



TFS High School
5635 Yong St. Suite 206,
Toronto, Ontario M2M 3S9

COURSE OUTLINE

**Principles of Mathematics, Academic
MPM2D**

Department	Mathematics
Instructor	Ms. Farah Mazidi
Developed Date	2017
Course Code	MPM2D
Credit Value	1.00
Ministry Curriculum Document	Mathematics, The Ontario Curriculum, Grades 9 and 10, 2005- Grades 11 and 12 2007 (Revised) http://www.edu.gov.on.ca/eng/curriculum/secondary/math9_10curr.pdf http://www.edu.gov.on.ca/eng/policyfunding/growsuccess.pdf
Prerequisites	Grade 9 Mathematics, Academic or Mathematics Transfer
Course Revision Date (TFS)	Sep 2020

Course Description:

This course enables students to broaden their understanding of relationships and extend their problem-solving and algebraic skills through investigation, the effective use of technology, and abstract reasoning. Students will explore quadratic relations and their applications; solve and apply linear systems; verify properties of geometric figures using analytic geometry; and investigate the trigonometry of right and acute triangles. Students will reason mathematically and communicate their thinking as they solve multi-step problems.

Units of Study

Unit Titles and Descriptions	Time and Sequence
Linear Systems Linear relationships are not only important to understand for everyday use - understanding the interplay between distance and time for the calculation of speed, or rates of change in business, for example. Linear relationships are also fundamental to more complex forms of mathematics. This unit reviews the concepts of linear algebra that were developed in Grade 9, and expands upon important procedures such as rearranging equations and developing accurate graphs.	16 hours
Analytical Geometry Expanding upon the foundation built in the last unit, the equations of lines and line segments will be examined. Developing logical and mathematical methods for determining line segment length and midpoint, based upon an equation or upon coordinates, will enable a deeper study of geometric shapes and properties.	16 hours
Algebraic Skills To progress beyond a certain point in any mathematics, some rather advanced algebraic skills must first be mastered. In this unit, students will consider various operations on monomials, binomials and polynomials. Factoring of binomials and trinomials will be studied.	16 hours
Quadratic Functions Until this point, all algebraic relations that have been considered have been linear. In this unit, second-order functions are introduced. The concept of the function will be studied; the domain, range and simple transformations of quadratic functions will be explored; and students will learn how to complete the square.	16 hours
Quadratic Equations Having explored quadratic functions graphically, the algebra of quadratic equations will be considered. The Quadratic Formula, which will be used extensively throughout all future math courses, will be derived and used.	22 hours
Trigonometry Triangles have a particularly significant role to play in mathematics. This unit is all about triangles and how they can be used to describe many phenomena in the universe. A review of Pythagorean Theorem will start the discussion, which will lead the student through sine, cosine and tangent ratios, the sine law and cosine law, and the ability to solve problems using these tools.	22 hours
Final Assessment	
Exam This is a proctored exam worth 30% of your final grade.	2 hours
Total	110 hours

Overall Curriculum Expectations

A. Quadratic Relations of the Form $y = ax^2 + bx + c$	
A1	determine the basic properties of quadratic relations;
A2	relate transformations of the graph of $y = x^2$ to the algebraic representation $y = a(x - h)^2 + k$;
A3	solve quadratic equations and interpret the solutions with respect to the corresponding relations;
A4	solve problems involving quadratic relations.
B. Analytic Geometry	
B1	model and solve problems involving the intersection of two straight lines;
B2	solve problems using analytic geometry involving properties of lines and line segments;
B3	verify geometric properties of triangles and quadrilaterals, using analytic geometry.
C. Trigonometry	
C1	use their knowledge of ratio and proportion to investigate similar triangles and solve problems related to similarity;
C2	solve problems involving right triangles, using the primary trigonometric ratios and the Pythagorean theorem;
C3	solve problems involving acute triangles, using the sine law and the cosine law.

