

# Kansas School For the Deaf

## Mathematics Curriculum

Adapted from Kansas Curricular  
Standards for Mathematics  
July 2003

# Standards and Benchmarks

## Kindergarten

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

B1 – Number Sense – The student demonstrates number sense for whole numbers, fractions, and money using concrete objects in a variety of situations.

B2 – Number Systems and Their Properties – The student demonstrates an understanding of whole numbers with a special emphasis on place value in a variety of situations.

B3 – Estimation – The student uses computational estimation with whole numbers in a variety of situations.

B4 – Computation – The student models, performs, and explains computation with whole numbers using concrete objects in a variety of situations.

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

B1 – Patterns – The student recognizes, describes, extends, develops, and explains relationships in patterns using concrete objects in a variety of situations.

B2 – Variables, Equations, and Inequalities – The student solves addition equations using concrete objects in a variety of situations.

B3 – Functions – The student recognizes and describes whole number relationships using concrete objects in a variety of situations.

B4 – Models – The student uses mathematical models including concrete objects to represent, show, and communicate mathematical relationships in a variety of situations.

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

B1 – Geometric Figures and Their Properties – The student recognizes geometric shapes and their attributes using concrete objects in a variety of situations.

B2 – Measurement and Estimation – The student estimates and measures using standard and nonstandard units of measurement with concrete objects in a variety of situations.

B3 – Transformational Geometry – The student develops the foundation for spatial sense using concrete objects in a variety of situations.

B4 – Geometry from an Algebraic Perspective – The student identifies one or more points on a number line in a variety of situations.

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

B1 – Probability – The student applies the concepts of probability using concrete objects in a variety of situations.

B2 – Statistics – The student collects, records, and explains numerical (whole numbers) and non-numerical data sets including the use of concrete objects in a variety of situations.

### **N – Noncalculator**

## Kindergarten

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

**B1 – Number Sense – The student demonstrates number sense for whole numbers, fractions, and money using concrete objects in a variety of situations.**

1. The student establishes a one-to-one correspondence with whole numbers from 0 through 20 using concrete objects and identifies, states, and writes the appropriate cardinal number.
2. The student compares and orders whole numbers from 0 through 20 using concrete objects.
3. The student recognizes a whole, a half, and parts of a whole using concrete objects.
4. The student identifies positions as first and last.
5. The student identifies pennies and dimes and states the value of the coins.

**B2 – Number Systems and Their Properties – The student demonstrates an understanding of whole numbers with a special emphasis on place value in a variety of situations.**

1. The student reads and writes whole numbers from 0 through 20 in numerical form.
2. The student represents whole numbers from 0 through 20 using place value models.
3. The student counts:
  - a. Whole numbers from 0 through 20,
  - b. Whole numbers from 10 to 0 backwards,

- c. Subsets of whole numbers from 0 through 20;
  - d. Forwards and backwards from a specific whole number using a number line from 0 through 10.
4. The student groups objects by 5s and by 10s.
  5. The student uses the concept of the zero property of addition (additive identity) with whole numbers from 0 through 20 and demonstrates its meaning using concrete objects.

**B3 – Estimation – The student uses computational estimation with whole numbers in a variety of situations.**

1. The student determines if a group of 20 concrete objects or less has more, less, or about the same number of concrete objects as a second set of the same kind of objects.
2. Application: The student compares two randomly arranged groups of 10 objects or less and states the comparison using the terms: more, less, about the same.

**B4 – Computation – The student models, performs, and explains computation with whole numbers using concrete objects in a variety of situations.**

1. The student adds and subtracts using whole numbers from 0 through 10 and various mathematical models.
2. The student uses repeated addition (multiplication) with whole numbers to find the sum when given the number of groups (three or less) and given the same number of concrete objects in each group (five or less).
3. The student uses repeated subtraction (division) with whole numbers when given the total number of concrete objects in each group to find the number of groups.
4. Application: The student solves one-step real-world addition or subtraction problems with whole numbers from 0 through

10 using concrete objects in various groupings and explains reasoning.

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

**B1 – Patterns – The student recognizes, describes, extends, develops, and explains relationships in patterns using concrete objects in a variety of situations.**

1. The student uses concrete objects, drawings, and other representations to work with types of patterns:
  - a. Repeating patterns;
  - b. Growing (extending) patterns.
2. The student uses these attributes to generate patterns:
  - a. Whole numbers, e.g. 2,4,6,...;
  - b. Geometric shapes with one attribute change, e.g.,  $\Delta$ ,  $\circ$ ,  $\Delta$ ,  $\circ$ ,  $\Delta$ ,  $\circ$ , ...;
  - c. Things related to daily life, e.g. breakfast, lunch, dinner.
3. The student identifies and continues a pattern.
4. The student generates:
  - a. Repeating patterns for the AB pattern, the ABC pattern, and the AAB pattern;
  - b. Growing (extending) patterns that add 1,2, or 10 to continue the pattern.
5. The student classifies and sorts concrete objects by similar attributes.
6. Application: The student uses concrete objects to model a whole number pattern:
  - a. Counting by ones;
  - b. Counting by twos;
  - c. Counting by tens.

**B2 – Variables, Equations, and Inequalities – The student solves addition equations using concrete objects in a variety of situations.**

1. The student finds the unknown sum using the basic facts with sums through 10 using concrete objects and pictures.
2. Application: The student describes real-world problems using concrete objects and pictures and the basic facts with sums through 10, e.g., given some marbles, Sue says, "There are 3 red marbles and 3 blue marbles. Altogether, there are 6 marbles."

**B3 – Functions – The student recognizes and describes whole number relationships using concrete objects in a variety of situations.**

1. The student locates whole numbers from 0 through 20 on a number line.
2. Application: The student represents and describes mathematical relationships for whole numbers from 0 through 10.

**B4 – Models – The student uses mathematical models including objects to represent, show, and communicate mathematical relationships in a variety of situations.**

1. The student knows, explains, and uses mathematical models to represent mathematical concepts, procedures, and relationships. Mathematical models include:
  - a. Process models (concrete objects, pictures, number lines, unifix cubes, measurement tools, or calendars) to model computational procedures and mathematical relationships, to compare and order numerical quantities, and to represent fractional parts;

- b. Place value models (ten frames, unifix cubes, bundles of straws, or base ten blocks) to represent numerical quantities;
  - c. Fraction models (fraction strips or pattern blocks) to represent numerical quantities;
  - d. Money models (base ten blocks or coins) to represent numerical quantities;
  - e. Two-dimensional geometric models (geoboards, dot paper, or attribute blocks), three-dimensional geometric models (solids), and real-world objects to compare size and to model attributes of geometric shapes;
  - f. Two-dimensional geometric models (spinners), three-dimensional geometric models (number cubes), and concrete objects to model probability;
  - g. Graphs using concrete objects, pictographs, and frequency tables to organize and display data.
2. The student uses concrete objects, pictures, drawings, diagrams, or dramatizations to show the relationship between two or more things.

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

**B1 – Geometric Figures and Their Properties – The student recognizes geometric shapes and their attributes using concrete objects in a variety of situations.**

- 1. The student recognizes circles, squares, rectangles, triangles, and ellipses (ovals) (plane figures/two-dimensional figures).
- 2. The student recognizes and investigates attributes of circles, squares, rectangles, triangles, and ellipses using concrete objects, drawings, and/or appropriate technology.

- 3. The student sorts cubes, rectangular prisms, cylinders, cones, and spheres (solids/three-dimensional figures) by their attributes using concrete objects.

**B2 – Measurement and Estimation – The student estimates and measures using standard and nonstandard units of measure with concrete objects in a variety of situations.**

- 1. The student uses whole number approximations (estimations) for length using nonstandard units of measure, e.g. the classroom door is about two kindergartners high or this paper is about two pencils long.)
- 2. The student compares two measurements using these attributes:
  - a. Longer, shorter (length);
  - b. Taller, shorter (height);
  - c. Heavier, lighter (weight);
  - d. Hotter, colder (temperature).
- 3. The student reads and tells time at the hour using analog and digital clocks.
- 4. Application: The student locates and names concrete objects that are about the same length or weight as a given concrete object.

**B3 – Transformational Geometry – The student develops the foundation for spatial sense using concrete objects in a variety of situations.**

- 1. The student describes the spatial relationship between two concrete objects using appropriate vocabulary, e.g. behind, above, below, on, or under.
- 2. The student identifies two like objects or shapes from a set of four objects or shapes.

**B4 – Geometry from an Algebraic Perspective – The student identifies one or more points on a number line in a variety of situations.**

1. The student locates and plots whole numbers from 0 through 20 on a horizontal number line.
2. The student counts forwards and backwards from a given whole number from 0 through 10 on a number line.

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

**B1 – Probability – The student applies the concepts of probability using concrete objects in a variety of situations.**

1. The student recognizes whether an event is impossible or possible, e.g. the possibility of a person having ten heads is impossible, while the possibility of a person having red hair is possible.
2. The student recognizes and states whether a simple event in an experiment or simulation including the use of concrete objects can have more than one outcome.
3. Application: The student conducts an experiment or simulation with a simple event and records the results in a graph using concrete objects or frequency tables (tally marks).

**B2 – Statistics – The student collects, records, and explains numerical (whole numbers) and non-numerical data sets including the use of concrete objects in a variety of situations.**

1. The student records numerical (quantitative) and non-numerical (qualitative) data including concrete objects, graphs, and tables using these data displays:

- a. Graphs using concrete objects,
  - b. Pictographs with a whole symbol or picture representing one (no partial symbols or pictures),
  - c. Frequency tables (tally marks).
2. The student collects data related to familiar everyday experiences by counting and tallying.
  3. The student determines the mode (most) after sorting by one attribute, e.g. color, shape, or size.
  4. Application: The student communicates the results of data collection from graphs using concrete objects and frequency tables.

# Standards and Benchmarks

## First Grade

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

B1 – Number Sense – The student demonstrates number sense for whole numbers, fractions, and money using concrete objects in a variety of situations.

B2 – Number Systems and Their Properties – The student demonstrates an understanding of whole numbers with a special emphasis on place value and recognizes, applies, and explains the concepts of properties as they relate to whole numbers in a variety of situations.

B3 – Estimation – The student uses computational estimation with whole numbers in a variety of situations.

B4 – Computation – The student models, performs, and explains computation with whole numbers using concrete objects in a variety of situations.

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

B1 – Patterns – The student recognizes, describes, extends, develops, and explains relationships in patterns using concrete objects in a variety of situations.

B2 – Variable, Equations, and Inequalities – The student solves addition and subtraction equations using concrete objects in a variety of situations.

B3 – Functions – The student recognizes and describes whole number relationships using concrete objects in a variety of situations.

B4 – Models – The student uses mathematical models including concrete objects to represent, show, and communicate mathematical relationships in a variety of situations.

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

B1 – Geometric Figures and Their Properties – The student recognizes geometric shapes and describes their attributes using concrete objects in a variety of situations.

B2 – Measurement and Estimation – The student estimates and measures using standard and nonstandard units of measure with concrete objects in a variety of situations.

B3 – Transformational Geometry – The student develops the foundation for spatial sense using concrete objects in a variety of situations.

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

B1 – Probability – The student applies the concepts of probability using concrete objects in a variety of situations.

B2 – Statistics – The student collects, displays, and explains numerical (whole numbers) and non-numerical data sets including the use of concrete objects in a variety of situations.

**N = Non-calculator**

## First Grade

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

**B1 – Number Sense – The student demonstrates number sense for whole numbers, fractions, and money using concrete objects in a variety of situations.**

1. The student knows, explains, and represents whole numbers from 0 through 100 using concrete objects.
2. The student compares and orders:
  - a. Whole numbers from 0 through 100 using concrete objects
  - b. Fractions with like denominators (halves and fourths) using concrete objects.
3. The student recognizes a whole, a half, and a fourth and represents equal parts of a whole (halves, fourths) using concrete objects, pictures, diagrams, fraction strips, or pattern blocks.
4. The student identifies and uses ordinal numbers first (1<sup>st</sup>) through tenth (10<sup>th</sup>).
5. The student identifies coins (pennies, nickels, dimes, and quarters) and currency (\$1, \$5, \$10) and states the value of each coin and each type of currency using money models.
6. The student recognizes and counts a like group of coins (pennies, nickels, dimes).
7. Application: The student solves real-world problems using equivalent representations and concrete objects to compare and order whole numbers from 0 through 50.
8. Application: The student determines whether or not numerical values using whole numbers from 0 through 50 are reasonable.

**B2 – Number Systems and Their Properties – The student demonstrates an understanding of whole numbers with a special emphasis on place value and recognizes, applies, and explains the concepts of properties as they relate to whole numbers in a variety of situations.**

1. The student reads and writes whole numbers from 0 through 100 in numerical form.
2. The student represents whole numbers from 0 through 100 using various groupings and place value models (place value mats, hundred charts, or base ten blocks) emphasizing ones, tens, and hundreds.
3. The student counts subsets of whole numbers from 0 through 100 both forwards and backwards.
4. The student writes in words whole numbers from 0 through 10.
5. The student identifies the place value of digits in whole numbers from 0 through 100.
6. The student identifies any whole number from 0 through 30 as even or odd.
7. The student **uses** the **concepts** of these properties with whole numbers from 0 through 100 and demonstrates their meaning using concrete objects:
  - a. Commutative property of addition,
  - b. Zero property of addition (additive identity).

**B3 – Estimation – The student uses computational estimation with whole numbers in a variety of situations.**

1. The student estimates whole number quantities from 0 through 100 using various computational methods including mental math, paper and pencil, concrete objects, and appropriate technology.
2. The student estimates to check whether or not results of whole number quantities from 0 through 100 are reasonable.

3. Application: The student adjusts original whole number estimate of a real-world problem using whole numbers from 0 through 50 based on additional information.

**B4 – Computation – The student models, performs, and explains computation with whole numbers using concrete objects in a variety of situations.**

1. The student computes with efficiency and accuracy using various computational methods including mental math, paper and pencil, concrete objects, and appropriate technology.
2. The student computes basic addition facts with sums from 0 through 10 and corresponding subtraction facts. **N**
3. The student skip counts by 2s, 5s, 10s, through 50.
4. The student uses repeated addition (multiplication) with whole numbers to find the sum when given the number of groups (ten or less) and given the same number of **concrete objects** in each group.
5. The student uses repeated subtraction (division) with whole numbers when given the total number of **concrete objects** in each group to find the number of groups.
6. The student performs and explains these computational procedures:
  - a. Adds whole numbers with sums through 99 **without** regrouping using concrete objects
  - b. Subtracts two-digit whole numbers **without** regrouping using concrete objects.
7. The student shows that addition and subtraction are inverse operations using concrete objects.
8. The student reads and writes horizontally and vertically the same addition expression.
9. Application: The student solves one-step real-world addition or subtraction problems with various groupings of two-digit numbers **without** regrouping.

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

**B1 – Patterns – The student recognizes, describes, extends, develops, and explains relationships in patterns using concrete objects in a variety of situations.**

1. The student uses concrete objects, drawings, and other representations to work with types of patterns:
  - a. repeating patterns;
  - b. growing (extending) patterns.
2. The student uses the following attributes to generate patterns:
  - a. counting numbers related to number theory;
  - b. whole numbers that increase;
  - c. geometric shapes;
  - d. measurements;
  - e. the calendar;
  - f. money and time;
  - g. things related to daily life;
  - h. things related to size, shape, color, texture, or movement.
3. The student identifies and continues a pattern.
4. The student generates:
  - a. repeating patterns for the AB pattern, the ABC pattern, and the AAB pattern;
  - b. growing patterns that add 1, 2, 5, or 10.

**B2 – Variable, Equations, and Inequalities – The student solves addition, subtraction equations using concrete objects in a variety of situations.**

1. The student explains and uses symbols to represent unknown whole number quantities from 0 through 20.
2. The student finds the unknown sum or difference of the basic facts using concrete objects.
3. The student describes and compares two whole numbers from 0 through 100 using the terms: is equal to, is less than, is greater than.
4. Application: The student generates and solves problem situations using the basic facts to find the unknown sum or difference with concrete objects.

**B3 – Functions – The student recognizes and describes whole number relationships using concrete objects in a variety of situations.**

1. The student plots whole numbers from 0 through 100 on segments of a number line.
2. The student states mathematical relationships between whole numbers from 0 through 50.
3. The student states numerical relationships for whole numbers from 0 through 50 in a horizontal or vertical function table (input/output machine, T-table), e.g.

Number of bicycles	1	2	3	4	5	...
Total number of wheels	2	4	6	8	10	...

The student states: For every bicycle added, you add two more wheels.

4. Application: The student recognizes numerical patterns (counting by 2s, 5s, and 10s) through 50 using a hundreds chart.

**B4 – Models – The student uses mathematical models including concrete objects to represent, show, and**

**communicate mathematical relationships in a variety of situations.**

1. The student knows, explains, and uses mathematical models to represent mathematical concepts, procedures, and relationships. The student recognizes that various mathematical models can be used to represent the same problem situation. Mathematical models include:
  - a. Process models to compare and order numerical quantities, and to represent fractional parts, and to model computational procedures;
  - b. Fraction models to compare, order, and represent numerical quantities.
  - c. Money models to compare, order, and represent numerical quantities;
  - d. Function tables to model numerical relationships;
  - e. Two-dimensional geometric models, three-dimensional geometric models, and real-world objects to compare size and to model attributes of geometric shapes;
  - f. Two-dimensional geometric models, three-dimensional geometric models, and concrete objects to model probability;
  - g. Graphs using concrete objects, pictographs, frequency tables, horizontal and vertical bar graphs, and Venn diagrams or other pictorial displays to organize, display, and explain data;
  - h. Venn diagrams to sort data.
2. The student uses concrete objects, pictures, diagrams, drawings, or dramatizations to show the relationship between two or more things.

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

**B1 – Geometric Figures and their Properties – The student recognizes geometric shapes and describes their attributes using concrete objects in a variety of situations.**

1. The student recognizes and draws circles, squares, rectangles, triangles, and ellipses.
2. The student recognizes and investigates attributes of circles, squares, rectangles, triangles, ellipses using concrete objects, drawings, and appropriate technology.
3. The student recognizes cubes, rectangular prisms, cylinders, cones, and spheres.
4. Application: The student demonstrates how:
  - a. A geometric shape made of several plane figures can be separated to make two or more different plane figures;
  - b. Several plane figures can be combined to make a new geometric shape;
  - c. Several solids can be combined to make a new geometric shape.
5. Application: The student sorts plane figures and solids by a given attribute.

**B2 – Measurement and Estimation – The student estimates and measures using standard and nonstandard units of measure with concrete objects in a variety of situations.**

1. The student uses whole number approximations for length and weight using nonstandard units of measure.
2. The student compares two measurements using these attributes:

- a. Longer, shorter;
- b. Taller, shorter;
- c. Heavier, lighter;
- d. Hotter, colder.

3. The student reads and tells time at the hour and half-hour using analog and digital clocks.
4. The student selects appropriate measuring tools for length, weight, volume, and temperature for a given situation.
5. The student measures length and weight to the nearest whole unit using nonstandard units.
6. The student states the number of days in a week and months in a year.
7. Application: The student compares and orders concrete objects by length or weight.
8. Application: The student compares the weight of two concrete objects using a balance.
9. Application: The student locates and names concrete objects that are about the same length, weight, or volume as a given concrete object.

**B3 – Transformational Geometry – The student develops the foundation for spatial sense using concrete objects in a variety of situations.**

1. The student describes the spatial relationship between two concrete objects using appropriate vocabulary.
2. The student recognizes that changing an object's position or orientation does not change the name, size, or shape of the object.
3. The student describes movement of concrete objects using appropriate vocabulary, e.g. right, left, up, or down.
4. Application: The student shows two concrete objects or shapes are congruent by physically fitting one object or shape on top of the other.

5. Application: The student gives and follows directions to move concrete objects from one location to another using appropriate vocabulary.

**B4 – Geometry from an Algebraic Perspective – The student identifies one or more points on a number line in a variety of situations.**

1. The student locates and plots whole numbers from 0 through 100 on a segment of a number line.
2. The student describes a given whole number from 0 to 100 as coming before or after another number on a number line.
3. The student uses a number line to model addition and counting using whole numbers from 0 to 100.

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

**B1 – Probability – The student applies the concepts of probability using concrete objects in a variety of situations.**

1. The student recognizes whether an outcome of a simple event in an experiment or simulation is impossible, possible, or certain.
2. The student recognizes and states whether a simple event in an experiment or simulation including the use of concrete objects can have more than one outcome.
3. Application: The student makes a prediction about a simple event in an experiment or simulation, conducts the experiment or simulation, and records the results in a graph using concrete objects, a pictograph with a symbol or picture representing only one, or a bar graph.

**B2 – Statistics – The student collects, displays, and explains numerical (whole numbers) and non-numerical data sets**

**including the use of concrete objects in a variety of situations.**

1. The student displays and reads numerical and non-numerical data:
  - a. Graphs using concrete objects,
  - b. Pictographs with a whole symbol or picture representing one,
  - c. Frequency tables,
  - d. Horizontal and vertical bar graphs,
  - e. Venn diagrams or other pictorial displays.
2. The student collects data using different techniques and explains the results.
3. The student identifies the minimum and maximum values in a data set.
4. The student determines the mode after sorting by one attribute.
5. The student sorts and records qualitative data sets using one attribute.
6. Application: The student communicates the results of data collection and answers questions based on information from:
  - a. Graphs using concrete objects,
  - b. A pictograph with a whole symbol or picture representing only one,
  - c. A horizontal or vertical bar graph.

# Standards and Benchmarks

## Second Grade

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

B1 – Number Sense – The student demonstrates number sense for whole numbers, fractions, and money using concrete objects in a variety of situations.

B2 – Number Systems and Their Properties – The student demonstrates an understanding of whole numbers with a special emphasis on place value and recognizes, uses, and explains the concepts of properties as they relate to whole numbers in a variety of situations.

B3 – Estimation – The student uses computational estimation with whole numbers and money in a variety of situations.

B4 – Computation – The student models, performs, and explains computation with whole numbers and money using concrete objects in a variety of situations.

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

B1 – Patterns – The student recognizes, describes, extends, develops, and explains relationships in patterns using concrete objects in a variety of situations.

B2 – Variables, Equations, and Inequalities – The student uses symbols and whole numbers to solve addition and subtraction equations using concrete objects in a variety of situations.

B3 – Functions – The student recognizes and describes whole number relationships using concrete objects in a variety of situations.

