Mathematics Standards Articulation by Grade
Pre-School

STRAND 1: Number Sense and Operations:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems. Upon entering Kindergarten Pre-School students will:
B 1. Make a model to represent a given whole number at least through 10
B 2. Identify a written whole number by its name through 10
B 3. Count aloud forward in consecutive order at least through 10
B 4. Identify whole numbers in consecutive order at least through 10
B 5. Recognize "how many" in sets of objects
B 6. Connect number words and numerals to quantities they represent

Concept 2: Numerical Operations Understand and apply numerical operations and their relationship to one another. Students will:
B 1. Model addition using manipulatives with teacher guidance
B 2. Model subtraction using manipulatives with teacher guidance
B 4. Solve word problems presented orally
B 6. Use grade-level appropriate mathematical terminology

Concept 3: Estimation Use estimation strategies reasonable and fluently. Students will:
B 1. Solve oral problems with teacher guidance (e.g. "How many apples will fit in this bowl?"

STRAND 2: Set Analysis, Probability, and Discrete Mathematics:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and

Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Data Analysis (Statistics) Understand and apply data collection, organization, and representation to analyze and sort data. Students will with teacher guidance:
B 1. Formulate questions to collect data in contextual situations
B 2. Interpret a pictograph, bar graph, and tally chart in group situations
B 3. Answer questions about a pictograph, bar graph, and tally chart in group situations

Concept 2: Probability Understand and apply the basic concepts of probability. Students will:
B 3. Predict the outcome of a grade-level appropriate probability experiment with teacher direction (e.g. Place red cubes in a bag. Ask if a blue cube can be drawn from the bag)

Concept 3: Discrete Mathematics – Systematic Listing and Counting Understand and demonstrate the systematic listing and counting of possible outcomes. Students will:
(Grades K – High School)

STRAND 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Patterns Identify patterns and apply pattern recognition to reason mathematically. Students will:
B 1. Communicate orally a grade-level appropriate pattern
B 2. Extend simple repetitive patterns using manipulatives
B 3. Create grade-level appropriate patterns

Concept 2: Functions and Relationships Describe and model functions and their relationships. Students will:
(Grades 2 – High School)

Concept 3: Algebraic Representations Represent and analyze mathematical situations and structures using algebraic representations. Students will:
(Grades 1 – High School)

Concept 4: Analysis of Change Analyze change in a variable over time and in various contexts. Students will:
(Grades 1 – High School)

STRAND 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Geometric Properties Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships. Students will:
B 1. Identify 2-dimensional shapes by attribute (size, shape, number of sides)
B 2. Identify concepts and terms of position and size in contextual situations o Near/far/between o Over/under o Smaller/larger
B 3. Identify shapes in different environments (e.g. nature, buildings, classroom)

Concept 2: Transformation of Shapes Apply spatial reasoning to create transformations and use of symmetry to analyze mathematical situations. Students will:
(Grades 1 – High School)

Concept 3: Coordinate Geometry Specify and describe spatial relationships using coordinate geometry and other representational systems. Students will:
(Grades 3 – High School)

Concept 4: Measurement – Units of Measure – Geometric Objects Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements. Students will:
B 1. Verbally compare objects according to observable and measurable attributes
B 2. Communicate orally how different attributes of an object can be measured
B 3. Order objects according to observable and measurable attributes

STRAND 5: Structure and Logic

Concept 1: Algorithms and Algorithmic Thinking Use reasoning to solve mathematical problems in contextual situations. Students will:
(Grades 1 – High School)

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications. Students will:
B 1. Sort objects according to observable attributes
B 2. Provide rationale for classifying objects according to observable attributes (color, size, shape, etc.)

Mathematics Standards Articulation by Grade
Kindergarten

STRAND 1: Number Sense and Operations:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems. Students will:
B 1. Make a model to represent a given whole number 0 through 20
B 2. Identify orally a whole number represented by a model with a word name and symbol 0 through 20. (Say 3 and write number 3 when presented with three objects)
B 3. Count aloud, forward to 20 or backward from 10, in consecutive order (0 through 20)
B 4. Identify whole numbers through 20 or backward from 10, in consecutive order (0 through 20)
B 5. Write whole numbers through 20 in or out of order
B 6. Construct equivalent forms of whole numbers, using manipulatives, through 10
B 7. Compare two whole numbers through 20
B 8. Recognize the ordinal numbers through fifth (e.g. first, second, third)
B 9. Order three or more whole numbers through 20 (least to greatest or greatest to least)
B 10. Identify penny, nickel, dime, quarter, and dollar by using manipulatives or pictures
B 11. Make models that represent given fractions halves and quarters

Concept 2: Numerical Operations Understand and apply numerical operations and their relationship to one another. Students will:
B 1. Model addition through sums of 10 using manipulatives
B 2. Model subtraction with minuends of 10 using manipulatives
B 3. Select the operation to solve word problems using numbers 0 through 9
B 4. Solve word problems presented orally using addition or subtraction with numbers through 9
B 5. Identify symbols: + , - , = , < , > , ≠
B 6. Use grade-level appropriate mathematical terminology

Concept 3: Estimation Use estimation strategies reasonable and fluently. Students will:
B 1. Solve problems using a variety of mental computations and reasonable estimations

STRAND 2: Set Analysis, Probability, and Discrete Mathematics:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Data Analysis (Statistics) Understand and apply data collection, organization, and representation to analyze and sort data. Students will:
B 1. Formulate questions to collect data in contextual situations
B 2. Interpret a pictograph, bar graph, and tally chart
B 3. Answer questions about a pictograph, bar graph, and tally chart
B 4. Formulate questions based on graphs, charts, and tables
B 5. Solve problems based on simple graphs, charts, and tables

Concept 2: Probability Understand and apply the basic concepts of probability. Students will:
B 1. Name the possible outcomes for a probability experiment with teacher direction
B 2. Predict the most likely or least likely outcome in probability experiments with teacher direction (e.g. from a bag of 2 different colored marbles of unequal numbers a student will predict the most likely color to be drawn out)
B 3. Predict the outcome of a grade-level appropriate probability experiment with teacher direction

Concept 3: Discrete Mathematics – Systematic Listing and Counting Understand and demonstrate the systematic listing and counting of possible outcomes. Students will:
B 1. Make arrangements that represent the number of combinations that can be formed by pairing items taken from 2 sets, using manipulatives (e.g. How many outfits can one make with 2 different color shorts and 2 different pairs of pants?)

STRAND 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Patterns Identify patterns and apply pattern recognition to reason mathematically. Students will:
B 1. Communicate orally a grade-level appropriate pattern
B 2. Extend simple repetitive patterns using manipulatives
B 3. Create grade-level appropriate patterns

Concept 2: Functions and Relationships Describe and model functions and their relationships. Students will:
(Grades 2 – High School)

Concept 3: Algebraic Representations Represent and analyze mathematical situations and structures using algebraic representations. Students will:
(Grades 1 – High School)

Concept 4: Analysis of Change Analyze change in a variable over time and in various contexts. Students will:
(Grades 1 – High School)

STRAND 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Geometric Properties Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships. Students will:
B 1. Identify 2-dimensional shapes by attribute (size, shape, number of sides)
B 2. Identify concepts and terms of position and size in contextual situations o Inside/outside o Above/below/between o Smaller/larger o Longer/shorter
B 3. Identify shapes in different environments (e.g. nature, buildings, classroom)

Concept 2: Transformation of Shapes Apply spatial reasoning to create transformations and use of symmetry to analyze mathematical situations. Students will:
(Grades 1 – High School)

Concept 3: Coordinate Geometry Specify and describe spatial relationships using coordinate geometry and other representational systems. Students will:
(Grades 3 – High School)

Concept 4: Measurement – Units of Measure – Geometric Objects Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements. Students will:
B 1. Verbally compare objects according to observable and measurable attributes
B 2. Communicate orally how different attributes of an object can be measured
B 3. Order objects according to observable and measurable attributes

STRAND 5: Structure and Logic

Concept 1: Algorithms and Algorithmic Thinking Use reasoning to solve mathematical problems in contextual situations. Students will:
(Grades 1 – High School)

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications. Students will:
B 1. Sort objects according to observable attributes
B 2. Provide rationale for classifying objects according to observable attributes (color, size, shape, weight, etc.)

