

MARIANOPOLIS COLLEGE

PLAN D'ETUDES

FALL, 2008

COURSE #: MEQ-124
PREREQUISITE: None.
PONDERATION: 3-1-3
TEACHER: John Osborne (room I-322)
OFFICE HOURS: As posted

COURSE TITLE: Principles of Mathematics and Logic.

OBJECTIVES:

1. To demonstrate the nature of mathematical reasoning.
2. To present some of the central concepts of mathematics and logic such as validity, soundness, consistency, axiom, postulate, proof, theorem, etcetera.
3. To familiarize students with deductive and inductive systems.
4. To demonstrate the principles of postulational thinking and their importance/application in 'elementary' mathematics.
5. To draw the distinction between 'pure' and 'applied' mathematics and to show the importance of mathematics as the language of science.

CONTENTS:

Unit 1: Deductive logic: truth and validity. The formal character of deductive reasoning. The nature of a proof. Some famous proofs (for example, the Pythagorean Theorem, Irrationality of $\sqrt{2}$, Infinitude of the Primes). The "some famous proofs" may appear in Unit 2.

Unit 2: Axiom systems, postulational thinking.

- a- An example of a deductive postulational system: an axiomatic development of the ordinary number system or of Euclidean and non-Euclidean geometries, or both.
- b- An example of an inductive postulational system: elementary probability theory, including set theory.

Unit 3: Topics selected, as time permits, from among (no order or priorities implied):

- a- Alternative number systems. For example, Binary Arithmetic and how, electronically, a computer adds two numbers.
- b- Proof by Mathematical Induction.
- c- Mathematics and science, mathematics and computers (Boolean Algebra, possibly introduced in Unit 2), pure mathematics versus applied, mathematics and technology, mathematics and society.
- d- Biographical sketches of some of the Great Mathematicians and their mathematics. For example, Georg Cantor: To Infinity and Beyond!
- e- Algebra and analytic geometry: expressing relations and finding patterns in numbers, combining arithmetic and geometry (for example, The Fibonacci Sequence).
- f- A glimpse at a pure mathematical science (e.g. group theory) and its applications.

METHODOLOGY:

The bulk of the theory will be presented through lectures. Some class time will be devoted to "hands-on" practice in formulating mathematical proofs--using axioms, definitions, reasoning deductively, etc. At these times, students will be encouraged to work in small groups of no more than three and submit group work.

Some material may be presented through student presentations. Students may present singly or in pairs (to be decided in collaboration with me). Possible topics and source material will be discussed during the first weeks of class.

EVALUATION:

The students' mark will be based on three in-class tests, possibly a presentation, assignments/quizzes and class participation as follows:

	Strongest Test Result	Middle Test Result	Weakest Test Result	Project/ Presentation	Assignments/ Quizzes	Attendance/ Engagement
With Project	25%	20%	15%	15%	15%	10%
No Project	30%	25%	20%	---	15%	10%

If you work closely with another person you may submit homework assignments with *two* names on it for full credit. In class "lab" exercises will be counted as assignments. Late assignments will not be accepted, instead, I will count only the best $n - 2$ submissions.

The periodic quizzes will be based *directly* on material presented in class, may be presented without warning and may *not* be made up.

Test dates: approximately in weeks 5, 10 and (exactly) in the Last Class.

TEXT: There is no assigned text and this makes regular, active attendance all the more important!

CONTACTING ME:

If you cannot see me during my posted office hours (preferable) then see me and we will try to make other arrangements. At the college I am at extension 412, which is equipped with voice mail (although this is the least reliable method). You may use e-mail: write to josborne@iti.qc.ca or j.osborne@marianopolis.edu or a message ("MIO") via Omnivox. If necessary, you may call me at home, 514-634-6362, but not after 10:00 PM please. Course materials (outline, assignments, etcetera) will be posted on Omnivox (and "mirrored" at <http://webusers.globale.net/josborne>) as they become available.