Sample Problems (with answers) from Fall 2006 Final

1. **Chapter 5: Counting**

   (a) **(4 pts)** Imagine that each locker in Peterson is labeled with an upper-case letter followed by three digits.

   - How many different labels for lockers are there? 26*10*10*10
   - Name the rule(s) that you used to compute the number of labels. Product

   (b) **(4 pts)** Now imagine that there are 805 lockers in Peterson and 4026 students who need lockers. Therefore, some students must share lockers.

   - What is the largest number of students who must necessarily share a locker? 6
   - Name the rule(s) that you used to compute the number of students. Pigeonhole

   (c) **(5 pts)** Imagine a license plate consists of three letters followed by three digits or four letters followed by two digits.

   - How many different license plates can be made? 26**3 * 10**3 + 26**4 *10**2 (** means exponentiation, * means multiplication)
   - Name the rule(s) that you used to compute the number of license plates. Product and Sum

   (d) **(4 pts)** Let the set A = {1,2,3}.

   - List all of the 2-permutations of the set A. The 6 ordered arrangements 1,2 ; 1,3 ; 2,1; 2,3; 3,1 ; 3,2
   - List all of the 2-combinations of the set A. The 3 subsets {1,2}, {1,3}, {2,3}
   - Verify the size of your list by using the formulas for permutations and combinations. P(3,2) = 3*2=6; C(3,2)= 3!/(2!1!)=3

2. **Chapter 6: Discrete Probability**

   (a) **(2 pts)** What is the probability that a fair coin lands heads four times out of five flips? Reduce to a fraction. C(5,4)/ (2**5) = 5/32

   (b) **(3 pts)** What is the probability that a positive integer less than 100 picked at random has all distinct digits? 90/99

   (c) **(6 pts)** A computer picks out at random a sequence of six digits.

   - What is the probablity that a person picks all six digits in their corrrect positions? 1/(10**6)
   - What is the probability that a person picks exactly five of the digits, in the correct order? 54/(10**6)