B4 – Models – The student uses mathematical models including concrete objects to represent, show, and communicate mathematical relationships in a variety of situations.

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

B1 – Geometric Figures and Their Properties – The student recognizes geometric shapes and describes their properties using concrete objects in a variety of situations.

B2 – Measurement and Estimation – The student estimates and measures using standard and nonstandard units of measure with concrete objects in a variety of situations.

B3 – Transformational Geometry – The student recognizes and shows one transformation on simple shapes and concrete objects in a variety of situations.

B4 – Geometry from an Algebraic Perspective – The student identifies one or more points on a number line in a variety of situations.

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

B1 – Probability – The student applies the concepts of probability using concrete objects in a variety of situations.

B2 – Statistics – The student collects, organizes, displays, and explains numerical (whole numbers) and non-numerical data sets including the use of concrete objects in a variety of situations.

**▲ – Assessed Indicator**

**N – Non-calculator**

## Second Grade

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

**B1 – Number Sense – The student demonstrates number sense for whole numbers, fractions, and money using concrete objects in a variety of situations.**

1. The student knows, explains, and represents whole numbers from 0 through 1,000 using concrete objects.
2. The student compares and orders:
  - a. Whole numbers from 0 through 1,000;
  - b. Fractions greater than or equal to zero with like denominators using concrete objects;
  - c. Add and subtract whole numbers from 0 through 100;
  - d. Compare and order a mixed group of coins to \$1.00;
  - e. Find equivalent values of coins to \$1.00 without mixing coins.
3. The student uses addition and subtraction to show equivalent representations for whole numbers from 0 through 100.
4. The student identifies and uses ordinal positions from first (1<sup>st</sup>) through twentieth (20<sup>th</sup>).
5. The student identifies coins, states their values, and determines the total value to \$1.00 of a mixed group of coins using pennies, nickels, dimes, quarters, and half-dollars. ▲
6. The student counts a like combination of currency (\$1, \$5, \$10, \$20) to \$100.
7. Application: The student determines whether or not numerical values that involve whole numbers from 0 through 1,000 are reasonable.

**B2 – Number Systems and Their Properties – The student demonstrates an understanding of whole numbers with a special emphasis on place value and recognizes, uses, and explains the concepts of properties as they relate to whole numbers in a variety of situations.**

1. The student reads and writes:
  - a. Whole numbers 0 through 1,000 in numerical form;
  - b. Whole numbers from 0 through 100 in words;
  - c. Whole numbers 0 through 1,000 in numerical form when presented in word form.
2. The student represents whole numbers from 0 through 1,000 using various groupings and place value models emphasizing 1s, 10s, and 100s; explains the groups; and states the value of digit in ones place, tens place, and hundreds place. ▲
3. The student counts subsets of whole numbers from 0 through 1,000 forwards and backwards.
4. The student identifies the place value of the digits in whole numbers from 0 through 1,000. ▲
5. The student identifies any whole number from 0 through 100 as even or odd.
6. The student uses the concepts of these properties with whole numbers from 0 through 100 and demonstrates their meaning including the use of concrete objects:
  - a. Commutative property of addition;
  - b. Zero property of addition (additive identity);
  - c. Associative property of addition
  - d. Symmetric property of equality applied to basic addition and subtraction facts.

**B3 – Estimation – The student uses computational estimation with whole numbers and money in a variety of situations.**

1. The student estimates whole number quantities from 0 through 1,000 and monetary amounts through \$50.
2. The student uses various estimation strategies to estimate whole number quantities from 0 through 1,000.
3. Application: The student adjusts original whole number estimate of a real-world problem using numbers from 0 through 1,000 based on additional information.
4. Application: The student estimates to check whether or not the result of a real-world problem using whole numbers from 0 through 1,000 and monetary amounts through \$50 is reasonable and makes predictions based on the information.

**B4 – Computation – The student models, performs, and explains computation with whole numbers and money using concrete objects in a variety of situations.**

1. The student computes with efficiency and accuracy using various computational methods including mental math, paper and pencil, concrete objects, and appropriate technology.
2. The student states and uses with efficiency and accuracy basic addition facts with sums from 0 through 20 and corresponding subtraction facts. **N**
3. The student skip counts by 2s, 5s, and 10s through 100 and skip counts by 3s through 36.
4. The student uses repeated addition with whole numbers to find the sum when given the number of groups and given the same number of concrete objects in each group.
5. The student uses repeated subtraction with whole numbers when given the total number of concrete objects in each group to find the number of groups.
6. The student fair shares/measures out a total amount through 100 concrete objects into equal groups.

7. The student performs and explains these computational procedures: **N▲**
  - a. adds and subtracts three-digit whole numbers with and without regrouping including the use of concrete objects;
  - b. adds and subtracts monetary amounts through 99¢ using cent notation (25¢+52¢) and money models.
8. The student identifies basic addition and subtraction fact families. **N▲**
9. The student reads and writes horizontally and vertically the same addition or subtraction expression.

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

**B1 – Patterns – The student recognizes, describes, extends, develops, and explains relationships in patterns using concrete objects in a variety of situations.**

1. The student uses concrete objects, drawings, and other representations to work with types of patterns;
  - a. Repeating patterns;
  - b. Growing (extending) patterns.
2. The student uses the following attributes to generate patterns:
  - a. Counting numbers related to number theory;
  - b. Whole numbers that increase or decrease;
  - c. Geometric shapes;
  - d. Measurements;
  - e. The calendar;
  - f. Money and time;
  - g. Things related to daily life;
  - h. Things related to size, shape, color, texture, or movement.

3. The student identifies and continues a pattern presented in various formats. ▲
4. The student generates:
  - a. repeating patterns,
  - b. growing patterns.
5. Application: The student generalizes these patterns using a written description:
  - a. Whole number patterns;
  - b. Patterns using geometric shapes;
  - c. Calendar patterns;
  - d. Money and time patterns;
  - e. Patterns using size, shape, color, texture, or movement.

**B2 – Variables, Equations, and Inequalities – The student uses a symbols and whole numbers to solve addition and subtraction equations using concrete objects in a variety of situations.**

1. The student explains and uses symbols to represent unknown whole number quantities from 0 through 100.
2. The student finds the sum or difference in one-step equations with:
  - a. Whole numbers from 0 through 99;
  - b. Up to two different coins.
3. The student finds unknown addend or subtrahend using basic addition and subtraction facts.
4. The student describes and compares two whole numbers from 0 through 1,000 using the terms: is equal to, is less than, is greater than.
5. Application: The student generates:
  - a. Addition or subtraction equations to match a given real-world problem with one operation and one unknown using whole numbers from 0 through 99;

- b. A real-world problem to match a given addition or subtraction equation with one operation using the basic facts.

**B3 – Functions – The student recognizes and describes whole number relationships using concrete objects in a variety of situations.**

1. The student states mathematical relationships between whole numbers from 0 through 100 using various methods including mental math, paper and pencil, and concrete objects.
2. The student finds the values and determines the rule that involves addition or subtraction of whole numbers from 0 through 100 using a horizontal or vertical function table, e.g., after looking at the function table, different students might respond that the rule if  $In+2$  equals  $Out$ , the rule is  $N+2$ , or the rule is plus 2.

In	Out
9	11
2	4
13	15
42	44
57	59
6	?
72	?
N	?

3. The student generalizes numerical patterns using whole numbers from 0 through 100 with one operation by stating the rule using words.

**B4 – Models – The student uses mathematical models including concrete objects to represent, show, and communicate mathematical relationships in a variety of situations.**

1. The student knows, explains, and uses mathematical models to represent mathematical concepts, procedures, and relationships. Mathematical models include:
  - a. Process models to model computational procedures and mathematical relationships, to compare and order numerical quantities, and to represent fractional parts;
  - b. Place value models to compare, order, and represent numerical quantities and to model computational procedures;
  - c. Fraction models to compare, order, and represent numerical quantities;
  - d. Money models to compare, order, and represent numerical quantities;
  - e. Function tables to model numerical relationships;
  - f. Two-dimensional geometric models to model perimeter and properties of biometric shapes and three-dimensional geometric models and real-world objects to compare size and to model attributes or geometric shapes;
  - g. Two-dimensional geometric models, three-dimensional geometric models, and process models to model probability;
  - h. Graphs using concrete objects, representational objects, or abstract representations, pictographs, frequency tables, horizontal and vertical bar graphs, Venn diagrams or other pictorial displays, and line plots to organize and display data;
  - i. Venn diagrams to sort data.

2. The student creates a mathematical model to show the relationship between two or more things.

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

**B1 – Geometric Figures and their Properties – The student recognizes geometric shapes and describes their properties using concrete objects in a variety of situations.**

1. The student recognizes and investigates properties of circles, squares, rectangles, triangles, and ellipses using concrete objects, drawings, and appropriate technology.
2. The student recognizes, draws, and describes circles, squares, rectangles, triangles, ellipses.
3. The student recognizes cubes, rectangular prisms, cylinders, cones, and spheres.
4. The student recognizes the square, triangle, rhombus, hexagon, parallelogram, and trapezoid from a pattern block set.
5. The student compares geometric shapes to one another.
6. The student recognizes whether a shape has a line of symmetry.
7. Application: The student demonstrates how plane figures can be combined or separated to make a new shape. ▲
8. Application: The student identifies the plane figures used to form a composite figure.

**B2 – Measurement and Estimation – The student estimates and measures using standard and nonstandard units of measure with concrete objects in a variety of situations.**

1. The student uses whole number approximations for length, weight, and volume using standard and nonstandard units of measure.
2. The student reads and tells time by five-minute intervals using analog and digital clocks. ▲
3. The student selects and uses appropriate measurement tools and units of measure for length, weight, volume, and temperature for a given situation.
4. The student measures:
  - a. Length to the nearest inch or foot and to the nearest whole unit of a nonstandard unit; ▲
  - b. Weight to the nearest nonstandard unit;
  - c. Volume to the nearest cup, pint, quart, or gallon;
  - d. Temperature to the nearest degree.
5. The student states:
  - a. The number of minutes in an hour,
  - b. The number of days in each month.
6. Application: The student compares the weights of more than two concrete objects using a balance.
7. Application: The student estimates to check whether or not measurements or calculations for length in real-world problems are reasonable.
8. Application: The student adjusts original measurement or estimation for length and weight in real-world problems based on additional information.

**B3 – Transformational Geometry – The student recognizes and shows one transformation on simple shapes and concrete objects in a variety of situations.**

1. The student knows and uses the cardinal points (north, south, east, west).
2. The student recognizes that changing an object's position or orientation including whether the object is nearer or farther

away does not change the name, size, or shape of the object.

3. The student recognizes when a shape has undergone one transformation.
4. Application: The student shows two concrete objects or shapes are congruent by physically fitting one shape or object on top of the other.
5. Application: The student follows directions to move objects from one location to another using appropriate vocabulary and the cardinal points.

**B4 – Geometry from an Algebraic Perspective – The student identifies one or more points on a number line in a variety of situations.**

1. The student locates and plots whole numbers from 0 through 1,000 on a segment of a number line.
2. The student represents the distance between two whole numbers from 0 through 1,000 on a segment of a number line.
3. The student uses a segment of a number line to model addition and subtraction using whole numbers from 0 through 1,000.

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

**B1 – Probability – The student applies the concepts of probability using concrete objects in a variety of situations.**

1. The student recognizes any outcome of a simple event in an experiment or simulation as impossible, possible, certain, likely, or unlikely.

2. The student lists some of the possible outcomes of a simple event in an experiment or simulation including the use of concrete objects.
3. Application: The student makes a prediction about a simple event in an experiment or simulation; conducts the experiment or simulation including the use of concrete objects; records the results in a chart, table, or graph; and makes an accurate statement about the results.

**B2 – Statistics – The student collects, organizes, displays, and explains numerical (whole numbers) and non-numerical data sets including the use of concrete objects in a variety of situations.**

1. The student organizes, displays, and reads numerical and non-numerical data in a clear, organized, and accurate manner including a title, labels, categories, and whole number intervals using these **data displays**:
  - a. Graphs using concrete objects; ▲
  - b. Pictographs with a whole symbol or picture representing one, two, or ten; ▲
  - c. Frequency tables; ▲
  - d. Horizontal and vertical bar graphs; ▲
  - e. Venn diagrams or other pictorial displays;
  - f. Line plots.
2. The student collects data using different techniques (observations, interviews, or surveys) and explains the results.
3. The student identifies the minimum and maximum values in a whole number data set.
4. The student finds the range for a data set using two-digit whole numbers.
5. The student finds the mode (most) for a data set using concrete objects that include:
  - a. Quantitative/numerical data;

- b. Qualitative/non-numerical data.
6. Application: The student communicates the results of data collection and answers questions based on information from:
  - a. Graphs using concrete objects,
  - b. Pictographs with a whole symbol or picture representing one;
  - c. Horizontal or vertical bar graphs.
7. Application: The student recognizes that the same data set can be displayed in various formats including the use of concrete objects.
8. Application: The student recognizes appropriate conclusions from data collected.

# Standards and Benchmarks

## Third Grade

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

B1 – Number Sense – The student demonstrates number sense for whole numbers, fractions, decimals, and money using concrete objects in a variety of situations.

B2 – Number Systems and Their Properties – The student demonstrates an understanding of whole numbers with a special emphasis on place value and recognizes, uses, and explains the concepts of properties as they relate to whole numbers, fractions, decimals, and money in a variety of situations.

B3 – Estimation – The student uses computational estimation with whole numbers, fractions, and money in a variety of situations.

B4 – Computation – The student models, performs, and explains computation with whole numbers and money including the use of concrete objects in a variety of situations.

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

B1 – Patterns – The student recognizes, describes, extends, develops, and explains relationships in patterns using concrete objects in a variety of situations.

B2 – Variables, Equations, and Inequalities – The student uses symbols and whole numbers to solve equations including the use of concrete objects in a variety of situations.

B3 – Functions – The student recognizes and describes whole number relationships using concrete objects in a variety of situations.

B4 – Models – The student develops and uses mathematical models including the use of concrete objects to represent and show mathematical relationships in a variety of situations.

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

B1 – Geometric Figures and Their Properties – The student recognizes geometric shapes and investigates their properties using concrete objects in a variety of situations.

B2 – Measurement and Estimation – The student estimates and measures using standard and nonstandard units of measure with concrete objects in a variety of situations.

B3 – Transformational Geometry – The student recognizes and performs one transformation on simple shapes or concrete objects in a variety of situations.

B4 – Geometry From An Algebraic Perspective – The student relates geometric concepts to a number line and the first quadrant of a coordinate plane in a variety of situations.

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

B1 – 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.

B2 – Statistics – The student collects, organizes, displays, explains, and interprets numerical (whole numbers) and non-numerical data sets including the use of concrete objects in a variety of situations.

**▲-Assessed indicator on state assessment    N-Noncalculator**

**■-Assessed indicator on the Optional Constructed Response Assessment**

**⌘-Financial Literacy**

### Third Grade

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

**B1 – Number Sense – The student demonstrates number sense for whole numbers, fractions, decimals, and money using concrete objects in a variety of situations.**

1. The student knows, explains, and represents:
  - a. Whole numbers from 0 through 10,000;
  - b. Fractions greater than or equal to zero;
  - c. Decimals greater than or equal to zero through tenths place.
2. The student compares and orders:
  - a. Whole numbers from 0 through 10,000 with and without the use of concrete objects; ▲
  - b. Fractions greater than or equal to zero with like denominators using concrete objects;
  - c. Decimals greater than or equal to zero through tenths place using concrete objects.
3. The student knows, explains, and uses equivalent representations including the use of mathematical models for: ▲
  - a. Addition and subtraction of whole numbers from 0 through 1,000;
  - b. Multiplication using the basic facts through the 5s and the multiplication facts of the 10s;
  - c. Addition and subtraction of money.
4. The student determines the value of mixed coins and bills with a total value of \$50 or less. **N▲**
5. Application: The student determines whether or not solutions to real-world problems that involve the following are reasonable:

- a. Whole numbers from 0 through 1,000;
  - b. Fractions greater than or equal to zero;
  - c. Decimals greater than or equal to zero when used as monetary amounts.
6. Application: The student determines the amount of change owed through \$100.

**B2 – Number Systems and Their Properties – The student demonstrates an understanding of whole numbers with a special emphasis on place value and recognizes, uses, and explains the concepts of properties as they relate to whole numbers, fractions, decimals, and money in a variety of situations.**

1. The student identifies, reads, and writes numbers using numerals and words from tenths place through ten thousands place, e.g., sixty-four thousand, three hundred eighty and five tenths is written in numerical forms as 64,380.5. \$
2. The student identifies, models, reads, and writes numbers using expanded form from tenths place through ten thousands place, e.g.,  $56,277.3 = (5 \times 10,000) + (6 \times 1,000) + (2 \times 100) + (7 \times 10) + (7 \times 1) + (3 \times .1) = 50,000 + 6,000 + 200 + 70 + 7 + .3$ .
3. The student classifies various subsets of numbers as whole numbers, fractions (including mixed numbers), or decimals.
4. The student identifies the place value of various digits from tenths to one hundred thousands place. \$
5. The student identifies any whole number through 1,000 as even or odd.
6. The student uses concepts of these properties with whole numbers from 0 through 100 and demonstrates their meaning including the use of concrete objects: \$

- a. Commutative properties of addition and multiplication, e.g.,  $7+8=8+7$  or  $3 \times 6=6 \times 3$ ;
  - b. Zero property of addition (additive identity), e.g.  $4+0=4$ ;
  - c. Property of one for multiplication (multiplicative identity),  $1 \times 3=3$ ;
  - d. Associative property of addition, e.g.,  $(3+2)+4=3+(2+4)$ ;
  - e. Symmetric property of equality applied to addition and multiplication, e.g.,  $100=20+80$  is the same as  $20+80=100$  and  $3 \times 4=12$  is the same as  $12=3 \times 4$ ;
  - f. Zero property of multiplication, e.g.,  $9 \times 0=0$  or  $0 \times 32=0$ .
7. The student divides whole numbers from 0 through 99,999 into groups of 10,000s; 1,000s; 100s; 10s; and 1s using base ten models.

**B3 – Estimation – The student uses computational estimation with whole numbers, fractions, and money in a variety of situations.**

1. The student estimates whole numbers quantities from 0 through 1,000; fractions (halves, fourths); and monetary amounts through \$500.
2. The student uses various estimation strategies to estimate using whole number quantities from 0 through 1,000 and explains the process used.
3. The student recognizes and explains the difference between an exact and an approximate answer.

**B4 – Computation – The student models, performs, and explains computation with whole numbers and money including the use of concrete objects in a variety of situations.**

1. The student computes with efficiency and accuracy using various computations methods including mental math, paper and pencil, concrete objects, and appropriate technology.
2. The student states and uses with efficiency and accuracy the multiplication facts through the 5s and the multiplication facts of the 10s and corresponding division facts. **N**
3. The student skip counts (multiples) by 2s, 3s, 4s, 5s, and 10s.
4. The student performs and explains these computational procedures: **N**
  - a. Adds and subtracts whole numbers from 0 through 10,000;
  - b. Multiplies whole numbers when one factor is 5 or less and the other factor is a multiple of 10 through 1,000 with or without the use of concrete objects;
  - c. Adds and subtracts monetary amounts using dollar and cents notation through \$500.00.
5. The student fair shares/measures out (divides) a total amount through 100 concrete objects into equal groups.
6. The student explains the relationship between addition and subtraction.
7. The student identifies multiplication and division fact families through the 5s and the multiplication and division fact families of the 10s. **▲N**
8. The student reads and writes horizontally, vertically, and with different operational symbols the same addition, subtraction, multiplication, or division expression.
9. Application: The student solves one-step real-world addition or subtraction problems with: **▲N**
  - a. Whole numbers from 0 through 10,000;
  - b. Monetary amounts using dollar and cents notation through \$500.00.

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

**B1 – Patterns – The student recognizes, describes, extends, develops, and explains relationships in patterns using concrete objects in a variety of situations.**

1. The student uses concrete objects, drawings, and other representations to work with types of patterns:
  - a. Repeating patterns;
  - b. growing patterns.
2. The student uses these attributes to generate patterns:
  - a. Counting numbers related to number theory;
  - b. Whole numbers that increase or decrease;
  - c. Geometric shapes including one attribute change;
  - d. Measurements;
  - e. Money and time;
  - f. Things related to daily life;
  - g. things related to size, shape, color, texture, or movement.
3. The student 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. \$
4. The student generates:
  - a. Repeating patterns,
  - b. Growing patterns,
  - c. Patterns using function tables.
5. The student generalizes the following patterns using a written description:
  - a. Counting numbers related to number theory;
  - b. Whole number patterns;
  - c. Patterns using geometric shapes;
  - d. Measurement patterns;
  - e. Money and time patterns;

- f. Patterns using size, shape, color, texture, or movement.

6. The student recognizes multiple representations of the same pattern. ▲

**B2 – Variables, Equations, and Inequalities – The student uses symbols and whole numbers to solve equations including the use of concrete objects in a variety of situations.**

1. The student explains and uses symbols to represent unknown whole number quantities from 0 through 1,000.
2. The student finds the sum or difference in one-step equations with:
  - a. Whole numbers from 0 through 99;
  - b. Monetary values through a dollar.
3. The student finds the unknown in the multiplication and division fact families through the 5s and the 10s.
4. The student compares two whole numbers from 0 through 1,000 using the equality and inequality symbols ( $=$ ,  $<$ ,  $>$ ) and their corresponding meanings (is equal to, is less than, is greater than).
5. Application: The student represents real-world problems using symbols with one operation and one unknown that:
  - a. Adds or subtracts using whole numbers from 0 through 99;
  - b. Multiplies or divides using the basic facts through the 5s and the basic facts of the 10s.
6. Application: The student generates one-step equations to solve real-world problems with one unknown and a whole number solution that:
  - a. Adds or subtracts using the basic fact families;
  - b. Multiplies or divides using the basic fact through the 5s and the basic facts of the 10s.
7. The student generates:

- a. A real-world problem with one operation that matches a given addition equation or subtraction equation using whole numbers from 0 through 99;
- b. A real-world problem with one operation that matches a given multiplication equation or division equation using basic facts through the 5s and the basic facts of 10s;
- c. Number comparison statements using equality and inequality symbols ( $=$ ,  $<$ ,  $>$ ) for whole numbers from 0 through 100, measurement, and money.

