USD 368
Curriculum Guide

▲KS Assessment

Curricular Area: Math
Grade/Course: Sixth

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 1: Number Sense – The student demonstrates number sense for rational numbers and simple algebraic expressions in one variable in a variety of situations.

Knowledge Base Indicators

The student…
1. knows, explains, and uses equivalent representations for rational numbers expressed as fractions, terminating decimals, and percents; positive rational number bases with whole number exponents; time; and money (2.4.K1a-c) $.
2. ▲compares and orders (2.4.K1a-c) $:
   a. integers;
   b. fractions greater than or equal to zero,
   c. decimals greater than or equal to zero through thousandths place.
3. explains the relative magnitude between whole numbers, fractions greater than or equal to zero, and decimals greater than or equal to zero (2.4.K1a-c).
4. ▲ knows and explains numerical relationships between percents, decimals, and fractions between 0 and 1 (2.4.K1a,c), e.g., recognizing that percent means out of a 100, so 60% means 60 out of 100, 60% as a decimal is .60, and 60% as a fraction is 60/100.
5. uses equivalent representations for the same simple algebraic expression with understood coefficients of 1 (2.4.K1a), e.g., when students are developing their own formula for the perimeter of a square, they combine s + s + s + s to make 4s.

Application Indicators

The student…
1. generates and/or solves real-world problems using equivalent representations of (2.4.A1a-c) $:
   a. integers, e.g., the basketball team made 15 out of 25 free throws this season. Express their free throw shooting as a fraction and as a decimal.
   b. fractions greater than or equal to zero, e.g., the basketball team made 15 out of 25 free throws this season, express their free throw shooting as a fraction.
   c. decimals greater than or equal to zero through thousandths place (2.4.1a), e.g., the basketball team made 15 out of 25 free throws this season, express their free throw shooting as a decimal.
2. determines whether or not solutions to real-world problems that involve the following are reasonable $.
   a. integers (2.4.A1a), e.g., the football is placed on your own 10-yard line with 90 yards to go for a touchdown. After the first down, your team gains 7 yards. On the second down, your team loses 4 yards; and on the third down your team gains 2 yards. Is it reasonable for the football to be placed on the 5 yard line for the beginning of the fourth down? No, you have gained more than you have lost.

b. fractions greater than or equal to zero (2.4.A1c), e.g., Gary, Tom, and their parents are selling greeting cards. Gary receives 1/3 of the profit and Tom receives 1/4 of the profit. Is it reasonable that together they received 2/7 of the profits?
c. decimals greater than or equal to zero through thousandths place (2.4.A1c), e.g., the beginning bank balance is $250.40 A deposit of $175, a withdrawal of $198, and a $2 service charge are made. The checkbook balance reads $127.40. Is this a reasonable balance? Why or why not?

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.

Benchmark 2: Number Systems and Their Properties – The student demonstrates an understanding of the rational number system and the irrational number pi; recognizes, uses, and describes their properties; and extends these properties to algebraic expressions in one variable.

Knowledge Base Indicators

The student…

1. classifies subsets of the rational number system as counting numbers, whole numbers, integers, fractions (including mixed numbers), or decimals (2.4.K1a,c,k).
2. identifies prime and composite numbers and explains their meaning (2.4.K1d).
3. uses and describes these properties with the rational number system and demonstrates their meaning including the use of concrete objects (2.4.K1a) $:
   a. commutative and associative properties of addition and multiplication (commutative – changing the order of the numbers does not change the solution; associative – changing the grouping of the numbers does not change the solution);
   b. identity properties for addition and multiplication (additive identity – zero added to any number is equal to that number; multiplicative identity – one multiplied by any number is equal to that number);
   c. symmetric property of equality, e.g., 24 x 72 = 1,728 is the same as 1,728 = 24 x 72;
   d. zero property of multiplication (any number multiplied by zero is zero);
   e. distributive property (distributing multiplication or division over addition or subtraction), e.g., 26(9 + 15) = 26(9) + 26(15);
   f. substitution property (one name of a number can be substituted for another name of the same number), e.g., if a = 3 and a + 2 = b, then 3 + 2 = b;
   g. addition property of equality (adding the same number to each side of an equation results in an equivalent equation – an equation with the same solution), e.g., if a = b, then a + 3 = b + 3;
   h. multiplication property of equality (for any equation, if the same number is multiplied to each side of that equation, then the new statement describes an equation equivalent to the original), e.g., if a= b, then a x 7 = b x 7;
   i. additive inverse property (every number has a value known as its additive inverse and when the original number is added to that additive inverse, the answer is zero), e.g., $^{+}5 + (^{-}5) = 0$.
4. recognizes and explains the need for integers, e.g., with temperature, below zero is negative and above zero is positive; in finances, money in your pocket is positive and money owed someone is negative.
5. recognizes that the irrational number pi can be represented by an approximate rational value, e.g., 22/7 or 3.14.

