



Shakopee Area Catholic School
Math Standards and Benchmarks
Grade Level: 8 - Algebra

The students will apply skills of mathematical representations, communication and reasoning.

1. Assess the reasonableness of a solution by comparing the solution to appropriate graphical or numerical estimates or by recognizing the feasibility of solutions in a given context and rejecting extraneous solutions.
2. Appropriately use examples and counterexamples to make and test conjectures, justify solutions, and explain results
3. Translate a problem described verbally or by tables, diagrams or graphs, into suitable mathematical language, solve the problem mathematically and interpret the result in the original context.
4. Support mathematical results by explaining why the steps in a solution are valid and why a particular solution method is appropriate.
5. Determine whether or not relevant information is missing from a problem and if so, decide how to best express the results that can be obtained without that information.
6. Know and use the relationship that exists among a logical implication of the form “if A, then B,” its converse “if B, then A,” its inverse “if not A, then not B,” and its contra positive “if not B, then not A.”

The students will use real numbers, represented in a variety of ways, to quantify information and to solve real-world and mathematical problems.

The students will appropriately use calculators and other technologies to solve algebraic, geometric, probabilistic and statistical problems.

1. Apply the correct order of operations and grouping symbols when using calculators and other technologies.
2. Know, use and translate calculator notational conventions to mathematical notation.
3. Recognize that applying an inverse function with a calculator may lead to extraneous or incomplete solutions.
4. Understand the limitations of calculators such as missing or additional features on graphs due to viewing parameters or misleading representations of zero or very large numbers.
5. Understand that use of a calculator requires appropriate mathematical reasoning and does not replace the need for mental computation.

The students will represent and analyze real-world and mathematical problems using numeric, graphic and symbolic methods for a variety of functions.

1. Know the numeric, graphic and symbolic properties of linear, step, absolute value and quadratic functions. Graphic properties may include rates of change, intercepts, maxima and minima.
2. Model exponential growth and decay, numerically, graphically and symbolically, using exponential functions with integer inputs.
3. Analyze the effects of coefficient changes on linear and quadratic functions and their graphs.

4. Apply basic concepts of linear, quadratic and exponential expressions or equations in real world problems such as loans, investments and the path of a projectile.
5. Distinguish functions from other relations using graphic and symbolic methods.

The students will be able to solve simple equations and inequalities numerically, graphically, and symbolically. The students will use recursion to model and solve real-world and mathematical problems.

1. Translate among equivalent forms of expressions, such as, simplify algebraic expressions involving nested pairs of parentheses and brackets, simplify rational expressions, factor a common term from an expression and apply associative, commutative and distributive laws.
2. Understand the relationship between absolute value and distance on the number line and graph simple expressions involving absolute value such as, $x - 3 = 6$ or $x + 2 < 5$.
3. Find equations of a line given two points on the line, a point and the slope of the line or the slope and the y-intercept of the line.
4. Translate among equivalent forms of linear equations and inequalities.
5. Use a variety of models such as equations, inequalities, algebraic formulas, written statements, tables and graphs or spreadsheets to represent functions and patterns in real world and mathematical problems.
6. Apply the laws of exponents to perform operations on expressions with integer exponents.
7. Solve linear equations and inequalities in one variable with numeric, graphic and symbolic methods.
8. Find real solutions to quadratic equations in one variable with numeric, graphic and symbolic methods.
9. Use appropriate terminology and mathematical notation to define and represent recursion.
10. Solve systems of two linear equations and inequalities with two variables using numeric, graphic and symbolic methods.
11. Understand how slopes can be used to determine whether lines are parallel or perpendicular. Given a line and a point not on the line, find the equations for the lines passing through that point and parallel or perpendicular to the given line.

The students will represent data and use various measures associated with data to draw conclusions and identify trends. The students will understand the effects of display distortion and measurement error on the interpretation of data.

1. Construct and analyze circle graphs, bar graphs, histograms, box-and-whisker plots, scatter plots and tables, and demonstrate the strengths and weaknesses of each format by choosing appropriately among them for a given situation.
2. Use measures of central tendency and variability, such as, mean, median, maximum, minimum, range, standard deviation, quartile and percentile, to describe, compare and draw conclusions about sets of data.
3. Determine an approximate best-fit line from a given scatter plot and use the line to draw conclusions.
4. Know the influence of outliers on various measures and representations of data about real world and mathematical problems.

The students will use appropriate counting procedures, calculate probabilities in various ways and apply theoretical probability concepts to solve real-world and mathematical problems.

1. Select and apply appropriate counting procedures to solve real-world and mathematical problems, including probability problems.

2. Use area, trees, unions and intersections to calculate probabilities and relate the results to mutual exclusiveness, independence and conditional probabilities, in real-world and mathematical problems.
3. Use probability models, including area and binomial models, in real-world and mathematical problems.
4. For simple probability models, determine the expected values of random variables.
5. Know the effect of sample size on experimental and simulation probabilities.
6. Use a variety of experimental, simulation and theoretical methods to calculate probabilities.

The students will use models to represent and understand two- and three-dimensional shapes and how various motions affect them. The students will recognize the relationship between different representations of the same shape.

1. Use models and visualization to understand and represent three-dimensional objects and their cross sections from different perspectives.

The students will apply basic theorems of plane geometry, right triangle trigonometry, coordinate geometry and a variety of visualization tools to solve real-world and mathematical problems.

1. Know and use theorems about triangles and parallel lines in elementary geometry to justify facts about various geometrical figures and solve real-world and mathematical problems. These theorems include criteria for two triangles to be congruent or similar and facts about parallel lines cut by a transversal.
2. Know and use theorems about circles to justify geometrical facts and solve real-world and mathematical problems. These theorems include the relationships involving tangent lines and radii, the relationship between inscribed and central angles and the relationship between the measure of a central angle and arc length.
3. Know and use properties of two- and three-dimensional figures to solve real-world and mathematical problems such as: finding area, perimeter, volume and surface area; applying direct or indirect methods of measurement; the Pythagorean theorem and its converse; and properties of 45° - 45° - 90° and 30° - 60° - 90° triangles.
4. Apply the basic concepts of right triangle trigonometry including sine, cosine and tangent to solve real-world and mathematical problems.
5. Use coordinate geometry to represent and examine geometric concepts such as the distance between two points, the midpoint of a line segment, the slope of a line and the slopes of parallel and perpendicular lines.

The students will use the interconnectedness of geometry, algebra and measurement to explore real-world and mathematical problems.