

Course Outline

School Name: Keewaytinook Internet High School

Department Name: Mathematics

Ministry of Education Course Title: Foundations of Mathematics

Grade Level: 9

Ministry Course Code: MFM1P

Teacher's Name: Erik Tu

Developed by: Christine Avgeropoulos **Date:** October 2009

Revision Date: September 2013

Developed from: Ontario Curriculum, Grades 9 and 10 Mathematics, 2005

Text: Mathpower 9, McGraw-Hill Ryerson, Ontario Edition, 1999

Prerequisite: None

Credits: 1

Length: 110 Hours

Principal's Name: Darrin Potter

Principal's Approval (signature): _____

Approval Date:

Course Description/Rational

This course enables students to develop an understanding of mathematical concepts related to introductory algebra, proportional reasoning, and measurement and geometry through investigation, the effective use of technology, and hands on activities. Students will investigate real life examples to develop various representations of linear relations, and will determine the connections between representations. They will also explore certain relationships that emerge from the measurement of three-dimensional figures and two dimensional shapes. Students will consolidate their mathematical skills as they solve problems and communicate their thinking.

Overall Curriculum Expectations

Number Sense and Algebra

- solve problems involving proportional reasoning.
- simplify numerical and polynomial expressions in one variable, and solve simple first degree equations.

Relationships

- apply data-management techniques to investigate relationships between two variables.
- determine the characteristics of linear relations.
- demonstrate an understanding of constant rate of change and its connection to linear relations.

Measurement and Geometry

- determine through investigation, the optimal values of various measurements of rectangles.
- solve problems involving the measurements of two-dimensional shapes and the volumes of three-dimensional figures.
- determine, through investigation facilitated by dynamic geometry software, geometric properties and relationships involving two-dimensional shapes, and apply the results to solving problems.

Course Content

Unit	Length
Constructing Graphical Models Through Investigation	35 Hours
Algebraic Models and Rates of Change	30 Hours
Dynamic Geometry and Measurement	30 Hours
Summative Assessment Activities	15 Hours
Total	110 Hours

Unit Descriptions

Unit 1 - Constructing Graphical Models Through Investigation

This unit will introduce abstract concepts through activities which will engage grade 9 students, and embed the teaching of skills within contexts.

Students will gather, analyze, manipulate, and display data from primary and secondary sources to model and communicate results about both linear and non-linear situations. Many contextual problems will be studied to ensure that students gain depth of understanding through meeting the same specific expectations in different contexts. Students will conduct investigations to verify or refute their own conjecture, using lines or curves of best fit, tables and pattern descriptions. They will communicate their findings and describe trends. A rich contextual foundation for subsequent algebraic studies will be built in this unit. Several different types of technologies will be introduced for gathering, analyzing, and displaying data.

Unit 2 - Algebraic Models and Rates of Change

This unit is designed to:

- weave the expectations of the Analytic Geometry strand together with expectations from each of the other strands in the policy document.
- introduce the abstraction of x 's, y 's, and vocabulary like 'slope' and 'intercepts'.
- allow the teacher and students to tie these abstractions back to contexts from the first unit.
- highlight the power of these abstract symbols and concepts as a means to summarize similar models (e.g., $y=2x$ summarizes $H=2A$, total points are double the number of baskets, etc.) and to communicate with technology.
- help students consolidate and extend their algebraic and numeration skills.

Students will use the ideas and contexts of the first unit to develop algebraic models of linear relations. Students will explore and determine the characteristics of lines and their corresponding equations through the use of spreadsheets, graphing technology, and paper and pencil. To solve problems, students will recognize and model realistic situations that involve constant rates of change. The need for algebraic techniques, numeric skills and the laws of exponents will emerge from problems in context.

