CS 145 – Foundations of Computer Science

Professor Eric Aaron

Lecture – M W 1:30pm
Lab – F 1:30pm

Lecture Meeting Location: SP 105
Lab Meeting Location: SP 309

Business

• HW5 due already
• HW6 out today, due May 1 / May 2

• (Please bring exams to class until we can finish going over them!)

• Reading: Makinson, Ch. 5
• Document on structural induction available from course website (follow the Additional Notes link)
Business, pt. 2

- Lab5, lab6, and course scheduling:
  - Lab5 is posted already; can be worked on anytime
  - Lab6 will be held as usual this Friday, April 22 (Coaches will run lab in my absence)
  - Both labs due by the end of the day Thursday, April 28

- Class session on Monday, April 25 will be held in the Asprey Lab, SP307 (where Coaching Hours are held)
  - (Coaches will run this class session)
  - That class session will be exclusively for work on labs (completing them, getting them checked off, etc.)
  - Attendance is not mandatory on April 25 (though it is at all other lab sessions)

A Note On Scheme:
(apply append (...))

- In Scheme, the apply function takes a function F and a list L = (L1 .. Lk), and it applies function F with arguments L1 ... Lk.
  - That is, the elements of the list become the arguments of F
- This can be useful when F is the append function—then, (apply append (...)) can “flatten” a list
- Examples:
  - (apply append '(a b c) (d e f) (g h) (i) (j k l)))
A Note On Scheme: (apply append (…))

- In Scheme, the `apply` function takes a function F and a list L = (L1 .. Lk), and it applies function F with arguments L1 ... Lk.
  - That is, the elements of the list become the arguments of F
- This can be especially useful when working with the result of the map function, which returns a list
- Example:
  - `(apply append (map (lambda (listy) (map (lambda (elt) (list elt elt)) listy)) '((1 2 3) (4 5) (6 7 8))))`
Counting 2—Repetition

• It can be useful to think about situations in terms of possibly repeated elements being counted, as well as possible orderings of elements

• Using the counting ideas from combinations and permutations…

• Exercises
  – A restaurant has five flavors of ice cream, and you can order one, two, or three scoops. How many different ice cream orders could you place?
Counting 3—Repetition

• Using the counting ideas from combinations and permutations…

• Exercises
  – How many ways are there to rearrange the letters in the word banana?

(As always, explain your answer, including the way you model the situation)

Counting 3—Repetition

• Using the counting ideas from combinations and permutations…

• Exercises
  – How many ways are there to rearrange the letters in the word banana?

  – In general, if we have an n-letter word made up of k different letters, how many ways are there to rearrange the letters in that word?