Ontario eSecondary School
Course Outline
2023 - 2024

Ministry of Education Course Title: Principles of Mathematics, Grade 10	
Ministry Course Code: MPM2D	
Course Type: Academic	
Grade: 10	
Credit Value: 1.0	
Prerequisite(s): De-streamed Mathematics, Grade 9 (MTH1W)	
Department: Mathematics	
Course developed by: **Asif Sami Haque**	**Created: July 2017**
Length: **One Semester**	**Hours:** **110**

This course has been developed based on the following Ministry documents:
1. *The Ontario Curriculum, Gr 9 Destreamed Mathematics 2021*
2. *Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools (2010)*
3. *Learning for All (2013)*

COURSE DESCRIPTION/RATIONALE

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.

OVERALL CURRICULUM EXPECTATIONS

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

By the end of this course, students will:

1. Determine the basic properties of quadratic relations;
2. Relate transformations of the graph of $y = x^2$ to the algebraic representation $y = a(x - h)^2 + k$; 3.
3. Solve quadratic equations and interpret the solutions with respect to the corresponding relations; 4. Solve problems involving quadratic relations.

Analytic Geometry

By the end of this course, students will:

1. Model and solve problems involving the intersection of two straight lines;
2. Solve problems using analytic geometry involving properties of lines and line segments;
3. Verify geometric properties of triangles and quadrilaterals, using analytic geometry.

Trigonometry

By the end of this course, students will:

1. Use their knowledge of ratio and proportion to investigate similar triangles and solve problems related to similarity;
2. Solve problems involving right triangles, using the primary trigonometric ratios and the Pythagorean theorem;
3. Solve problems involving acute triangles, using the sine law and the cosine law

COURSE CONTENT

Unit	Length
1: Linear Systems	22 hours
2: Geometry	25 hours
3A: Polynomials	15 hours
3B: Quadratics	15 hours
3C: Transformations of Quadratics	17 hours
4: Trigonometry	13 hours
Final Exam	3 hours
	110 Hours

UNIT DESCRIPTIONS

UNIT 1: LINEAR SYSTEMS

In this unit, students will investigate the importance and meaning of mathematics in their surroundings. Many real-life problems can be modeled using linear equations. These mathematical models let us establish trends and make predictions about relationships. Sometimes a model involves only one equation, but for many, the model involves two or more equations.

UNIT 2: GEOMETRY

This unit introduces analytic geometry. Analytic geometry is an important tool in many occupations. It is used by surveyors when they lay out exact positions for construction projects. Students will develop formulas for the distance of a point from the origin, and the length of a line segment and its midpoint. We will also solve problems involving length, slope, and midpoint of a line segment.

UNIT 3: POLYNOMIALS, QUADRATICS, AND TRANSFORMATIONS OF QUADRATICS

This unit shows the importance of real-life problems that involve quadratic relations. We will identify and apply the relationship between the roots of a quadratic relationship and its graph. Students will graph quadratic relations by hand and using technology. By exploring the properties of parabolas, we will relate them to their applications to optimization problems. Students will develop the algebraic skills to expand and factor a variety of polynomial expressions. Graphing will show students quadratic relations and how they are used as mathematical models for many real-life situations. Students will investigate properties of quadratic relations and how they relate to graphs. We will use the symmetry properties of a parabola to write its equation in vertex form. We will also use the algebraic method "completing the square" to write a quadratic relation in vertex form. Students will graph quadratic relations and find roots. We will also learn how to choose the best method to solve a quadratic problem.

UNIT 4: TRIGONOMETRY

Students will be introduced to trigonometry and its importance in solving physics, chemistry, navigation, architecture, and engineering problems. We will compute the angle of inclination or declination that corresponds to the slope of a line. Students will use analytic geometry to solve problems and prove conjectures involving angles, areas, and the perimeter of similar triangles. We will develop three primary trigonometric ratios and use them to solve practical problems.

TEACHING AND LEARNING STRATEGIES

In this course, students will experience the following activities.