Mathematics Standards Articulation by Grade
First Grade

STRAND 1: Number Sense and Operations:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems. Students will:
B 1. Make a model to represent a given whole number 0 through 100
B 2. Identify orally a whole number represented by a model with a word name and symbol 0 through 100. (Say 3 and write number 3 when presented with three objects)
B 3. Count aloud, forward or backward in consecutive order (0 through 100)
B 4. Identify whole numbers through 100 in or out of order
B 5. Write whole numbers through 100 in or out of order
B 6. Construct equivalent forms of whole numbers, using manipulatives or symbols, through 99
B 7. State verbally whole numbers, through 100, using correct place value (e.g. read 84 as eight tens and four ones)
B 8. Construct models to represent place value concepts for the one's and ten's places
B 9. Apply expanded notation to model place value through 099 (e.g. 37 = 3 groups of ten + 7 units)
B 10. Identify odd and even whole numbers through 100
B 11. Compare two whole numbers through 100
B 12. Use ordinal numbers through tenth
B 13. Order three or more whole numbers through 100 (least to greatest or greatest to least)
B 14. Make models that represent given fractions: ½'s, ¼'s
B 15. Identify in symbols and in words a model that is divided into equal fractional parts: ½'s, ¼'s, ⅓'s
B 16. Identify money by name and value: penny, nickel, dime, quarter, and dollar
B 17. Count money through $1.00 using coins
B 18. Identify the value of a collection of coins using the symbols for dollars and cents

Concept 2: Numerical Operations Understand and apply numerical operations and their relationship to one another. Students will:
B 1. Demonstrate the process of addition through sums of 20 using manipulatives
B 2. Demonstrate the process of subtraction with minuends of 20 using manipulatives
B 3. State addition facts for sums through 18 and subtractions for differences with minuends through 9 or less
B 4. Add 1- and 2-digit whole numbers without regrouping
B 5. Subtract 1- and 2-digit whole numbers without regrouping
B 6. Select the grade-level appropriate operation to solve word problems
B 7. Solve word problems using addition or subtraction of 2-digit numbers without regrouping
B 8. Count by multiples to show the process of multiplication (2's, 5's, 10's)
B 9. Demonstrate families of equations for addition and subtraction through 18
B 10. Demonstrate the identity and commutative properties of addition through 18
B 11. Identify addition and subtraction as inverse operations
B 12. Identify symbols: + , - , = , < , > , ≠
B 13. Use grade-level appropriate mathematical terminology
B 14. Demonstrate addition of fractions with like denominators ($\frac{1}{2}$) using models
B 15. Demonstrate subtraction of fractions with like denominators ($\frac{1}{2}$) using models
B 16. Add and subtract money without regrouping using manipulatives and paper and pencil, through $.99

Concept 3: Estimation Use estimation strategies reasonably and fluently. Students will:
B 1. Solve problems using a variety of mental computations and reasonable estimations
B 2. Estimate the measurement of an object using U. S. customary standard and non-standard units of measurement

STRAND 2: Set Analysis, Probability, and Discrete Mathematics:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Data Analysis (Statistics) Understand and apply data collection, organization, and representation to analyze and sort data. Students will:
B 1. Formulate questions to collect data in contextual situations
B 2. Make a simple pictograph, bar graph, and tally chart with appropriate labels from organized data
B 3. Interpret pictographs, bar graphs, and tally charts using terms such as most, least, equal, more than, less than, and greatest
B 4. Answer questions about pictographs, bar graphs, and tally charts using terms such as most, least, equal, more than, less than, and greatest
B 5. Formulate questions based on graphs, charts, and tables
B 6. Solve problems using simple graphs, charts, and tables

Concept 2: Probability Understand and apply the basic concepts of probability. Students will:
B 1. Name the possible outcomes for a probability experiment with teacher guidance
B 2. Predict the most likely or least likely outcome in probability experiments with teacher guidance (e.g. from a bag of 2 different colored marbles of unequal numbers a student will predict the most likely color to be drawn out)
B 3. Predict the outcome of a grade-level appropriate probability experiment with teacher guidance

Concept 3: Discrete Mathematics – Systematic Listing and Counting Understand and demonstrate the systematic listing and counting of possible outcomes. Students will:
B 1. Make arrangements that represent the number of combinations that can be formed by pairing items taken from 2 sets, using manipulatives (e.g. How many ice cream cones can one make with 2 different types of ice cream and 2 different kinds of cones?)

STRAND 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Patterns Identify patterns and apply pattern recognition to reason mathematically. Students will:
B 1. Communicate orally grade-level appropriate patterns
B 2. Extend simple repetitive patterns using manipulatives
B 3. Create grade-level appropriate patterns

Concept 2: Functions and Relationships Describe and model functions and their relationships. Students will:
(Grades 2 – High School)

Concept 3: Algebraic Representations Represent and analyze mathematical situations and structures using algebraic representations. Students will:
B 1. Use variables in contextual situations
B 2. Find the missing sum or difference in number sentences for sums and minuends through 9

Concept 4: Analysis of Change Analyze change in a variable over time and in various contexts. Students will:
B 1. Identify the change in a variable over time (e.g. an object grows taller, colder, etc.)
B 2. Make simple predictions based on a variable (e.g. select next stage of growth)

STRAND 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Geometric Properties Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships. Students will:
B 1. Use the words vertex and side when describing simple 2-dimensional geometric shapes
B 2. Identify 2-dimensional shapes by attribute (size, shape, number of sides, vertices)
B 3. Use concepts and terms of position and size in contextual situations o Inside/outside o Left/right o Above/below/between o Smaller/larger o Longer/shorter
B 4. Name common 2-dimentional shapes (square, rectangle, triangle, circle)
B 5. Draw 2-dimentional shapes (square, rectangle, triangle, circle)
B 6. Recognize where a line of symmetry divides a 2-dimentional shape into mirror images

Concept 2: Transformation of Shapes Apply spatial reasoning to create transformations and use of symmetry to analyze mathematical situations. Students will:
B 1. Recognize the same shape in different positions (slide/translations)

Concept 3: Coordinate Geometry Specify and describe spatial relationships using coordinate geometry and other representational systems. Students will:
(Grades 3 – High School)

Concept 4: Measurement – Units of Measure – Geometric Objects Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements. Students will:
B 1. Compare the measurable characteristics of two objects (e.g. length, weight, size)
B 2. Select the appropriate measure of accuracy in U. S. customary measure for length, capacity/volume, mass/weight
B 3. Tell time to the hour using analog and digital clocks

B 4. Name the days of the week for yesterday, today, and tomorrow
B 5. Name the 12 months of the year in proper order starting with January
B 6. Name the 7 days of the week in proper order starting with Sunday
B 7. Measure a given object using the appropriate unit of U. S. customary measure for length, capacity/volume, mass/weight

STRAND 5: Structure and Logic

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Algorithms and Algorithmic Thinking Use reasoning to solve mathematical problems in contextual situations. Students will:
B 1. Create problems based on contextual situations using addition facts up to 18 and subtraction facts from 9

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications. Students will:
B 1. List the quantitative components found in word problems
B 2. Provide rationale for classifying objects according to observable attributes (color, size, shape, weight, etc.)

Mathematics Standards Articulation by Grade
Second Grade

STRAND 1: Number Sense and Operations:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems. Students will:
B 1. Make a model to represent a given whole number 0 through 999
B 2. Identify orally a whole number represented by a model with a word name and symbol 0 through 999. (Say "34" and write number 34 when presented with cusinaire rods of 3 tens and 4 ones)
B 3. Count aloud, forward or backward in consecutive order (0 through 100)
B 4. Identify whole numbers through 999 in or out of order
B 5. Write whole numbers through 999 in or out of order
B 6. State equivalent forms of whole numbers, using multiples of 10 through 1,000 (430 + 200 = 600 + 30)
B 7. State verbally whole numbers, through 999, using correct place value (e.g. read 584 as five hundred, eight tens and four ones)
B 8. Construct models to represent place value concepts for the one's, ten's, and hundred's places
B 9. Apply expanded notation to model place value through 999 (e.g. 537 = 5 hundreds + 3 ten + 7 units)
B 10. Identify odd and even whole numbers through 999
B 11. Compare two whole numbers through 999
B 12. Use ordinal numbers
B 13. Order three or more whole numbers through 999 (least to greatest or greatest to least)
B 14. Order three or more proper fractions with like denominators with teacher guidance (½'s, ¼'s, ⅛'s, $\frac{1}{10}$'s)
B 15. Make models that represent given fractions: ½'s, ¼'s, ⅛'s, $\frac{1}{10}$'s
B 16. Identify in symbols and in worlds a model that divided into equal fractional parts: ½'s, ¼'s, ⅓'s, ⅛'s, $\frac{1}{10}$'s
B 17. Count money through $5.00 using manipulatives and pictures of bills and coins
B 18. Identify the value of a collection of money using the symbols for dollars and cents through $5.00
B 19. Use decimals through hundredths in contextual situations with money

