

KINDERGARTEN BENCHMARKS AND INDICATORS

Grade Level Indicators	
S01. Number, Number Sense and Operations	
A. Use place value concepts to represent whole numbers using numerals, words and physical models.	
NS0KA05	05 Relate, read and write numerals for single-digit numbers (0 to 9).
B. Recognize, classify, compare and order whole numbers.	
NS0KB01	01 Compare and order whole numbers up to 10.
NS0KB07	07 Compare the number of objects in two or more sets when one set has one or two more, or one or two fewer objects.
NS0KB13	13 Recognize the number or quantity of sets up to 5 without counting; e.g. recognize without counting the dot arrangement on a domino as 5.
D. Determine the value of a collection of coins and dollar bills.	
NS0KD09	09 Identify and state the value of a penny, nickel and dime.
F. Count, using numerals and ordinal numbers.	
NS0KF02	02 Explain rules of counting, such as each object should be counted once and that order does not change the number.
NS0KF03	03 Count to twenty; e.g., in play situations or while reading number books.
NS0KF04	04 Determine "how many" in sets (groups) of 10 or fewer objects.
G. Model, represent and explain addition as combining sets and counting on.	
NS0KG08	08 Represent and use whole numbers in flexible ways, including relating, composing and decomposing numbers; e.g., 5 marbles can be 2 red and 3 green or 1 red and 4 green.
NS0KG10	10 Model and represent addition as combining sets and counting on, and subtraction as take-away and comparison. For example: a. Combine and separate small sets of objects in contextual situations; e.g., add or subtract one, two or another small amount. b. Count on (forward) and count back (backward) on a number line between 0 and 10.
H. Model, represent and explain subtraction as comparison, take-away and part-to-whole.	
NS0KH08	08 Represent and use whole numbers in flexible ways, including relating, composing and decomposing numbers; e.g., 5 marbles can be 2 red and 3 green or 1 red and 4 green.
NS0KH10	10 Model and represent addition as combining sets and counting on, and subtraction as take-away and comparison. For example: a. Combine and separate small sets of objects in contextual situations; e.g., add or subtract one, two or another small amount. b. Count on (forward) and count back (backward) on a number line between 0 and 10.

I. Model, represent and explain multiplication as repeated addition, rectangular arrays and skip counting.	
NS0KI06	06 Construct multiple sets of objects each containing the same number of objects.
NS0KI11	11 Demonstrate joining multiple groups of objects, each containing the same number of objects: e.g., combining 3 bags of candy, each containing 2 pieces.
J. Model, represent and explain division as sharing equally, repeated subtraction and rectangular arrays.	
NS0KJ12	12 Partition or share a small set of objects into groups of equal size; e.g., sharing 6 stickers equally among 3 children.
K. Demonstrate fluency in addition facts with addends through 9 and corresponding subtractions.	
NS0KK08	08 Represent and use whole numbers in flexible ways, including relating, composing and decomposing numbers; e.g., 5 marbles can be 2 red and 3 green or 1 red and 4 green.
S02. Measurement	
B. Select appropriate units for length, weight, volume (capacity) and time, using: - objects; i.e., non-standard units; - U.S. customary units: inch, foot, yard, ounce, pound, cup, quart, gallon, minute, hour, day, week and year; - metric units: centimeter, meter, gram and liter.	
M0KB01	01 Identify units of time (day, week, month, year) and compare calendar elements; e.g., weeks are longer than days.
M0KB02	02 Compare and order objects of different lengths, areas, weights and capacities; and use relative terms, such as longer, shorter, bigger, smaller, heavier, lighter, more and less.
C. Develop common referents for units of measure for length, weight, volume (capacity) and time to make comparisons and estimates.	
M0KC01	01 Identify units of time (day, week, month, year) and compare calendar elements; e.g., weeks are longer than days.
M0KC02	02 Compare and order objects of different lengths, areas, weights and capacities; and use relative terms, such as longer, shorter, bigger, smaller, heavier, lighter, more and less.
M0KC04	04 Order events based on time. For example: a. activities that take a long or short time; b. review what we do first, next, last; c. recall what we did or plan to do yesterday, today, tomorrow.
D. Apply measurement techniques to measure length, weight and volume (capacity).	
M0KD03	03 Measure length and volume (capacity) using uniform objects in the environment. For example, find: a. how many paper clips long is a pencil; b. how many small containers it takes to fill one big container using sand, rice, beans.

S03. Geometry and Spatial Sense	
C. Sort and compare two-dimensional figures and three-dimensional objects according to their characteristics and properties.	
GSS0KC01	01 Identify and sort two-dimensional shapes and three-dimensional objects. For example: <ul style="list-style-type: none"> a. Identify and describe two-dimensional figures and three-dimensional objects from the environment using the child's own vocabulary. b. Sort shapes and objects into groups based on student-defined categories. c. Select all shapes or objects of one type from a group. d. Build two-dimensional figures using paper shapes or tangrams; build simple three-dimensional objects using blocks.
F. Describe location, using comparative (before, after), directional (above, below), and positional (first, last) words.	
GSS0KF02	02 Name and demonstrate the relative position of objects as follows: <ul style="list-style-type: none"> a. place objects over, under, inside, outside, on, beside, between, above, below, on top of, upside-down, behind, in back of, in front of; b. describe placement of objects with terms such as on, inside, outside, above, below, over, under, beside, between, in front of, behind.
S04. Patterns, Functions and Algebra	
A. Sort, classify and order objects by size, number and other properties, and describe the attributes used.	
PFA0KA01	01 Sort, classify and order objects by size, number and other properties. For example: <ul style="list-style-type: none"> a. Identify how objects are alike and different. b. Order three events or objects according to a given attribute, such as time or size. c. Recognize and explain how objects can be classified in more than one way. d. Identify what attribute was used to sort groups of objects that have already been sorted.
B. Extend sequences of sounds and shapes or simple number patterns, and create and record similar patterns.	
PFA0KB02	02 Identify, create, extend and copy sequences of sounds (such as musical notes), shapes (such as buttons, leaves or blocks), motions (such as hops or skips), and numbers from 1 to 10.
C. Create and extend patterns, and describe the rule in words.	
PFA0KC03	03 Describe orally the pattern of a given sequence.

D. Model problem situations, using objects, pictures, numbers and other symbols.	
PFA0KD04	04 Model a problem situation using physical materials.
S05. Data Analysis & Probability	
A. Pose questions and gather data about everyday situations and familiar objects.	
DAP0KA01	01 Gather and sort data in response to questions posed by teacher and students; e.g., how many sisters and brothers, what color shoes.
B. Sort and classify objects by attributes, and organize data into categories in a simple table or chart.	
DAP0KB02	02 Arrange objects in a floor or table graph according to attributes, such as use, size, color, or shape.
DAP0KB03	03 Select the category or categories that have the most or fewest objects in a floor or table graph.
S06. Mathematical Processes	
A. Use a variety of strategies to understand problem situations; e.g., discussing with peers, stating problems in own words, modeling problems with diagrams or physical materials, identifying a pattern.	
B. Identify and restate in own words the question or problem and the information needed to solve the problem.	
C. Generate alternative strategies to solve problems.	
D. Evaluate the reasonableness of predictions, estimations and solutions.	
E. Explain to others how a problem was solved.	
F. Draw pictures and use physical models to represent problem situations and solutions.	
G. Use invented and conventional symbols and common language to describe a problem situation and solution.	
H. Recognize the mathematical meaning of common words and phrases, and relate everyday language to mathematical language and symbols.	
I. Communicate mathematical thinking by using everyday language and appropriate mathematical language.	

GRADE 1 BENCHMARKS AND INDICATORS

Grade Level Indicators	
S01. Number, Number Sense and Operations	
A. Use place value concepts to represent whole numbers using numerals, words and physical models.	
NS01A05	05 Use place value concepts to represent whole numbers using numerals, words, expanded notation and physical models with ones and tens. For example: <ol style="list-style-type: none"> a. Develop a system to group and count by twos, fives and tens. b. Identify patterns and groupings in a 100's chart and relate to place value concepts. c. Recognize the first digit of a two-digit number as the most important to indicate size of a number and the nearness to 10 or 100.
NS01A03	03 Use ordinal numbers to order objects; e.g., first, second, third.
B. Recognize, classify, compare and order whole numbers.	
NS01B01	01 Use ordinal numbers to order objects; e.g., first, second, third.
NS01B02	02 Recognize and generate equivalent forms for the same number using physical models, words and number expressions; e.g., concept of ten is described by "10 blocks", full tens frame, numeral 10, $5 + 5$, $15 - 5$, one less than 11, my brother's age.
NS01B04	04 Count forward to 100, count backwards from 100, and count forward or backward starting at any number between 1 and 100.
NS01B15	15 Demonstrate that equal means "the same as" using visual representations.
C. Represent commonly used fractions using words and physical models.	
NS01C09	09 Represent commonly used fractions using words and physical models for halves, thirds and fourths, recognizing fractions are represented by equal size parts of a whole and of a set of objects.
D. Determine the value of a collection of coins and dollar bills.	
NS01D06	06 Identify and state the value of a penny, nickel, dime, quarter and dollar.
NS01D07	07 Determine the value of a small collection of coins (with a total value up to one dollar) using 1 or 2 different type coins, including pennies, nickels, dimes and quarters.
E. Make change using coins for values up to one dollar.	
NS01E08	08 Show different combinations of coins that have the same value.
F. Count, using numerals and ordinal numbers.	
NS01F04	04 Count forward to 100, count backwards from 100, and count forward or backward starting at any number between 1 and 100.

G. Model, represent and explain addition as combining sets and counting on.	
NS01G10	10 Model, represent and explain addition as combining sets (part + part = whole) and counting on. For example: a. Model and explain addition using physical materials in contextual situations. b. Draw pictures to model addition. c. Write number sentences to represent addition. d. Explain that adding two whole numbers yields a larger whole number.
NS01G12	12 Use conventional symbols to represent the operations of addition and subtraction.
H. Model, represent and explain subtraction as comparison, take-away and part-to-whole.	
NS01H11	11 Model, represent and explain subtraction as take-away and comparison. For example: a. Model and explain subtraction using physical materials in contextual situations. b. Draw pictures to model subtraction. c. Write number sentences to represent subtraction. d. Explain that subtraction of whole numbers yields an answer smaller than the original number.
NS01H12	12 Use conventional symbols to represent the operations of addition and subtraction.
I. Model, represent and explain multiplication as repeated addition, rectangular arrays and skip counting.	
NS01I13	13 Model and represent multiplication as repeated addition and rectangular arrays in contextual situations; e.g., four people will be at my party and if I want to give 3 balloons to each person, how many balloons will I need to buy?
J. Model, represent and explain division as sharing equally, repeated subtraction and rectangular arrays.	
NS01J14	14 Model and represent division as sharing equally in contextual situations; e.g., sharing cookies.
K. Demonstrate fluency in addition facts with addends through 9 and corresponding subtractions.	
NS01K16	16 Develop strategies for basic addition facts, such as: a. counting all; b. counting on; c. one more, two more; d. doubles; e. doubles plus or minus one; f. make ten; g. using tens frames; h. identify property (adding zero).

NS01K17	17 Develop strategies for basic subtraction facts, such as: a. relating to addition (for example, think of $7 - 3 = ?$ as "3 plus ? equals 7"); b. one less, two less; c. all but one (for example, $8 - 7, 5 - 4$); d. using tens frames; and, e. missing addends.
L. Demonstrate fluency in adding and subtracting multiples of 10, and recognize combinations that make 10.	
NS01L16	16 Develop strategies for basic addition facts, such as: a. counting all; b. counting on; c. one more, two more; d. doubles; e. doubles plus or minus one; f. make ten; g. using tens frames; and, h. identity property (adding zero).
NS01L17	17 Develop strategies for basic subtraction facts, such as: a. relating to addition (for example, think of think of $7 - 3 = ?$ as "3 plus ? equals 7"); b. one less, two less; c. all but one (for example, $8 - 7, 5 - 4$); d. using tens frames; and, e. missing addends.
S02. Measurement	
A. Explain the need for standard units of measure.	
M01A01	01 Recognize and explain the need for fixed units and tools for measuring length and weight; e.g., rulers and balance scales.
C. Develop common referents for units of measure for length, weight, volume (capacity) and time to make comparisons and estimates.	
M01C02	02 Tell time to the hour and half hour on digital and analog (dial) timepieces.
M01C03	03 Order a sequence of events with respect to time; e.g., summer, fall, winter and spring; morning, afternoon and night.
D. Apply measurement techniques to measure length, weight and volume (capacity).	
M01D04	04 Estimate and measure weight using non-standard units; e.g., blocks of uniform size.
M01D05	05 Estimate and measure lengths using non-standard and standard units; i.e., centimeters, inches and feet.

