soc180 Mathematics for the Social Sciences, Fall 2007

The core of this workshop consists of 15 lessons or modules which students will work through and master at their own pace. In addition to independent work, participation requires attendance at a weekly workshop seminar, peer tutoring, and workshop presentations. Links to individual modules are in the following table. Further details about the structure of the workshop, requirements, etc. are below.

1 Symbols, Notation, Operations	6 Graphs I	11 Curves and Derivatives
2 Fractions, Percentages, Decimals, Proportions	7 Equations and Relations I	12 Vectors and Matrices
3 Sets and Logic	8 Equations and Relations II	13 TBA
4 A Little Geometry and a Little Trigonometry	9 Systems of Equations	14 TBA
5 Exponents, Powers, Logarithms	10 Probability	15 Advanced Topics for Projects

About the Workshop

What this course is: A self-paced, collaborative workshop on mathematics tailored for students of anthropology, economics, public policy, and sociology, which allows students to be active participants in their own learning. Students who have had mixed feelings about math can develop new confidence in their skills, but self-motivation is required. Group work, student-teaching, and peer-mentoring are key components of student participation.

What this course is NOT: A study hall for other classes, a "math for dummies," or a way to get around taking a more traditional math class.

How this course is different from other courses you've taken: There is a greater aim here—to be part of the effort towards minimizing the gender gap in mathematics and those fields in the social sciences that make use of mathematics. In that spirit, taking this course means that you take on some responsibility for your classmates' learning. Supporting and challenging one another will prove instrumental to everyone's progress here. Think of it as a sort of socialist learning process, where you pay a whole lot in taxes but you're always well taken care of. It's important to note that challenging one another is just as important as offering support, if not more so. This is meant to be rigorous—just not terrifying.

We'll have a few required texts but these won't be textbooks in the usual sense. Rather, we'll use them as resources alongside a fantastic variety of material drawn from the internet and from other published sources.

How it Works

This course is divided into 11 lessons, which operate almost like autonomous courses. In collaboration with Dan, you will determine which lessons you need to work on and which you already understand well. If you already have some experience with College-level math, you can devise additional lessons to augment the list of topics already offered. Based on the topics you need to work on, you'll devise a schedule for completing your lessons. In addition, you'll determine which lessons you can help your classmates with. You'll be expected to lead a seminar with other students and to serve as the go-to person for a given lesson that you've already mastered—meaning you'll make yourself available to help your folks who are working on that lesson over the course of the semester.

How to get the maximum return on your efforts here

In order to optimize the knowledge and confidence building potential of this experience, your commitment is essential. You must have initiative, and you will be responsible for your own progress. But above all else, there are two things you must agree to:

1. Doing daily homework
2. Communicating

Perhaps one of the things that has discouraged you in prior math courses is the necessity of daily homework. It is now time for you to get over it and to make the commitment that will allow you to build your skills. Because this course is designed to promote learning while minimizing stress, you will plan for yourself the amount of time you can reasonably spend on this homework. It cannot be stated enough, however, that success in this—and any other math course—requires some work each day.

Communication, on the other hand, is the thing that will make this course different than other courses you've taken. In particular, it is communicating with your peers that will allow you to make progress and to stay on top of your goals. You are expected to challenge and to support your classmates, and you should expect the same from them. Tell your classmates when you are struggling, and ask for help. When your classmates ask you for help, take it upon yourself to provide that help or to assist them in finding it.

The primary way you should keep in touch with your classmates is by using the class e-mail list. Think of this as a listserv, where questions and responses are shared publicly. When you have a question or concern, send out an e-mail to the whole class with a clear subject line that includes the course name and the kind of help you need, such as:

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math camp: Help with absolute value problem or
math camp: Meeting to plan seminar on Lesson 4
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Having a clear subject heading like this will keep the e-mail volume manageable. Note that there's a different subject heading used to e-mail Instructor:
SOC 180: [describe what you need help with]

Course Structure

The first two weeks of class will be spent figuring out your strong points and your weak points. With this information, you will make a plan for the course. The elements of this plan are the following:

1. Which lessons you will work on over the course of the semester
2. Which lessons you can offer others help with
3. Which seminar/s you will lead and who you will lead them with
4. A calendar detailing the anticipated start and end dates for your lessons and the schedule for preparing and leading your seminar/s.

Your calendar should reflect your credit goals by detailing the pace you'll keep in order to complete the appropriate number of lessons. You'll have to consider how much nightly homework you'll be doing, but since this isn't an exact science, you can revise your plan if you need to. Given the option of revising your plan after you've tried it out for awhile, we suggest that you set a very challenging pace for yourself when you devise your course plan.