Application Indicators

The student…

1. generates and/or solves real-world problems with rational numbers using the concepts of these properties to explain reasoning (2.4.A1a-c,e) **$**:
   a. commutative and associative properties for addition and multiplication, e.g., at a delivery stop, Sylvia pulls out a flat of eggs. The flat has 5 columns and 6 rows of eggs. Show two ways to find the number of eggs: 5 • 6 = 30 or 6 • 5 = 30.
   b. additive and multiplicative identities, e.g.,
   c. symmetric property of equality, e.g., Sam took a $15 check to the bank and received a $10 bill and a $5 bill. A $15 check is the same amount as a $10 bill and a $5 bill.
   d. distributive property, e.g., trim is used around the outside edges of a bulletin board with dimensions 3 ft by 5 ft. Show two different ways to solve this problem: 2(3 + 5) = 16 or 2 • 3 + 2 • 5 = 6 + 10 = 16. Then explain why the answers are the same.
   e. substitution property, e.g., V = IR [Ohm's Law –voltage (V) = current (I) x resistance (R)] If the current is 5 amps (I = 5) and the resistance is 4 ohms (R = 4), what is the voltage? Substitute values for I and R. To find the voltage:
      V = IR
      V = 5 • 4
      V = 20
   f. addition property of equality, e.g., ex.
   g. multiplication property of equality, e.g., the total price (P) of a car including tax (T), is $14, 685. 33. If the tax is $785.42, what is the sale price of the car (S)? P = S + T
      $14, 685.3 = S + $785.42
      $14,685.33 - $785.42 = S
      $13, 899. 91 = S
   h. additive inverse property, e.g., I had $50 to spend. I went to the shopping mall one day and spent $20 in one store, $25 at a second store, and then $5 at the food court. One way to solve might be: $50 – ($20 + $25 + $5) = $50 - $50 = 0. Then explain your reasoning.
2. analyzes and evaluates the advantages and disadvantages of using integers, whole numbers, fractions (including mixed numbers), decimals, or the irrational number pi and its rational approximations in solving a given real-world problem (2.4.A1a-c) **$**, e.g., in the store everything is 50 % off. When calculating the discount, which representation of 50% would you use and why?

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.

Benchmark 3: Estimation – The student uses computational estimation with rational numbers and the irrational number pi in a variety of situations.

Knowledge Base Indicators

The student…

1. estimates quantities with combinations of rational numbers and/or the irrational number pi using various computational methods including mental math, paper and pencil, concrete objects, and/or appropriate technology (2.4.K1a-c) **$**.
2. uses various estimation strategies and explains how they were used to estimate rational number quantities or the irrational number pi (2.4.K1a-c) **$**
3. recognizes and explains the difference between an exact and an approximate answer (2.4.K1a-c).

4. determines the appropriateness of an estimation strategy used and whether the estimate is greater than (overestimate) or less than (underestimate) the exact answer and its potential impact on the result (2.4.K1a).

Application Indicators

The student…

1. adjusts original rational number estimate of a real-world problem based on additional information (a frame of reference) (2.4.A1a) $, e.g., given a large container of marbles, estimate the quantity of marbles. Then, using a smaller container filled with marbles, count the number of marbles in the smaller container and adjust your original estimate.
2. ▲**N** estimates to check whether or not the result of a real-world problem using rational numbers and/or the irrational number pi is reasonable and makes predictions based on the information (2.4.A1a) $, e.g., a class of 28 students has a goal of reading 1,000 books during the school year. If each student reads 13 books each month, will the class reach their goal?
3. selects a reasonable magnitude from given quantities based on a real-world problem and explains the reasonableness of the selection (2.4.A1a), e.g., length of a classroom in meters – 1-3 meters, 5-8 meters, 10-15 meters.
4. determines if a real-world problem calls for an exact or approximate answer and performs the appropriate computation using various computational methods including mental math, paper and pencil, concrete objects, or appropriate technology (2.4.A1a) $, e.g., Kathy buys items at the grocery store priced at: $32.56, $12.83, $6.99, 5 for $12.49 each. She has $120 with her to pay for the groceries. To decide if she can pay for her items, does she need an exact or an approximate answer?

Standard 1: Number and Computation – The student uses numerical and computational concepts and procedures in a variety of situations.
Benchmark 4: Computation – The student models, performs, and explains computation with positive rational numbers and integers in a variety of situations.

