Math 102: Mathematics for Liberal Arts Students

Texts:
- **For All Practical Purposes**, Eighth Edition.

Catalog Description:
For students whose primary interest is neither engineering nor science; promotes the understanding of mathematical thinking in a variety of topics, including common real-world problems; uses puzzles and experiments to motivate the material. Topics include probability, statistics, and/or other topics chosen by the instructor.

Prerequisite: MTH 020 or score of at least 27 on Part I and 35 on Part II of the CUNY COMPASS proficiency/placement exam.

What's the idea behind this syllabus?
This syllabus has several aims. The most important is to allow repeat instructors to introduce some variety to the course. There are only so many times a human can teach something before it becomes boring, and if its old hat to you it will likely be dull to the students.

The Mathematical Association of America studied successful college math departments around the country, and made suggestions (search the web for “cupm” to get the full report) for improving undergraduate math education. This redesign of the syllabus has one eye on their recommendations.

Specifically, students should be more strongly encouraged to read mathematics: this is a skill that is important on its own, independent of what is being read. Students should practice writing essay-type answers to math questions. Students should have the opportunity to speak about mathematics in class (by presenting their solutions to the sample quiz on the board, for example). Finally, students feel better about their “educational experience” if it involves the use of technology. The new syllabus includes a handful of “online discovery” exercises.

How to teach this course:
The revised syllabus is intended to be the opposite of a straitjacket. The syllabus is divided into a handful of modules with the idea that each section of Math 102 can be unique. You should feel free to choose those topics that you find interesting, and perhaps even a topic that you aren't yet familiar with. Teaching is a marvelous way to learn.

The modules currently deployed are
Graph Theory (16 lectures)
- Financial Math (20 lectures)
- Graphs and Charts (4 lectures, needs expansion)
- Statistics (14 lectures)
- Probability (12 lectures)
- Sudoku (6 lectures)
- Voting (12 lectures)
- Geometry (14 lectures)

The lecture count for each module includes some review time and 2 periods for an exam. Other modules are in development. If you have an idea for a module, we encourage you to pursue it. We hope to expand the list of modules to at least 10.

All instructors are required to include the modules on Probability, Statistics, and Graphs and Charts. These required modules together with the module on Financial Math will take 50 lectures. That leaves 6 lectures of “wiggle room”: time for additional review sessions or perhaps to teach your class Sudoku.

The new textbook:

The strength of FAPP is not in the text, it is in the supplements.

- **FAPP (main text)**: this contains the material from an overview level. The students should be encouraged (repeatedly) to read the relevant section before class. If this were the midwest, students would understand the aphorism: you can't reap if you don't sow. What's the New Yorker equivalent?

  This book also contains 20 short exercises at the end of each chapter (the Skills Check problems). All of these should be assigned. Following the Skills Check problems are harder exercises, writing projects, and applet (online) exercises. Each module contains a recommendation on which and how many of these to assign. Note that the answers (but not solutions) to odd-numbered problems are in the back of this book.

- **Study Guide**: The study guide contains for each chapter a checklist of ideas to be learned, and for each section several fully-worked-out examples, several questions with answers (but not solutions, those are in the Teaching Guide), hints for the exercises in FAPP, a sample quiz, flash cards with vocabulary, and a vocabulary word search. The students are required to have this book and the main text.

- **Student Solutions Manual**: This contains solutions (not merely answers) to all of the odd-numbered problems in the main text. Students are not required to purchase this, but you should assume that at least some of your students have access to it.

- **Instructor's Manual**: This book has solutions to all of the problems. More importantly, it contains for each section a chapter summary, a list of objectives for the chapter, Teaching Tips (really just warnings about what students tend to have problems with), and some ideas for “group work” assignments.

- **Teaching Guide for First-Time Instructors**: Despite the title, this book is valuable for experienced instructors, too. It contains another chapter summary, teaching tips (things we all know, but sometimes forget), and
examples suitable for including in your lecture. This book is really what sets FAPP apart.

- **Test Bank**: For each chapter, this book contains roughly 100 problems: some multiple choice, some free response. Of course, answers are also provided. Given the power of the Internet, we should assume that some student may have a copy of this book, but if a student can memorize the answers to 100 problems, more power to her.

- **Website**: The text has a website:
  
  www.whfreeman.com/fapp8e

  The website includes several applets (small browser-based programs) to help students understand some of the algorithms. Also, the website allows students to take a multiple choice quiz for each chapter, with the results of that quiz compiled for your section and available only to you. Unfortunately, the quiz covers the entire chapter, so if you leave out some topics the quiz may become inappropriate.

- **Blackboard**: A “cartridge” has been prepared for using the text with Blackboard web software. About half of the class will have used, or be using, Blackboard in another classes already. This web-based software contains quizzes (same quizzes as through the website, except that you can eliminate questions, and the grades are deposited directly into the Blackboard gradebook), supplemental videos and applets, and a gradebook. You can think of the software as “somebody” trying very hard to be your friend: often it will be annoying but on balance it’s helpful. Contact Professor O’Bryant if you’d like to investigate the use of Blackboard for your section.

**How well did the course go?**

Another initiative currently underway campus wide is to evaluate the quality of our courses. To this end, the department would like to distribute a questionnaire to your students on the penultimate day of class. Questions will be focused on the course, not on you, and will be open-ended rather than “on a scale of 1 to 10.” Other measures of the success of this course include the number of students who take another math course after Math 102, the number of students who graduate within 5 years of taking Math 102, the COMPASS/CPE scores of students who take the exam after Math 102. If you have suggestions regarding the questionnaire, or indeed regarding any Math 102-related topic, please send them to obryant@gmail.com.

**Exam Policies:**

Exam and homework policies vary wildly from instructor to instructor. A valuable resource for MTH102 instructors would be a library of old exams. I envision distributing samples of these to students. In the interest of creating such a bank of problems, I propose the following guidelines for exams.

- The first page of the exam should contain the date of the exam, the name of the module that the exam covers, the name of the instructor, space for the students name and ID number, and a statement of the ground rules for the exam (including the time allowed for the exam). The first page should not contain any problems.

- Standard ground rules: Students are allowed to use calculators, but not cell-phones. Students should remove sunglasses and brimmed hats. Students should
use a pencil, not a pen. Students should not confer with one another. Any questions asked during the exam must be asked before any students have left, so students should look through the exam early in the period.

- The value of each problem (number of points) should be clearly labeled on the exam.
- At some point after the exam has been graded, the instructor should provide a copy of the exam (please improve any rough spots that surfaced during the test period or during grading) to the main office for storage in the exam bank.

Future Modules:

The following ideas for modules have been proposed, but the modules have not yet been created.

- Numeration systems
- Math 030: linear equations, ratios, percents
- Sequences: recognize a sequence of integers, Fibonacci numbers, golden ratio, Fundamental Theorem of Calculus (Kevin has this nearly ready)
- Tiling
- Infinities: countable, uncountable, diagonalization
- Cryptography: Caesar, Monoalphabetic, Vigenere, index of coincidence, frequency analysis
- Math in Cinema: Good Will Hunting, Proof, Numb3rs, Pi, A Beautiful Mind

Creation: K. O'Bryant, August 9, 2009