**B3 – Functions – The student recognizes and describes whole number relationships using concrete objects in a variety of situations.**

1. The student states mathematical relationships between whole numbers from 0 through 200 using various methods including mental math, paper and pencil, concrete objects, and appropriate technology.
2. The student finds the values and determines the rule with one operation (addition, subtraction) of whole numbers from 0 through 200 using a horizontal or vertical function table (input/output, machine, T-table), e.g., using this input/output machine, different student responses might be that the rule is Input minus 10 equals Output, the rule is  $N - 10$ , or the rule is subtract 10.

Input	Output
92	82
156	146
13	3
113	103
?	59
106	?
?	?
N	?

3. The student generalizes numerical patterns using whole numbers from 0 through 200 with one operation (addition, subtraction) by stating the rule using words. ▲
4. The student uses a function table to identify and plot ordered pairs in the first quadrant of a coordinate plane.

**B4 – Models – The student develops and uses mathematical models including the use of concrete objects to represent and show mathematical relationships in a variety of situations.**

1. The student knows, explains, and uses mathematical models to represent mathematical concepts, procedures, and relationships. Mathematical models include:
  - a. Process models to model computational procedures and mathematical relationships;
  - b. Place value models to compare, order, and represent numerical quantities and to model computational procedures;
  - c. Fraction models and decimal models to compare, order, and represent numerical quantities;
  - d. Money models to compare, order, and represent numerical quantities;
  - e. Function tables to find numerical relationships;
  - f. Two-dimensional geometric models to model perimeter, area, and properties of geometric shapes and three-dimensional geometric models and real-world objects to compare size and to model attributes of geometric shapes;
  - g. Two-dimensional geometric models, three-dimensional models, and process models to model probability;
  - h. Graphs using concrete objects, representational objects, or abstract representations, pictographs,

- frequency tables, horizontal and vertical bar graphs, Venn diagrams or other pictorial displays, line plots, charts, and tables to organize and display data;
  - i. Venn diagrams to sort data and show relationships.
2. The student creates a mathematical model to show relationships between two or more things.

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

**B1 – Geometric Figures and their Properties – The student recognizes geometric shapes and investigates their properties using concrete objects in a variety of situations.**

1. The student recognizes and investigates properties of plane figures using concrete objects, drawings, and appropriate technology.
2. The student recognizes, draws, and describes plane figures.
3. The student recognizes the solids.
4. The student recognizes and describes the square, triangle, rhombus, hexagon, parallelogram, and trapezoid from a pattern block set. ▲
5. The student recognizes and describes a quadrilateral as any four-sided figures.
6. The student determines if geometric shapes and real-world objects contain line(s) of symmetry and draws the line(s) of symmetry if the line(s) exist(s).
7. Application: The student identifies the plane figures used to form a composite figure.

**B2 – Measurement and Estimation – The student estimates and measures using standard and nonstandard units of measure with concrete objects in a variety of situations.**

1. The student uses whole number approximations for length, width, weight, volume, temperature, time, and perimeter using standard and non-standard units of measure.
2. The student reads and tells time to the minute using analog and digital clocks. ▲
3. The student selects, explains the selection of, and uses measurement tools, units of measure, and degree of accuracy appropriate for a given situation to measure:
  - a. Length, width, and height to the nearest half inch, inch, foot, and yard; and to the nearest whole unit of nonstandard unit;
  - b. Length, width, and height to the nearest centimeter and meter;
  - c. Weight to the nearest whole unit of a nonstandard unit;
  - d. Volume to the nearest cup, pint, quart, and gallon;
  - e. Volume to the nearest liter;
  - f. Temperature to the nearest degree.
4. The student states:
  - a. The number of hours in a day and days in a year;
  - b. The number of inches in a foot, inches in a yard, and feet in a yard;
  - c. The number of centimeters in a meter;
  - d. The number of cups in a pint, pints in a quart, and quarts in a gallon.
5. The student finds the perimeter of squares, rectangles, and triangles given the measures of all sides.
6. Application: The student estimates to check whether or not measurements or calculations for length, temperature, and time in real-world problems are reasonable.

**B3 – Transformational Geometry – The student recognizes and performs one transformation on simple shapes or concrete objects in a variety of situations.**

1. The student knows and uses cardinal points and intermediate points.
2. The student recognizes and performs one transformation on a two-dimensional figure.
3. Application: The student recognizes real-world transformations.
4. Application: The student gives and uses directions to move from one location to another on a map and follows directions including the use of cardinal and intermediate points.

**B4 – Geometry from an Algebraic Perspective – The student relates geometric concepts to a number line and the first quadrant of a coordinate plane in a variety of situations.**

1. The student uses a number line to model the basic multiplication facts through the 5s and the multiplication facts of the 10s.
2. The student identifies points on a coordinate plane using:
  - a. Two positive whole numbers,
  - b. A letter and a positive whole number.
3. The student identifies points as ordered pairs in the first quadrant of a coordinate plane.

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

**B1 – 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.**

1. The student recognizes any outcome of a simple event in an experiment or simulation as impossible, possible, certain, likely, unlikely, or equally likely.

2. The student lists some of the possible outcomes of a simple event in an experiment or simulation including the use of concrete objects. ▲
3. Application: The student makes predictions about a simple event in an experiment or simulation; conducts the experiment or simulation including the use of concrete objects; records the results in a chart, table, or graph; and uses the results to draw conclusions about the event.
4. Application: The student compares what should happen with what did happen in an experiment or simulation with a simple event.

**B2 – Statistics – The student collects, organizes, displays, explains, and interprets numerical (whole numbers) and non-numerical data sets including the use of concrete objects in a variety of situations.**

1. The student organizes, displays, and reads numerical and non-numerical data in a clear, organized, and accurate manner including a title, labels, categories, and whole number intervals using these **data displays**:
  - a. Graphs using concrete objects;
  - b. Pictographs with a whole symbol or picture representing one, two, five, ten, twenty-five, or one-hundred;
  - c. Frequency tables;
  - d. Horizontal and vertical bar graphs;
  - e. Venn diagrams or other pictorial displays;
  - f. Line plots;
  - g. Charts and tables.
2. The student collects data using different techniques and explains the results.
3. The student finds these statistical measures of a data set with less than ten data points using whole numbers from 0 through 1,000: ▲

- a. Minimum and maximum data values,
  - b. Range,
  - c. Mode,
  - d. Median when data set has an odd number of data points.
4. Application: The student interprets and uses data to make reasonable inferences and predictions, answer questions, and make decisions from these data displays:
  - a. Graphs using concrete objects;
  - b. Pictographs with a whole symbol or picture representing one, two, five, ten, twenty-five, or one-hundred;
  - c. Frequency tables;
  - d. Horizontal and vertical bar graphs;
  - e. Venn diagrams or pictorial displays;
  - f. Line plots;
  - g. Charts and tables.
5. Application: The student uses these statistical measures with a data set of less than ten data points using whole numbers from 0 through 1,000 to make reasonable inferences and predictions, answer questions, and make decisions:
  - a. Minimum and maximum data values,
  - b. Range,
  - c. Mode,
  - d. Median when data set has an odd number of data points.

# Assessed Indicators

## Third Grade

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

**B1 – Number Sense – The student demonstrates number sense for whole numbers, fractions, decimals, and money using concrete objects in a variety of situations.**

2. The student compares and orders:
  - a. Whole numbers from 0 through 10,000 with and without the use of concrete objects.
3. The student knows, explains and uses equivalent representations including the use of mathematical models for:
  - b. Addition and subtraction of whole numbers from 0 through 1,000.
  - c. Multiplication using the basic facts through the 5s and the multiplication facts of the 10s;
  - d. Addition and subtraction of money.
4. The student determines the value of mixed coins and bills with a total value of \$50 or less.  
▲ N

**B4 – Computation – The student models, performs, and explains computation with whole numbers and money including the use of concrete objects in a variety of situations.**

7. The student identifies multiplication and division fact families through the 5s and the multiplication and division fact families of the 10s. N▲
9. Application: The student solves one-step real-world addition or subtraction problems with:  
▲
  - a. whole numbers from 0 through 10,000;
  - b. monetary amounts using dollar and cents notation through \$500.00.

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

**B1 – Patterns – The student recognizes, describes, extends, develops, and explains relationships in patterns using concrete objects in a variety of situations.**

6. Application: The student recognizes multiple representations of the same pattern. ▲

**B3 – Functions – The student recognizes and describes whole number relationships using concrete objects in a variety of situations.**

3. The student generalizes numerical patterns using whole numbers from 0 through 200 with one operations (addition, subtraction) by stating the rules using words, e.g., if the sequence is 30, 50, 70, 90,...; in words, the rule is add twenty to the number before. ▲

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

**B1 – Geometric Figures and their Properties – The student recognizes geometric shapes and investigates their properties using concrete objects in a variety of situations.**

4. The student recognizes and describes the square, triangle, rhombus, hexagon, parallelogram, and trapezoid from a pattern block set. ▲

**B2 – Measurement and Estimation – The student estimates and measures using standard and nonstandard units of measure with concrete objects in a variety of situations.**

2. The student reads and tells time to the minute using analog and digital clocks. ▲

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

**B1 – 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.**

2. The student lists some of the possible outcomes of a simple event in an experiment or simulation including the use of concrete objects. ▲

**B2 – Statistics – The student collects, organizes, displays, explains, and interprets numerical (whole numbers) and non-numerical data sets including the use of concrete objects in a variety of situations.**

3. The student finds these statistical measures of a data set with less than ten data points using whole numbers from 0 through 1,000: ▲
  - a. minimum and maximum data values,
  - b. range,
  - c. mode (uni-modal only),
  - d. median when data set has an odd number of data points.

# Standards and Benchmarks

## Fourth Grade

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

B1 – Number Sense – The student demonstrates number sense for whole numbers, fractions (including mixed numbers), decimals, and money including the use of concrete objects in a variety of situations.

B2 – Number Systems and their Properties – The student demonstrates an understanding of whole numbers with a special emphasis on place value; recognizes, uses, and explains the concepts of properties as they relate to whole numbers; and extends these properties to fractions (including mixed numbers), decimals, and money.

B3 – Estimation – The student uses computational estimation with whole numbers, fractions (including mixed numbers) and money in a variety of situations.

B4 – Computation – The student models, performs, and explains computation with whole numbers, fractions, and money including the use of concrete objects in a variety of situations.

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

B1 – Patterns – The student recognizes, describes, extends, develops, and explains relationships in patterns using concrete objects in a variety of situations.

B2 – Variables, Equations, and Inequalities – The student uses variables, symbols, and whole numbers to solve equations including the use of concrete objects in a variety of situations.

B3 – Functions – The student recognizes and describes whole number relationships including the use of concrete objects in a variety of situations.

B4 – Models – The student develops and uses mathematical models including the use of concrete objects to represent and explain mathematical relationships in a variety of situations.

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

B1 – Geometric Figures and their Properties – The student recognizes geometric shapes and investigates their properties including the use of concrete objects in a variety of situations.

B2 – Measurement and Estimation – The student estimates and measures using standard and nonstandard units of measure including the use of concrete objects in a variety of situations.

B3 – Transformational Geometry – The student recognizes and performs one transformation on simple shapes or concrete objects in a variety of situations.

B4 – Geometry from an Algebraic Perspective – The student relates geometric concepts to a number line and the first quadrant of a coordinate plane in a variety of situations.

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

B1 – 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.

B2 – Statistics – The student collects, organizes, displays, explains, and interprets numerical (whole numbers) and non-numerical data sets including the use of concrete objects in a variety of situations.


**N-Noncalculator**

**▲-Assessed Indicator**

## Fourth Grade

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

**B1 – Number Sense – The student demonstrates number sense for whole numbers, fractions (including mixed numbers), decimals, and money including the use of concrete objects in a variety of situations.**

1. The student knows, explains, and uses equivalent representations for:
  - a. Whole numbers from 0 through 100,000;
  - b. Fractions greater than or equal to zero including mixed numbers;
  - c. Decimals greater than or equal to zero through hundredths place and when used as monetary amounts, e.g.,  $7¢ = \$0.07 = 7/100$  of a dollar or a hundreds grid with 7 sections colored or  $.1 = 1/10 =$   

2. The student compares and orders:
  - a. whole numbers from 0 through 100,000;
  - b. fractions greater than or equal to zero including mixed numbers with a special emphasis on concrete objects;
  - c. decimals greater than or equal to zero through hundredths place and when used as monetary amounts.
3. Application: The student determines whether or not solutions to real-world problems that involve the following are reasonable:
  - a. Whole numbers from 1 through 10,000;
  - b. Fractions greater than or equal to zero;

- c. Decimals greater than or equal to zero when used as monetary amounts.

**B2 – Number Systems and their Properties – The student demonstrates an understanding of whole numbers with a special emphasis on place value; recognizes, uses, and explains the concepts of properties as they relate to whole numbers; and extends these properties to fractions (including mixed numbers), decimals, and money.**

1. The student identifies, models, reads, and writes numbers using numerals, words, and expanded notation from hundredths place through one-hundred thousands place.
2. The student classifies various subsets of numbers as whole numbers, fractions (including mixed numbers), or decimals.
3. The student identifies the place value of various digits from hundredths place through one hundred thousands place.
4. The student identifies any whole number as even or odd.
5. The student uses the concepts of these properties with the whole number system and demonstrates their meaning including the use of concrete objects:
  - a. Commutative properties of addition and multiplication; ▲
  - b. Zero property of addition (additive identity) and property of one for multiplication (multiplicative identity); ▲
  - c. Associative properties of addition and multiplication; ▲
  - d. Symmetric property of equality applied to addition and multiplication; ▲
  - e. Zero property of multiplication;
  - f. Distributive property.

**B3 – Estimation – The student uses computational estimation with whole numbers, fractions (including mixed numbers) and money in a variety of situations.**

1. The student estimates whole number quantities from 0 through 10,000; fractions; and monetary amounts through \$1,000 using various computational methods including mental math, paper and pencil, concrete materials, and appropriate technology.
2. The student uses various estimation strategies and explains how they are used when estimating whole numbers quantities from 0 through 10,000; fractions including mixed numbers; and monetary amounts through \$1,000.
3. The student recognizes and explains the difference between an exact and an approximate answer.
4. The student selects from an appropriate range of estimation strategies and determines if the estimate is an **overestimate** or **underestimate**.
5. Application: The student estimates to check whether or not the result of a real-world problem using whole numbers from 0 through 10,000, fractions, and monetary amounts is reasonable.
6. Application: The student 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, and appropriate technology.

**B4 – Computation – The student models, performs, and explains computation with whole numbers, fractions, and money including the use of concrete objects in a variety of situations.**

1. The student computes with efficiency and accuracy using various computational methods including mental math,

paper and pencil, concrete materials, and appropriate technology.

2. The student states and uses with efficiency and accuracy multiplication facts from  $1 \times 1$  through  $12 \times 12$  and corresponding division facts. **N**
3. The student performs and explains these computational procedures: **N**
  - a. Adds and subtracts whole numbers from 0 through 100,000 and when used as monetary amounts;
  - b. Multiplies through a three-digit whole number by a two-digit whole number;
  - c. Multiplies whole dollar monetary amounts by a one- or two-digit whole number;
  - d. Multiplies monetary amounts less than \$100.00 by whole numbers less than ten;
  - e. Divides through a two-digit whole number by a one-digit whole number with a one-digit whole number quotient with or without a remainder;
  - f. Adds and subtracts fractions greater than or equal to zero with like denominators;
  - g. Figures correct change through \$20.00.
4. The student identifies multiplication and division fact families.
5. The student reads and writes horizontally, vertically, and with different operational symbols the same addition, subtraction, multiplication, or division expression.
6. The student shows the relationship between these operations with the basic fact families) including the use of mathematical models: **N▲**
  - a. Addition and subtraction;
  - b. Addition and multiplication;
  - c. Multiplication and division;
  - d. Subtraction and division.
7. The student finds factors and multiples of whole numbers from 1 through 100.

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

**B1 – Patterns – The student recognizes, describes, extends, develops, and explains relationships in patterns using concrete objects in a variety of situations.**

1. The student uses concrete objects, drawings, and other representations to work with **types** of patterns:
  - a. Repeating patterns;
  - b. growing patterns.
2. The student uses these **attributes** to generate patterns:
  - a. Counting numbers related to number theory;
  - b. Whole numbers that increase or decrease;
  - c. Geometric shapes including one or two attribute changes;
  - d. Measurements;
  - e. Money and time;
  - f. Things related to daily life;
  - g. Things related to size, shape, color, texture, or movement.
3. The student identifies, states and continues a pattern presented in visual various formats including numeric, visual, verbal, kinesthetic, and written.
4. The student generates:
  - a. A pattern;
  - b. A pattern using a function table.
5. Application: The student generalizes these patterns using a written description:
  - a. Counting numbers related to number theory,
  - b. Whole number patterns,
  - c. Patterns using geometric shapes,
  - d. Measurement patterns,
  - e. Money and time patterns,

- f. Patterns using size, shape, color, texture, or movement.
6. Application: The student recognizes multiple representations of the same pattern.

**B2 – Variables, Equations, and Inequalities – The student uses variables, symbols, and whole numbers to solve equations including the use of concrete objects in a variety of situations.**

1. The student explains and uses variables and symbols to represent unknown whole number quantities from 0 through 1,000.
2. The student solves one-step equations using whole numbers with one variable and a whole number solution that: ▲
  - a. Find the unknown in a multiplication or division equation based on the multiplication facts from 1 X 1 through 12 X 12 and corresponding division facts;
  - b. Find the unknown in a money equation using multiplication and division based upon the facts and addition and subtraction with values through \$10;
  - c. Find the unknown in a time equation involving whole minutes, hours, days, and weeks with values through 200.
3. The student compares two whole numbers from 0 through 10,000 using equality and inequality symbols ( $=$ ,  $\neq$ ,  $<$ ,  $>$ ) and their corresponding meanings (is equal to, is not equal to, is less than, is greater than).
4. The student reads and writes whole number equations and inequalities using mathematical vocabulary and notation.
5. Application: The student generates one-step equations to solve real-world problems with one unknown (represented by a variable or symbol) and a whole number solution that:

- a. Add or subtract whole numbers from 0 through 1,000;
- b. Multiply or divide using the basic facts.

**B3 – Functions – The student recognizes and describes whole number relationships including the use of concrete objects in a variety of situations.**

1. Application: The student represents and describes mathematical relationships between whole numbers from 0 through 1,000 using concrete objects, pictures, written descriptions, symbols, equations, tables, and graphs. ▲
2. The student finds the values, determines the rule, and states the rule using symbolic notation with one operation of whole numbers from 0 through 200 using a horizontal or vertical function table (input/output machines, T-table), e.g. using the function table, find the rule, the rule is **N-4**. ▲

<b>N</b>	<b>?</b>
1	4
5	20
2	8
3	?
4	?
?	24

3. The student generalizes numerical patterns using whole numbers from 0 through 200 with one operation by stating the rule using words.
4. The student uses a function table to identify, plot, and label the ordered pairs in the first quadrant of a coordinate plane.
5. Application: The student finds the rule, states the rule, and extends numerical patterns using real-world applications using whole numbers from 0 through 200.

**B4 – Models – The student develops and uses mathematical models including the use of concrete objects to represent and explain mathematical relationships in a variety of situations.**

1. The student knows, explains, and uses mathematical models to represent mathematical concepts, procedures, and relationships. Mathematical models include:
  - a. Process models) to model computational procedures, mathematical relationships, and equations;
  - b. Place value models to compare, order, and represent numerical quantities and to model computational procedures;
  - c. Fraction and mixed number models and decimal models to compare, order, and represent numerical quantities;
  - d. Money models to compare, order, and represent numerical quantities;
  - e. Function tables to model numerical and algebraic relationships;
  - f. Two-dimensional geometric models to model perimeter, area, and properties of geometric shapes and three-dimensional geometric models and real-world objects to compare size and to model properties of geometric shapes;
  - g. Two-dimensional geometric models, three-dimensional models, and process models to model probability;
  - h. Graphs using concrete objects, pictographs, frequency tables, horizontal and vertical bar graphs, line graphs, circle graphs, Venn diagrams, line plots, charts, and tables to organize and display data;
  - i. Venn diagrams to sort data and show relationships.

2. The student creates a mathematical model to show the relationship between two or more things.

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

**B1 – Geometric Figures and their Properties – The student recognizes geometric shapes and investigates their properties including the use of concrete objects in a variety of situations.**

1. The student recognizes and investigates properties of plane figures using concrete objects, drawings, and appropriate technology.
2. The student recognizes, draws, and describes plane figures.
3. The student describes the solids using the terms faces, edges, and vertices.
4. The student recognizes and describes the square, triangle, rhombus, hexagon, parallelogram, and trapezoid from a pattern block set.
5. The student recognizes:
  - a. Squares, rectangles, rhombi, parallelograms, trapezoids as special quadrilaterals;
  - b. Similar and congruent figures;
  - c. Points, lines (intersecting, parallel, perpendicular), line segments, and rays.
6. The student determines if geometric shapes and real-world objects contain line(s) of symmetry and draws the line(s) of symmetry if the line(s) exist(s).
7. The student identifies the plane figures used to form a composite figure. ▲

**B2 – Measurement and Estimation – The student estimates and measures using standard and nonstandard units of**

**measure including the use of concrete objects in a variety of situations.**

1. The student uses whole number approximations for length, width, weight, volume, temperature, time, perimeter, and area using standard and nonstandard units of measure.
2. The student selects, explains the selection of, and uses measurement tools, units of measure, and degree of accuracy appropriate for a given situation **to measure:** ▲
  - a. Length, width, and height to the nearest fourth of an inch or to the nearest centimeter;
  - b. Volume to the nearest cup, pint, quart, or gallon; to the nearest liter; or to the nearest whole unit of a nonstandard unit;
  - c. Weight to the nearest ounce or pound or to the nearest whole unit of a nonstandard unit of measure;
  - d. Temperature to the nearest degree;
  - e. Time including elapsed time.
3. The student states:
  - a. The number of weeks in a year;
  - b. The number of ounces in a pound;
  - c. The number of milliliters in a liter, grams in a kilogram, and meters in a kilometer;
  - d. The number of items in a dozen.
4. The student converts:
  - a. Within the customary system: inches and feet, feet and yards, inches and yards, cups and pints, pints and quarts, quarts and gallons;
  - b. Within the metric system: centimeters and meters.
5. The student finds:
  - a. The perimeter of two-dimensional figures given the measures of all the sides.
  - b. The area of squares and rectangles using concrete objects.