Knowledge Base Indicators

The student…

1. computes with efficiency and accuracy using various computational methods including mental math, paper and pencil, concrete objects, and appropriate technology (2.4.K1a).
2. performs and explains these computational procedures:
   a. ▲**N** divides whole numbers through a 2-digit divisor and a 4-digit dividend and expresses the remainder as a whole number, fraction, or decimal (2.4.K1a-b), e.g., 7452 ÷ 24 = 310 r 12, 310 12/24, 310 ½, or 310.5;
   b. **N** adds and subtracts decimals from millions place through thousandths place (2.4.K1c);
   c. **N** multiplies and divides a four-digit number by a two-digit number using numbers from thousands place through hundredths place (2.4.K1a-b), e.g., 4,350 ÷ 1.2 = 3,625;
   d. **N** multiplies and divides using numbers from thousands place through thousandths place by 10; 100; 1,000; .1; .01; .001; or single-digit multiples of each (2.4.K1a-c); e.g., 54.2 ÷ .002 or 54.3 x 300;
   e. **N** adds integers, e.g., $^{+}6 + {}^{-}7 = {}^{-}1$ (2.4.K1a);
   f. ▲**N** adds, subtracts, and multiplies fractions (including mixed numbers) expressing answers in simplest form (2.4.K1c); e.g., ex
   g. **N** finds the root of perfect whole number squares (2.4.K1a);

   h. **N** uses basic order of operations (multiplication and division in order from left to right, then addition and subtraction in order from left to right) with whole numbers;
   i. adds, subtracts multiplies, and divides rational numbers using concrete objects.
3. recognizes, describes, and uses different representations to express the same computational procedures, e.g., 3/4 = 3 ÷ 4 = $4\overline{)3}$.
4. identifies, explains, and finds the prime factorization of whole numbers (2.4.K1d).
5. finds prime factors, greatest common factor, multiples, and the least common multiple (2.4.K1d).
6. finds a whole number percent (between 0 and 100) of a whole number (2.4.K1a,c) **$**, e.g., 12% of 40 is what number?

Application Indicators

The student…
1. generates and/or solves one- and two-step real-world problems with rational numbers using these computational procedures **$**:
   a. division with whole numbers (2.4.A1b), e.g., the perimeter of a square is 128 feet. What is the length of its side?
   b. ▲addition, subtraction, multiplication, and division of decimals through hundredths place (A2.4.A1a-c), e.g., it is 25.8 miles from Allen to Barber, 15.2 miles from Barber to Chase, and 14.9 miles from Chase to Douglas. What is the halfway point between Allen and Douglas?
   c. addition, subtraction, and multiplication of fractions (including mixed numbers) (2.4.A1c), e.g., the student council is having a contest between classes. On the average, each student takes 3 1/3 minutes for the relay. How much time is needed for a class of 24 to run the relay?

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.

Benchmark 1: Patterns – The student recognizes, describes, extends, develops, and explains the general rule of a pattern in variety of situations.

Knowledge Base Indicators

The student…
1. identifies, states, and continues a pattern presented in various formats including numeric (list or table), visual (picture, table, or graph), verbal (oral description), kinesthetic (action), and written using these **attributes** include:
   a. counting numbers including perfect squares, and factors and multiples (number theory) (2.4.K1a);
   b. positive rational numbers limited to two operations (addition, subtraction, multiplication, division) including arithmetic sequences (a sequence of numbers in which the difference of two consecutive numbers is the same) (2.4.K1a);
   c. geometric figures through two attribute changes (2.4.K1g);
   d. measurements (2.4.K1a);
   e. things related to daily life (2.4.K1a) **$**, e.g., time (a full moon every 28 days), tide, calendar, traffic, or appropriate topics across the curriculum.
2. generates a pattern repeating, growing) (2.4.K1a).

3. extends a pattern when given a rule of one or two simultaneous operational changes (addition, subtraction, multiplication, division) between consecutive terms (2.4.K1a), e.g., find the next three numbers in a pattern that starts with 3, where you double and add 1 to get the next number; the next three numbers are 7, 15, and 31.

