Course Outline

School Name: Keewaytinook Internet High School

Department Name: Mathematics

Ministry of Education Course Title: Principles of Mathematics

Grade Level: 9

Ministry Course Code: MPM1D

Teacher's Name: Rose Kakekagumick

Developed by: Christine Avgeropoulos   Date: October, 2009

Revision Date: September 2015

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

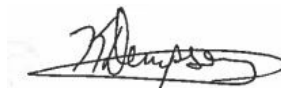Text: Mathpower 9, McGraw-Hill Ryerson, Ontario Edition, 2006

Prerequisite: None

Credits: 1

Length: 110 Hours

Principal's Name: Kevin Dempsey

Principal's Approval (signature):

Approval Date: September 8, 2015

Course Description/Rational

This course enables students to develop an understanding of mathematical concepts related to algebra, analytic geometry, and measurement and geometry through investigation, the effective use of technology, and abstract reasoning. Students will investigate relationships, which they will then generalize as equations of lines, and will determine the connections between different representations of a linear relation. They will also explore relationships that emerge from the measurement of three dimensional figures and two dimensional shapes. Students will reason mathematically and communicate their thinking as they solve multi-step problems.

Overall Curriculum Expectations

Number Sense and Algebra
- Demonstrate an understanding of the exponent rules of multiplication and division, and apply them to simplify expressions.
- Manipulate numerical and polynomial expressions, and solve first-degree equations.

Linear Relations
- Apply data-management techniques to investigate relationships between variables.
- Demonstrate an understanding of the characteristics of a linear relation.
- Connect various representations of a linear relation.

Analytic Geometry
- Determine the relationship between the form of an equation and the shape of its graph with respect to linearity and non-linearity.
- Determine, through investigation, the properties of the slope and y-intercept of a linear relation.
- Solve problems involving linear relations.

Measurement and Geometry

- Determine, through investigation, the optimal values of various measurements.
- Solve problems involving the measurements of two-dimensional shapes and the surface areas and volumes of three dimensional figures.
- Verify 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
Mathematical Processes	15 Hours
Relations	10 Hours
Polynomials	10 Hours
Equations	10 Hours
Modeling with Graphs	10 Hours
Analyze Linear Relationships	10 Hours
Geometric Relationships	10 Hours
Measurement Relationships	10 Hours

Optimizing Measurements	10 Hours
Summative Activities	15 Hours
Total	**110 Hours**

Unit Descriptions

Unit 1 - Mathematical Processes
Problem solving, communicating; connecting; representing; selecting tools and computational strategies; reasoning and proving; reflecting.

Unit 2 - Relations
Hypothesis and sources of data; sampling principles; use of scatter plots to analyze data; trends, interpolation, and extrapolation; linear and non-linear relations, distance-time graphs,

Unit 3 - Polynomials
Build algebraic models using concrete material; work with exponents; discover the exponent laws; communicate with algebra; collect like terms; add and subtract polynomials and distributive property,

Unit 4 - Equations
Solve simple equations; solve multi-step equations; solve equations involving fractions; modeling with formulas; modeling with algebra.

Unit 5 - Modeling with Graphs
Direct variation; partial variation; slope; slope as a rate of change; first differences; connecting variation, slope, and first differences.

Unit 6 - Linear Relations
The equation of a line in slope y-intercept form, the equation of a line in standard form; graph a line using intercepts; parallel and perpendicular lines; find an equation for a line given the slope and appoint; find an equation for a line given two points; linear systems.

Unit 7 - Geometric Relationships
Angle relationships in triangles; angle relationships in quadrilaterals; angle relationships in polygons; midpoints and median in triangles; midpoints and diagonals in quadrilaterals.

Unit 8 - Measurement Relationships
Apply the Pythagorean Theorem; perimeter and are of composite figures, surface area and volume of prisms and pyramids; surface area of a cone; volume of a cone; surface area of a sphere; volume of a sphere.

Unit 9 - Optimizing Measurements:
Investigate measurement concepts; perimeter and area relationships of a rectangle; minimize the surface area of a square-based prism; maximize the volume of a square-based prism; maximize the volume of a cylinder; minimize the surface area of a cylinder.

Unit 10 - Summative 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 2/3 be based on performance tasks, and at most 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.

- 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 th 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	- Demonstrate an understanding of the exponent rules of multiplication and division, and apply them to simplify expressions. - Demonstrate an understanding of the characteristics of a linear relation. - Solve problems involving the measurements of two-dimensional shapes and the surface areas and volumes of three dimensional figures.	13%
	Thinking & Inquiry	- Determine the relationship between the form of an equation and the shape of its graph with respect to linearity and non-linearity. - Determine, through investigation, the properties of the slope and y-intercept of a linear relation.	19%
	Application	- Verify through investigation facilitated by dynamic geometry software, geometric properties and relationships involving two-dimensional shapes, and apply the results to solving problems. - Apply data-management techniques to investigate relationships between variables. - Manipulate numerical and polynomial expressions, and solve first-degree equations. - Solve problems involving linear relations.	19%
	Communication	- Determine, through investigation, the optimal values of various measurements. - Connect various representations of a linear relation.	19%

Final Assessment (30%)	**Culminating Activity (15%)**	Part 1 - Solve problems involving the measurements of two-dimensional shapes and the surface areas and volumes of three-dimensional figures	K/U	3%
			T/I	4%
		Part 2 - Solve problems involving linear relations and connect various representations of a linear relation	C	4%
		Part 3 - Determine through investigation, the optimal values of various measurements	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
-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	-Tests -Examinations (open-ended questioning) -Essays -Research -Creation of Communication Products and Displays -Self Evaluation.	-Open Ended Questions -Tests -Exams -Essays -Organizers (webs) -Creation of Communication Products and Displays -Interviews -Portfolios	-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, 2006

Course Profile: Principles of Mathematics, Grade 9, Academic

GED Mathematics, Steck-Vaughnn, USA, 2002

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

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 - 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

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 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. 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.