STA 320 Midterm 1
Probability

October 10th, 2008

There are five questions on this test. DO use calculators if you need them. "And then a miracle occurs" is not a valid answer. There will be no bathroom break allowed. Please keep all prayers silent.

You have 50 minutes to complete this test. Please ask me questions if a question needs clarification.

Each question is worth the same number of points.

Question 1: Sample space and set theory

Five applicants (Jim, Don, Mary, Sure, and Nancy) are available for two identical jobs. A supervisor selects two applicants to fill theses jobs.

(a) List all possible ways in which the jobs can be filled, that is, list all possible selections of two applicants from the five.

(b) Let A be the set of selections containing at least one male. How many elements are in A?

(c) Let B be the set of selections containing **exactly** one male. How many elements are in B?

(d) List elements in A^c, AB, $A \cup B$, and $(AB)^c$.

Question 2: Combinatorics

A fleet of eight taxis is to be divided among three airports, A, B, and C with 2 going to A, 5 going to B and 1 going to C.

(a) How many ways can this be done?

(b) What is the probability that the cab driven by Jones ends up to the airport C?

Question 3: Conditional probability

By using the definition of conditional probability show that

$$P(ABC) = P(A)P(B|A)P(C|AB),$$

where A, B, C are events.

Questions 4: Bayes Theorem

A blood test for hepatits yields the probability for true and false results listed in the table.

| | Test results | |
	+	−
patients		
With hepatits	0.90	0.10
Without hepatits	0.01	0.99

The probability that a person has the disease is 0.00001.

What is the probability that a person who recieves a positive blood result actually has hepatits?

Questions 5: Discrete random variables

(a) Write the probability function for the bionomial distribution $B(n, p)$.

(b) Experiment: Toss a coin with $1/3$ chance to obtain head and $2/3$ chance to obtain tail 20 times. What is the probability to observe 5 heads in this experiment?