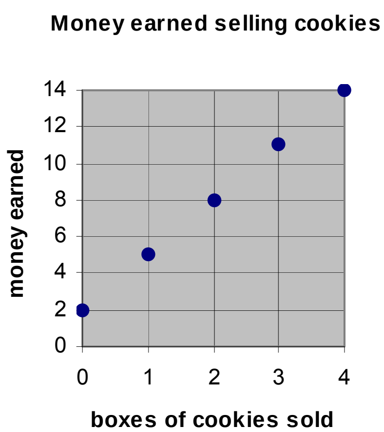
4. **▲ states the rule to find the next number of a pattern with one operational change (addition, subtraction, multiplication, division) to move between consecutive terms (2.4.K1a), e.g., given 4, 8, and 16, double the number to get the next term, multiply the term by 2 to get the next term, or add the number to itself for the next term.**

Application Indicators

The student…

1. recognizes the same general pattern presented in different representations [numeric (list or table), visual (picture, table, or graph), and written] (2.4.A1a,k), e.g., you are selling cookies by the box. Each box costs $3. You have $2 to begin your sales. This can be written as a pattern that begins with 2 and adds three each time, as a table or graph.

X	Y
0	2
2	8
3	11
4	14



2. recognizes multiple representations of the same pattern (2.4.A1a) $, e.g., 1, 10; 100; 1,000; 10,000…
   - represented as 1; 10; 10 x 10; 10 x 10 x 10; 10 x 10 x 10 x 10; …;
   - represented as $10^{0;}$ 10^1; 10^2; 10^3; 10^4; …;
   - represented as a unit; a rod; a flat; a cube; … using base ten blocks; or
   - represented as a $1 bill; a $10 bill; a $100 bill ; a $1,000 bill; ….

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.

Benchmark 2: Variables, Equations, and Inequalities – The student uses variables, symbols, positive rational numbers, and algebraic expressions in one variable to solve linear equations and inequalities in a variety of situations.

Knowledge Base Indicators

The student…

1. explains and uses variables and/or symbols to represent unknown quantities and variable relationships (2.4.K1a), e.g., x < 2.
2. uses equivalent representations for the same simple algebraic expression with understood coefficients of 1 (2.4.K1a), e.g., when students are developing their own formula for the perimeter of a square they combine s + s + s + s to make 4s.
3. solves (2.4.K1a,e) \$:
    a. one-step linear equations (addition, subtraction, multiplication, division) with one variable and whole number solutions, e.g.,
    2 x = 8 or x + 7 = 12
    b. one-step linear inequalities(addition, subtraction) in one variable with whole numbers, e.g., x – 5 < 12 x < 17;
4. explains and uses equality and inequality symbols (=, ≠, <, ≤, >, ≥) and corresponding meanings (is equal to, is not equal to, is less than, is less than or equal to, is greater than, is greater than or equal to) to represent mathematical relationships with positive rational numbers (2.4.K1a-b) \$.
5. knows and uses the relationship between ratios, proportions, and percents and finds the missing term in simple proportions where the missing term is a whole number (2.4.K1a,c), e.g., $\frac{1}{2} = \frac{x}{4}$, $\frac{2}{3} = \frac{4}{x}$, $\frac{1}{4} = \frac{x}{100}$.
6. finds the value of algebraic expressions using whole numbers (2.4.Ka), e.g., If x =3, then 5x = 5(3) = 15.

Application Indicators

The student…

1. represents real-world problems using variables and symbols to (2.4.A1a,e) \$:
    a. write algebraic or numerical expressions or one-step equations (addition, subtraction, multiplication, division) with whole number solutions, e.g., John has three times as much money as his sister. If M is the amount of money his sister has, what is the expression that represents the amount of money that John has? The expression would be written as 3M.
    b. ▲ write and/or solve one-step equations (addition, subtraction, multiplication, and division), e.g., a player scored three more points today than yesterday. Today, the player scored 17 points. How many points were scored yesterday? Write an equation to represent this problem. The equation would be written as y + 3 = 17. The answer is y = 14.
2. generates real-world problems that represent simple expressions or one-step linear equations (addition, subtraction, multiplication, division) with whole number solutions (2.2.A1a,e), \$ e.g., write a problem situation that represents the expression x + 10. The problem could be: How old will a person be ten years from now?
3. explains the mathematical reasoning that was used to solve a real-world problem using a one-step equation (addition, subtraction, multiplication, division) (2.2.A1a,e) \$, e.g., use the equation form y + 3 = 17. Solve by subtracting 3 from both sides to get y = 14.

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.

Benchmark 3: Functions – The student recognizes, describes, and analyzes linear relationships in a variety of situations.

Knowledge Base Indicators

The student…

1. recognizes linear relationships using various methods including mental math, paper and pencil, concrete objects, and graphing utilities or appropriate technology (2.4.K1a).
2. finds the values and determines the rule with one operation using a function table (input/output machine, T-table) (2.4.K1f).
3. generalizes numerical patterns up to two operations by stating the rule using words (2.4.K1a), e.g., If the sequence is 2400, 1200, 600, 300, 150, …, what is the rule? In words, the rule could be split the number in half or divide the number before by 2.
4. uses a given function table (input/output machine, T-table) to identify, plot, and label the ordered pairs using the four quadrants of a coordinate plane (2.4.K1a,f).

