Grade 11 U/C Functions and Applications (MCF3M)
Support Materials

Consortium of Boards Joint Project
Summer 2006

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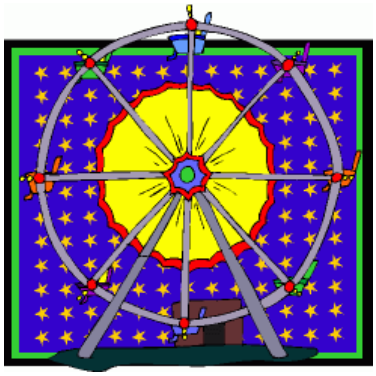
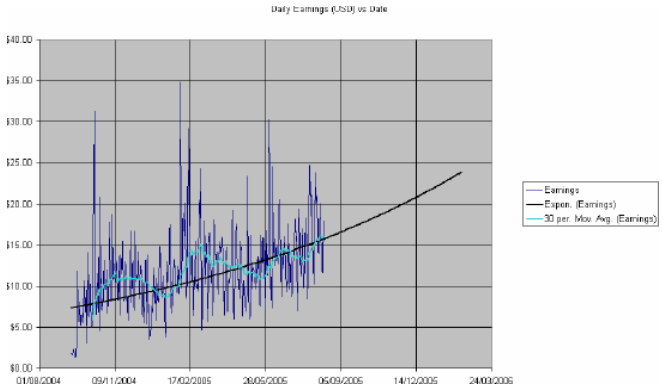
Funding provided by the 5 boards and OMCA.

MCF 3M

Ball flying through the air

Ferris wheel at the fair





Compounding interest of an heir

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Introduction

This package of materials has been created in response to the revised grade 11 mathematics curriculum to be implemented in September, 2006. The prepared lessons are not exhaustive, but rather were developed to give a flavour of the intended approach for this course. Attention was given to address areas where there was a lack of resources as well as modelling how to bridge the understanding for students between the abstract and application. Teachers are encouraged to work together in school and board teams to develop lessons not included to extend their own learning as the writers in this project have done.

Guiding Principles:

- Student success (teaching considerations to support the profile of the learner)
- Interweave and revisit the big idea of this course - modelling data with functions and connecting to real world applications
- Emphasis on problem solving and inquiry
- Make the mathematical processes and literacy strategies explicit
- Use TIPS4RM as models

Processes

The seven mathematical process expectations describe the actions of doing mathematics. In the revised curriculum, these process expectations have been highlighted in their importance because they support the acquisition and use of mathematical knowledge and skills. They can be mapped to three categories of the Achievement Chart – Thinking, Communication and Application. The fourth category, Knowledge and Understanding, connects to the content of the course. Students apply the mathematical processes as they learn the content for the program.
Students need multiple opportunities to engage in the processes. Every lesson included in this project highlights at least one process to be developed (summarized in Appendix B).The summative performance tasks provide criteria for assessment on all the processes.
To assist students' development of these processes (instructional strategies, questions and feedback) see TIPS4RM Processes Package on the Leading Math Success website http://www.curriculum.org/lms/

Literacy Strategies

To improve student success there needs to be more emphasis on developing literacy competencies linked to mathematics learning. To consolidate understanding, learners need opportunities to share their understanding both in oral as well as written form. Weakness in reading or writing skills provides barriers to success in problem solving. This resource explicitly embeds at least one literacy strategy in every lesson.
Starting points for teachers:

- Use strategies from Think Literacy: Cross-Curricular Approaches, Mathematics, Grades 10-12, 2005 http://www.curriculum.org/thinkliteracy/library.html
- Use strategies to develop vocabulary and comprehension skills (eg., word walls)
- Use strategies relating to the organization of information (eg., concept maps)
- Use strategies to help students understand features of textbooks and graphics
- Read problems aloud and highlight key words

(LEADING MATH SUCCESS, REPORT OF EXPERT PANEL, 2004)

Assessment

The primary purpose of assessment and evaluation is to improve student learning. Information gathered through assessment helps to provide feedback to students as well as guiding teachers' instruction.
Assessment must based on the four categories of the achievement chart and include the mathematical processes. The following chart provides a connection between the two:

Connecting Achievement Chart and Mathematical Processes

Category	
Knowledge and Understanding	Procedural Knowledge Conceptual Understanding
Category	**Processes**
Thinking	Problem Solving Reflecting Reasoning and Proving
Communication	Communicating Representing
Application	Selecting Tools and Strategies Connecting

