

NUMBER SENSE
Grade 8

CONTENT STANDARD 1: Students develop number sense and use numbers and number relationships in problem-solving situations and communicate the reasoning used in solving these problems.

State Model Content Standards Grades 5-8	District Expectations Grade 8
1.1 Demonstrate meanings for integers, rational numbers, percents, exponents, square roots, and pi (π) using physical materials and technology in problem-solving situations.	<ul style="list-style-type: none"> • Locate rational numbers and commonly-used irrational numbers on the number line (e.g., $-7/2$, -2.48, 0, $15/16$, π, $\sqrt{2}$). • Explain the meaning of percent • Distinguish between the set of rational and irrational number $\sqrt{72}$. • Determine two consecutive whole numbers between which the square root of a whole number (e.g., lies between 8 and 9). • Determine the estimated value of common irrational numbers (e.g., $\sqrt{2}$, π) • Use equivalent forms of a number to solve problems (e.g., whole numbers, fractions, decimals, and percents).
1.2 Reading, writing, and ordering integers, rational numbers, and common irrational numbers such as $\sqrt{2}$, $\sqrt{5}$, and pi (π).	<ul style="list-style-type: none"> • Read, write, and order rational numbers and commonly used irrational number. • Compare rational numbers and commonly used irrational number using the symbols =, <, >.
1.3 Applying number theory concepts (e.g., primes, factors, multiples) to represent numbers in various ways.	<ul style="list-style-type: none"> • Demonstrates proficiency of number theory concepts (e.g., multiples, factors, primes, and divisibility). • Demonstrate proficiency of the meaning of a^n, where a is any rational number and n is a counting number. • Read, write, and interpret numbers in standard notation.
1.4 Using the relationships among fractions, decimals, and percents, including the concepts of ratio and proportion in problem-solving situations.	<ul style="list-style-type: none"> • Demonstrate proficiency of the concepts of ratio and proportion. • Apply proportional reasoning to solve problems.
1.5 Developing, testing, and explaining conjectures (statements which can be shown to be true or false) about properties of integers and rational numbers.	<ul style="list-style-type: none"> • Use vocabulary of number sets (e.g., counting, whole, integer, rational, irrational, and real numbers). • Demonstrate properties for rational numbers.
1.6 Using number sense to estimate and justify the reasonableness of solutions to problems involving integers, rational numbers, and common irrational numbers such as $\sqrt{2}$, $\sqrt{5}$, and π .	<ul style="list-style-type: none"> • Estimate using appropriate techniques, solve, and then justify the reasonableness of solutions to problems involving positive and negative rational numbers. • Estimate using appropriate techniques, solve, and then justify the reasonableness of solutions to problems involving common irrational numbers such as $\sqrt{2}$, $\sqrt{5}$, and π.

ALGEBRA

Grade 8

CONTENT STANDARD 2: Students use algebraic methods to explore, model and describe patterns and functions involving numbers, shapes, data, and graphs in problem-solving situations and communicate the reasoning used in solving these problems.

