Ontario eSecondary School
Course Outline
2020-2021

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): Principles of Mathematics, Grade 9 (MPM1D)	
Department: Mathematics	
Course developed by: **Asif Sami Haque**	**Date: July 2017**
Length: **One Semester**	**Hours:** **110**
This course has been developed based on the following Ministry documents: 1. *The Ontario Curriculum, Grades 9 and 10 Mathematics, Revised 2005*	

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. 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*
Unit 1: Linear Systems	22 hours
Unit 2: Geometry	25 hours
Unit 3A: Polynomials	15 hours
Unit 3B: Quadratics	15 hours
Unit 3C: Transformations of Quadratics	19 hours
Unit 4: Trigonometry	13 hours
Final Exam	3 hours
Total	***110 hours**
	***Plus 3-Hour exam**

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 the analytic geometry and show the importance of it. Analytic geometry is important tool in many occupations. They are used by surveyors when they lay out exact positions for constructions projects. We develop formulas for the distance of a point from the origin, and the length of a line segment and its midpoint. 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 involves quadratic relations. Identify and apply the relationship between the roots of a quadratic relationship and its graph. Graph quadratic relations by hand and by technology. Explore the properties of parabolas and their applications to optimization problems. 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. Investigate properties of quadratic relations and how they relate to graphs. Use the symmetry properties of a parabola to write its equation in vertex form. Use the algebraic method called completing the square to write a quadratic relation in vertex form. Graph quadratic relations and find its roots. Learn how to choose the best method to solve a quadratic problem.

UNIT 4: TRIGONOMETRY

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

TEACHING AND LEARNING STRATEGIES

The students will experience a variety of activities:

Whole-Class Activities

Whole class activities are designed to introduce concepts and skills that are directly applicable to the workplace and to build on the content being studied during small group and individual activities. These activities include the following:

Class discussions that are facilitated through video conferencing and telephone conversations with their subject teacher or discussions with other students concerning the concepts and skills being studied. This is done with the use of Socratic circles for discussions.

Teacher demonstrations (research skills, etc.) through video conferencing, email, or telephone conversations with subject teacher, or videos provided of a teacher or student demonstrating the concepts and skills being studied. This helps the student and teacher create an atmosphere of trust and respect to aid in the online learning environment.

Video presentations and technological aids (research) with videos embedded to enrich the course content and clarify concepts and skills being studied. Also the use of online pre-approved quizzes and games to help a student become more familiar with the concepts and skills being studied.

Diagnostic and review activities (audio and video taping) can be student-lead or teacher lead to work as a review for students through audio and video made to share among each other to help reinforce the concepts and skills being studied.

Brainstorming, charts and graphs are a great way for students to demonstrate their knowledge of subject matter through graphic organizers, pictures, and texts. This is communicated through assignments in Moodle.

Small Group Activities

The teacher sets up small group activities to provide opportunities for active and oral learning as well as to bolster practical communication and teamwork skills. The teacher plays a critical role during group activities by monitoring group progress as well as answering questions that arise and using questions to assist students in their understanding. In this way, the teacher also facilitates student understanding of effective learning, communication, and team building during group activities.

The small group activities include the following:

Paired or small group research activities students are able to share their work online with not only their teachers, but their classmates too. Students are able to share resources through online chat and video conferencing. The ability to learn from each other, work on teamwork skills, and practice communication are valued and encouraged throughout the course.

Comparison and evaluation of written work is very important in this course. This course focuses on giving many examples of correct work, and helping students build the skills needed to peer-correct and self-correct. Students are given a variety of texts to read through embedded links, to make comparisons with different texts, real life situations, and their own writing.

Practical extension and application of knowledge is used as an effective learning strategy in this course because it allows the students to read and listen to the texts and stories and reflect back with connections to themselves, other texts and the world. Students are encouraged to share their understandings through work submitted each day, phone conversations about course work, or videoconferencing.

Oral presentations in an online environment we have the equipment to have student either live video conference oral presentations, or make videos and submit them for their oral presentations. These oral presentations can be viewed by fellow students (when appropriate) and the teacher. Students can learn from one another, and from their teacher. Such activities include dramatic readings and performances.

Story boarding an excellent way for students to present their findings, thoughts, and ideas. This allows another way for their work to be communicated and shared between the student and teacher, and student to student. This can be down through uploading on Moodle and video conferencing.

Charts and graphs are used to present effective learning opportunities of concepts and skills to students who would benefit from visual objects to learn. Every student learns differently, and it is used to help students discover another way to present their information such as graphic organizers, lists, and pictures.

Individual Activities

> The teacher should provide a variety of individual assignments to expand and consolidate the learning that takes place in the whole-class and small group activities. Individual activities allow the teacher to accommodate interests and needs and to access the progress of individual students. The teacher plays an important role in supporting these activities through the provision of ongoing feedback to the students, both orally and in writing. Teachers are encouraged to include individual activities such as the following in the course:

Research is completed in an online environment by teaching the students first about plagiarism rules and giving examples of good sources to use. The students are not only limited to the online search for information, but have resources available by links on the Moodle page of information that has been scanned and uploaded.

Individual assignments are worked on at a student's own pace. The teacher can support the student in these activities with ongoing feedback.

Oral presentations are facilitated through the use of video conferencing and video recording.

Practical extension and application of knowledge helps students develop their own voice, and gives them the ability to make personal connections, and connections to the world throughout their course. Students are given a variety or reading and viewing texts to give them many chances to apply their new concepts, skills, and knowledge.

