



Foundation for College Mathematics, MBF3C, Grade 11, College Course Outline

Name of School: CanSTEM Education Private School Inc.

Department: Mathematics

Course Developer: Sajjala P Sankhe

Course Development Date: September 2017

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Course Title: Foundation for College Mathematics

Grade: 11

Type: College preparation

Ministry Course Code: MBF3C

Credit Value: 1.0

Developed from: The Ontario Curriculum, Grade 11 and 12: Mathematics, 2007(Revised)

Prerequisite: Foundations of Mathematics, Grade 10, Applied MFM2P

Course Description:

This course introduces the mathematical concept of the function 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 facility in determining equivalent algebraic expressions. Students will reason mathematically and communicate their thinking as they solve multi-step problems.

Overall Expectations

By the end of this course, students will:

MATHEMATICAL MODELS:-

1. make connections between the numeric, graphical, and algebraic representations of quadratic relations, and use the connections to solve problems;
2. Demonstrate an understanding of exponents, and make connections between the numeric, graphical, and algebraic representations of exponential relations;
3. Describe and represent exponential relations, and solve problems involving exponential relations arising from real-world applications.

PERSONAL FINANCE

1. compare simple and compound interest, relate compound interest to exponential growth, and solve problems involving compound interest;
2. Compare services available from financial institutions, and solve problems involving the cost of making purchases on credit;
3. Interpret information about owning and operating a vehicle, and solve problems involving the associated costs.



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GEOMETRY AND TRIGONOMETRY

1. represent, in a variety of ways, two-dimensional shapes and three-dimensional figures arising from real-world applications, and solve design problems;
2. Solve problems involving trigonometry in acute triangles using the sine law and the cosine law, including problems arising from real-world applications.

DATA MANAGEMENT

1. solve problems involving one-variable data by collecting, organizing, analysing, and evaluating data;
2. Determine and represent probability, and identify and interpret its applications.

Titles and Descriptions	Time and Sequence
<p style="text-align: center;">Trigonometry</p> <p>In this unit, we will look at the basics of Trigonometry, the study of triangles. We will consider different methods of determining information about triangles, the lengths of sides and their angles, and develop the skills that will enable us to choose an appropriate strategy based on the information we have.</p>	18 hours
<p style="text-align: center;">Measurement</p> <p>In this unit, we will consider the measurement of length area and volume. We will consider the different ways of measuring, and develop an understanding of their origins. We will tackle one of Mathematics' most useful tools- optimization- the process of maximizing one quantity given certain restraints in another.</p>	16 hours
<p style="text-align: center;">Data and Statistics</p> <p>In this unit, we will gain some vital skills in data management. Perhaps the most important of those is the ability to analyse information, to spot patterns, and to be able to make predictions based on them. We will use tools that will help us process information and develop the skills that will enable us to analyse our findings.</p>	18 hours
<p style="text-align: center;">Graphical Models</p> <p>In this unit, we will look at various means of graphically representing relationships. We will consider different situations, and determine the form of graphical representation that would best illustrate the relationship. We will develop the skills to both produce and analyse such graphs.</p>	13 hours
<p style="text-align: center;">Algebraic Models</p> <p>In this unit, we will look at ways of representing relationships using algebra. We will again look at a number of different relationships, and determine how they might best be described using the language of mathematics. We will use these representations to further study and develop the relationships.</p>	16 hours



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Financial Applications	18 hours
Mathematics becomes a critical life-skill when we apply it to our finances. We will look at various financial applications including annuities and mortgages, and gain the skills that will allow us to make educated and rational choices when faced with some of the biggest decisions we will ever make.	
Budgeting	11 hours
In this unit, we will bring those skills into the personal budget, and look at the cost of living. We will consider savings plans, renting versus owning a home, and maintaining a budget. We will develop skills that everyone, regardless of their path thorough life, will need and use.	
Final Evaluation	2 hours
The final assessment task is a proctored two hour exam worth 30% of the student's final mark.	
Total	110 hours

