MATHEMATICS
High School Standards

By the end of tenth grade, students determine, understand, apply, and justify properties involving geometric figures. They pose, test, and justify conjectures in algebraic and geometric contests. Students write, simplify, evaluate and solve linear, quadratic inverse variation, and other equations in applied and abstract contexts. Students work with a variety of algebraic expressions, generalize exponent properties and use right-triangle trigonometry in applications.

By the end of twelfth grade, students understand and can justify advanced and abstract ideas in algebra, geometry, and trigonometry. They can perform complex algebraic simplifications and manipulations as required to solve problems. Students use algebraic and geometric arguments to prove important mathematical ideas. They have a deep understanding of families of functions, exponential equations, their use in the world and the mathematical techniques required to write, solve, simplify and interpret features of standard functions. Students understand and apply the connection between a function and its inverse; between right triangle trigonometry and circular functions; and between coordinates in polar vector and rectangular form.

CONTENT STANDARD 1

1. Number Sense and Operations

Not applicable

CONTENT STANDARD 2

2. Measurement and Geometry

Students will:

- Identify common geometric objects and explore properties such as length, weight, capacity
- Describe, draw and compare the attributes of plane and solid geometric figures and classify them by common attributes and describe their relative location and use their understanding to show relationships and solve problems
- Students explore the concept of time
- Use direct comparison and non-standard units to describe the measurements of objects
- Understand that measurement is accomplished by identifying a unit of measure and comparing it to the item to be measured
- Identify and describe the elements that compose common figures in the plane and common objects in space
- Choose appropriate units and measurement tools to quantify the properties of objects
- Understand perimeter, area, and volume of objects and measure in English and Metric units

Performance Indicators

2.HS.1	Estimate quantity, length, distance, weight, time, capacity and temperature by applying techniques of estimations.
2.HS.2	Calculate length, area, and volume by applying formulas.
2.HS.3	Apply appropriate tools of measurement (rulers, protractors, compasses, tape measures, transits, etc.) to measure the dimensions of various.

2.HS.4 Sketch geometric figures and identify their dimensions.
2.HS.5 Measure using English and Metric units.

2.HS.6 Describe, relate, and differentiate a plane, line, ray, and line segment.

2.HS.7 Identify, describe, compare, and classify parallel, perpendicular and intersecting lines.

2.HS.8 Classify and analyze geometric figures in terms of differences, similarities and congruence.

2.HS.9 Construct visual representations of three dimensional objects from descriptions or given dimensions.

2.HS.10 Represent problem situations with geometric models and apply properties of figures.

2.HS.11 Deduce properties of, and relationships between figures and given assumptions.

2.HS.12 Compute the perimeter, circumference, area, and volume of real objects.

2.HS.13 Analyze the effects of basic transformation on geometric shapes using coordinates.

2.HS.14 Identify congruent and similar figures using transformations.

CONTENT STANDARD 3

3. Algebra

Students will:
- Sort and classify objects
- Use number sentences to solve problems
- Model, represent, and interpret number relationships to create and solve problems involving addition and subtraction
- Select appropriate symbols, operations and properties to represent, describe, simplify, and solve problems involving number relationships
- Use and interpret variables, mathematical symbols and properties to write and simplify expressions and equations, compute the value or values of a specific variable, and plot and interpret the results

Performance Indicators

3.HS.1 Represent (real world) situations that involve variable quantities with expressions, equations, and inequalities.

3.HS.2 Use tables and graphs as tools to interpret expressions, equations, inequalities, and functions.

3.HS.3 Solve problems involving equations and inequalities using manipulatives, symbols, charts, diagrams, and tables.

3.HS.4 Operate on expressions and matrices, and solve equations and equalities.

3.HS.5 Use patterns to generate the laws of exponents.

CONTENT STANDANRD 4

4. Probability and Statistics

Students will:

- Collect information about objects and events in the environment
- Organize, represent, compare, and interpret categorical data on simple graphs and charts and communicate their findings
- Collect, record, organize, display, and interpret numerical data on bar graphs, and other representations
- Display, analyze, compare and interpret different data sets, including data sets that are not the same size
- Demonstrate an understanding of patterns and how they grow, and describe them in general ways
- Conduct simple probability experiments by determining the number of possible outcomes, and make simple predictions

Performance Indicators

4.HS.1 Develop a plan for collecting data, choosing an appropriate sampling method, then communicate the information in the form of charts, tables, and graphs.

4.HS.2 Make appropriate inferences and predictions from displayed data.

4.HS.3 Solve and analyze the effects of data transformations on central tendency, variability, and correlation.

4.HS.4 Use simulations to estimate probabilities.

4.HS.5 Understand the concept of random variable.

4.HS.6 Create and interpret discrete probability distributions.

CONTENT STANDARD 5

5. Problem Solving and Reasoning

Students will:

- Make decisions about how to set up a problem, justify their reasoning, and make connections between problems
- Use strategies, skills and concepts to make decisions about how to approach problems, find solutions, and make generalizations to other situations

Performance Indicators

5.HS.1 Make and test conjectures

5.HS.2 Interpret and verify results of real-world problems by formulating counter examples.