Teaching / Learning Strategies:

Since the over-riding aim of this course is to help students use language skillfully, confidently and flexibly, a wide variety of instructional strategies are used to provide learning opportunities to accommodate a variety of learning styles, interests and ability levels. These include:

Guided Exploration	Problem Solving	Graphing
Visuals	Direct Instruction	Independent Reading
Independent Study	Ideal Problem Solving	Multimedia Productions
Logical Mathematical Intelligence	Graphing Applications	Problem Posing
Model Analysis		Self-Assessments

Assessment is a systematic process of collecting information or evidence about student learning. Evaluation is the judgment we make about the assessments of student learning based on established criteria. The purpose of assessment is to improve student learning. This means that judgments of student performance must be criterion-referenced so that feedback can be given that includes clearly expressed next steps for improvement. Tools of varying complexity are used by the teacher to facilitate this. For the more complex evaluations, the criteria are incorporated into a rubric where levels of performance for each criterion are stated in language that can be understood by students

ASSESSMENT ACTIVITIES

- Homework assignments
- Individual conference meetings
- Discussion Forums
- Diagnostic tests and writing tasks
- Free-writing journals/blogs
- Outlining and planning sheets
- Completed Templates & Graphic Organizers
- Editing Checklists
- Reflections
- Oral presentations & Active Listening
- Tests & Exam
- Evaluations

Assessment and Evaluation Strategies of Student Performance based on Growing Success

Strategy	Purpose	Who	Assessment Tool
Self Assessment Quizzes	Diagnostic	Self/Teacher	Marking scheme
Problem Solving	Diagnostic	Self/Peer/Teacher	Marking scheme
Graphing Application	Diagnostic	Self	Anecdotal records
Problem Solving	Assessment	Peer/teacher	Marking scheme
Research	Assessment	Peer/teacher	Anecdotal records
Problem Solving	Evaluation	Teacher	Marking scheme
Graphing	Evaluation	Teacher	Checklist
Investigations	Evaluation	Teacher	Checklist
Unit Tests	Evaluation	Teacher	Marking scheme
Final Exam	Evaluation	Teacher	Checklist

Percentage of Final Mark	Weight	Evaluation Categories	Assessment will be ongoing to inform the students of their performance and the opportunity for success. Four achievement categories are illustrated in the chart.
70%	60%	Tests and Quizzes	
	10%	Projects and Assignments	
30%	30%	Final Written Examination	
			Inquiry 25%
			Communication 25%
			Application 25%

Potential Resources:

- Nelson Principle of Mathematics Textbook

Achievement Chart: Mathematics, Grades 9-12

Categories	50-59% (Level 1)	60-69% (Level 2)	70-79% (Level 3)	80-100% (Level 4)
Knowledge and Understanding - Subject-specific content acquired in each course (knowledge), and the comprehension of its meaning and significance (understanding)				
	The student:			
Knowledge of content (e.g., facts, terms, procedural skills, use of tools)	demonstrates limited knowledge of content	demonstrates some knowledge of content	demonstrates considerable knowledge of content	demonstrates thorough knowledge of content
Understanding of mathematical concepts	demonstrates limited understanding of content	demonstrates some understanding of content	demonstrates considerable understanding of content	demonstrates thorough and insightful understanding of content
Thinking - The use of critical and creative thinking skills and/or processes				
	The student:			
Use of planning skills -understanding the problem (e.g., formulating and interpreting the problem, making conjectures) -making a plan for problem solving	uses planning skills with limited effectiveness	uses planning skills with moderate effectiveness	uses planning skills with considerable effectiveness	uses planning skills with a high degree of effectiveness
Use of processing skills -carrying out a plan (e.g., collecting data, questioning, testing, revising, modelling, solving, inferring, forming conclusions) -looking back at the solution (e.g., evaluating reasonableness, making convincing arguments, reasoning, justifying, proving, reflecting)	uses processing skills with limited effectiveness	uses processing skills with some effectiveness	uses processing skills with considerable effectiveness	uses processing skills with a high degree of effectiveness
Use of critical/creative thinking processes (e.g., problem solving, inquiry)	uses critical / creative thinking processes with limited effectiveness	uses critical / creative thinking processes with some effectiveness	uses critical / creative thinking processes with considerable effectiveness	uses critical / creative thinking processes with a high degree of effectiveness
Communication - The conveying of meaning through various forms				
	The student:			
Expression and organization of ideas and mathematical thinking (e.g., clarity of expression, logical	expresses and organizes mathematical thinking with	expresses and organizes mathematical thinking with some	expresses and organizes mathematical thinking with	expresses and organizes mathematical thinking with a

