

### 38. Count and Say

Recursive formulae :

base :  $\text{countAndSay}(1) = 1$

Example:

$$n = 4$$

$$\text{CAS}(1) = "1"$$

$$\text{CAS}(2) = \text{one } 1 = "11"$$

$$\text{CAS}(3) = \text{two } 1 = "21"$$

$$\text{CAS}(4) = \text{one } 2 \text{ one } 1 = "1211"$$

Analyse:

$\text{count}(n)$  is based on  $\text{count}(n-1)$ ,

$\therefore$  we need  $\text{count}(n-1)$  for this recursion

what should we do ?

Example :

$$n = 2$$

$$\text{CAS}(2) = ??$$

do

wait to find.

back

$\downarrow$   
 $CAS(1) = '1'$

with  $CAS(1) = '1'$

Now, we can start to construct our new string.

"1"  $\rightarrow$  one 1  $\rightarrow$  "1"

Okay.

Now, how to count the string?

Obviously, two-pointers would be fantastic

example string  $a = '333221'$   
 $\begin{matrix} i \\ 333221 \\ j \end{matrix}$

Algorithm:

(1) if  $a[i] == a[j]$ :

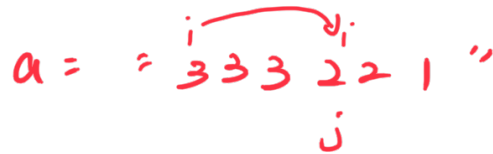
$i$  stay,  $j$  move

$a = '333221'$   
 $\begin{matrix} i \\ 333221 \\ j \end{matrix}$

else

adding the counted part to  
the res string, and move  
i and j to the same place

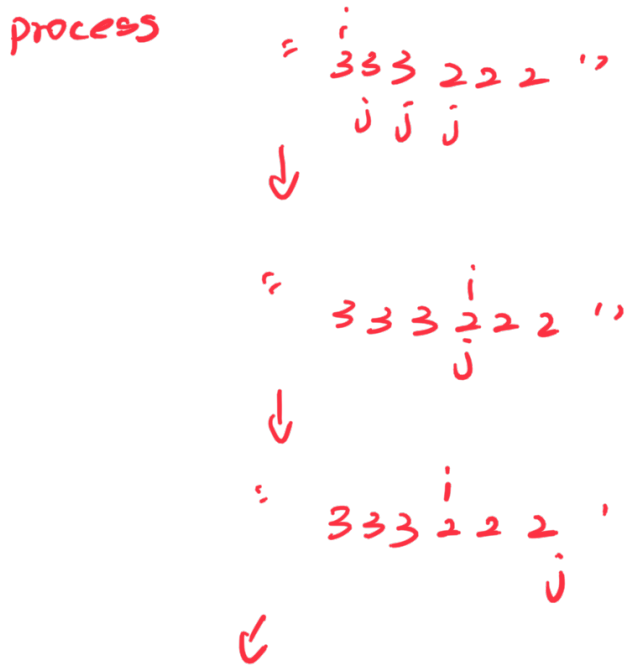
a = "333221"



special consideration:

if a = "333222"

process



i cannot reach end, but  
j seems to be okay for  
every situation.

Then, I guess we should loop j  
to the end rather than loop i

psendo code :

```
def CAS(n) :  
    if n == 1 :  
        return "1"  
  
    else :  
        a = CAS(n-1)  
  
        i = 0  
        j = 0  
        ans = ""  
  
        while j < len(a) :  
            if a[i] == a[j] :  
                # special situation when j is last  
                if "333222" :  
                    ans += str(j-i+1) + a[i]  
                if "3332221" :  
                    ans += "1" + a[i]  
                j++  
  
            else :  
                ans += str(j-i) + a[i]  
                i = j
```

Above code actually works for the  
Leetcode submission. However, it

Seems like there's a better way to  
do the two pointers.

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Better two-pointers:

while  $i < \text{len}$ :

while  $j < \text{len}$  and  $a[i] == a[j]$   
 $j++$

$\text{ans} += \text{str}(j-i) + s[i]$

$i = j - 1$

$i++$