Ongoing project work is something that is valued in the earning of an English credit. The ongoing project can be submitted to the teacher for ongoing feedback in both written and oral work.

Reading students are able to read a variety of texts online. The students may print out the reading material to use it to highlight, take notes, and have with them when a computer is not available.

Written assignments are used to allow students to develop their skills in writing, comprehension, and communication. With the online format students submit their work, and have a chance to get feedback from the teacher, and submit their best work. This can be demonstrated with reading responses, personal writing, report writing, essay writing, script writing, business and technical writing, and individual research assignments.

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 from essays that build towards and prepare students for the end-of-course culminating task in Unit Five. 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, i.e. check bricks; teacher-adapted generic rubrics available in many sources, including the *Ontario Secondary School Literacy Course (OSSLC) Profile,* so that they are more task-specific. The teacher might ask: "What does the criteria look like for this particular task?" Or "What does limited effectiveness look like?" The teacher could involve students in the discussion, modification, or creation of rubrics, and teach students to use rubrics as a learning tool that can support the writing process and practice.

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
- ❑ Essay Writing
- ❑ Evaluations

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 will 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)

Weightings	
Course Work	**70**
Knowledge/Understanding	25
Thinking/Inquiry	10
Communication	15
Application	20
Final	**30**
Final Exam	30

TERM WORK EVALUATIONS (70%):

Evaluation Item	Description	Category
Unit 1: Review Assignment	An assignment to establish the baseline of prior knowledge required for this course.	K,I,C,A
Unit 1: Initials Assignment	The initials project serves as a reinforcement of the concepts learned in linear systems.	K,I,C,A
Unit 1 Assignment	Unit assignment that explores linear systems.	K,I,C,A
Unit 1 and 2 Problem Creation	This assessment serves as a method to get students to start to think critically about how questions are created. This serves as a valuable inquiry skill in mathematics.	K,I,C,A
Unit 2 Assignment	Unit assignment that explores geometry	K,I,C,A
Factoring and Expanding Worksheet	Reinforcement of factoring and expanding polynomials.	K,I,C

Unit 3A Assignment	Polynomials mini-assessment	K,I,C,A
Unit 3B Interview	Conversation with teacher about concepts addressed in all the units until 3B	K,I,C,A
Unit 3B Assignment	Quadratics mini-assessment	K,I,C,A
Unit 3C Assignment	Transformations of Quadratics mini-assessment	K,I,C,A
Unit 4 Assignment	Trigonometry Assignment	K,I,C,A
Unit Review Conference	Discussion with the teacher about Grade 10 concepts. This conversation is expected to be at the level of a student who has mastered the concepts taught in the class.	K,I,C,A

FINAL EVALUATIONS (30%):

Evaluation Item	Description	Category
Final Exam	Formal examination that tests all the concepts for Grade 10 mathematics	K,I,C,A

AFL/AAL/AOL Tracking sheet:

Unit 1: Linear Systems – 22 hours

AAL	AFL	AOL
Unit 1 Resource Forum	Lesson 1.1 Order of Operations Worksheet	Unit 1 Initials Project
Graphing Linear Systems Practice	Lesson 1.1 Notes and Problems Sets Assignment	Unit 1 Linear Systems Assignment
	Lesson 1.6 Linear Systems Handout	

Unit 2: Geometry – 25 hours

AAL	AFL	AOL
Unit 2 Resource Forum	Lesson 2.4 Equations of Lines Worksheet	Unit 2 Problem Set Project and Rubric
Lesson 2.7 Distance From a Point to a Line Notesheet	Lesson 2.6 Submission Box	Unit 2 Assignment

Unit 3A: Polynomials – 15 hours

AAL	AFL	AOL
Unit 3A Resource Forum	Lesson 3A.5 Factoring by Grouping Worksheet	Lesson 3A.7 General Factoring Worksheet
Lesson 3A.2 Multiplying Special Cases Polynomials Worksheet	Lesson 3A.6 Factoring Special Cases Worksheet	Unit 3A Expanding and Factoring Assignment
Lesson 3A.3 Greatest Common Factor Worksheet		

Unit 3B: Quadratics – 15 hours

AAL	AFL	AOL
Unit 3B Resource Forum	Lesson 3B.1 Introduction to Quadratic Relations Worksheet	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 – 19 hours

AAL	AFL	AOL
Unit 3C Resource Forum	Lesson 3C.2 Translations Forum	Unit 3C Assignment
	Lesson 3C.4 Completing the Square Practice	

Unit 4: Transformations of Quadratics – 19 hours

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

Finals

AOL
Culminating Project
Final Exam

CONSIDERATION FOR PROGRAM PLANNING

Students learn best when they are engaged in a variety of ways of learning. Guidance and career education courses lend themselves to a wide range of approaches in that they require students to research, think critically, work cooperatively, discuss relevant issues, and learn through practice in a variety of settings. Helping students become self-directed, lifelong learners is a fundamental aim of the guidance and career education curriculum. When students are engaged in active and experiential learning strategies, they tend to retain knowledge for longer periods and develop meaningful skills. Active and experiential learning strategies also enable students to apply their knowledge and skills to real-life issues and situations.

ANTIDISCRIMINATION EDUCATION IN GUIDANCE AND CAREER EDUCATION

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 per cent 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 ENGLISH 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 parent, teachers, administration and external educational assessment report. 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.
- ❑ ***Environmental accommodations:*** such as preferential seating or special lighting.
- ❑ ***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.
- ❑ Record key words on the board or overhead when students are expected to make their own notes.
- ❑ 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.