Ontario eSecondary School
Course Outline
2024-2025

Ministry of Education Course Title: Functions and Applications, University/College Preparation	
Ministry Course Code: MCF3M	
Course Type: University/College Preparation	
Grade: 11	
Credit Value: 1.0	
Prerequisite(s): Principles of Mathematics, Grade 10 (MPM2D or MPM2P)	
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 11 and 12 Mathematics, Revised 2007*
2. *Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools (2010)*
3. *Learning for All (2013)*

COURSE DESCRIPTION/RATIONALE

This course introduces the mathematical concept of the function by extending students' experiences with quadratic relations. It focuses on quadratic, trigonometric, and exponential functions and their use in modelling real-world situations. Students will represent functions numerically, graphically, and algebraically; simplify expressions; solve equations; and solve problems relating to applications. Students will reason mathematically and communicate their thinking as they solve multi-step problems.

OVERALL CURRICULUM EXPECTATIONS

Quadratic Functions

By the end of this course, students will:

1. Expand and simplify quadratic expressions, solve quadratic equations, and relate the roots of a quadratic equation to the corresponding graph;
2. Demonstrate an understanding of functions, and make connections between the numeric, graphical, and algebraic representations of quadratic functions;
3. Solve problems involving quadratic functions, including problems arising from real-world applications.

Exponential Functions

By the end of this course, students will:

1. Simplify and evaluate numerical expressions involving exponents, and make connections between the numeric, graphical, and algebraic representations of exponential functions;
2. Identify and represent exponential functions, and solve problems involving exponential functions, including problems arising from real-world applications;
3. Demonstrate an understanding of compound interest and annuities and solve related problems.

Trigonometric Functions

By the end of this course, students will:

1. Solve problems involving trigonometry in acute triangles using the sine law and the cosine law, including problems arising from real-world applications;
2. Demonstrate an understanding of periodic relationships and the sine function, and make connections between the numeric, graphical, and algebraic representations of sine functions;
3. Identify and represent sine functions, and solve problems involving sine functions, including problems arising from real-world applications.

COURSE CONTENT

Unit	Length
Unit 1: Quadratic Functions	33 hours
Unit 2: Exponential Functions	28 hours
Unit 3: Trigonometric Functions	24 hours
Unit 4: Financial Applications and Review	20 hours
Final Exam	3 hours
Total	**110 Hours**

UNIT DESCRIPTIONS

UNIT 1: QUADRATIC FUNCTIONS

Students will explore what the difference between a function and a relation is. They will learn how to express the details of a function such as domain and range. They will learn to apply these terms on different functions such as linear, quadratic, and radical. They will also learn how to determine the numeric or graphical representation of the inverse of a linear or quadratic function, given the numeric, graphical, or algebraic representation of the function.

UNIT 2: EXPONENTIAL FUNCTIONS

Students will learn how to express an exponential function. They will investigate it using a variety of tools (e.g., calculator, paper and pencil, graphing technology) and strategies that they used to express functions that they learned in the past. Students will be expected to be able to compare exponential functions with the functions they learned in the past. They will explore different types of exponential functions and make connection through graphing and transformation, also identify exponential functions. An emphasis will be made to expose students to real world applications of growth and decay.

UNIT 3: TRIGONOMETRIC FUNCTIONS

Students will extend their knowledge about trigonometric functions through describing key properties (e.g., cycle, amplitude, period) of periodic functions arising from real-world applications, given a numeric or graphical representation and making connections between the sine and cosine function and the unit circle with or without technology. They will pose problems involving right triangles and oblique triangles in two-dimensional settings/three-dimensional settings, and solve these and other such problems using the primary trigonometric ratios, the cosine law, and the sine law.

UNIT 4: FINANCIAL APPLICATIONS AND REVIEW

Students will extend their knowledge about trigonometric functions through describing key properties (e.g., cycle, amplitude, period) of periodic functions arising from real-world applications, given a numeric or graphical representation and making connections between the sine and cosine function and the unit circle with or without technology. They will pose problems involving right triangles and oblique triangles in two-dimensional settings/three-dimensional settings, and solve these and other such problems using the primary trigonometric ratios, the cosine law, and the sine law.

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.

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
- ❑ 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 (K)	25
Thinking/Inquiry (T)	10
Communication (C)	15
Application (A)	20
Final	**30**
Final Exam (11K, 4.6T, 4.2C, 10.2A)	30

TERM WORK EVALUATIONS (70%)

Evaluation Item	Description	Category	Weight
Unit 1 Quadratic and Polynomials	Students will complete an assignment evaluating their knowledge of quadratic and polynomials.	K, T, C, A	30
Unit 1 Factored Form Application	Students will complete an assignment evaluating their knowledge of factored form application.	K, T, C, A	
Unit 1 Functions and quadratics	Students will complete an assignment evaluating their knowledge of functions and quadratics.	K, T, C, A	
Unit 1 and 2 Problem Set	Students will complete problem sets to demonstrate their understanding of unit concepts.	K, T, C, A	
Unit 2 Mini Assignment	Students will complete an assignment evaluating their knowledge in unit 2.	K, T, C, A	25
Unit 2 First Half Conference	Students will meet with their teacher in a midterm conference.	K, T, C, A	
Unit 2 Assignment 2	Students will complete an assignment evaluating their knowledge from the unit.	K, T, C, A	
Unit 3 Assignment	Students will complete an assignment evaluating their knowledge from the unit.	K, T, C, A	10
Unit 4 Assignment	Students will complete an assignment evaluating their knowledge from the unit.	K, T, C, A	
Unit 4 Second Half Conference	Students will meet with their teacher for an exit meeting.	K, T, C, A	5

FINAL EVALUATIONS (30%)

Evaluation Item	Description	Category	Weight
Final Exam	A final, written examination, covering all curriculum expectations for the course.	K, T, C, A	30

AFL/AAL/AOL TRACKING SHEET

Unit 1: Quadratic Functions – 33 hours

AAL	AFL	AOL
Unit 1 Resource Forum	Lesson 1.1 Factoring Simple Trinomials Worksheet	Unit 1 Quadratic and Polynomials Assignment
Lesson 1.2 Functions, Relations, Domain and Range Forum	Reflection Conference	Factored Form Application Assignment
		Unit 1 Transformations of Quadratics Assignment

Unit 2: Exponential Functions – 28 hours

AAL	AFL	AOL
Unit 2 Resource Forum	Lesson 2.2 Submission Box	Unit 1 and 2 Problem Set
Lesson 2.1 Exponential Growth Forum	Lesson 2.5 Submission Box	Mini Assignment for Unit 2
Lesson 2.4 Properties of Exponential Functions Forum	Reflection Conference	Unit 2 Assignment

Unit 3: Trigonometric Functions – 24 hours

AAL	AFL	AOL
Unit 3 Resource Forum	Lesson 3.2 Submission Box	Unit 3 Assignment
Lesson 3.1 Introduction to Trigonometry Forum	Lesson 3.5 Graphing Sine and Cosine Worksheet	
Unit 3 Reflection	Lesson 3.6 Rapid Review of Trigonometric Functions Worksheet	

Unit 4: Financial Applications and Review – 20 hours

AAL	AFL	AOL
Unit 4 Resource Forum	Lesson 4.2 Annuities Worksheet	Unit 4 Assignment
Lesson 4.1 Simple and Compound Interest Worksheet		

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.