

Course Outline

School Name: Keewaytinook Internet High School

Department Name: Mathematics

Ministry of Education Course Title: Foundations of Mathematics

Grade Level: 10

Ministry Course Code: MFM2P

Teacher's Name: Erik Tu

Developed by: Erik Tu

Date: August 2016

Revision Date: August 2017

Developed from: The Ontario Curriculum, Grade 9 and 10, Mathematics, 2005

Text: Mathpower 10, McGraw-Hill Ryerson, Ontario Edition, 2005

Prerequisite: MFM1P or MPM1D

Credits: One

Length: 110 hours

Principal's Name: Kevin Dempsey

Principal's Approval (signature)



Approval Date: September 11, 2017

Course Description/Rationale

This course enables students to consolidate their understanding of linear relations and extend their problem-solving and algebraic skills through investigation, the effective use of technology, and hands-on activities. Students will develop and graph equations in analytic geometry; solve and apply linear systems, using real-life examples; and explore and interpret graphs of quadratic relations. Students will investigate similar triangles, the trigonometry of right triangles, and the measurement of three-dimensional figures. Students will consolidate their mathematical skills as they solve problems and communicate their thinking.

Overall Curriculum Expectations

Measurement and Trigonometry

- use their knowledge of ratio and proportion to investigate similar triangles and solve problems related to similarity;
- solve problems involving right triangles, using the primary trigonometric ratios and the Pythagorean theorem;
- solve problems involving the surface areas and volumes of three-dimensional figures, and use the imperial and metric systems of measurement.

Modelling Linear Relations

- manipulate and solve algebraic equations, as needed to solve problems,
- graph a line and write the equation of a line from given information,
- solve systems of two linear equations, and solve related problems that arise from realistic situations.

Quadratic Relations of the Form $y = ax^2 + bx + c$

- manipulate algebraic expressions, as needed to understand quadratic relations;
- identify characteristics of quadratic relations;
- solve problems by interpreting graphs of quadratic relations.

Course Content

Unit	Length
Measurement and Trigonometry	38 Hours
Linear Relations	40 Hours
Quadratic Functions	32 Hours
Total	110 Hours

Unit Descriptions

Unit 1 - Measurement and Trigonometry

This unit will investigate the properties of similar triangles and determine the primary trigonometric ratios. The primary trigonometric ratios will provide students with a method to solve triangle problems in realistic situations.

Unit 2 - Linear Relations

In this unit, students will explore linear functions. Students will solve complex equations and translate written descriptions of equations into mathematical expressions. Students will use a variety of techniques to graph linear equations such as paper-and-pencil and graphing software. Students will use algebraic methods to find the intersection point of two lines, without drawing a line graph. Students will learn about an algebraic technique called elimination. Once this technique is mastered they will use this technique to solve systems of equations derived from word problems.

Unit 3 - Quadratic Functions

In this unit, students will discover that not all relationships are linear. Students will learn that one type of non-linear relationship is a special curve that describes a quadratic relationship. Students will describe a nature of changes in a quadratic function using finite differences in a table of values. They will determine the zeros and maximum and minimum value of a quadratic function using graphical and algebraic techniques. Students will solve problems related to many applications using spreadsheet software.

Unit 4 - Final Assessment Activities

This unit will be used to model a final assessment in Grade 10 mathematics. Individual and group performance skills will be assessed using traditional and performance based tasks, over a period of several days. Thirty percent of the final evaluation for the course will be based on this summative assessment unit and it is recommended that at least $\frac{2}{3}$ be based on performance tasks, and at most $\frac{1}{3}$ be based on pencil and paper tests. It is suggested that the form and substance of this summative assessment unit be shared with students and their parents near the beginning of the course, so that their energies can be directed towards acquisition of the required skills and knowledge.

In this final assessment unit, students will demonstrate their achievement of the expectations of the course. They will do this by solving problems which require them to:

- form and test conjectures;
- model situations;
- gather, organize, and display data for a purpose;
- identify necessary and/or sufficient conditions in a problem;
- decide, with awareness, what is important and what can be ignored in a problem.
- communicate reasoning and results;
- demonstrate their skills using technology for a purpose;
- carry out pencil and paper routines.

Teaching/Learning Strategies

The course is organized into a eight-week series of lessons delivered to students via the internet to computers set up at an access site in their communities.

Weeks eight is used for culminating activities, and the final examination. The delivery of lessons, assignments, questions, and course material relies heavily on the use of an internet connection, the availability of e-mail, as well as feedback and comments on assignments and the 'Discussion' section. The teacher/mentor in each community acts as a liaison between the instructor and the student.