6. Application: The student estimates to check whether or not measurements and calculations for length, width, weight, volume, temperature, time, and perimeter in real-world problems are reasonable. ▲

**B3 – Transformational Geometry – The student recognizes and performs one transformation on simple shapes or concrete objects in a variety of situations.**

1. The student describes a transformation using cardinal points or positional directions.
2. The student recognizes, performs, and describes one transformation on a two-dimensional figure or concrete object. ▲
3. The student recognizes three-dimensional figures and concrete objects from various perspectives.
4. Application: The student gives and uses cardinal points or positional directions to move from one location to another on a map or grid.

**B4 – Geometry from an Algebraic Perspective – The student relates geometric concepts to a number line and the first quadrant of a coordinate plane in a variety of situations.**

1. The student uses a number line to model whole number multiplication facts from  $1 \times 1$  through  $12 \times 12$  and corresponding division facts.
2. The student uses points in the first quadrant of a coordinate plane to identify locations.
3. The student identifies and plots points as whole number ordered pairs in the first quadrant of a coordinate plane to identify locations. ▲

4. The student organizes whole number data using a T-table and plots the ordered pairs in the first quadrant of a coordinate plane.

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

**B1 – 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.**

1. The student recognizes that the probability of an impossible event is zero and that the probability of a certain event is one.
2. The student lists all possible outcomes of a simple event in an experiment or simulation including the use of concrete objects.
3. The student recognizes and states the probability of a simple event in an experiment or simulation.
4. Application: The student makes predictions about a simple event in an experiment or simulation; conducts an experiment or simulation including the use of concrete objects; records the results in a chart, table, or graph; and uses the results to draw conclusions about the event.
5. Application: The student uses the results from a completed experiment or simulation of a simple event to make predictions in a variety of real-world problems.
6. Application: The student compares what should happen with what did happen in an experiment or simulation with a simple event.

**B2 – Statistics – The student collects, organizes, displays, explains, and interprets numerical (whole numbers) and non-numerical data sets including the use of concrete objects in a variety of situations.**

1. The student organizes, displays, and reads numerical and non-numerical data in a clear, organized, and accurate manner including a title, labels, categories, and whole number intervals using these **data displays**: ▲
  - a. graphs using concrete objects;
  - b. pictographs with a symbol or picture representing one, two, five, ten, twenty-five, or one-hundred including partial symbols when the symbol represents an even amount;
  - c. frequency tables;
  - d. horizontal and vertical bar graphs;
  - e. Venn diagrams or other pictorial displays;
  - f. Line plots;
  - g. Charts and tables;
  - h. Line graphs;
  - i. Circle graphs.
2. The student collects data using different techniques and explains the results.
3. The student identifies, explains, and calculates or finds these statistical measures of a data set with less than ten whole number data points using whole numbers from 0 through 1,000:
  - a. Minimum and maximum values,
  - b. Range,
  - c. Mode,
  - d. Median when data set has an odd number of data points,
  - e. Mean when data set has a whole number mean.
4. Application: The student interprets and uses data to make reasonable inferences and predictions, answer questions, and make decisions from data displays.
5. Application: The student uses these statistical measures of a data set using whole numbers from 0 through 1,000 with less than ten whole number data points to make reasonable inferences and predictions, answer questions, and make decisions: ▲
  - a. Minimum and maximum values,
  - b. Range,
  - c. Mode,
  - d. Median when the data set has an odd number of data points, mean when the data set has a whole number mean.
6. Application: The student recognizes and explains the effects of scale and interval changes on graphs or whole number sets.

# Assessed Items

## Fourth Grade

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

**B2 – Number Systems and their Properties – The student demonstrates an understanding of whole numbers with a special emphasis on place value; recognizes, uses, and explains the concepts of properties as they relate to whole numbers; and extends these properties to fractions (including mixed numbers), decimals, and money.**

1. The student identifies, models, reads, and writes numbers using numerals, words, and expanded notation from hundredths place through one-hundred thousands place. ▲
5. The student **uses** the **concepts** of these properties with the whole number system and demonstrates their meaning including the use of concrete objects:
  - a. commutative properties of addition and multiplication; ▲
  - b. zero property of addition (additive identity) and property of one for multiplication (multiplicative identity); ▲
  - c. associative properties of addition and multiplication; ▲
  - d. symmetric property of equality applied to addition and multiplication; ▲

**B4 – Computation – The student models, performs, and explains computation with whole numbers, fractions, and money including the use of concrete objects in a variety of situations.**

5. The student shows the relationship between these operations with the basic fact families (addition facts with sums from 0 through 20 and corresponding subtraction facts, multiplication facts from 1 X 1 through 12 X 12 and corresponding division facts) including the use of mathematical models: ▲**N**
  - a. Addition and subtraction,
  - b. Addition and multiplication,
  - c. Multiplication and division,
  - d. Subtraction and division.

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

**B2 – Variables, Equations, and Inequalities – The student uses variables, symbols, and whole numbers to solve equations including the use of concrete objects in a variety of situations.**

2. The student solves one-step equations using whole numbers with one variable and a whole number solution that: ▲
  - a. Find the unknown in a multiplication or division equation based on the multiplication facts from 1 X 1 through 12 X 12 and corresponding division facts;
  - b. Find the unknown in a money equation using multiplication and division based upon the facts and addition and subtraction with values through \$10;
  - c. Find the unknown in a time equation involving whole minutes, hours, days, and weeks with values through 200.

**B3 – Functions – The student recognizes and describes whole number relationships including the use of concrete objects in a variety of situations.**

1. Application: The student represents and describes mathematical relationships between whole numbers from 0 through 1,000 using concrete objects, pictures, written descriptions, symbols, equations, tables, and graphs. ▲
2. The student finds the values, determines the rule, and states the rule using symbolic notation with one operation of whole numbers from 0 through 200 using a horizontal or vertical function table (input/output machine, T-table), e.g., using the function table, find the rule, the rule is  $N \cdot 4$ . ▲

<b>N</b>	<b>?</b>
1	4
5	20
2	8
3	?
4	?
?	24

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

**B1 – Geometric Figures and their Properties – The student recognizes geometric shapes and investigates their properties including the use of concrete objects in a variety of situations.**

7. Application: The student identifies the plane figures used to form a composite figure. ▲

**B2 – Measurement and Estimation – The student estimates and measures using standard and nonstandard units of measure including the use of concrete objects in a variety of situations.**

2. The student selects, explains the selection of, and uses measurement tools, units of measure, and degree of accuracy appropriate for a given situation **to measure**: ▲
  - a. Length, width, and height to the nearest fourth of an inch or to the nearest centimeter;
  - b. Volume to the nearest cup, pint, quart, or gallon; to the nearest liter; or to the nearest whole unit of a nonstandard unit;
  - c. Weight to the nearest ounce or pound or to the nearest whole unit of a nonstandard unit of measure;
  - d. Temperature to the nearest degree;
  - e. Time including elapsed time.
6. Application: The student estimates to check whether or not measurements and calculations for length, width, weight, volume, temperature, time, and perimeter in real-world problems are reasonable. ▲

**B3 – Transformational Geometry – The student recognizes and performs one transformation on simple shapes or concrete objects in a variety of situations.**

2. The student recognizes, performs, and describes one transformation on a two-dimensional figure or concrete object. ▲

**B4 – Geometry from an Algebraic Perspective – The student relates geometric concepts to a number line and the first quadrant of a coordinate plane in a variety of situations.**

3. The student identifies and plots points as whole number ordered pairs in the first quadrant of a coordinate plane. ▲

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

**B2 – Statistics – The student collects, organizes, displays, explains, and interprets numerical (whole numbers) and non-numerical data sets including the use of concrete objects in a variety of situations.**

1. The student organizes, displays, and reads numerical (quantitative) and non-numerical (qualitative) data in a clear, organized, and accurate manner including a title, labels, categories, and whole number intervals using these **data displays**: ▲
  - a. Graphs using concrete objects, (for testing, does **not** have to use concrete objects in items);
  - b. Pictographs with a symbol or picture representing one, two, five, ten, twenty-five, or one-hundred including partial symbols when the symbol represents an even amount;
  - c. Frequency tables (tally marks);
  - d. Horizontal and vertical bar graphs;
  - e. Venn diagrams or other pictorial displays, e.g., glyphs;
  - f. Line plots;
  - g. Charts and tables;
  - h. Line graphs;
  - i. Circle graphs.

## Standards and Benchmarks Fifth Grade

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

B1 – Number Sense – The student demonstrates number sense for integers, fractions, decimals, and money in a variety of situations.

B2 – Number Systems and their Properties – The student demonstrates an understanding of the whole number system; recognizes, uses, and explains the concepts of properties as they relate to the whole number system; and extends these properties to integers, fractions (including mixed numbers), decimals.

B3 – Estimation – The student uses computational estimation with whole numbers, fractions, decimals, and money in a variety of situations.

B4 – Computation – The student models, performs, and explains computation with whole numbers, fractions including mixed numbers, and decimals including the use of concrete objects in a variety of situations.

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

B1 – Patterns – The student recognizes, describes, extends, develops, and explains relationships in patterns in a variety of situations.

B2 – Variables, Equations, and Inequalities – The student uses variables, symbols, whole numbers, and algebraic expressions in one variable to solve linear equations in a variety of situations.

B3 – Functions – The student recognizes, describes, and examines whole number relationships in a variety of situations.

B4 – Models – The student develops and uses mathematical models including the use of concrete objects to represent and explain mathematical relationships in a variety of situations.

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

B1 – Geometric Figures and their Properties – The student recognizes geometric shapes and compares their properties in a variety of situations.

B2 – Measurement and Estimation – The student estimates, measures, and uses measurement formulas in a variety of situations.

B3 – Transformational Geometry – The student recognizes and performs one transformation on geometric shapes including the use of concrete objects in a variety of situations.

B4 – Geometry from an Algebraic Perspective – The student relates geometric concepts to a number line and the first quadrant of a coordinate plane in a variety of situations.

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

B1 – 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.

B2 – Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational numbers) and non-numerical data sets in a variety of situations with a special emphasis on measures of central tendency.

**N-Non-calculator**

**▲-Assessed Indicator**

## Fifth Grade

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

**B1 – Number Sense – The student demonstrates number sense for integers, fractions, decimals, and money in a variety of situations.**

1. The student knows, explains, and uses equivalent representations for: **▲N**
  - a. Whole numbers from 0 through 1,000,000;
  - b. Fractions greater than or equal to zero through hundredths place and when used as monetary amounts.
2. The student compares and orders:
  - a. Integers,
  - b. Fractions greater than or equal to zero,
  - c. Decimals greater than or equal to zero through hundredths place and when used as monetary amounts.
3. The student explains the numerical relationships between whole numbers, fractions greater than or equal to zero, and decimals greater than or equal to zero through hundredths place.
4. The student knows equivalent percents and decimals for one whole, one-half, one-fourth, three-fourths, and one tenth through nine tenth.
5. The student identifies integers and gives real-world problems where integers are used.
6. Application: The student determines whether or not solutions to real-world problems that involve the following are reasonable:
  - a. Whole numbers from 0 through 100,000;

- b. Fractions greater than or equal to zero;
- c. Decimals greater than or equal to zero through hundredths place.

**B2 – Number Systems and their Properties – The student demonstrates an understanding of the whole number system; recognizes, uses, and explains the concepts of properties as they relate to the whole number system; and extends these properties to integers, fractions (including mixed numbers), and decimals.**

1. The student classifies subsets of numbers as integers, whole number, fractions, or decimals.
2. The student identifies prime and composite numbers from 0 through 50.
3. The student **uses** the **concepts** of these properties with whole numbers, integers, fractions greater than or equal to zero, and decimals greater than or equal to zero and demonstrates their meaning including the use of concrete objects:
  - a. Commutative properties of addition and multiplication;
  - b. Associative properties of addition and multiplication;
  - c. Zero property of addition (additive identity) and property of one for multiplication (multiplicative identity);
  - d. Symmetric property of equality;
  - e. Zero property of multiplication;
  - f. Distributive property;
  - g. Substitution property.
4. The student recognizes Roman Numerals that are used for dates, on clock faces, and in outlines.
5. The student recognizes the need for integers.

**B3 – Estimation – The student uses computational estimation with whole numbers, fractions, decimals, and money in a variety of situations.**

1. The student estimates whole numbers quantities from 0 through 100,000; fractions greater than or equal to zero; decimals greater than or equal to zero through hundredths place; and monetary amounts to \$10,000 using various computational methods including mental math, paper and pencil, concrete materials, and appropriate technology.
2. The student uses various estimation strategies to estimate whole number quantities from 0 through 100,000; fractions greater than or equal to zero; decimals greater than or equal to zero through hundredths place; and monetary amounts to \$10,000 and explains how various strategies are used. **▲N**
3. The student recognizes and explains the difference between an exact and an approximate answer.
4. The student explains the appropriateness of an estimation strategy used and whether the estimate is greater than (overestimate) or less than (underestimate) the exact answer.
5. Application: The student determines if a real-world problem calls for an exact or approximate answer using whole numbers from 0 through 100,000 and performs the appropriate computation using various computational methods including mental math, paper and pencil, concrete materials, and appropriate technology. **▲**

**B4 – Computation – The student models, performs, and explains computation with whole numbers, fractions including mixed numbers, and decimals including the use of concrete objects in a variety of situations.**

1. The student computes with efficiency and accuracy using various computational methods including mental math,

paper and pencil, concrete materials, and appropriate technology.

2. The student performs and explains these computational procedures:
  - a. Divides whole numbers through a 2-digit divisor and a 4-digit dividend with the remainder as a whole number or a fraction using paper and pencil; **N**
  - b. Divides whole numbers beyond a 2-digit divisor and a 4-digit dividend using appropriate technology;
  - c. Adds and subtracts decimals from thousands place through hundredths place; **N**
  - d. Multiplies decimals up to three digits by two digits from hundreds place through hundredths place; **N**
  - e. Adds and subtracts fractions greater than or equal to zero without regrouping and without expressing answers in simplest form with special emphasis on manipulatives, drawings, and models; **N**
  - f. Multiplies and divides by 10; 100; 1,000; or single-digit multiples of each. **N**
3. The student reads and writes horizontally, vertically, and with different operational symbols in the same addition, subtraction, multiplication, or division expression.
4. The student identifies, explains, and finds the greatest common factor and the least common factor and least common multiple of two or more whole numbers through the basic multiplication facts from 1x1 through 12x12. **N▲**
5. Application: The student solves one- and two-step real-world problems using these computational procedures: **▲N**
  - a. Adds and subtracts whole numbers from 0 through 100,000;
  - b. Multiplies through a four-digit whole number by a two-digit whole number;
  - c. Multiplies monetary amounts up to \$1,000 by a one- or two-digit whole number;

- d. Divides whole numbers through a 2-digit divisor and a 4-digit dividend with the remainder as a whole number of a fraction;
- e. Adds and subtracts decimals from thousands place through hundredths place when used as monetary amounts;
- f. Multiplies and divides by 10; 100; and 1,000 and single digit multiples of each.

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

**B1 – Patterns – The student recognizes, describes, extends, develops, and explains relationships in patterns in a variety of situations.**

1. The student uses concrete objects, drawings, and other representations to work with these **types** of patterns:
  - a. Repeating patterns;
  - b. Growing patterns.
2. The student uses these **attributes** to generate patterns:
  - a. Counting number related to number theory;
  - b. Whole numbers;  
Geometric shapes through two attribute changes;
  - c. measurements
  - d. things related to daily life;
  - e. things related to size, shape, color, texture, or movement.
3. The student identifies, states, and continues a pattern presented in various formats including numeric, visual, verbal, kinesthetic, and written.
4. The student generates:
  - a. A pattern.
  - b. A pattern using a function table.

5. Application: The student generalizes these patterns using a written description:
  - a. Numerical patterns,
  - b. Patterns using geometric shapes through two attribute changes,
  - c. Measurement patterns,
  - d. Patterns related to daily life.

**B2 – Variables, Equations, and Inequalities – The student uses variables, symbols, whole numbers, and algebraic expressions in one variable to solve linear equations in a variety of situations.**

1. The student explains and uses variables and symbols to represent unknown whole number quantities from 0 through 1,000 and variable relationships. ▲
2. The student solves one-step linear equations with one variable and a whole number solution using addition and subtraction with whole numbers from 0 through 100 and multiplication with the basic facts, e.g.,  $3y=12$ ,  $45=17+q$ , or  $r-42=36$ . N▲
3. The student explains and uses equality and inequality symbols ( $=$ ,  $\neq$ ,  $<$ ,  $\leq$ ,  $>$ ,  $\geq$ ) 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) with whole numbers from 0 to 100,000. \$
4. The student recognizes ratio as a comparison of part-to-part and part-to-whole relationships, e.g., the relationship between the number of boys and the number of girls (part-to-part) or the relationship between the number of girls to the total number of students in the classroom (part-to-whole).

**B3 – Functions – The student recognizes, describes, and examines whole number relationships in a variety of situations.**

1. The student states mathematical relationships between whole numbers from 0 through 10,000 using various methods including mental math, paper and pencil, concrete objects, and appropriate technology.
2. The student finds the values, determines the rule, and states the rule using symbolic notation with one operation of whole numbers from 0 through 10,000 using a vertical or horizontal function table (input/output machine, T-table), e.g., using the function table, fill in the values and find the rule, the rule is  $N \cdot 80$ .

<b>N</b>	4	9	11	?	2	7	?
<b>?</b>	320	720	880	640	?	?	800

3. The student generalizes numerical patterns using whole numbers from 0 through 5,000 up to two operations by stating the rule using words.
4. The student uses a function table to identify, plot, and label whole number ordered pairs in the first quadrant of a coordinate plane. ▲
5. The student plots and locates points for integers on a horizontal number line and vertical number line.
6. The student describes whole number relationships using letters and symbols.

**B4 – Models – The student develops and uses mathematical models including the use of concrete objects to represent and explain mathematical relationships in a variety of situations.**

1. The student knows, explains, and uses mathematical models to represent mathematical concepts, procedures, and relationships. Mathematical models include:

- a. Process models to model computational procedures and mathematical relationships and to solve equations;
  - b. Place value models to compare, order, and represent numerical quantities and to model computational procedures;
  - c. Fraction and mixed number models and decimal and money models to compare, order, and represent numerical quantities;
  - d. Factor trees to find least common multiple and greatest common factor;
  - e. Equations and inequalities to model numerical relationships;
  - f. Function tables to model numerical and algebraic relationships;
  - g. Two-dimensional geometric models to model perimeter, area, and properties of geometric shapes and three-dimensional models and real-world objects to compare size and to model volume and properties of geometric shapes;
  - h. Tree diagrams to organize attributes through three different sets and determine the number of possible combinations;
  - i. Two- and three-dimensional geometric models and process models to model probability;
  - j. Graphs using concrete objects, pictographs, frequency tables, bar graphs, line graphs, circle graphs, Venn diagrams, line plots, charts, tables, and single stem-and-leaf plots to organize and display data;
  - k. Venn diagrams to sort data and show relationships.
2. The student creates mathematical models to show the relationship between two or more things.

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

**B1 – Geometric Figures and their Properties – The student recognizes geometric shapes and compares their properties in a variety of situations.**

1. The student recognizes and investigates properties of plane figures and solids using concrete objects, drawings, and appropriate technology.
2. The student recognizes and describes:
  - a. Regular polygons having up to and including ten sides;
  - b. Similar and congruent figures.
3. The student recognizes and describes the solids using the terms faces, edges, and vertices. ▲
4. The student determines if geometric shapes and real-world objects contain line(s) of symmetry and draws the line(s) of symmetry if the line(s) exist(s).
5. The student recognizes, draws, and describes:
  - a. Points, lines, line segments, and rays;
  - b. Angles as right, obtuse, or acute.
6. The student recognizes and describes the difference between intersecting, parallel, and perpendicular lines.
7. The student identifies circumference, radius, and diameter of a circle.
8. Application: The student solves real-world problems by applying the properties of:
  - a. Plane figures, ▲
  - b. Solids,
  - c. Intersecting, parallel, and perpendicular lines.

**B2 – Measurement and Estimation – The student estimates, measures, and uses measurement formulas in a variety of situations.**

1. The student determines and uses whole number approximations for length, width, weight, volume, temperature, time, perimeter, and area using standard and nonstandard units of measure.
2. The student selects, explains the selection of, and uses measurement tools, units of measure, and degree of accuracy appropriate for a given situation to measure length, width, weight, volume, temperature, time, perimeter, and area using:
  - a. Customary units of measure to the nearest fourth and eighth inch,
  - b. Metric units of measure to the nearest centimeter,
  - c. Nonstandard units of measure to the nearest whole unit,
  - d. Time including elapsed time.
3. The student states the number of feet and years in a mile.
4. The student converts:
  - a. Within the customary system: inches and feet, feet and yards, inches and yards, cups and pints, pints and quarts, quarts and gallons, pounds and ounces; ▲
  - b. Within the metric system: centimeters and meters, meters and kilometers, milliliters and liters, grams and kilograms.
5. The student knows and uses perimeter and area formulas for squares and rectangles.
6. Application: The student solves real-world problems by applying appropriate measurements and measurement formulas:
  - a. Length to the nearest eighth of an inch or to the nearest centimeter; ▲
  - b. Temperature to the nearest degree;
  - c. Weight to the nearest whole unit; ▲
  - d. Time including elapsed time;

- e. Hours in a day, days in a week, and days and weeks in a year;
  - f. Months in a year and minutes in an hour; ▲
  - g. Perimeter of squares, rectangles, and triangles; ▲
  - h. Area of squares and rectangles. ▲
7. Application: The student estimates to check whether or not measurements or calculations for length, weight, temperature, time, perimeter, and area in real-world problems are reasonable.

**B3 – Transformational Geometry – The student recognizes and performs transformations on geometric shapes including the use of concrete objects in a variety of situations.**

- 1. The student recognizes and performs through two transformations on a two-dimensional figure.
- 2. The student recognizes when an object is reduced or enlarged.
- 3. The student recognizes three-dimensional figures from various perspectives. ▲
- 4. Application: The student describes and draws a two-dimensional figure after performing one transformation.
- 5. Application: The student makes scale drawings of two-dimensional figures using a simple scale and grid paper.

**B4 – Geometry from an Algebraic Perspective – The student relates geometric concepts to a number line and the first quadrant of a coordinate plane in a variety of situations.**

- 1. The student locates and plots points on a number line using integers.