Presentations with embedded videos are utilized to outline concepts, explain theory with the use of examples and practice questions, and incorporate multi-media opportunities for students to learn more (e.g. online simulations, quizzes, etc.).

End of unit conversations and Poodlls are opportunities for students to express their ideas, problem solving, and thought processes with a teacher who provides timely feedback.

Reflection is an opportunity for students to look back at concepts and theories with new eyes, to relate theory to practice, and to align learning with their own values and beliefs.

Discussions with the instructor are facilitated through video conferencing, discussing the concepts and skills being studied. This enables two-way communication between the student and the instructor, to share ideas and ask questions in dialogue. This also helps to build a relationship between the student and instructor.

Instructor demonstrations (research skills, etc.) are opportunities for the instructor to lead a student through a concept or skill through video conferencing, videos, or emailing with the student.

Discussion forums are an opportunity for students to summarize and share their ideas and perspectives with their peers, which deepens understanding through expression. It also provides an opportunity for peer-to-peer feedback.

Practical extension and application of knowledge are integrated throughout the course. The goal is to help students make connections between what they learn in the classroom and how they understand and relate to the world around them and their own lives. Learning becomes a dynamic opportunity for students to be more aware that their learning is all around them and enable them to create more meaning in their lives.

Individual activities/assignments assessments are completed individually at a student's own pace and are intended to expand and consolidate the learning in each lesson. Individual activities allow the teacher to accommodate interests and needs and to assess the progress of individual students. For this reason, students are encouraged to discuss IEPs (Individual Education Plans) with their teacher and to ask to modify assessments if they have a unique interest that they feel could be pursued in the assessment. The teacher plays an important role in supporting these activities by providing ongoing feedback to students, both orally and in writing.

Research is an opportunity to apply inquiry skills to a practical problem or question. Students perform research to gather information, evaluate quality sources, analyze findings, evaluate their analysis, and synthesize their findings into conclusions. Throughout, students apply both creative thinking and critical thinking. New questions are also developed to further learning.

Writing as a learning tool helps students to think critically about course material while grasping, organizing, and integrating prior knowledge with new concepts.   Good communication skills are important both in and out of the classroom.

Virtual simulations are interactive websites that provide students with an opportunity to ask questions, relate variables, and examine relationships.

Diagrams are visual representations of mathematical ideas and concepts. They provide another perspective to organize ideas. Visuals are thought to promote cognitive plasticity - meaning, they can help us change our minds or help us to remember an idea.

Graphs and charts are visual representations of math concepts and analysis. This helps us to see the relationships within and between sets of data.

Tables involve organizing information in terms of categories (rows and columns). This helps us to understand the relationships between ideas and data, as well as highlight trends.

Practice problems provide students with a scenario/problem to solve by applying concepts and skills learned in a context. This helps students to understand the relevance of their learning.

ASSESSMENT, EVALUATION, AND REPORTING

Assessment: The process of gathering information that accurately reflects how well a student is achieving the identified curriculum expectations. Teachers provide students with descriptive feedback that guides their efforts towards improved performance.

Evaluation: Assessment of Learning focuses on Evaluation, which is the process of making a judgement about the quality of student work on the basis of established criteria over a limited, reasonable period of time.

Reporting: Involves communicating student achievement of the curriculum expectations and Learning Skills and Work Habits in the form of marks and comments as determined by the teacher's use of professional judgement.

STRATEGIES FOR ASSESSMENT

Assessment practices can nurture students' sense of progress and competency and information instruction. Many diagnostic tools, e.g. checklists and inventories, are used at regular intervals throughout the units to encourage students' understanding of their current status as learners and to provide frequent and timely reviews of their progress. Assessment of student acquisition of listening and talking, reading and viewing and writing skills also occurs regularly through unobtrusive teacher observation and conferencing.

