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Programming Assignment DSA -1

1) a) Given

Sequence of n numbers
and each number is distinct (or) occurs in duplicate (at most 2 times.

Goal: No of permutation that are good (no duplicates occur together.

let $a_1, a_2, \ldots a_n$ be the sequence
let the number of repetitive pairs be denoted by "d".

=> if 1 2 2 3 is the sequence $d=1$

let n be the total no of elements
Hence, # of unique numbers = $\underline{\underline{n-d}}$
let us construct a table with rows i where
$0 \leq i \leq n$ and

columns j where $0 \leq j \leq d$

$c[i,0]$ => represents good permutations of length i

$c[i,j]$ => represents permutations of length i with error "j".

I am trying to populate 2x2 matrix using an Example

Sequence : 1 2 2 3

$n = 4$ and $d = 1$

$i \downarrow$ \ $j \rightarrow$	0	1	
0	0	0	
1	3	0	
2	6	1	$\rightarrow {}^{2}C_0 \cdot 1!$
3	8	4	$\rightarrow {}^{2}C_1 \cdot 2!$
4	6	6	$\rightarrow {}^{2}C_2 \cdot 3!$

$c[0, j] = 0$
since length $= 0$

This is the no of good permutations of length "n"
$c[n, 0]$

So from above

$c[i, 1]$ is filled using the formula

$$\left[{}^{n-d}C_{i-d-1} \cdot (i-1)! \right]$$

using the ${}^{n}C_{r}$ formula $=$ ${}^{n}C_{r+1} = \left(\frac{n-r}{r+1}\right) {}^{n}C_{r}$

Hence we can fill up the column using value in the row above instead of computing the value Every time

$$c[i+1, j] = \left(\frac{n-(i-d-2)}{(i-d-1)} \right) (i-1) \cdot c[i,j]$$

using this recursion formula, we calculate the values of that column.

We compute the value in c[i,0] by subsracting the total value for each row and c[i,1]

Total value of row i is : $^{n-d-1}C_{i-d-1} \; (i-1)!$