S03. Geometry and Spatial Sense	
A. Describe and create plane figures: circle, rectangle, square, triangle, hexagon, trapezoid, parallelogram and rhombus, and identify them in the environment.	
GSS01A02	02 Create new shapes by combining or cutting apart existing shapes.
GSS01A03	03 Identify the shapes of the faces of three-dimensional objects.
B. Describe solid objects: cube, rectangular prism, sphere, cylinder, cone and pyramid, and identify them in the environment.	
GSS01B03	03 Identify the shapes of the faces of three-dimensional objects.
C. Sort and compare two-dimensional figures and three-dimensional objects according to their characteristics and properties.	
GSS01C01	01 Identify, compare and sort two-dimensional shapes; i.e., square, circle, ellipse, triangle, rectangle, rhombus, trapezoid, parallelogram, pentagon and hexagon. For example: <ul style="list-style-type: none"> a. Recognize and identify triangles and rhombuses independent of position, shape or size; b. Describe two-dimensional shapes using attributes such as number of sides and number of vertices (corners or angles).
D. Identify, explain and model (superposition, copying) the concept of shapes being congruent and similar.	
GSS01D05	05 Copy figures and draw simple two-dimensional shapes from memory.
E. Recognize two- and three-dimensional objects from different positions.	
GSS01E05	05 Copy figures and draw simple two-dimensional shapes from memory.
F. Describe location, using comparative (before, after), directional (above, below), and positional (first, last) words.	
GSS01F04	04 Extend the use of location words to include distance (near, far, close to) and directional words (left, right).
G. Identify and draw figures with line symmetry.	
GSS01G05	05 Copy figures and draw simple two-dimensional shapes from memory.
S04. Patterns, Functions and Algebra	
A. Sort, classify and order objects by size, number and other properties, and describe the attributes used.	
PFA01A01	01 Sort, classify and order objects by two or more attributes, such as color and shape, and explain how objects were sorted.
B. Extend sequences of sounds and shapes or simple number patterns, and create and record similar patterns.	
PFA01B02	02 Extend sequences of sounds and shapes or simple number patterns, and create and record similar patterns. <ul style="list-style-type: none"> a. Analyze and describe patterns with multiple attributes using numbers and shapes; e.g., AA, B, aa, b, AA, B, aa, b,... b. Continue repeating and growing patterns with materials, pictures and geometric items; e.g., XO, XO0, X000, X0000.

C. Create and extend patterns, and describe the rule in words.	
PFA01C03	03 Describe orally the basic unit or general plan of a repeating or growing pattern.
D. Model problem situations, using objects, pictures, numbers and other symbols.	
PFA01D05	05 Describe orally and model a problem situation using words, objects or number phrase or sentence.
E. Solve open sentences and explain strategies.	
PFA01E04	04 Solve open sentences by representing an expression in more than one way using the commutative property; e.g., $4 + 5 = 5 + 4$ or the number of blue balls plus red balls is the same as the number of red balls plus blue balls ($R + B = B + R$).
S05. Data Analysis & Probability	
A. Pose questions and gather data about everyday situations and familiar objects.	
DAP01A05	05 Construct a question that can be answered by using information from a graph.
B. Sort and classify objects by attributes, and organize data into categories in a simple table or chart.	
DAP01B01	01 Identify multiple categories for sorting data.
DAP01B02	02 Collect and organize data into charts using tally marks.
DAP01B06	06 Arrange five objects by an attribute, such as size or weight, and identify the ordinal position of each object.
DAP01B07	07 Answer questions about the number of objects represented in a picture graph, bar graph or table graph; e.g., category with most, how many more in a category compared to another, how many altogether in two categories.
C. Represent data using objects, picture graphs and bar graphs.	
DAP01C03	03 Display data in picture graphs with units of 1 and bar graphs with intervals of 1.
DAP01C04	04 Read and interpret charts, picture graphs and bar graphs as sources of information to identify main ideas, draw conclusions, and make predictions.
D. Describe the probability of chance events as more, less or equally likely to occur.	
DAP01D08	08 Describe the likelihood of simple events as possible/impossible and more likely/less likely; e.g., when using spinners or number cubes in classroom activities.
S06. Mathematical Processes	
A. Use a variety of strategies to understand problem situations; e.g., discussing with peers, stating problems in own words, modeling problems with diagrams or physical materials, identifying a pattern.	
B. Identify and restate in own words the question or problem and the information needed to solve the problem.	
C. Generate alternative strategies to solve problems.	
D. Evaluate the reasonableness of predictions, estimations and solutions.	

E. Explain to others how a problem was solved.
F. Draw pictures and use physical models to represent problem situations and solutions.
G. Use invented and conventional symbols and common language to describe a problem situation and solution.
H. Recognize the mathematical meaning of common words and phrases, and relate everyday language to mathematical language and symbols.
I. Communicate mathematical thinking by using everyday language and appropriate mathematical language.

GRADE 2 BENCHMARKS AND INDICATORS

Grade Level Indicators	
S01. Number, Number Sense and Operations	
A. Use place value concepts to represent whole numbers using numerals, words and physical models.	
NS02A01	01 Use place value concepts to represent, compare and order whole numbers using physical models, numerals and words, with ones, tens and hundreds. <ul style="list-style-type: none"> a. Recognize 10 can mean "10 ones" or a single entity (1 ten) through physical models and trading games. b. Read and write 3-digit numerals (e.g., 243 as two hundred forty three, 24 tens and 3 ones, or 2 hundreds and 43 ones, etc.) and construct models to represent each.
B. Recognize, classify, compare and order whole numbers.	
NS02B01	01 Use place value concepts to represent, compare and order whole numbers using physical models, numerals and words, with ones, tens and hundreds. For example: <ul style="list-style-type: none"> a. Recognize 10 can mean "10 ones" or a single entity (1 ten) through physical models and trading games. b. Read and write 3-digit numerals (e.g., 243 as two hundred forty three, 24 tens and 3 ones, or 2 hundreds and 43 ones, etc.) and construct models to represent each.
NS02B02	02 Recognize and classify numbers as even or odd.
C. Represent commonly used fractions using words and physical models.	
NS02C05	05 Represent fractions (halves, thirds, fourths, sixths and eighths), using words, numerals and physical models. For example: <ul style="list-style-type: none"> a. Recognize that a fractional part can mean different amounts depending on the original quantity. b. Recognize that a fractional part of a rectangle does not have to be shaded with contiguous parts. c. Identify and illustrate parts of a whole and parts of sets of objects. d. Compare and order physical models of halves, thirds and fourths in relation to 0 and 1.
D. Determine the value of a collection of coins and dollar bills.	
NS02D04	04 Represent and write the value of money using the ¢ sign and in decimal form when using the \$ sign.
E. Make change using coins for values up to one dollar.	
NS02E03	03 Count money and make change using coins and a dollar bill.

H. Model, represent and explain subtraction as comparison, take-away and part-to-whole.	
NS02H06	06 Model, represent and explain subtraction as comparison, take-away and part-to-whole; e.g., solve missing addend problems by counting up or subtracting, such as "I had six baseball cards, my sister gave me more, and I now have ten. How many did she give me?" can be represented as $6 + ? = 10$ or $10 - 6 = ?$.
I. Model, represent and explain multiplication as repeated addition, rectangular arrays and skip counting.	
NS02I07	07 Model, represent and explain multiplication as repeated addition, rectangular arrays and skip counting.
J. Model, represent and explain division as sharing equally, repeated subtraction and rectangular arrays.	
NS02J08	08 Model, represent and explain division as sharing equally and repeated subtraction.
K. Demonstrate fluency in addition facts with addends through 9 and corresponding subtractions.	
NS02K10	10 Demonstrate fluency in addition facts with addends through 9 and corresponding subtractions; e.g., $9 + 9 = 18$, $18 - 9 = 9$.
L. Demonstrate fluency in adding and subtracting multiples of 10, and recognize combinations that make 10.	
NS02L11	11 Add and subtract multiples of 10.
M. Add and subtract two-digit numbers with and without regrouping.	
NS02M09	09 Model and use the commutative property for addition.
NS02M12	12 Demonstrate multiple strategies for adding and subtracting 2- or 3-digit whole numbers, such as: a. compatible numbers; b. compensatory numbers; and, c. informal use of commutative and associative properties of addition.
S02. Measurement	
B. Select appropriate units for length, weight, volume (capacity) and time, using: - objects; i.e., non-standard units; - U.S. customary units: inch, foot, yard, ounce, pound, cup, quart, gallon, minute hour, day, week and year; - metric units: centimeter, meter, gram and liter.	
M02B01	01 Identify and select appropriate units of measure for: a. length - centimeters, meters, inches, feet or yards; b. volume (capacity) - liters, cups, pints or quarts; c. weight - grams, ounces or pounds; and, d. time - hours, half-hours, quarter-hours or minutes and time designations, a.m. or p.m.

C. Develop common referents for units of measure for length, weight, volume (capacity) and time to make comparisons and estimates.	
M02C02	02 Establish personal or common referents for units of measure to make estimates and comparisons; e.g., the width of a finger is a centimeter, a large bottle of soda pop is 2 liters, a small paper clip weighs about one gram.
M02C04	04 Tell time to the nearest minute interval on digital and to the nearest 5 minute interval on analog (dial) timepieces.
D. Apply measurement techniques to measure length, weight and volume (capacity).	
M02D05	05 Estimate and measure the length and weight of common objects, using metric and U.S. customary units, accurate to the nearest unit.
M02D06	06 Select and use appropriate measurement tools; e.g., a ruler to draw a segment 3 inches long, a measuring cup to place 2 cups of rice in a bowl, a scale to weigh 50 grams of candy.
E. Recognize that using different units of measurement will yield different numbers for the same measurement.	
M02E03	03 Describe and compare the relationships among units of measure, such as centimeters and meters; inches, feet and yards; cups, pints and quarts; ounces and pounds; and hours, half-hours, and quarter-hours; e.g., how many inches in a foot?
M02E07	07 Make and test predictions about measurements, using different units to measure the same length or volume.
S03. Geometry and Spatial Sense	
A. Describe and create plane figures: circle, rectangle, square, triangle, hexagon, trapezoid, parallelogram and rhombus, and identify them in the environment.	
GSS02A01	01 Identify, describe, compare and sort three-dimensional objects (i.e., cubes, spheres, prisms, cones, cylinders and pyramids) according to the shape of the faces or the numbers of faces, edges or vertices.
GSS02A02	02 Predict what new shapes will be formed by combining or cutting apart existing shapes.
B. Describe solid objects: cube, rectangular prism, sphere, cylinder, cone and pyramid, and identify them in the environment.	
GSS02B01	01 Identify, describe, compare and sort three-dimensional objects (i.e., cubes, spheres, prisms, cones, cylinders and pyramids) according to the shape of the faces or the numbers of faces, edges or vertices.
C. Sort and compare two-dimensional figures and three-dimensional objects according to their characteristics and properties.	
GSS02C01	01 Identify, describe, compare and sort three-dimensional objects (i.e., cubes, spheres, prisms, cones, cylinders and pyramids) according to the shape of the faces or the numbers of faces, edges or vertices.

D. Identify, explain and model (superposition, copying) the concept of shapes being congruent and similar.	
GSS02D04	04 Identify and determine whether two-dimensional shapes are congruent (same shape and size) or similar (same shape different size) by copying or using superposition (lay one thing on top of another).
E. Recognize two- and three-dimensional objects from different positions.	
GSS02E03	03 Recognize two-dimensional shapes and three-dimensional objects from different positions.
G. Identify and draw figures with line symmetry.	
GSS02G05	05 Create and identify two-dimensional figures with line symmetry; e.g., what letter shapes, logos, polygons are symmetrical?
S04. Patterns, Functions, and Algebra	
B. Extend sequences of sounds and shapes or simple number patterns, and create and record similar patterns.	
PFA02B01	01 Extend simple number patterns (both repeating and growing patterns), and create similar patterns using different objects, such as using physical materials or shapes to represent numerical patterns.
C. Create and extend patterns, and describe the rule in words.	
PFA02C02	02 Use patterns to make generalizations and predictions; e.g., determine a missing element in a pattern.
PFA02C03	03 Create new patterns with consistent rules or plans, and describe the rule or general plan of existing patterns.
D. Model problem situations, using objects, pictures, numbers and other symbols.	
PFA02D04	04 Use objects, pictures, numbers and other symbols to represent a problem situation.
E. Solve open sentences and explain strategies.	
PFA02E05	05 Understand equivalence and extend the concept to situations involving symbols; e.g., $4 + 5 = 9$ and $9 = 4 + 5$, and $4 + 5 = 3 + 6 = \triangle + \triangle \dots$
F. Represent an unknown quantity as a variable using a symbol, such as \square, \triangle, O.	
PFA02F06	06 Use symbols to represent unknown quantities and identify values for symbols in an expression or equation using addition and subtraction; e.g., $\triangle + O = 10$, $\triangle - 2 = 4$
G. Describe and compare qualitative and quantitative change.	
PFA02G07	07 Describe qualitative and quantitative changes, especially those involving addition and subtraction; e.g., a student growing taller versus a student growing two inches in one year.
S05. Data Analysis & Probability	
A. Pose questions and gather data about everyday situations and familiar objects.	
DAP02A01	01 Pose questions, use observations, interviews and surveys to collect data, and organize data in charts, picture graphs and bar graphs.

DAP02A06	06 Recognize that data may vary from one population to another; e.g., favorite TV shows of students and of parents.
B. Sort and classify objects by attributes, and organize data into categories in a simple table or chart.	
DAP02B01	01 Pose questions, use observations, interviews and surveys to collect data, and organize data in charts, picture graphs and bar graphs.
DAP02B04	04 Write a few sentences to describe and compare categories of data represented in a chart or graph, and make statements about the data as a whole.
C. Represent data using objects, picture graphs and bar graphs.	
DAP02C02	02 Read, interpret and make comparisons and predictions from data represented in charts, line plots, picture graphs and bar graphs.
DAP02C03	03 Read and construct simple timelines to sequence events.
DAP02C05	05 Identify untrue or inappropriate statements about a given set of data.
D. Describe the probability of chance events as more, less or equally likely to occur.	
DAP02D07	07 List some of the possible outcomes of a simple experiment, and predict whether given outcomes are more, less or equally likely to occur.
DAP02D08	08 Use physical models and pictures to represent possible arrangements of 2 or 3 objects.
S06. Mathematical Processes	
A. Use a variety of strategies to understand problem situations; e.g., discussing with peers, stating problems in own words, modeling problems with diagrams or physical materials, identifying a pattern.	
B. Identify and restate in own words the question or problem and the information needed to solve the problem.	
C. Generate alternative strategies to solve problems.	
D. Evaluate the reasonableness of predictions, estimations and solutions.	
E. Explain to others how a problem was solved.	
F. Draw pictures and use physical models to represent problem situations and solutions.	
G. Use invented and conventional symbols and common language to describe a problem situation and solution.	
H. Recognize the mathematical meaning of common words and phrases, and relate everyday language to mathematical language and symbols.	
I. Communicate mathematical thinking by using everyday language and appropriate mathematical language.	

**GRADE 3
BENCHMARKS AND INDICATORS**

Grade Level Indicators	
S01. Number, Number Sense and Operations	
A. Use place value structure of the base-ten number system to read, write, represent and compare whole numbers and decimals.	
NS03A02	02 Use place value concepts to represent whole numbers and decimals using numerals, words, expanded notation and physical models. For example: <ol style="list-style-type: none"> a. Recognize 100 means "10 tens" as well as a single entity (1 hundred) through physical models and trading games. b. Describe the multiplicative nature of the number system; e.g., the structure of 3205 as 3×1000 plus 2×100 plus 5×1. c. Model the size of 1000 in multiple ways; e.g., packaging 1000 objects into 10 boxes of 100, modeling a meter with centimeter and decimeter strips, or gathering 1000 pop-can tabs. d. Explain the concept of tenths and hundredths using physical models, such as metric pieces, base ten blocks, decimal squares or money.
NS03A03	03 Use mathematical language and symbols to compare and order; e.g., less than, greater than, at most, at least, $<$, $>$, $=$, greater than, less than.
B. Recognize and generate equivalent representations for whole numbers, fractions and decimals.	
NS03B01	01 Identify and generate equivalent forms of whole numbers; e.g., 36, $30 + 6$, 9×4 , $46 - 10$, number of inches in a yard.
NS03B07	07 Recognize and use decimal and fraction concepts and notations as related ways of representing parts of a whole or a set; e.g., 3 of 10 marbles are red can also be described as $3/10$ and 3 tenths are red.
C. Represent commonly used fractions and mixed numbers using words and physical models.	
NS03C05	05 Represent fractions and mixed numbers using words, numerals and physical models.
D. Use models, points of reference and equivalent forms of commonly used fractions to judge the size of fractions and to compare, describe and order them.	
NS03D03	03 Use mathematical language and symbols to compare and order; e.g., less than, greater than, at most, at least, $<$, $>$, $=$, greater than/equal to, less than/equal to.
NS03D06	06 Compare and order commonly used fractions and mixed numbers using number lines, models (such as fraction circles or bars), points of reference (such as more or less than $1/2$), and equivalent forms found using physical or visual models.

F. Count money and make change using both coins and paper bills.	
NS03F04	04 Count money and make change using coins and paper bills to ten dollars.
G. Model and use commutative and associative properties for addition and multiplication.	
NS03G11	11 Model and use the commutative and associative properties for addition and multiplication.
H. Use relationships between operations, such as subtraction as the inverse of addition and division as the inverse of multiplication.	
NS03H10	10 Explain and use relationships between operations, such as: a. relate addition and subtraction as inverse operations; b. relate multiplication and division as inverse operations; c. relate addition to multiplication (repeated addition); and, d. relate subtraction to division (repeated subtraction).
I. Demonstrate fluency in multiplication facts with factors through 10 and corresponding divisions.	
NS03I13	13 Demonstrate fluency in multiplication facts through 10 and corresponding division facts.
J. Estimate the results of whole number computations using a variety of strategies, and judge the reasonableness.	
NS03J15	15 Evaluate the reasonableness of computations based upon operations and the numbers involved; e.g., considering relative size, place value and estimates.
K. Analyze and solve multi-step problems involving addition, subtraction, multiplication and division of whole numbers.	
NS03K12	12 Add and subtract whole numbers with and without regrouping.
NS03K14	14 Multiply and divide 2- and 3-digit numbers by a single-digit number, without remainders for division.
L. Use a variety of methods and appropriate tools (mental math, paper and pencil, calculators) for computing with whole numbers.	
NS03L08	08 Model, represent and explain multiplication; e.g., repeated addition, skip counting, rectangular arrays and area model. For example: a. Use conventional mathematical symbols to write equations for word problems involving multiplication. b. Understand that, unlike addition and subtraction, the factors in multiplication and division may have different units; e.g., 3 boxes of 5 cookies each.
NS03L09	09 Model, represent and explain division; e.g., sharing equally, repeated subtraction, rectangular arrays and area model. For example: a. Translate contextual situations involving division into conventional mathematical symbols. b. Explain how a remainder may impact an answer in a real world situation; e.g., 14 cookies being shared by 4 children.

SO2. Measurement	
A. Select appropriate units for perimeter, area, weight, volume (capacity), time and temperature, using: - objects of uniform size; - U.S. customary units; e.g., mile, square inch, cubic inch, second degree Fahrenheit, and other units as appropriate; - metric units; e.g., millimeter, kilometer, square centimeter, kilogram, cubic centimeter, degree Celsius, and other units as appropriate.	
M03A01	01 Identify and select appropriate units for measuring: a. length - miles, kilometers and other units of measure as appropriate. b. volume (capacity) - gallons; c. weight - ounces, pounds, grams, or kilograms; and, d. temperature - degrees (Fahrenheit or Celsius).
M03A04	04 Read thermometers in both Fahrenheit and Celsius scales.
C. Develop common referents for units of measure for length, weight, volume (capacity) and time to make comparisons and estimates.	
M03C02	02 Establish personal or common referents to include additional units; e.g., a gallon container of milk; a postage stamp is about a square inch.
M03C05	05 Estimate and measure length, weight and volume (capacity), using metric and U.S. customary units, accurate to the nearest $\frac{1}{2}$ or $\frac{1}{4}$ unit as appropriate.
D. Identify appropriate tools and apply counting techniques for measuring side lengths, perimeter and area of squares, rectangles, and simple irregular two dimensional shapes, volume of rectangular prisms, and time and temperature.	
M03D04	04 Read thermometers in both Fahrenheit and Celsius scales.
M03D06	06 Use appropriate measurement tools and techniques to construct a figure or approximate an amount of specified length, weight or volume (capacity); e.g., construct a rectangle with length 2 and $\frac{1}{2}$ inches and width 3 inches, fill a measuring cup to the $\frac{3}{4}$ cup mark.
M03D07	07 Make estimates for perimeter, area and volume using links, tiles, cubes and other models.
E. Tell time to the nearest minute.	
M03E03	03 Tell time to the nearest minute and find elapsed time using a calendar or a clock.
S03. Geometry and Spatial Sense	
A. Provide rationale for groupings and comparisons of two-dimensional figures and three-dimensional objects.	
GSS03A01	01 Analyze and describe properties of two-dimensional shapes and three-dimensional objects using terms such as vertex, edge, angle, side and face.

D. Identify and draw right, obtuse, acute and straight angles	
GSS03D02	02 Identify and describe the relative size of angles with respect to right angles as follows: a. Use physical models, like straws, to make different sized angles by opening and closing the sides, not by changing the side lengths. b. Identify, classify and draw right, acute, obtuse and straight angles.
E. Use attributes to describe, classify and sketch plane figures and build solid objects.	
GSS03E01	01 Analyze and describe properties of two-dimensional shapes and three-dimensional objects using terms such as vertex, edge, angle, side and face.
GSS03E05	05 Build a three-dimensional model of an object composed of cubes; e.g., construct a model based on an illustration or actual object.
G. Find and name locations in coordinate systems.	
GSS03G03	03 Find and name locations on a labeled grid or coordinate system; e.g., a map or graph.
H. Identify and describe line and rotational symmetry in two-dimensional shapes and designs.	
GSS03H04	04 Draw lines of symmetry to verify symmetrical two-dimensional shapes.
S04. Patterns, Functions and Algebra	
A. Describe qualitative and quantitative changes, especially those involving addition and subtraction; e.g., a student growing taller versus a student growing two inches in one year.	
PFA03A01	01 Extend multiplicative and growing patterns, and describe the pattern or rule in words.
PFA03A02	02 Analyze and replicate arithmetic sequences with and without a calculator.
B. Use patterns to make predictions, identify relationships, and solve problems.	
PFA03B03	03 Use patterns to make predictions, identify relationships, and solve problems.
C. Write and solve open sentences and explain strategies.	
PFA03C05	05 Write, solve and explain simple mathematical statements, such as $7 + \Delta > 8$ or $\Delta + 8 = 10$.
PFA03C06	06 Express mathematical relationships as equations and inequalities.
E. Use variables to create and solve equations representing problem situations.	
PFA03E04	04 Model problem situations using objects, pictures, tables, numbers, letters and other symbols.
F. Construct and use a table of values to solve problems associated with mathematical relationships.	
PFA03F07	07 Create tables to record, organize and analyze data to discover patterns and rules.

G. Describe how a change in one variable affects the value of a related variable.	
PFA03G08	08 Identify and describe quantitative changes, especially those involving addition and subtraction; e.g., the height of water in a glass becoming 1 centimeter lower each week due to evaporation.
S05. Data Analysis & Probability	
A. Gather and organize data from surveys and classroom experiments, including data collected over a period of time.	
DAP03A01	01 Collect and organize data from an experiment, such as recording and classifying observations or measurements, in response to a question posed.
B. Read and interpret tables, charts, graphs (bar, picture, line, line plot), and timelines as sources of information, identify main idea, draw conclusions, and make predictions.	
DAP03B04	04 Support a conclusion or prediction orally and in writing, using information in a table or graph.
DAP03B05	05 Match a set of data with a graphical representation of the data.
DAP03B07	07 Analyze and interpret information represented on a timeline.
C. Construct charts, tables and graphs to represent data, including picture graphs, bar graphs, line graphs, line plots and Venn diagrams.	
DAP03C06	06 Translate information freely among charts, tables, line plots, picture graphs and bar graphs; e.g., create a bar graph from the information in a chart.
D. Read, interpret and construct graphs in which icons represent more than a single unit or intervals greater than one; e.g., each (bicycle picture) = 10 bicycles or the intervals on an axis are multiples of 10.	
DAP03D02	02 Draw and interpret picture graphs in which a symbol or picture represents more than one object.
DAP03D03	03 Read, interpret and construct bar graphs with intervals greater than one.
E. Describe data using mode, median and range.	
DAP03E08	08 Identify the mode of a data set and describe the information it gives about a data set.
F. Conduct a simple probability experiment and draw conclusions about the likelihood of possible outcomes.	
DAP03F09	09 Conduct a simple experiment or simulation of a simple event, record the results in a chart, table or graph, and use the results to draw conclusions about the likelihood of possible outcomes.
G. Identify and represent possible outcomes, such as arrangements of a set of up to four members and possible combinations from several sets, each containing 2 or 3 members.	
DAP03G10	10 Use physical models, pictures, diagrams and lists to solve problems involving possible arrangements or combinations of two to four objects.
S06. Mathematical Processes	
A. Apply and justify the use of a variety of problem-solving strategies; e.g., make an organized list, guess and check.	

B. Use an organized approach and appropriate strategies to solve multi-step problems.
C. Interpret results in the context of the problem being solved; e.g., the solution must be a whole number of buses when determining the number of buses necessary to transport students.
D. Use mathematical strategies to solve problems that relate to other curriculum areas and the real world; e.g., use a timeline to sequence events, use symmetry in artwork.
E. Link concepts to procedures and to symbolic notation; e.g., model 3×4 with a geometric array, represent one-third by dividing an object into three equal parts.
F. Recognize relationships among different topics within mathematics; e.g., the length of an object can be represented by a number.
G. Use reasoning skills to determine and explain the reasonableness of a solution with respect to the problem situation.
H. Recognize basic valid and invalid arguments, and use examples and counter examples, models, number relationships, and logic to support or refute.
I. Represent problem situations in a variety of forms (physical model, diagram, in words or symbols), and recognize when some ways of representing a problem may be more helpful than others.
J. Read, interpret, discuss and write about mathematical ideas and concepts using both everyday and mathematical language.
K. Use mathematical language to explain and justify mathematical ideas, strategies and solutions.

**GRADE 4
BENCHMARKS AND INDICATORS**

Grade Level Indicators	
S01. Number, Number Sense and Operations	
A. Use place value structure of the base-ten number system to read, write, represent and compare whole numbers and decimals.	
NS04A02	02 Use place value structure of the base-ten number system to read, write, represent and compare whole numbers through millions and decimals through thousandths.
NS04A03	03 Round whole numbers to a given place value.
B. Recognize and generate equivalent representations for whole numbers, fractions and decimals.	
NS04B01	01 Identify and generate equivalent forms of fractions and decimals. For example: a. Connect physical, verbal and symbolic representations of fractions, decimals and whole numbers; e.g., $1/2$, $5/10$, "five tenths", 0.5, shaded rectangles with half, and five tenths. b. Understand and explain that ten tenths is the same as one whole in both fraction and decimal form.
D. Use models, points of reference and equivalent forms of commonly used fractions to judge the size of fractions and to compare, describe and order them.	
NS04D05	05 Use models and points of reference to compare commonly used fractions.
E. Recognize and classify numbers as prime or composite and list factors.	
NS04E04	04 Identify and represent factors and multiples of whole numbers through 100, and classify numbers as prime or composite.
F. Count money and make change using both coins and paper bills.	
NS04F08	08 Solve problems involving counting money and making change, using both coins and paper bills.
I. Demonstrate fluency in multiplication facts with factors through 10 and corresponding divisions.	
NS04I14	14 Demonstrate fluency in adding and subtracting whole numbers and in multiplying and dividing whole numbers by 1- and 2-digit numbers and multiples of ten.
J. Estimate the results of whole number computations using a variety of strategies, and judge the reasonableness.	
NS04J09	09 Estimate the results of computations involving whole numbers, fractions and decimals, using a variety of strategies.

K. Analyze and solve multi-step problems involving addition, subtraction, multiplication and division of whole numbers.	
NS04K08	08 Use geometric models to solve problems in other areas of mathematics, such as number (multiplication / division) and measurement (area, perimeter border). <i>Geometry and Spatial Sense</i>
NS04K06	06 Use associative and distributive properties to simplify and perform computations; e.g., use left to right multiplication and the distributive property to find an exact answer without paper and pencil, such as: $5 \times 47 = 5 \times 40 + 5 \times 7 = 200 + 35 = 235$.
NS04K07	07 Recognize that division may be used to solve different types of problem situations and interpret the meaning of remainders; e.g., situations involving measurement, money.
NS04K12	12 Analyze and solve multi-step problems involving addition, subtraction, multiplication and division using an organized approach, and verify and interpret results with respect to the original problem.
L. Use a variety of methods and appropriate tools (mental math, paper and pencil, calculators) for computing with whole numbers.	
NS04L11	11. Develop and explain strategies for performing computations mentally.
NS04L13	13 Use a variety of methods and appropriate tools for computing with whole numbers; e.g., mental math, paper and pencil, and calculator.
NS04L14	14 Demonstrate fluency in adding and subtracting whole numbers and in multiplying and dividing whole numbers by 1- and 2-digit numbers and multiples of ten.
M. Add and subtract commonly used fractions with like denominators and decimals, using models and paper and pencil.	
NS04M09	09 Estimate the results of computations involving whole numbers, fractions and decimals, using a variety of strategies.
NS04M10	10 Use physical models, visual representations, and paper and pencil to add and subtract decimals and commonly used fractions with like denominators.
S02. Measurement	
A. Select appropriate units for perimeter, area, weight, volume (capacity), time and temperature, using: - objects of uniform size; - U.S. customary units; e.g., mile, square inch, cubic inch, second degree Fahrenheit, and other units as appropriate; -metric units; e.g., millimeter, kilometer, square centimeter, kilogram, cubic centimeter, degree Celsius, and other units as appropriate.	
M04A03	03 Identify and select appropriate units to measure: a. perimeter - string or links (inches or centimeters). b. area - tiles (square inches or square centimeters). c. volume - cubes (cubic inches or cubic centimeters).

B. Know that the number of units is inversely related to the size of the unit for any item being measured.	
M04B01	01 Relate the number of units to the size of the units used to measure an object; e.g., compare the number of cups to fill a pitcher to the number of quarts to fill the same pitcher.
C. Develop common referents for units of measure for length, weight, volume (capacity) and time to make comparisons and estimates.	
M04C02	02 Demonstrate and describe perimeter as surrounding and area as covering a two-dimensional shape, and volume as filling a three-dimensional object.
D. Identify appropriate tools and apply counting techniques for measuring side lengths, perimeter and area of squares, rectangles, and simple irregular two dimensional shapes, volume of rectangular prisms, and time and temperature.	
M04D04	04 Develop and use strategies to find perimeter using string or links, area using tiles or a grid, and volume using cubes; e.g., count squares to find area of regular or irregular shapes on a grid, layer cubes in a box to find its volume.
M04D05	05 Make conversions within the same measurement system while performing computations. <i>(Grade 5)</i>
M04D06	06 Make conversions within the same measurement system while performing computations. <i>(Grade 5)</i>
S03. Geometry and Spatial Sense	
A. Provide rationale for groupings and comparisons of two-dimensional figures and three-dimensional objects.	
GSS04A03	03 Identify similarities and differences of quadrilaterals; e.g., squares, rectangles, parallelograms and trapezoids.
GSS04A04	04 Identify and define triangles based on angle measures (equiangular, right, acute and obtuse triangles) and side lengths (isosceles, equilateral and scalene triangles).
B. Describe and identify points, lines and planes in the environment.	
GSS04B05	05 Describe points, lines and planes, and identify models in the environment.
C. Describe and identify intersecting, parallel and perpendicular lines or segments in the environment.	
GSS04C01	01 Identify, describe and model intersecting, parallel and perpendicular lines and line segments; e.g., use straws or other material to model lines.
E. Use attributes to describe, classify and sketch plane figures and build solid objects.	
GSS04E02	02 Describe, classify, compare and model two- and three-dimensional objects using their attributes.

F. Develop definitions of classes of shapes.	
GSS04F03	03 Identify similarities and differences of quadrilaterals; e.g., squares, rectangles, parallelograms and trapezoids.
GSS04F04	04 Identify and define triangles based on angle measures (equiangular, right, acute and obtuse triangles) and side lengths (isosceles, equilateral and scalene triangles).
G. Find and name locations in coordinate systems.	
GSS04G06	06 Specify locations and plot ordered pairs on a coordinate plane, using first quadrant points.
I. Describe, identify and model reflections, rotations and translations, using physical materials.	
GSS04I07	07 Identify, describe and use reflections (flips), rotations (turns), and translations (slides) in solving geometric problems; e.g., use transformations to determine if 2 shapes are congruent.
J. Describe a motion or series of transformations that show two shapes are congruent.	
GSS04J07	07 Identify, describe and use reflections (flips), rotations (turns), and translations (slides) in solving geometric problems; e.g., use transformations to determine if 2 shapes are congruent.
SO4. Patterns, Functions and Algebra	
A. Analyze and extend patterns, and describe the rule in words.	
PFA04A02	02 Represent and analyze patterns and functions using words, tables and graphs.
B. Use patterns to make predictions, identify relationships, and solve problems.	
PFA04B01	01 Use models and words to describe, extend and make generalizations of patterns and relationships occurring in computation, numerical patterns, geometry, graphs and other applications.
C. Write and solve open sentences and explain strategies.	
PFA04C05	05 Represent mathematical relationships with equations or inequalities.
D. Represent an unknown quantity as a variable using a symbol, including letters.	
PFA04D01	01 Represent and analyze patterns and functions using words, tables and graphs.
E. Use variables to create and solve equations representing problem situations.	
PFA04E04	04 Use rules and variables to describe patterns and other relationships.

F. Construct and use a table of values to solve problems associated with mathematical relationships.	
PFA04F03	03 Construct a table of values to solve problems associated with a mathematical relationship.
G. Describe how a change in one variable affects the value of a related variable.	
PFA04G06	06 Describe how a change in one variable affects the value of a related variable; e.g., as one increases the other increases or as one increases the other decreases.
S05. Data Analysis & Probability	
A. Gather and organize data from surveys and classroom experiments, including data collected over a period of time.	
DAP04A01	01 Create a plan for collecting data for a specific purpose.
B. Read and interpret tables, charts, graphs (bar, picture, line, line plot), and timelines as sources of information, identify main idea, draw conclusions, and make predictions.	
DAP04B02	02 Represent and interpret data using tables, bar graphs, line plots and line graphs.
DAP04B05	05 Propose and explain interpretations and predictions based on data displayed in tables, charts and graphs.
C. Construct charts, tables and graphs to represent data, including picture graphs, bar graphs, line graphs, line plots and Venn diagrams.	
DAP04C02	02 Represent and interpret data using tables, bar graphs, line plots and line graphs.
DAP04C03	03 Interpret and construct Venn diagrams to sort and describe data.
DAP04C04	04 Compare different representations of the same data to evaluate how well each representation shows important aspects of the data, and identify appropriate ways to display the data.
E. Describe data using mode, median and range.	
DAP04E06	06 Describe the characteristics of a set of data based on a graphical representation, such as range of the data, clumps of data, and holes in the data.
DAP04E07	07 Identify the median of a set of data and describe what it indicates about the data.
DAP04E08	08 Use range, median and mode to make comparisons among related sets of data.
F. Conduct a simple probability experiment and draw conclusions about the likelihood of possible outcomes.	
DAP04F09	09 Conduct simple probability experiments and draw conclusions from the results; e.g., rolling number cubes or drawing marbles from a bag.
DAP04F10	10 Represent the likelihood of possible outcomes for chance situations; e.g., probability of selecting a red marble from a bag containing 3 red and 5 white marbles.
DAP04F11	11 Relate the concepts of impossible and certain-to-happen events to the numerical values of 0 (impossible) and 1 (certain).

