ACM ICPC

- Is everyone on a team?
- Send Prof. Eugster (peugster@cs.purdue.edu)
  - Team name
  - Team members and t-shirt sizes (important)
  - BY NOON TOMORROW (WEDNESDAY)

- Leave: Fri, Oct 30 @ 1:00 pm from Lawson
- Return: Sat, Oct 31 @ 9:00 pm to Lawson
- Cost: $0.00 (except a fast-food meal on Friday)

Pairsumonious Numbers

- Backtracking (will revisit in Chapter 8)
  - Choose first value carefully
  - Recurse on n-value array
  - Prune dead-end attempts
- Simultaneous equations with back substitution

Counting Things

- Using bijections to count things
  - One-to-one mapping between known and unknown
  - Permutations of n elements to henways of d elements
  - Count subsets by counting binary numbers
- Product rule
- Sum rule
- Permutations: n!
- Subsets: 2^n

Recurrence Relations

- Recursive formula, plus basis case(s)
- $a_n = f(a_{n-1}, \ldots)$, $a_1 = \ldots$
- Another way to count things: find a recurrence relation
- Polynomials can be represented, hence counted
- Ditto for any exponential
- And weird ones, too, e.g., factorial and Fibonacci
- Use recursive function if cannot find closed form

Binomial Coefficient

- (n choose k) = number of ways to choose k items from a set of n items
- (n choose 1) = n
- (n choose n) = 1
- (n choose k) = n! / (k!(n-k)!)
  - Bijection: derive from committees of size k from set of n people
  - n(n-1)(n-2)…(n-k) permutations of k people
  - divide by k! to remove duplicate permutations

Pascal's Triangle

- Draw
- Examine implicit recurrence

  (n choose k) = (n-1 choose k-1) + (n-1 choose k)
- Write program that computes triangle
- Important concept: retain intermediate results (special case of dynamic programming)

Fibonacci Numbers

- Recurrence relation
- Some problems result in Fibonacci sequence

- Related: Catalan sequence
- Another recurrence, Cn = Cn-k * Ck [CHECK]

Today's Problems

- 110601 How Many Fibs?
- 110602 How Many Pieces of Land?
- 110603 Counting
- 110607 Self-describing Sequence

- Difficulties: Combinatorics and Recurrences not Programming (except need bignums)

Today's Problems -- Hints

- 110601 How Many Fibs?
  - Pre-compute fibs
  - Store as zero padded strings
- 110602 How Many Pieces of Land?
  - Count: number of lines + number intersections
  - Recurrence: count crossings of line n-k between sides
- 110603 Counting
  - Recurrence: consider leading digit of f(n)
  - Pre-compute the 1000 values
- 110607 Self-describing Sequence