



NSRIC International School in Toronto

London, ON, Canada

1. Course Outline: 2023-2024

Name of School: NSRIC International School in Toronto

Department: Mathematics

Course Title: Functions, Grade 11 University Preparation

Course Name: Functions

Ministry Course Code: MCR3U

Course Type: University Preparation

Credit Value: 1.00

Prerequisites: MPM2D, Principles of Mathematics Grade 10

Course Developer: Anna A Nicolaou

Course Development Date: June 2023

2. Curriculum Policy Documents

- 1.The Ontario Curriculum, Grades 11 and 12, Mathematics, 2005 (Revised)
- 2.Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools, 2010
- 3.Ontario Schools Kg to Gr 12 – Policy and Program Requirement, 2011

3. Course Description

This course introduces the mathematical concept of functions by extending students' experiences with linear and quadratic relations. Students will investigate properties of discrete and continuous functions, including trigonometric and exponential functions; represent functions numerically, algebraically, and graphically; solve problems involving applications of functions; investigate inverse functions; and develop a facility for determining equivalent algebraic expressions. Students will reason mathematically and communicate their thinking as they solve multi-step problems.

4. Course Unit Titles and Descriptions

Unit Titles and Descriptions	Time
Unit 1 - Introduction to Functions By the end of this unit, students will be able to learn what a function is, the various parent functions, how to transform them, and how to add/subtract/multiply functions. They will also learn how to find and state the domain and range using set notation.	17 hours
Unit 2/3 - Quadratic and Exponential Functions By the end of this unit, students will be able to factor and solve quadratic functions, find the number of solutions of quadratic functions, and find the minimum/maximum value of a quadratic function in two different ways (completing the square and finding the zeros to solve). Students will also learn exponent laws, logarithm laws, and how to apply both. They will also learn about exponential growth and decay with applications.	30 hours
Unit 4 - Financial Applications By the end of this unit, students will learn to calculate simple interest and compound interest using various different numbers of payments annually, monthly, and weekly. Students will also learn about present value and future value and how to apply them to real life situations.	20 hours
Unit 5 - Sequences and Series By the end of this unit, students will be able to identify arithmetic sequences and geometric sequences. They will also learn how to find the sum of the first n terms and learn how to find the n th term.	15 hours
Unit 6 - Sinusoidal Functions and Trigonometry By the end of this unit, students will review basic trigonometric functions, sine law, cosine law, and applications. They will be introduced to periodic functions with real world applications and transformations.	25 hours
Final Assessment	

Exam and Final Assignment	3 hours
This is a proctored exam worth 30% of your final grade.	
Total	1 1 0 hours

5. Overall Curriculum Expectations

A. Introduction to Functions	
A1	demonstrate an understanding of functions, their representations, and their inverses, and make connections between the algebraic and graphical representations of functions using transformations;
A2	determine the zeros and the maximum or minimum of a quadratic function, and solve problems involving quadratic functions, including problems arising from real-world applications;
B. Quadratic and Exponential Functions	
B1	evaluate powers with rational exponents, simplify expressions containing exponents, and describe properties of exponential functions represented in a variety of ways;
B2	make connections between the numeric, graphical, and algebraic representations of exponential functions;
B3	identify and represent exponential functions, and solve problems involving exponential functions, including problems arising from real-world applications.
C. Financial Applications	
C1	make connections between sequences, series, and financial applications, and solve problems involving compound interest and ordinary annuities.
C2	
C3	
D. Sequences and Series	

D1	demonstrate an understanding of recursive sequences, represent recursive sequences in a variety of ways, and make connections to Pascal's triangle;
D2	demonstrate an understanding of the relationships involved in arithmetic and geometric sequences and series, and solve related problems;
D3	make connections between sequences, series, and financial applications, and solve problems involving compound interest and ordinary annuities.
E. Sinusoidal Functions and Trigonometry	
E1	determine the values of the trigonometric ratios for angles less than 360° ; prove simple trigonometric identities; and solve problems using the primary trigonometric ratios, the sine law, and the cosine law;
E2	demonstrate an understanding of periodic relationships and sinusoidal functions, and make connections between the numeric, graphical, and algebraic representations of sinusoidal functions;
E3	identify and represent sinusoidal functions, and solve problems involving sinusoidal functions, including problems arising from real-world applications.
F1	
F2	
F3	

6. Teaching and Learning Strategies

The overriding aim of this course is to help students use the language of mathematics 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. The following mathematical processes are used throughout the course as strategies for teaching and learning the concepts presented:

- *Problem solving:* This course scaffolds learning by providing students with opportunities to review and activate prior knowledge (e.g., reviewing factoring techniques from prior mathematics courses), and build off of this knowledge to acquire new skills. The course

guides students toward recognizing opportunities to apply knowledge they have gained to solve real-world problems.

