

Montserrat 106Q – Mathematical Thinking  
Syllabus – Fall 2016

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Office Hours: Mon. 1-2pm, Tues. 8-9am, Weds. 2-3pm, Thurs. 10-11am, Fri. 1-2pm,  
and by appointment

Course Homepage: <http://mathcs.holycross.edu/~little/Montserrat201617/Fall.html>

*Core Human Questions Cluster Theme*

If borders define us but we want to transcend them, how then shall we live?

*Course Description*

This course is a part of the *Core Human Questions (CHQ) Cluster* of the Montserrat program. This means that at various times we will be addressing one or several of the following objectives:

- addressing the general aims of Montserrat – continued development of your thinking, writing, and communication skills, and the fostering of connections between living, learning and doing in your college education,
- engaging with the common readings and theme of this year's CHQ Cluster,
- participating in various common activities scheduled for all of the seminars in the CHQ Cluster, including:
  - (a) a showing of film *Cartel Land*, 7:00pm Tuesday, September 13, Seelos Theater.
  - (b) a performance of *Othello in the Seraglio*, 8:00pm Thursday, October 27, Fenwick Theater.
  - (c) a performance of *Will Eno, Middletown*, 8pm Thursday, November 10, Fenwick Theater
  - (d) a lecture by Prof. Thomas Banchoff on E.A. Abbott and *Flatland*, 7:00pm, Tuesday, December 6, Hogan Campus Center.
- and finally, studying the specific subject matter of this seminar.

This semester, we will examine various sorts of mathematical thinking from the experience and knowledge of a wide range of different human societies. We will begin by casting our net wide across cultures and through time and looking at how this way of seeing and understanding the world can be found in perhaps unexpected places:

- in the ways people have developed systems for measuring *space* and recording the passage of *time*,
- in the ways people have conceptualized their *family and kinship relationships*,
- in the ways people have created *games and puzzles* to challenge their minds, and
- in some of the ways people have used ideas of symmetry and other mathematical structures to create *decorative elements in architecture, textiles and other everyday artifacts* to add beauty and harmony to their physical surroundings.

I think the examples we will look at will be pretty strong evidence for accepting the following basic premise from one of our course text books (G.G. Joseph, *The Crest of the Peacock*, p. 512):

*No society, however small or remote, has ever lacked the basic curiosity and “number sense” that is part of the global mathematical experience.*

But you may be inclined to disagree and say, in effect, “no, that is not mathematics, or even mathematical thinking, at all.” If you think that way, then of course you are creating a *border* around what you think of as mathematics, and you would not be alone in doing that. Some people claim that mathematics is actually the *exclusive creation* of particular societies, especially the ancient Greeks. We must ask what it is that causes us to create those borders, and whether we should try to transcend them.

In the second semester, we will explore the possibility that perhaps the various versions of the traditional “Eurocentric” account of the history of mathematics focusing on the contributions of the Greeks need to be modified to obtain a more historically accurate picture of the way the subject has developed. We will trace some of the actual history of the mathematics you learned in high school and see how key aspects come from perhaps unexpected sources. We will also try to see what mathematicians have said about their subject and what it means to them.

### *Some Groundrules*

Most class meetings will be devoted to discussions, oral presentations, or work in smaller groups, so your active participation will be important for the success of what we do.

- Unless specifically directed otherwise, please *turn off* all cell phones, tablet or laptop computers and other similar electronic devices for the duration of each class meeting – your full attention and participation will be necessary.
- No distracting or “provocative” clothing, headgear, or other personal items in class, please.
- In on-campus events, possible off-campus trips next semester, etc. you are representing this seminar, the Montserrat program, and, by extension, Holy Cross in a wider community. Take responsibility and regulate your behavior accordingly.
- In discussions, there may be times that you disagree with Prof. Little or with a classmate. Please feel free to express that disagreement and be prepared to say why you disagree and back up your ideas with evidence. But please keep the conversation civil and respectful.

### *Course Texts*

The main mathematical texts for the course are:

- 1) G. G. Joseph, *The Crest of the Peacock*, Princeton University Press.
- 2) M. Ascher, *Ethnomathematics*, A Multicultural View of Mathematical Ideas, Chapman and Hall.

We will also read and discuss the Core Human Questions Cluster common readings:

- 3) M. Hammond, *The Curious Incident of the Dog in the Night-time*, Vintage Books.
- 4) Herodotus, *The Landmark Herodotus, The Histories*, R. Strassler ed., Anchor Books.

- 5) W. Shakespeare, *Othello*, Folger Shakespeare Library edition.
- 6) E.A. Abbott, *Flatland*, Dover Books.

It is expected that Holy Cross students will have textbooks and other required class materials in order to achieve academic success. If you are unable to purchase course materials, please speak to a representative at the Office of Financial Aid for assistance.

### *Course Schedule*

A detailed day-by-day course schedule and listing of required and suggested outside events will be maintained on the course homepage. That listing is a tentative, evolving schedule, so you will probably want to refer to it frequently. Any important changes will also be announced in class well in advance.