TEACHING & LEARNING STRATEGIES

Strategies marked with “x” are used in the course.			
Direct Instruction (teacher-led)	x	Class Activity (teacher facilitation)	
Direct Instruction (discussion possible)		Experiential learning (learn by doing)	x
Class Discussion (teacher facilitated)	x	Worksheets/Surveys	x
Small Group Discussion	x	Individual or Group Research	
Partner Discussion/Conferencing	x	Teacher modeling	
1:1 Conferencing Teacher & Student		Text-based modeling	x
Teacher reading to class		Use of Computers / Internet	
Silent individual reading		Use of video tape or audio materials	
Group based reading		Role Playing	
Independent Work (teacher facilitation)	x	Presentations	
Group Work (teacher facilitation)	x	Guest Speaker / Interviews / Questions	
Brainstorming	x	Field Trip	

ASSESSMENT & EVALUATION

Purpose

The primary purpose of assessment is to improve student learning. Assessment relates directly to the expectations for the course.

A variety of assessments for and as learning are conducted on a regular basis to allow ample opportunities for students to improve and ultimately demonstrate their full range of learning and in order for the teacher



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to gather information to provide feedback. Assessment tasks relate to the success criteria set out in lesson plans. Success criteria allow students to see what quality looks like.

Evaluation is the process of judging the quality of student work in relation to the achievement chart categories and criteria, and assigning a percentage grade to represent that quality. Evaluations based on gathering evidence of student achievement through:

- Products
- Observations
- Conversations

Assessment for Learning - we provide feedback and coaching

Assessment FOR Learning is the process of seeking and interpreting evidence for the use of learners and their teachers to decide where the learners are in their learning, where they need to go, and how best to go there.

Assessment as Learning - we help students monitor progress, set goals, reflect on their learning

Assessment AS Learning is the process of the explicit fostering of students' capacity over time to be their own best assessors, but teachers need to start by presenting and modeling, external, structured opportunities for students to assess themselves.

Assessment of Learning – we use assessments as ways of providing evaluative statements about the level of achievement of students

Assessment OF Learning is the assessment that becomes public and results in statements of symbols (marks/grades/levels of achievement) about how well students are learning. It often contributes to pivotal decisions that will affect students' future.

Weighting of categories

Knowledge & Understanding	Thinking	Communication	Application
20%	30%	20%	30%

Grading

- The final grade is based on performance in 3 areas: products, observations, conversations.
- 70% of the grade is based on evaluations conducted throughout the course.
- 30% is based on a final evaluations

Assessment Tools

Assessment tools marked with "x" are used in the course.			
Marking schemes	x	Rubrics	x
Anecdotal comments	x	Checklists	x



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Rating Scales			
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Assessment Strategies

Assessment for Learning		Assessment as Learning		Assessment of Learning	
Quizzes	x	Journal		Tests	x
Tests	x	Exit and Entrance Cards	x	Presentations	
Presentations		KWL Chart		Journals	
Journals		Self/Peer assessment	x	Essays	
Essays		Logs		Models	
Models				Projects	
Projects				Demonstrations	
Demonstrations				Conferencing	
Conferencing				Questioning	
Questioning				Independent Study Assignment	x
Independent Study Assignment	x			Art Exhibits	
Art Exhibits				Researching	
Researching				Reading Aloud	
Reading Aloud				Problem Solving (process focused)	x
Problem Solving (process focused)	x			Debates	
Debates				Work Sheets	x
Work Sheets	x			Role Playing	
Role Playing				Direct Instruction	x
Direct Instruction	x				

CONSIDERATIONS FOR PROGRAM PLANNING

Teaching Approaches

To make new learning more accessible to students, teachers draw upon the knowledge and Skills students have acquired in previous years – in other words, they help activate prior Knowledge. It is important to assess where students are in their mathematical growth and to bring them forward in their learning.

In order to apply their knowledge effectively and to continue to learn, students must have a Solid conceptual foundation in mathematics. Successful classroom practices involve students in activities that require higher-order thinking, with an emphasis on problem solving. Students who have completed the elementary program should have a good grounding in the investigative approach to learning new concepts, including the inquiry model of problem solving, and this approach is still fundamental in the Grade 9 and 10 program.