- *Selecting Tools and Computational Strategies:* Modeling the use of tools and having students use technology to help solve problems.
- *Connecting:* This course models the use of software for personal finance to familiarize students with available software and resources which will allow them to simplify calculations in order to better and more accurately manage money.
- *Representing:* Through the use of examples, practice problems, and solution videos, the course models various ways to demonstrate understanding, poses questions that require students to use different representations as they are working at each level of conceptual development - concrete, visual or symbolic, and allows individual students the time they need to solidify their understanding at each conceptual stage.
- *Self-Assessment:* Through the use of interactive activities (e.g. multiple choice quizzes, and drag-and-drop activities) students receive instantaneous feedback and are able to self-assess their understanding of concepts.
- Computer-based Learning - students use simulations and relevant computer programs to explore physics problems
- Brainstorming - group generation of initial ideas expressed without criticism or analysis
- Case Study - investigation of real and simulated problems
- Collaborative/Co-operative Learning - various small group learning techniques
- Conferencing - student to student or student to teacher discussion
- Field Study - students perform investigations on locations beyond the school
- Independent Study - students explore and research a topic of interest
- Report/Presentation - oral and written presentation of researched topic to class

7. Strategies for Assessment and Evaluation of Student Performance

Assessment and evaluation techniques are an integral part of teaching/learning strategies and expectations. The assessment/evaluation techniques are selected to effectively assist students in achieving the overall and specific expectations and be consistent with the teaching/learning strategies. A variety of assessment and evaluation methods, strategies and tools are required as appropriate to the expectation being assessed. Our theory of assessment and evaluation follows the Ministry of Education's *Growing Success* document, and it is our firm belief that doing so is in the best interests of students. These include Assessment for Learning (diagnostic), Assessment

as Learning (formative) and Assessment of Learning (summative) within the course as a whole and within each unit. Specific strategies and tools are described in detail in each activity and unit.

a) Assessment strategies include:

self-assessment	peer assessment
cooperative learning/group work	case studies
student-teacher conferencing	concept maps
research projects/reports	presentations
practical applications	unit and activity tests/quizzes.
Exam	

Strategy Example	Assessment Type / Assessor	Assessment Tool
Speeches	- for learning / teacher - as learning / by student, peer, teacher - of learning / by teacher	checklist or rubric or marking scheme
Tests	- of learning / by teacher	marking scheme
Homework/ Study and Discussion questions	- for learning / teacher - as learning / by student, peer, teacher	Checklist or rubric
Analytical Writing or Experiment	- for learning / teacher - as learning / by student - of learning / by teacher	Guided questions, checklist, and rubric
Creative	- for learning / teacher - as learning / by student - of learning / by teacher	Guided questions, checklist, and rubric
Independent Study Unit	- for learning / teacher - as learning / by student - of learning / by teacher	Checklist, marking scheme, rubric
Summative Assignment	- as learning / teacher - of learning / by teacher	rubric or marking scheme, checklist
Final Written Exam	- of learning / by teacher	marking scheme

b) Assessments AS learning, FOR learning, and OF learning are listed for the following strategies:

The performance standards, outlined in the achievement chart for the course, are a standard province-wide guide and are used to assess and evaluate student achievement of the expectations in the course.

The achievement chart identifies four categories of knowledge and skills which are as follows:

- **Knowledge and Understanding:** Subject-specific content acquired in the course (knowledge), and the comprehension of its meaning and significance (understanding).
- **Thinking:** The use of critical and creative thinking skills and/or processes.
- **Communication:** The conveying of meaning through various forms.
- **Application:** The use of knowledge and skills to make connections within and between various contexts.

For a full explanation, please refer to [*Growing Success*](#).

c) The Final Grade

The evaluation for this course is based on the student's achievement of curriculum expectations and the demonstrated skills required for effective learning. The final percentage grade represents the quality of the student's overall achievement of the expectations for the course and reflects the corresponding level of achievement as described in the achievement chart for the discipline. A credit is granted and recorded for this course if the student's grade is 50% or higher. The final grade will be determined as follows:

- 70% of the grade will be based upon evaluations conducted throughout the course. This portion of the grade will 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 final evaluations administered at the end of the course. The final assessment may be a final exam, a final project, or a combination of both an exam and a project.

8. Learning Skills and Work Habits

The development of learning skills and work habits is an integral part of a student's learning; therefore, assessing, evaluating, and reporting on the achievement of curriculum expectations and on the demonstration of learning skills and work habits are done separately, apart from when learning skills and work habits may be included as part of a curriculum expectation. All curriculum expectations are accounted for in instruction and assessment. Evidence of student

achievement for evaluation is collected over time from three different sources: observations, conversations, and student products.

The development, assessment, and evaluation of the following categories of learning skills and work habits will occur responsibility, organization, independent work, collaboration, initiative, and self-regulation. Learning skills and work habits, apart from when learning skills and work habits may be included as part of a curriculum expectation, will not be considered in the determination of a student's grade.

