Study Guide

Chapter 2
- Addition and Multiplication Rules
- 3 basic combinatorial objects: strings, permutations, combinations
  - identification
  - formulas
  - "twists" e.g. can't use a letter in one spot, or you have to use precisely 4 of one letter
  - tricks about using combinations to select spaces for a certain letter
- applications of binomial coefficients
  - counting integer sol'ns
    - formulas
    - "twists"
      - different lower bounds
      - inequality instead of an equation
      - case with one upper bound
  - counting lattice paths
    - formula
    - complications (have to pass through or avoid certain pts
  - Binomial Theorem
    - using Thm to find coefficients
    - complications (powers and numbers in binomial)
- multinomials
  - multinomial coefficient ~~(in terms of binomial coefficients)~~
    - what does it represent; mathematical formula
  - Multinomial Thm
    - same deal as Binomial Thm

Chapter 2 cont'd
- combinatorial proofs
  - Strategy: find a set that both sides of eqn count
  - Possible Strategy: if you see a sum, try splitting into cases
  - look over previous examples/problems

Chapter 3: Recursion & Induction

- Recursive Formula:
  - Recursive Step: Define $S(n)$ in terms of $S(n-1), S(n-2), \ldots$
  - Base Cases: Define $S(0), S(1), S(2), \ldots$
- Pf by Induction
  - Inductive Hypothesis: Assume true $n=m$
  - Inductive Step: Use I. H. to prove true for $n=m+1$
  - Base Case

Chapter 4: Pigeonhole Principle

- principles: simple (n+1 pigeons, n pigeonholes); complex (nk+1 pigeons in n pigeonholes)
- Strategy: What are the pigeons? What are the pigeonholes?

Chapter 7: Inclusion-Exclusion

- formula: $|\bar{X}| - \sum_i |X_i| + \sum_{i,j} |X_{ij}| - \ldots$
  - what $\bar{X}, X_i, X_{ij}, \ldots$ they are?
- two specific cases: surjections and derangements