DAP04F12	12 Place events in order of likelihood and use a diagram or appropriate language to compare the chance of each event occurring; e.g. impossible, unlikely, equal, likely, certain.
G. Identify and represent possible outcomes, such as arrangements of a set of up to four members and possible combinations from several sets, each containing 2 or 3 members.	
DAP04G13	13 List and count all possible combinations using one member from each of several sets, each containing 2 or 3 members; e.g., the number of possible outfits from 3 shirts, 2 shorts and 2 pair of shoes.
H. Use the set of possible outcomes to describe and predict events.	
DAP04H10	10 Represent the likelihood of possible outcomes for chance situations; e.g., probability of selecting a red marble from a bag containing 3 red and 5 white marbles.
DAP04H11	11 Relate the concepts of impossible and certain-to-happen events to the numerical values of 0 (impossible) and 1 (certain).
S06. Mathematical Processes	
A. Apply and justify the use of a variety of problem-solving strategies; e.g., make an organized list, guess and check.	
B. Use an organized approach and appropriate strategies to solve multi-step problems.	
C. Interpret results in the context of the problem being solved; e.g., the solution must be a whole number of buses when determining the number of buses necessary to transport students.	
D. Use mathematical strategies to solve problems that relate to other curriculum areas and the real world; e.g., use a timeline to sequence events, use symmetry in artwork.	
E. Link concepts to procedures and to symbolic notation; e.g., model 3 X 4 with a geometric array, represent one-third by dividing an object into three equal parts.	
F. Recognize relationships among different topics within mathematics; e.g., the length of an object can be represented by a number.	
G. Use reasoning skills to determine and explain the reasonableness of a solution with respect to the problem situation.	
H. Recognize basic valid and invalid arguments, and use examples and counter examples, models, number relationships, and logic to support or refute.	
I. Represent problem situations in a variety of forms (physical model, diagram, in words or symbols), and recognize when some ways of representing a problem may be more helpful than others.	
J. Read, interpret, discuss and write about mathematical ideas and concepts using both everyday and mathematical language.	
K. Use mathematical language to explain and justify mathematical ideas, strategies and solutions.	

**GRADE 5
BENCHMARKS AND INDICATORS**

Grade Level Indicators	
S01. Number, Number Sense and Operations	
A. Represent and compare numbers less than 0 through familiar applications and extending the number line.	
NS05A06	06 Represent and compare numbers less than 0 by extending the number line and using familiar applications; e.g., temperature, owing money.
B. Compare, order and convert among fractions, decimals and percents.	
NS05B01	01 Use models and visual representation to develop the concept of ratio as part-to-part and part-to-whole, and the concept of percent as part-to-whole.
NS05B02	02 Use various forms of "one" to demonstrate the equivalence of fractions; e.g., $18/24 = 9/12 \times 2/2 = 3/4 \times 6/6$.
NS05B03	03 Identify and generate equivalent forms of fractions, decimals and percents.
D. Use models and pictures to relate concepts of ratio, proportion and percent.	
NS05D01	01 Use models and visual representation to develop the concept of ratio as part-to-part and part-to-whole, and the concept of percent as part-to-whole.
E. Use order of operations, including use of parenthesis and exponents to solve multi-step problems, and verify and interpret the results.	
NS05E08	08 Identify and use relationships between operations to solve problems.
NS05E09	09 Use order of operations, including use of parentheses, to simplify numerical expressions.
F. Apply number system properties when performing computations.	
NS05F07	07 Use commutative, associative, distributive, identity and inverse properties to simplify and perform computations.
G. Apply and explain the use of prime factorizations, common factors, and common multiples in problem situations.	
NS05G05	05 Recognize and identify perfect squares and their roots.
H. Use and analyze the steps in standard and non-standard algorithms for computing with fractions, decimals and integers.	
NS05H10	10 Justify why fractions need common denominators to be added or subtracted.
NS05H11	11 Explain how place value is related to addition and subtraction of decimals; e.g., $0.2 + 0.14$; the two tenths is added to the one tenth because they are both tenths.
I. Use a variety of strategies, including proportional reasoning, to estimate, compute, solve and explain solutions to problems involving integers, fractions, decimals and percents.	
NS05I04	04 Round decimals to a given place value and round fractions (including mixed numbers) to the nearest half.

NS05I12	12 Use physical models, points of reference, and equivalent forms to add and subtract commonly used fractions with like and unlike denominators and decimals.
NS05I13	13 Estimate the results of computations involving whole numbers, fractions and decimals, using a variety of strategies.
S02. Measurement	
A. Select appropriate units to measure angles, circumference, surface area, mass and volume, using: - U.S. customary units; e.g., degrees, square feet, pounds, and other units as appropriate; - Metric units; e.g., square meters, kilograms and other units as appropriate.	
M05A01	01 Identify and select appropriate units to measure angles; i.e., degrees.
B. Convert units of length, area, volume, mass and time within the same measurement system.	
M05B05	05 Make conversions within the same measurement system while performing computations.
C. Identify appropriate tools and apply appropriate techniques for measuring angles, perimeter or circumference and area of triangles, quadrilaterals, circles and composite shapes, and surface area and volume of prisms and cylinders.	
M05C06	06 Use strategies to develop formulas for determining perimeter and area of triangles, rectangles and parallelograms, and volume of rectangular prisms.
M05C07	07 Use benchmark angles (e.g.; 45, 90, 120 degrees) to estimate the measure of angles, and use a tool to measure and draw angles.
E. Use problem solving techniques and technology as needed to solve problems involving length, weight, perimeter, area, volume, time and temperature.	
M05E02	02 Identify paths between points on a grid or coordinate plane and compare the lengths of the paths; e.g., shortest path, paths of equal length.
F. Analyze and explain what happens to area and perimeter or surface area and volume when the dimensions of an object are changed.	
M05F03	03 Demonstrate and describe the differences between covering the faces (surface area) and filling the interior (volume) of three-dimensional objects.
M05F04	04 Demonstrate understanding of the differences among linear units, square units and cubic units.
G. Understand and demonstrate the independence of perimeter and area for two-dimensional shapes and of surface area and volume for three dimensional shapes.	
M05G03	03 Demonstrate and describe the differences between covering the faces (surface area) and filling the interior (volume) of three-dimensional objects.
M05G04	04 Demonstrate understanding of the differences among linear units, square units and cubic units.

S03. Geometry and Spatial Sense	
A. Identify and label angle parts and the regions defined within the plane where the angle resides.	
GSS05A02	02 Use standard language to describe line, segment, ray, angle, skew, parallel and perpendicular.
GSS04A03	03 Label vertex, rays, interior and exterior for an angle.
B. Draw circles, and identify and determine the relationships among the radius, diameter, center and circumference.	
GSS05B01	01 Draw circles, and identify and determine relationships among the radius, diameter, center and circumference; e.g., radius is half the diameter, the ratio of the circumference of a circle to its diameter is an approximation of π .
C. Specify locations and plot ordered pairs on a coordinate plane.	
GSS05C06	06 Extend understanding of coordinate system to include points whose x or y values may be negative numbers.
D. Identify, describe and classify types of line pairs, angles, two-dimensional figures and three-dimensional objects using their properties.	
GSS05D02	02 Use standard language to describe line, segment, ray, angle, skew, parallel and perpendicular.
GSS05D05	05 Use physical models to determine the sum of the interior angles of triangles and quadrilaterals.
GSS05D07	07 Understand that the measure of an angle is determined by the degree of rotation of an angle side rather than the length of either side.
F. Describe and use the concepts of congruence, similarity and symmetry to solve problems.	
GSS05F04	04 Describe and use properties of congruent figures to solve problems.
G. Describe and use properties of triangles to solve problems involving angle measures and side lengths of right triangles.	
GSS05G05	05 Use physical models to determine the sum of the interior angles of triangles and quadrilaterals.
I. Identify and draw three-dimensional objects from different views (top, side, front and perspective).	
GSS05I08	08 Predict what three-dimensional object will result from folding a two-dimensional net, then confirm the prediction by folding the net.
J. Apply properties of equality and proportionality to solve problems involving congruent or similar figures; e.g., create a scale drawing.	
GSS05J04	04 Describe and use properties of congruent figures to solve problems.

S04. Patterns, Functions and Algebra	
A. Describe, extend and determine the rule for patterns and relationships occurring in numeric patterns, computation, geometry, graphs and other applications.	
PFA05A01	01 Justify a general rule for a pattern or a function by using physical materials, visual representations, words, tables or graphs.
PFA05A02	02 Use calculators or computers to develop patterns, and generalize them using tables and graphs.
B. Represent, analyze and generalize a variety of patterns and functions with tables, graphs, words and symbolic rules.	
PFA05B03	03 Use variables as unknown quantities in general rules when describing patterns and other relationships.
C. Use variables to create and solve equations and inequalities representing problem situations.	
PFA05C04	04 Create and interpret the meaning of equations and inequalities representing problem situations.
E. Use rules and variables to describe patterns, functions and other relationships.	
PFA05E03	03 Use variables as unknown quantities in general rules when describing patterns and other relationships.
F. Use representations, such as tables, graphs and equations, to model situations and to solve problems, especially those that involve linear relationships.	
PFA05F05	05 Model problems with physical materials and visual representations, and use models, graphs and tables to draw conclusions and make predictions.
G. Write, simplify and evaluate algebraic expressions.	
PFA05G03	03 Use variables as unknown quantities in general rules when describing patterns and other relationships.
I. Explain how inverse operations are used to solve linear equations.	
PFA05I08	08 Identify and use relationships between operations to solve problems. (<i>Number, Number Sense and Operations</i>)
J. Use formulas in problem-solving situations.	
PFA05J06	06 Use strategies to develop formulas for determining perimeter and area of triangles, rectangles and parallelograms, and volume of rectangular prisms. (<i>Measurement</i>)
K. Graph linear equations and inequalities.	
PFA05K05	05 Model problems with physical materials and visual representations, and use models, graphs and tables to draw conclusions and make predictions.
L. Analyze functional relationships, and explain how a change in one quantity results in a change in the other.	
PFA05L06	06 Describe how the quantitative change in a variable affects the value of a related variable; e.g., describe how the rate of growth varies over time, based upon data in a table or graph.

S05. Data Analysis and Probability	
A. Read, create and use line graphs, histograms, circle graphs, box-and-whisker plots, stem-and-leaf plots, and other representations when appropriate.	
DAP05A01	01 Read, construct and interpret frequency tables, circle graphs and line graphs.
C. Evaluate interpretations and conclusions as additional data are collected, modify conclusions and predictions, and justify new findings.	
DAP05C05	05 Modify initial conclusions, propose and justify new interpretations and predictions as additional data are collected.
D. Compare increasingly complex displays of data, such as multiple sets of data on the same graph.	
DAP05D03	03 Read and interpret increasingly complex displays of data, such as double bar graphs.
E. Collect, organize, display and interpret data for a specific purpose or need.	
DAP05E02	02 Select and use a graph that is appropriate for the type of data to be displayed; e.g., numerical vs. categorical data, discrete vs. continuous data.
DAP05E04	04 Determine appropriate data to be collected to answer questions posed by students or teacher, collect and display data, and clearly communicate findings.
F. Determine and use the range, mean, median and mode to analyze and compare data, and explain what each indicates about the data.	
DAP05F06	06 Determine and use the range, mean, median and mode, and explain what each does and does not indicate about the set of data.
H. Find all possible outcomes of simple experiments or problem situations, using methods such as lists, arrays and tree diagrams.	
DAP05H07	07 List and explain all possible outcomes in a given situation.
I. Describe the probability of an event using ratios, including fractional notation.	
DAP05I08	08 Identify the probability of events within a simple experiment, such as three chances out of eight.
DAP05I09	09 Use 0,1 and ratios between 0 and 1 to represent the probability of outcomes for an event, and associate the ratio with the likelihood of the outcome.
J. Compare experimental and theoretical results for a variety of simple experiments.	
DAP05J10	10 Compare what should happen (theoretical/expected results) with what did happen (experimental/actual results) in a simple experiment.
K. Make and justify predictions based on experimental and theoretical probabilities.	
DAP05K11	11 Make predictions based on experimental and theoretical probabilities.
S06. Mathematical Processes	
A. Clarify problem-solving situation and identify potential solution processes; e.g., consider different strategies and approaches to a problem, restate problem from various perspectives.	