Application Indicators

The student…

1. represents a variety of mathematical relationships using written and oral descriptions of the rule, tables, graphs, and when possible, symbolic notation (2.4.A1f,k) $, e.g., linear patterns and graphs can be used to represent time and distance situations. Pretend you are in a car traveling from home at 50 miles per hour. Then, represent the n^{th} term. 50n meaning 50 times the number of hours traveling equals the distance away from home.

Time	Distance
0	0
1	50
2	100
.	.
.	.
.	.
n	50n

2. interprets and describes the mathematical relationships of numerical, tabular, and graphical representations (2.4.Alf,k).

Standard 2: Algebra – The student uses algebraic concepts and procedures in a variety of situations.

Benchmark 4: Models – The student generates and uses mathematical models to represent and justify mathematical relationships in a variety of situations.

Knowledge Base Indicators

The student…

1. knows, explains, and uses mathematical models to represent mathematical concepts, procedures, and relationships. Mathematical models include:
   a. process models (concrete objects, pictures, diagrams, number lines, hundred charts, measurement tools, multiplication arrays, division sets, or coordinate planes/grids) to model computational procedures and mathematical relationships and to solve equations (1.1.K1-5, 1.2.K1, 1.3.K1-4, 1.4.K1, 1.4.K2a, 1.4.K2c-e, 1.4.K2g, 1.4.K2i, 1.4.K6, 2.1.K1a-b, 2.1.K1d-e, 2.1.K2-4, 2.2.K1-6, 2.3.K1, 2.3.K3-4, 3.2.K1-4, 3.2.K8, 3.3.K1-4, 3.4.K1-3, 4.2.K4) $;
   b. place value models (place value mats, hundred charts, base ten blocks, or unifix cubes) to compare, order, and represent numerical quantities and to model computational procedures (1.1.K1-4, 1.2.K1, 1.3.K1-3, 1.4.K2b, 1.4.K2c-d, 2.2K4) $;
   c. fraction and mixed number models (fraction strips or pattern blocks and decimal and money models (base ten blocks or coins to compare, order, and represent numerical quantities (1.1.K1-4, 1.2.K1, 1.3.K1-3, 1.4.K2b, 1.4.K2d, 1.4.K2f, 1.4.K6, 2.2.K5, 4.1.K4, 4.2.K4) $:
   d. factor trees to find least common multiple and greatest common factor (1.4.K4-5);
   e. equations and inequalities to model numerical relationships (2.2.K3,) $;
   f. function tables (input/output machines, T-tables) to model numerical and algebraic relationships (2.3.K2, 2.3.K4) $;
   g. two-dimensional geometric models (geoboards or dot paper) to model perimeter, area, and properties of geometric shapes and three-dimensional geometric models (nets or solids) and real-world objects to model volume and to identify attributes (faces, edges, vertices, bases) of geometric shapes (2.1.K1c, 3.1.K1-5, 3.1.K7-10, 3.2.K7, 3.3.K1-4);
   h. tree diagrams to organize attributes and determine the number of possible combinations (4.1.K2);
   i. graphs using concrete objects, two- and three-dimensional geometric models (spinners or number cubes) and process models (concrete objects, pictures, diagrams, or coins) to model probability (4.1.K1-4) $.
   j. frequency tables, bar graphs, line graphs, circle graphs, Venn diagrams, line plots, charts, tables, single stem-and-leaf plots, and scatter plots to organize and display data (4.2.K1-3) $;
   k. Venn diagrams to sort data and to show relationships (1.2.K1).
2. uses one or more mathematical models to show the relationship between two or more things.

Application Indicator

The student…

1. recognizes that various mathematical models can be used to represent the same problem situation. Mathematical models include:
   a. process models (concrete objects, pictures, diagrams, number lines, hundred charts, measurement tools, multiplication arrays, division sets, or coordinate planes/grids) to model computational procedures and mathematical relationships, to represent problem situations, and to solve equations (1.1.A1, 1.1.A1a, 1.2.A1-2, 1.3.A1-4, 1.4.A1a-b, 2.1.A1-2, 2.1.A1-3, 3.2.A1a, 3.2.A1c, 3.2.A2, 3.3.A1-2, 3.4.A1-2, 4.2.A1) $;
   b place value models (place value mats, hundred charts, base ten blocks, or unifix cubes) to model problem situations (1.1.A1, 1.2.A1-2, 2.2.A3) $;
   c. fraction and mixed number models (fraction strips or pattern blocks) and decimal and money models (base ten blocks or coins) to compare, order, and represent numerical quantities (1.1.A1, 1.1.A2b-c, 1.2.A1-2, 1.4.A1b-c) $;
   d. factor trees to find least common multiple and greatest common factor;
   e. equations and inequalities to model numerical relationships (2.2.A1-3) $;
   f. function tables (input/output machines, T-tables) to model numerical and algebraic relationships