- 2. The student explains mathematical relationships between whole numbers, fractions, and decimals and where they appear on a number line.
- 3. The student identifies and plots points as ordered pairs in the first quadrant of a coordinate plane.
- 4. The student organizes whole number data using a T-table and plots the ordered pairs in the first quadrant of a coordinate plane.
- 5. Application: The student solves real-world problems that involve distance and location using coordinate planes and map grids with positive whole number and letter coordinates.
- 6. Application: The student solves real-world problems by plotting ordered pairs in the first quadrant of a coordinate plane.

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

**B1 – 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.**

- 1. The student recognizes that all probabilities range from zero through one.
- 2. The student lists all possible outcomes of a simple event in an experiment or simulation in an organized manner including the use of concrete objects.
- 3. The student recognizes a simple event in an experiment or simulation where the probabilities of all outcomes are equal.
- 4. The student represents the probability of a simple event in an experiment or simulation using fractions.
- 5. Application: The student conducts an experiment or simulation with a simple event including the use of concrete

materials; records the results in a chart, table, or graph; uses the results to draw conclusions about the event; and makes predictions about future events.

6. Application: The student uses the results from a completed experiment or simulation of a simple event to make predictions in a variety of real-world situations.
7. Application: The student compares what should happen with what did happen in an experiment or simulation with a simple event.

**B2 – Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational numbers) and non-numerical data sets in a variety of situations with a special emphasis on measures of central tendency.**

1. The student organizes, displays, and reads numerical and non-numerical data in a clear, organized, and accurate manner including a title, labels, categories, and whole number and decimal intervals using these **data displays**:
  - a. Graphs using concrete objects,
  - b. Pictographs,
  - c. Frequency tables,
  - d. Bar and line graphs,
  - e. Venn diagrams and other pictorial displays, e.g., glyphs,
  - f. Line plots,
  - g. Charts and tables,
  - h. Circles graphs,
  - i. Single stem-and-leaf plots.
2. The student collects data using different techniques and explains the results.
3. The student identifies, explains, and calculates or finds these statistical measures of a whole number data set of up to twenty whole number data points from 0 through 1,000: ▲
  - a. Minimum and maximum values,

- b. Range,
- c. Mode,
- d. Median,
- e. Mean.

4. Application: The student interprets and uses data to make reasonable inferences, predictions, and decisions, and to develop convincing arguments from these data displays: ▲
  - a. Graphs using concrete materials,
  - b. Pictographs,
  - c. Frequency tables,
  - d. Bar and line graphs,
  - e. Venn diagrams and other pictorial displays,
  - f. Line plots,
  - g. Charts and tables,
  - h. Circle graphs.
5. Application: The student recognizes and explains the effects of scale and interval changes on graphs of whole number data sets.

# Assessed Indicators

## Fifth Grade

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

**B1 – Number Sense – The student demonstrates number sense for integers, fractions, decimals, and money in a variety of situations.**

1. The student knows, explains, and uses equivalent representations for: **▲N**
  - a. Whole numbers from 0 through 1,000,000;
  - b. Fractions greater than or equal to zero (including mixed numbers);
  - c. Decimals greater than or equal to zero through hundredths place and when used as money amounts.

**B3 – Estimation – The student uses computational estimation with whole numbers, fractions, decimals, and money in a variety of situations.**

2. The student uses various estimation strategies to estimate whole number quantities from 0 through 100,000; fractions greater than or equal to zero (including mixed numbers); decimals greater than or equal to zero through hundredths place; and monetary amounts to \$10,000 and explains how various strategies are used. **▲N**
4. The student determines if a real-world problem calls for an exact or approximate answer using whole numbers from 0 through 100,000 and performs the appropriate computation using various computational methods including mental math, paper and pencil, concrete materials, and appropriate technology. **▲**

**B4 – Computation – The student models, performs, and explains computation with whole numbers, fractions including mixed numbers, and decimals including the use of concrete objects in a variety of situations.**

4. The student identifies, explains, and finds the greatest common factor and least common multiple of two or more whole numbers through the basic multiplication facts from 1x1 through 12x12. **▲N**
5. The student solves one- and two-step real-world problems using these computational procedures: **▲N**
  - a. Adds and subtracts whole number from 0 through 100,000;
  - b. Multiplies through a four-digit whole number by a two-digit whole number;
  - c. Multiplies monetary amounts up to \$1,000 by a one- and two-digit whole number;
  - d. Divides whole numbers through a 2-digit divisor and 4-digit dividend with the remainder as a whole number or a fraction;
  - e. Adds and subtracts decimals from thousands place through hundredths place when used as monetary amounts;
  - f. Multiplies and divides by 10; 100; and 1,000 and single digit multiples of each.

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

**B2 – Variables, Equations, and Inequalities – The student uses variables, symbols, whole numbers, and algebraic expressions in one variable to solve linear equations in a variety of situations.**

1. The student explains and uses variables and symbols to represent unknown whole number quantities from 0 through 1,000 and variable relationships. ▲
2. The student solves one-step linear equations with one variable and a whole number solution using addition and subtraction with whole numbers from 0 through 100 and multiplication with the basic facts. ▲**N**

**B3 – Functions – The student recognizes, describes, and examines whole number relationships in a variety of situations.**

2. The student uses a function table to identify, plot, and label whole number ordered pairs in the first quadrant of a coordinate plane. ▲

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

**B1 – Geometric Figures and their Properties – The student recognizes geometric shapes and compares their properties in a variety of situations.**

3. The student recognizes and describes the solids using the terms faces, edges, and vertices. ▲

**B2 – Measurement and Estimation – The student estimates, measures, and uses measurement formulas in a variety of situations.**

4. The student converts:
  - a. Within the customary system: inches and feet, feet and yards, inches and yards, cups and pints, pints and quarts, quarts and gallons, pounds and ounces; ▲
6. Application: The student solves real-world problems by applying appropriate measurements and measurement formulas:
  - a. Length to the nearest eighth of an inch or to the nearest centimeter; ▲
  - b. Temperature to the nearest degree; ▲
  - c. Weight to the nearest whole unit; ▲
  - f. Months in a year and minutes in an hour; ▲
  - g. Perimeter of squares, rectangles, and triangles; ▲
  - h. Area of squares and rectangles. ▲

**B3 – Transformational Geometry – The student recognizes and performs transformations on geometric shapes including the use of concrete objects in a variety of situations.**

3. The student recognizes three-dimensional figures from various perspectives. ▲

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

**B2 – Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational numbers) and non-numerical data sets in a variety of situations with a special emphasis on measures of central tendency.**

3. The student identifies, explains, and calculates or finds these statistical measures of a whole number data set of up to twenty whole number data points from 0 through 1,000:



- a. Minimum and maximum values,
- b. Range,
- c. Mode (no-, uni-, bi-),
- d. Median (including answers expressed as a decimal or a fraction without reducing to simplest form),
- e. Mean (including answers expressed as a decimal or a fraction without reducing to simplest form).

4. Application: The student interprets and uses data to make reasonable inferences, predictions, and decisions, and to develop convincing arguments from these data displays: ▲

- a. Graphs using concrete materials,
- b. Pictographs,
- c. Frequency tables,
- d. Bar and line graphs,
- e. Venn diagrams and other pictorial displays,
- f. Line plots,
- g. Charts and tables,
- h. Circle graphs.

# Standards and Benchmarks

## Sixth Grade

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

B1 – Number Sense – The student demonstrates number sense for rational numbers and simple algebraic expressions in one variable in a variety of situations.

B2 – 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.

B3 – Estimation – The student uses computational estimation with rational numbers and the irrational number  $\pi$  in a variety of situations.

B4 – Computation – The student models, performs, and explains computation with positive rational numbers and integers in a variety of situations.

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

B1 – Patterns – The student recognizes, describes, extends, develops, and explains the general rule of patterns in a variety of situations.

B2 – 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.

B3 – Functions – The student recognizes, describes, and analyzes linear relationships in a variety of situations.

B4 – Models – The student generates and uses mathematical models to represent and justify mathematical relationships in a variety of situations.

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

B1 – Geometric Figures and their Properties – The student recognizes geometric figures and compares their properties in a variety of situations.

B2 – Measurement and Estimation – The student estimates, measures, and uses measurement formulas in a variety of situations.

B3 – Transformational Geometry – The student recognizes and performs transformations on two- and three-dimensional geometric figures in a variety of situations.

B4 – Geometry from an Algebraic Perspective – The student relates geometric concepts to a number line and a coordinate plane in a variety of situations.

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

B1 – 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.

B2 – 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.

**N-Non-calculator**

**▲-Assessed Indicator**

## Sixth Grade

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

**B1 – Number Sense – The student demonstrates number sense for rational numbers and simple algebraic expressions in one variable in a variety of situations.**

1. The student 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. The student compares and orders: ▲
  - a. Integers;
  - b. Fractions greater than or equal to zero,
  - c. Decimals greater than or equal to zero through thousandths place.
3. The student explains the relative magnitude between whole numbers, fractions greater than or equal to zero, and decimals greater than or equal to zero.
4. The student knows and explains numerical relationships between percents, decimals, and fractions between 0 and 1, 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. ▲ **N**
5. The student uses equivalent representations for the same simple algebraic expression with understood coefficients of 1, e.g., when students are developing their own formula for the perimeter of a square, they combine  $s+s+s+s$  to make  $4s$ .
6. Application: The student demonstrates whether or not solutions to real-world problems that involve the following are reasonable:

- a. Integers,
- b. Fractions greater than or equal to zero,
- c. Decimals greater than or equal to zero through thousandths place.

**B2 – 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.**

1. The student classifies subsets of the rational number system as counting numbers, whole numbers, integers, fractions (including mixed numbers), or decimals.
2. The student identifies prime and composite numbers and explains their meaning.
3. The student uses and describes these properties with the rational number system and demonstrates their meaning including the use of concrete objects:
  - a. Commutative and associative properties of addition and multiplication;
  - b. Identity properties for addition and multiplication;
  - c. Symmetric property of equality;
  - d. Zero property of multiplication;
  - e. Distributive property;
  - f. Substitution property;
  - g. Addition property of equality;
  - h. Multiplication property of equality;
  - i. Additive inverse property.
4. The student recognizes and explains the need for integers.
5. The student recognizes that the irrational number pi can be represented by an approximate rational value.

**B3 – Estimation – The student uses computational estimation with rational numbers and the irrational number pi in a variety of situations.**

1. The student 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. The student uses various estimation strategies and explains how they were used to estimate rational number quantities or the irrational number  $\pi$ .
  3. The student recognizes and explains the difference between an exact and an approximate answer.
  4. The student determines the appropriateness of an estimation strategy used and whether the estimate is greater than (overestimate) or less (underestimate) the exact answer and its potential impact on the result.
  5. Application: The student estimates to check whether or not the result of a real-world problem using rational numbers is reasonable and make predictions based on the information.
- ▲ N

**B4 – Computation – The student models, performs, and explains computation with positive rational numbers and integers in a variety of situations.**

1. The student computes with efficiency and accuracy using various computational methods including mental math, paper and pencil, concrete objects, and appropriate technology.
2. The student performs and explains these computational procedures:
  - a. Divides whole numbers through a two-digit divisor and a four-digit dividend and expresses the

remainder as a whole number, fraction, or decimal;  
▲ N

- b. Adds and subtracts decimals from millions place through thousandths place; N
  - c. Multiplies and divides a four-digit number by a two-digit number using numbers from thousands place through hundredths place; N
  - d. 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; N
  - e. Adds integers; N
  - f. Adds, subtracts, and multiplies fractions (including mixed numbers) expressing answers in simplest form;
  - g. Finds the root of perfect whole number squares; ▲ N
  - h. 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; N
  - i. Adds, subtracts, multiplies, and divides rational numbers using concrete objects;
3. The student recognizes, describes, and uses different representations to express the same computational procedures.
  4. The student identifies, explains, and finds the prime factorization of whole numbers.
  5. The student finds prime factors, greatest common factor, multiples, and the least common multiple.
  6. The student finds a whole number percent (between 0 and 100) of a whole number.
  7. The student generates and/or solves one- and two-step real-world problems with rational numbers using these computational procedures:

- a. Division with whole numbers;
- b. Addition, subtraction, multiplication, and division of decimals through hundredths place; ▲
- c. Addition, subtraction, and multiplication of fractions (including mixed numbers).

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

**B1 – Patterns – The student recognizes, describes, extends, develops, and explains the general rule of a pattern in a variety of situations.**

1. The student 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 multiple;
  - b. Positive rational numbers limited to two operations including arithmetic sequences;
  - c. Geometric figures through two attribute changes;
  - d. Measurements;
  - e. Things related to daily life.
2. The student generates a pattern.
3. The student extends a pattern when given a rule of one or two simultaneous operational changes between consecutive terms.
4. The student states the rule to find the next number of a pattern with one operational change to move between consecutive terms. ▲
5. Application: The student recognizes multiple representations of the same pattern.

**B2 – 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.**

1. The student explains and uses variables and/or symbols to represent unknown quantities and variable relationships.
2. The student uses equivalent representations for the same simple algebraic expression with understood coefficients of 1.
3. The student solves:
  - a. One-step linear equations (addition, subtraction, multiplication, division) with one variable and whole number solutions;
  - b. One-step linear inequalities (addition, subtraction) in one variable with whole numbers.
4. The student explains and uses equality and inequality symbols ( $=, \neq, <, \leq, >, \geq$ ) 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.
5. The student 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.
6. The student finds the value of algebraic expressions using whole numbers.
7. Application: The student represents real-world problems using variables and symbols to:
  - a. Write algebraic or numerical or one-step equations with whole number solutions;
  - b. Write and/or solve one-step equations. ▲
8. Application: The student explains the mathematical reasoning that was used to solve a real-world problem using a one-step equation.

**B3 – Functions – The student recognizes, describes, and analyzes linear relationships in a variety of situations.**

1. The student recognizes linear relationships using various methods including mental math, paper and pencil, concrete objects, and graphing utilities or appropriate technology.
2. The student finds the values and determines the rule with one operation using a function table.
3. The student generalizes numerical patterns up to two operations by stating the rule using words.
4. The student uses a given function table to identify, plot, and label the ordered pairs using the four quadrants of a coordinate plane.
5. Application: The student interprets and describes the mathematical relationships of numerical, tabular, and graphical representations.

**B4 – Models – The student generates and uses mathematical models to represent and justify mathematical relationships in a variety of situations.**

1. The student knows, explains, and uses mathematical models to represent mathematical concepts, procedures, and relationships. Mathematical models include:
  - a. Process models to model computational procedures and mathematical relationships and to solve equations;
  - b. Place value models to compare, order, and represent numerical quantities and to model computational procedures;
  - c. Fraction and mixed number models and decimal and money models to compare, order, and represent numerical quantities;
  - d. Factor trees to find least common multiple and greatest common factor;

- e. Equations and inequalities to model numerical relationships
- f. Function tables to model numerical and algebraic relationships;
- g. Two-dimensional geometric models to model perimeter, area, and properties of geometric shapes and three-dimensional geometric models and real-world objects to model volume and to identify attributes of geometric shapes;
- h. Tree diagrams to organize attributes and determine the number of possible combinations;
- i. Graphs using concrete objects, two- and three-dimensional geometric models and process models to model probability;
- 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;
- k. Venn diagrams to sort data and to show relationships.

2. The student uses one or more mathematical models to show the relationship between two or more things.

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

**B1 – Geometric Figures and their Properties – The student recognizes geometric figures and compares their properties in a variety of situations.**

1. The student recognizes and compares properties of plane figures and solids using concrete objects, constructions, drawings, and appropriate technology.
2. The student recognizes and names regular and irregular polygons through 10 sides including all special types of

quadrilaterals: squares, rectangles, parallelograms, rhombi, trapezoids, kites.

3. The student names and describes the solids using the terms faces, edges, vertices, and bases.
4. The student recognizes all existing lines of symmetry in two-dimensional figures.
5. The student recognizes and describes the attributes of similar and congruent figures.
6. The student recognizes and uses symbols for angle (find symbol for), line ( $\leftrightarrow$ ), line segment ( $-$ ), ray ( $\rightarrow$ ), parallel ( $\parallel$ ), and perpendicular ( $\perp$ ).
7. The student classifies: ▲
  - a. Angles as right, obtuse, acute, or straight;
  - b. Triangles as right, obtuse, acute, scalene, isosceles, or equilateral.
8. The student identifies and defines circumference, radius, and diameter of circles and semicircles.
9. The student recognizes that the sum of the angles of a triangle equals  $180^\circ$ .
10. The student determines the radius or diameter of a circle given one or the other.
11. Application: The student decomposes geometric figures made from:
  - a. Regular and irregular polygons through 10 sides, circles, and semi-circles;
  - b. Nets (two-dimensional shapes that can be folded into three-dimensional figures).
12. Application: The student composes geometric figures made from:
  - a. Regular and irregular polygons through 10 sides, circles, and semi-circles;
  - b. Nets (two-dimensional shapes that can be folded into three-dimensional figures).

**B2 – Measurement and Estimation – The student estimates, measures, and uses measurement formulas in a variety of situations.**

1. The student 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. The student 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.
3. The student converts:
  - a. Within the customary system;
  - b. Within the metric system using the prefixes: kilo, hector, deka, deci, centi, and milli. ▲
4. The student uses customary units of measure to the nearest sixteenth of an inch and metric units of measure to the nearest millimeter.
5. The student recognizes and states perimeter and area formulas for squares, rectangles, and triangles.
  - a. Uses given measurement formulas to find perimeter and area of: squares and rectangles,
  - b. Figures derived from squares and/or rectangles.
6. The student describes the composition of the metric system:
  - a. Meter, liter, and gram (root measures);
  - b. Kilo, hector, deka, deci, centi, and milli (prefixes).
7. The student finds the volume of rectangular prisms using concrete objects.
8. The student estimates an approximate value of the irrational number pi.
9. Application: The student solves real-world problems by applying these measurement formulas:

- a. Perimeter of polygons using the same unit of measurement; ▲
- b. Area of squares, rectangles, and triangles using the same unit of measurement; ▲
- c. Conversions within the metric system.

**B3 – Transformational Geometry – The student recognizes and performs transformations on two- and three-dimensional geometric figures in a variety of situations.**

1. The student identifies, describes, and performs one or two transformations on a two-dimensional figure. ▲
2. The student reduces and enlarges simple shapes with simple scale factors.
3. The student recognizes three-dimensional figures from various perspectives.
4. The student recognizes which figures will tessellate.
5. Application: The student describes a transformation of a given two-dimensional figure that moves it from its initial placement to its final placement.
6. Application: The student makes a scale drawing of a two-dimensional figure using a simple scale.

**B4 – Geometry from an Algebraic Perspective – The student relates geometric concepts to a number line and a coordinate plane in a variety of situations.**

1. The student uses a number line to order integers and positive rational numbers.
2. The student organizes integer data using a T-table and plots the ordered pairs in all four quadrants of a coordinate plane.
3. The student uses all four quadrants of the coordinate plane to: ▲
  - a. Identify the ordered pairs of integer values on a given graph;
  - b. Plot the ordered pairs of integer values.

4. Application: The student represents and/or generates real-world problems using a coordinate plane with integer values to find:
  - a. The perimeter of squares and rectangles;
  - b. The area of triangles, squares, and rectangles.

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

**B1 – 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.**

1. The student recognizes that all probabilities range from zero through one and can be written as a fraction, decimal, or a percent.
2. The student lists all possible outcomes of an experiment or simulation with a compound event composed of two independent events in a clear and organized way. ▲
3. The student recognizes whether an outcome in a compound event in an experiment or simulation is impossible, certain, likely, unlikely, or equally likely.
4. The student represents the probability of a simple event in an experiment or simulation using fractions and decimals. ▲
5. Application: The student 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.
6. Application: The student 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.

7. Application: The student compares what should happen with what did happen in an experiment or simulation with a compound event composed of two independent events.

**B2 – 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.**

1. The student 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**:
  - 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. The student selects and justifies the choice of data collection techniques and sampling techniques in a given situation.
3. The student uses sampling to collect data and describe the results.
4. The student determines mean, median, mode, and range for:
  - a. A whole number data set,
  - b. A decimal data set with decimals greater than or equal to zero.
5. Application: The student recognizes and explains the effects of scale and/or interval changes on graphs of whole number data sets.

# Assessed Items

## Sixth Grade

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

**B1 – Number Sense – The student demonstrates number sense for rational numbers and simple algebraic expressions in one variable in a variety of situations.**

2.The student compares and orders: ▲

- a. Integers;
- b. Fractions greater than or equal to zero,
- c. Decimals greater than or equal to zero through thousandths place.

4.The student knows and explains numerical relationships between percents, decimals, and fractions between 0 and 1. ▲N

**B3 – Estimation – The student uses computational estimation with rational numbers and the irrational number pi in a variety of situations.**

5.Application: The student estimates to check whether or not the result of a real-world problem using rational numbers is reasonable and make predictions based on the information. ▲N

**B4 – Computation – The student models, performs, and explains computation with positive rational numbers and integers in a variety of situations.**

2.The student performs and explains these computational procedures:

- a. Divides whole numbers through a two-digit divisor and a four-digit dividend and expresses the remainder as a whole number, fraction, or decimal; ▲N
- b. Adds and subtracts decimals from millions place through thousandths place; N
- c. Multiplies and divides a four-digit number by a two-digit number using numbers from thousands place through hundredths place; N
- d. 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; N
- e. Adds integers; N
- f. Adds, subtracts, and multiplies fractions (including mixed numbers) expressing answers in simplest form;
- g. Finds the root of perfect whole number squares; ▲ N
- h. 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; N

7.The student generates and/or solves one- and two-step real-world problems with rational numbers using these computational procedures:

- b.Addition, subtraction, multiplication, and division of decimals through hundredths place; ▲

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

**B1 – Patterns – The student recognizes, describes, extends, develops, and explains the general rule of a pattern in a variety of situations.**

4. The student states the rule to find the next number of a pattern with one operational change to move between consecutive terms. ▲

**B2 – 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.**

- 7.Application: The student represents real-world problems using variables and symbols to:
  - b. Write and/or solve one-step equations. ▲

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

**B1 – Geometric Figures and their Properties – The student recognizes geometric figures and compares their properties in a variety of situations.**

- 7.The student classifies: ▲
  - a. Angles as right, obtuse, acute, or straight;
  - b. Triangles as right, obtuse, acute, scalene, isosceles, or equilateral.