### *Assignments and Grading*

- 1) Midterm Exam (15 % of course grade) – tentative date: Monday, October 24.
- 2) Final Exam (25 % of course grade) – given at the regular scheduled time for MWF 9:00am classes; watch for announcement from the Registrar
- 3) Problem Sets (about 5 through the semester – 10 % of course grade)
- 4) In-class group work leading to oral presentations (about 4 assignments – 10 % of course grade). More information about these assignments will be distributed later.
- 5) Four essays related to the readings and other topics. More information and guidelines for each of these assignments to be distributed later. (40 % of course grade)

I will be keeping your course average in numerical form throughout the semester, and only converting to a letter for the final course grade. The course grade will be assigned according to the following conversion table (also see Note below):

- A – 94 and above
- A- – 90 - 93
- B+ – 87 - 89
- B – 84 - 86
- B- – 80 - 83
- C+ – 77 - 79
- C – 74 - 76
- C- – 70 - 73
- D+ – 67 - 69
- D – 60 - 66
- F – 59 and below.

Note: Depending on how the class as a whole is doing, some downward adjustments of the above letter grade boundaries may be made. No upward adjustments will be made, however. (This means, for instance, that an 85 course average would never convert to a letter grade of B- or below, although it might be a B+ in some circumstances.) If you ever have a question about the grading policy or your standing in the course, don't hesitate to ask me.

### *Advice On How To Succeed In This Class*

**A good “work ethic” is key.** As you should be able to tell from the course description above, you do not need to be a “math genius” to do well in this course. But you will need to put in a consistent effort and keep up with the reading and assignments.

**Come to class.** Unless you are deathly ill, have a genuine family emergency, are away at a game or meet of a college athletic team, etc. please plan on showing up here at 9:00 am every Monday, Wednesday, and Friday this semester. As mentioned before, many of the class meetings will be structured around discussions or student presentations. Your regular attendance and participation is expected and needed for the success of the course!

**Take notes and use them.** This may seem obvious, but it is worth saying! Used intelligently, your notes can be a valuable resource as you work on problem sets and prepare for exams.

**Use the texts and class notes actively.** Reading about mathematics is not like reading a novel. You will probably need to read and think over things more than once. You may want to work through examples or draw your own diagrams to understand some of the Euclidean proofs that we do.

**Set up a regular study schedule and work at a steady pace.** It’s not easy to play catch-up in a mathematics course (even when the course is part of a first-year program with additional goals beyond the mathematics). You should expect to budget at least 6 hours in a typical week for work outside of class. The best way to use your time is to do a few problems, some reading from the books, and reviewing of class notes every day.

**Most importantly, if you are having difficulty learning something, get help as soon as possible.** You can do this by asking questions during class (any time something isn’t clear), or seeing me during office hours.

### *Statement on Academic Integrity*

All education is a cooperative enterprise between teachers and students. This cooperation works well only when there is trust and mutual respect between everyone involved. To become an engaged and advanced learner, you must be able to think and work both independently and in concert with your peers. The College academic honesty policy states: “As an institution devoted to teaching, learning, and intellectual inquiry, Holy Cross expects all members of the College community to abide by the highest standards of academic integrity. Any violation of academic honesty undermines the student-teacher relationship, thereby wounding the whole community. The principal violations of academic honesty are plagiarism, cheating, and collusion.

Plagiarism is the act of taking the words, ideas, data, illustrative material, or statements of someone else, without full and proper acknowledgment, and presenting them as one’s own.

Cheating is the use of improper means or subterfuge to gain credit or advantage. Forms of cheating include the use, attempted use, or improper possession of unauthorized aids in any examination or other academic exercise submitted for evaluation; the fabrication or falsification of data; misrepresentation of academic or extracurricular credentials; and deceitful performance on placement examinations. It is also cheating to submit the same work for credit in more than one course, except as authorized in advance by the course instructors.

Collusion is assisting or attempting to assist another student in an act of academic dishonesty. The full statement on Academic Honesty in the College Catalog is available at

<http://www.holycross.edu/catalog/academic-honesty-policy.pdf>

The temptation to engage in an act of academic dishonesty will almost certainly arise, but the chance to possibly enhance a single grade is not worth the loss of your personal integrity. If you do not know how to correctly cite reference materials, consult with your professor or the campus Writers Workshop. NOTE: If you are in doubt about whether what you plan to do or write violates academic honesty guidelines, PLEASE ASK!

*Specific Guidelines for this Course*

In this course, all examinations will be closed-book. No sharing of information with other students or consultation of electronic or physical sources in any form will be permitted during exams. On group discussion write-ups, close collaboration with the other members of your group is expected. On the individual problem sets, discussion of the questions with other students in the class and with me during office hours is allowed, *even encouraged*. However, your final problem solutions should be prepared individually and the wording and organization of your final problem solutions should be entirely your own work. Moreover, if you do take advantage of any of the above options for discussion of problems with others, you will be required to state that fact in a footnote accompanying the problem solution. Failure to follow this rule will be treated as a violation of the College's Academic Integrity policy. For the essays, if you do consult a source other than the course texts, include a full reference in a bibliography section at the end of your paper, and identify any direct quotations. Information about the acceptable formats for doing this will be distributed with the paper assignments.