

MA 111: Mathematics as a Liberal Art
Spring 2009

The Basics

MA111A:	MWF 11 - 11:50 AM.	Keyes 102
MA111B:	MWF 1 - 1:50 PM	Lovejoy 119

The Texts

- (1 *) Gardner, Martin. The New Ambidextrous Universe. 3rd Revised Edition, 2005. Dover.
- (2 *) Weyl, Hermann. Symmetry. 1980. Princeton.
- (3) Abbott, Edwin. Flatland. Introduction by Banchoff. 1991. Princeton.
- (4 *) Devlin, Keith. The Unfinished Game. 2008. Basic Books.
- (5) Course Reader available from the bookstore.

*The texts marked * are on reserve in the Olin Science Library. Abbott's Flatland is available in many editions and is available online for free.*

The Instructor

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The Course

To speak of “the liberal arts” is to speak of the unity of thought and the discourse of the disciplines. The modern college and university is divided into departments, majors, and extra-curricular clubs. Our interests, though multiple, are narrow and rarely converse with each other. This is not how it always was in the western world. A classical, medieval, and renaissance education sought to unify disparate modes of thought and sought for wisdom in the unification. The ideals of liberal arts colleges, such as Colby, are direct descendents of this older view of education.

The place of mathematics in this vision is the subject of this course. Of course, we are (post)-moderns, and so lack the classical education that made it easy to have a unified view of the world. Our aims in this course, therefore, will be modest. We will look at three basic ideas and see what perspectives a mathematical outlook can provide. The three ideas are: Symmetry, Space, and Chance.

As we study these subjects we will keep mathematics in constant conversation with the other disciplines of the university and even with culture (both high and low). For this to be successful you will need to do a lot of reading, thinking, and writing. Indeed, you will even need to do some mathematics! The authors whose works we will read are known for their excellent exposition aimed at a non-mathematical audience. At times, however, you will be confused, puzzled, and consternated. You may not agree with everything the authors say; sometimes, you may even be appalled. That is okay – the purpose of the reading is to get you to think and to see the world from a new point of view. I welcome your comments, reactions, and criticism.

As important as the reading are the problem sets. You cannot understand mathematics unless you are doing it. Doing mathematics can often be a frustrating experience, but the reward of a correctly solved problem makes it worthwhile. You are encouraged to work together on the problem sets and to discuss them with me.

With some effort on everybody's part, we should have a fun semester exploring some amazing mathematical ideas.

Major Course Objectives

- Read and understand a variety of popular mathematical writing
- Understand and communicate ways in which mathematics and culture are intertwined
- Understand and communicate a mathematical view of symmetry using the language of groups and sets
- Calculate the symmetry groups of basic objects and patterns
- Articulate the role of symmetry and asymmetry in art and physics
- Recognize different types of symmetry
- Articulate a mathematical view of space
- Understand and communicate Victorian views of science, mathematics, and imagination and their relationship to Victorian religion, philosophy, and education
- Articulate the mathematical notion of dimension
- Understand some mathematical properties of higher dimensional spaces
- Describe the achievements of Pascal and Fermat in creating probability theory
- Perform basic probability calculations
- Articulate and critique Pascal's wager

The Grading

Class Participation	5 %	A	93% - 100%	C-	70% - 73%
Reading Assignments	15 %	A-	90% - 93%	D+	67% - 70%
Papers	15 %	B+	87% - 90%	D	63% - 67%
Problem Sets	15 %	B	83% - 87%	D-	60% - 63%
Exam 1	15 %	B-	80% - 83%	F	< 60%
Exam 2	15 %	C+	77% - 80%		
Final Exam	20 %	C	73% - 77%		

An A+ will be awarded to those students who show exceptional ability in and engagement with the course material. Such students will, for example, achieve close to 100% of the possible points in the course. Any curve will be determined at the discretion of the professor at the end of the semester.

CLASS PARTICIPATION

You should participate in both small group and large group discussions. Repeated disengagement will result in significant reduction of your grade. It is expected that all class discussions will be conducted with respect and consideration for others.

READING ASSIGNMENTS

Reading assignments will usually be due at 6 AM on Mondays, Wednesdays, and Fridays. The reading assignments will be submitted by email to either

MA111A@colby.edu

or

MA111B@colby.edu

depending on the section in which you are enrolled. The subject line of your email must contain the assignment title (and nothing else) and your responses must be included in the body of the email. You are encouraged to write your responses in a text editor or word processor and then copy and paste them into an email message. **Failing to follow these instructions may result in a complete loss of credit for the assignment.** The email addresses above are only for the submission of assignments. If you wish to communicate with the professor personally you should use his personal email address.

A grade of 0 – 5 will be assigned to each reading assignment. A 5 means that it is evident that you read the assignment, gave it considerable thought, and were able to articulate answers to the questions. A 0 means that you did not do the assignment. You will generally not get these assignments back. If you want to know your current grade for the reading assignments, you are welcome to email me. If you are doing poorly on the assignments you will hear from me.

Late assignments will not be accepted. You may turn in assignments early. The lowest two reading assignment scores will be dropped.

PROBLEM SETS

These will due at most once per week. The problems will be related to what we have been discussing in class, but will typically not be trivial, rote exercises. You are encouraged to work together on the problem sets, but all work must be your own. If you are asked to explain, show, or prove something, you should write a thorough, coherent explanation. If you have questions about what is expected, you are welcome to email me or stop by my office. The assignments will consist of a lot more writing and a lot less calculation that what you are, perhaps, accustomed to in a mathematics class.

EXAMS

These will given in class. You will be given considerable advance notice of the date on which the exams will take place. **The date of the final exam cannot be changed for personal convenience, including airline tickets.** There are certain circumstances which allow you to take the exam at a different time; consult the registrar's webpage.

LECTURE NOTES

Notes on the mathematics lectures will be available on the website after the class in which the lecture was delivered. These notes are meant to supplement, not replace, whatever notes you take in class.