B. Apply and adapt problem-solving strategies to solve a variety of problems, including unfamiliar and non-routine problem situations.
C. Use more than one strategy to solve a problem, and recognize there are advantages associated with various methods.
D. Recognize whether an estimate or an exact solution is appropriate for a given problem situation.
E. Use deductive thinking to construct informal arguments to support reasoning and to justify solutions to problems.
F. Use inductive thinking to generalize a pattern of observations for particular cases, make conjectures, and provide supporting arguments for conjectures.
G. Relate mathematical ideas to one another and to other content areas; e.g., use area models for adding fractions, interpret graphs in reading, science and social studies.
H. Use representations to organize and communicate mathematical thinking and problem solutions.
I. Select, apply, and translate among mathematical representations to solve problems; e.g., representing a number as a fraction, decimal or percent as appropriate for a problem.
J. Communicate mathematical thinking to others and analyze the mathematical thinking and strategies of others.
K. Recognize and use mathematical language and symbols when reading, writing and conversing with others.

**GRADE 6
BENCHMARKS AND INDICATORS**

Grade Level Indicators	
S01. Number, Number Sense and Operations Standard	
C. Develop meaning for percents, including percents greater than 100 and less than 1.	
NS06C04	04 Describe what it means to find a specific percent of a number, using real-life examples.
NS06C05	05 Use models and pictures to relate concepts of ratio, proportion and percent, including percents less than 1 and greater than 100.
D. Use models and pictures to relate concepts of ratio, proportion and percent.	
NS06D03	03 Explain why a number is referred to as being "rational," and recognize that the expression a/b can mean a parts of size $1/b$ each, a divided by b , or the ratio of a to b .
NS06D05	05 Use models and pictures to relate concepts of ratio, proportion and percent, including percents less than 1 and greater than 100.
NS06D09	09 Give examples of how ratios are used to represent comparisons; e.g., part-to-part, part-to-whole, whole-to-part.
E. Use order of operations, including use of parenthesis and exponents to solve multi-step problems, and verify and interpret the results.	
NS06E06	06 Use the order of operations, including the use of exponents, decimals and rational numbers, to simplify numerical expressions.
G. Apply and explain the use of prime factorizations, common factors, and common multiples in problem situations.	
NS06G01	01 Decompose and recompose whole numbers using factors and exponents (e.g., $32 = 2 \times 2 \times 2 \times 2 \times 2 = 2$ to the 5th power), and explain why "squared" means "second power" and "cubed" means "third power".
NS06G02	02 Find and use the prime factorization of composite numbers. For example: <ol style="list-style-type: none"> a. Use the prime factorization to recognize the greatest common factor (GCF). b. Use the prime factorization to recognize the least common multiple (LCM). c. Apply the prime factorization to solve problems and explain solutions.
H. Use and analyze the steps in standard and non-standard algorithms for computing with fractions, decimals and integers.	
NS06H08	08 Represent multiplication and division situations involving fractions and decimals with models and visual representations; e.g., show with pattern blocks what it means to take 2 and $2/3$ divided by $1/6$.
NS06H12	12 Develop and analyze algorithms for computing with fractions and decimals, and demonstrate fluency in their use.

I. Use a variety of strategies, including proportional reasoning, to estimate, compute, solve and explain solutions to problems involving integers, fractions, decimals and percents.	
NS06I07	07 Use simple expressions involving integers to represent and solve problems; e.g., if a running back loses 15 yards on the first carry but gains 8 yards on the second carry, what is the net gain/loss?
NS06I10	10 Recognize that a quotient may be larger than the dividend when the divisor is a fraction; e.g., $6 \div \frac{1}{2} = 12$.
NS06I11	11 Perform fraction and decimal computations and justify their solutions; e.g., using manipulatives, diagrams, mathematical reasoning.
NS06I13	13 Perform fraction and decimal computations and justify their solutions; e.g., using manipulatives, diagrams, mathematical reasoning.
NS06I14	14 Use proportional reasoning, ratios and percents to represent problem situations and determine the reasonableness of solutions.
NS06I15	15 Determine the percent of a number and solve related problems; e.g., find the percent markdown if the original price was \$140, and the sale price is \$100.
S02. Measurement	
C. Identify appropriate tools and apply appropriate techniques for measuring angles, perimeter or circumference and area of triangles, quadrilaterals, circles and composite shapes, and surface area and volume of prisms and cylinders.	
M06C02	02 Use strategies to develop formulas for finding circumference and area of circles, and to determine the area of sectors; e.g., $\frac{1}{2}$ circle, $\frac{2}{3}$ circle, $\frac{1}{3}$ circle, $\frac{1}{4}$ circle.
M06C03	03 Estimate perimeter or circumference and area for circles, triangles and quadrilaterals, and surface area and volume for prisms and cylinders by: <ul style="list-style-type: none"> a. estimating lengths using string or links, areas using tiles or grid, and volumes using cubes; b. measuring attributes (diameter, side lengths, or heights) and using established formulas for circles, triangles, rectangles, parallelograms and rectangular prisms.
PFA06C06	06 Use strategies to develop formulas for finding circumference and area of circles, and to determine the area of sectors; e.g., $\frac{1}{2}$ circle, $\frac{2}{3}$ circle, $\frac{1}{3}$ circle, $\frac{1}{4}$ circle.
E. Use problem-solving techniques and technology as needed to solve problems involving length, weight, perimeter, area, volume, time and temperature.	
M06E04	04 Determine which measure (perimeter, area, surface area, volume) matches the context for a problem situation; e.g., perimeter is the context for fencing a garden, surface area is the context for painting a room.

F. Analyze and explain what happens to area and perimeter or surface area and volume when the dimensions of an object are changed.	
M06F01	01 Understand and describe the difference between surface area and volume.
M06F06	06 Describe what happens to the perimeter and area of a two dimensional shape when the measurements of the shape are changed; e.g. length of sides are doubled.
G. Understand and demonstrate the independence of perimeter and area for two-dimensional shapes and of surface area and volume for three dimensional shapes.	
M06G01	01 Understand and describe the difference between surface area and volume.
M06G05	05 Understand the difference between perimeter and area, and demonstrate that two shapes may have the same perimeter, but different areas or may have the same area, but different perimeters.
S03. Geometry and Spatial Sense	
D. Identify, describe and classify types of line pairs, angles, two-dimensional figures and three-dimensional objects using their properties.	
GSS06D01	01 Classify and describe two-dimensional and three-dimensional geometric figures and objects by using their properties; e.g., interior angle measures, perpendicular / parallel sides, congruent angles / sides.
GSS06D02	02 Use standard language to define geometric vocabulary: vertex, face, altitude, diagonal, isosceles, equilateral, acute, obtuse, etc.
GSS06D04	04 Identify and define relationships between planes; i.e., parallel, perpendicular and intersecting.
F. Describe and use the concepts of congruence, similarity and symmetry to solve problems.	
GSS06F06	06 Draw similar figures that model proportional relationships; e.g., model similar figures with a 1 to 2 relationship by sketching two of the same figure, one with corresponding sides twice the length of the other.
G. Describe and use properties of triangles to solve problems involving angle measures and side lengths of right triangles.	
GSS06G03	03 Use multiple classification criteria to classify triangles; e.g., right scalene triangle.
H. Predict and describe results (size, position, orientation) of transformations of two-dimensional figures.	
GSS06H05	05 Predict and describe sizes, positions and orientations of two-dimensional shapes after transformations such as reflections, rotations, translations and dilations.
I. Identify and draw three-dimensional objects from different views (top, side, front and perspective).	
GSS06I07	07 Build three-dimensional objects with cubes, and sketch the two-dimensional representations of each side; i.e., projection sets.

J. Apply properties of equality and proportionality to solve problems involving congruent or similar figures; e.g., create a scale drawing.	
GSS06J06	06 Draw similar figures that model proportional relationships; e.g., model similar figures with a 1 to 2 relationship by sketching two of the same figure, one with corresponding sides twice the length of the other.
S04. Patterns, Functions and Algebra	
A. Describe, extend and determine the rule for patterns and relationships occurring in numeric patterns, computation, geometry, graphs and other applications.	
PFA06A01	01 Represent and analyze patterns, rules and functions, using physical materials, tables and graphs.
PFA06A02	02 Use words and symbols to describe numerical and geometric patterns, rules and functions.
C. Use variables to create and solve equations and inequalities representing problem situations.	
PFA06C05	05 Produce and interpret graphs that represent the relationship between two variables.
PFA06C06	06 Evaluate simple expressions by replacing variables with given values, and use formulas in problem-solving situations.
D. Use symbolic algebra to represent and explain mathematical relationships.	
PFA06D03	03 Recognize and generate equivalent forms of algebraic expressions, and explain how the commutative, associative and distributive properties can be used to generate equivalent forms; e.g., perimeter as $2(1 + w)$ or $21 + 2w$.
E. Use rules and variables to describe patterns, functions and other relationships.	
PFA06E02	02 Use words and symbols to describe numerical and geometric patterns, rules and functions.
G. Write, simplify and evaluate algebraic expressions.	
PFA06G06	06 Evaluate simple expressions by replacing variables with given values, and use formulas in problem-solving situations.
H. Solve linear equations and inequalities symbolically, graphically and numerically.	
PFA06H04	04 Solve simple linear equations and inequalities using physical models, paper and pencil, tables and graphs.
J. Use formulas in problem-solving situations.	
PFA06J02	02 Use strategies to develop formulas for finding circumference and area of circles, and to determine the area of sectors; e.g., $1/2$ circle, $2/3$ circle, $1/3$ circle, $1/4$ circle. (<i>Measurement</i>)
PFA06J06	06 Evaluate simple expressions by replacing variables with given values, and use formulas in problem-solving situations.
K. Graph linear equations and inequalities.	
PFA06K04	04 Solve simple linear equations and inequalities using physical models, paper and pencil, tables and graphs.
PFA06K05	05 Produce and interpret graphs that represent the relationship between two variables.

L. Analyze functional relationships, and explain how a change in one quantity results in a change in the other.	
PFA06L07	07 Identify and describe situations with constant or varying rates of change, and compare them.
M. Approximate and interpret rates of change from graphical and numerical data.	
PFA06M08	08 Use technology to analyze change; e.g., use computer applications or graphing calculators to display and interpret rate of change.
S05. Data Analysis & Probability	
A. Read, create and use line graphs, histograms, circle graphs, box-and-whisker plots, stem-and-leaf plots, and other representations when appropriate.	
DAP06A01	01 Read, construct and interpret line graphs, circle graphs and histograms.
B. Interpret data by looking for patterns and relationships, draw and justify conclusions, and answer related questions.	
DAP06B05	05 Describe the frequency distribution of a set of data, as shown in a histogram or frequency table, by general appearance or shape; e.g., number of modes, middle of data, level of symmetry, outliers.
D. Compare increasingly complex displays of data, such as multiple sets of data on the same graph.	
DAP06D03	03 Compare representations of the same data in different types of graphs, such as a bar graph and circle graph.
E. Collect, organize, display and interpret data for a specific purpose or need.	
DAP06E02	02 Select, create and use graphical representations that are appropriate for the type of data collected.
F. Determine and use the range, mean, median and mode to analyze and compare data, and explain what each indicates about the data.	
DAP06F04	04 Understand the different information provided by measures of center (mean, mode and median) and measures of spread (range).
G. Evaluate conjectures and predictions based upon data presented in tables and graphs, and identify misuses of statistical data and displays.	
DAP06G06	06 Make logical inferences from statistical data
K. Make and justify predictions based on experimental and theoretical probabilities.	
DAP06K07	07 Design an experiment to test a theoretical probability and explain how the results may vary.
S06. Mathematical Processes	
A. Clarify problem-solving situation and identify potential solution processes; e.g., consider different strategies and approaches to a problem, restate problem from various perspectives.	
B. Apply and adapt problem-solving strategies to solve a variety of problems, including unfamiliar and non-routine problem situations.	

