MATHEMATICS/ PRE-ALGEBRA Seventh Grade

VALUES AND ATTITUDES	The student will: Realize that there is a definite sense of order in God's world. Understand numbers, ways of representing numbers, relationships among numbers, and number systems. Understand that God's universe is composed of appropriate spacing, measurement and geometric designs. Use visualization, spatial reasoning, and geometric modeling. Understand patterns, relations, and functions. Use varied methods for analyzing data. Use the ability to reason with our minds. Develop mathematical knowledge through problem solving.

DIOCESAN STRAND A Number Sense, Numeration, and Numerical Operations

OBJECTIVES

Real numbers

- Write whole numbers in scientific notation.
- Convert scientific notation to standard form.
- Compare and order rational numbers.
- Differentiate between rational and irrational numbers.
- Read, write and compare rational numbers in scientific notation, positive and negative powers of 10, with approximate numbers using scientific notation.
- Know that every rational number is either a terminating or repeating decimal and be able to convert terminating decimals into reduced fractions.
- Calculate the percentage of increases and decreases of a quantity.
- Add, subtract, multiply, and divide rational numbers and take positive rational numbers to whole-number power.
- Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
- Compute with integers.
- Write and solve proportions.
- Use ratio, proportion and percent to estimate and solve problems including discounts, profit, taxes, commissions, simple interest and compound interest.
- Use geometric models to develop the meaning of the square of a number and its positive square root.
- Investigate and estimate square root.
- Analyze and select appropriate operations, models, strategies and methods to solve a variety of multi- step problems using positive rational numbers, integers, and their inverses.

Exponents, powers, and roots

- Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base.
- Add and subtract fractions by using factoring to find common denominators.
- Multiply, divide and simplify rational numbers by using exponent rules.
- Understand the meaning of the absolute value of a number.
- Interpret the absolute value as the distance of the number from zero on a number line.
- Determine the absolute value of real numbers and expressions.

STRAND B Spatial Sense, Measurement, and Geometry

OBJECTIVES

Properties and relationships in geometry, and standard units of metric and customary measurement

- Construct perpendicular and parallel lines.
- Identify the congruent and supplementary relationships of the angles formed by cutting parallel lines by a transversal.
- Classify types of angles, triangles, and polygons.
- Locate, give the coordinates of, and graph plane figures that are the results of translations or reflections in all quadrants of the coordinate plane.
- Build models of three-dimensional figures.
- Draw end, side and top views of three-dimensional figures given models.
- Find the surface area of rectangular solids and cylinders using models.
- Find the volume of prisms and cylinders using models.
- Find the volume of prisms, cylinders, pyramids, and cones, with and without models.
- Calculate the volume of rectangular solids.
- Identify the effect on the area and perimeter when one or two dimensions of a plane figure are changed.
- Use proportions to express relationships between corresponding parts of similar figures.

Problem solving with appropriate units of measure and ratios

- Compare weights, capacities, geometric measures, times and temperatures within and between measurement systems, e.g., miles per hour and feet per second.
- Construct and read models to scale.
- Use measures expressed as rates, e.g., speed and density, and measures expressed as products, e.g., person-days, to solve problems; check the units of the solutions; use dimensional analysis to check the reasonableness of the answer.

Perimeter, area and volume of geometric objects

- Use formulas routinely to find the perimeter and area of basic two-dimensional figures and the surface area and volume of basic three-dimensional figures, including rectangles, parallelograms, trapezoids, squares, triangles, circles, prisms and cylinders.
- Estimate and compute the area of more complex or irregular two and three-dimensional figures by breaking the figures down into more basic geometric objects.
- Compute the length of the perimeter, the surface area of the faces, and the volume of a three-dimensional object built from rectangular solids.

Pythagorean theorem

- Use models to investigate the concept of the Pythagorean Theorem.
- Identify and construct basic elements of geometric figures, e.g., altitudes, mid-points, diagonals, angle bisectors, and perpendicular bisectors; central angles, radii, diameters and chords of circles by using a compass and straightedge.
- Know and understand the Pythagorean Theorem and its converse and use to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, verify by direct measurement.
- Demonstrate an understanding of conditions that indicate two geometrical figures are congruent and what congruence means about the relationships between the sides and angles of the two figures.
- Construct two-dimensional patterns for three-dimensional models, e.g., cylinders, prisms, and cones.
- Understand special right triangles, e.g., 45° and 30°/60°.

STRAND C Patterns, Algebra, and Functions

OBJECTIVES

Patterns, relationships, and fundamental algebraic concepts

- Evaluate algebraic expressions.
- Model and solve simple equations and inequalities and graph solutions.
- Interpret the meaning of a specific part of a graph in the situation represented by the graph.
- Write or model a simple linear equation or inequality to solve a given problem.
- Solve two-step linear equations and inequalities one variable over the rational numbers.
- Write a problem given a simple linear equation or inequality.
- Describe, extend, analyze and create a wide variety of patterns to investigate relationships and solve problems.
- Find the equation of a line in slope-intercept form given a graph or two points on a line.
- Identify the slope, X-intercept and y-intercept of an equation or graph.

Quantitative relationships using algebraic terminology, expressions, equations, inequalities, and graphs

- Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description, e.g., three less than a number.
- Use correct order of operations to evaluate algebraic expressions.
- Simplify numerical expressions by applying properties of rational numbers and justify process used.
- Use algebraic terminology correctly.

Interpret and evaluate expressions involving integer powers and simple roots

- Interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse.
- Simplify and evaluate expressions that include exponents.
- Multiply and divide monomials; extend the process of taking powers and extracting roots to monomials.

STRAND D Data, Probability, and Statistics

OBJECTIVES

Graphing, probability, and data analysis

- Interpret and construct histograms.
- Compare bar graphs and histograms.
- Construct circle graphs using ratios, proportions, and percents.
- Create, compare, contrast, and evaluate different graphic representations of the same data.
- Know various forms of display for data sets, including a stem and leaf plot or box and whisker plot.
- Represent two numerical variables on a scatter-plot and describe how the data points are distributed.
- Understand and compute the minimum, the lower quartile, the median, the upper quartile, and the maximum of a data set.
- Identify appropriate uses of different measures of central tendency.
- Recognize and identify misuses of statistical and numerical data.
- Find all possible outcomes of simple experiments using lists, tree diagrams, frequency distribution tables, and the Fundamental Counting Principle.
- Compute and apply simple permutations and combinations.
- Find the probability of independent and dependent events.
- Explain the relationship between experimental results and theoretical probability.

STRAND E Mathematical Reasoning

OBJECTIVES

Problem solving

- Identify relationships, distinguish relevant from irrelevant information, identify missing information, sequence and prioritize information and observe patterns.
- Determine when and how to break a problem into simpler parts.
- Solve problems using logical reasoning, arithmetic and algebraic techniques.
- Use estimation to verify the reasonableness of results.
- Apply strategies and results from simpler problems to more complex problems.
- Estimate unknown quantities graphically.
- Use inductive and deductive reasoning.
- Explain mathematical reasoning with a variety of methods including words, numbers, symbols, charts, graphs, tables, diagrams, and models.
- Express solution using appropriate mathematical notation, terms and language.
- Support solutions with evidence in both verbal and symbolic work.
- Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- Make precise calculations. Check validity of results from the context of the problem.
- Evaluate the reasonableness of a solution in the context of the original situation.
- Demonstrate conceptual understanding by noting the method of solution of one problem to solve similar problems.
- Generalize results and strategies solving problems and apply to new problems.