Syllabus for the CS111 Quiz 4

Topics:

- Linear non-homogeneous recurrences equations
    - Solve the recurrence $D_n = 3D_{n-1} +1$, $D_0 = 0$.
    - Find a general solution of the recurrence $f_n = 5f_{n-1} - 6f_{n-2} + 2^n$.
    - Find a particular solution of the recurrence $g_n = 5g_{n-1} - 6g_{n-2} + 2^n$.
- Divide-and-conquer recurrence equations
    - State the Master Theorem
    - Give an (asymptotic) solution to the following recurrence: $f(n) = 3f(n/2) + 3n$
    - Give an (asymptotic) solution to the following recurrence: $f(n) = 8f(n/2) + 5*n^4$
    - Given the pseudo-code below, what is the (asymptotic) number of lines printed on input n? ...
- Inclusion-Exclusion
    - Give a complete statement of the inclusion-exclusion principle.
    - Suppose that we have sets A, B, C such that $|A|= 22$, $|B| = 36$, $|C| = 26$, $|A \cap B| = 2|A \cap B \cap C|$, $|A \cap C| = 3|A \cap B \cap C|$, $|B \cap C| = 4|A \cap B \cap C|$, $|A \cup B \cup C| = 13|A \cap B \cap C|$. Determine the number of elements in the of these three sets.
    - Compute the number of permutations of $\{1,2,3,4,5,6,7,8,9\}$ in which either 2,3,4 are consecutive or 4,5 are consecutive or 8,9,2 are consecutive.
    - We have a group of 53 people, including 22 US citizens, 15 Mexican citizens, and 27 Canadian citizens. Among them, 4 people have a dual US-Mexican citizenship, 5 have US-Canadian citizenship, and 6 have Canadian-Mexican citizenship. How many people have a triple citizenship?
    - Compute $\varphi(440)$ ($\varphi(n)$ is the Euler totient function).
    - Give the number of solutions of $x+y+z = 30$, for $4 \leq x \leq 14$, $3 \leq y \leq 17$, $10 \leq z \leq 25$.