C. Use more than one strategy to solve a problem, and recognize there are advantages associated with various methods.
D. Recognize whether an estimate or an exact solution is appropriate for a given problem situation.
E. Use deductive thinking to construct informal arguments to support reasoning and to justify solutions to problems.
F. Use inductive thinking to generalize a pattern of observations for particular cases, make conjectures, and provide supporting arguments for conjectures.
G. Relate mathematical ideas to one another and to other content areas; e.g., use area models for adding fractions, interpret graphs in reading, science and social studies.
H. Use representations to organize and communicate mathematical thinking and problem solutions.
I. Select, apply, and translate among mathematical representations to solve problems; e.g., representing a number as a fraction, decimal or percent as appropriate for a problem.
J. Communicate mathematical thinking to others and analyze the mathematical thinking and strategies of others.
K. Recognize and use mathematical language and symbols when reading, writing and conversing with others.

**GRADE 7
BENCHMARKS AND INDICATORS**

Grade Level Indicators	
S01. Number, Number Sense and Operations Standard	
B. Compare, order and convert among fractions, decimals and percents.	
NS07B01	01 Demonstrate an understanding of place value using powers of 10 and write large numbers in scientific notation.
NS07B03	03 Describe differences between rational and irrational numbers; e.g., use technology to show that some numbers (rational) can be expressed as terminating or repeating decimals and other (irrational) as non-terminating and non-repeating decimals.
E. Use order of operations, including use of parenthesis and exponents to solve multi-step problems, and verify and interpret the results.	
NS07E04	04 Use order of operations and properties to simplify numerical expressions involving integers, fractions and decimals.
G. Apply and explain the use of prime factorizations, common factors, and common multiples in problem situations.	
NS07G09	09 Represent and solve problem situations that can be modeled by and solved using concepts of absolute value, exponents and square roots (for perfect squares).
H. Use and analyze the steps in standard and non-standard algorithms for computing with fractions, decimals and integers.	
NS07H05	05 Explain the meaning and effect of adding, subtracting, multiplying and dividing integers; e.g., how adding two integers can result in a lesser value.
NS07H08	08 Develop and analyze algorithms for computing with percents and integers, and demonstrate fluency in their use.
I. Use a variety of strategies, including proportional reasoning, to estimate, compute, solve and explain solutions to problems involving integers, fractions, decimals and percents.	
NS07I06	06 Simplify numerical expressions involving integers and use integers to solve real-life problems.
NS07I07	07 Solve problems using the appropriate form of a rational number (fraction, decimal or percent).
NS07I09	09 Represent and solve problem situations that can be modeled by and solved using concepts of absolute value, exponents and square roots (for perfect squares).
NS08A01	01 Demonstrate an understanding of place value using powers of 10 and write large numbers in scientific notation. <i>(Reflects this benchmark.)</i>
NS08I02	02 Explain the meaning of exponents that are negative or 0. <i>(Reflects this benchmark.)</i>

NS08B03	03 Describe differences between rational and irrational numbers; e.g., use technology to show that some numbers (rational) can be expressed as terminating or repeating decimals and others (irrational) as non-terminating and non-repeating decimals. (<i>Reflects this benchmark.</i>)
NS08F05	05 Explain the meaning and effect of adding, subtracting, multiplying and dividing integers; e.g., how adding two integers can result in a lesser value. (<i>Reflects this benchmark.</i>)
S02. Measurement	
A. Select appropriate units to measure angles, circumference, surface area, mass and volume, using:	
- U.S. customary units; e.g., degrees, square feet, pounds, and other units as appropriate;	
- Metric units; e.g., square meters, kilograms and other units as appropriate	
M07A01	01 Select appropriate units for measuring derived measurements; e.g., miles per hour, revolutions per minute.
B. Convert units of length, area, volume, mass and time within the same measurement system.	
M07B02	02 Convert units of area and volume within the same measurement system using proportional reasoning and a reference table when appropriate; e.g., square feet to square yards, cubic meters to cubic centimeters.
C. Identify appropriate tools and apply appropriate techniques for measuring angles, perimeter or circumference and area of triangles, quadrilaterals, circles and composite shapes, and surface area and volume of prisms and cylinders.	
M07C06	06 Use strategies to develop formulas for finding area of trapezoids and volume of cylinders and prisms.
M07C07	07 Develop strategies to find the area of composite shapes using the areas of triangles, parallelograms, circles and sectors.
PFA07J06	06 Use strategies to develop formulas for finding area of trapezoids and volume of cylinders and prisms.
D. Select a tool and measure accurately to a specified level of precision.	
M07D03	03 Estimate a measurement to a greater degree of precision than the tool provides.
E. Use problem solving techniques and technology as needed to solve problems involving length, weight, perimeter, area, volume, time and temperature.	
M07E04	04 Solve problems involving proportional relationships and scale factors; e.g., scale models that require unit conversions within the same measurement system.
F. Analyze and explain what happens to area and perimeter or surface area and volume when the dimensions of an object are changed.	
M07F09	09 Describe what happens to the surface area and volume of a three-dimensional object when the measurements of the object are changed; e.g., length of sides are doubled.

G. Understand and demonstrate the independence of perimeter and area for two-dimensional shapes and of surface area and volume for three dimensional shapes.	
M07G08	08 Understand the difference between surface area and volume and demonstrate that two objects may have the same surface area, but different volumes or may have the same volume, but different surface areas.
S03. Geometry and Spatial Sense	
D. Identify, describe and classify types of line pairs, angles, two-dimensional figures and three-dimensional objects using their properties	
GSS07D02	02 Determine sufficient (not necessarily minimal) properties that define a specific two-dimensional figure or three-dimensional object. For example: <ul style="list-style-type: none"> a. Determine when one set of figures is a subset of another; e.g., all squares are rectangles. b. Develop a set of properties that eliminates all but the desired figure; e.g., only squares are quadrilaterals with all sides congruent and all angles congruent.
E. Use proportions to express relationships among corresponding parts of similar figures.	
GSS07E01	01 Use proportional reasoning to describe and express relationships between parts and attributes of similar and congruent figures.
GSS07E06	06 Determine and use scale factors for similar figures to solve problems using proportional reasoning.
F. Describe and use the concepts of congruence, similarity and symmetry to solve problems.	
GSS07F04	04 Determine necessary conditions for congruence of triangles.
GSS07F07	07 Identify the line and rotation symmetries of two-dimensional figures to solve problems.
G. Describe and use properties of triangles to solve problems involving angle measures and side lengths of right triangles.	
GSS07G03	03 Use and demonstrate understanding of the properties of triangles. For example: <ul style="list-style-type: none"> a. Use Pythagorean Theorem to solve problems involving right triangles. b. Use triangle angle sum relationships to solve problems.
GSS07G05	05 Apply properties of congruent or similar triangles to solve problems involving missing lengths and angle measures.

H. Predict and describe results (size, position, orientation) of transformations of two-dimensional figures.	
GSS07H08	08 Perform translations, reflections, rotations and dilations of two-dimensional figures using a variety of methods (paper folding, tracing, graph paper).
I. Identify and draw three-dimensional objects from different views (top, side, front and perspective).	
GSS07I09	09 Draw representations of three-dimensional geometric objects from different views.
J. Apply properties of equality and proportionality to solve problems involving congruent or similar figures; e.g., create a scale drawing.	
GSS07J01	01 Use proportional reasoning to describe and express relationships between parts and attributes of similar and congruent figures.
GSS07J06	06 Determine and use scale factors for similar figures to solve problems using proportional reasoning.
S04. Patterns, Functions and Algebra	
B. Represent, analyze and generalize a variety of patterns and functions with tables, graphs, words and symbolic rules.	
PFA07B01	01 Represent and analyze patterns, rules and functions with words, tables, graphs and simple variable expressions.
PFA07B02	02 Generalize patterns by describing in words how to find the next term.
D. Use symbolic algebra to represent and explain mathematical relationships.	
PFA07D09	09 Recognize a variety of uses for variables; e.g., placeholder for an unknown quantity in an equation, generalization for a pattern, formula.
E. Use rules and variables to describe patterns, functions and other relationships.	
PFA07E03	03 Recognize and explain when numerical patterns are linear or nonlinear progressions; e.g., 1, 3, 5, 7... is linear and 1, 3, 4, 8, 16... is nonlinear.
F. Use representations, such as tables, graphs and equations, to model situations and to solve problems, especially those that involve linear relationships.	
PFA07F05	05 Represent linear equations by plotting points in the coordinate plane.
PFA07F06	06 Represent inequalities on a number line or a coordinate plane.
G. Write, simplify and evaluate algebraic expressions.	
PFA07G01	01 Represent and analyze patterns, rules and functions with words, tables, graphs and simple variable expressions.
PFA07G07	07 Justify that two forms of an algebraic expression are equivalent, and recognize when an expression is simplified; e.g., $4m = m + m + m + m$ or $a * 5 + 4 = 5a + 4$.

H. Solve linear equations and inequalities symbolically, graphically and numerically.	
PFA07H04	04 Create visual representations of equation-solving processes that model the use of inverse operations.
I. Explain how inverse operations are used to solve linear equations.	
PFA07I04	04 Create visual representations of equation-solving processes that model the use of inverse operations.
J. Use formulas in problem-solving situations.	
PFA07J08	08 Use formulas in problem-solving situations.
PFA07J06	06 Use strategies to develop formulas for finding area of trapezoids and volume of cylinders and prisms. (<i>Measurement</i>)
PFA07J03	03 Use and demonstrate understanding of the properties of triangles. For examples: a. Use Pythagorean Theorem to solve problems involving right triangles. b. Use triangle angle sum relationships to solve problems
K. Graph linear equations and inequalities	
PFA07K05	05 Graph linear equations and inequalities
PFA07K06	06 Represent inequalities on a number line or a coordinate plane.
L. Analyze functional relationships, and explain how a change in one quantity results in a change in the other.	
PFA07L10	10 Analyze linear and simple nonlinear relationships to explain how a change in one variable results in the change of another.
M. Approximate and interpret rates of change from graphical and numerical data.	
PFA07M11	11 Use graphing calculators or computers to analyze change; e.g., distance-time relationships.
S05. Data Analysis & Probability	
A. Read, create and use line graphs, histograms, circle graphs, box-and-whisker plots, stem-and-leaf plots, and other representations when appropriate.	
DAP07A01	01 Read, create and interpret box-and-whisker plots, stem-and-leaf plots, and other types of graphs, when appropriate.
B. Interpret data by looking for patterns and relationships, draw and justify conclusions, and answer related questions.	
DAP07B04	04 Construct opposing arguments based on analysis of the same data, using different graphical representations.
D. Compare increasingly complex displays of data, such as multiple sets of data on the same graph.	
DAP07D05	05 Compare data from two or more samples to determine how sample selection can influence results.
E. Collect, organize, display and interpret data for a specific purpose or need.	
DAP07E02	02 Analyze how decisions about graphing affect the graphical representation; e.g., scale, size of classes in a histogram, number of categories in a circle graph.

F. Determine and use the range, mean, median and mode to analyze and compare data, and explain what each indicates about the data.	
DAP07F03	03 Analyze a set of data by using and comparing combinations of measures of center (mean, mode, median) and measures of spread (range, quartile, inter-quartile range), and describe how the inclusion or exclusion of outliers affects those measures.
G. Evaluate conjectures and predictions based upon data presented in tables and graphs, and identify misuses of statistical data and displays.	
DAP07G02	02 Analyze how decisions about graphing affect the graphical representation; e.g., scale, size of classes in a histogram, number of categories in a circle graph.
DAP07G06	06 Identify misuses of statistical data in articles, advertisements, and other media.
I. Describe the probability of an event using ratios, including fractional notation.	
DAP07I07	07 Compute probabilities of compound events; e.g., multiple coin tosses or multiple rolls of number cubes, using such methods as organized lists, tree diagrams and area models.
K. Make and justify predictions based on experimental and theoretical probabilities.	
DAP07K08	08 Make predictions based on theoretical probabilities, design and conduct an experiment to test the predictions, compare actual results to predicted results, and explain differences.
S06. Mathematical Processes	
A. Clarify problem-solving situation and identify potential solution processes; e.g., consider different strategies and approaches to a problem, restate problem from various perspectives.	
B. Apply and adapt problem-solving strategies to solve a variety of problems, including unfamiliar and non-routine problem situations.	
C. Use more than one strategy to solve a problem, and recognize there are advantages associated with various methods.	
D. Recognize whether an estimate or an exact solution is appropriate for a given problem situation.	
E. Use deductive thinking to construct informal arguments to support reasoning and to justify solutions to problems.	
F. Use inductive thinking to generalize a pattern of observations for particular cases, make conjectures, and provide supporting arguments for conjectures.	
G. Relate mathematical ideas to one another and to other content areas; e.g., use area models for adding fractions, interpret graphs in reading, science and social studies.	
H. Use representations to organize and communicate mathematical thinking and problem solutions.	