Once your plan has been approved, you will get started on your first lesson, whichever that happens to be. If there are other folks starting on the same lesson you're starting on, you'll figure out who they are and discuss good times to get together for homework sessions. You'll come to class having completed three regular assignments, which include your homework problems for the week (which will be specific to your lesson), a brief homework log that outlines which homework problems you did, when you did them, and how long they took; and finally a progress report. The progress report will describe how well you're keeping up with your calendar and thoughts on what worked and what didn't work that week.

During the class period, you'll start by participating in some activities with the whole class, after which you'll either lead or listen to a one-hour seminar on a weekly topic. The topics are outlined in the general course schedule below. After the seminar, you'll break into groups with folks covering similar material, get help from someone who has mastered the material you're working on, or provide help to someone who's stuck on material you've already mastered. This is time to ask or answer questions and to work through challenging material. After that there will be time to wrap up with the whole class.

Outside of class, you will meet with classmates for homework sessions, keep up on class e-mails, do homework on your own, and support students working on the lesson/s you've committed to providing assistance with (as per item 2 of your course plan), and seek out support from the students who are assisting with the lesson you're working on.

Suggestions and Concerns

Because this is a bit of an experiment, your feedback is welcome and is, in fact, pretty important. There will be a "suggestion folder" outside Dan's office door where you can drop notes on how things are going. You can leave them anonymously or leave your contact info if you'd like a response. Ideally, these will be checked every Wednesday. Of course, you can also send Dan an e-mail or schedule an appointment at the website.
About credit and grading

Assuming there are no unanticipated administrative barriers, this course will be "graded" in credit value—instead of earning a letter grade, you will earn your credit value. All students who get at least .25 credits will receive an A. The amount of work you put into the course will affects your credit, not your grade. Credits will normally range from .25-1. Total lack of commitment to the course can result in your receiving no credit, and if you show absolute commitment in terms of leadership and lesson completion, you may be able to receive 1.25 credits for the course.

Assignments, including final project

Regular weekly assignments include turning in a homework log, the problem sets you've completed, and a progress report (between one paragraph and one page in length) describing how you're progressing towards your lesson completions goals and how well you're managing the workload.
In addition to regular weekly assignments, there are some additional assignments. These include readings, exercises, etc…. Some are listed in the schedule on the date that they are due, and others will be impromptu.

The final project will a five to seven page packet for a lesson that you've recently completed or to create one that wasn't offered this time. You must choose lesson from the last three lessons you cover (say you covered up to lesson nine; you can then choose to write a packet for lesson 7, 8, or 9). In essence, you'll be creating something very similar to what will be given to you: a packet with an explanation of the topic, its applications to the social sciences, and a set of readings, homeworks, etc… A handout describing all the requirements will be given to you later in the semester. The point of this project is to demonstrate that you've mastered the subject of the lesson, but also to contribute to the education of future students who'll take the class by improving upon the materials.

Week 1
3Sep

Labor Day - No Class

Week 2
5Sep

The Math of Voting

- For first class, read "Three Party Elections: Interactive Examples" by James E. Hamblin
- You might want to listen to Mathgrad.com's Podcast on the math of voting (Itunes)

Week 2
10Sep

Welcome, Introduction and Orientation
Discussion: Introduction to course: Philosophy, math memoirs, and goals.
Warmup
Refresher Lecturette: Symbols and Notation
Activity: Where are you? An assessment in three parts
The Big List of Math and Social Science
The Geometry of Voting
Understanding this article and where one can go from there
For Next Week
Readings by Kristin
Work on first packet

Wed 12Sep

Last day to add/increase credit/etc.

Assignment due next week: Read paper on gender gap in mathematics, read paper (by a woman? Gillian?) where quantitative tools were used (Doran 1989?). Highlight every part of the methodology/analysis section/s where you're not sure what author did and how they did it. Bring to class to discuss.

Week 3
17Sep

Discussion: How these papers relate to the philosophy of the course, what surprised you, and what you highlighted. Then, how to build a course map.
Activities: Build your course map—see handout for details. Also, what credit level you're aiming for, and what you'll do to achieve that.
Due: Ready to discuss 2 papers

Week 4
24Sep

Discussion: Guest Lecturer—Gillian?—on the mathematical toolkit
Activities: break into lesson groups, ask/answer questions on homework, work tricky problems