(2.3.A1-2) $;

g. two-dimensional geometric models (geoboards or dot paper) to model perimeter, area, and properties of geometric shapes and three-dimensional geometric models (nets or solids) and real-world objects to model volume and to identify attributes (faces, edges, vertices, bases) of geometric shapes (3.1.A1-3. 3.2.A1b, 3.4.A2);
h. scale drawings to model large and small real-world objects (3.4.A2);
i. tree diagrams to organize attributes and determine the number of possible combinations;
j. two- and three-dimensional geometric models (spinners or number cubes) and process models (concrete objects, pictures, diagrams, or coins) to model probability (4.1.A1-3) $;
k. graphs using concrete objects, frequency tables, bar graphs, line graphs, circle graphs, Venn diagrams, line plots, charts, tables, and single stem-and-leaf plots to organize, display, explain, and interpret data (2.1.A1, 2.3.A1-2, 4.1.A1-2, 4.2.A1-3) $;
l. Venn diagrams to sort data and to show relationships.

2. selects a mathematical model and justifies why some mathematical models are more accurate than other mathematical models in certain situations. (For purposes of assessment, the focus will be on graphs using concrete objects, frequency tables, bar graphs, line graphs, circle graphs, Venn diagrams, charts, tables, and single stem-and-leaf plots.)

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.

Benchmark 1: Geometric Figures and Their Properties – The student recognizes geometric figures and compares their properties in a variety of situations.

<u>Knowledge Base Indicators</u>

The student…

1. recognizes and compares properties of plane figures and solids using concrete objects, constructions, drawings, and appropriate technology (2.4.K1g).
2. recognizes and names regular and irregular polygons through 10 sides including all special types of quadrilaterals: squares, rectangles, parallelograms, rhombi, trapezoids, kites (2.4.K1g).
3. names and describes the solids [prisms (rectangular and triangular), cylinders, cones, spheres, and pyramids (rectangular and triangular)] using the terms faces, edges, vertices, and bases (2.4.K1g).
4. recognizes all existing lines of symmetry in two-dimensional figures (2.4.K1g).
5. recognizes and describes the attributes of similar and congruent figures (2.4.K1g).
6. recognizes and uses symbols for angle (find symbol for), line(↔), line segment (—), ray (→), parallel (||), and perpendicular (⊥).
7. ▲ classifies (2.4.K1g):
   a. angles as right, obtuse, acute, or straight;
   b. triangles as right, obtuse, acute, scalene, isosceles, or equilateral.
8. identifies and defines circumference, radius, and diameter of circles and semicircles.
9. recognize that the sum of the angles of a triangle equals 180° (2.4.K1g).
10. determines the radius or diameter of a circle given one or the other.

Application Indicator

The student…

1. solves real-world problems by applying the properties of (2.4.A1g):
   a. plane figures (regular polygons through 10 sides, circles, and semicircles) and the line(s) of symmetry, e.g., twins are having a birthday party. The rectangular birthday cake is to be cut into two equal sizes of the same shape. How would you cut the cake?
   b. solids (cubes, rectangular prisms, cylinders, cones, spheres, triangular prisms) emphasizing faces, edges, vertices, and bases, e.g., lace is to be glued on all of the edges of a cube. If one edge measures 34 cm, how much lace is needed?
   c. intersecting, parallel, and perpendicular lines, e.g., railroad tracks form what type of lines? Two roads are perpendicular, what is the angle between them?
2. decomposes geometric figures made from (2.4.A1g):
   a. regular and irregular polygons through 10 sides, circles, and semicircles, e.g., draw a picture of a house (rectangular base) with a roof (triangle) and a chimney on the side of the roof (trapezoid). Identify the three geometrical figures.
   b. nets (two-dimensional shapes that can be folded into three-dimensional figures), e.g., the cardboard net that becomes a shoebox.
3. composes geometric figures made from (2.4.A1g):
   a. regular and irregular polygons through 10 sides, circles, and semicircles;
   b. nets (two-dimensional shapes that can be folded into three-dimensional figures).