organization), using oral, visual, and written forms (e.g., pictorial, graphic, dynamic, numeric, algebraic forms; concrete materials)	limited effectiveness	effectiveness	considerable effectiveness	high degree of effectiveness
Communication for different audiences (e.g., peers and teachers) and purposes (e.g., to present data, justify a solution, express a mathematical argument) in oral, visual, and written forms	communicates for different audiences and purposes with limited effectiveness	communicates for different audiences and purposes with some effectiveness	communicates for different audiences and purposes with considerable effectiveness	communicates for different audiences and purposes with a high degree of effectiveness
Use of conventions, vocabulary, and terminology of the discipline (e.g., terms, symbols) in oral, visual, and written forms	uses conventions, vocabulary, and terminology of the discipline with limited effectiveness	uses conventions, vocabulary, and terminology of the discipline with some effectiveness	uses conventions, vocabulary, and terminology of the discipline with considerable effectiveness	uses conventions, vocabulary, and terminology of the discipline with a high degree of effectiveness
Application - The use of knowledge and skills to make connections within and between various contexts				
	The student:			
Application of knowledge and skills in familiar contexts	applies knowledge and skills in familiar contexts with limited effectiveness	applies knowledge and skills in familiar contexts with some effectiveness	applies knowledge and skills in familiar contexts with considerable effectiveness	applies knowledge and skills in familiar contexts with a high degree of effectiveness
Transfer of knowledge and skills to new contexts	transfers knowledge and skills to new contexts with limited effectiveness	transfers knowledge and skills to new contexts with some effectiveness	transfers knowledge and skills to new contexts with considerable effectiveness	transfers knowledge and skills to new contexts with a high degree of effectiveness
Making connections within and between various contexts (e.g., connections between concepts, representations, and forms within mathematics; connections involving use of prior knowledge and experience; connections between mathematics, other disciplines, and the real world))	makes connections within and between various contexts with limited effectiveness	makes connections within and between various contexts with some effectiveness	makes connections within and between various contexts with considerable effectiveness	makes connections within and between various contexts with a high degree of effectiveness

Learning Skills:

Learning Skills are skills and habits essential to success in school and in the workplace. Teachers report achievement on the six Learning Skills in the table below using letter codes:

E = Excellent

G = Good

S = Satisfactory

N = Needs Improvement.

Learning Skills	Sample Behaviors
Responsibility	The student fulfils responsibilities and commitments within the learning environment; completes and submits class work, homework, and assignments according to agreed-upon timelines; takes responsibility for and manages own behavior.
Organization	The student devises and follows a plan and process for completing work and tasks; establishes priorities and manages time to complete tasks and achieve goals; identifies, gathers, evaluates, and uses information, technology, and resources to complete tasks.
Independent Work	The student independently monitors, assesses, and revises plans to complete tasks and meet goals; uses class time appropriately to complete tasks; follows instructions with minimal supervision.
Collaboration	The student accepts various roles and an equitable share of work in a group; responds positively to the ideas, opinions, values, and traditions of others; builds healthy peer-to-peer relationships through personal and media-assisted interactions; works with others to resolve conflicts and build consensus to achieve group goals; shares information, resources, and expertise and promotes critical thinking to solve problems and make decisions.
Initiative	The student looks for and acts on new ideas and opportunities for learning; demonstrates the capacity for innovation and a willingness to take risks; demonstrates curiosity and interest in learning; approaches new tasks with a positive attitude; recognizes and advocates appropriately for the rights of self and others.
Self-Regulation	The student sets own individual goals and monitors progress towards achieving them; seeks clarification or assistance when needed; assesses and reflects critically on own strengths, needs, and interests; identifies learning opportunities, choices, and strategies to meet personal needs and achieve goals; perseveres and makes an effort when responding to challenges.

Academic Honesty: Cheating and Plagiarism:

Plagiarism is a serious offense. It is defined as taking words, phrasing, sentence structure, or any other element of the expression of another person's **ideas**, and using them as if they were your own. Plagiarism is a violation of another person's rights, whether the material taken is excessive or small. Students will be assisted in developing strategies and techniques to avoid plagiarism. They need to be aware that plagiarized term work will be penalized and could result in a mark of zero.

Program Planning Considerations:

- *The Role of Technology in the Curriculum.* Using information technology will assist students in the achievement of many of the expectations in the curriculum regarding research, written work, analysis of information, and visual presentations.
- *English As a Second Language (ESL):* Appropriate accommodations in teaching, learning, and evaluation strategies will be made to help ESL students gain proficiency in English, since students taking ESL at the secondary level have limited time in which to develop this proficiency.
- *Career Education:* Expectations in this course include many opportunities for students to explore educational and career options, and to become self-directed learners.
- Literacy, Numeracy, and Inquiry/Research Skills