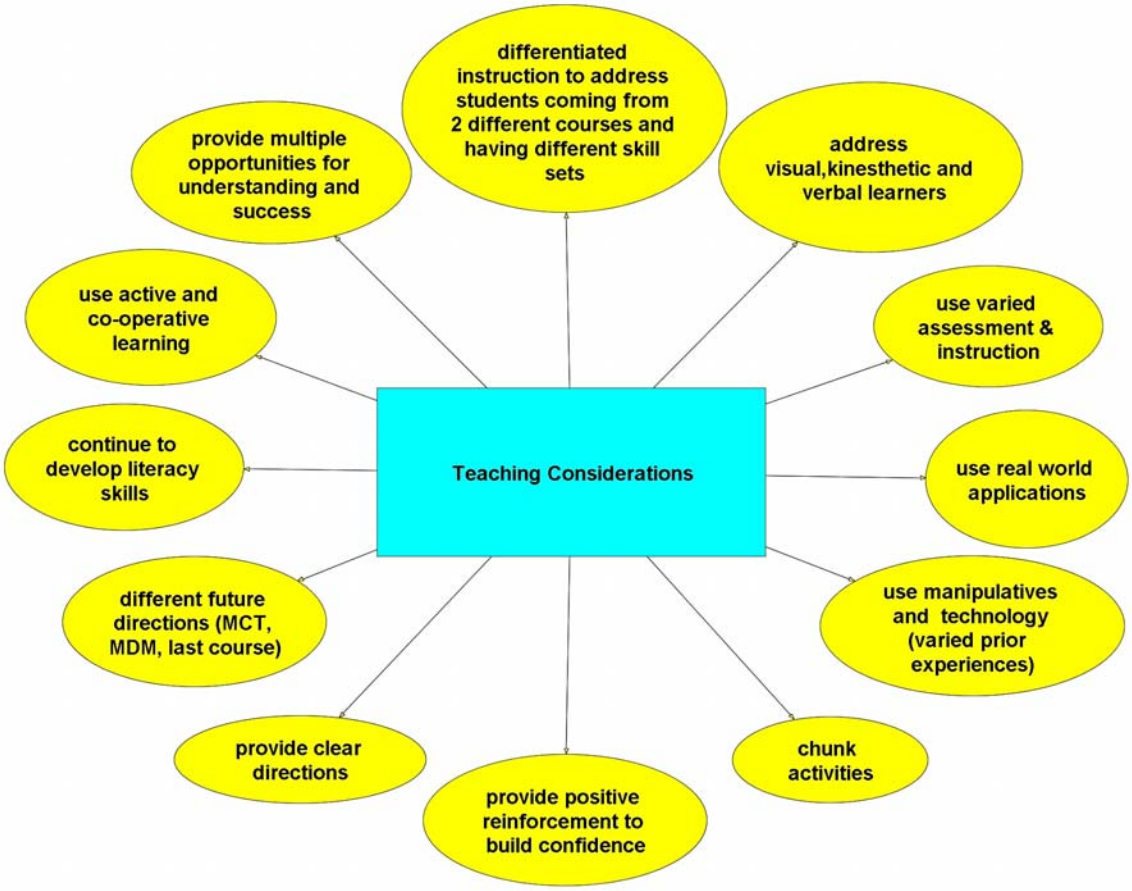
Assessment should be varied in nature. The chart below provides suggestions for a variety of assessment tools and the categories that they could be connected to.

Category	**Assessment Tools**
Knowledge and Understanding	Quiz, Test, Exam, Checbric, Demonstration, Short Answer , True/False , Multiple Choice, Observation
Thinking, and Problem Solving	Editorials, Observations, Portfolio/Digital Portfolio, Essays, Articles, Debates, Report, Investigations, Graphic Organizers, Open-ended Questions, Performance Assessment Tasks, Video Tapes, Plays, Student /Teacher Conferences
Communication	Concept Map, Journals, Plays , Multi media presentations , Oral presentations , Drawings , Discussions, Explanations , Performance Task Assessment, Student/Teacher Conferences, Portfolio
Application	Concept Map, Debates, Editorials, Portfolio, Observation, Tests, Quizzes, Open-ended Questions, Design of Products, Models/Concrete Representations, Discussion

Note : This is by no means an exclusive or exhaustive list. It is only a guide.

Teaching Considerations

To support the grade 11 U/C learner, the following should be considered:



Summative Tasks

Midterm (two versions) and final summative performance tasks are included in this resource. They provide opportunities to assess the important concepts in the course through the mathematical processes. It is important for teachers to be aware of the skills and knowledge expected of the students on those assessments at the beginning of the course, so that students are appropriately prepared for them by having similar opportunities during the course. A paper and pencil test at midterm and final exam can assess the Knowledge and Understanding category.

