

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: Nikki Osborne

Developed by: Eric Tu

Date: August 2017

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Developed from:

Ontario Ministry of Education. (2005). *The Ontario curriculum, grades 9 and 10: Mathematics*. Toronto ON: Queen's Printer for Ontario.

Text:

Knill, G., Collins, E., Conrad, E., Ferneyhough, F., Hamilton, M., Miller, R., Wardrop, H. & Webb, M. (2000). *Mathpower 10 (Ontario Edition)*. McGraw-Hill Companies.

Prerequisite: MFM1P or MPM1D

Credits: One

Length: 110 hours

Principal's Name: Angela Batsford-Mermans

Principal's Approval:



Approval Date: September 14, 2021

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
1. Measurement and Trigonometry	38 hours
2. Linear Relations	40 hours
3. Quadratic Functions	32hours
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 relevant to Indigenous peoples in Northern Ontario.

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 the 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 graphing 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

This course is organized into an eight-week series of lessons and activities that is presented to students in remote northern communities via the internet. The eighth week is used for course consolidation, review, and the final examination. Teacher and students communicate over the internet through timely activity feedback, emails, messages, video and audio calls. Classroom mentors assume the role of liaison between the teacher and student while also supporting a holistic approach to motivate, engage and support each individual student.

A variety of strategies will be used in the online delivery of this course. Some instructional strategies include:

- 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.

Learning goals will be discussed at the beginning of each assignment and success criteria will be provided to students. The success criteria are used to develop the assessment tools in this course, including rubrics and checklists.

Evaluation

The final grade will be determined as follows (Ontario Ministry of Education, 2010):

- 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 percent 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 (p. 41).

Ontario Ministry of Education. (2010). *Growing success: Assessment, evaluation and reporting in Ontario schools*. Toronto ON: Queen's Printer for Ontario.

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 Evaluation (30%)	Culminating Activity (15%)	1. Similarity and Trigonometry (solve problems related to similarity; solve problems	K/U	3
			T	4
			C	4

		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.)	A	4
	Exam (15%)	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

A variety of assessment and evaluation methods, strategies and tools are required as appropriate to the expectation being assessed. These include diagnostic, formative, and summative within the course and within each unit.

Assessment *for* learning and assessment *as* learning is obtained through a variety of means, including the following:

- Ongoing descriptive feedback;
- Self-assessment;
- Graphic organizers;
- Checklists;
- Rating Scales
- Personal profile;
- Mentor observations;
- Conversations with student on a regular basis to verbalize observations, ask questions, and clarify understanding.

Evidence of student achievement (assessment *of* learning) is collected from various sources, including the following:

- Ongoing observations of most consistent work, with consideration given to most recent work;
- Conversations with students (e.g., discussion about personal wants and needs relative to specific family and local community values as well as values in the Westernized world);
- Summative unit activities;
- Tests;
- Exam.

The Ministry of Education's 2010 document, *Growing Success*, outlines the seven fundamental principles that guide best practice in the assessment and evaluation of students. KiHS teachers use practices that:

- are fair, transparent, and equitable for all students;
- support all students, including those with special education needs, those who are learning the language of instruction (English or French), and those who are First Nation, Métis, or Inuit;
- are carefully planned to relate to the curriculum expectations and learning goals and, as much as possible, to the interests, learning styles and preferences, needs, and experiences of all students;
- are communicated clearly to students and parents at the beginning of the course and at other points throughout the school year or course;

- are ongoing, varied in nature, and administered over a period of time to provide multiple opportunities for students to demonstrate the full range of their learning;
- provide ongoing descriptive feedback that is clear, specific, meaningful, and timely to support improved learning and achievement;
- develop students' self-assessment skills to enable them to assess their own learning, set specific goals, and plan next steps for their learning (p.6).

Resources

EduGAINS. (n.d.). Mathematics K-12. <http://www.edugains.ca/newsite/HOME/index.html>

Indigenous knowledge. (n.d.). Indigenous Knowledge & Mathematics. <http://mkn-rcm.ca/indigenouknowledge/>

Knill, G., Collins, E., Conrad, E., Ferneyhough, F., Hamilton, M., Miller, R., Wardrop, H. & Webb, M. (2000). *Mathpower 10 (Ontario Edition)*. McGraw-Hill Companies.

Ontario Ministry of Education. (n.d.). *Indigenous education strategy*. <http://www.edu.gov.on.ca/eng/aboriginal/>

Ontario Ministry of Education. (2005). *The Ontario curriculum, grades 9 and 10: Mathematics*. <http://www.edu.gov.on.ca/eng/curriculum/secondary/ssciences.html>

Ontario Ministry of Education. (2010). *Growing success: Assessment, evaluation and reporting in Ontario schools*. <http://www.edu.gov.on.ca/eng/policyfunding/growSuccess.pdf>

Ontario Ministry of Education. (2016). *Ontario schools, kindergarten to grade 12: Policy and program requirements*. <http://edu.gov.on.ca/eng/document/policy/os/index.html>

Tomlinson, C. (2014). *The differentiated classroom: Responding to the needs of all learners*. ASCD.

Program Planning

This course is offered to Indigenous students living in isolated, northern Ontario communities. It is offered by qualified teachers in a blended classroom with a balance of academic, wellness, land-based learning, local language and culture to support the success of the whole student. 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 support as required.

Indigenous and local content is used throughout the course to meet students' learning needs. Opportunities for outdoor activities and land-based learning are also incorporated and students are encouraged to use local knowledge in their products. Considerations are made to the learning preferences of the student population and lessons can be adjusted for individual students as required. Opportunities have been provided for students to apply ideas and concepts encountered in this course to their lives as an individual and as a member of a First Nations community. Teachers consult the Ontario Ministry of Education policies, guidelines and important initiatives when planning a comprehensive program in this area.