MATH/STAT 394A FALL 2008 Midterm 1: October 10, 2008

---

1. Permutations and combinations

There are $n! = \prod_{i=1}^{n} i = 1.2.3.4. \ldots n$ permutations of n objects.

There are $\left(\begin{array}{c} n \\ k \end{array} \right) = n!/(k!(n-k)!)$ different combinations of k objects chosen from n.

2. Joint and conditional probabilities

If C and D are any events: $P(C \bigcup D) = P(C) + P(D) - P(C \bigcap D)$.

The conditional probability of C given D is $P(C \mid D) = P(C \bigcap D) \; / \; P(D)$.

C and D are independent if $P(C \bigcap D) = P(C).P(D)$.

3. Laws and theorems

Suppose $E_1, \ldots, E_k$ is a partition of Ω. That is $E_i \bigcap E_j$ is empty for all i,j, and $E_1 \bigcup E_2 \bigcup \ldots \bigcup E_k = \Omega$.

The law of total probability states that: $P(D) = \sum_{j=1}^{k} P(D \bigcap E_j) = \sum_{j=1}^{k} P(D \mid E_j) \; P(E_j)$

Bayes' Theorem states that: $P(E_i \mid D) = P(D \mid E_i) \; P(E_i)/P(D)$

THREE QUESTIONS WILL FOLLOW HERE