Manipulatives and Technology

Many expectations in the revised curriculum make reference to using a variety of tools, including manipulatives, calculators and computer software. All new learning should begin with explorations using manipulatives whenever possible to provide students with representations of abstract mathematical ideas in varied, concrete, tactile, and visually rich ways. *(LEADING MATH SUCCESS, REPORT OF EXPERT PANEL, 2004)*

Information and communication technologies provide a range of tools that can significantly extend and enrich teachers' instructional strategies and support students' learning. Technology can reduce the time spent on routine mathematical tasks thus allowing students to devote more of their efforts to thinking and concept development. *(The Ontario Curriculum, Grade 11 Mathematics, Revised, 2006)*

The lessons and assessment written for this support document identify these learning tools. Teachers need to make arrangements to have these materials available and for computer lab booking at the beginning of the course.

Lesson Planning (Match Template)

The lessons and assessments have been created using the MATCH template from the TIPS4RM resource. The acronym MATCH is organized around a three part lesson, paying attention to:

Minds on…getting students mentally engaged in the first few minutes of class
Action! the main portion of the lesson where students investigate new concepts
Consolidate/Debrief ideas for 'pulling out the math', and checking for understanding

Meaningful and appropriate follow-up to the lesson is provided in the Home Activity section.
The time allocation in the upper left corner suggests how much time should be devoted to each of the three parts of the lesson.
The materials section in the upper right corner identifies resources needed for the class.
The right hand column offers Tips for teachers such as instructional strategies, references to resources, literacy strategies used, and explanations.
The narrow column to the left of this suggests opportunities for assessment.
For further details about this organizers go to http://www.curriculcum.org/lms/

The following supports are included in this package.

- Scope and Sequence (order and timing of topics and summative assessments)
  - Appendix A
- Unit outlines (Big Ideas; expectations; teaching notes)
  - Appendix A
- Lessons and BLMs for over 50 % of the course (identified as those which would most support teachers)
- Two midterm and a course summative performance tasks
- A table identifying lessons that focus on each of the mathematical processes
  - Appendix B
- Electronic Resources (GSP sketches, Fathom Data files, power point slide shows)

These resources are also posted on the OAME website: http://www.oame.on.ca

The poem on last page was written by Punitha Kandasamy, Peel DSB.
An overhead of this poem could be displayed for the first day of class as a novel way to introduce the concepts of the course.

Online Resources

TI Resources

TI Education	http://education.ti.com/educationportal/sites/US/homePage/index.html
Forensics: Connecting Science Explorations	http://education.ti.com/educationportal/sites/US/nonProductSingle/activitybook_forensics.html
EasyData Activities: Modeling Algebraic Functions	http://education.ti.com/educationportal/sites/US/nonProductSingle/activitybook_math_easydata.html
Exploring Mathematics with the Transformation Graphing Application	http://education.ti.com/educationportal/sites/US/nonProductSingle/activitybook_transgraphapp_exploring.html
Real World Math Made Easy	http://education.ti.com/educationportal/sites/US/nonProductSingle/activitybook_math_realworld.html
Quadratic modeling using the Transform application	http://education.ti.com/educationportal/activityexchange/Activity.do?cid=US&aId=2702

Data Sets

Teacher Web Data Sets	http://teacherweb.com/ON/statistics/Math/photo2.stm
Data and Story Library	http://lib.stat.cmu.edu/DASL/
American Government Data sets	http://www.fedstats.gov/
Carnegie Mellon Data Library	http://lib.stat.cmu.edu/datasets/

E-Stat Data Sets (http://estat.statcan.ca/)

Name	Model	Table Number
Canadian Births (1948-1968)	Quadaratic	053-0001
Potato Production (1908-2004)	Exponential	001-0014
Operating Revenue in Cable Industry (353-0001)	Exponential	353-0001
Absence Rates for Full-time Employees (2000-2004)	Exponential	279-0031
Total Farm Slaughtering (1965-1976)	Exponential	003-0026
Federal Debt (1955-1999(	Exponential	385-0010
Production and Stock of Beverages (2000-2003)	Sinusoidal	303-0019
Imports by Summary Import Groups (2000-2004)	Sinusoidal	226-0002

Virtual Manipulatives

National Library of Virtual Manipulatives	http://nlvm.usu.edu/en/nav/vlibrary.html

These functions you will explore

Numerically, algebraically,
Graphically and more.

To identify them is your task,

Quadratic, periodic or
Exponential you must ask.

Apply the knowledge you will
Acquire.

See the connections that are
Required.

These functions everywhere
Abound.

Great thinking ways yet to be
Found.