STAT 280 Sept 10, 2001

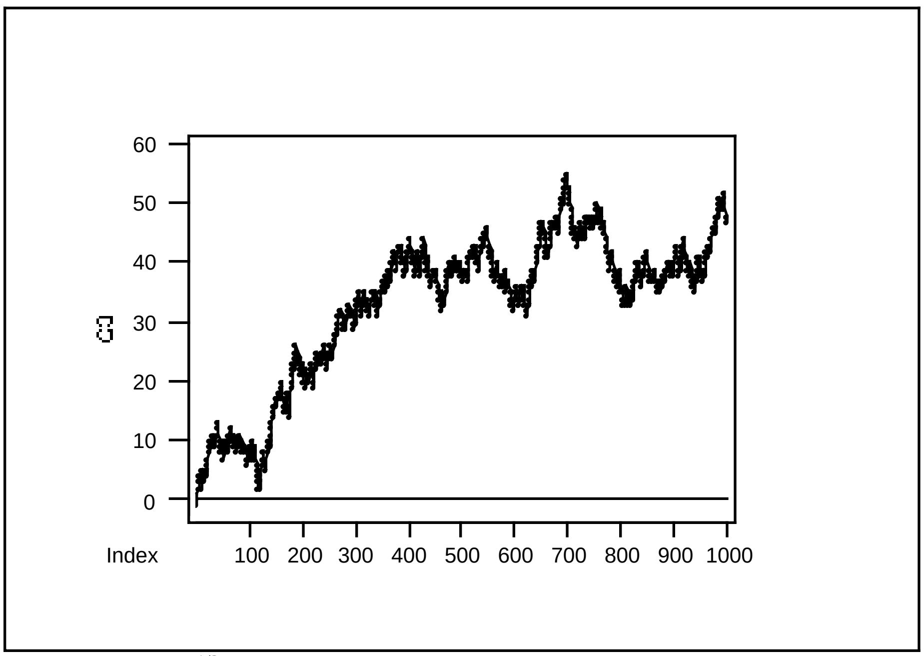
In Chapter 1&2, we are reviewing the basic mechanics of probability, including some experiences with simulation. We need these to be able to work with the modeling and applications used in the rest of the course.

The exercises from Ch 1 that I asked you to do were not to hand in. I'll discuss them briefly today. 1.4-15, 1.5-11,1.6-7.

The graph of the random walk? Examples?

Here is an example produced by rwprog:

There was only 1 zero crossing in this case. This may surprise you because the mean of each S(n) is 0. On the other hand, note that the SD of S(n) increases with n. In fact the




SD of S(n) is $n^{1/2}$ which explains why the series will wander far from 0.

Understanding this may help to understand the following Sports League phenomenon.

League of 16 teams: 1 round home and away. See PP.
Also see actual league outcome.

Also, stock market implications.

Back to Ch 1 exercises:

1.4-15. The MISSISSIPPI problem. To establish the formula given, note that if k=2, the formula is just $nCr_1$, the number of ways $r_1$ things can be selected from n things. But a permutation of the n things with $r_1$ of them indistinguishable will correspond to the $r_1$ position numbers of the indisting uishable things, so $nCr_1$ is the number of permutations of n things with $r_1$ of them indistinguishable. The general result comes by induction of this argument. Another way to see this is to realize that a permutation of indistinguishable things does not lead to a new arrangement, and so the list of n! permutations has subgroups groups of size $r_1$ and $r_2$ and $r_3$ etc that with the indistinguishable objects will not look like different permutations. So we will have subgroups of $r_1! \; r_2! \ldots . r_k!$ in the list of n! that look identical, and hence the result.

Applying this to MISSISSIPPI we note that among the 11 letters there is 1 M, 2 Ps, 4 Is and 4 Ss, so the number of arrangements is 11!/(1! 2! 4! 4! ) = 34650

1.5-11. Coins in a box. First we look at the P(dime). If you knew the die outcome was i, then the probability of a dime would be 1/(i+1) since the box selected would have 1 dime and i pennies. But each box is selected with the same probability 1/6. So the P(dime) = 1/6*1/2 + 1/6*1/3 + ….+1/6*1/7 = .265. The formula we are using is the one on p 31, but it should seem obvious - think about it until it is obvious.

Next we want P(box1|dime). But this is (see p 28) = P(dime AND box1)/P(dime) = 1/6*1/2 /.265 = .314. Does this seem reasonable? The dime is most likely when box 1 is selected, so when you know a dime is picked, it lends weight to box1. (i.e the probability should be greater than 1/6). Right?

1.6-7 Component system. This looks like a lot of work until you see there are really only three possibilities. A with B on the same side, A with C, or A with D. The probability that the circuit works is $p_1*p_2+p_3*p_4 - p_1*p_2*p_3*p_4$ and the probabilities for the three possibilities are .758, .818, .778 so clearly A with C and B with D is the best configuration. Would you have guessed this? It turns out it was best to give one side a great change to work and sacrifice the other side. Not obvious though.

Work through Ch 2

Ask questions in tutorials.