Counting Homework
for Janet Vassilev's Math 327 course

1. In a class of twenty, 5 people slip out the door to leave class one by one throughout the course of the lecture, how many ways can the students slip out of the class?
2. How many permutations of the letters a, b, c, d, e, f contain neither the string abc nor def?
3. How many 5 digit number contain no repeated digits?
4. How many ways are there to distribute 7 books among 12 people so that no person receives more than one book?
5. How many 10 digit strings of 0's and 1's contain 7 1's?
6. If there are 3 girls, 4 boys, 8 women and 6 men, how many ways can you make a team of 6 people if:
   (a) There are no restrictions on the people on the team?
   (b) Each team has 1 girl, 2 boys, 2 women and 1 man?
   (c) Each team has at most one girl and at most one boy?
7. On a qualifying exam for the Mathematics Ph.D. program, the students are allowed to choose 8 of the 12 problems to work on.
   (a) How many ways are there to choose 8 problems?
   (b) How many ways are there to choose the 8 problems if the first three must be attempted?
8. How many anagrams are there of CALCULUS?
9. How many non-negative integer solutions are there to $x + y + z + w = 14$?
10. How many ways can you place three identical cubes and seven identical spheres in 5 boxes?
11. How many ways can you place three identical cubes, five identical spheres and four identical pyramids into fifteen boxes so that each box contains at most one object?
12. What is the coefficient of x^3y^5 in the expansion of $(2x - y)^8$?
13. Show $\binom{n}{0} - \binom{n}{1} + \binom{n}{2} - \cdots + (-1)^n\binom{n}{n} = 0$.