

Question1:

Given: A combination String with S,N,A,K,E

Aim: Find the maximum level of the combination that consist with x letters of S,N,A,K,E

Solve:

\* Step 1:

Initialize 5 different integer variables into a set  $P = \{i_1, i_2, i_3, i_4, i_5\}$ , each of  $i$ 'th represents the occurrence of each letter "S,N,A,K,E" correspondingly.

\* Step 2:

Count through the string, find out the occurrence of each letters  
(This step will take  $O(n)$  time complexity)

\* Step 3:

Find the minimum number  $M$  among all the integers in set  $P$ . Creating a integer variable  $L$ , and  $L = M$ , the number  $L$  will be the level number where  $L$  must smaller than or equal to  $M$ .

\* Step 4:

Use the binary search method:

Step 4.1:

In the beginning of binary search. If the occurrence of each letter are equal and equal to  $L$  then  $L = M$ , so that the final answer is  $L$ .

Step 4.2:

If the occurrence of each letter are not equal, then try  $L = \left\lfloor \frac{M}{2} \right\rfloor$  and  $M$   
 $= \left\lfloor \frac{M}{2} \right\rfloor$ . Then Count the occurrence of each letters. If occurrences are equal to each other, then go to Step 4.2.1; If occurrences are equal to each other, then go to Step 4.2.2

Step 4.2.1:

If the occurrence of all letters are equal to each other and equal to  $L$ , Then try  $L = \left\lfloor M + \frac{M}{2} \right\rfloor$  and  $L \leq M$  and  $M = \left\lfloor \frac{M}{2} \right\rfloor$  and count the occurrence of each letters. Check if each letter's occurrences are equal to  $L$  and equal to each other. If so Go To Step 4.3.1. Else go to Step 4.3.2.

Step 4.2.2:

If the occurrence of all letters are not equal to each other and not equal to  $L$ , Then try Step 4.2 again, will keep divide it until  $L$  equal to 0 or find a cases the occurrences are equal to each other and equal to  $L$  and  $L < M$ .

Step 4.3.1

If the occurrence of all letters are equal to each other and equal to L, Then try  $L = \left\lfloor M + \frac{M}{2} \right\rfloor$  and  $L \leq M$  and  $M = \left\lfloor \frac{M}{2} \right\rfloor$  and count the occurrence of each letters.

If the occurrence of each letters are equals and occurrence of each letters are equal to L and  $L \leq M$ , then repeat Step 4.2.1.

Else, the final result of L is equal to the value of L in Step 4.2.1.

Step 4.3.2:

If the all letters are not equal to each other, then repeat the Step 4.2.2 until L equal to 0 or find a cases the occurrences are equal to each other and equal to L and  $L < M$ .

(These steps are using a recursion typed binary search, In the worst case it will count all letter occurrence in the String which will take  $O(n \cdot \log(n))$ )