B 20. Compare two decimals using money, through hundredths, using models, illustrations, or symbols

Concept 2: Numerical Operations Understand and apply numerical operations and their relationship to one another. Students will:
B 1. Demonstrate the process of addition through two three-digit whole numbers, using manipulatives
B 2. Demonstrate the process of subtraction using manipulatives with two-digit whole numbers
B 3. State addition and subtractions facts
B 4. Add 1- and 2-digit whole numbers with regrouping
B 5. Subtract 1- and 2-digit whole numbers with regrouping
B 6. Add 3 1- or 2-digit addends
B 7. Select the grade-level appropriate operation to solve word problems
B 8. Solve word problems using addition or subtraction of two 2-digit numbers with regrouping and two 3-digit numbers without regrouping
B 9. Count by multiples of three
B 10. State multiplication facts 2's, 5's, and 10's
B 11. Demonstrate the associative property of addition [(3+2) + 5 = 3 + (2+5)]
B 12. Apply grade-level appropriate properties to assist in computation
B 13. Apply the symbols: + , - , x, /, = , , ≠, < , >, %
B 14. Use grade-level appropriate mathematical terminology
B 15. Demonstrate addition of fractions with like denominators (½,¼) using models
B 16. Demonstrate subtraction of fractions with like denominators (½,¼) using models
B 17. Add and subtract money without regrouping using manipulatives and paper and pencil, through $5.00

Concept 3: Estimation Use estimation strategies reasonably and fluently. Students will:
B 1. Solve problems using a variety of mental computations and reasonable estimations
B 2. Estimate the measurement of an object using U. S. customary standard and non-standard units of measurement
B 3. Compare an estimate to the actual measure
B 4. Evaluate an estimate to see if it is reasonable

STRAND 2: Set Analysis, Probability, and Discrete Mathematics:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Data Analysis (Statistics) Understand and apply data collection, organization, and representation to analyze and sort data. Students will:
B 1. Formulate questions to collect data in contextual situations
B 2. Make a simple pictograph, bar graph, and tally chart with appropriate labels from organized data
B 3. Interpret pictographs, bar graphs, and tally charts using terms such as most, least, equal, more than, less than, and greatest
B 4. Answer questions about pictographs, bar graphs, and tally charts using terms such as most, least, equal, more than, less than, and greatest
B 5. Formulate questions based on graphs, charts, and tables
B 6. Solve problems using simple graphs, charts, and tables
B 7. Calculate median, mode, and range with teacher guidance using a set of given data

Concept 2: Probability Understand and apply the basic concepts of probability. Students will:
B 1. Name the possible outcomes for a probability experiment with teacher guidance
B 2. Predict the most likely or least likely outcome in probability experiments with teacher guidance (e.g. from a bag of 2 different colored marbles of unequal numbers a student will predict the most likely color to be drawn out)
B 3. Predict the outcome of a grade-level appropriate probability experiment with teacher guidance
B 4. Record the data from performing a grade-level appropriate probability experiment
B 5. Compare the outcome of an experiment to predictions made prior to performing the experiment
B 6. Compare the results of two repetitions of the same grade-level appropriate probability experiment

Concept 3: Discrete Mathematics – Systematic Listing and Counting Understand and demonstrate the systematic listing and counting of possible outcomes. Students will:
B 1. Make arrangements that represent the number of combinations that can be formed by pairing items taken from 2 sets, using manipulatives (e.g. How many ice cream cones can one make with 3 different types of ice cream and 2 different kinds of cones?)

STRAND 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Patterns Identify patterns and apply pattern recognition to reason mathematically. Students will:
B 1. Communicate orally grade-level appropriate patterns
B 2. Extend grade-level appropriate repetitive patterns
B 3. Create grade-level appropriate patterns

Concept 2: Functions and Relationships Describe and model functions and their relationships. Students will:
B 1. Describe the rule used in a simple grade-level appropriate function (e.g. T-chart, input/output model, and flow charts)

Concept 3: Algebraic Representations Represent and analyze mathematical situations and structures using algebraic representations. Students will:
B 1. Use variables in contextual situations
B 2. Find the missing element (addend, subtrahend, minuend, sum, and difference) in addition and subtraction number sentences for sums through 18 and minuends through 9

Concept 4: Analysis of Change Analyze change in a variable over time and in various contexts. Students will:
B 1. Identify the change in a variable over time (e.g. an object grows taller, colder, etc.)
B 2. Make simple predictions based on a variable (e.g. height from year to year)

STRAND 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Geometric Properties Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships. Students will:
B 1. Compare attributes of 2-dimensional shapes (square, rectangle, triangle, and circle)
B 2. Recognize congruent shapes
B 3. Recognize line(s) of symmetry for a 2-dimensional shape
B 4. Name concrete objects of 3-dimensional shapes (cone, cube, and sphere)

Concept 2: Transformation of Shapes Apply spatial reasoning to create transformations and use of symmetry to analyze mathematical situations. Students will:
B 1. Recognize same shape in different positions (flip/reflections)

Concept 3: Coordinate Geometry Specify and describe spatial relationships using coordinate geometry and other representational systems. Students will:
(Grades 3 – High School)

Concept 4: Measurement – Units of Measure – Geometric Objects Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements. Students will:
B 1. Identify the type of measure for each attribute of an object (weight, length, and time)
B 2. Select the appropriate measure of accuracy in U. S. customary measure for length, capacity/volume, mass/weight
B 3. Tell time to the ¼ hour using analog and digital clocks
B 4. Determine the passage of time using units of days and weeks within a month using a calendar
B 5. Select the appropriate tool to measure the given characteristics of an object
B 6. Measure a given object using the appropriate unit of measure for length, capacity/volume, mass/weight

B 7. State equivalent relationships
- 12 inches = 1 foot
- 60 minutes = 1 hour
- 24 hours = 1 day
- 7 days = 1 week
- 12 months = 1 year
- 100 pennies = 1 dollar
- 10 dimes (and other combinations of coins) = 1 dollar

STRAND 5: Structure and Logic

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Algorithms and Algorithmic Thinking Use reasoning to solve mathematical problems in contextual situations. Students will:
B 1. Create contextual problems that require addition or subtraction with 1or 2-digit numbers

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications. Students will:
B 1. Identify the concepts *some, every,* and *many* within the context of logical reasoning
B 2. Identify the concepts *all* and *none* within the context of logical reasoning

Mathematics Standards Articulation by Grade
Third Grade

STRAND 1: Number Sense and Operations:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems. Students will:
B 1. Read whole numbers in contextual situations (through seven-digit numbers)
B 2. Identify seven-digit whole numbers in or out of order
B 3. Write whole numbers through seven-digits in or out of order
B 4. State whole numbers, through seven digits, with correct place value, by using words, models, illustrations, symbols, or expanded notation (e.g. 53,941 = 50,000 + 3,000 + 900 + 40 + 1 = fifty-three thousand, nine hundred, forty-one)
B 5. Construct models to represent place value concepts for the one's ten's, hundred's, and thousand's place
B 6. Sort whole numbers into sets containing only odd numbers or only even numbers
B 7. Compare two whole numbers through seven digits
B 8. Order three or more whole numbers through seven digit numbers (least to greatest and greatest to least)
B 9. Demonstrate knowledge and use of numbers and their representation on a number line
B 10. Make models that represent proper fractions (halves, thirds, fourths, eighths, and tenths)
B 11. Identify symbols, words, or models that represent proper fractions (halves, thirds, fourths, eighths, and tenths)
B 12. Use proper fractions in contextual situations
B 13. Compare two proper fractions with like denominators
B 14. Order three or more proper fractions with like denominators (halves, thirds, fourths, eighths, and tenths)
B 15. Make models that represent mixed numbers
B 16. Identify symbols, words, or models that represent mixed numbers
B 17. Count amounts of money through $20.00 using pictures or actual bills and coins
B 18. Use decimals through hundredths in contextual situations
B 19. Compare two decimals, through hundredths, using models illustrations, or symbols
B 20. Order three or more decimals, through hundredths, using models, illustration, or symbols
B 21. Determine the equivalency among decimals, fractions, and percents (e.g. $^1/_4$ = 0.25 = 25%)

