

The Combinatorial Gardner

Winter Term 2013

Course Description

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Office Hours: Tuesday, Wednesday 3pm–4:30pm and by arrangement

Meeting Times:

Monday, Tuesday, Wednesday, Thursday 1–3pm, Warner Hall 506

Course Description:

It has been said that the Mathematical Games column written by Martin Gardner for *Scientific American* turned a generation of children into mathematicians and mathematicians into children. In this course we will read selections from three decades of this column, focusing on those that deal with combinatorics, the “science of counting”, and strive to solve the problems and puzzles given. An example problem that illustrates the science of counting is: what is the maximum number of pieces of pancake (or donut or cheesecake) one can obtain via n linear (or planar) cuts?

Textbook: *Martin Gardner’s Mathematical Games* (on CD) by Martin Gardner, Mathematical Association of America (MAA), 2005. (Current sale price of \$49.95 from the MAA or from the college bookstore)

Texts (including a copy of course text) written by Martin Gardner and available on reserve in Davis Family Library

- *Martin Gardner’s Mathematical Games*
- *Martin Gardner’s Sixth Book of Mathematical Games from Scientific American*
- *aha! Gotcha: Paradoxes to puzzle and delight*
- *aha! Insight*

- *A Gardner's workout: training the mind and entertaining the spirit*
- *Hexaflexagons, Probability, Paradoxes, and the Tower of Hanoi*
- *Knotted Doughnuts and Other Mathematical Entertainments*
- *The Last Recreations: Hydras, Eggs and Other Mathematical Mystifications*
- *Mathematical Magic Show*
- *Mathematical Puzzles and Diversions*
- *New Mathematical Diversions*, original version and revised version
- *Origami, Eleusis, and the Soma Cube*
- *Penrose Tiles to Trapdoor Ciphers*
- *Time Travel and Other Mathematical Bewilderments*
- *The Universe in a Handkerchief: Lewis Carroll's Mathematical Recreations, Games, Puzzles, and Word Plays*
- *Wheels, Life and Other Mathematical Amusements*

Texts in the style of and inspired by Martin Gardner, available on reserve in Davis Family Library

- *The Mathematical Gardner*. Edited by David. A. Klarner. Wadsworth International, Belmont, CA, PWS Publishers, Boston, MA, 1981.
- *A lifetime of puzzles*. A collection of puzzles in honor of Martin Gardner's 90th birthday. Edited by Erik D. Demaine, Martin L. Demaine and Tom Rodgers. A K Peters, Ltd., Wellesley, MA 2008.
- *Tribute to a mathemagician*. Edited by Barry Cipra, Erik D. Demaine, Martin L. Demaine and Tom Rodgers. A K Peters, Ltd., Wellesley, MA 2005.
- *Homage to a Pied Puzzler*. Edited by Ed Pegg Jr., Alan Schoen, Tom Rodgers. A K Peters, Ltd., Wellesley, MA 2009.

All of the above listed works fall into the genre known as "recreational mathematics". The Davis Family Library also has a subscription to *The Journal of Recreational Mathematics*.

A requirement:

As a result of your readings you will create many mathematical objects, puzzles, and curiosities. This is a required part of your reading, and so reading ten pages of text might take a couple of hours as a result of creating and puzzling. You are REQUIRED to bring these creations to class following the assigned reading and to save these creations in an organized portfolio. These creations will form part of your grade.

Philosophy:

This course is part lecture-style, part seminar-style and part problem-(solving)-style Thus, your active participation will drive our class meeting time. Each day we meet you will be prepared — you will have done the reading, puzzled the puzzles, and generated answers and **questions** for us all to consider.

Goals of the Course:

- Think deeply about simple ideas.
- Discover the breadth of mathematics.
- Learn some basics of combinatorics.
- Prove and conjecture!
- Have intellectual fun.

Special Needs: If you require special arrangements for class or during tests/exams please talk to me as soon as possible to make such arrangements. (It will be important to let me know if you are color-blind.)

Grading Percentages:

Participation	25
Paper	25
Presentation	25
Notebook and exit interview	25

Assignment of Grades:

The assignment of grades will follow the scheme below.

90 and above	A
80 - 89	B
70 - 79	C
60 -69	D
below 60	F

Plus and minus will be assigned at my discretion.

The “Participation” portion of your grade will derive from your active participation in class. This includes the following: the intelligent observations you make, the good questions you ask, the solutions you provide, your preparedness, etc. It is a somewhat subjective component on which I am willing to give you feedback on a regular basis — just ask!

The topic of the paper will be given to you during the second week of the term. It is expected to be 7–10 pages, typed, double-spaced and not including diagrams, tables, figures, or bibliography. (Papers prepared using the mathematical typesetting tool LaTeX are particularly welcome, though this is not required.)

The presentation you give will be about the topic you write about. It will occur on the last or next to last day of class. It should last 20–25 minutes, with 5 minutes of questions. You can expect one question from each person in the class, as this will also be a requirement.

The reading that you do will prompt the taking of notes, solving of problems, making of calculations and conjectures, doodling and constructing physical objects. These “notes” should be contained in one spiral or marbled notebook. This notebook and the objects will be brought with you to an exit interview. You’ll be asked to highlight your best observations, solutions, conjectures, etc.

Course supplies:

You will find it useful to have the following supplies: scissors, glue, a ruler and compass, colored pens/pencils, various shades and thicknesses of paper, a large quantity of counters (e.g. buttons, coins, beads), deck of playing cards, checkerboard, cardboard, . . . This list is not exhaustive. You are expected to bring to life the objects that we read about. Some of these supplies will help do that, at other times you will need to be creative in how best to bring some object to life. You need not spend much money, or any at all (visit the college’s “re-use trailer”), in obtaining some of these — be creative!

Absences:

Each absence will result in a deduction of 5 percentage points from the Participation portion of your grade.

Honor Code:

The Honor Code will be observed throughout this class and for written assignments. Plagiarism will not be tolerated.

Prove and Conjecture:

Erdős said that the point of life is “to prove and conjecture”. I agree. Thus, anyone solving an unsolved problem presented in the course will automatically earn an A.