CS 145 – Foundations of Computer Science

Professor Eric Aaron

Lecture – M W 10:30am  
Lab – F 3:10pm

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 (x) (list x (* 10 x)))
    '(1 2 3 4 5)))
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?