5.HS.3 Follow logical arguments.

5.HS.4 Judge the validity of an argument.

5.HS.5 Recognize and apply deductive and inductive reasoning.

5.HS.6 Construct simple valid arguments.

5.HS.7 Apply mathematical thinking and modeling to solve problems that arise in other disciplines such as art, music, science, and business.

All students are encouraged to continue their study of mathematics beyond the grade 10 benchmark year. Further courses should include content described below and may go beyond the content specified here to include rigorous courses in calculus, statistics, linear algebra, discrete mathematics and/or advanced geometry.

I. Trigonometry

I.HS.1 Apply trigonometry to problem situations involving triangle.

I.HS.2 Explore periodic real-world situations using trigonometric functions.

I.HS.3 Use circular functions to model periodic real-world phenomena.

I.HS.4 Apply general graphing techniques to trigonometric functions.

I.HS.5 Solve trigonometric equations and verify trigonometric identities.

II. Precalculus/Calculus

II.HS.1 Construct and draw inferences from charts, tables, and graphs that summarize data from real-world situations.

II.HS.2 Use curve fitting to predict from data.

II.HS.3 Understand and apply measures of central tendency, variability, and correlation.

II.HS.4 Understand sampling and recognize its role in statistical claims.

II.HS.5 Design a statistical experiment to study a problem, conduct the experiment, and interpret and communicate the outcomes.

II.HS.6 Test hypotheses using appropriate statistics.

II.HS.7 Use experimental or theoretical probability, as appropriate, to represent and solve problems involving uncertainty.

II.HS.8	Use simulations to estimate probabilities.
II.HS.9	Understand the concept of a random variable.
II.HS.10	Describe, in general terms, the normal curve and use its properties to answer questions about sets of data that are assumed to be normally distributed.
II.HS.11	Expand binomials and use the Binomial Theorem to solve probability problems.
II.HS.12	Demonstrate the understanding of equations of lines.
II.HS.13	Appreciate the significance of the solutions of quadratic equations.
II.HS.14	Be able to communicate with others about equations of circles and the intersections of lines circles.
II.HS.15	Analyze the effects of parameter changes on the graphs of functions so the student can understand operations on, and the general properties and behavior of, classes of functions--including functions that display symmetry and asymptotic behavior.
II.HS.16	Understand polar coordinates/equations and their relationships to rectangular coordinates/equations.
II.HS.17	Discuss the geometric representation of complex numbers including their conversion from polar to rectangular form.
II.HS.18	Demonstrate the understanding of roots of complex numbers.
II.HS.19	Understand the meanings of arithmetic and geometric sequence - including the meaning of recursive definition of a sequence.
II.HS.20	Demonstrate the understanding of arithmetic and geometric series and their sums and apply this knowledge to real-world problems.
II.HS.21	Discuss the concepts of the limit of an infinite sequence and the sum of an infinite series as well as sigma notation.
II.HS.22	Understand the method of mathematical induction to prove statements.
II.HS.23	Understand the concept of vectors and the geometric representation of vectors.
II.HS.24	Demonstrate the understanding of the polar and component form of an vector.
II.HS.25	Perform the basic operations of vectors.
II.HS.26	Apply the concept of vectors to real-world problems.
II.HS.27	Understand the significance of the dot product.

II.HS.28	Be able to work with vectors in three dimensions and recognize the equation of a plane.
II.HS.29	Be able to discuss determinants and their applications (including vectors in three dimensions.
II.HS.30	Demonstrate the understanding of the definition, domain and range of a function.
II.HS.31	Be aware of algebra and the composition of functions.
II.HS.32	Demonstrate the understanding of the absolute value functions.
II.HS.34	Discuss periodicity, graphs, symmetry, and asymptotes.
II.HS.35	Find and discuss the significance of the zeroes of a function.
II.HS.36	Derive trigonometric identities.
II.HS.37	Recognize and graph trigonometric functions, exponential and logarithm functions.
II.HS.38	Define and discuss algebraic properties which apply to limits.
II.HS.39	Demonstrate the understanding of the number *e* as a limit.
II.HS.40	Discuss continuity and its uses.
II.HS.41	Discuss differentiability vs. continuity.
II.HS.42	Find derivatives of elementary, exponential, and logarithm functions.
II.HS.43	Use the sum, product, quotient and chain rule.
II.HS.44	Discuss and find higher order derivatives.
II.HS.45	Discuss and explain the significance of the mean value theorem.
II.HS.46	Use the derivative as an aid in curve sketching to find the maximum and minimum values of functions, to solve problems about velocity and acceleration, rates of change.
II.HS.47	Use basic formulas as well as a substitution and integration by parts to find the anti-derivative of functions.
II.HS.48	Define and calculate Riemann sums.
II.HS.49	Explain the fundamental theorem of calculus.
II.HS.50	Use the integral to solve average value, area, volume and work problems.