

CMSC 203 - Discrete Structures - Spring 1999 - Exam 3

1. Suppose I have a collection of 30 Math books, 20 Chemistry books, 10 Biology books, and 40 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 adjacent?
 - 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?
 - e. How many ways can I select 12 books if all the books are distinct and I want 3 of each type?
2. Suppose 10 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?

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

4. Fill in the blanks for the first 10 rows of Pascal's Triangle:

Row 0: 1

Row 1: 1 1

Row 2: 1 _____ 1

Row 3: 1 _____ _____ 1

Row 4: 1 _____ _____ _____ 1

Row 5: 1 _____ _____ _____ _____ 1

Row 6: 1 _____ _____ _____ _____ _____ 1

Row 7: 1 _____ _____ _____ _____ _____ _____ 1

Row 8: 1 _____ _____ _____ _____ _____ _____ _____ 1

Row 9: 1 _____ _____ _____ _____ _____ _____ _____ _____ 1

5. Find the next 5 terms in the recurrence relation:

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

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

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

7. Find the general solution to the recurrence relation whose characteristic polynomial has roots 3,3,3,3,3,(-2),(-2),(-2).

8. Find the general solution to the 2nd order, linear, homogeneous recurrence relation with constant coefficients: $s_n = 2s_{n-1} + 15s_{n-2}$.

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

$$s_n = A4^n + B(-3)^n, \text{ when } s_0=7 \text{ and } s_1=14.$$