B 22. Identify whole number factors and /or pairs of factors for a given whole number
B 23. Determine multiples of a given whole number (skip counting)

Concept 2: Numerical Operations Understand and apply numerical operations and their relationship to one another. Students will:
B 1. Demonstrate the process of subtraction using manipulatives through three-digit whole numbers
B 2. Add two three-digit whole numbers
B 3. Subtract two three-digit whole numbers
B 4. Add a column of numbers
B 5. Select grade-level appropriate operations to solve word problems
B 6. Solve word problems using grade-level appropriate operations and numbers
B 7. Demonstrate the process of multiplication as repeatedly adding the same number, counting by multiples, combining equal sets, and making arrays
B 8. Demonstrate the process of division with one-digit divisors (separating elements of a set into smaller equal sets, sharing equally, or repeatedly subtracting the same number)
B 9. Demonstrate families of equations for multiplication and division through 12's
B 10. State multiplication and division facts through10's
B 11. Demonstrate the commutative and identity properties of multiplication
B 12. Identify multiplication and division as inverse operations
B 13. Apply grade-level appropriate properties to assist in computation
B 14. Apply the symbols: x, /, *, %, + , - , = , < , > ,( ), ≠, and ","
B 15. Use grade-level appropriate mathematical terminology
B 16. Add or subtract fractions with like denominators (halves, thirds, fourths, eighths, and tenths) appropriate to grade level
B 17. Apply addition and subtraction of money in contextual situations up to $1,000

Concept 3: Estimation Use estimation strategies reasonable and fluently. Students will:
B 1. Solve grade-level appropriate problems using a variety of mental computations and reasonable estimations
B 2. Estimate length and weight using U. S. customary units
B 3. Record estimated and actual linear measurements for real-life objects (e.g. length of finger, height of the desk)
B 4. Compare estimations of appropriate measures to actual measures
B 5. Evaluate estimations to see if it is reasonable

STRAND 2: Set Analysis, Probability, and Discrete Mathematics:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Data Analysis (Statistics) Understand and apply data collection, organization, and representation to analyze and sort data.
B 1. Formulate questions to collect data in contextual situations
B 2. Construct a horizontal bar, vertical bar, pictograph, or tally chart with appropriate labels
B 3. Interpret data found in number lines, line plots, pictographs, single-bar graphs (horizontal and vertical), and pie charts
B 4. Answer questions based on data found in line plots, pictographs, and single-bar graphs (horizontal and vertical)
B 5. Formulate questions based on graphs, charts, and tables to solve problems
B 6. Solve problems using graphs, charts, and tables
B 7. Calculate mean, median, mode, and range using a set of given data

Concept 2: Probability Understand and apply the basic concepts of probability.
B 1. Name the possible outcomes for a probability experiment
B 2. Make predictions about the probability of events being more likely, less likely, equally likely or unlikely
B 3. Predict the outcome of a grade-level appropriate probability experiment
B 4. Record the data from performing a grade-level appropriate probability experiment
B 5. Compare the outcome of an experiment to predictions made prior to performing the experiment
B 6. Compare the results of two repetitions of the same grade-level appropriate probability experiment

Concept 3: Discrete Mathematics – Systematic Listing and Counting Understand and demonstrate the systematic listing and counting of possible outcomes.
B 1. Make a diagram to represent the number of combinations available when 1 item is selected from each of 3 sets of 2 items (2 different shirts, 2 different hats, 2 different belts)

STRAND 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Patterns Identify patterns and apply pattern recognition to reason mathematically. Students will:
B 1. Communicate a grade-level appropriate repetitive pattern using symbols or numbers
B 2. Extend a grade-level appropriate repetitive pattern
B 3. Solve grade-level appropriate pattern problems

Concept 2: Functions and Relationships Describe and model functions and their relationships. Students will:
B 1. Describe the rule used in a simple grade-level appropriate function (e.g. T-chart, input/output model, and flow charts)

Concept 3: Algebraic Representations Represent and analyze mathematical situations and structures using algebraic representations. Students will:
B 1.Use variables in contextual situations
B 2. Solve equations with one variable using missing addends to sums of 18 (e.g. $x + 9 = 18$) and using minuends through 18 (e.g. $18 – x = 9$)

Concept 4: Analysis of Change Analyze change in a variable over time and in various contexts. Students will:
B 1. Identify the change in a variable over time
B 2. Make simple predictions based on a variable

STRAND 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Geometric Properties Analyze the attributes and properties of 2 and 3- dimensional shapes and develop mathematical arguments about their relationships. Students will:
B 1. Build geometric figures with other common shapes (e.g. tangrams, pattern blocks, geoboards)
B 2. Name concrete objects and pictures of 3-dimensional solids (cones, spheres, cubes, prisms, pyramids)
B 3. Describe relationships between 2-dimensional and 3-dimensional objects (squares/cubes, circles/spheres, triangles/cones)
B 4. Classify angles (right, acute, obtuse, straight)
B 5. Classify triangles as right, acute, or obtuse
B 6. Identify congruent geometric shapes
B 7. Identify similar shapes
B 8. Identify and draw a 2-dimensional shape that has line symmetry

Concept 2: Transformation of Shapes Apply spatial reasoning to create transformations and use of symmetry to analyze mathematical situations. Students will:
B 1. Recognize same shape in different positions (slide/translation, turn/rotation, flip/reflection)

Concept 3: Coordinate Geometry Specify and describe spatial relationships using coordinate geometry and other representational systems. Students will:
B 1. Identify points in the first quadrant of a grid using ordered pairs

Concept 4: Measurement – Units of Measure – Geometric Objects Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements. Students will:
B 1. Select the appropriate measure of accuracy in U. S. customary and metric
B 2. Tell time with one-minute precision
B 3. Determine the elapsed time

B 4. Measure a given object using the appropriate unit of measure in U. S. customary and metric
B 5. Determine and record temperatures to the nearest degree in Fahrenheit and Celsius as shown on a thermometer
B 6. Compare units of measure to determine more or less relationships
B 7. Determine relationships for U. S. customary and metric
B 8. Compare the length of two objects using U. S. customary and metric
B 9. Determine the perimeter and area using a rectangular array

STRAND 5: Structure and Logic

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Algorithms and Algorithmic Thinking Use reasoning to solve mathematical problems in contextual situations. Students will:
B 1. Discriminate necessary information from unnecessary information in a given grade-level appropriate word problem

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications. Students will:
B 1. Draw conclusions based on existing information and apply it appropriately in problem-solving

Mathematics Standards Articulation by Grade
Fourth Grade

STRAND 1: Number Sense and Operations:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems. Students will:
B 1. Read ten-digit whole numbers in contextual situations
B 2. Identify ten-digit whole numbers in or out of order
B 3. Write whole numbers through ten-digits in or out of order
B 4. State whole numbers, through ten-digits, with correct place value, by using words, models, illustrations, symbols, or expanded notation
B 5. Construct models to represent place value concepts for the one's, ten's, hundred's, and thousand's place
B 6. Compare two whole numbers through ten-digits
B 7. Order three or more whole numbers through ten-digit numbers
B 8. Make models that represent mixed numbers
B 9. Identify symbols, words, or models that represent mixed numbers
B 10. Use mixed numbers in contextual situations
B 11. Compare two unit fractions, (e.g. ½ to ⅕) proper, or mixed numbers with like denominators
B 12. Order three or more unit fractions, proper, or improper fractions with like denominators
B 13. Use decimals in contextual situations
B 14. Compare two decimals
B 15. Order three or more decimals
B 16. Determine the equivalency among decimals, fractions, and percents (e.g. $^{49}/_{100} = 0.49 =$ 49%)
B 17. Identify all whole number factors and pairs of factors for a given whole number
B 18. Determine multiples of a given whole number

Concept 2: Numerical Operations Understand and apply numerical operations and their relationship to one another. Students will:
B 1. Add whole numbers
B 2. Subtract whole numbers
B 3. Select the grade-level appropriate operation to solve word problems
B 4. Solve word problems using grade-level appropriate operations and numbers
B 5. Multiply multi-digit numbers by two-digit numbers
B 6. Divide with one-digit and two digit divisors
B 7. State multiplication and division facts through 12s
B 8. Demonstrate the associative, commutative, and identity properties of multiplication
B 9. Apply grade-level appropriate properties to assist in computation
B 10. Apply the symbols: $\cdot$ for multiplication, and $\leq$, $\geq$
B 11. Use grade-level appropriate mathematical terminology
B 12. Add or subtract fractions with like denominators, no regrouping
B 13. Simplify numerical expressions using the order of operations with grade-appropriate operations

