DISCRETE MATH (MATH 2100)
HANDOUT 7 (December 12, 2008)

SUMMARY OF TOPICS FROM 11/3/08-12/12/08

I. Counting Methods (Section 3.3 + handout)
  (i) Multinomial coefficients.
    (a) Multinomial Theorem.
    (b) Counting ordered partitions with possibly empty cells.
    (c) Higher dimensional versions of Pascal's triangle.
  (ii) Inclusion/Exclusion
    (a) Formula $N_{=}(S) = \sum_{S \subseteq T \subseteq P} (-1)^{|T|-|S|} N_{\geq}(T)$.
    (b) Formulas for the number of functions, injective functions and surjective functions from an m-element set to an n-element set.
    (c) Ordered partitions with nonempty cells.
    (d) Stirling numbers of the second kind (including analogies with binomial coefficients).
    (e) Formula for Euler's totient function.
    (f) Derangements.
  (iii) Distributions (handout).
    (a) Formulas for distributing balls to distinct boxes with varying assumptions on the distinctness of the balls and the number of balls per box.

II. Logic (handout).
  (i) Propositional logic.
    (a) Truth tables for logical connectives.
    (b) Converse of a statement.
    (c) Equivalent methods of proof: direct proof, proof of the contrapositive, proof by contradiction.
  (ii) Predicate logic.
    (a) Syntax for formulas.
    (b) Quantifier games.
    (c) Truth.
    (d) Provability.
    (e) Completeness of predicate logic, and incompleteness of set theory.

General advice on preparing for a math test.

Be prepared to demonstrate understanding in the following ways.

(i) Know the definitions of new concepts, and the meanings of the definitions.

(ii) Know the statements and meanings of the major theorems.

(iii) Know examples/counterexamples. (The purpose of an example is to illustrate the extent of a definition or theorem. The purpose of a counterexample is to indicate the limits of a definition or theorem.)

(iv) Know how to perform the different kinds of calculations discussed in class.

(v) Be prepared to prove elementary statements. (Understanding the proofs done in class is the best preparation for this.)

(vi) Know how to correct mistakes made on old HW.