**B2 – Measurement and Estimation – The student estimates, measures, and uses measurement formulas in a variety of situations.**

3. The student converts:
  - b. Within the metric system using the prefixes: kilo, hector, deka, deci, centi, and milli. ▲
- 9.Application: The student solves real-world problems by applying these measurement formulas:
  - d. Perimeter of polygons using the same unit of measurement; ▲
  - e. Area of squares, rectangles, and triangles using the same unit of measurement; ▲

**B3 – Transformational Geometry – The student recognizes and performs transformations on two- and three-dimensional geometric figures in a variety of situations.**

1. The student identifies, describes, and performs one or two transformations on a two-dimensional figure. ▲

**B4 – Geometry from an Algebraic Perspective – The student relates geometric concepts to a number line and a coordinate plane in a variety of situations.**

- 3.The student uses all four quadrants of a coordinate plane to: ▲
  - a. Identify the ordered pairs of integer values on a given graph;
  - b. Plot the ordered pairs of integer values.

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

**B1 – 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.**

2. The student lists all possible outcomes of an experiment or simulation with a compound event composed of two independent events in a clear and organized way. ▲
  
4. The student represents the probability of a simple event in an experiment or simulation using fractions and decimals. ▲

# Standards and Benchmarks

## Seventh Grade

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

- B1 – Number Sense – The student demonstrates number sense for rational numbers, the irrational number  $\pi$ , and simple algebraic expressions in one variable in a variety of situations.
- B2 – 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.
- B3 – Estimation – The student uses computational estimation with rational numbers and the irrational number  $\pi$  in a variety of situations.
- B4 – Computation – The student models, performs, and explains computation with rational numbers, the irrational number  $\pi$ , and first degree algebraic expressions in a variety of situations.

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

- B1 – Patterns – The student recognizes, describes, extends, develops, and explains the general rule of a pattern in a variety of situations.
- B2 – Variables, Equations, and Inequalities – The student uses variables, symbols, rational numbers, and simple algebraic expressions in one variable to solve linear equations and inequalities in a variety of situations.
- B3 – Functions – The student recognizes, describes, and analyzes constant and linear relationships in a variety of situations.
- B4 – Models – The student generates and uses mathematical models to represent and justify mathematical relationships found in a variety of situations.

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

- B1 – Geometric Figures and their Properties – The student recognizes geometric figures and compares their properties in a variety of situations.
- B2 – Measurement and Estimation – The student estimates, measures, and uses measurement formulas in a variety of situations.
- B3 – Transformational Geometry – The student recognizes and performs transformations on two- and three-dimensional geometric figures in a variety of situations.
- B4 – Geometry from an Algebraic Perspective – The student relates geometric concepts to a number line and a coordinate plane in a variety of situations.

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

- B1 – Probability – The student applies the concepts of probability to draw conclusions, generate convincing arguments, and make predictions and decisions including the use of concrete objects in a variety of situations.
- B2 – 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.

**N-Non-calculator**

**▲-Assessed Indicator**

## Seventh Grade

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

**B1 – Number Sense – The student demonstrates number sense for rational numbers, the irrational number  $\pi$ , and simple algebraic expressions in one variable in a variety of situations.**

1. The student knows, explains, and uses equivalent representations for rational numbers and simple algebraic expressions including integers, fractions, decimals, percents, and ratios; integer bases with whole number exponents; positive rational numbers written in scientific notation with positive integer exponents; time; and money.
2. The student compares and orders rational numbers and the irrational number  $\pi$ .
3. The student explains the relative magnitude between rational numbers and between rational numbers and the irrational number  $\pi$ .
4. The student knows and explains what happens to the product or quotient when:
  - a. A whole number is multiplied or divided by a rational number greater than zero and less than one,
  - b. A whole number is multiplied or divided by a rational number greater than one,
  - c. A rational number (excluding zero) is multiplied or divided by zero.
5. The student explains and determines the absolute value of rational numbers.
6. Application: The student generates and/or solves real-world problems using:

- a. Equivalent representations of rational numbers and simple algebraic expressions; ▲
  - b. Fraction and decimal approximations of the irrational number  $\pi$ .
7. Application: The student determines whether or not solutions to real-world problems using rational numbers, the irrational number  $\pi$ , and simple algebraic expressions are reasonable.

**B2 – 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.**

1. The student knows and explains the relationships between natural (counting) numbers, whole numbers, integers, and rational numbers using mathematical models.
2. The student classifies a given rational number as a member of various subsets of the rational number system.
3. The student names, uses, and describes these properties with the rational number system and demonstrates their meaning including the use of concrete objects:
  - a. Commutative properties of addition and multiplication;
  - b. Associative properties of addition and multiplication;
  - c. Distributive property;
  - d. Substitution property.
4. The student uses and describes these properties with the rational number system and demonstrates their meaning including the use of concrete objects:
  - a. Identity properties for addition and multiplication;
  - b. Symmetric property of equality;
  - c. Zero property of multiplication;
  - d. Addition and multiplication properties of equality;

- e. Additive and multiplicative inverse properties.
- 5. The student recognizes that the irrational number pi can be represented by approximate rational values.

**B3 – Estimation – The student uses computational estimation with rational numbers and the irrational number pi in a variety of situations.**

1. The student estimates quantities with combinations of rational numbers and/or the irrational number pi using various computational methods.
2. The student uses various estimation strategies and explains how they were used to estimate rational number quantities and the irrational number pi. **N**
3. The student recognizes and explains the difference between an exact and approximate answer.
4. The student 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.
5. The student knows and explains why the fraction (22/7) or decimal (3.14) representation of the irrational number pi is an approximate value.
6. Application: The student estimates to check whether or not the result of a real-world problem using rational numbers, the irrational number pi, and/or simple algebraic expressions is reasonable and makes predictions based on the information.
7. Application: The student determines a reasonable range for the estimation of a quantity given a real-world problem and explains the reasonableness of the range.
8. Application: The student 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, and/or appropriate technology.

**B4 – Computation – The student models, performs, and explains computation with rational numbers, the irrational number pi, and first-degree algebraic expressions in one variable in a variety of situations.**

1. The student computes with efficiency and accuracy using various computational methods including mental math, paper and pencil, concrete objects, and appropriate technology.
2. The student performs and explains these computational procedures:
  - a. Adds and subtracts decimals from ten millions place through hundred thousandths place; **▲N**
  - b. Multiplies and divides a four-digit number by a two-digit number using numbers from thousands place through thousandths place; **▲N**
  - c. 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, e.g.,  $54.2 \div .002$  or  $54.3 \times 300$ ; **▲N**
  - d. Adds, subtracts, multiplies, and divides fractions and expresses answers in simplest form; **▲N**
  - e. Adds, subtracts, multiplies, and divides integers; **N**
  - f. Uses order of operations (evaluates within grouping symbols, evaluates powers to the second or third power, multiplies or divides in order from left to right, then adds or subtracts in order from left to right) using whole numbers; **N**
  - g. Simplifies positive rational numbers raised to positive whole number powers;
  - h. Combines like terms of a first degree algebraic expression.

3. The student recognizes, describes, and uses different ways to express computational procedures.
4. The student finds prime factors, greatest common factor, multiples, and the least common multiple.
5. The student finds percentages of rational numbers. ▲

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

**B1 – Patterns – The student recognizes, describes, extends, develops, and explains the general rule of a pattern in a variety of situations.**

1. The student identifies, states, and continues a pattern presented in various formats including numeric, algebraic, visual, verbal, kinesthetic, and written using these **attributes**:
  - a. Counting numbers including perfect squares, cubes, and factors and multiples (number theory); ▲
  - b. Positive rational numbers including arithmetic and geometric sequences (arithmetic: sequence of numbers in which the difference of two consecutive numbers is the same, geometric: a sequence of numbers in which each succeeding term is obtained by multiplying the preceding term by the same number); ▲
  - c. Geometric figures;
  - d. Measurements;
  - e. Things related to daily life.
2. The student generates a pattern.
3. The student extends a pattern when given a rule of one or two simultaneous changes (addition, subtraction, multiplication, division) between consecutive terms.

4. The student states the rule to find the  $n^{\text{th}}$  term of a pattern with one operational change (addition or subtraction) between consecutive terms. ▲
5. The student finds percentages of rational numbers.

**B2 – Variable, Equations, and Inequalities – The student uses variables, symbols, rational numbers, and simple algebraic expressions in one variable to solve linear equations and inequalities in a variety of situations.**

1. The student knows and explains that a variable can represent a single quantity that changes.
2. The student knows, explains, and uses equivalent representations for the same simple algebraic expressions.
3. The student shows and explains how changes in one variable affects other variables.
4. The student explains the difference between an equation and an expression.
5. The student solves:
  - a. One-step linear equations in one variable with positive rational coefficients and solutions;
  - b. Two-step linear equations in one variable with counting number coefficients and constants and positive rational solutions;
  - c. One-step linear inequalities with counting numbers and one variable.
6. The student explains and uses the equality and inequality symbols ( $=$ ,  $\neq$ ,  $<$ ,  $\leq$ ,  $>$ ,  $\geq$ ) 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 rational numbers.
7. The student knows the mathematical relationship between ratios, proportions, and percents and how to solve for a missing term in a proportion with positive rational number solutions and monomials. ▲

8. The student evaluates simple algebraic expressions using positive rational numbers. ▲
9. Application: The student represents real-world problems using variables and symbols to write linear expressions, one- or two-step equations. ▲

**B3 – Functions – The student recognizes, describes, and analyzes constant and linear relationships in a variety of situations.**

1. The student recognizes constant and linear relationships using various methods including mental math, paper and pencil, concrete objects, and graphing utilities or appropriate technology.
2. The student finds the values and determines the rule through two operations using a function table (input/output machine, T-table).
3. The student demonstrates mathematical relationships using ordered pairs in all four quadrants of a coordinate plane.
4. The student describes and/or gives examples of mathematical relationships that remain constant.

**B4 – Models – The student generates and uses mathematical models to represent and justify mathematical relationships found in a variety of situations.**

1. The student knows, explains, and uses mathematical models to represent and explain mathematical concepts, procedures, and relationships. Mathematical models include:
  - a. Process models to model computational procedures, algebraic relationships, and mathematical relationships and to solve equations;
  - b. Place value models to compare, order, and represent numerical quantities and to model computational procedures;

- c. Fraction and mixed number models and decimal and money models to compare, order, and represent numerical quantities;
  - d. Factor trees to find least common multiple and greatest common factor and to model prime factorization;
  - e. Equations and inequalities to model numerical relationships;
  - f. Function tables to model numerical and algebraic relationships;
  - g. Coordinate planes to model relationships between ordered pairs and linear equations;
  - h. Two- and three-dimensional geometric models to model perimeter, area, volume, and surface area and properties of two- and three-dimensional;
  - i. Geometric models, process models, and tree diagrams to model probability;
  - j. Frequency tables, bar graphs, line graphs, circle graphs, Venn diagrams, charts, tables, single stem-and-leaf plots, scatter plots, and box-and-whisker plots to organize and display data;
  - k. Venn diagrams to sort data and show relationships.
2. Application: The student recognizes that various mathematical models can be used to represent the same problem situation. Mathematical models include:
  - a. Process models to model computational procedures, algebraic relationships, mathematical relationships, and problem situations and to solve equations;
  - b. Place value models to model problem situations;
  - c. Fraction and mixed number models and decimal and money models to compare, order, and represent numerical quantities;
  - d. Factor trees to find least common multiple and greatest common factor and to model prime factorization;

- e. Equations and inequalities to model numerical relationships;
  - f. Function tables to model numerical and algebraic relationships;
  - g. Coordinate planes to model relationships between ordered pairs and linear equations;
  - h. Two- and three-dimensional geometric models to model perimeter, area, volume, and surface area, and properties of two- and three-dimensional models;
  - i. Scale drawings to model large and small real-world objects;
  - j. Geometric models, process models, and tree diagrams to model probability;
  - k. Frequency tables, bar graphs, line graphs, circle graphs, Venn diagrams, charts, tables, single stem-and-leaf plots, scatter plots, and box-and-whisker plots to describe, interpret, and analyze data;
  - l. Venn diagrams to sort data and show relationships.
3. Application: The student uses the mathematical modeling process to make inferences about real-world situations when the mathematical model used to represent the situation is given.

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

**B1 – Geometric Figures and their Properties – The student recognizes geometric figures and compares their properties in a variety of situations.**

1. The student recognizes and compares properties of two- and three-dimensional figures using concrete objects, constructions, drawings, appropriate terminology, and appropriate technology.
2. The student classifies regular and irregular polygons having through ten sides as convex or concave.
3. The student identifies angle and side properties of triangles and quadrilaterals: ▲
  - a. Sum of the interior angles of any triangle is  $180^\circ$ ;
  - b. Sum of the interior angles of any quadrilateral is  $360^\circ$ ;
  - c. Parallelograms have opposite sides that are parallel and congruent;
  - d. Rectangles have angles of  $90^\circ$ , opposite sides are congruent;
  - e. Rhombi have all sides the same length, opposite angles are congruent;
  - f. Squares have angles of  $90^\circ$ , all sides congruent;
  - g. Trapezoids have one pair of opposite sides parallel and the other pair of opposite sides are not parallel.
4. The student identifies and describes:
  - a. The altitude and base of a rectangular prism and triangular prism,
  - b. The radius and diameter of a cylinder.
5. The student identifies corresponding parts of a similar and congruent triangles and quadrilaterals.
6. The student uses symbols for right angle within a figure, parallel, perpendicular, and triangle to describe geometric figures.
7. The student classifies triangles as:
  - a. Scalene, isosceles, or equilateral;
  - b. Right, acute, obtuse, or equiangular.
8. The student determines if a triangle can be constructed given sides of three different lengths.
9. The student generate a pattern for the sum of angles for 3-, 4-, 5-, ... n-sides polygons.
10. The student describes the relationship between the diameter and the circumference of a circle.

11. Application: The student composes geometric figures made from:
  - a. Regular and irregular polygons through 10 sides, circles, and semicircles;
  - b. Nets (two-dimensional shapes that can be folded into three-dimensional figures);
  - c. Prisms, pyramids, cylinders, cones, spheres, and hemispheres.

**B2 – Measurement and Estimation – The student estimates, measures, and uses measurement formulas in a variety of situations.**

1. The student determines and uses rational number approximations (estimations) for length, width, weight, volume, temperature, time, perimeter, and area using standard and nonstandard units of measure.
2. The student selects 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.
3. The student converts within the customary system and within the metric system.
4. The student knows and uses perimeter and area formulas for circles, squares, rectangles, triangles, and parallelograms. ▲
5. The student finds perimeter and area of two-dimensional composite figures of circles, squares, rectangles, and triangles.
6. The student uses given measurement formulas to find: ▲
  - a. Surface area of cubes,
  - b. Volume of rectangular prisms.
7. The student finds surface area of rectangular prisms using concrete objects.

8. The student uses appropriate units to describe rate as a unit of measure.
9. The student finds missing angle measurements in triangles and quadrilaterals.
10. Application: The student estimates to check whether or not measurements or calculations for length, width, weight, volume, temperature, time, perimeter, and area in real-world problems are reasonable.

**B3 – Transformational Geometry – The student recognizes and performs transformations on two- and three-dimensional geometric figures in a variety of situations.**

1. The student identifies, describes, and performs single and multiple transformations [reflection, rotation, translation, reduction (contraction/shrinking), enlargement (magnification/growing)] on a two-dimensional figure.
2. The student identifies three-dimensional figures from various perspectives (top, bottom, sides, corners).
3. The student draws three-dimensional figures from various perspectives (top, bottom, sides, corners).
4. The student generates a tessellation.
5. Application: The student investigates congruency and similarity of geometric figures using transformations.
6. Application: The student determines the actual dimensions and/or measurements of a two-dimensional figure represented in a scale drawing. ▲■

**B4 – Geometry from an Algebraic Perspective – The student relates geometric concepts to a number line and a coordinate plane in a variety of situations.**

1. The student finds the distance between the points on a number line by computing the absolute value of their difference.

2. The student uses all four quadrants of a coordinate plane to:
  - a. Identify in which quadrant or on which axis a point lies when given the coordinates of a point,
  - b. Plot points,
  - c. Identify points,
  - d. List through five ordered pairs of a given line.
3. The student uses a given linear equation with whole number coefficients and constants and a whole number solution to find the ordered pairs, organize the ordered pairs using a T-table, and plot the ordered pairs on the coordinate plane.
4. The student examines characteristics of two-dimensional figures on a coordinate plane using various methods including mental math, paper and pencil, concrete objects, and graphing utilities or other appropriate technology.
5. Application: The student represents and/or generates real-world problems using a coordinate plane to find:
  - a. Perimeter of squares and rectangles;
  - b. Circumference (perimeter) of circles;
  - c. Area of circles, parallelograms, triangles, squares, and rectangles.

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

**B1 – Probability – The student applies the concepts of probability to draw conclusions, generate convincing arguments, and make predictions and decisions including the use of concrete objects in a variety of situations.**

1. The student finds the probability of a compound event composed of two independent events in an experiment or simulation.
2. The student explains and gives examples of simple or compound events in an experiment or simulation having probability of zero or one.

3. The student uses a fraction, decimal, and percent to represent the probability of:
  - a. A simple event in an experiment or simulation;
  - b. A compound event composed of two independent events in an experiment or simulation.
4. The student finds the probability of a simple event in an experiment or simulation using geometric models.
5. Application: The student 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 and make predictions about future events.
6. Application: The student compares results of theoretical (expected) probability with empirical (experimental) probability in an experiment or situation with a compound event composed of two simple independent events and understands that the larger the sample size, the greater the likelihood that the experimental results will equal the theoretical probability.
7. Application: The student makes predictions based on the theoretical probability of a simple event in an experiment or simulation.

**B2 – 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.**

1. The student 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**: ▲
  - a. Frequency tables;

- b. Bar, line, and circle graphs;
  - c. Venn diagrams or other pictorial displays;
  - d. Charts and tables;
  - e. Stem-and-leaf plots (single);
  - f. Scatter plots;
  - g. Box-and-whiskers plots.
2. The student 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.
  3. The student conducts experiments with sampling and describes the results.
  4. The student determines the measures of central tendency (mode, median, mean) for a rational number data set.
  5. The student identifies and determines the range and the quartiles of a rational number data set.
  6. The student identifies potential outliers within a set of data by inspection rather than formal calculation.
  7. Application: The student explains advantages and disadvantages of various data displays for a given data set.
  8. Application: The student recognizes and explains: ▲
    - a. Misleading representations of data; ■
    - b. The effects of scale or interval changes on graphs of data sets.

# Assessed Indicators

## Seventh Grade

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

**B1 – Number Sense – The student demonstrates number sense for rational numbers, the irrational number  $\pi$ , and simple algebraic expressions in one variable in a variety of situations.**

6. Application: The student generates and/or solves real-world problems using:
  - a. Equivalent representations of rational numbers and simple algebraic expressions. ▲

**B4 – Computation – The student models, performs, and explains computation with rational numbers, the irrational number  $\pi$ , and first-degree algebraic expressions in one variable in a variety of situations.**

2. The student performs and explains these computational procedures:
  - a. Adds and subtracts decimals from ten millions place through hundred thousandths place; ▲N
  - b. Multiplies and divides a four-digit number by a two-digit number using numbers from thousands place through thousandths place; ▲N
  - c. 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. ▲N
  - d. Adds, subtracts, multiplies, and divides fractions and expresses answers in simplest form. ▲N
5. The student finds percentages of rational numbers. ▲

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

**B1 – Patterns – The student recognizes, describes, extends, develops, and explains the general rule of a pattern in a variety of situations.**

1. The student identifies, states, and continues a pattern presented in various formats including numeric, algebraic, visual, verbal, kinesthetic, and written using these attributes:
  - a. Counting numbers including perfect squares, cubes, and factors and multiples; ▲
  - b. Positive rational numbers including arithmetic and geometric sequences. ▲
4. The student states the rule to find the  $n^{\text{th}}$  term of a pattern with one operational change. ▲

**B2 – Variable, Equations, and Inequalities – The student uses variables, symbols, rational numbers, and simple algebraic equations in one variable to solve linear equations and inequalities in a variety of situations.**

7. The student knows the mathematical relationship between ratios, proportions, and percents and how to solve for a missing term in a proportion with positive rational number solutions and monomials. ▲
8. The student evaluates simple algebraic expressions using positive rational numbers. ▲
9. Application: The student represents real-world problems using variables and symbols to write linear expressions, one- or two-step equations. ▲

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

**B1 – Geometric Figures and their Properties – The student recognizes geometric figures and compares their properties in a variety of situations.**

3. The student identifies angle and side properties of triangles and quadrilaterals: ▲
  - a. Sum of the interior angles of any triangle is  $180^\circ$ ;
  - b. Sum of the interior angles of any quadrilateral is  $360^\circ$ ;
  - c. Parallelograms have opposite sides that are parallel and congruent;
  - d. Rectangles have angles of  $90^\circ$ , opposite sides are congruent;
  - e. Rhombi have all sides the same length, opposite angles are congruent;
  - f. Squares have angles of  $90^\circ$ , all sides congruent;
  - g. Trapezoids have one pair of opposite sides parallel and the other pair of opposite sides are not parallel;

**B2 – Measurement and Estimation – The student estimates, measures, and uses measurement formulas in a variety of situations.**

4. The student knows and uses perimeter and area formulas for circles, squares, rectangles, triangles, and parallelograms. ▲
6. The student uses given measurement formulas to find: ▲
  - a. Surface area of cubes,
  - b. Volume of rectangular prisms.

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

**B2 – 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.**

1. The student 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: ▲
  - a. Frequency tables;
  - b. Bar, line, circle graphs;
  - c. Venn diagrams or other pictorial displays;
  - d. Charts and tables;
  - e. Stem-and-leaf plots (single);
  - f. Scatter plots;
  - g. Box-and-whiskers plots.
8. Application: The student recognizes and explains: ▲
  - c. Misleading representations of data; ■
  - d. The effects of scale or interval changes on graphs of data sets.

# Standards and Benchmarks

## Eighth Grade

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

B1 – Number Sense – The student demonstrates number sense for real numbers and simple algebraic expressions in a variety of situations.

B2 – Number Systems and their Properties – The student demonstrates an understanding of the real number system; recognizes, applies, and explains their properties; and extends these properties to algebraic expressions.

B3 – Estimation – The student uses computational estimation with real numbers in a variety of situations.

B4 – Computation – The student models, performs, and explains computation with rational numbers, the irrational number  $\pi$ , and algebraic expressions in a variety of situations.