Units conclude with performance tasks, e.g. interviews and summative assessments. Teachers are encouraged to share goals with students early in the course and to connect unit learning experiences

frequently and explicitly with big ideas, overall expectations, and performance tasks. The teacher is encouraged to involve students in the discussion, modification, or creation of rubrics, and teach students to use rubrics as a learning tool.

ASSESSMENT ACTIVITIES

- ❏ Homework assignments
- ❏ Individual conference meetings
- ❏ Discussion Forums
- ❏ Diagnostic tests and writing tasks
- ❏ Editing Checklists
- ❏ Reflections
- ❏ Oral presentations & Active Listening
- ❏ Tests & Exam
- ❏ Evaluations
- ❏ Labs and interactive diagrams

EVALUATION

The final grade will be determined as follows:

❏ 70% 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 will be given to more recent evidence of achievement.

❏ 30% 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)

Weightings	
Course Work	**70**
Knowledge/Understanding (K)	25
Thinking/Inquiry (T)	10
Communication (C)	15
Application (A)	20
Final Evaluation	**30**
Final Exam (15K, 7T, 3C, 5A)	30

TERM WORK EVALUATIONS (70%)

Evaluation Item	Description	Category
Unit 1 Initials Project	This project supports student understanding of graphing and plotting linear systems, converting equations between forms and relating each to applications.	K,T,C,A

Unit 1 Linear Systems Assignment	This is a summative assessment for Unit 1, integrating all major concepts.	K,T,C,A
Unit 1 Conference	This is an opportunity for students to demonstrate their Unit 1 learning with their instructor. Students explain their solutions and discuss practical applications of the concepts learned.	K,T,C,A
Unit 2 Problem Set Project	This assessment serves as a method to get students to start to think critically about how questions are created. This is a valuable inquiry skill in mathematics.	K,T,C,A
Unit 2 Analytic Geometry Assignment	This is a summative assessment for Unit 2, integrating all major concepts.	K,T,C,A
Unit 2 Conference	This is an opportunity for students to demonstrate their Unit 2 learning with their instructor. Students explain their solutions and discuss practical applications of the concepts learned.	K,T,C,A
Unit 3A Quadratics and Polynomials Assignment	This is a summative assessment for polynomials and quadratics, including expanding, simplifying, factoring, and word problem applications.	K,T,C,A
Unit 3B Quadratics Assignment	This is a quadratics mini-assessment.	K,T,C,A
Unit 3C Quadratic Relations Assignment	This is a transformation of quadratics mini-assessment.	K,T,C,A
Unit 3 Conference	This is an opportunity for students to demonstrate their Unit 3 learning with their instructor. Students explain their solutions and discuss practical applications of the concepts learned.	K,T,C,A
Unit 4 Trigonometry Assignment	This is a summative assessment for Unit 4, integrating all major concepts.	K,T,C,A
Unit 4 Conference	This is an opportunity for students to demonstrate their Unit 3 learning with their instructor. Students explain their solutions and discuss practical applications of the concepts learned.	K,T,C,A

FINAL EVALUATIONS (30%)

Evaluation Item	Description	Category
Final Exam	Formal, summative (comprehensive) examination that tests all of the concepts and skills for Grade 10 mathematics	K,T,C,A

AFL/AAL/AOL TRACKING SHEET

Unit 1: Linear Systems

AAL	AFL	AOL
Unit 1 Resource Forum	Lesson 1.1 Order of Operations	Unit 1 Initials Project
Graphing Linear Systems Practice	Lesson 1.3 Linear Relationships	Unit 1 Linear Systems Assignment
	Lesson 1.6 Systems of Linear Equations	

Unit 2: Geometry

AAL	AFL	AOL
Unit 2 Resource Forum	Lesson 2.4 Equations of Lines	Unit 2 Problem Set Project
Lesson 2.7 Distance From a Point to a Line	Lesson 2.6 Geometry of Figures	Unit 2 Analytic Geometry Assignment