State Model Content Standards Grades 5-8	District Expectations Grade 8
2.4 Representing, describing, and analyzing patterns and relationships using tables, graphs, verbal rules, and standard algebraic notation.	<ul style="list-style-type: none"> • Represent, describe, and analyze patterns with rational numbers. • Represent mathematical situations, using variables, expressions, equations, and inequalities with manipulatives and/or drawings. • Create, extend, and describe a wide variety of patterns and sequences. • Observe situations where the same patterns are seen and discuss why the patterns are the same. • Construct a graph that displays a functional relationship. • Use the functional relationship that exists in a T-chart or linear graph to complete or extend data necessary to solve problems. • Make predictions, explore relationships, find possible solutions and/or solve problems from trends observed in patterns.
2.5 Describing patterns using variables, expressions, equations, and inequalities in problem-solving situations.	<ul style="list-style-type: none"> • Solve problems from patterns involving rational numbers using tables, graphs, and rules. • Use the order or operation rules when calculating a series of different operations. • Practice using formulas to set up and solve problems. • Use equal, greater than, and less than symbols to show the relationship between two whole numbers, fractions, decimals and/or integers. • Solve simple equations, expressions, or inequalities with variables. • Use variables in statements of general principle (e.g., $a + b = b + a$). <p><u>IF TIME PERMITS:</u></p> <ul style="list-style-type: none"> • <i>Describe the regularity in a pattern and use numbers and/or variables to describe it.</i> • <i>Find the rule (formula) for describing a simple pattern.</i> • <i>Use rules and formulas to generate patterns and sequences.</i>
2.6 Analyzing functional relationships to explain how a change in one quantity results in a change in another (e.g., how the area of a circle changes as the radius increase, or how a person's height changes over time.	<ul style="list-style-type: none"> • Describe how a change in one quantity affects the other in any functional relationship involving rational numbers. • Explain the meaning of slope as a rate of change in a linear function. • Identify independent and dependent variables. • Explore the concept of mathematical function found in real situations.
2.7 Distinguishing between linear and nonlinear functions through informal investigations.	<ul style="list-style-type: none"> • Graph discrete linear and nonlinear functions. <p><u>IF TIME PERMITS:</u></p> <ul style="list-style-type: none"> • Graph and distinguish between continuous linear and nonlinear functions (e.g., $y = 3x + 2$, $y = x^2$, and $y = x^3$, either by creating a table or using technology.
2.8 Solving simple linear equations in problem-solving situations using a variety of methods (informal, formal, and graphical) and a variety of tools (physical materials, calculators and computers.)	<ul style="list-style-type: none"> • Translate written expressions or equations to algebraic expressions or equations, and vice versa. • Solve one-step linear equations involving rational numbers using formal methods. • Solve linear equations involving integers with variables and constants on both sides of the equation. • Use alternative ways to solve linear equations (graphically) using technology or charts.

STATISTICS AND PROBABILITY

Grade 8

CONTENT STANDARD 3: Students use data collection and analysis, statistics, and probability in problem-solving situations and communicate the reasoning and processes used in solving these problems.

State Model Content Standards Grades 5-8	District Expectations Grade 8
3.1 Reading and constructing displays of data using appropriate techniques (e.g., line graphs, circle graphs, scatter plots, box-and-whisker plots, stem-and-leaf plots) and appropriate technology.	<ul style="list-style-type: none"> • Demonstrates proficiency organizing and displaying data using appropriate graphs (e.g., line, bar, circle {using ratios to determine degrees and draw with protractors} frequency tables, stem-and-leaf, histograms, scatter plots, and box-and-whiskers.) • Read, interpret, and draw conclusions from various displays of data. • Collect data using a variety of appropriate data collection instruments (e.g., survey, interview, etc.
3.2 Displaying and using measures of central tendency, such as mean, median, and mode, and measures of variability, such as range and quartiles.	<ul style="list-style-type: none"> • State the purpose of using measures of central tendency and variability with data sets. • Create sets of data with the same mean and different ranges and compare the data. • Select the most appropriate display and measure of central tendency to solve a problem and justify reasoning.
3.3 Evaluating arguments that are based on statistical claims.	<ul style="list-style-type: none"> • Recognize a misleading display of data which arises from differences in scales of area models and volume model • Recognize the use and/or misuse of statistics in society.
3.4 Formulating hypotheses, drawing conclusions, and making convincing arguments based on data analysis.	<ul style="list-style-type: none"> • Display, analyze, draw conclusions, and make predictions based on a given set of data or a student-generated set of data.
3.5 Determining probabilities through experiments or simulations.	<ul style="list-style-type: none"> • Perform experiments of simple independent and dependent events to determine probability. • Perform experiments to determine the probability of complementary events. • Demonstrate finding the probability of dependent outcomes.
3.6 Making predictions and comparing results using both experimental and theoretical probability drawn from real-world problems.	<ul style="list-style-type: none"> • Demonstrate the probability of independent, dependent, and complementary events with replacement and without replacement. • Analyze games of chance to determine whether they are fair or unfair. If unfair, rewrite the rules of the game to make it fair. • Explain the difference between experimental and theoretical probabilities using simple situations.
3.7 Using counting strategies to determine all the possible outcomes from an experiment (e.g., the number of ways students can line up to have their picture taken).	<ul style="list-style-type: none"> • Determine the number of outcomes of independent compound events by using the fundamental counting principle (e.g., if one choice occurs in "m" ways and the second choice occurs in "n" ways, then the number of ways for them to occur together is $m \times n$).

