Course Outline

School Name:	Keewaytinook Internet High School
Department Name:	Mathematics
Ministry of Education Course Title:	Mathematics for College Technology
Grade Level:	12
Ministry Course Code:	MCT4C

Teacher's Name:	Zafer Erol
Developed by:	Erik Tu Date: July 2015
Revision Date:	September 2018
Developed from:	The Ontario Curriculum, Grades 11 and 12, Mathematics, 2007
Text:	None
Prerequisite:	Functions and Applications, Grade 11, University/College Preparation
Credits:	1
Length:	110 hours
Principal's Name:	Kevin Dempsey
Principal's Approval (signature)	
Approval Date:	September 17, 2018

Course Description/Rationale

This course enables students to extend their knowledge of functions. Students will investigate and apply properties of polynomial, exponential, and trigonometric functions; continue to represent functions numerically, graphically, and algebraically; develop facility in simplifying expressions and solving equations; and solve problems that address applications of algebra, trigonometry, vectors, and geometry. Students will reason mathematically and communicate their thinking as they solve multi-step problems. This course prepares students for a variety of college technology programs.

Overall Curriculum Expectations

- solve problems involving exponential equations graphically, including problems arising from real world applications;
- solve problems involving exponential equations algebraically using common bases and logarithms, including problems arising from real-world applications;
- recognize and evaluate polynomial functions, describe key features of their graphs, and solve problems using graphs of polynomial functions;
- make connections between the numeric, graphical, and algebraic representations of polynomial functions;
- solve polynomial equations by factoring, make connections between functions and formulas, and solve problems involving polynomial expressions arising from a variety of applications;
- determine the values of trigonometric ratios for angles less than 360, and solve problems using the primary trigonometric ratios, the sine law and the cosine law;
- make connections between the numeric, graphical, and algebraic representations of sinusoidal functions;
- demonstrate an understanding that sinusoidal functions can be used to model some periodic phenomena, and solve related problems, including those arising from real-world applications;
- represent vectors, add and subtract vectors, and solve problems using vector models, including those arising from real-world applications;
- solve problems involving two-dimensional shapes and three-dimensional figures and arising from real-world applications;
- determine circle properties and solve problems, including those arising from real-world applications.

Course Content

Unit	*Length*
Graphing Exponential Functions	16 hours
Exponential and Logarithmic Functions	16 hours
Key features of Polynomial Functions	16 hours
Exploring Polynomial Functions	16 hours
Graphing Trigonometric Functions	16 hours
Exploring Trigonometric Functions	15 hours
Applications of Geometry	15 hours
Total	110 hours

Unit Descriptions

Unit 1 - Graphing Exponential Functions
Through models, students are introduced to the definition of an exponential function and the notations associated with it. Students use graphing technology and paper-and-pencil tasks to investigate the properties of exponential functions. Students explore the domain and range of functions.

Unit 2 - Exponential and Logarithmic Functions
Students investigate properties of exponential functions and logarithmic functions. The relationship between exponential function and logarithmic function is explores both algebraically and graphically. Students use laws of logarithms to simplify and evaluate logarithmic expressions, and to solve problems. A variety of models are examined.

Unit 3 - Key features of Polynomial Functions
Students are introduced to the main concepts of graphing polynomial functions in order to explore them. Later in the course. Students examine the type and numbers of intercepts, the effect of changing coefficients, symmetry and the degree in relation to the shape of the functions. Using skills from previous years, students explore curve sketching from a factored form.

Unit 4 - Exploring Polynomial Functions
Students will explore polynomial equations. Real and complex roots of both factorable and non-factorable polynomials are determined through graphical investigation and algebraic manipulation. Finally, students will solve problems that involve functions arising from real-world applications.

Unit 5 - Graphing Trigonometric Functions
Students investigate the periodic nature and graphical properties of the primary trigonometric functions. Students use the primary trigonometric ratios, the sine law, and the cosine law to model and solve triangles. Students investigate the relationship between degree and radian measure, and explore the use of the unit circle and special triangles to determine selected values of the primary trigonometric ratios.

Unit 6 - Exploring Trigonometric Functions
Students consolidate and extend concepts first introduced. Using technology, students explore the effects of simple transformations on their graphs and equations. Students apply these concepts to model authentic and real-world problems. Students develop the skills to manipulate and solve trigonometric equations.

Unit 7 - Application of Geometry
Students will investigate, and then solve real-world problems. They will demonstrate an understanding of vectors, two-dimensional, three-dimensional in a variety of ways, including circle and related problems.

