# CMSC 203 - Discrete Structures - Fall 2000 - Exam 3

1. Suppose I have a collection of 27 Math books, 18 Chemistry books, 22 Biology books, and 25 Geology books.

a. How many ways can I arrange all these books on a shelf if all the books are distinct?

b. How many ways can I arrange all these books on a shelf if all the books are distinct and I want the books of each category to be grouped together?

c. How many ways can I select 10 books if all the books of each type are the same?

d. How many ways can I select 10 books if all the books of each type are the same and I want at least 2 of each type?

2. How many orderings are there of the letters of the words:

a. CHEMISTRY b. MATHEMATICS

3. Suppose 15 people go to eat at a restaurant.

a. How many ways can they arrange themselves around a round table?

b. How many ways can they arrange themselves around a round table if a certain pair of people cannot sit adjacent to one another?

4. Verify: $\binom{n}{k} = \binom{n-1}{k-1} + \binom{n-1}{k}$

5. If the a row of Pascal's Triangle is "1, 5, 10, 10, 5, 1" what is the next row?

6. Find $s_7$ in the recurrence relation:

$$s_n = (s_{n-1})(s_{n-3}) - (s_{n-2}) \text{ when } s_0 = 0,\ s_1 = 1 \text{ and } s_2 = (-1)$$

7. Use the Method of Iteration to find a general solution to the recurrence relation:

$$s_n = 3s_{n-1} + 2, \text{ when } s_0 = 5.$$

8. Find the general solution to the recurrence relation whose characteristic polynomial has roots 3,3,3,(–4),(–4),(–4),5,5,5,(–6),(–6),(–6),7,7,7 .

9. Find the general solution to the 2nd order, linear, homogeneous recurrence relation with constant coefficients: $s_n = 2s_{n-1} + 63s_{n-2}$.

10. Find the particular solution to the recurrence relation whose general solution is

$$s_n = A4^n + B(-3)^n, \text{ when } s_0 = 5 \text{ and } s_1 = 34.$$