9. Considerations for Program Planning

9 a). Instructional Approaches

Effective instructional approaches and learning activities draw on students' prior knowledge, capture their interest, and encourage successful/meaningful practice both inside the classroom. Successful classroom practices engage students in activities that require higher-order thinking, with an emphasis on problem solving. Students will be encouraged to see the connection between the mathematical concepts they are learning and their application in their workplace and everyday life.

Students will have opportunities to learn in a variety of ways – individually, cooperatively, independently, with teacher direction, through hands-on experiences, and through examples followed by practice. In this course students will learn concepts and procedures, acquire skills for analysis of a problem, analyze workplace and everyday life related mathematical problems, and apply mathematical processes of the problems, so that they become competent in these various areas with the aid of instructional and learning strategies that are suited to the learning. Activities related with practical life experience/examples are necessary for supporting the effective learning of this course for all students.

9 b). Promoting Positive Attitudes towards Learning Mathematics

Students will be encouraged to develop a willingness to persist, to investigate, to reason, to explore alternative solutions, to view challenges as opportunities to extend their learning, and to take the risks necessary to become successful problem solvers. Students will be provided with problems that are challenging but not beyond their ability to solve to develop their confidence and reduce anxiety and frustration.

Collaborative learning enhances students' understanding of mathematics. Working cooperatively in groups reduces isolation and provides students with opportunities to share ideas and communicate their thinking in a supportive environment as they work together towards a common goal. Communication and the connections among ideas that emerges students interact with one another enhance the quality of student learning. Considering these, group work will be encouraged by assigning group assignments and projects.

9 c). Planning Mathematics Programs for Students with Special Education Needs

This course work will be designed that recognize the diversity of learning process of among individual students. Student's performance will be given considering their particular abilities so that all students can derive the greatest possible benefit from the teaching and learning process. To planning the course for students with special education needs the current achievement level of the individual student, their strengths and learning needs, and the knowledge and skills that all students are expected to demonstrate at the end of the course will be examined in order to determine the types of accommodation they need in the course.

9 d). Program Considerations for English Language Learners

Appropriate adaptations and strategies for instruction and assessment to facilitate the success of the English language learners in their classrooms will be incorporate so that they can understand the lessons and complete their task properly. These adaptations and strategies might include:

- modification of some or all of the course expectations so that they are challenging but attainable for the learner at his or her present level of English proficiency, given the necessary support from the teacher;
- use of a variety of instructional strategies (e.g., extensive use of visual cues, scaffolding, manipulatives, pictures, diagrams, graphic organizers; attention to clarity of instructions);
- modeling of preferred ways of working in mathematics; previewing of textbooks; pre-teaching of key vocabulary; peer tutoring; strategic use of students' first languages;
- use of a variety of learning resources (e.g., visual material, simplified text, bilingual dictionaries, materials that reflect cultural diversity);
- use of assessment accommodations (e.g., granting of extra time; simplification of language used in problems and instructions; use of oral interviews, learning logs, portfolios, demonstrations, visual representations, and tasks requiring completion of graphic organizers or cloze sentences instead of tasks that depend heavily on proficiency in English).

10. Resources

Selections from the following may be considered for use:

- Ministry of Education and Training "Course Profile" (www.curriculum.org)
- Ontario Secondary Schools 9 to 12 – Program and Diploma Requirements 1999
- The Ontario Curriculum, Grades 9 to 12: Program Planning and Assessment, 2000.
- OTDSB documents
- Approved textbook: <https://amzn.to/3HrhO38> **Nelson Functions (University Preparation)**
- **Study Guide:** <https://amzn.to/3DesuQ2> or/and <https://amzn.to/3kPUHX5>
- Other sources

11. Late Submission Policy

There will be a **DUE DATE** and a **DEADLINE** to hand in assignments, projects, etc. For example,

I, the teacher, decide that Project A is due on Monday. That will be the **DUE DATE**. The **DEADLINE** will be five school days after the due date i.e., on next Monday but for 1st 3-days of delay in submission 10% marks will be deducted per day and after that 20% for rest of the days. No submission will be accepted after deadline. However, in case sickness or any other acceptable reason, the student could not submit his/her work within deadline; the student might get extension of time on the condition that the student provides a doctor's note or parent's note explaining the condition.

12. Test/Exam Policy

A student who remains absent with acceptable reason on the day of a test or exam will get no marks on that test/exam. A re-test will only be allowed on the condition that the student provides acceptable explanation of his/her absence on that day with proper evidence (doctor's and/or parent's note).

13. Academic Honesty

Academic honesty is a fundamental cornerstone in student learning. Academic dishonesty, including instances of **plagiarism** and **cheating**, are serious breaches of the school code of conduct. **All cases of academic dishonesty** will be reported to the school administration and guardians, and a disciplinary action taken. Disciplinary action taken may include Academic counselling; a compensatory task (e.g., writing an article about "ethics"); or a zero mark.