Concept 3: Estimation Use estimation strategies reasonable and fluently. Students will:
B 1. Solve grade-level appropriate problems using estimation
B 2. Use estimation to verify the reasonableness of a calculation (e.g. Is 3284 x 343 = 1200 reasonable?)
B 3. Estimate length and weight using both U.S. customary and metric units

STRAND 2: Set Analysis, Probability, and Discrete Mathematics:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Data Analysis (Statistics) Understand and apply data collection, organization, and representation to analyze and sort data.
B 1. Formulate questions to collect data in contextual situations
B 2. Construct a single-bar graph, line graph or Venn diagram with appropriate labels and title from organized data
B 3. Interpret graphical representations and data displays including single-bar graphs, circle graphs, Venn diagrams, and line graphs that display continuous data
B 4. Answer questions based graphical representations and data displays including single-bar graphs, circle graphs, Venn diagrams, and line graphs that display continuous data
B 5. Calculate mean, median, mode, and range using a set of given data
B 6. Draw conclusions from a given set of data
B 7. Solve contextual problems using graphs, charts, and tables

Concept 2: Probability Understand and apply the basic concepts of probability.
B 1. Name the possible outcomes for a probability experiment
B 2. Describe the probability of events as being more likely, less likely, equally likely, unlikely, certain, impossible, fair or unfair
B 3. Predict the outcome of a grade-level appropriate probability experiment
B 4. Record the data from performing a grade-level appropriate probability experiment
B 5. Compare the outcome of an experiment to predictions made prior to performing the experiment
B 6. Make predictions from the results of student-generated experiments using objects (e.g. coins, spinners, number cubes)
B 7. Compare the results of two repetitions of the same grade-level appropriate probability experiment

Concept 3: Discrete Mathematics – Systematic Listing and Counting Understand and demonstrate the systematic listing and counting of possible outcomes.
B 1. Find possible combinations when one item is selected from each of two sets containing up to three objects (e.g. How many outfits can be made with 3 pants and 2 tee shirts?)

STRAND 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Patterns Identify patterns and apply pattern recognition to reason mathematically. Students will:
B 1. Communicate a grade-level appropriate repetitive pattern using symbols or numbers
B 2. Extend a grade-level appropriate repetitive pattern
B 3. Create grade-level appropriate repetitive patterns
B 4. Solve grade-level appropriate pattern problems

Concept 2: Functions and Relationships Describe and model functions and their relationships. Students will:
B 1. Describe the rule used in a simple grade-level appropriate function (e.g. T-chart, input/output model, and flow charts)

Concept 3: Algebraic Representations Represent and analyze mathematical situations and structures using algebraic representations. Students will:
B 1. Evaluate expressions involving the four basic operations by substituting given whole numbers for the variable
B 2. Use variables in contextual situations
B 3. Solve one-step equations with one variable represented by a letter or symbol using whole numbers

Concept 4: Analysis of Change Analyze change in a variable over time and in various contexts. Students will:
B 1. Identify the change in a variable over time
B 2. Make simple predictions based on a variable
B 3. Describe patterns of change with teacher direction: constant rate

STRAND 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Geometric Properties Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships. Students will:
B 1. Identify the properties of 2 and 3-dimensional figures using appropriate terminology
B 2. Identify models or illustrations of prisms, pyramids, cones, cylinders, and spheres
B 3. Draw points, lines, line segments (open or closed endpoints), rays or angles
B 4. Classify angles (right, acute, obtuse, straight)
B 5. Classify triangles as right, acute, or obtuse
B 6. Describe and classify polygons
B 7. Identify congruent geometric shapes
B 8. Identify similar shapes
B 9. Identify and draw a 2-dimensional shape that has line symmetry
B 10. Identify diameter and radius of a circle

Concept 2: Transformation of Shapes Apply spatial reasoning to create transformations and use of symmetry to analyze mathematical situations. Students will:
B 1. Demonstrate slide/translation, turn/rotation, and flip/reflection using geographic figures
B 2. Identify a tessellation

Concept 3: Coordinate Geometry Specify and describe spatial relationships using coordinate geometry and other representational systems. Students will:
B 1. Name the coordinates of a point plotted in the first quadrant

Concept 4: Measurement – Units of Measure – Geometric Objects Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements. Students will:
B 1. Identify the appropriate measure of accuracy for the area of an object
B 2. Compute elapsed time using a clock (e.g. hours and minutes since or until…) or a calendar (e.g. days, weeks, years, since or until…)
B 3. Select an appropriate tool to use in a particular measurement situation
B 4. Approximate measurements to the appropriate degree of accuracy
B 5. Determine and record temperatures to the nearest degree in Fahrenheit and Celsius as shown on a thermometer
B 6. Compare units of measure to determine more or less relationships including: • Length – yards and miles, meters, and kilometers • Weight – pounds and tons, grams, and kilograms
B 7. State equivalent relationships (e.g. 3 teaspoons = 1 tablespoon, 16 cups = 1 gallon, 2000 pounds = 1 ton)
B 8. Compare the weight of two objects using U. S. customary and metric units
B 9. Determine the perimeter of simple polygons
B 10. Determine the area of squares and rectangles
B 11. Differentiate between perimeter and area of quadrilaterals

STRAND 5: Structure and Logic

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Algorithms and Algorithmic Thinking Use reasoning to solve mathematical problems in contextual situations. Students will:
B 1. Discriminate necessary information from unnecessary information in a given grade-level appropriate word problem
B 2. Develop an algorithm to calculate the perimeter of simple polygons

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications. Students will:
B 1. Draw conclusions based on existing information and apply it appropriately in problem-solving

Mathematics Standards Articulation by Grade
Fifth Grade

STRAND 1: Number Sense and Operations:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems. Students will:
B 1. Make models that represent improper fractions
B 2. Identify symbols, words, or models that represent improper fractions
B 3. Use improper fractions in contextual situations
B 4. Compare two proper fractions or improper fractions with like and unlike denominators
B 5. Order three or more unit fractions, proper or improper fractions, mixed numbers with like and unlike denominators
B 6. Compare two whole numbers, fractions and decimals (e.g. ½ to 0.6)
B 7. Order whole numbers, fractions and decimals
B 8. Determine the equivalency between and among fractions, decimals, and percents in contextual situations.
B 9. Identify all whole number factors and pairs of factors for a number
B 10. Recognize that 0 and 1 are neither a prime nor a composite number
B 11. Sort whole numbers (through 50) into sets containing only prime numbers or only composite numbers

Concept 2: Numerical Operations Understand and apply numerical operations and their relationship to one another. Students will:
B 1. Select the grade-level appropriate operation to solve word problems
B 2. Solve word problems using grade-level appropriate operations and numbers
B 3. Multiply whole numbers
B 4. Divide with whole numbers
B 5. Demonstrate the distributive property of multiplication over addition
B 6. Demonstrate the addition and multiplication properties of equality
B 7. Apply grade-level appropriate properties to assist in computation
B 8. Use grade-level appropriate mathematical terminology
B 9. Simplify fractions to lowest terms

B 10. Add or subtract proper fractions and mixed numbers with like and unlike denominators with regrouping
B 11. Multiply proper fractions and mixed numbers
B 12. Divide proper fractions and mixed numbers
B 13. Add, subtract, multiply and divide decimals
B 14. Simplify numerical expressions using the order of operations with grade appropriate operations

Concept 3: Estimation Use estimation strategies reasonable and fluently. Students will:
B 1. Solve grade-level appropriate problems using estimation
B 2. Use estimation to verify the reasonableness of a calculation (e.g. Is 4.1 x 2.7 about 12?)
B 3. Round to estimate quantities
B 4. Estimate and measure for area and perimeter

STRAND 2: Set Analysis, Probability, and Discrete Mathematics:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Data Analysis (Statistics) Understand and apply data collection, organization, and representation to analyze and sort data.
B 1. Formulate questions to collect data in contextual situations
B 2. Construct a double-bar graph, line plot, frequency table or Venn diagram with appropriate labels and title from organized data
B 3. Interpret graphical representations and data displays including bar graphs, circle graphs, frequency tables, Venn diagrams, and line graphs that display data
B 4. Answer questions based graphical representations and data displays including bar graphs, circle graphs, frequency tables, Venn diagrams, and line graphs that display data
B 5. Calculate mean, median, mode, and range of given data
B 6. Draw conclusions from a given set of data
B 7. Compare two sets of data related to the same investigation
B 8. Solve contextual problems using graphs, charts, and tables