Teaching/Learning Strategies
In order to address the wide range of expectations in this course, a variety of teaching, learning, and assessment strategies and tools need to be used including the following:

- the use of rich contextual problems which engage students and provide them with opportunities to demonstrate learning, and appreciate the need for new skills;
- the prompting, supporting, and challenging of individual students;
- the use of technological tools and software (e.g., graphing software, dynamic geometry software, the Internet, spreadsheets, and multimedia) in activities, demonstrations, and investigations to facilitate the exploration and understanding of mathematical concepts;
- the use of learning/performance tasks that are designed to link several expectations and give the students occasion to demonstrate their optimal levels of achievement through the demonstration of skill acquisition, the communication of results, the ability to pose extending questions following an inquiry, and the determination of a solution to unfamiliar problems;
- the use of accommodations, remediation, and/or extension activities, where necessary, to meet the needs of students with exceptionalities;

In addition to the contribution of the teacher, students themselves should play an active role in their own learning. In order to successfully complete the requirements of this course, students are expected to
- develop an increased responsibility for their own learning;
- be accountable for prerequisite skills;
- participate as active learners;
- engage in explorations using technology;
- apply individual and group learning skills;

- describe mathematical patterns that emerge verbally, algebraically, and visually in the course of learning.

Evaluation

The final grade will be determined as follows:

- Seventy per cent of the grade will be based on evaluation conducted throughout the course. This portion of the grade should reflect the student's most consistent level of achievement throughout the course, although special consideration should be given to more recent evidence of achievement.
- Thirty per cent of the grade will be based on a final evaluation administered at or towards the end of the course. This evaluation will be based on evidence from one or a combination of the following: an examination, a performance, an essay, and/or another method of evaluation suitable to the course content. The final evaluation allows the student an opportunity to demonstrate comprehensive achievement of the overall expectations for the course.

Growing Success: Assessment, Evaluation and Reporting in Ontario Schools. Ontario Ministry of Education Publication, 2010, p. 41.

Type of Assessment	Category	Details		Weighting (%)
Term Work (70%)	Knowledge/ Understanding	-Identify properties of functions using technology -Use key properties of functions		13
	Thinking	-Solve equations -Model exponential growth and decay -Model polynomial and trigonometric functions		19
	Communication	-Sketching functions and their inverse -Describe the nature of function change -Determine connections between functions and their inverse		19
	Application	-Solve exponential/polynomial equations arising from real-world applications -Apply logarithmic laws -Applying sine law and cosine law		19
Final Assessment (30%)	Culminating Activity (15%)	-Plot functions using technology -Perform transformations to plotted functions -Solve equations representing real world scenarios -Calculate triangle side lengths and angles using sine and cosine laws	K/U	3
			T	4
			C	4
			A	4
	Final Exam (15%)	-Simplify and solve equations -Analyse and determine key points such as vertex, intercepts, min/max value -Solve problems using graphical Representations of data -Solve problems arising from real-world applications	K/U	3
			T	4
			C	4
			A	4
			TOTAL	100

Assessment/Evaluation Strategies

An effective assessment program in mathematics must include a balance of diagnostic, formative and summative assessment instruments that incorporate the categories of learning as defined in The Achievement Chart for Mathematics. One approach is shown below:

	Knowledge/ Understanding	**Thinking**	**Communication**	**Application**
final examinations	✓	✓	✓	✓
observations		✓	✓	✓
performance tasks	✓	✓	✓	✓
quizzes	✓			
reports/assignments	✓		✓	✓
student-teacher conferences	✓		✓	
unit tests	✓	✓	✓	✓

Assessment tools such as observational checklists, performance criteria, the Achievement Chart for Mathematics, marking schemes, and rating scales can and should be used to assist in developing objective and consistent evaluations of student achievement.

Resources

Mathematics 12, McGraw-Hill Ryerson, 2001.

Ontario Ministry of Education. (2010). *Growing Success: Assessment, Evaluation and Reporting in Ontario School*s. Retrieved from http://www.edu.gov.on.ca/eng/policyfunding/growSuccess.pdf

Ontario Ministry of Education (2018). *Indigenous education strategy.* Retrieved from htpp://www.edu.gov.on.ca/eng/aboriginal/

Ontario Ministry of Education (2016). Ontario schools, kindergarten to grade 12: Policy and program requirements. Retrieved from htpp://www.edu.gov.on.ca/eng/document/policy/os/index.html

Quattro Pro, Geometer's Sketchpad

Program Planning

This course is offered to indigenous students living in northern Ontario communities which do not have access to regular high school facilities, equipment or teachers associated with secondary education. This course uses the internet for instruction, demonstration and research. It uses a student centered semi-virtual classroom which

capitalizes on the strengths of the internet program delivery to minimize the disadvantages of geographic remoteness.

Students are presented with instruction/activity via the internet. All lessons, assignments, questions and course material is presented in this manner with approved print materials available as a student resource. The student and instructor communicate via the internet, and there are regular, interactive, internet-based lessons during which the instructor presents key information to the class, and students have an opportunity to interact verbally with their instructor. A classroom mentor (a fully qualified teacher) assists students in completing tasks in a timely manner and provides tutoring as required. Students may also receive support from various programs at KIHS, including the First Nation Student Success Program and the Special Education Program.

Indigenous and local content is used throughout the course to meet students' learning needs. Considerations are made to the learning preferences of the student population, and lessons can be adjusted for individual students as required.