Unit 3 - Dynamic Geometry and Measurement

This unit is designed to:

- weave the expectations of the Measurement and Geometry strand together with expectations from each of the other strands in the policy document.
- help students to extend their skills in exploring geometric relationships, forming and testing reasonable conjectures, using dynamic geometry software and other means to manipulate and transform, communicating their findings and applying geometric relationships to solve problems.
- help students to consolidate and extend their algebraic and numeration skills through work with formulas and multi step problems.

Students will use concrete materials, diagrams, drawings and dynamic geometric software to investigate the properties of three dimensional objects, optimal measurements and geometric relationships of two dimensional figures. Students will confirm and extend their intuitive understanding of geometric properties through inquiry. They will pose questions, make observation with the help of the technology, judge the reasonableness of answers and solve multi step problems.

Unit 4 - Final Assessment Activities

This unit will be used to model a final assessment in grade 9 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 final 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 final 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 nine-week series of lessons delivered to students via the internet to computers set up at an access site in their communities.

Weeks eight and nine are used for topic consolidation, review, 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 9 Mathematics include the following:

- Include whole class, small group and individual instruction.
- Promote the role of teacher as a guide and facilitator in the classroom.
- 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 of Education Publication, 2010 p.41

Type of Assessment	Category	Details	Weighting (%)
Term (70%)	Knowledge/ Understanding	- determine the characteristics of linear relations. - demonstrate an understanding of constant rate of change and its connection to linear relations.	13%
	Thinking & Inquiry	- determine through investigation, the optimal values of various measurements of rectangles.	19%
	Application	- simplify numerical and polynomial expressions in one variable, and solve simple first degree equations. - solve problems involving proportional reasoning. - apply data-management techniques to investigate relationships between two variables.	19%
	Communication	- solve problems involving the measurements of two-dimensional shapes and the volumes of three-dimensional figures. - determine, through investigation facilitated by dynamic geometry software, geometric properties and relationships involving two-dimensional shapes, and apply the results to solving problems.	19%

Final Assessment (30%)	Culminating Activity (15%)	Part 1- solve problems involving the measurements of two-dimensional shapes and the volumes of three-dimensional figures Part 2 - determine the optimal values of various measurements of rectangles Part 3 - apply data-management techniques to investigate relationships between two variables	K/U	3%
			T/I	4%
			C	4%
			A	4%
	Final Examination (15%)	Written examination designed to cover all of the overall expectations of the course	K/U	3%
			T/I	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
- Rubrics
- Tests
- Rating Scales
- Personal Profile

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.

The four major categories of assessment/evaluation will be incorporated into the design of the various assessment strategies used in the course, as illustrated in the following table.

Knowledge/Understanding	Thinking/Inquiry	Communication	Application/Making Connections
<ul style="list-style-type: none"> - Quizzes - Paper and Pencil - Tests - Matching Columns - Short Answer - Essays - Written Examinations (open-ended questioning) - Organizers (tables, graphs, charts) - Communication - Technology Journals - Question and Answer by Discussion Board 	<ul style="list-style-type: none"> - Tests - Examinations (open-ended questioning) - Essays - Research - Creation of Communication Products and Displays - Self Evaluation. 	<ul style="list-style-type: none"> - Open Ended Questions - Tests - Exams - Essays - Organizers (webs) - Creation of Communication Products and Displays - Interviews - Portfolios 	<ul style="list-style-type: none"> - Open Ended Questions Allowing for Knowledge to be Applied to a New Situation/Problem - Essays - Design Projects - Portfolio - Rubrics - Computer Programs - Creation of Communication Products and Displays

Resources

MathPower 9, McGraw-Hill Ryerson, Ontario Edition, 1999

Course Profile: Foundations of Mathematics, Grade 9, Applied

Growing Success Document: <http://www.edu.gov.on.ca/eng/policyfunding/growSuccess.pdf>

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>

ProQuest - <http://www.umi.com/proquest>

Software

Graphcalc, Geometer's Sketchpad, and Calculator

Program Planning

This course is offered to 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 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, while a classroom mentor (a fully qualified teacher) assists students in completing tasks in a timely manner and provides tutoring as required.