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Students in a mathematics class typically demonstrate diversity in the ways they learn best. It is important, therefore, that students have opportunities to learn in a variety of ways – individually, cooperatively, independently, with teacher direction, through hands-on experience, through examples followed by practice. In mathematics, students are required to learn concepts, procedures, and processes and to acquire skills, and they become competent in these various areas with the aid of the instructional and learning strategies best suited to the particular type of learning. The approaches and strategies used in the classroom to help students meet the expectations of this curriculum will vary according to the object of the learning and the needs of the students.

Even at the secondary level, manipulatives are necessary tools for supporting the effective learning of mathematics. These concrete learning tools invite students to explore and represent abstract mathematical ideas in varied, concrete, tactile, and visually rich ways. Manipulatives are also a valuable aid to teachers. By analysing students' concrete representations of mathematical concepts and listening carefully to their reasoning, teachers can gain useful insights into students' thinking and provide supports to help enhance their thinking.

All learning, especially new learning, should be embedded in well-chosen contexts for learning – that is, contexts that are broad enough to allow students to investigate initial understandings, identify and develop relevant supporting skills, and gain experience with varied and interesting applications of the new knowledge. Such rich contexts for learning open the door for students to see the “big ideas” of mathematics – that is, the major underlying principles, such as pattern or relationship. This understanding of key principles will enable and encourage students to use mathematical reasoning throughout their lives.

See the resource document *Targeted Implementation & Planning Supports (TIPS): Grade 7, 8, and 9 Applied Mathematics* (Toronto: Queen's Printer for Ontario, 2003) for helpful information about the inquiry method of problem solving.

A list of manipulatives appropriate for use in intermediate and senior mathematics classrooms is provided in *Leading Math Success*, pages 48–49.

Promoting Attitudes Conducive to Learning Mathematics. Students' attitudes have a significant effect on how they approach problem solving and how well they succeed in mathematics.

Teachers can help students develop the confidence they need by demonstrating a positive disposition towards mathematics.⁶ Students need to understand that, for some mathematics problems, there may be several ways to arrive at the correct answer. They also need to believe that they are capable of finding solutions. It is common for people to think that if they cannot solve problems quickly and easily, they must be inadequate. Teachers can help students understand that problem solving of almost any kind often requires a considerable expenditure of time and energy and a good deal of perseverance. Once students have this understanding, teachers can encourage them to develop the willingness to persist, to investigate, to reason and explore alternative solutions, and to take the risks necessary to become successful problem solvers.

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 emerge as students interact with one another enhance the quality of student learning.



English as a Second Language and English Literacy Development (ESL/ELD)

Young people whose first language is not English enter Ontario secondary schools with diverse linguistic and cultural backgrounds. Some may have experience of highly sophisticated educational systems while others may have had limited formal schooling. All of these students bring a rich array of background knowledge and experience to the classroom, and all teachers must share in the responsibility for their English-language development.

Teachers of mathematics must incorporate appropriate strategies for instruction and assessment to facilitate the success of the ESL and ELD students in their classrooms. These strategies include:

- Modification of some or all of the course expectations, based on the student's level of English proficiency;
- Use of a variety of instructional strategies (e.g., extensive use of visual cues, manipulatives, pictures, diagrams, graphic organizers; attention to clarity of instructions; modelling of preferred ways of working in mathematics; previewing of textbooks; pre-teaching of key specialized vocabulary; encouragement of peer tutoring and class discussion; strategic use of students' first languages);
- Use of a variety of learning resources (e.g., visual material, simplified text, bilingual dictionaries, culturally diverse materials);
- Use of assessment accommodations (e.g., granting of extra time; use of alternative forms of assessment, such as oral interviews, learning logs, or portfolios; simplification of language used in problems and instructions).