Concept 2: Probability Understand and apply the basic concepts of probability.
B 1. Name the possible outcomes for a probability experiment
B 2. Describe the probability of events as being • certain (represented by "1") • impossible (represented by "0") • neither certain nor impossible (represented by a fraction less than 1)
B 3. Predict the outcome of a grade-level appropriate probability experiment
B 4. Record the data from performing a grade-level appropriate probability experiment
B 5. Compare the outcome of an experiment to predictions made prior to performing the experiment
B 6. Make predictions from the results of student-generated experiments using objects (e.g. coins, spinners, number cubes)
B 7. Compare the results of two repetitions of the same grade-level appropriate probability experiment

Concept 3: Discrete Mathematics – Systematic Listing and Counting Understand and demonstrate the systematic listing and counting of possible outcomes.
B 1. Find possible combinations when one item is selected from each of two sets containing up to three objects (e.g. How many outfits can be made with 3 pants and 2 tee shirts?)

STRAND 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Patterns Identify patterns and apply pattern recognition to reason mathematically. Students will:
B 1. Communicate a grade-level appropriate repetitive pattern using symbols or numbers
B 2. Extend a grade-level appropriate repetitive pattern
B 3. Solve grade-level appropriate pattern problems

Concept 2: Functions and Relationships Describe and model functions and their relationships. Students will:
B 1. Describe the rule used in a simple grade-level appropriate function (e.g. T-chart, input/output model)

Concept 3: Algebraic Representations Represent and analyze mathematical situations and structures using algebraic representations. Students will:
B 1. Evaluate expressions involving the four basic operations by substituting given decimals for the variable
B 2. Use variables in contextual situations
B 3. Solve one-step equations with one variable represented by a letter or symbols

Concept 4: Analysis of Change Analyze change in a variable over time and in various contexts. Students will:
B 3. Describe patterns of change with teacher direction: constant rate

STRAND 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Geometric Properties Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships. Students will:
B 1. Describe and classify regular polygons
B 2. Draw 2 dimensional figures by applying significant properties of each (e.g. Draw a quadrilateral with two sets of parallel sides and four right angles.)
B 3. Identify the properties of 2 and 3-dimensional figures using appropriate terminology and vocabulary
B 5. Draw points, lines, line segments, rays and angles with appropriate labels
B 6. Recognize that all pairs of vertical angles are congruent
B 7. Classify triangles by angles and sides, right, acute, or obtuse
B 8. Recognize that a circle is a 360° rotation about a point
B 9. Identify the diameter, radius, cord and circumference of a circle
B 10. Understand that the sum of the angles of a triangle is 180°
B 11. Draw two congruent geometric figures
B 12. Draw two similar geometric figures
B 13. Identify the lines of symmetry in a 2-dimensional shape

Concept 2: Transformation of Shapes Apply spatial reasoning to create transformations and use of symmetry to analyze mathematical situations. Students will:
B 1. Demonstrate slide/translation, turn/rotation, and flip/reflection using geographic figures
B 2. Describe the transformations that created a tessellation

Concept 3: Coordinate Geometry Specify and describe spatial relationships using coordinate geometry and other representational systems. Students will:
B 1. Graph points in the first quadrant on a grid using ordered pairs

Concept 4: Measurement – Units of Measure – Geometric Objects Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements. Students will:
B 1. State an appropriate measure of accuracy for a contextual situation (e.g. What unit of measurement would you use to measure the top of your desk?)
B 2. Draw 2-dimensional figures to specifications using the appropriate tools (e.g. Draw a circle with a 2-inch radius.)
B 3. Determine relationships including volume (e.g. pints and quarts, milliliters and liters)
B 4. Convert measurement units to equivalent units within a given system (U.S. customary and metric) (e.g. 12 inches = 1 foot; 10 decimeters = 1 meter)
B 5. Solve problems involving perimeter, area and volume
B 6. Measure angles using a protractor

STRAND 5: Structure and Logic

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Algorithms and Algorithmic Thinking Use reasoning to solve mathematical problems in contextual situations. Students will:
B 1. Discriminate necessary information from unnecessary information in a given grade-level appropriate word problem
B 2. Develop and design simple algorithms using whole numbers

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications. Students will:
B 1. Draw conclusions based on existing information and apply it appropriately in problem-solving

Mathematics Standards Articulation by Grade
Sixth Grade

STRAND 1: Number Sense and Operations:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems. Students will:
B 1. Express fractions as ratios, comparing two whole numbers (e.g. ¾ is equivalent to 3:4 and 3 to 4)
B 2. Compare two proper fractions or improper fractions, or mixed numbers
B 3. Order three or more proper fractions, improper fractions, or mixed numbers
B 4. Determine the equivalency between and among fractions, decimals, and percents in contextual situations
B 5. Identify the greatest common factor for two or three whole numbers
B 6. Determine the least common multiple for two or three whole numbers
B 7. Express a whole number as a product of its prime factors, using exponents when appropriate

Concept 2: Numerical Operations Understand and apply numerical operations and their relationship to one another. Students will:
B 1. Identify and Solve word problems using grade-level appropriate operations and numbers
B 2. Apply grade-level appropriate properties to assist in computation
B 3. Apply the symbols for "…" or "$\overline{\quad}$" to represent repeating decimals and ":" to represent ratios
B 4. Use grade-level appropriate mathematical terminology
B 5. Simplify fractions to lowest terms
B 6. Add or subtract proper fractions and mixed numbers with like and unlike denominators
B 7. Demonstrate the process of multiplication of proper fractions using models
B 8. Multiply proper fractions and mixed numbers
B 9. Demonstrate that division is the inverse of multiplication
B 10. Divide proper fractions and mixed numbers
B 11. Solve problems involving fractions or decimals in contextual situations
B 12. Simplify numerical expressions using the order of operations with grade-level appropriate operations

Concept 3: Estimation Use estimation strategies reasonable and fluently. Students will:
B 1. Solve grade-level appropriate problems using estimation
B 2. Use estimation to verify the reasonableness of a calculation (e.g. Is $\frac{5}{9} \times \frac{3}{7}$ more than 1?)
B 3. Round to estimate quantities in contextual situations (e.g. round up or down)
B 4. Estimate and measure the area and perimeter of polygons using a grid
B 5. Verify the reasonableness of estimates within a contextual situation

STRAND 2: Set Analysis, Probability, and Discrete Mathematics:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Data Analysis (Statistics) Understand and apply data collection, organization, and representation to analyze and sort data.
B 1. Formulate questions to collect data in contextual situations
B 2. Construct a histogram, line graph, scatter plot, or stem-and-leaf plot with appropriate labels and title from organized data
B 3. Interpret simple displays of data including double bar graphs, circle graphs, frequency tables, and line graphs
B 4. Answer questions based on displays of data including double bar graphs, circle graphs, frequency tables, and line graphs
B 5. Find the mean, median, mode, range and extreme values of a given numerical data set
B 6. Identify a trend (variable increasing, decreasing, remaining constant) from displayed data
B 7. Compare trends in data related to the same investigation
B 8. Solve contextual problems using graphs, charts, and tables

Concept 2: Probability Understand and apply the basic concepts of probability.
B 1. Name the possible outcomes for a probability experiment
B 2. Express probabilities of a single event as a decimal
B 3. Predict the outcome of a grade-level appropriate probability experiment
B 4. Record the data from performing a grade-level appropriate probability experiment
B 5. Compare the outcome of an experiment to predictions made prior to performing the experiment
B 6. Make predictions from the results of student-generated experiments using objects (e.g. coins, spinners, number cubes, cards)
B 7. Compare the results of two repetitions of the same grade-level appropriate probability experiment

Concept 3: Discrete Mathematics – Systematic Listing and Counting Understand and demonstrate the systematic listing and counting of possible outcomes.
B 1. Determine possible outcomes involving a combination of three sets of three items, using a systematic approach (e.g. 3 different shirts, 3 different pairs of pants, and three different belts)
B 2. Determine possible arrangements given a set with four or fewer objects using a systematic list, table or tree diagram when order is not important

STRAND 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Patterns Identify patterns and apply pattern recognition to reason mathematically. Students will:
B 1. Communicate a grade-level appropriate repetitive pattern using symbols or numbers
B 2. Extend a grade-level appropriate repetitive pattern
B 3. Solve grade-level appropriate pattern problems

Concept 2: Functions and Relationships Describe and model functions and their relationships. Students will:
B 1. Describe the rule used in a simple grade-level appropriate function (ex. T-chart, input/output model)

Concept 3: Algebraic Representations Represent and analyze mathematical situations and structures using algebraic representations. Students will:
B 1. Evaluate expressions involving the four basic operations by substituting given values for the variable
B 2. Use variables in contextual situations
B 3. Translate a written phrase to an algebraic expression
B 4. Solve one and two step equations with one variable represented by a letter or symbol, using inverse operations with whole numbers

Concept 4: Analysis of Change Analyze change in a variable over time and in various contexts. Students will:
B1. Identify values on a given line graph or scatter plot (e.g. Given a line showing wages earned per hour, what is the wage at five hours?)

