

Canterbury High School

Ottawa-Carleton District School Board

Mathematics Department

Semester I – 2010 / 2011 – Course Outline

Course Title: Functions and Applications	Grade Level: 11
Course Code: MCF3M	Credit Value: 1.0
Prerequisite: MFM2P, MPM 2D	

Teacher: D. Hughson

Course Overview 110 hours

This course introduces basic features 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.

Strands:

Course Expectations

As students work through the course they will develop a set of skills that will support lifelong learning in mathematics. These skills are a set of seven mathematical processes that are embedded throughout all of the course expectations; they are, problem-solving, reasoning and proving, reflecting, selecting tools and computational strategies, connecting, representing, and communicating. This course will provide students with rich problem-solving opportunities that will help the student develop and apply these processes.

A. Quadratic Functions

By the end of the 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.

B. Exponential Functions

By the end of the 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.

C. Trigonometric Functions

By the end of the course, students will:

1. solve problems involving trigonometry in acute triangles including problems arising from real-world applications;
2. demonstrate an understanding of periodic relationships between the numeric, graphical, and algebraic representations
3. identify and represent sine functions, and solve problems arising from real-world applications.

Units of Study

1. Introduction (4 days)

This is an opportunity for students to see the big picture of the course.

Students will explore 4 functions (linear, quadratic, exponential and periodic) in a very general way. Having students “walk” each of these graphs will give them a kinesthetic connection with the similarities and differences

2. Functions (7 days)

- quadratic expressions are expanded and simplified
- the solutions to quadratic equations have real-life connections
- properties of quadratic functions are explored
- problems are solved by modeling quadratic functions

3. Investigating Quadratics (11 days)

- strategies are developed for determining the zeroes of quadratic functions
- connections are made between the meaning of zeros in context
- quadratic data are modeled using algebraic techniques

4. Quadratics: Highs and Lows (18 days)
 - three forms of the quadratic function and the information that each form provides are investigated
 - technology is used to show that all three forms for a given quadratic function are equivalent
 - convert from standard (expanded) form to vertex form by completing the square
 - graphs of a quadratic function are sketched by using a suitable strategy. (i.e. factoring, completing the square and applying transformations)
 - the development of the quadratic formula is explored
 - the value of the discriminant is connected to the number of roots
 - data from primary and secondary sources are collected and modelled as a quadratic function using a variety of tools
 - problems are solved arising from real world applications given the algebraic representation of the quadratic function

5. Exponential Functions (12 days)
 - primary data and investigate secondary data that can be modelled as exponential growth/decay functions are collected
 - connections are made between numeric, graphical and algebraic representations of exponential functions
 - key features of the graphs of exponential functions are identified (e.g., domain, range, y-intercept, horizontal asymptote, regions of increase and decrease)
 - understand the meaning of domain and range to a variety of exponential models
 - solve real-world applications using given graphs or equations of exponential functions
 - simplify and evaluate numerical expressions involving exponents

6. Financial Applications of Exponential Functions (10 days)
 - connect compound interest to exponential growth
 - Examine annuities using technology
 - Make decisions and comparisons using the TVM solver

7. Acute Triangle Trigonometry (7 days)
 - solve acute triangles using the primary trigonometric ratios, sine law, and cosine law
 - solve real-world application problems requiring the use of the primary trigonometric ratios, sine law, and cosine law including 2-D problems involving 2 right triangles

8. Trigonometric Functions (11 days)
 - periodic functions are investigated with and without technology.
 - the properties of periodic functions are studied
 - transformations of the graph of the sine function are explored
 - real-world applications using sinusoidal data, graphs or equations are solved

Teaching Strategies

Students will have the opportunity to learn in a variety of ways; individually, cooperatively, investigative, teacher directed class discussion and notes.

Assessment and Evaluation Strategies

Student achievement will be monitored through the use of formative assessments in the form of quizzes, assignments, observations. Feedback on these assessments will provide the student with information to determine their level of understanding of the concepts. Student achievement will be recorded through the use of quizzes, tests, assignments/tasks. The percentage grade will represent the quality of the student's overall achievement of the expectations for the course and reflect the corresponding level of achievement as described in the achievement chart.

Evaluation Summary

Term Evaluation (70%) comprised of:

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|----|--|---------|
| a) | <u>Knowledge and Understanding</u>
(understand the concepts and computational skills of specific expectations) | - 24.5% |
| b) | <u>Application</u>
(knowing when and how to use appropriate tools and concepts to solve problems) | - 24.5% |
| c) | <u>Thinking, Inquiry, Problem Solving</u>
(being able to use critical and creative thinking skills to solve problems, connect ideas from other strands) | - 10.5% |
| d) | <u>Communication</u>
(reflect and express through writing a mathematical solution or concept) | - 10.5% |

Summative Evaluation (30%) comprised of:

- | | | |
|----|---|-------|
| a) | <u>Summative Task</u> (problems using a variety of tools) | - 10% |
| b) | <u>Examination</u> | - 20% |

References

www.edu.gov.on.ca/eng/curriculum/secondary/math1112currb.pdf

Student Resources / Texts

1. Functions and Applications 11, Nelson
2. www.oame.on.ca