Overarching Topics Across Mathematics Programs

Topic: Number Sense and Operations

- *Learning Outcome*:Recognize numbers, number systems and the relationships between them.
  Performance Objective(s):
  - Compare and order real numbers.
  - Identify all sets of which a given number is a member.
  - Give an example of any number described by the sets to which it does belong as well as those sets to which it does not belong.
  - Show the relationship between the various sets of numbers using any suitable pictorial representation.

Topic: Number Sense and Operations

- *Learning Outcome*: Understand and be able to apply the properties of real and complex numbers.
  Performance Objective(s):
  - Use effectively and accurately the associative, commutative and distributive properties.
  - Give the multiplicative and/or additive inverse of any real number.
  - Name the identity for multiplication and for addition of real numbers.
  - Use the order of operations to simplify numerical expressions.

Topic: Number Sense and Operations

- *Learning Outcome*: Have a working knowledge of the fundamental operations between numbers of the same or different sets with and/or without using a calculator.
  Performance Objective(s):
  - Add, subtract, multiply, and/or divide elements of the following sets: integers, rational numbers, irrational numbers, and complex numbers.
  - Raise integers, rational, and irrational numbers to any given power.
  - Extract or simplify the square and/or cube root of any given integer or rational number for which the expression is defined.

Topic: Number Sense and Operations

- *Learning Outcome*: Compute fluently and make reasonable estimates.
  Performance Objective(s):
  - Find approximate values of square and cube roots without the use of a calculator.
  - Apply an understanding of number systems to model and solve mathematical and applied problems.
  - Use estimation to judge the reasonableness of results of computations and of solutions to problems.
  - Use dimensional analysis for unit conversion and to confirm that expressions and equations make sense.

Topic: Patterns, Relationships, and Functions

- *Learning Outcome*: Students recognize similarities and generalize patterns using them to create models and make predictions.
  Performance Objective(s):
  - Analyze, interpret, and translate among representations of patterns including tables, charts, graphs and equations.
  - Recognize families of functions generated by applying transformations to fundamental functions.
  - Use patterns and reasoning to solve problems and explore new contents and to use technology where appropriate.

Topic: Patterns, Relationships, and Functions

- *Learning Outcome*: Represent, analyze, and solve mathematical situations using algebraic methods.

  Performance Objective(s):
  - Solve equations (linear, absolute value, rational, radical, exponential, quadratic, direct and inverse variation).
  - Solve inequalities.
  - Solve literal equations for a specific variable.
  - Solve systems of equations.
  - Analyze and determine strategies to solve problems that can be modeled by functions and/or equations.

Topic: Patterns, Relationships, and Functions

- *Learning Outcome*: Relate graphs of functions to their equations or inequalities.

  Performance Objective(s):
  - Determine domain and range of functions.
  - Determine the slope of a line and x and y intercepts.
  - Find the vertex of quadratic equations.
  - Write the equation of functions given various information.
  - Use technology where appropriate including setting a window on a graphing calculator.

Topic: Patterns, Relationships, and Functions

- *Learning Outcome*: Operations on Functions

  Performance Objective(s):
  - Find a composite function and evaluate it at given points.
  - Find the inverse of a function if it exists.
  - Recognize inverse functions by their graphs.

Topic: Geometry and Measurements

- *Learning Outcome*: Analyze characteristics and properties of two and three dimensional geometric figures.

  Performance Objective(s):
  - Recognize special types of polygons.
  - Know and apply properties of sides, angles, and diagonals in special polygons.
  - Establish relationships within and between shapes including parallelism, perpendicularity, congruence, and similarity.
  - Detect symmetries of geometric figures on paper as well as in nature and architecture.

Topic: Geometry and Measurement

- *Learning Outcome*: Determine and verify relationships between internal and external parts of polygonal figures and between congruent and similar figures.

  Performance Objective(s):
  - Apply congruence and similarity correspondences and/or the properties of the given figure to find missing parts of geometric figures .
  - Provide logical justification for relationships among and between parts of geometric special figures.
  - Know the fundamental trigonometric ratios and apply them to solve problems.
  - Know and apply the following important triangular relationships:
    - Pythagorean Theorem
    - Special right triangles

      30-60-90

      45-45-90

Topic: Geometry and Measurement

- *Learning Outcome*: Recognize and know relationships between angles, segments, and lines defined on a circle.

  Performance Objective(s):
  - Recognize the four special types of angles.
  - Know and apply properties of sides, angles, radii, and diameters.

Topic: Geometry and Measurement

- *Learning Outcome*: Calculate various measurements relating to special geometric figures, including polygonal and circular figures – in two or three dimensions.

  Performance Objective(s):
  - Know and apply the formula for perimeter, circumference, area, and volume of plane geometric figures, including triangles, parallelograms, rectangles, trapezoids, and circles.
  - Given the formula, find the lateral area, surface area and volume of prisms, pyramids, spheres, cylinders, and cones.
  - Relate changes in the measurement of one attribute of an object to changes in other attributes.
  - Know and apply distance and mid-point formulas.

Topic: Data Analysis and Probability

- *Learning Outcome*: Understand and apply basic concepts of probability.

  Performance Objective(s):
  - Develop an understanding of randomness, chance, and odds.
  - Set up a sample space to determine the theoretical probability of simple and compound events.
  - Compare the theoretical and experimental probabilities for the same event.

Topic: Data Analysis and Probability

- *Learning Outcome*: Collect and organize data into a useful form.

  Performance Objective(s):
  - Collect and explore data through observation, measurement, and surveys. Surveys, both in their content and approach, should reflect Catholic philosophy and Catholic social consciousness.
  - Organize data using tables, charts, graphs, and spreadsheets.
  - Find and interpret mean, median, and mode.

Topic: Data Analysis and Probability

- *Learning Outcome*: Develop and evaluate inferences and predictions based on data.

  Performance Objective(s):
  - Critically read collected data from various formats and make inferences based on the data.
  - Formulate and communicate arguments and conclusions based on data.