

DISCRETE STRUCTURES - CMSC 203 EXAM 3 Spring 1994

- A restaurant's menu consists of: 2 soups, 3 appetizers, 4 salads, 5 entrees, 6 desserts, and 7 beverages. How many distinct dinners can they serve if each dinner contains:
 - a soup, an appetizer, a salad, an entree, a dessert, and a beverage?
 - one appetizer, one of either soup or salad, one entree, and one of either a dessert or a beverage?
- How many ways can 4 married couples sit at a dinner table if:
 - the table is long and narrow (like a bar!) and each couple must sit together?
 - the table is circular and one of the couples cannot sit next to one another?
- How many ways can I permute the letters of the word **BASEBALL** ?
- How many strings of length 15 from the alphabet {a,e,i,o,u} contain exactly three of each character?
- Expand $(x + y)^5$ using the binomial theorem.
 - Prove or disprove that the coefficient of $x^{14}y^{17}$ equals the coefficient of $x^{17}y^{14}$ in the expansion of $(x + y)^{31}$.
- Prove:
$$\frac{P(n,r)}{r!} = \frac{P(n-1,r-1)}{(r-1)!} + \frac{P(n-1,r)}{r!}$$
- Using the Iteration Method, solve the Recurrence Relation: $s_n = 5s_{n-1} + 2$ with $s_0 = 1$.
- What LHSORRCC has general solution: $s_n = (A + Bn)(-3)^n$?
- If $s_n = 12s_{n-1} - 35s_{n-2}$, and $s_0 = -1$ and $s_1 = 1$, find an expression for $s_{1000000}$. (Hint: $12s_{999999} - 35s_{999998}$ is not what I am looking for!)
- What is the **order** of the following functions:
 - $f(x) = 2x - 7$
 - $f(x) = 3x^2(2x^3 + 5x^2 - 4x + 1)$
 - $f(x) = (\log_B x)(x^2 + 1)$
 - $f(x) = x!$
- What is the order of the loop given in the following lines of code:

```
FOR I = 1 TO N
  FOR J = 1 TO N
    FOR K = 1 TO N
      P = P + 1;
    NEXT K;
  NEXT J;
NEXT I;
```
- Given sorted array of the integers 1, 2, ..., 100,
 - how many steps will a *sequential search* require to find 36?
 - how many steps will a *binary search* require to find 36?