Students who are no longer taking ESL or ELD courses may still need program adaptations to be successful. If a student requires modified expectations or accommodations in a mathematics course, a checkmark must be placed in the ESL/ELD box on the student's report card (see *Guide to the Provincial Report Card, Grades 9–12, 1999*).

For further information on supporting ESL/ELD students, refer to *The Ontario Curriculum, Grades 9 to 12: English As a Second Language and English Literacy Development, 1999*.

Antidiscrimination Education in Mathematics

To ensure that all students in the province have an equal opportunity to achieve their full potential, the curriculum must be free from bias and all students must be provided with a safe and secure environment, characterized by respect for others that allows them to participate fully and responsibly in the educational experience.

Learning activities and resources used to implement the curriculum should be inclusive in nature, reflecting the range of experiences of students with varying backgrounds, abilities, interests, and learning styles. They should enable students to become more sensitive to the diverse cultures and perceptions of others, including Aboriginal peoples. For example, activities can be designed to relate concepts in geometry or patterning to the arches and tile work often found in Asian architecture or to the patterns used in Aboriginal basketry design.

By discussing aspects of the history of mathematics, teachers can help make students aware of the various cultural groups that have contributed to the evolution of mathematics over the centuries. Finally, students need to recognize that ordinary people use mathematics in a variety of everyday contexts, both at work and in their daily lives. Connecting mathematical ideas to real-world situations through learning activities can



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Enhance students' appreciation of the role of mathematics in human affairs, in areas including health, science, and the environment. Students can be made aware of the use of mathematics in contexts such as sampling and surveying and the use of statistics to analyse trends. Recognizing the importance of mathematics in such areas helps motivate students to learn and also provides a foundation for informed, responsible citizenship.

Teachers should have high expectations for all students. To achieve their mathematical potential, however, different students may need different kinds of support. Some boys, for example, may need additional support in developing their literacy skills in order to complete mathematical tasks effectively. For some girls, additional encouragement to envision themselves in careers involving mathematics may be beneficial. For example, teachers might consider providing strong role models in the form of female guest speakers who are mathematicians or who use mathematics in their careers.

Antidiscrimination Education

Learning resources reflect students' interests, backgrounds, cultures, and experiences. Learning materials: involve protagonists of both sexes from a wide variety of backgrounds reflect the diversity of Canadian and world cultures, including those of contemporary First Nations, Métis, and Inuit peoples include, in English, use of short stories, novels, magazine and newspaper articles, television programs, and films

Include, in English, use of short stories, novels, magazine and newspaper articles, television programs, and films provide opportunities for students to explore issues relating to their self-identity make students aware of the historical, cultural, and political contexts for both the traditional and non-traditional gender and social roles represented in the materials they are studying.

Literacy and Inquiry/Research Skills

Literacy skills can play an important role in student success in mathematics courses. Many of the activities and tasks students undertake in math courses involve the use of written, oral, and visual communication skills. For example, students use language to record their observations, to explain their reasoning when solving problems, to describe their inquiries in both informal and formal contexts, and to justify their results in small-group conversations, oral presentations, and written reports. The language of mathematics includes special terminology. The study of mathematics consequently encourages students to use language with greater care and precision and enhances their ability to communicate effectively. The Ministry of Education has facilitated the development of materials to support literacy instruction across the curriculum.

Helpful advice for integrating literacy instruction in mathematics courses may be found in the following resource documents:

- *Think Literacy: Cross-Curricular Approaches, Grades 7–12, 2003*
- *Think Literacy: Cross-Curricular Approaches, Grades 7–12 – Mathematics: Subject-Specific Examples, Grades 7–9, 2004*

In all courses in mathematics, students will develop their ability to ask questions and to plan investigations to answer those questions and to solve related problems. Students need to learn a variety of research methods and inquiry approaches in order to carry out these investigations and to solve problems, and they need to be able to select the methods that are most appropriate for a particular inquiry. Students learn how



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to locate relevant information from a variety of sources, such as statistical databases, newspapers, and reports. As they advance through the grades, students will be expected to use such sources with increasing sophistication. They will also be expected to distinguish between primary and secondary sources, to determine their validity and relevance, and to use them in appropriate ways.

