MATH 579: Combinatorics
Spring 2009 (TR 9:30-10:45am, P-147)

Overview:
Combinatorics is concerned with the sizes of finite sets. For example, consider the set of all possible different necklaces made with m beads, chosen from a tub of n different beads. A variety of tools have been developed to find the size of such a set exactly, or perhaps to find an estimate or bound.

Learning Objectives:
There are three distinct phases to solving a combinatorial problem. Generally, the first phase is the most difficult to learn, and the last phase is the easiest. Students will learn all three in this course. First, the problem must be categorized as to which combinatorial tool would be appropriate. Second, a model must be created that translates the abstract formulation of the problem into the symbols required for the combinatorial tools to work. Third, the combinatorial tools must be applied to the symbols.

Students will, on exams, mimic solutions to specific problems; this allows students to demonstrate mastery of the third phase even while still learning the earlier phases.

Students will, at home, produce solutions to problems of specific types; this allows students to achieve mastery of the second phase even while still learning the first phase. Their mastery of this phase will be demonstrated on exams, when they mimic solutions they themselves produced earlier.

Students will, on exams, find solutions to problems of unknown types; this allows students to demonstrate mastery of all three phases.

Textbook:
A Walk Through Combinatorics, by Miklós Bóna, 2nd edition. This course will cover chapters 1-8.1, omitting 6.2. There is also a supplement on recurrence relations, which is available on the instructor's website.

Students are expected to read the text; it is quite brief and easy to understand. It contains many exercises, some with brief solutions and some without.

Portfolio:
Students are expected to keep a portfolio in a three-ring binder or something similar, containing a detailed and complete solution to every exercise in the text (those marked + or ++ are optional). These portfolios will not be collected or checked, except upon a student's request; however, they will be an invaluable resource during exams. The exams are structured so that there is just enough time to mimic a solution from a portfolio but not enough time to create it fresh.

Students are NOT required to personally solve every exercise appearing in their portfolios; they are strongly encouraged to collaborate with classmates. However, before accepting a classmate's solution into their portfolio, students are expected to carefully check it for completeness and correctness.

Attendance:
Students are expected to attend every class; otherwise, they are personally responsible for copying notes from a classmate. Makeup exams are not given under any circumstances. The lowest exam grade is dropped, to account for emergencies.

EXAM SCHEDULE:

Tue.	Feb. 3	Chapter 1	Thu.	Mar. 12	Chapter 4	Tue.	Apr. 21	Chapter 7
Thu.	Feb. 12	Chapter 2	Tue.	Mar. 24	Chapter 5.1-5.2	Thu.	Apr. 30	Recurrences
Thu.	Feb. 26	Chapter 3	Thu.	Apr. 9	Chapter 5.3-6.1	Tue.	May 12	Chapter 8.1

FINAL EXAM: Tuesday, May 19 10:30-12:30

Exams:
Exams are open book, open notes. The use of calculators is required; students must have at minimum a basic calculator for this course (a scientific calculator is better). Exams will consist of two parts, worth a total of 50 points. Depending on the choice of questions in Part I, it is possible to earn over 100%, and it is also possible to have a perfect exam but only earn 96%. The maximum value of each question will be clearly indicated on the exam.

Part I will contain five questions somewhat similar to exercises in the text. Students will pick three to complete. One will be easier, worth 5-8 points. One will be harder, worth 5-12 points. The other questions will be worth 5-10 points. A blank response will still be worth 5 points; to earn more students must demonstrate mastery of the material. (NOTE: the solutions in the text are sometimes incomplete, and would not earn full credit). Part II will contain one challenging question that builds on all previous knowledge, not necessarily from the material most recently covered. It will be worth 10-20 points; a blank is worth 10 points.

Grading:
The lowest of nine exam scores will be dropped. The purpose of this policy is to account for emergencies, not to artificially raise grades. The 8 remaining exams will be worth 8% of the course grade each. Class participation will be worth 6% of the course grade. The final exam will be worth 30% of the course grade. The grading policy is as follows: A 92-100, B 82-87, C 72-77, D 62-67, $\pm$ as obvious

Extra Credit:
On the next class day after an exam (before the exam is returned), students may submit extra credit to improve their grades. This consists of solutions to *all six* exam problems. The revised exam score will be calculated with the three *lowest* (from five) problem scores on part I, added to the problem score on part II. Note that the highest possible score on a revised exam is 48/50. This revised score will be averaged with the original exam score, rounding fractions up, but only if it increases the exam grade.

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Classmate Contact Info: