Homework 3, Sta/OR 524 Fall 2005

Due Sept. 28

The idea/example of a significant test in Statistics:

Select n subjects. Each subject is treated with a new treatment and the old treatment. Suppose that the new treatment is no different from the old. If we control everything else (disguise the label, etc), then the outcome will be 50/50 favoring the new treatment.

In n such repeated experiments, you may get k outcome favoring the new. The chance/probability of getting k favors out of n can be computed by a binomial probability formula.

We say that the result is "statistically significant" if the k is so large that the probability $P(X \geq k)$ is so small (say smaller than 0.01) under the "50/50" assumption.

Here "statistically significant" should be interpreted as the result is significantly different from the assumption of "50/50".

Some example: for $n = 20$, $P(X \geq 13) = 0.131588$.
Some example: for $n = 20$, $P(X \geq 14) = 0.05765915$.
Some example: for $n = 20$, $P(X \geq 15) = 0.02069473$.
Some example: for $n = 20$, $P(X \geq 16) = 0.005908966$.

1. A state has one million registered voters, you select 1500 at random to ask their opinion about an election. Suppose that 600,000 of the voters will vote for candidate A while the other 400,000 will vote for candidate B.

   Let X be the number of selected voters (among the 1500) that will vote for candidate A.

   a) What is the distributions of X?

   b) Write a formula (do not evaluate it) for P(X = 700) and P(X = 701) using the distribution.

2. Find the variance of a Poisson(λ) random variable.

3. Page 265 number 18. (Hint: $Var(\bar{x}) = E(\bar{x} - \mu)^2$)