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.
Benchmark 2: Measurement and Estimation – The student estimates, measures, and uses measurement formulas in a variety of situations.

Knowledge Base Indicators

The student…

1. determines and uses whole number approximations (estimations) for length, width, weight, volume, temperature, time, perimeter, and area using standard and nonstandard units of measure (2.4.K1a) **$**.
2. selects, explains the selection of, and uses measurement tools, units of measure, and level of precision appropriate for a given situation to find accurate rational number representations for length, weight, volume, temperature, time, perimeter, area, and angle measurements (2.4.K1a) **$**.
3. converts (2.4.K1a):
   a. within the customary system, e.g., converting feet to inches, inches to feet, gallons to pints, pints to gallons, ounces to pounds, or pounds to ounces;
   b. ▲ within the metric system using the prefixes: kilo, hecto, deka, deci, centi, and milli; e.g., converting millimeters to meters, meters to millimeters, liters to kiloliters, kiloliters to liters, milligrams to grams, or grams to milligrams.
4. uses customary units of measure to the nearest sixteenth of an inch and metric units of measure to the nearest millimeter (2.4.K1a).
5. recognizes and states perimeter and area formulas for squares, rectangles, and triangles (2.4.K1g).
   a. uses given measurement formulas to find perimeter and area of: squares and rectangles,
   b. figures derived from squares and/or rectangles.
6. describes the composition of the metric system (2.4.K1a):
   a. meter, liter, and gram (root measures);

   b. kilo, hecto, deka, deci, centi, and milli (prefixes).
7. finds the volume of rectangular prisms using concrete objects (2.4.K1g).
8. estimates an approximate value of the irrational number pi (2.4.K1a).

Application Indicator

The student…
1. solves real-world problems by applying these measurement formulas $:
   a. ▲ perimeter of polygons using the same unit of measurement (2.4.A1a,g), e.g., measures the length of the fence around a yard;
   b. ▲ area of squares, rectangles, and triangles using the same unit of measurement (2.4.A1g), e.g., finds the area of a room for carpeting;
   c. conversions within the metric system (2.4.A1a), e.g., your school is having a balloon launch. Each student needs 40 centimeters of string, and there are 42 students. How many meters of string are needed?
2. estimates to check whether or not measurements and calculations for length, width, weight, volume, temperature, time, perimeter, and area in real-world problems are reasonable and adjusts original measurement or estimation based on additional information (a frame of reference) (2.4.A1a) $, e.g., students estimate, in feet, the height of a bookcase in their classroom. Then a student who is about 5 feet tall stands beside it. The students then adjust their estimate.

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.

Benchmark 3: Transformational Geometry – The student recognizes and performs transformations on two- and three-dimensional geometric figures in a variety of situations.

Knowledge Base Indicators

The student…
1. ▲identifies, describes, and performs one or two transformations (reflection, rotation, translation) on a two-dimensional figure (2.4.K1a).
2. reduces (contracts/shrinks) and enlarges (magnifies/grows) simple shapes with simple scale factors (2.4.K1a), e.g., tripling or halving.
3. recognizes three-dimensional figures from various perspectives (top, bottom, sides, corners) (2.4.K1a).
4. recognizes which figures will tessellate (2.4.K1a).

Application Indicator

The student…
1. describes a transformation of a given two-dimensional figure that moves it from its initial placement (preimage) to its final placement (image) (2.4.A1a).

2. makes a scale drawing of a two-dimensional figure using a simple scale (2.4.A1a), e.g., using the scale 1 cm = 30 m, the student makes a scale drawing of the school.

Standard 3: Geometry – The student uses geometric concepts and procedures in a variety of situations.

Benchmark 4: Geometry From An Algebraic Perspective – The student relates geometric concepts to a number line and a coordinate plane in a variety of situations.

Knowledge Base Indicators

The student…

1. uses a number line (horizontal/vertical) to order integers and positive rational numbers (in both fractional and decimal form) (2.4.K1a).
2. organizes integer data using a T-table and plots the ordered pairs in all four quadrants of a coordinate plane (coordinate grid) (2.4.K1a).
3. ▲uses all four quadrants of the coordinate plane to (2.4.K1a):
   a. identify the ordered pairs of integer values on a given graph;
   b. plot the ordered pairs of integer values.