GEOMETRY

Grade 8

CONTENT STANDARD 4: Students use geometric concepts, properties, and relationships in problem-solving situations and communicate the reasoning used in solving these problems.

State Model Content Standards Grades 5-8	District Expectations Grade 8
4.1 Constructing two-and-three dimensional models using a variety of materials and tools.	<ul style="list-style-type: none"> • Demonstrates geometric constructions using a straight edge and a compass, paper folding, or computer software application <ul style="list-style-type: none"> • of a perpendicular line to a point on a line segment. • of a perpendicular line to another line from a point not on the line segment. <p>INTRODUCE</p> <ul style="list-style-type: none"> • Triangle congruence of Side-Side-Side, Side-Angle-side, and angle-Side-Angle. • Using isometric dot paper to draw a three-dimensional model built with cubes. Creating: <ul style="list-style-type: none"> • Isometric drawings – a drawing that shows corner view and top or bottom view. • Build the models given isometric and orthogonal drawings or foundational views.
4.2 Describing, analyzing, and reasoning about the properties (e.g., parallelism, perpendicularity, congruence) of two- and three-dimensional figures;	<ul style="list-style-type: none"> • (INTRODUCE) Identifying and using correct notation for triangle congruence of Side-Side-Side, Side-Angle-Side, and Angle-Side-Angle. • Explain relationships among angles formed by two lines cut by a transversal and two parallel lines cut by a transversal. • Explain why the sum of the measures of the angles of a triangle equals 180°. • (INTRODUCE) Explaining and describing the properties of the special right triangles, 30°, 60°, 90°, and 45°, 45°, 90°. •
4.3 Applying the concepts of ration, proportion, and similarity I problem-solving situations.	<ul style="list-style-type: none"> • Demonstrate understanding of the relationships between the sides and angles of congruent and similar polygons. • Demonstrate proportional reasoning to indirectly determine lengths of segments of similar polygons. • Use critical attributes to classify triangles and quadrilaterals. • Use vocabulary and show examples: altitude, legs, hypotenuse, and angles related to parallel lines cut by a transversal.
4.4 Solving problems using coordinate geometry.	<ul style="list-style-type: none"> • Determine the increase or decrease of perimeter and area of the enlargement or reduction of squares, rectangles, and triangles. • Describe the relationship of more than two points on the coordinate plane.
4.5 Solving problems involving perimeter and area in two dimensions, and involving surface area and volume in three dimensions.	<ul style="list-style-type: none"> • Solve problems involving perimeter and area of right prisms. • Solve problems involving volume of prisms and cylinders. • Solve problems involving surface area of cylinders and prisms. • Apply the Pythagorean Theorem to solve real-life problems.
4.6 Transforming geometric figures using reflections, translations, and rotations to explore congruence.	<ul style="list-style-type: none"> • Determine the scale factor for dilations to illustrate similarity. • Create Escher-type tessellations to illustrate congruence. • State the coordinates to describe the reflection of a figure across the x- and y- axes.

NUMBER SENSE
Grade 8

CONTENT STANDARD 5: Students use a variety of tools and techniques to measure, apply the results in problem-solving situations, and communicate the reasoning used in solving these problems.

