

Course Outline

School Name: *Keewaytinook Internet High School*

Department Name: *Mathematics*

Ministry of Education Course Title: *Principles of Mathematics*

Grade Level: *10*

Ministry Course Code: *MPM2D*

Teacher's Name: Erik Tu

Developed by: Erik Tu

Date: September 2016

Revision Date: September 2016

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

Text: Mathpower10, McGraw-Hill Ryerson, Ontario Edition, 2000


Prerequisite: MPM1D

Credits: One

Length: 110 hours

Principal's Name: Kevin Dempsey

Principal's Approval (signature) _____



Approval Date: 2016-09-16

Course Description/rationale

This course enables students to broaden their understanding of relations, extend their skills in multi-step problem solving, and continue to develop their abilities in abstract reasoning. Students will model linear and quadratic relationships arising from a variety of contexts. Using trigonometric ratios and analytic geometry techniques, student will learn how to find exact measures in geometric contexts, as opposed to the approximate measures they have found using scale drawings and measurement tools. Geometric relationships investigated in Grade 9 will be confirmed, analytically, in specific cases, and students will be introduced to proof in general. Algebraic skills will be extended to generate factored, expanded, and completed square forms of quadratic expressions, and to solve linear systems and quadratic equations. Fundamental mathematical ideas of modeling, patterning, optimization, and superimposing a grid onto a geometric situation are reinforced. Connections among the various strands of the course are intentionally developed.

Overall Curriculum Expectations

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

- determine the basic properties of quadratic relations;
- relate transformations of the graph of $y = x^2$ to the algebraic representation $y = a(x - h)^2 + k$;
- solve quadratic equations and interpret the solutions with respect to the corresponding relations;
- solve problems involving quadratic relations.

Analytic Geometry

- model and solve problems involving the intersection of two straight lines;
- solve problems using analytic geometry involving properties of lines and line segments;
- verify geometric properties of triangles and quadrilaterals, using analytic geometry.

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 acute triangles, using the sine law and the cosine law.

Course Content

Unit	Length
Quadratic Functions	27 hr.
Linear Systems	21 hr
Analytic Geometry	21 hr
Similar Triangles and Trigonometry	26 hr
Summative Assessment Activities	15 hr
	110 hr

Unit Descriptions

Unit 1 - Quadratic Functions

This unit enables students to broaden their understanding of relations, extend their skills in multi-step problem solving, and continue to develop their abilities in abstract reasoning. Students will gather, organize, manipulate, and analyse data from primary and secondary sources to model and communicate results about quadratic situations. A variety of problems will be studied to ensure that students will gain depth of understanding of quadratics through meeting the same specific expectations in different contexts. Students will conduct investigations to verify or refute their own conjectures about relationships, using lines or curves of best fit, tables, and pattern descriptions. They will communicate their findings and describe trends. A rich foundation for quadratics, built on experiences from a variety of real world contexts, will be built before subsequent algebraic studies are undertaken.

Unit 2 - Linear Systems

This unit will focus on the use of two linear equations to model a problem. In some cases, both lines are graphical models where the point of intersection of the lines has meaning in the context of the problem. Points of intersection will be found through numerical, graphical, and algebraic analysis. In other cases, only parts of two lines are needed to model a single situation. These result in consideration of a range of values for solution to an optimization problem through linear programming analysis. This unit also contains multi-step problems in analytic geometry which require solution of a linear system.

Unit 3 - Analytic Geometry

This unit provides contexts for developing formulas for midpoint, distance between points, and circles centered at the origin. Then geometric relationships investigated in Grade 9 mathematics are confirmed through the use of the Cartesian system and formulas. Properties of triangles and quadrilaterals are investigated analytically.

Unit 4 - Similar Triangles and Trigonometry

Students are introduced to applications of similar triangles and trigonometry through a variety of activities that use concrete materials and allow students to move about inside and

outside the classroom. Primary trigonometric ratios, Sine and Cosine Laws are used to solve problems that are modelled by right-angled or acute triangles. As students move from the first unit to the second unit, they investigate how the tangent ratio for the angle of inclination is connected to slope of a line.

Unit 5 - Summative 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 summative 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, and carry out pencil and paper routines.

Teaching/Learning Strategies

The course is organized into an eight-week series of lessons delivered to students via the internet to computers set up at an access site in their communities. Week 8 is 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 10 Mathematics include the following:

- 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.
- 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, 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 an inquiry, and to provide the solution to unfamiliar problems.
- 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 Work (70%)	Knowledge/ Understanding	- use their knowledge of ratio and proportion to investigate similar triangles and solve problems related to	13%

		similarity.		
	Thinking	- relate transformations of the graph of $y = x^2$ to the algebraic representation $y = a(x - h)^2 + k$. - verify geometric properties of triangles and quadrilaterals, using analytic geometry. - determine the basic properties of quadratic relations.		19%
	Communication	- solve quadratic equations and interpret the solutions with respect to the corresponding relations. - solve problems involving quadratic relations. - solve problems using analytic geometry involving properties of lines and line segments. - solve problems involving right triangles, using the primary trigonometric ratios and the Pythagorean theorem. - solve problems involving acute triangles, using the sine law and the cosine law.		19%
	Application	- model and solve problems involving the intersection of two straight lines.		19%
Final Assessment (30%)	Culminating Activity	<ol style="list-style-type: none"> solve real life application problems using a variety of methods choose from among all the skills learned in the course to solve given questions solve problems ranging from all strands of the course show insight into how skills and formula can be applied to different problems and situations 	K/U	3%
			T/I	4%
			C	4%
			A	4%
	Final Exam	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
- 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.

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	Communication	Application/Making Connections
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	Tests Examinations Short Answers Diagrams Research Creation of Displays Self Evaluation.	Open Ended Questions Exams Essays Organizers Displays Interviews Portfolios	Open Ended Questions Graphs Design Projects Portfolio Rubrics Computer Programs

Resources

MathPower 10, McGraw-Hill Ryerson, Ontario Edition, 2000

Growing Success - assessment, evaluation and reporting: improving student learning, 1st edition, 2008

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 - <http://www.edu.gov.on.ca/eng/webmap.html>

ProQuest - This website provides access to more than 3000 journals, magazines, dissertations, newspapers, and other publications, for a fee. This is a good source of secondary data. There are several similar services available. <http://www.umi.com/proquest>

Software

Graphcalc, Geometer's Sketchpad, and Calculator

Online grapher

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 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.