Unit 3A: Polynomials

AAL	AFL	AOL
Unit 3A Resource Forum	Lesson 3A.5 Factoring by Grouping	Unit 3A Quadratics and Polynomials Assignment
Lesson 3A.2 Multiplying Special Cases Polynomials	Lesson 3A.6 Factoring Special Cases	
Lesson 3A.3 Greatest Common Factor		

Unit 3B: Quadratics

AAL	AFL	AOL
Unit 3B Resource Forum	Lesson 3B.1 Introduction to Quadratic Relations	Unit 3B Quadratics Assignment
Lesson 3B.4 Quadratic Relations in Factored Form Forum	Lesson 3B.7 Solving Quadratic Equations in Standard Form Forum	

Unit 3C: Transformations of Quadratics

AAL	AFL	AOL
Unit 3C Resource Forum	Lesson 3C.2 Translations Forum	Unit 3C Quadratic Relations Assignment

	Lesson 3C.4 Completing the Square	

Unit 4: Transformations of Quadratics

AAL	AFL	AOL
Unit 4 Resource Forum	Lesson 4.2 Trigonometry Forum	Unit 4 Trigonometry Assignment
	Lesson 4.4 Cosine Law Forum	

Finals

AOL
Final Exam

CONSIDERATION FOR PROGRAM PLANNING

PLANNING PROGRAMS FOR STUDENTS WITH SPECIAL EDUCATION NEEDS
Classroom teachers are the key educators of students who have special education needs. They have a responsibility to help all students learn, and they work collaboratively with special education teachers, where appropriate, to achieve this goal. Special Education Transformation: The Report of the Co-Chairs with the Recommendations of the Working Table on Special Education, 2006 endorses a set of beliefs that should guide program planning for students with special education needs in all disciplines. Those beliefs are as follows: All students can succeed. Universal design and differentiated instruction are effective and interconnected means of meeting the learning or productivity needs of any group of students. Successful instructional practices are founded on evidence-based research, tempered by experience.

PROGRAM CONSIDERATIONS FOR ENGLISH LANGUAGE LEARNERS
Ontario schools have some of the most multilingual student populations in the world. The first language of approximately 20 percent of the students in Ontario's English language schools is a language other than English. Ontario's linguistic heritage includes several Aboriginal languages; many African, Asian, and European languages; and some varieties of English, such as Jamaican Creole. Many English language learners were born in Canada and raised in families and communities in which languages other than English were spoken, or in which the variety of English spoken differed significantly from the English of Ontario classrooms. Other English language learners arrive in Ontario as newcomers from other countries; they may have experience of highly sophisticated educational systems, or they may have come from regions where access to formal schooling was limited. When they start school in Ontario, many of these students are entering a new linguistic and cultural environment.

THE ROLE OF TECHNOLOGY IN THE PROGRAM
Information and communications technologies (ICT) provide a range of tools that can significantly extend and enrich teachers' instructional strategies and support students' language learning. ICT tools include multimedia resources, databases, Internet websites, digital cameras, and word-processing programs. Tools such as these can help students to collect, organize, and sort the data they gather and to write, edit, and present reports on their findings. Information and communications technologies can also be used to connect students to other schools, at home and abroad, and to bring the global community into the local classroom. Whenever appropriate, therefore, students should be encouraged to use ICT to support and communicate their learning.

ACCOMMODATIONS

Accommodations will be based on meeting with parents, teachers, administration and external educational assessment reports. The following three types of accommodations may be provided:

- ❏ ***Instructional accommodations:*** such as changes in teaching strategies, including styles of presentation, methods of organization, or use of technology and multimedia.
- ❏ ***Assessment accommodations:*** such as allowing additional time to complete tests or assignments or permitting oral responses to test questions.

Other examples of modifications and aids, which may be used in this course, are:

- ❏ Provide step-by-step instructions.
- ❏ Help students create organizers for planning writing tasks.
- ❏ Allow students to report verbally to a scribe (teacher/ student) who can help in note taking.
- ❏ Permit students a range of options for reading and writing tasks.
- ❏ Where an activity requires reading, provide it in advance.
- ❏ Provide opportunities for enrichment.