Stat 280: Sept 5, 2001

Notices:

My office hours: MWF 10-12 (exceptions e-mailed to stat280-e1@sfu.ca)

Course Outline: Text Ch 1-8

Review of basics of probability - Ch 1 and 2
Discrete Models- Ch 3
Markov Chains - Ch 4
Continuous Models, general - Ch 5
Continuous Models, specific - Ch 6
Queuing Processes - Cj 7
Sums of RVs - Ch 8

Assignment for Monday, Sept 10:
Read Ch 1, Try 1.4-15, 1.5-11, 1.6-7 (answers in text).

Assignment for Monday, Sept 17 (to hand in at Monday Class): 2.1-8, 2.2-6, 2.3-8, 2.4-6, 2.5-3, 2.6-4, 2.7-4, 2.8-2, 2.9-2

Advance Warning: Projects: You will be required to do at least one simulation project. I will discuss some examples of this kind of project. This will be due sometime during the second half of the course. Here are the steps needed for it:

1. Think of a real life process that can be modeled by a combination of elementary models (the ones you will learn in this course).
Send me a paragraph describing the process you intend to simulate.
2. Build the model and simulate it with guessed parameter values
3. Compare the simulated output with your informal knowledge of the process and adjust parameters of your model, repeating step 2 until output is satisfactory
4. Write a brief report (1-2 pages) describing your model and result.

Lecture Notes:

1. Suppose we draw three letters at random (from A-Z) and attempt to form three letter words. What is the sample space?
2. What is the probability of each "word"?
3. How would we figure out the probability that a "word" is a real English word?
4. Look at the "sign-change" example in the book p 18. Explain why the algorithm works.
5. Repeat this simulation and note your answer for Monday's class. Also,

make a graph of your S(n) series and bring it to class.
6. mn rule for number of ways to do something. p 20.
7. nPr formula p 22 - passwords example.
nPr is n!/((n-r)! Why? The easy way is to note that there are n ways to choose the first position, and given the first position there are n-1 ways to choose the second position, and so on so the mn rule gives the answer as n*n-1*n-2***n-(r-1) which is n!/(n-r)!

The way I wanted to use in class (i.e the hard way) was this:
Imagine the list of n! orders of the n things, and suppose the first r things in each ordering is considered as an ordering of r things. Each such permutation of r of the n things is associated with (n-r)! of the original permutations of n things, where only the (n-r) things change order. So if we are counting distinct orderings of length r, we have to use only one from the original list of n! out of the (n-r)! that have the same first r things. So the number of orderings of length r is n!/(n-r)! For example,

For n=4, r=2, we have

AB CD
AB DC
AC BD
AC DB
AD BC
AD CB
BC AD
BC DA
BD AC
BD CA
CD AB
CD BA

And you can see that if we use the first two positions to get our 4P2 permutations, we have groups of size (4-2)! That are associated with the same first two letters. To get the number of distinct permutations, we need to divide the 12 (n!) by 2 ((4-2)!)

8. nCr Rule A similar "hard-way" argument can be used to get nCr. From the n!/(n-r)! distinct permutations of r of the n things, note that groups of size r! in that list will all involve the same combination of chosen letters. So we must divide the n!/(n-r)! by r! to get the number of distinct combinations. For example, for n=5, r=2 the 5P2 permutations are

AB, AC, AD, AE, BC, BD, BE, CD, CE, DE and
BA, CA, DA, EA, CB, DB. EB, DC, EC, ED

And it is easy to see that pairs like AB and BA are the same combination, so we must divide the 5P2=20 by 2! to get 5C2 = 10 distinct combinations.

Can we use this argument to infer the number of permutations of the
numbers 1,1,1, 2, 2, 2, 3?
If the numbers were distinct we would have 7! ways. But there are subgroups
of these 7! numbers of size 3! that correspond to permutations of the positions where the
1s are, and similarly for the 2s. so the number of permutations is $7!/(3!\ 3!) = 140$

For next time, from Ch 1:

Conditional Probability, Independence
Law of Total Probability
Bayes Formula