Application Indicator

The student…

1. represents, generates, and/or solves real-world problems using a number line with integer values (2.4.A1a) $, e.g., the difference between $^{-}2$ degrees and 10 degrees on a thermometer is 12 degrees (units); similarly, the distance between $^{-}2$ to $^{+}10$ on a number line is 12 units.
2. represents and/or generates real-world problems using a coordinate plane with integer values to find (2.4.A1a,g-h):
   a. the perimeter of squares and rectangles, e.g., Alice made a scale drawing of her classroom and put it on a coordinate plane marked off in feet. The rectangular table in the back of the room was described by the points (8,9), (8,12), (14,12) and (14,9). Now Alice wants to put a skirting around the outer edge of the table. Using the drawing, find the amount of skirting she will need.
   b. the area of triangles, squares, and rectangles, e.g., a scale drawing of a flower garden is found in a book with the coordinates of the four corners being (9,5), (9,13), (18,13) and (18,5). The scale is marked off in meters. How many square meters is the flower garden?

Standard 4: Data – The student uses concepts and procedures of data analysis in a variety of situations.

Benchmark 1: Probability – The student applies the concepts of probability to draw conclusions and to make predictions and decisions including the use of concrete objects in a variety of situations.

Knowledge Base Indicators

The student…

1. recognizes that all probabilities range from zero (impossible) through one (certain) and can be written as a fraction, decimal, or a percent (2.4.K1i) $, e.g., when you flip a coin, the probability of the coin landing on heads (or tails) is ½, .5, or 50%.
2. ▲lists all possible outcomes of an experiment or simulation with a compound event composed of two independent events in a clear and organized way (2.4.K1h-j), e.g., using a tree diagram or list to find all the possible color combinations of pant and shirt ensembles, if there are 3 shirts (red, green, blue) and 2 pairs of pants (black and brown).
3. recognizes whether an outcome in a compound event in an experiment or simulation is impossible, certain, likely, unlikely, or equally likely (2.4.K1i).
4. ▲represents the probability of a simple event in an experiment or simulation using fractions and decimals (2.4.K1c,i), e.g., the probability of rolling an even number on a single number cube is represented by ½ or .5.

Application Indicator

The student…

1. conducts an experiment or simulation with a compound event composed of two independent events including the use of concrete objects; records the results in a chart, table, or graph; and uses the results to draw conclusions about the events and make predictions about future events (2.4.A1j-k).
2. analyzes the results of a given experiment or simulation of a compound event composed of two independent events to draw conclusions and make predictions in a variety of real-world situations (2.4.A1j-k), e.g., given the equal likelihood that a customer will order a pizza with either thick or thin crust, and an equal probability that a single topping of beef, pepperoni, or sausage will be selected –
   1) What is the probability that a pizza ordered will be thin crust with beef topping?
   2) Given sales of 30 pizzas on a Friday night, how many would the manager expect to be thin crust with beef topping?
3. compares what should happen (theoretical probability/expected results) with what did happen (experimental probability/empirical results) in an experiment or simulation with a compound event composed of two independent events (2.4.A1j).

Standard 4: Data – The student uses concepts and procedures of data analysis in a variety of situations.

Benchmark 2: Statistics – The student collects, organizes, displays, and explains numerical (rational numbers) and non-numerical data sets in a variety of situations with a special emphasis on measures of central tendency.

Knowledge Base Indicators

The student…

1. organizes, displays, and reads quantitative (numerical) and qualitative (non-numerical) data in a clear, organized, and accurate manner including a title, labels, categories, and rational number intervals using these **data displays** (2.4.K1j) $:
   a. graphs using concrete objects;
   b. frequency tables and line plots;
   c. bar, line, and circle graphs;
   d. Venn diagrams or other pictorial displays;
   e. charts and tables;

    f. single stem-and-leaf plots;
    g. scatter plots;
2. selects and justifies the choice of data collection techniques (observations, surveys, or interviews) and sampling techniques (random sampling, samples of convenience, or purposeful sampling) in a given situation (2.4.K1j).
3. uses sampling to collect data and describe the results (2.4.K1j) **$**.
4. determines mean, median, mode, and range for (2.4.K1a,c) **$**:
    a. a whole number data set,
    b. a decimal data set with decimals greater than or equal to zero.

Application Indicator

The student…
1. uses data analysis (mean, median, mode, range) of a whole number data set or a decimal data set with decimals greater than or equal to zero to make reasonable inferences, predictions, and decisions and to develop convincing arguments from these **data displays** (2.4.A1k) **$**:
    a. graphs using concrete objects;
    b. frequency tables and line plots;
    c. bar, line, and circle graphs;
    d. Venn diagrams or other pictorial displays;
    e. charts and tables;
    f. single stem-and-leaf plots.
2. explains advantages and disadvantages of various data displays for a given data set (2.4.A1k) **$**.
3. recognizes and explains the effects of scale and/or interval changes on graphs of whole number data sets (2.4.A1k).