

University of New Hampshire: Department of Mathematics

## Mathematics for the Liberal Arts

MATH 401

Fall, 2006

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**Helpful tidbit:** Look up your final grades, course schedules, billing and financial aid information, and print your unofficial transcript by using Webcat (the URL is [webcat.unh.edu](http://webcat.unh.edu)).

**Office Hours** (Room 243): immediately after class (for up to an hour, as needed), and by appointment. Help is generously offered!

**Text:** Tannenbaum, P. (2004). Excursions in Modern Mathematics (5<sup>th</sup> ed.). Upper Saddle River, NJ: Prentice Hall.

**Prerequisites:** Two college preparatory math units (Algebra I & II or their functional equivalent).

**The Class in a Nutshell:** The class will be broken into houses (*a la* Harry Potter). Each house will work as a team throughout the semester. The houses will work on problems presented in class, and more notably, on designing mathematics “experiments” of their own where, ultimately, they will be presented to a classroom of kids in an area K-12 school. This will be discussed in greater detail during the first class, but essentially the idea is this: you will be learning to think critically, engage in high-order reasoning, all through problem-based learning. Rather than viewing the professor as the vessel of all mathematical knowledge, and viewing your role as merely learning that knowledge piece by piece as the class progresses, instead you will be learning mathematics through an inquiry-based approach. Piaget (a renowned cognitive developmental theorist), said it best when he said “To know is to construct. To construct is to know.” Hence, the hope is that I will facilitate an environment – with appropriately chosen activities – for each of you (in concert with the peers in your house) to construct your own knowledge through inquiry. Ultimately, your house will devise its own mathematical experiments, and collectively, you will go into a given classroom (say, a 5<sup>th</sup>-grade class here in a Manchester school) and lead them through an experiment so they, too, can learn through inquiry, all the while constructing their own knowledge.

**Social Responsibility Option:** This is a program wherein my students from *Mathematics for the Liberal Arts* tutor at-risk youth in the community with one of the partnerships I’ve created; e.g., after-school tutoring programs at the Manchester Boys and Girls Club and the Salvation Army. It is expected that participating students will put in a *minimum* of 25 hours, keep a journal (which I will retain for my records at the end of the semester), and participate on a regular basis, as the kids come to depend on the tutors. In that regard, if you choose this option you must commit to it; i.e., you can’t start it and then change your mind later. *Flexibility* in not only your schedule, but also your personality, is a necessary ingredient to making this option work. Further details will be discussed in class.

**Grading Criteria:** There will be two major tests throughout the semester on a listed group of

topics (see schedule). There will be six quizzes – both announced and unannounced – on various topics which will act as both a review of the material and a catalysis for future exams. The lowest quiz grade will be dropped *in lieu of make-ups* (i.e., no make-ups on quizzes). A cumulative final examination will be given.

<u>Percentage Totals</u> <i>with the Social Responsibility Option</i>		<u>Percentage Totals</u> <i>without the Social Responsibility Option</i>	
<b>Social Responsibility option</b> .....	<b>20%</b>		
<b>Quizzes</b> .....	<b>20%</b>	<b>Quizzes</b> .....	
		<b>25%</b>	
<b>Exam I</b> .....	<b>20%</b>	<b>Exam I</b> .....	
		<b>25%</b>	
<b>Exam II</b> .....	<b>20%</b>	<b>Exam II</b> .....	
		<b>25%</b>	
<b>Final Exam</b> .....	<b>20%</b>	<b>Final Exam</b> .....	
		<b>25%</b>	

Grades are assigned as illustrated.	<b>A</b>	starts at 92.5	<b>Excellent</b>
	A-	starts at 90	
	B+	starts at 87.5	
	<b>B</b>	starts at 82.5	<b>Superior</b>
	B-	starts at 80	
	C+	starts at 77.5	
	<b>C</b>	starts at 72.5	<b>Satisfactory (competent)</b>
	C-	starts at 70	
	D+	starts at 67.5	
	<b>D</b>	starts at 62.5	<b>Marginal</b>
D-	starts at 60		
<b>F</b>	below 60	<b>Failure</b>	

**Assignments:** The homework for the entire semester is found at the end of each section; generally speaking, do the odd-numbered exercises. You will notice that the homework is normally broken down into three Levels followed by an Explorations' segment. Each level gets progressively harder. In most sections, if you were to do all the odd-numbered problems at each level, you would reach a point of diminishing return. Thus, do enough problems at each level until you're comfortable with the material, but be sure to cover all three levels (e.g., don't bog-down at levels one or two at the exclusion of level three). Although you may wish to read and cogitate on the problems in the Explorations' segment, there is no need to do them. Answers to the homework problems are found at the end of the text, and their respective solutions are found in the *Student Solution Manual*. You are encouraged to purchase the solutions manual if you haven't already; most students find it an invaluable resource, especially for those late nights and weekends.

To see the entire SCHEDULE on one page for your easy perusal, see the next page ☹️

## SCHEDULE

<u>Date</u>	<u>Class</u>	<u>Chapters</u>	<u>Topics</u>
08/00	1	Review the Course Structure, Social Responsibility Option, & Community Outreach	
09/00	2	1	The Mathematics of Voting: The Paradoxes of Democracy
09/00	3	2	Weighted Voting Systems: The Power Game
09/00	4	3	Fair Division: The Mathematics of Sharing
09/00	5	4	The Mathematics of Apportionment
09/00	6	Houses Begin Their 1 <sup>st</sup> Mathematics Experiment	
09/00	7	5	Euler Circuits
09/00	8	6	Traveling Salesman Problem
09/00	9	7	The Mathematics of Networks
09/00	10	8	The Mathematics of Scheduling: Directed Graphs & Critical Paths
09/00	11	REVIEW	
10/00	12	<b>EXAM I</b>	
10/00	13	Houses Go into the Schools	
10/00	14	Houses Share Their Field Experiences with the Class	
10/00	15	9	Fibonacci Numbers and the Golden Ratio
10/00	16	10	The Mathematics of Population Growth
10/00	17	11	Symmetry
10/00	18	12	Fractal Geometry
10/00	19	Houses Begin Their 2 <sup>nd</sup> & 3 <sup>rd</sup> Mathematics Experiment	
10/00	20	13	Collecting Statistical Data: Censuses, Surveys, and Studies
11/00	21	14	Descriptive Statistics: Graphing and Summarizing Data
11/00	22	15	Measuring Uncertainty: Probability and Odds
11/00	23	16	Normal Distributions
11/00	24	REVIEW	
11/00	25	<b>EXAM II</b>	
11/00	26	Houses Go into the Schools with their 2 <sup>nd</sup> Mathematics Experiment	
11/00	27	Houses Share Their Field Experiences with the Class	
12/00	28	Problem Solving: the Kind You Don't Typically Learn in College	
12/00	29	Houses Go into the Schools with their 3 <sup>rd</sup> Mathematics Experiment	
12/00	30	House Share Their Field Experiences with the Class	
12/00	31	REVIEW	
12/00	32	<b>FINAL EXAM</b>	