Q1

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Answer:

First, we count the number of each letter S, N, A, K and E in the original sequence. Let us say $N_s, N_n, N_a, N_k\ and\ N_e$ and let M be the smallest number of them. Clearly, there is no way the largest possible venom level L > M. secondly, we use greedy strategy to find out the largest L. There are two cases.

Case 1:

Every letter in the sequence is exactly same as the patten SS⋯SNN⋯NAA⋯AKK⋯KEE⋯E then we delete the extra letters in the sequence to keep the number of each letter is equal M.

Hence, the level of venom L will be M and this algorithm will take O(n).

Case 2:

Every letter in the sequence is not same as the patten SS⋯SNN⋯NAA⋯AKK⋯KEE⋯E.

For example, let us say the sequence is

$$\underbrace{SS\cdots S}_{M}\underbrace{NN\cdots N}_{J1}\underbrace{AA\cdots A}_{J2}\underbrace{KK\cdots K}_{J3}\underbrace{NN\cdots N}_{J4}\underbrace{EE\cdots E}_{J5}$$

and the number of letter S is the smallest.

First, we delete each letter until the number of each letter is M. Notice, for the letters are not in correct position, we should delete them first. Then we have

$$\underbrace{SS\cdots S}_{M}\underbrace{NN\cdots N}_{I1}\underbrace{AA\cdots A}_{M}\underbrace{KK\cdots K}_{M}\underbrace{NN\cdots N}_{I2}\underbrace{EE\cdots E}_{M}\ where\ I_1 + I_2 = M\ .$$

Clearly, then venom level L can not be M, then we try if level L can be M/2 or not.

We do the same process above in case 2. If the level L can be M/2 then we try if level L can be 3M/4 until the level L = $\sum_{i=1}^{n}\frac{M}{2^i}$ < M can not be reached.

This will take O(nlogn).