	Due: Part I of Imagining Numbers, the week's homework, homework log, and progress report
Week 5 1Oct	Seminar on Lesson Zero: Symbols, Notation, and Operations Activities: break into lesson groups, ask/answer questions on homework, work tricky problems Wrap-Up: reconvene and ask any remaining questions your lesson group is stumped on, share any insights that may be valuable to other groups. Due: Part II Imagining Numbers, the week's homework, homework log, and progress report
Week 7 8Oct	Seminar on Lesson One: Fractions Activities: break into lesson groups, etc… Due: Part III Imagining Numbers, the week's homework assignment, homework log, and progress report
Week 8 15Oct	Seminar on Lesson Two: Numbers Activities: break into lesson groups Due: the week's homework assignment, homework log, and progress report
Week 9 22Oct	Seminar on Lesson Three: Exponents, Powers, Logarithms Activities: break into lesson groups Due: the week's homework assignment, homework log, and progress report
Week 9 24Oct	Last day to drop/decrease credit/etc.
Week 10 29Oct	Pressure-valve week. In class discussion on class progress—what's worked well, what can change—and on coping with school stress, managing time, etc… No new assignments; catch up and assist others in catching up.
Week 11 5Nov	Seminar on Lesson Four: Sets and Logic Activities: break into lesson groups Due: the week's homework assignment, homework log, and progress report
Week 11 7Nov	Last day to withdraw
Week 12 12Nov	Seminar on Lesson Five: Two Dimensions Activities: break into lesson groups Due: the week's homework assignment, homework log, and progress report
Week 13 19Nov	Seminar on Lesson Six: Equations and Relations Activities: break into lesson groups Due: the week's homework assignment, homework log, and progress report
Week 13	Thanksgiving

23Nov

Week 14 26Nov	Seminar on Lesson Seven: Systems of Equations Activities: break into lesson groups Due: the week's homework assignment, homework log, and progress report
Week 15 3Dec	Seminar on Lesson Eight: Probability Activities: break into lesson groupsDue: the week's homework assignment, homework log, and progress report
Week 16 10Dec	Seminar on Lesson Nine: Curves and Derivatives Activities: break into lesson groups Due: the week's homework assignment, homework log, and progress report

Readings

On the Web

- WTAMU Virtual Math Lab College Algebra Tutorials
- "The Joy of Mathematics...No, Really" by Susan Goldstine (short article about using Fibonacci sequence to design a mobile)
- Sociology and Math Joint Graduate Program at Johns Hopkins (Press Release 2001)
- "My sociology teacher told the class a few days ago that he sees no relevence of geometry to sociology or basically anything."
- "Chance," a website full of great stuff on probability (lectures, videos, etc.)
- "The Problem with Algebraic Models of Marriage Structure" - James M. Cargal
- Condorcet.org - links about voting

In the Electronic Mills Library

JSTOR
Sociological Forum, Vol. 12, No. 1, Special Issue: Mathematics in Thinking about Sociology, Mar., 1997

1. Mathematics in Thinking about Sociology, pp. 3-9. Scott L. Feld.
2. Modeling Social Processes: Some Lessons from Sports, pp. 11-35. Stanley Lieberson.
3. The Common Mathematical Structure of Disparate Sociological Questions, pp. 37-51. Guillermina Jasso.
4. Can Mathematics Be Social? Flexible Representations for Interaction Process and Its Sociocultural Constructions, pp. 53-71. Harrison C. White.
5. Reflections on Mathematical Sociology, pp. 73-101. Thomas J. Fararo.
6. Simulation Games in Theory Development, pp. 103-115. Scott L. Feld.

Annual Review of Sociology Vol. 4 (1978), pp. 345-371. "Mathematical Models in Sociology." Aage B. Sorensen

EBSCO
Annual Review of Sociology Vol. 28 (2002), pp. 197-220. "Mathematics in Sociology." Christopher R. Edling

In the Mills Bricks and Mortar Library

- *Fear of math : how to get over it and get on with your life* / Claudia Zaslavsky. New Brunswick, N.J. : Rutgers University Press, 1994. [370.156 Z38f 1994]
- *She does math! : real-life problems from women on the job* / Marla Parker, editor. Washington, DC : Mathematical Association of America, 1995. [510.23 S539 1995]
- *Math, a four letter word! : the math anxiety handbook* / Angela Sembera and Michael Hovis ; with illustrations by Matthew Hovis. Wimberly, Texas : The Wimberly Press, 1993. [510.71 M426s 1993]
- *A mindset for math : techniques for identifying and working with math-anxious girls* / Ohio State University ; project directors, Judy Genshaft, Jack Naglieri. Newton, Mass. : WEEA Pub. Center, Education Development Center, 1987. [510.7 M663]
- *Math talks for undergraduates* / Serge Lang. New York : Springer, 1999. [510 L271m 1999]
- *Solve this : math activities for students and clubs* / James S. Tanton. Washington, D.C. : Mathematical Association of America, 2001. [510.76 T169s 2001]
- *All the math you'll ever need : a self-teaching guide* / Steve Slavin. New York : Wiley, 1999. [510 S6319 1999]
- *Change and motion [videorecording] : calculus made clear* / Michael Starbird. Chantilly, VA : Teaching Co., 2006. [515 S7952DVD]
- *Mathematical models in the social sciences* / John G. Kemeny and J. Laurie Snell. Cambridge, Mass., MIT Press, 1972. [300.151 K31m]
- Mathematical models in the social and biological sciences / Edward Beltrami. Beltrami, Edward J. Boston : Jones and Bartlett Publishers, 1993. [300.151 B453m 1993]