The school emphasizes the importance of the following:

Using clear, concise communication in the classroom involving the use of diagrams, charts, tables, and graphs

Emphasizing students' ability to interpret and use graphic texts.

Acquiring the skills to locate relevant information from a variety of sources, such as books, newspapers, dictionaries, encyclopedias, interviews, videos, and the Internet.

Learning that all sources of information have a particular point of view,

Learning that the recipient of the information has a responsibility to evaluate it, determine its validity and relevance, and use it in appropriate ways.

The Role of Technology in Mathematics

Information and communication technology (ICT) provides a range of tools that can significantly extend and enrich teachers' instructional strategies and support students' learning in mathematics. Teachers can use ICT tools and resources both for whole-class instruction and to design programs that meet diverse student needs. Technology can help to reduce the time spent on routine mathematical tasks and to allow students to devote more of their efforts to thinking and concept development. Useful ICT tools include simulations, multimedia resources, databases, sites that gave access to large amounts of statistical data, and computer-assisted learning modules.

Applications such as databases, spreadsheets, dynamic geometry software, dynamic statistical software, graphing software, computer algebra systems (CAS), word-processing software, and presentation software can be used to support various methods of inquiry in mathematics. The technology also makes possible simulations of complex systems that can be useful for problem solving purposes or when field studies on a particular topic are not feasible.

Information and communications technology can also be used in the classroom to connect students to other schools, at home and abroad, and to bring the global community into the local classroom.

Information and communications technologies (ICT) tools used in many ways:

Students use multimedia resources, databases, Internet websites, digital cameras, and word-processing programs. They use technology to collect, organize, and sort the data they gather and to write, edit, and present reports on their findings. Students are encouraged to use ICT to support and communicate their learning. For example, students working individually or in groups can use computer technology and/or Internet websites to gain access to museums and archives in Canada and around the world. Students use digital cameras and projectors to design and present the results of their research to their classmates. The school plans to use ICT to connect students to other schools and to bring the global community into the classroom. Students are made aware of issues of Internet privacy, safety, and responsible use, as well as of the potential for abuse of this technology, particularly when it is used to promote hatred.

Career Education in Mathematics



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Teachers can promote students' awareness of careers involving mathematics by exploring applications of concepts and providing opportunities for career-related project work. Such activities allow students the opportunity to investigate mathematics-related careers compatible with their interests, aspirations, and abilities.

Students should be made aware that mathematical literacy and problem solving are valuable assets in an ever-widening range of jobs and careers in today's society. The knowledge and skills students acquire in mathematics courses are useful in fields such as science, business, engineering, and computer studies; in the hospitality, recreation, and tourism industries; and in the technical trades.

Students are given opportunities to develop career-related skills by:

applying their skills to work-related situations, exploring educational and career options ,developing research skills, practicing expository writing ,learning strategies for understanding informational reading material making oral presentations working in small groups with classmates to help students express themselves confidently and work cooperatively with others.

Health and Safety in Mathematics

Although health and safety issues are not normally associated with mathematics, they may be important when the learning involves fieldwork or investigations based on experimentation.

Out-of-school fieldwork can provide an exciting and authentic dimension to students' learning experiences. It also takes the teacher and students out of the predictable classroom environment and into unfamiliar settings. Teachers must preview and plan activities and expeditions carefully to protect students' health and safety.

Academic Honesty .Students who present the work of others as their own are guilty of plagiarism and will receive a mark of zero for the work and will have the details of the plagiarism noted in their school records. Students who are guilty of cheating on tests or examinations will receive a mark of zero on the test or examination and have the details of the cheating noted in their school records.

Late Assignments. Students are responsible for providing evidence of their achievement of the overall expectations within the time frame specified by the teacher, and in a form approved by the teacher. There are consequences for not completing assignments for evaluation or for submitting those assignments late.

Resources

1. **Mathematics11** (Nelson 2007)

2 Various Internet Resources (you Tube, Wikipedia, etc)