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

B1 – Patterns – The student recognizes, describes, extends, develops, and explains the general rule of a pattern in a variety of situations.

B2 – Variables, Equations, and Inequalities – The student uses variables, symbols, real numbers, and algebraic expressions to solve equations and inequalities in a variety of situations.

B3 – Functions – The student recognizes, describes, and analyzes constant, linear, and nonlinear relationships in a variety of situations.

B4 – Models – The student generates and uses mathematical models to represent and justify mathematical relationships found in a variety of situations.

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

B1 – Geometric Figures and their Properties – The student recognizes geometric figures and compares their properties in a variety of situations.

B2 – Measurement and Estimation – The student estimates, measures, and uses geometric formulas in a variety of situations.

B3 – Transformational Geometry – The student recognizes and applies transformations on geometric figures in a variety of situations.

B4 – Geometry from an Algebraic Perspective – The student uses algebraic perspective to examine the geometry of two-dimensional figures in a variety of situations.

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

B1 – Probability – The student applies the concepts of probability to draw conclusions, generate convincing arguments, and make predictions and decisions including the use of concrete objects in a variety of situations.

B2 – Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational) and non-numerical data sets in a variety of situations.

**N-Non-calculator**

**▲-Assessed Indicator**

## Eighth Grade

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

**B1 – Number Sense – The student demonstrates number sense for real numbers and simple algebraic expressions in a variety of situations.**

1. The student knows, explains, and uses equivalent representations for rational numbers and simple algebraic expressions.
2. The student compares and orders rational numbers, the irrational number  $\pi$ , and algebraic expressions.
3. The student explains the relative magnitude between rational numbers, the irrational number  $\pi$ , and algebraic expressions.
4. The student recognizes and describes irrational numbers.
5. The student knows and explains what happens to the product or quotient when: ▲
  - a. A positive number is multiplied or divided by a rational number greater than zero and less than one,
  - b. A positive number is multiplied or divided by a rational number great than one,
  - c. A nonzero real number is multiplied or divided by zero.
6. The student explains and determines the absolute value of real numbers.
7. Application: The student determines whether or not solutions to real-world problems using rational numbers, the irrational number  $\pi$ , and simple algebraic expressions are reasonable.

**B2 – Number Systems and their Properties – The student demonstrates an understanding of the real number system; recognizes, applies, and explains their properties; and extends these properties to algebraic expressions.**

1. The student explains and illustrates the relationship between the subsets of the real number system using mathematical models.
2. The student identifies all the subsets of the real number system to which a given number belongs. ▲
3. The student names, uses, and describes these properties with the rational number system and demonstrates their meaning including the use of concrete objects:
  - a. Commutative, associative, distributive, and substitution properties;
  - b. Identity properties for addition and multiplication and inverse properties of addition and multiplication;
  - c. Symmetric property of equality;
  - d. Addition and multiplication properties of equalities;
  - e. Addition property of inequalities;
  - f. Zero product property.
4. Application: The student generates and/or solves real-world problems with rational numbers using the concepts of these properties to explain reasoning:
  - a. Commutative, associative, distributive, and substitution properties; ▲
  - b. Identity and inverse properties of addition and multiplication; ▲
  - c. Symmetric property of equality;
  - d. Addition and multiplication properties of equality;
  - e. Zero product property.
5. Application: The student analyzes and evaluates the advantages and disadvantages of using integers, whole numbers, fractions or decimals in solving a given real-world problem.

**B3 – Estimation – The student uses computational estimation with real numbers in a variety of situations.**

1. The student estimates real number quantities using various computational methods including mental math, paper and pencil, concrete objects and/or appropriate technology.
2. The student uses various estimation strategies and explains how they were used to estimate real number quantities and simple algebraic expressions.
3. The student knows and explains why a decimal representation of the irrational number pi is an approximate value.
4. The student knows and explains between two consecutive integers an irrational number lies.
5. Application: The student estimates to check whether or not the result of a real-world problem using rational numbers and/or simple algebraic expressions is reasonable and makes predictions based on the information.
6. Application: The student explains the impact of estimation on the result of a real-world problem.

**B4 – Computation – The student models, performs, and explains computation with rational numbers, the irrational number pi, and algebraic expressions in a variety of situations.**

1. The student computes with efficiency and accuracy using various computational methods including mental math, paper and pencil, concrete objects, and appropriate technology.
2. The student performs and explains these computational procedures with rational numbers:
  - a. Addition, subtraction, multiplication, and division of integers; ▲N
  - b. Order of operations; ▲N

- c. Approximation of roots of numbers using calculators;
  - d. Multiplication or division to find:
    - i. A percent of a number;
    - ii. Percent of increase and decrease;
    - iii. Percent one number is of another number;
    - iv. A number when a percent of the number is given.
  - e. addition of polynomials;
  - f. Simplifies algebraic expressions in one variable by combining like terms or using the distributive property.
3. The student finds factors and common factors of simple monomial expressions.
  4. Application: The student generates and/or solves one- and two-step real-world problems using computational procedures and mathematical concepts with: ▲
    - a. Rational numbers; ■
    - b. The irrational number pi as an approximation;
    - c. Applications of percents.

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

**B1 – Patterns – The student recognizes, describes, extends, develops, and explains the general rule of a pattern from a variety of situations.**

1. The student identifies, states, and continues a pattern presented in various formats including numeric, algebraic, visual, verbal, kinesthetic, and written using these **attributes**:
  - a. Counting numbers including perfect squares, cubes, and factors and multiples with positive rational numbers;

- b. Rational numbers including arithmetic and geometric sequences;
  - c. Geometric figures;
  - d. Measurements;
  - e. Things related to daily life;
  - f. Variables and simple expressions.
2. The student generates and explains a pattern.
  3. The student generates a pattern limited to two operations (addition, subtraction, multiplication, division, exponents) when given a rule for the  $n$ th term.
  4. The student states the rule to find the  $n$ th term of a pattern using explicit symbolic notation.
  5. The student describes the pattern when given a table of linear values and plots the ordered pairs on a coordinate plane, e.g., in the table below, the pattern could be described as the  $x$ -coordinates are increasing by three, while the  $y$ -coordinates are increasing by 6, or the  $x$  is doubled and one is added to find the  $y$ .

<b>X</b>	2	5	8	11
<b>Y</b>	5	11	17	23

**B2 – Variable, Equations, and Inequalities – The student uses variables, symbols, real numbers, and algebraic expressions to solve equations and inequalities in a variety of situations.**

1. The student identifies independent and dependent variables within a given situation.
2. The student simplifies algebraic expressions in one variable by combining like terms or using the distributive property.
3. The student solves:
  - a. One- and two-step linear equations in one variable with rational number coefficients and constants intuitively and/or analytically; ▲

- b. One-step linear inequalities in one variable with rational number coefficients and constants intuitively, analytically, and graphically;
  - c. Systems of given linear equations with whole number coefficients and constants graphically.
4. The student knows and describes the mathematical relationship between ratios, proportions, and percents and how to solve for a missing monomial or binomial term in a proportion.
5. The student represents and solves algebraically:
  - a. The number when a percent and a number are given,
  - b. What percent one number is of another number,
  - c. Percent of increase or decrease.
6. The student evaluates formulas using substitution.
7. Application: The student represents real-world problems using:
  - a. Variables, symbols, expressions, one- or two-step equations with rational number coefficients and constants, ▲■
  - b. One-step inequalities with rational number coefficients and constants,
  - c. Systems of linear equations with whole number coefficients and constants.

**B3 – Functions – The student recognizes, describes, and analyzes constant, linear, and nonlinear relationships in a variety of situations.**

1. The student recognizes and examines constant, linear, and nonlinear relationships.
2. The student knows and describes the difference between constant, linear, and nonlinear relationships.
3. The student explains the concepts of slope and  $x$ - and  $y$ -intercepts of a line.

4. The student recognizes and identifies the graphs of constant and linear functions.
5. The student identifies ordered pairs from a graph, and/or plots ordered pairs using a variety of scales for the x- and y-axis.
6. Application: The student translates between the numerical, tabular, graphical, and symbolic representations of linear relationships with integer coefficients and constants. ▲

**B4 – Models – The student generates and uses mathematical models to represent and justify mathematical relationships found in a variety of situations.**

1. The student knows, explains, and uses mathematical models to represent and explain mathematical concepts, procedures, and relationships. Mathematical models include:
  - a. Process models to model computational relationships and to solve equations;
  - b. Place value models to compare, order, and represent numerical quantities and to model computational procedures;
  - c. Fraction and mixed number models an decimal and money models to compare, order, and represent numerical quantities;
  - d. Factor trees to model least common multiple, greatest common factor, and prime factorization;
  - e. Equations and inequalities to model numerical relationships;
  - f. Function tables to model numerical and algebraic relationships;
  - g. Coordinate planes to model relationships between ordered pairs and linear equations and inequalities;
  - h. Two- and three-dimensional geometric models and real-world objects to model perimeter, area, volume,

surface area, and properties of two- and three-dimensional figures;

- i. Scale drawings to model large and small real-world objects;
- j. Geometric models, process models, and tree diagrams to model probability;
- k. Frequency tables, bar graphs, line graphs, circle graphs, Venn diagrams, charts, tables, single and double stem-and-leaf plots, scatter plots, box-and-whisker plots, and histograms to organize and display data;
- l. Venn diagrams to sort data and to show relationships.

2. Application: The student determines if a given graphical, algebraic, or geometric model is an accurate representation of a given real-world situation. ▲

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

**B1 – Geometric Figures and their Properties – The student recognizes geometric figures and compares their properties in a variety of situations.**

1. The student recognizes and compares properties of two- and three-dimensional figures using concrete objects, constructions, drawings, appropriate terminology, and appropriate technology.
2. The student discusses properties of triangles and quadrilaterals related to:
  - a. Sum of the interior angles of any triangle is  $180^\circ$ ;
  - b. Sum of the interior angles of any quadrilateral is  $360^\circ$
  - c. Parallelograms have opposite sides that are parallel and congruent, opposite angles are congruent;

- d. Rectangles have angles of  $90^\circ$ , sides may or may not be equal;
  - e. Rhombi have all sides equal in length, angles may or may not be equal;
  - f. Squares have angles of  $90^\circ$ , all sides congruent;
  - g. Trapezoids have one pair of opposite sides parallel and the other pair of opposite sides are not parallel;
  - h. Kites have two distinct pairs of adjacent congruent sides.
3. The student recognizes and describes the rotational symmetries and line symmetries that exist in two-dimensional figures.
  4. The student recognizes and uses properties of corresponding parts of similar and congruent triangles and quadrilaterals to find side or angle measures using standard notation for similarity and congruence.
  5. The student knows and describes Triangle Inequality Theorem to determine if a triangle exists.
  6. The student uses the Pythagorean Theorem to: ▲
    - a. Determine if a triangle is a right triangle,
    - b. Find a missing side of a right triangle where the lengths of all three sides are whole numbers.
  7. The student recognizes and compares the concepts of a point, line, and plane.
  8. The student describes the intersection of plane figures.
  9. The student describes and explains angle relationships:
    - a. When two lines intersect including vertical and supplementary angles;
    - b. When formed by parallel lines, cut by a transversal including corresponding, alternate interior, and alternate exterior angles.
  10. The student recognizes and describes arcs and semicircles as parts of a circle and uses the standard notation for arc and circle.
  11. Application: The student solves real-world problems by:

- a. Using the properties of corresponding parts of similar and congruent figures, ▲
- b. Applying the Pythagorean Theorem.

**B2 – Measurement and Estimation – The student estimates, measures, and uses geometric formulas in a variety of situations.**

1. The student determines and uses rational number approximations for length, width, weight, volume, temperature, time, perimeter, area, and surface area using standard and nonstandard units of measure.
2. The student selects and uses measurement tools, units of measure, and level of precision appropriate for a given situation to find accurate real number representations for length, weight, volume, temperature, time, perimeter, area, surface area, and angle measurements.
3. The student converts within the customary system and within the metric system.
4. The student estimates the measure of a concrete object in one system given the measure of that object in another system and the approximate conversion factor.
5. The student uses given measurement formulas to find:
  - a. Area of parallelograms and trapezoids;
  - b. Surface area of rectangular prisms, triangular prisms, and cylinders;
  - c. Volume of rectangular prisms, triangular prisms, and cylinders.
6. The student recognizes how ratios and proportions can be used to measure inaccessible objects.
7. The student calculates rates of change.
8. Application: The student uses ratio and proportion to measure inaccessible objects.

**B3 – Transformational Geometry – The student recognizes and applies transformations on geometric figures in a variety of situations.**

1. The student identifies, describes, and performs single and multiple transformations, enlargement on a two-dimensional figure.
2. The student describes a reflection of a given two-dimensional figure that moves if from its initial placement to its final placement in the coordinate plane of the x- and y-axis.
3. The student draws:
  - a. Three-dimensional figures from a variety of perspectives;
  - b. A scale drawing of a two-dimensional figure;
  - c. A two-dimensional drawing of a three-dimensional figure.
4. The student determines where and how an object or a shape can be tessellated using single or multiple transformations.
5. Application: The student describes and draws a two-dimensional figure after undergoing two specified transformations without using a concrete object.
6. Application: The student uses a scale drawing to determine the actual dimensions and/or measurements of a two-dimensional figure represented in a scale drawing.

**B4 – Geometry from an Algebraic Perspective – The student uses an algebraic perspective to examine the geometry of two-dimensional figures in a variety of situations.**

1. The student uses the coordinate plane to:
  - a. List several ordered pairs on the graph of a line and find the slope of the line; ▲

- b. Recognize that ordered pairs that lie on the graph of an equation are solutions to that equation; ▲
  - c. Recognize that points that do not lie on the graph of an equation are not solutions to that equation; ▲
  - d. Determine the length of a side of a figure drawn on a coordinate plane with vertices having the same x- or y-coordinates; ▲
  - e. Solve simple systems of linear equations.
2. The student uses a given linear equation with integer coefficients and constants and an integer solution to find the ordered pairs, organizes the ordered pairs using a T-table, and plots the ordered pairs on a coordinate plane.
3. The student examines characteristics of two-dimensional figures on a coordinate plane using various methods including mental math, paper and pencil, concrete objects, and graphing utilities or other appropriate technology.
4. Application: The student represents, generates, and/or solves distance problems.

**Standard 4 – Data – The student applies the concepts and procedures of data analysis in a variety of situations.**

**B1 – Probability – The student applies the concepts of probability to draw conclusions, generate convincing arguments, and make predictions and decisions including the use of concrete objects in a variety of situations.**

1. The student knows and explains the difference between independent and dependent events in an experiment, simulation, or situation.
2. The student identifies situations with independent or dependent events in an experiment, simulation, or situation.
3. The student finds the probability of a compound event composed of two independent events in an experiment, simulation, or situation. ▲

4. The student finds the probability of simple and/or compound events using geometric models.
5. The student finds the odds of a desired outcome in an experiment or simulation and expresses the answer as a ratio.
6. The student describes the difference between probability and odds.
7. Application: The student conducts an experiment or simulation with independent or dependent events including the use of concrete objects; records the results in a chart, table, or graph; and uses the results to draw conclusions and make predictions about future events.
8. The student makes predictions based on the theoretical probability of:
  - a. A simple event in an experiment or simulation; ▲■
  - b. Compound events composed of two independent events in an experiment or simulation.

**B2 – Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational) and non-numerical data sets in a variety of situations.**

1. The student 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**:
  - a. Frequency tables;
  - b. Bar, line, and circle graphs;
  - c. Venn diagrams or other pictorial displays;
  - d. Charts and tables;
  - e. Stem-and-leaf plots (single and double);
  - f. Scatter plots;
  - g. Box-and-whiskers plots;
  - h. Histograms.

2. The student recognizes valid and invalid data collection and sampling techniques.
3. The student determines and explains the measures of central tendency (mode, median, mean) for a rational number data set. ▲
4. The student determines and explains the range, quartiles, and interquartile range for a rational number data set.
5. The student explains the effects of outliers on the median, mean, and range of a rational number data set.
6. The student makes a scatter plot and draws a line that approximately represents the data, determines whether a correlation exists, and if that correlation is positive, negative, or that no correlation exists.
7. Application: The student recognizes and explains:
  - a. Misleading representations of data;
  - b. The effects of scale or interval changes on graphs of data sets.
8. Application: The student recognizes faulty arguments and common errors in data analysis.

# Assessed Items

## Eighth Grade

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

**B1 – Number Sense – The student demonstrates number sense for real numbers and simple algebraic expressions in a variety of situations.**

5. The student knows and explains what happens to the product or quotient when: ▲
- A positive number is multiplied or divided by a rational number greater than zero and less than one, e.g., if 24 is divided by  $\frac{1}{3}$ , will the answer be larger than 24 or smaller than 24? Explain.
  - A positive number is multiplied or divided by a rational number greater than one.
  - A nonzero real number is multiplied or divided by zero.

**B2 – Number Systems and their Properties – The student demonstrates an understanding of the real number system; recognizes, applies, and explains their properties; and extends these properties to algebraic expressions.**

2. The student identifies all the subsets of the real number system [natural (counting) numbers, whole numbers, integers, rational numbers, irrational numbers] to which a given number belongs. ▲
4. Application: The student generates and/or solves real-world problems with rational numbers using the concepts of these properties to explain reasoning:
- Commutative, associative, distributive, and substitution properties; ▲
  - Identity and inverse properties of addition and multiplication; ▲

**B4 – Computation – The student models, performs, and explains computation with rational numbers, the irrational number pi, and algebraic expressions in a variety of situations.**

2. The student performs and explains these computational procedures with rational numbers:
- Addition, subtraction, multiplication, and division of integers, ▲N
  - Order of operations (evaluates within grouping symbols, evaluates powers to the second or third power, multiplies or divides in order from left to right, then adds or subtracts in order from left to right); ▲N
4. Application: The student generates and/or solves one- and two-step real-world problems using computational procedures and mathematical concepts with: ▲
- Rational numbers; ■
  - The irrational number pi as an approximation;
  - Applications of percents.

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

**B2 – Variable, Equations, and Inequalities – The student uses variables, symbols, real numbers, and algebraic expressions to solve equations and inequalities in a variety of situations.**

3.The student solves:

- a. One- and two-step linear equations in one variable with rational number coefficients and constants intuitively and/or analytically. ▲

7.Application: The student represents real-world problems using:

- a. Variables, symbols, expressions, one- or two-step equations with rational number coefficients and constants, ▲■

**B3 – Functions – The student recognizes, describes, and analyzes constant, linear, and nonlinear relationships in a variety of situations.**

6.Application: The student translates between the numerical, tabular, graphical, and symbolic representations of linear relationships with integer coefficients and constants. ▲

**B4 – Models – The student generates and uses mathematical models to represent and justify mathematical relationships found in a variety of situations.**

2. Application: The student determines if a given graphical, algebraic, or geometric model is an accurate representation of a given real-world situation. ▲

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

**B1 – Geometric Figures and their Properties – The student recognizes geometric figures and compares their properties in a variety of situations.**

6.The student uses the Pythagorean theorem to: ▲

- a. Determine if a triangle is a right triangle,
- b. Find a missing side of a right triangle where the lengths of all three sides are whole numbers.

11.Application: The student solves real-world problems by:

- a. Using the properties of corresponding parts of similar and congruent figures, ▲

**B4 – Geometry from an Algebraic Perspective – The student uses an algebraic perspective to examine the geometry of two-dimensional figures in a variety of situations.**

1. The student uses the coordinate plane to:

- a. List several ordered pairs on the graph of a line and find the slope of the line; ▲
- b. Recognize that ordered pairs that lie on the graph of an equation are solutions to that equation; ▲
- c. Recognize that points that do not lie on the graph of an equation are not solutions to that equation; ▲
- d. Determine the length of a side of a figure drawn on a coordinate plane with vertices having the same x- or y-coordinates. ▲

**Standard 4 – Data – The student applies the concepts and procedures of data analysis in a variety of situations.**

**B1 – Probability – The student applies the concepts of probability to draw conclusions, generate convincing arguments, and make predictions and decisions including the use of concrete objects in a variety of situations.**

3. The student finds the probability of a compound event composed of two independent events in an experiment, simulation, or situation. ▲
8. The student makes predictions based on the theoretical probability of:
  - a. a simple event in an experiment or simulation. ▲■

**B2 – Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational) and non-numerical data sets in a variety of situations.**

3. The student determines and explains the measures of central tendency (mode, median, mean) for a rational number data set. ▲

# Standards and Benchmarks

## High School

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

B1 – Number Sense – The student demonstrates number sense for real numbers and algebraic expressions in a variety of situations.

B2 – Number Systems and their Properties – The student demonstrates an understanding of the real number system; recognizes, applies, and explains their properties; and extends these properties to algebraic expressions.

B3 – Estimation – The student uses computational estimation with real numbers in a variety of situations.

B4 – Computation – The student models, performs, and explains computation with real numbers and polynomials in a variety of situations.

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

B1 – Patterns – The student recognizes, describes, extends, develops, and explains the general rule of a pattern in a variety of situations.

B2 – Variables, Equations, and Inequalities – The student uses variables, symbols, real numbers, and algebraic expressions to solve equations and inequalities in a variety of situations.

B3 – Functions – The student analyzes functions in a variety of situations.

B4 – Models – The student develops and uses mathematical models to represent and justify mathematical relationships found in a variety of situations involving tenth grade knowledge and skills.

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

B1 – Geometric Figures and their Properties – The student recognizes geometric figures and compares and justifies their properties in a variety of situations.

B2 – Measurement and Estimation – The student estimates, measures, and uses geometric formulas in a variety of situations.

B3 – Transformational Geometry – The student recognizes and applies transformations on two- and three-dimensional figures in a variety of situations.

B4 – Geometry from an Algebraic Perspective – The student uses algebraic perspective to analyze the geometry of two- and three-dimensional figures in a variety of situations.

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

B1 – Probability – The student applies probability theory to draw conclusions, generate convincing arguments, make predictions and decisions, and analyze decisions including the use of concrete objects in a variety of situations.

B2 – Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational) and non-numerical data sets in a variety of situations.