STRAND 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Geometric Properties Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships. Students will:
B 1. Classify polygons by their attributes (e.g. number of sides, length of sides, angles, parallelism, perpendicularity)
B 2. Draw a geometric figure showing specified properties, such as parallelism and perpendicularity
B 3. Classify prisms, pyramids, cones, and cylinders by base shape and lateral surface shape
B 4. Classify 3-dimensional figures by their attributes
B 5. Compare attributes of 2-dimensional figures with 3 dimensional figures
B 6. Identify supplementary or complementary angles
B 7. Identify the diameter, radius, cord and circumference of a circle or sphere
B 8. Draw a two dimensional shape with a given number of lines of symmetry

Concept 2: Transformation of Shapes Apply spatial reasoning to create transformations and use of symmetry to analyze mathematical situations. Students will:
B 1. Identify reflections, translations, and rotations using models
B 2. Perform elementary transformations to create a tessellation

Concept 3: Coordinate Geometry Specify and describe spatial relationships using coordinate geometry and other representational systems. Students will:
B 1. Graph a polygon using ordered pairs
B 2. State the missing coordinate of a given figure of a coordinate grid using geometric properties (e.g. Find the coordinates of the missing vertex of a rectangle when two adjacent sides are drawn.)

Concept 4: Measurement – Units of Measure – Geometric Objects Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements. Students will:
B 1. Determine the appropriate measure of accuracy within a system for a given contextual situation
B 2. Determine the appropriate tool needed to measure to the needed accuracy
B 3. Determine a linear measurement to the appropriate degree of accuracy
B 4. Measure angles using a protractor
B 5. Convert within a single measurement system
B 6. Solve problems involving perimeter, area, and volume
B 7. Determine the area of triangles
B 8. Distinguish between perimeter and area in contextual situation
B 9. Identify parallelograms having the same perimeter or area
B 10. Determine the actual measure of objects using a scale drawing or map

STRAND 5: Structure and Logic

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Algorithms and Algorithmic Thinking Use reasoning to solve mathematical problems in contextual situations. Students will:
B 1. Discriminate necessary information from unnecessary information in a given grade-level appropriate word problem
B 2. Solve problems using algorithms

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications. Students will:
B 1. Solve a simple logic problem from given information

Mathematics Standards Articulation by Grade
Seventh Grade

STRAND 1: Number Sense and Operations:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems. Students will:
B 1. Express fractions as Terminating or repeating decimals
B 2. Identify the greatest common factor for a set of whole numbers and apply in problem solving
B 3. Determine the least common multiple for a set of whole numbers and apply in problem solving
B 4. Choose the appropriate signed real number to represent a contextual situation
B 5. Recognize the absolute value of a number used in contextual situations
B 6. Locate integers on a number line
B 7. Order integers
B 8. Classify rational numbers as natural, whole or integers.

Concept 2: Numerical Operations Understand and apply numerical operations and their relationship to one another. Students will:
B 1. Add integers
B 2. Subtract integers
B 3. Select the grade level appropriate operation to solve word problems
B 4. Solve word problems using grade-level appropriate operations and numbers
B 5. Multiply integers
B 6. Divide integers
B 7. Apply grade-level appropriate properties to assist in computation
B 8. Apply the symbols + and – to represent positive and negative, and " $\left\vert \right\vert$ " to represent absolute value
B 9. Use grade-level appropriate mathematical terminology
B 10. Calculate the percent of a given number
B 11. Convert numbers expressed in standard notation to scientific notation and vice versa
B 12. Simplify numerical expressions using the order of operations with grade-level appropriate operations on number sets

Concept 3: Estimation Use estimation strategies reasonable and fluently. Students will:
B 1. Solve grade-level appropriate problems using estimation
B 2. Use estimation to verify the reasonableness of a calculation (e.g. Is -2.5 x 18 about -50?)
B 3. Verify the reasonableness of estimates within a contextual situation

STRAND 2: Set Analysis, Probability, and Discrete Mathematics:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Data Analysis (Statistics) Understand and apply data collection, organization, and representation to analyze and sort data.
B 1. Formulate questions to collect data in contextual situations
B 2. Construct a circle graph with appropriate labels and title from organized data
B 3. Determine when it is appropriate to use histograms, line graphs, double bar graphs, and stem –and-leaf plots
B 4. Interpret data displays including histograms, stem-and-leaf plots, circle graphs, and double line graphs.
B 5. Answer questions based on data displays including histograms, stem-and-leaf plots, circle graphs, and double line graphs
B 6. Determine the most appropriate measure of central tendency
B 7. Compare trends in data related to the same investigation
B 8. Solve contextual problems using graphs, charts, and tables

Concept 2: Probability Understand and apply the basic concepts of probability.
B 1. Determine the probability that a specific event will occur in a single stage probability experiment (e.g. Find the probability of drawing a red marble from a bag with 3 red, 5 blue, and 9 black marbles)
B 2. Compare probabilities to determine the fairness of a contextual situation (e.g. If John wins when two or greater shows after a six-sided number cube is rolled and Joaquin wins otherwise, is this a fair game?)
B 3. Predict the outcome of a grade-level appropriate probability experiment
B 4. Record the data from performing a grade-level appropriate probability experiment
B 5. Compare the outcome of an experiment to theoretic probability made prior to performing the experiment
B 6. Make predictions from the results of student-generated experiments using objects (e.g. coins, spinners, number cubes, cards)
B 7. Compare the results of two repetitions of the same grade-level appropriate probability experiment

Concept 3: Discrete Mathematics – Systematic Listing and Counting Understand and demonstrate the systematic listing and counting of possible outcomes.
B 1. Determine possible outcomes involving a combination of three sets of three items (e.g. How many outfits can be made with 3 pants, 2 tee shirts and 2 sets of shoes?)
B 2. Determine all possible arrangements of a given set, using a systematic list, table, tree diagram or other representation

STRAND 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Patterns Identify patterns and apply pattern recognition to reason mathematically. Students will:
B 1. Communicate a grade-level appropriate repetitive pattern using symbols or numbers
B 2. Solve grade-level appropriate repetitive pattern problems

Concept 2: Functions and Relationships Describe and model functions and their relationships. Students will:
B 1. Describe the rule used in a simple grade-level appropriate function (ex. T-chart, input/output model)

Concept 3: Algebraic Representations Represent and analyze mathematical situations and structures using algebraic representations. Students will:
B 1. Evaluate an expression containing two variables by substituting integers for the variable (e.g. $7x = m$, when $x = -4$ and $m = 12$)
B 2. Use variables in contextual situations
B 3. Translate a written sentence into a one-step, one-variable algebraic equation
B 4. Translate a sentence written in context into an algebraic equation involving one operation
B 5. Solve one-step equations using inverse operations with positive rational numbers (e.g. $^{2}/_{3}n = 6$)

Concept 4: Analysis of Change Analyze change in a variable over time and in various contexts. Students will:
B1. Analyze change in various linear contextual situations

STRAND 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Geometric Properties Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships. Students will:
B 1. Draw a geometric figure showing specified properties
B 2. Identify the net (2-dimensional representation that corresponds to a rectangular prism, cone, or cylinder
B 3. Distinguish between length, area, and volume, using 2- and 3- dimensional geometric figures
B 4. Draw polygons with appropriate labels
B 5. Recognize the relationship between central angles and intercepted arcs
B 6. Identify arcs and chords of a circle
B 7. Identify arcs and chords of a circle
B 8. Model the triangle inequality theorem using manipulatives

