MATH 4473, Seminar - Discrete Mathematical Structures  
Practice Test 1, Spring 2010

Your test will be of similar content and material, but the questions will be different and the questions may be asked in a different manner. The test questions will come from all the material we have covered in class.

This is a closed book, closed note test, and should be your work only. You may use a calculator during this exam. Stay calm, read all the instructions, show your work and write your answers on this test. Ask the instructor for clarification if you are confused as to what is being asked.

1. A bowl contains 7 red balls and 7 blue balls. You select balls at random without looking at them.

a. How many balls must you select to be sure of having at least 3 balls of the same color?

b. How many balls must you select to be sure of having at least 2 blue balls?

2. How many different three-letter initials can people have?

3. How many different strings can be made from the letters in EVERGREEN?
4. What is the coefficient of $x^7y^{10}$ in the expansion of $(3x + 2y)^{17}$?

5. Suppose that Bob selects a ball by first picking one of two boxes at random and then selecting a ball from this box at random. The first box contains four white balls and four blue balls, and the second box contains five white balls and two blue balls. What is the probability that Bob picked a ball from the second box if she has selected a blue ball?

6. Assume that the probability a child is a boy is 0.52 and that the sexes of children born into a family are independent. What is the probability that a family of five children has

a. exactly three girls?

b. at least one girl?
7. What is the probability that a five-card poker hand contains a flush, that is five cards of the same suit?

8. How many permutations of the letters $ABCDEFGH$ contain
   a. the string $ED$?
   b. the strings $BA$ and $FGH$?

9. Use a combinatorical argument to prove that $C(n + 1, k) = C(n, k - 1) + C(n, k)$. 
10. How many ways are there to deal hands of seven cards to each of five players from a standard deck of 52 cards?

11. What is the probability that a card selected from a deck is a two or a spade?

12. A coin is biased so that the probability a head comes up when it is flipped is 0.6. What is the expected number of heads that come up when it is flipped 5 times?

BONUS QUESTION (in the style of Math Jeopardy): Considered to be one of two mathematicians that laid the foundations for the modern theory of probability, he also discovered important results concerning conic sections at the young age of 16.