**N-Non-calculator**

**▲-Assessed Indicator**

## High School

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

**B1 – Number Sense – The student demonstrates number sense for real numbers and algebraic expressions in a variety of situations.**

1. The student knows, explains, and uses equivalent representations for real numbers and algebraic expressions including integers, fractions, decimals, percents, ratios; rational number bases with integer exponents; rational numbers written in scientific notation; absolute value; time; and money.
2. The student compares and orders real numbers and/or algebraic expressions and explains the relative magnitude between them.
3. The student knows and explains what happens to the product or quotient when a real number is multiplied or divided by:
  - a. A rational number greater than zero and less than one;
  - b. A rational number greater than one,
  - c. A rational number less than zero.
4. Application: The student determines whether or not solutions to real-world problems using real numbers and algebraic expressions are reasonable.

**B2 – Number Systems and their Properties – The student demonstrates an understanding of the real number system; recognizes, applies, and explains their properties, and extends these properties to algebraic expressions.**

1. The student explains and illustrates the relationship between the subsets of the real number system using mathematical models.
2. The student identifies all the subsets of the real number system to which a given number belongs.
3. The student names, uses, and describes these properties with the real number system and demonstrates their meaning including the use of concrete objects: ▲
  - a. Commutative, associative, distributive, and substitution properties;
  - b. Identity properties for addition and multiplication and inverse properties of addition and multiplication;
  - c. Symmetric property of equality;
  - d. Addition and multiplication properties of equality;
  - e. Zero product property.
4. The student uses and describes these properties with the real number system:
  - a. Transitive property,
  - b. Reflexive property.

**B3 – Estimation – The student uses computational estimation with real numbers in a variety of situations.**

1. The student estimates real number quantities using various computational methods including mental math, paper and pencil, concrete objects, and/or appropriate technology.
2. The student uses various estimation strategies and explains how they were used to estimate real number quantities and algebraic expressions.
3. The student knows and explains why a decimal representation of an irrational number is an approximate value.
4. The student knows and explains between which two consecutive integers an irrational number lies.

5. Application: The student adjusts original rational number estimate of a real-world problem based on additional information (a frame of reference). ▲

**B4 – Computation – The student models, performs, and explains computation with real numbers and polynomials in a variety of situations.**

1. The student computes with efficiency and accuracy using various computational methods including mental math, paper and pencil, concrete objects and appropriate technology.
2. The student performs and explains these computational procedures:
  - a. Addition, subtraction, multiplication, and division using the order of operations; **N**
  - b. Multiplication or division to find:
    - i. A percent of a number,
    - ii. Percent of increase and decrease,
    - iii. Percent one number is of another number,
    - iv. A number when a percent of the number is given.
  - c. manipulation of variable quantities within an equation or inequality;
  - d. simplification of radical expressions including square roots of perfect square monomials and cube roots of perfect cubic monomials;
  - e. simplification or evaluation of real numbers and algebraic monomial expressions raised to a whole number power and algebraic binomial expressions squared or cubed;
  - f. simplification of products and quotients of real number and algebraic monomial expressions using the properties of exponents;
  - g. matrix addition;

- h. scalar-matrix multiplication.
3. The student finds prime factors, greatest common factor, multiples, and the last common multiple of algebraic expressions.
4. Application: The student generates and/or solves multi-step real-world problems with real numbers and algebraic expressions using computational procedures (addition, subtraction, multiplication, division, roots, and powers excluding logarithms) and mathematical concepts with:
  - a. Applications from business, chemistry, and physics that involve addition, subtraction, multiplication, division, squares, and square roots when the formulae are given as part of the problem and variables are defined; ▲
  - b. Volume and surface area given the measurement formulas of rectangular solids and cylinders; ▲
  - c. Probabilities;
  - d. Application of percents. ▲■

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

**B1 – Patterns – The student recognizes, describes, extends, develops, and explains the general rule of a pattern in a variety of situations.**

1. The student identifies, states, and continues the following patterns using various formats including numeric (list or table), algebraic (symbolic notation), visual (picture, table, graph), verbal (oral description), kinesthetic (action), and written:
  - a. Arithmetic and geometric sequences using real numbers and/or exponents;
  - b. Patterns using geometric figures;

- c. Algebraic patterns including consecutive number patterns or equations of functions;
  - d. Special patterns.
2. The student generates and explains a pattern.
  3. The student classifies sequences as arithmetic, geometric, or neither.
  4. The student defines:
    - a. A recursive or explicit formula for arithmetic sequences and finds any particular term,
    - b. A recursive or explicit formula for geometric sequences and finds any particular term.
  5. Application: The student recognizes the same general pattern presented in different representations [numeric (list or table), visual (picture, table, or graph), and written].

**B2 – Variables, Equations, and Inequalities – The student uses variables, symbols, real numbers, and algebraic expressions to solve equations and inequalities in a variety of situations.**

1. The student knows and explains the use of variables as parameters for a specific variable situation.
2. The student manipulates variable quantities within an equation or inequality.
3. The student solves:
  - a. Linear equations and inequalities both analytically and graphically; **N**
  - b. Quadratic equations with integer solutions (may be solved by trial and error, graphing, quadratic formula, or factoring);
  - c. Systems of linear equations with two unknowns using integer coefficients and constants; **▲N**
  - d. Radical equations with no more than one inverse operation around the radical expression;

- e. Equations where the solution to a rational equation can be simplified as a linear equation with a nonzero denominator;
  - f. Equations and inequalities with absolute value quantities containing one variable with a special emphasis on using a number line and the concept of absolute value;
  - g. Exponential equations with the same base without the aid of a calculator or computer.
4. Application: The student represents and/or solves real-world problems with:
    - a. Linear equations and inequalities both analytically and graphically; **▲N**
    - b. Quadratic equations with integer solutions (may be solved by trial and error, graphing, quadratic formula, or factoring);
    - c. Systems of linear equations with two unknowns;
    - d. Radical equations with no more than one inverse operation around the radical expression;
    - e. A rational equation where the solution can be simplified as a linear equation with nonzero denominator.

**B3 – Functions – The student analyzes functions in a variety of situations.**

1. The student evaluates and analyzes functions using various methods including mental math, paper and pencil, concrete objects, and graphing utilities or other appropriate technology.
2. The student matches equations and graphs of constant and linear functions and quadratic functions limited to  $y=ax^2+c$ .
3. The student determines whether a graph, list of ordered pairs, table of values, or rule represents a function.

4. The student determines x- and y-intercepts and maximum and minimum values of the portion of the graph that is shown on a coordinate plane.
5. The student identifies domain and range of:
  - a. Relationships given the graph or table;
  - b. Linear, constant, and quadratic functions given the equation(s).
6. The student recognizes how changes in the constant and/or slope within a linear function changes the appearance of a graph. ▲
7. The student uses function notation.
8. The student evaluates function(s) given a specific domain.
9. The student describes the difference between independent and dependent variables and identifies independent and dependent variables.
10. Application: The student translates between the numerical, graphical, and symbolic representations of functions.
11. Application: The student interprets the meaning of the x- and y-intercepts, slope, and/or points on and off the line on a graph in the context of a real-world situation. ▲
12. Application: The student analyzes:
  - a. The effects of parameter changes (scale changes or restricted domains) on the appearance of a function's graph,
  - b. How changes in the constants and/or slope within a linear function affects the appearance of a graph,
  - c. How changes in the constants and/or coefficients within a quadratic function in the form of  $y=ax^2+c$  affects the appearance of a graph.

**B4 – Models – The student develops and uses mathematical models to represent and justify mathematical relationships found in a variety of situations involving tenth grade knowledge and skills.**

1. The student knows, explains, and uses mathematical models to represent and explain mathematical concepts, procedures, and relationships. Mathematical models include:
  - a. Process models (concrete objects, pictures, diagrams, number lines, hundred charts, measurement arrays, division sets, or coordinate grids) to model computational relationships and to solve equations;
  - b. Factor trees to model least common multiple, greatest common factor, and prime factorization;
  - c. Algebraic expressions to model relationships between two successive numbers in a sequence or other numerical patterns;
  - d. Equations and inequalities to model numerical and geometric relationships;
  - e. Function tables to model numerical and algebraic relationships;
  - f. Coordinate planes to model relationships between ordered pairs and equations and inequalities and linear and quadratic functions;
  - g. Constructions to model geometric theorems and properties;
  - h. Two- and three-dimensional geometric models (geoboards, dot paper, coordinate plane, nets, or solids) and real-world objects to model perimeter, area, volume, and surface area, properties of two- and three-dimensional figures, and isometric views of three-dimensional figures;
  - i. Scale drawings to model large and small real-world objects;
  - j. Pascal's Triangle to model binomial expansion and probability;
  - k. Geometric models (spinners, targets, or number cubes), process models (concrete objects, pictures,

- diagrams, or coins), and tree diagrams to model probability;
- l. Frequency tables, bar graphs, line graphs, circle graphs, Venn diagrams, charts, tables, single and double stem-and-leaf plots, scatter plots, box-and-whisker plots, histograms, and matrices to organize and display data;
  - m. Venn diagrams to sort data and show relationships.

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

**B1 – Geometric Figures and their Properties – The student recognizes geometric figures and compares and justifies their properties of geometric figures in a variety of situations.**

1. The student recognizes and compares properties of two- and three-dimensional figures using concrete objects, constructions, drawings, appropriate terminology, and appropriate technology.
2. The student discusses properties of regular polygons related to:
  - a. Angle measures,
  - b. Diagonals.
3. The student recognizes and describes the symmetries (point, line, plane) that exist in three-dimensional figures.
4. The student recognizes that similar figures have congruent angles, and their corresponding sides are proportional.
5. The student uses the Pythagorean Theorem to:
  - a. Determine if a triangle is a right triangle,
  - b. Find a missing side of a right triangle.
6. The student recognizes and describes:

- a. Congruence of triangles using: Side-Side-Side (SSS), Angle-Side-Angle (ASA), Side-Angle-Side (SAS), and Angle-Angle-Side (AAS);
  - b. The ratios of the sides in special right triangles:  $30^\circ$ - $60^\circ$ - $90^\circ$  and  $45^\circ$ - $45^\circ$ - $90^\circ$ .
7. The student recognizes, describes, and compares the relationships of the angles formed when parallel lines are cut by a transversal.
8. The student recognizes and identifies parts of a circle: arcs, chords, sectors of circles, secant and tangent lines, central and inscribed angles.
9. Application: The student solves real-world problems by:
  - a. Using the properties of corresponding parts of similar and congruent figures,
  - b. Applying the Pythagorean Theorem,  $\blacktriangle$
  - c. Using properties of parallel lines.
10. Application: The student uses deductive reasoning to justify the relationships between the sides of  $30^\circ$ - $60^\circ$ - $90^\circ$  and  $45^\circ$ - $45^\circ$ - $90^\circ$  triangles using the ratios of sides of similar triangles.
11. Application: The student understands the concepts of and develops a formal or informal proof through understanding of the difference between a statement verified by proof (theorem) and a statement supported by examples.

**B2 – Measurement and Estimation – The student estimates, measures, and uses geometric formulas in a variety of situations.**

1. The student determines and uses real number approximations (estimations) for length, width, weight, volume, temperature, time, distance, perimeter, area, surface area, and angle measurement using standard and nonstandard units of measure.
2. The student selects and uses measurement tools, units of measure, and level of precision appropriate for a given

- situation to find accurate real number representations for length, weight, volume, temperature, time, distance, area, surface area, mass, midpoint, and angle measurements.
3. The student approximates conversions between customary and metric systems given the conversion unit or formula.
  4. The student states, recognizes, and applies formulas for:
    - a. Perimeter and area of squares, rectangles, and triangles;
    - b. Circumference and area of circles;
    - c. volume of rectangular solids.
  5. The student uses given measurement formulas to find perimeter, area, volume, and surface area of two- and three-dimensional figures (regular and irregular).
  6. The student recognizes and applies properties of corresponding parts of similar and congruent figures to find measurements of missing sides.
  7. The student knows, explains, and uses ratios and proportions to describe rates of change.
  8. Application: The student solves real-world problems by:
    - a. Converting within the customary and the metric systems,
    - b. Finding the perimeter and the area of circles, squares, rectangles, triangles, parallelograms, and trapezoids,
    - c. Finding the volume and the surface area of rectangular solids and cylinders,
    - d. Using the Pythagorean Theorem,
    - e. Using rates of change.
  9. Application: The student estimates to check whether or not measurements or calculations for length, weight, volume, temperature, time, distance, perimeter, area, surface area, and angle measurement in real-world problems are reasonable and adjusts original measurement or estimation based on additional information. (a frame of reference).

10. Application: The student uses indirect measurements to measure inaccessible objects.

**B3 – Transformational Geometry – The student recognizes and applies transformations on two- and three-dimensional figures in a variety of situations.**

1. The student describes and performs single and multiple transformations [reflection, rotation, translation, reduction (contraction/shrinking), enlargement (magnification/growing)] on two- and three-dimensional figures.
2. The student recognizes a three-dimensional figure created by rotating a simple two-dimensional figure around a fixed line.
3. The student generates a two-dimensional representation of a three-dimensional figure.
4. The student determines where and how an object or a shape can be tessellated using a single or multiple transformations and creates a tessellation.
5. Application: The student analyzes the impact of transformations on the perimeter and area of circles, rectangles, and triangles and volume of rectangular prisms and cylinders. ▲
6. Application: The student describes and draws a simple three-dimensional shape after undergoing one specified transformation without using concrete objects to perform the transformation.
7. Application: The student uses a variety of scales to view and analyze two- and three-dimensional figures.
8. Application: The student analyzes and explains transformations using such things as sketches and coordinate systems.

**B4 – Geometry from an Algebraic Perspective – The student uses an algebraic perspective to analyze the geometry of two- and three-dimensional figures in a variety of situations.**

1. The student recognizes and examines two- and three-dimensional figures and their attributes including the graphs of functions on a coordinate plane using various methods including mental math, paper and pencil, concrete objects, and graphing utilities or other appropriate technology.
2. The student determines if a given point lies on the graph of a given line or parabola without graphing and justifies the answer.
3. The student calculates the slope of a line from a list of ordered pairs on the line and explains how the graph of the line is related to its slope.
4. The student finds and explains the relationship between the slopes of a parallel and a perpendicular lines. ▲
5. The student uses the Pythagorean Theorem to find distance.
6. The student recognizes the equation of a line and transforms the equation into slope-intercept form in order to identify the slope and y-intercept and uses this information to graph the line. ▲
7. The student recognizes the equation  $y=ax^2+c$  as a parabola; represents and identifies characteristics of the parabola including opens upward or opens downward, steepness (wide/narrow), the vertex, maximum and minimum values, and line of symmetry; and sketches the graph of the parabola.
8. The student explains the relationship between the solution(s) to systems of equations and systems of inequalities in two unknowns and their corresponding graphs, e.g., for equations, the lines intersect in either one point, no points, or infinite points; and for inequalities, all points in double-shaded areas are solutions for both inequalities.

9. Application: The student represents, generates, and/or solves real-world problems that involve distance and two-dimensional geometric figures including parabolas in the form of  $ax^2+c$ .
10. Application: The student recognizes and explains the effects of scale changes on the appearance of the graph of an equation involving a line or parabola.
11. Application: The student analyzes how changes in the constants and/or leading coefficients within the equation of a line or parabola affects the appearance of the graph of the equation.

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

**B1 – Probability – The student applies probability theory to draw conclusions, generate convincing arguments, make predictions and decisions, and analyze decisions including the use of concrete objects in a variety of situations.**

1. The student finds probability of two independent events in an experiment, simulation, or situation.
2. The student finds the conditional probability of two dependent events in an experiment, simulation, or situation.
3. The student explains the relationship between probability and odds and computes one given the other. ▲
4. Application: The student conducts an experiment or simulation with two dependent events; records the results in charts, tables, or graphs; and uses the results to generate convincing arguments, draw conclusions and make predictions.
5. Application: The student uses theoretical or empirical probability of a simple or compound event composed of two or more simple, independent events to make predictions and analyze decisions about real-world situations including:

- a. Work in economics, quality control, genetics, meteorology, and other areas of science,
  - b. Games,
  - c. Situations involving geometric models.
6. Application: The student compares theoretical probability (expected results) with empirical probability (experimental results) of two independent and/or dependent events and understands that the larger the sample size, the greater the likelihood that experimental results will match theoretical probability.
7. Application: The student uses conditional probabilities of two dependent events in an experiment, simulation, or situation to make predictions and analyze decisions.

**B2 – Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational) and non-numerical data sets in a variety of situations.**

1. The student 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**:
- a. Frequency tables and line plots;
  - b. Bar, line, and circle graphs;
  - c. Venn diagrams or other pictorial displays;
  - d. Charts and tables;
  - e. Stem-and-leaf plots (single and double);
  - f. Scatter plots;
  - g. Box-and-whiskers plots;
  - h. Histograms.
2. The student explains how the reader's bias, measurement errors, and display distortions can affect the interpretation of data.

3. The student calculates and explains the meaning of range, quartiles, and interquartile range for a real number data set.
4. The student explains the effects of outliers on the measures of central tendency (mean, median, mode) and range and interquartile range of a real number data set. ▲
5. The student approximates a line of best fit given a scatter plot and makes predictions using the graph or the equation of that line. ▲
6. The student compares and contrasts the dispersion of two given sets of data in terms of range and the shape of the distribution including:
- a. Symmetrical (including normal),
  - b. Skew (left or right),
  - c. Bimodal,
  - d. Uniform (rectangular).
7. Application: The student uses data analysis in real-world problems with rational number data sets to compare and contrast two sets of data, to make accurate inferences and predictions, to analyze decisions, and to develop convincing arguments from these **data displays**: ▲
- a. Frequency tables and line plots; ■
  - b. Bar, line, and circle graphs;
  - c. Venn diagrams or other pictorial displays;
  - d. Charts and tables;
  - e. Stem-and-leaf plots (single and double);
  - f. Scatter plots;
  - g. Box-and-whiskers plots;
  - h. Histograms.
8. Application: The student determines and describes appropriate data collection techniques and sampling techniques in a given situation.
9. Application: The student uses changes in scales, intervals, and categories to help support a particular interpretation of the data.
10. Application: The student analyzes the effects of:

- a. Outliers on the mean, median, and range of a real number data set;
  - b. Changes within a real number data set on mean, median, mode, range, quartiles, and interquartile range.
11. Application: The student approximates a line of best fit given a scatter plot, makes predictions, and analyzes decisions using the equation of that line.

# Assessed Items

## High School

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

**B2 – Number Systems and their Properties – The student demonstrates an understanding of the real number system; recognizes, applies, and explains their properties, and extends these properties to algebraic expressions.**

3. The student names, uses, and describes these properties with the real number system and demonstrates their meaning including the use of concrete objects: ▲
- Commutative, associative, distributive, and substitution properties;
  - Identity properties for addition and multiplication and inverse properties of addition and multiplication;
  - Symmetric property of equality;
  - Addition and multiplication properties of equality;
  - Zero product property.

**B3 – Estimation – The student uses computational estimation with real numbers in a variety of situations.**

5. Application: The student adjusts original rational number estimate of a real-world problem based on additional information (a frame of reference). ▲

**B4 – Computation – The student models, performs, and explains computation with real numbers and polynomials in a variety of situations.**

4. Application: The student generates and/or solves multi-step real-world problems with real numbers and algebraic expressions using computational procedures (addition, subtraction, multiplication, division, roots, and powers excluding logarithms) and mathematical concepts with:
- Applications from business, chemistry, and physics that involve addition, subtraction, multiplication, division, squares, and square roots when the formulae are given as part of the problem and variables are defined; ▲
  - Volume and surface area given the measurement formulas of rectangular solids and cylinders; ▲
  - Probabilities;
  - Application of percents. ▲■

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

**B2 – Variables, Equations, and Inequalities – The student uses variables, symbols, real numbers, and algebraic expressions to solve equations and inequalities in a variety of situations.**

3. The student solves:

c. systems of linear equations with two unknowns using integer coefficients and constants. ▲ N

4. Application: The student represents and/or solves real-world problems with:

- a. Linear equations and inequalities both analytically and graphically; ▲ N
- b. Quadratic equations with integer solutions (may be solved by trial and error, graphing, quadratic formula, or factoring);
- c. Systems of linear equations with two unknowns;
- d. Radical equations with no more than one inverse operation around the radical expression;
- e. A rational equation where the solution can be simplified as a linear equation with nonzero denominator.

**B3 – Functions – The student analyzes functions in a variety of situations.**

6. The student recognizes how changes in the constant and/or slope within a linear function changes the appearance of a graph. ▲

11. Application: The student interprets the meaning of the x- and y-intercepts, slope, and/or points on and off the line on a graph in the context of a real-world situation. ▲

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

**B1 – Geometric Figures and their Properties – The student recognizes geometric figures and compares and justifies their properties of geometric figures in a variety of situations.**

9. Application: The student solves real-world problems by:

- b. Applying the Pythagorean Theorem. ▲■

**B3 – Transformational Geometry – The student recognizes and applies transformations on two- and three-dimensional figures in a variety of situations.**

5. Application: The student analyzes the impact of transformations on the perimeter and area of circles, rectangles, and triangles and volume of rectangular prisms and cylinders. ▲

**B4 – Geometry from an Algebraic Perspective – The student uses an algebraic perspective to analyze the geometry of two- and three-dimensional figures in a variety of situations.**

4. The student finds and explains the relationship between the slopes of parallel and perpendicular lines, e.g. the equation of a line  $2x+3y=12$ . The slope of this line is  $-2/3$ . What is the slope of a line perpendicular to this line? ▲

6. The student recognizes the equation of a line and transforms the equation into slope-intercept form in order to identify the slope and y-intercept and uses this information to graph the line. ▲

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

**B1 – Probability – The student applies probability theory to draw conclusions, generate convincing arguments, make predictions and decisions, and analyze decisions including the use of concrete objects in a variety of situations.**

3. The student explains the relationship between probability and odds and computes one given the other. ▲

**B2 – Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational) and non-numerical data sets in a variety of situations.**

4. The student explains the effects of outliers on the measures of central tendency (mean, median, mode) and range and interquartile range of a real number data set. ▲

5. The student approximates a line of best fit given a scatter plot and makes predictions using the graph or the equation of that line. ▲

7. Application: The student uses data analysis in real-world problems with rational number data sets to compare and contrast two sets of data, to make accurate inferences and predictions, to analyze decisions, and to develop convincing arguments from these **data displays**: ▲

- a. Frequency tables and line plots; ■
- b. Bar, line, and circle graphs;
- c. Venn diagrams or other pictorial displays;
- d. Charts and tables;
- e. Stem-and-leaf plots (single and double);
- f. Scatter plots;
- g. Box-and-whiskers plots;
- h. Histograms.