Concept 2: Transformation of Shapes Apply spatial reasoning to create transformations and use of symmetry to analyze mathematical situations. Students will:
B 1. Identify rotations about a point, using pictorial models
B 2. Recognize simple single rotations, translations or reflections on a coordinate grid

Concept 3: Coordinate Geometry Specify and describe spatial relationships using coordinate geometry and other representational systems. Students will:
B 1. Graph data points in any quadrant of a coordinate grid

Concept 4: Measurement – Units of Measure – Geometric Objects Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements. Students will:
B 1. Identify the appropriate unit of measure for the volume of an object (e.g. cubic inches or

cubic cm)
B 2. Measure to the appropriate degree of accuracy
B 3. Convert a measurement from U.S. customary to metric and vice versa
B 4. Solve problems using the circumference of a circle
B 5. Solve problems involving the area of a circle
B 6. Solve problems for the areas of parallelograms, triangles, and circles
B 7. Compare estimated to actual lengths based on scale drawings or maps

STRAND 5: Structure and Logic

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Algorithms and Algorithmic Thinking Use reasoning to solve mathematical problems in contextual situations. Students will:
B 1. Discriminate necessary information from unnecessary information in a given grade-level appropriate word problem
B 2. Analyze algorithms

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications. Students will:
B 1. Solve a logic problem using multiple variables

Mathematics Standards Articulation by Grade
Eighth Grade

STRAND 1: Number Sense and Operations:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems. Students will:
B 1. Locate rational numbers on a number line
B 2. Identify irrational numbers
B 3. Classify real numbers as rational or irrational
B 4. Express fractions as terminating, repeating or non-repeating decimals

Concept 2: Numerical Operations Understand and apply numerical operations and their relationship to one another. Students will:
B 1. Select the grade level appropriate operation to solve word problems
B 2. Solve word problems using grade-level appropriate operations and numbers
B 3. Determine the square of an integer
B 4. Determine the square root of an integer
B 5. Identify squaring and finding square roots as inverse operations
B 6. Apply grade-level appropriate properties to assist in computation
B 7. Apply the symbols "√" to represent square root, and "±" to represent roots, and "[ ]" as grouping symbols
B 8. Use grade-level appropriate mathematical terminology
B 9. Calculate the missing value in a percentage problem
B 10. Convert standard notation to scientific notation and vice versa
B 11. Compute using scientific notation
B 12. Simplify numerical expressions using the order of operations

Concept 3: Estimation Use estimation strategies reasonable and fluently. Students will:
B 1. Solve grade-level appropriate problems using estimation
B 2. Use estimation to verify the reasonableness of a calculation (e.g. Is 32 the square root of 64?)
B 3. Express answers to the appropriate place or degree of precision (e.g. time, money
B 4. Verify the reasonableness of estimates within a contextual situation

STRAND 2: Set Analysis, Probability, and Discrete Mathematics:

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Data Analysis (Statistics) Understand and apply data collection, organization, and representation to analyze and sort data.
B 1. Formulate questions to collect data in contextual situations
B 2. Determine the appropriate type of graphical display for a given data set
B 3. Solve problems in contextual situations using the most appropriate measure of central tendency
B 4. Formulate reasonable predictions based on a given set of data
B 5. Compare trends in data related to the same investigation
B 6. Solve contextual problems using graphs, charts and tables
B 7. Evaluate the effects of missing, incorrect or extreme values of data on the results of an investigation (e.g. Susie's teacher recorded a 39 instead of a 93 for her last quiz, what will happen to Susie's average?)
B 8. Identify a line of best fit for a scatter plot

Concept 2: Probability Understand and apply the basic concepts of probability.
B 1. Determine the probability that a specific event will occur in a 2- stage probability experiment
B 2. Solve contextual situations using probability (e.g. If the probability of Michelle making a free throw is 0.25, what is the probability that she will make three free throws in a row?)
B 3. Predict the outcome of a grade-level appropriate probability experiment
B 4. Record the data from performing a grade-level appropriate probability experiment
B 5. Compare the outcome of an experiment to predictions made prior to performing the experiment
B 6. Distinguish between independent and dependent events
B 7. Compare the results of two repetitions of the same grade-level appropriate probability experiment

Concept 3: Discrete Mathematics – Systematic Listing and Counting Understand and demonstrate the systematic listing and counting of possible outcomes.
B 1. Determine possible outcomes involving a combination of two or more sets of objects (e.g. If you roll a six-sided number cube 4 times, how many possible outcomes are possible?)
B 2. Determine all possible arrangements of a given set (e.g. How many ways can you arrange a set of 7 books on a shelf?)

STRAND 3: Patterns, Algebra, and Functions

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Patterns Identify patterns and apply pattern recognition to reason mathematically. Students will:
B 1. Communicate a grade-level appropriate repetitive pattern using symbols or numbers
B 2. Solve grade-level appropriate repetitive pattern problems

Concept 2: Functions and Relationships Describe and model functions and their relationships. Students will:
B 1. Describe the rule used in a simple grade-level appropriate function (ex. T-chart, input/output model)
B 2. Distinguish between linear and nonlinear functions, given graphic examples
B 3. Identify independent and dependent variables for a contextual situation

Concept 3: Algebraic Representations Represent and analyze mathematical situations and structures using algebraic representations. Students will:
B 1. Evaluate algebraic expressions by substituting rational values for variables [e.g. 2(ab+ac+bc), when a = 2, b = $^{3}/_{5}$, and c – 4]
B 2. Use variables in contextual situations
B 3. Translate a written sentence or phrase into an algebraic equation or expression, and vice versa (e.g. Three less than twice a number is 2 n – 3)
B 4. Translate a sentence written in context into an algebraic equation involving two operations
B 5. Translate a contextual situation into an algebraic inequality (e.g. Joe earns more than $5.00 and hour; therefore, x > 5)
B 6. Identify an equation or inequality that represents a contextual situation
B 7. Solve one-step equations with rational numbers as coefficients or as solutions
B 8. Solve one-step equations that model contextual situations
B 9. Solve two-step equations with rational coefficients and integer solutions (e.g. 3x + 5 = 11, 4x – 20 = 8)
B 10. Solve multivariable formula for any given unknown (A=L x W, Solve for W)

B 11. Graph an inequality on a number line
B 12. Solve a simple algebraic proportion
B 13. Solve applied problems using the Pythagorean theorem

Concept 4: Analysis of Change Analyze change in a variable over time and in various contexts. Students will:
B1. Identify the slope of a line as the rate of change (the ration of rise over run)

STRAND 4: Geometry and Measurement

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Geometric Properties Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships. Students will:
B 1. Recognize the 3-dimensional figure represented by a net
B 2. Represent the surface area of rectangular prisms and cylinders as the area of their net
B 3. Draw regular polygons with appropriate labels
B 4. Identify the properties of angles created by a transversal intersecting two parallel lines (e.g. corresponding angles are congruent)
B 5. Identify corresponding angles of similar polygons as congruent and sides as proportional

Concept 2: Transformation of Shapes Apply spatial reasoning to create transformations and use of symmetry to analyze mathematical situations. Students will:
B 1. Model a simple transformation on a coordinate grid (e.g. Translate right four units and down two units)

Concept 3: Coordinate Geometry Specify and describe spatial relationships using coordinate geometry and other representational systems. Students will:
B 1. Use a table of values to graph a linear equation
B 2. Determine the midpoint given two points on a number line
B 3. Determine the distance between two points on a number line

Concept 4: Measurement – Units of Measure – Geometric Objects Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements. Students will:
B 1. Solve problems for the area of a trapezoid
B 2. Solve problems involving the volume of rectangular prisms and cylinders
B 3. Calculate the surface area of rectangular prisms or cylinders

B 4. Find the measure of a missing interior angle in a triangle or quadrilateral
B 5. Solve problems using rations and proportions, given the scale factor
B 6. Calculate the length of a side, given two similar triangles

STRAND 5: Structure and Logic

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Algorithms and Algorithmic Thinking Use reasoning to solve mathematical problems in contextual situations. Students will:
B 1. Describe how to use a proportion to solve a problem in context
B 2. Analyze algorithms

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications. Students will:
B 1. Solve a logic problem given the necessary information
B 2. Identify simple valid arguments using *if…then* statements (e.g. All squares are rectangles. If quadrilateral ABCD is a rectangle, is it a square?)
B 3. Model a contextual situation using a flow chart