State Model Content Standards Grades 5-8	District Expectations Grade 8
5.1 Estimating, using, and describing measures of distance, perimeter, area, volume, capacity, weight, mass, and angle comparison.	<ul style="list-style-type: none"> • Compare the estimate and direct measurement of the length of the sides and heights of quadrilaterals. • Compare the estimate and direct measurement of the perimeter and area of quadrilaterals.
5.2 Estimating, making, and using direct and indirect measurements to describe and make comparisons.	<ul style="list-style-type: none"> • Make reasonable estimates and use capacity, weight, volume, and mass measurements. • Compare the estimate and direct measurement of measures of angles. • Demonstrate proportional reasoning to indirectly determine lengths of segments of similar polygons. • Determine the connections between mass and weight, and surface area and volume.
5.3 Reading and interpreting various scales including those based on number lines, graphs, and maps.	<ul style="list-style-type: none"> • Read and interpret scales on number lines, graphs, and maps. • Select the appropriate scale for a given problem • Construct scale drawings.
5.4 Developing and using formulas and procedures to solve problems involving measurement.	<ul style="list-style-type: none"> • Develop, use, and compare formulas for the perimeter and area of quadrilaterals using appropriate units. • Develop, use, and compare the formula for volume of prisms and cylinders using appropriate units. • Develop and use the Pythagorean Theorem. <p><u>INTRODUCE IF TIME PERMITS</u></p> <ul style="list-style-type: none"> • Using the relationships in 30-60-90 and 45-45-90 triangles to solve problems.
5.5 Describing how a change in an object's linear dimensions affects its perimeter, area & volume.	<ul style="list-style-type: none"> • Describe how changing the radius of a circle affects the circumference and area. • Describe how changing the height or radius of the base of a cylinder affects the volume.
5.6 Selecting and using appropriate units and tools to measure to the degree of accuracy required in a particular problem-solving situation.	<ul style="list-style-type: none"> • Select and use the appropriate units and tools to measure to the degree of accuracy required in a particular problem. • Measure the length of the sides and heights of quadrilaterals to the nearest sixteenth inch and nearest millimeter. • Measure angles of two lines cut by a transversal and angles of two parallel lines cut by a transversal using a protractor. • Find perimeter/circumference and area of triangles, quadrilaterals and circles in problem-solving situations. • Solve problems involving perimeter and circumference. • Use the measurement of angles to solve problems including complementary and supplementary angles and angles formed when parallel lines are cut by a transversal. • Find the volume of cubes, rectangular prisms and triangular prisms in problem-solving situations. <p><u>IF TIME PERMITS: SCIENCE??</u></p> <ul style="list-style-type: none"> • Use the relationship between distance, rate, and time to solve problems.

COMPUTATION
Grade 8

CONTENT STANDARD 6: Students link concepts and procedures as they develop and use computational techniques, including estimation, mental arithmetic, paper-and-pencil, calculators, and computers, in problem-solving situations and communicate the reasoning involved in solving these problems.

State Model Content Standards Grades 5-8	District Expectations Grade 8
6.1 Using models to explain how ratios, proportions, and percents can be used to solve real-world problems.	<ul style="list-style-type: none"> • Compute percent of increase or decrease in real-world problems. • Convert from one set of units to another using proportions.
6.1 Constructing, using, and explaining procedures to compute and estimate with whole numbers, fractions, decimals, and integers.	<ul style="list-style-type: none"> • Demonstrate order of operations with rational numbers. • Demonstrate the meaning of the four basic operations of rational numbers. • Demonstrate with proficiency computation of rational number using paper and pencil. • Demonstrate the inverse relationship of addition and subtraction of rational numbers. • Demonstrate the inverse relationship of multiplication and division of rational numbers. • Demonstrate multiplication of rational numbers as repeated addition. • Solve problems requiring operations with integers. • Practice finding the value of expressions containing exponents and common square roots (e.g., 7^3, $\sqrt{125}$).
6.2 Developing, applying, and explaining a variety of different estimation strategies in problem-solving situations, and explaining why an estimate may be acceptable in place of an exact answer.	<ul style="list-style-type: none"> • Determine from real-world problems whether an estimated or exact answer is acceptable. • Use estimation techniques before performing operations.
6.4 Selecting and using appropriate methods for computing with commonly use fractions and decimals, percents, and integers in problem-solving situations from among mental arithmetic, estimation, paper and pencil, calculator, and computer methods, and determining whether the results are reasonable.	<ul style="list-style-type: none"> • Use the correct operation and appropriate method in a real-world problem-solving situation (e.g., mental math, estimation, paper and pencil, calculator or computer). • Create and illustrate a real-world problem given a math sentence with rational numbers. • Determine whether the results are reasonable and justify those results with correct computations in a problem-solving situation. • Maintain computation skills in problem-solving situations requiring: <ul style="list-style-type: none"> • Addition, subtraction, multiplication, and division of whole numbers. • Addition, subtraction, multiplication and division of fractions. • Addition, subtraction and multiplication of decimals. • Use a calculator to solve problems and explore patterns and relationships among integers, decimals, fractions, and percents. • Use percent formulas and/or proportions to solve percent problems.