and of the sum of the angles of a triangle to solve problems involving an unknown angle.**
- 2.3 Draw quadrilaterals and triangles from given information about them (e.g., a quadrilateral having equal sides but no right angles, a right isosceles triangle).

**STATISTICS, DATA ANALYSIS and PROBABILITY**

**1.0 Students compute and analyze statistical measurement for data sets:**

- 1.1 Compute the range, mean, median and mode of data sets.
- 1.2 Understand how additional data added to data sets can effect these computations of measures of central tendency.
- 1.3 Understand how the inclusion or exclusion of outliers affect measures of central tendency.
- 1.4 **Know why a specific measure of central tendency (mean, median, mode) provides the most useful information in a given context.**

**2.0 Students use data samples of a population and describe the characteristics and limitations of the samples:**

- 2.1 Compare different samples from a population with the data from the entire population and identify when it makes sense to use a sample.
- 2.2 **Identify different ways of selecting a sample (e.g., convenience sampling, those who respond to a survey, random sampling) and which makes a sample more representative for a population.**
- 2.3 **Analyze data displays and explain how the way the question was asked might have influenced the results obtained, and/or how the way the results were displayed might have influenced the conclusions reached.**
- 2.4 Identify data that represent sampling and explain why the sample (and the display) may be biased.
- 2.5 **Identify claims based on statistical data and, in simple cases, evaluate the validity of the claims.**

**3.0 Students determine theoretical and experimental probabilities and use these to**

**make predictions about events:**

- 3.1 Represent all possible outcomes for compound events in an organized way (e.g., tables, grids, tree diagrams) and express the theoretical probability of each outcome.**
- 3.2 Use data to estimate the probability for future events (e.g., batting averages or number of accidents per mile driven).**
- 3.3 Represent probabilities as ratios, proportions, and decimals between 0 and 1, and percents between 0 and 100 and check that probabilities computed are reasonable; know how this is related to the probability of an event not occurring.**
- 3.4 Understand that the probability of either of two disjoint events occurring is the sum of the two individual probabilities and that the probability of one event following another, in independent trials, is the product of the two probabilities.
- 3.5 Understand the difference between independent and dependent events and how this affects the results for specific probability situations.**

## **MATHEMATICAL REASONING**

**1.0 Students make decisions about how to approach problems:**

- 1.1 Analyze problems by identifying relationships, discriminating relevant from irrelevant information, identifying missing information, sequencing and prioritizing information and observing patterns.**
- 1.2 Formulate and justify mathematical conjectures based upon a general description of the mathematical question or problem posed.
- 1.3 Determine when and how to break a problem into simpler parts.**

**2.0 Students use strategies, skills and concepts in finding solutions:**

- 2.1 Use estimation to verify the reasonableness of calculated results.**
- 2.2 Apply strategies and results from simpler problems to more complex problems.**
- 2.3 Estimate unknown quantities graphically and solve for them using logical reasoning, and arithmetic and algebraic techniques.
- 2.4 Use a variety of methods such as words, numbers, symbols, charts, graphs, tables, diagrams and models to explain mathematical reasoning.**
- 2.5 Express the solution clearly and logically using appropriate mathematical notation and terms and clear language, and support solutions with evidence, in both verbal and symbolic work.**
- 2.6 Indicate the relative advantages of exact and approximate solutions to problems

and give answers to a specified degree of accuracy.

2.7 Make precise calculations and check the validity of the results from the context of the problem.

**3.0 Students move beyond a particular problem by generalizing to other situations:**

3.1 Evaluate the reasonableness of the solution in the context of the original situation.

3.2 Note method of deriving the solution and demonstrate conceptual understanding of the derivation by solving similar problems.

3.3 Develop generalizations of the results obtained and the strategies used and extend them to new problem situations.