I. Select, apply, and translate among mathematical representations to solve problems; e.g., representing a number as a fraction, decimal or percent as appropriate for a problem.
J. Communicate mathematical thinking to others and analyze the mathematical thinking and strategies of others.
K. Recognize and use mathematical language and symbols when reading, writing and conversing with others.

**PRE-ALGEBRA
BENCHMARKS AND INDICATORS**

Grade Level Indicator	
S01. Number, Number Sense and Operations Standard	
A. Use scientific notation to express large numbers and numbers less than one.	
NS08A01	01 Use scientific notation to express large numbers and small numbers between 0 and 1.
B. Identify subsets of the real number system.	
NS08B02	02 Recognize that natural numbers, whole numbers, integers, rational numbers and irrational numbers are subsets of the real number system.
C. Apply properties of operations and the real number system, and justify when they hold for a set of numbers.	
NS08C04	04 Explain and use the inverse and identity properties and use inverse relationships (addition/subtraction, multiplication/division, squaring/square roots) in problem solving situations.
G. Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions.	
NS08G05	05 Determine when an estimate is sufficient and when an exact answer is needed in problem situations, and evaluate estimates in relation to actual answers; e.g., very close, less than, greater than.
NS08G06	06 Estimate, compute and solve problems involving rational numbers, including ratio, proportion and percent, and judge the reasonableness of solutions.
H. Find the square root of perfect squares, and approximate the square root of non-perfect squares.	
NS08H07	07 Find the square root of perfect squares, and approximate the square root of non-perfect squares as consecutive integers between which the root lies; e.g., (square root of 130) is between 11 and 12.
I. Estimate, compute and solve problems involving scientific notation, square roots and numbers with integer exponents.	
NS08I03	03 Apply order of operations to simplify expressions and perform computations involving integer exponents and radicals.
NS08I08	08 Add, subtract, multiply, divide and compare numbers written in scientific notation.
S02. Measurement	
A. Solve increasingly complex non-routine measurement problems and check for reasonableness of results.	
M08A06	06 Solve and determine the reasonableness of the results for problems involving rates and derived measurements, such as velocity and density, using formulas, models and graphs.

B. Use formulas to find surface area and volume for specified three dimensional objects accurate to a specified level of precision.	
M08B03	03 Use appropriate levels of precision when calculating with measurements.
M08B04	04 Derive formulas for surface area and volume and justify them using geometric models and common materials. For example, find: <ul style="list-style-type: none"> a. the surface area of a cylinder as a function of its height and radius; b. that the volume of a pyramid (or cone) is one-third of the volume of a prism (or cylinder) with the same base area and height.
C. Apply indirect measurement techniques, tools and formulas, as appropriate, to find perimeter, circumference and area of circles, triangles, quadrilaterals and composite shapes, and to find volume of prisms, cylinders, and pyramids.	
M08C05	05 Determine surface area for pyramids by analyzing their parts.
M08C09	09 Demonstrate understanding of the concepts of perimeter, circumference and area by using established formulas for triangles, quadrilaterals, and circles to determine the surface area and volume of prisms, pyramids, cylinders, spheres and cones. (Note: Only volume should be calculated for spheres and cones.)
D. Use proportional reasoning and apply indirect measurement techniques, including right triangle trigonometry and properties of similar triangles, to solve problems involving measurements and rates.	
M08D01	01 Compare and order the relative size of common U.S. customary units and metric units; e.g., mile and kilometer, gallon and liter, pound and kilogram.
M08D02	02 Use proportional relationships and formulas to convert units from one measurement system to another; e.g., degrees Fahrenheit to degrees Celsius.
M08D07	07 Apply proportional reasoning to solve problems involving indirect measurements or rates.
E. Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision.	
M08E03	03 Use appropriate levels of precision when calculating with measurements.
M08E08	08 Find the sum of the interior and exterior angles of regular convex polygons with and without measuring the angles with a protractor.
M08E10	10 Use conventional formulas to find the surface area and volume of prisms, pyramids and cylinders and the volume of spheres and cones to a specified level of precision.

F. Write and solve real-world, multi-step problems involving money, elapsed time and temperature, and verify reasonableness of solutions.	
M08F06	06 Solve and determine the reasonableness of the results for problems involving rates and derived measurements, such as velocity and density, using formulas, models and graphs.
S03. Geometry and Spatial Sense	
B. Describe and apply the properties of similar and congruent figures; and justify conjectures involving similarity and congruence.	
GSS08B01	01 Make and test conjectures about characteristics and properties (e.g., sides, angles, symmetry) of two-dimensional figures and three-dimensional objects.
GSS08B03	03 Use proportions in several forms to solve problems involving similar figures (part-to-part, part-to-whole, corresponding sides between figures).
C. Recognize and apply angle relationships in situations involving intersecting lines, perpendicular lines and parallel lines.	
GSS08C02	02 Recognize the angles formed and the relationship between the angles when two lines intersect and when parallel lines are cut by a transversal.
D. Use coordinate geometry to represent and examine the properties of geometric figures.	
GSS08D01	01 Make and test conjectures about characteristics and properties (e.g., sides, angles, symmetry) of two-dimensional figures and three-dimensional objects.
GSS08D04	04 Represent and analyze shapes using coordinate geometry; e.g., given three vertices and the type of quadrilateral, find the coordinates of the fourth vertex.
E. Draw and construct representations of two- and three-dimensional geometric objects using a variety of tools, such as straightedge, compass and technology.	
GSS08E06	06 Draw nets for a variety of prisms, pyramids, cylinders and cones.
F. Represent and model transformations in a coordinate plane and describe the results.	
GSS08F05	05 Draw the results of translations, reflections, rotations and dilations of objects in the coordinate plane, and determine properties that remain fixed; e.g., lengths of sides remain the same under translations.
H. Establish the validity of conjectures about geometric objects, their properties and relationships by counter-example, inductive and deductive reasoning, and critiquing arguments made by others.	
GSS08H01	01 Make and test conjectures about characteristics and properties (e.g., sides, angles, symmetry) of two-dimensional figures and three-dimensional objects.

S04. Patterns, Functions and Algebra	
A. Generalize and explain patterns and sequences in order to find the next term and the nth term.	
PFA08A02	02 Generalize patterns and sequences by describing how to find the n th term.
B. Identify and classify functions as linear or nonlinear, and contrast their properties using tables, graphs or equations.	
PFA08B03	03 Identify functions as linear or nonlinear based on information given in a table, graph or equation.
C. Translate information from one representation (words, table, graph or equation) to another representation of a relation or function.	
PFA08C01	01 Relate the various representations of a relationship; i.e., relate a table to graph, description and symbolic form.
D. Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations.	
PFA08D04	04 Extend the uses of variables to include co-variants where y depends on x .
PFA08D05	05 Use physical models to add and subtract monomials and polynomials, and to multiply a polynomial by a monomial.
PFA08D07	07 Use symbolic algebra (equations and inequalities), graphs and tables to represent situations and solve problems.
PFA08D08	08 Write, simplify and evaluate algebraic expressions (including formulas) to generalize situations and solve problems.
E. Analyze and compare functions and their graphs using attributes, such as rates of change, intercepts and zeros.	
PFA08E06	06 Describe the relationship between the graph of a line and its equation, including being able to explain the meaning of slope as a constant rate of change and y -intercept in real-world problems.
F. Solve and graph linear equations and inequalities.	
PFA08F07	07 Use symbolic algebra (equations and inequalities), graphs and tables to represent situations and solve problems.
PFA08F09	09 Solve linear equations and inequalities graphically, symbolically and using technology.
G. Solve quadratic equations with real roots by graphing, formula and factoring.	
PFA08G12	12 Solve simple quadratic equations graphically; e.g., $y = x^2(\text{squared}) - 16$.
H. Solve systems of linear equations involving two variables graphically and symbolically.	
PFA08H10	10 Solve 2 by 2 systems of linear equations graphically and by simple substitution.
PFA08H11	11 Interpret the meaning of the solution of a 2 by 2 system of equations; i.e., point, line, no solution.

I. Model and solve problem situations involving direct and inverse variation.	
PFA08I14	14 Differentiate and explain types of changes in mathematical relationships, such as linear vs. nonlinear, continuous vs. non-continuous, direct variation vs. inverse variation.
J. Describe and interpret rates of change from graphical and numerical data.	
PFA08J13	13 Compute and interpret slope, midpoint and distance given a set of ordered pairs.
PFA08J15	15 Describe and compare how changes in an equation affects the related graphs; e.g., for a linear equation changing the coefficient of x affects the slope and changing the constant affects the intercepts.
PFA08J16	16 Use graphing calculators or computers to analyze change; e.g., interest compounded over time as a nonlinear growth pattern.
S05. Data Analysis & Probability	
A. Create, interpret and use graphical displays and statistical measures to describe data; e.g., box-and-whisker plots, histograms, scatter plots, measures of center and variability.	
DAP08A01	01 Use, create and interpret scatter plots and other types of graphs as appropriate.
B. Evaluate different graphical representations of the same data to determine which is the most appropriate representation for an identified purpose.	
DAP08B02	02 Evaluate different graphical representations of the same data to determine which is the most appropriate representation for an identified purpose; e.g., line graph for change over time, circle graph for part-to-whole comparison, scatter plot for relationship between two variants.
DAP08B03	03 Differentiate between discrete and continuous data and appropriate ways to represent each.
C. Compare the characteristics of the mean, median and mode for a given set of data, and explain which measure of center best represents the data.	
DAP08C05	05 Explain the mean's sensitivity to extremes and its use in comparison with the median and mode.
D. Find, use and interpret measures of center and spread, such as mean and quartiles, and use those measures to compare and draw conclusions about sets of data.	
DAP08D04	04 Compare two sets of data using measures of center (mean, mode, median) and measures of spread (range, quartiles, inter-quartile range, percentiles).
E. Evaluate the validity of claims and predictions that are based on data by examining the appropriateness of the data collection and analysis.	
DAP08E08	08 Describe how the relative size of a sample compared to the target population affects the validity of predictions.

F. Construct convincing arguments based on analysis of data and interpretation of graphs.	
DAP08F06	06 Make conjectures about possible relationship in a scatter plot and approximate line of best fit.
DAP08F09	09 Construct convincing arguments based on analysis of data and interpretation of graphs.
G. Describe sampling methods and analyze the effects of method chosen on how well the resulting sample represents the population.	
DAP08G07	07 Identify different ways of selecting samples, such as survey response, random sample, representative sample and convenience sample.
H. Use counting techniques, such as permutations and combinations, to determine the total number of options and possible outcomes.	
DAP08H10	10 Calculate the number of possible outcomes for a situation, recognizing and accounting for when items may occur more than once or when order is important.
J. Compute probabilities of compound events, independent events, and simple dependent events.	
DAP08J11	11 Demonstrate an understanding that the probability of either of two disjoint events occurring can be found by adding the probabilities for each and that the probability of one independent event following another can be found by multiplying the probabilities.
S06. Mathematical Processes Standard	
A. Formulate a problem or mathematical model in response to a specific need or situation, determine information required to solve the problem, choose method for obtaining this information, and set limits for acceptable solution.	
B. Apply mathematical knowledge and skills routinely in other content areas and practical situations.	
C. Recognize and use connections between equivalent representations and related procedures for a mathematical concept; e.g., zero of a function and the x-intercept of the graph of the function, apply proportional thinking when measuring, describing functions, and comparing probabilities.	
D. Apply reasoning processes and skills to construct logical verifications or counter-verifications or counter-examples to test conjectures and to justify and defend algorithms and solutions.	
E. Use a variety of mathematical representations flexibly and appropriately to organize, record and communicate mathematical ideas.	
F. Use precise mathematical language and notations to represent problem situations and mathematical ideas.	
G. Write clearly and coherently about mathematic thinking and ideas.	
H. Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner.	