Only through the use of a wide variety of teaching, learning, and assessment strategies and tools can the wide range of expectations in this course be addressed.

Instructional strategies in Grade 10 Mathematics include the following:

- Use electronic technology in investigations as appropriate (including computer software, calculators, video, and digital effects).
- Promote direct involvement in a variety of concrete experiences with the natural world which enable students to construct their own understanding of concepts and principles.
- Use formative assessment to provide opportunities for re-learning.
- Address a variety of learning styles in each unit.
- Plan so that sufficient class time is spent in engaging students in the solution of rich contextual problems.
- Be accountable to addressing the overall and specific expectations in their planning, and accountable to tracking student progress in the overall expectations, including the most specific expectations.
- Provide many opportunities for students to demonstrate their ability to meet course expectations.
- Provide opportunities for students to practice or extend their skills and knowledge, outside of the classroom.
- Ensure that the culmination of an activity helps the students to build a solid understanding of the mathematical concepts arising from that activity and sets the stage for future learning.
- Prompt at the beginning of an activity, provide suggestions in the middle, and support a challenge at the end, as needed by individual students, and by the class as a whole.
- Use learning/performance tasks that are designed to link several expectations and give the students occasion to demonstrate their optimal levels of achievement through the communication of results, the ability to pose extending questions following and inquiry, and to provide the solution to unfamiliar problems.
- Provide regular, informal assessment which provides the feedback that students need in order to improve their achievement.
- Provide remedial or extension opportunities.

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 Education Publication, 2010, p. 41.

Type of Assessment	Category	Details	Weighting %	
Term Work (70%)	Knowledge/ Understanding	-use knowledge of ratio and proportion to investigate similar triangles and solve problems related to similarity	13%	
	Thinking	- manipulate algebraic expressions, as needed to understand quadratic relations. - manipulate and solve algebraic equations, as needed to solve problems.	19%	
	Communication	- solve problems involving right triangles, using the primary trigonometric ratios and the Pythagorean theorem. - solve problems involving the surface areas and volumes of three-dimensional figures, and use the imperial and metric systems of measurement. - solve systems of two linear equations, and solve related problems that arise from realistic situations. - solve problems by interpreting graphs of quadratic relations.	19%	
	Application	- graph a line and write the equation of a line from given information. - identify characteristics of quadratic relations.	19%	
Final Assessment (30%)	Culminating Activity	1. Similarity and Trigonometry (solve problems related to similarity; solve problems involving right triangles, using the primary trigonometric ratios) 2. Linear Equations (solve systems of two linear equations, and solve related problems that arise from realistic situations.) 3. Quadratic Equations (solve problems by interpreting graphs of quadratic relations; identify characteristics of quadratic relations.)	K/U	3%
			T	4%
			C	4%
			A	4%
	Final Exam	Written examination designed to cover all of the overall expectations of the course	K/U	3%
		T	4%	
		C	4%	
		A	4%	
			TOTAL	100%

Assessment/Evaluation Strategies

Students will be assessed and evaluated through activities which focus on: paper and pencil, performance assessment, and personal communication. The following tools are used to determine how well students have achieved the expectations:

- Graphic Organizers
- Checklists
- Rating Scales
- Personal Profile
- Rubrics
- Tests

Where possible, assessment tasks are designed in “real world” contexts so that students see the learning in Foundations of Mathematics as meaningful and relevant and are motivated to apply their learning in an assessment situation.

Resources

MathPower 10, McGraw-Hill Ryerson, Ontario Edition, 2005

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

GED Mathematics, Steck-Vaughn, USA, 2002

Mathematical and Education Websites

Gateway to Educational Materials <http://www.thegateway.org/>

Kathy Schrock’s Guide for Educators <http://discoveryschool.com/shrockguide/>

MET Web Index - To find anything on the ministry’s website.
<http://www.edu.gov.on.ca/eng/webmap.html>

Software

Graphcalc, Geometer’s Sketchpad, and Calculator

Program Planning

This course is offered to Indigenous students living in isolated 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 utilizes a student-centered semi-virtual classroom which capitalizes on the strengths of internet program delivery to minimize the disadvantages of geographic remoteness.

Students are presented with 1320 minutes of instruction/activity via the internet over the period of one week. All lessons, assignments, questions and course material is presented in this manner, with approved print materials available as a student resource in each classroom. The student and instructor communicate via the internet, while 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.