1) character Encoding -> Binomial th application (TEE) 2) Learn this thing -> direct Lucas th application with p=2 (as it decides odd/even) 3) count good Subsequences - when something (here median) is defined seperately (here even and add), then you need to solve problem for our possibilities and never use permutation/choice concept in subsequence. Always do by combination concept Jough Mex = we see Mex < N < 105, so herse generalised x = Mex (like Multiply all gcols).

we try to find too each x (mex) (1 < x < N)

how many subsequences/ subsets have that

Character Encoding

rom < https://www.learning.algozenith.com/problems/Character-Encoding-168>

Description

Find the number of solutions of following equation.

 $x_1 + x_2 + x_3 + ... + x_n = k$, satisfying that $0 \le x_i < m$, modulo 1000000007.

Input Format

The only line of input contains three space-separated integers n, m, k.

Output Format

Print the number of solutions.

Coeff of
$$x^k$$
 in $(x^0 + x^1 + \dots + x^{m-1})(x^1 + x^1 + \dots + x^{m-1})$
 $\cdots (x^0 + x^1 + \dots + x^{m-1})(x^1 + \dots + x^{m-1})$

$$\Rightarrow (\frac{1-x}{1-x})^n$$

Learn This Thing

Ask Doubt

From < https://www.learning.algozenith.com/problems/Learn-This-Thing-1892

Description

For a given **n**, find the number of even and odd numbers among the set, { ${}^{n}C_{0}$, ${}^{n}C_{1}$,...

Input Format

First-line contains T (1 \leq T \leq 10⁵), the number of test cases. Next T lines contain one integer per line, denoting $n (0 \le n \le 10^{12})$.

Output Format

For each test case, output two space-separated integers specifying the number of even numbers and odd numbers respectively.

Sof-Lucas theoroem

niphonsny -> Base P of n vivory buse p of r

for old and even P=2 decides

n→ Binary form→ 101

1-> Binary from->

Note 0:0=1 | 0:4=1 at position of 0, in 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | 1:0=1 | If at least one $\binom{n_1}{r_1}=0$ then it is $\binom{n_1}{r_1}=1$

both yield one

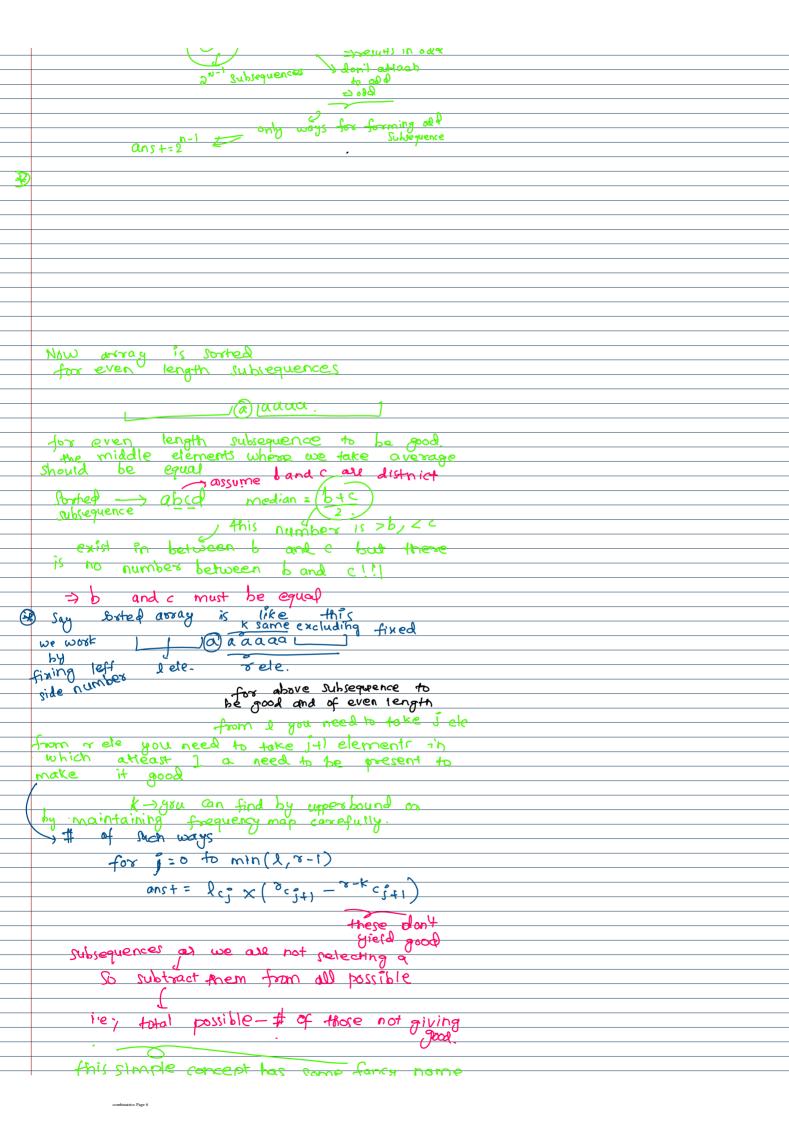
र्ने ६ ४ व	all	(NI.)=)		both	yield one	2
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shttps://www.learning.algozenith.com/problems/Count-Good-Subsequences-1

Subsequence good median of subsequence is element of The median of a set of data is the middlemost number in the set. The median is also the number that is halfway into the set. To find the median, the data should first be arranged in order from least to greatest.
 For odd length sequence, the median is the middle element in the sorted subsequence # good subsequences Constraims The first line of input contains T - the number of test cases. The first line of each test case contains a number N - the size of the array. The second line of each test case contains N space-separated integers A_1 , A_2 . > 050°Z (0/V3/V) 0(N2) sd: Brute Find all rubsequences [27] median for every sex and chock O(N) n) -> O(N) aplimise Object who requences of odd length are. U+U(U-1) (U-5) The middle two elements should be same Ly why? avg of two diff middle values cannot give a number in subsequences _ No that +++=>> Sorted order

(by def of median) if two no are different, then the resulting and is present in the middle of those two in sorted order, but no element is present in between —) If ele are liff — not good. Now let's find No. of such sequences 080 is only condition Ly sorted is only come subjequence for subjequence for subject to get satisfied 91 solution 1ength subsequence & old, then median definitely lies inside it > good No. of odd length Subsequences = 2"-! attach to form Jubi equences with element @ ven length ->eruts in odd & don't attach

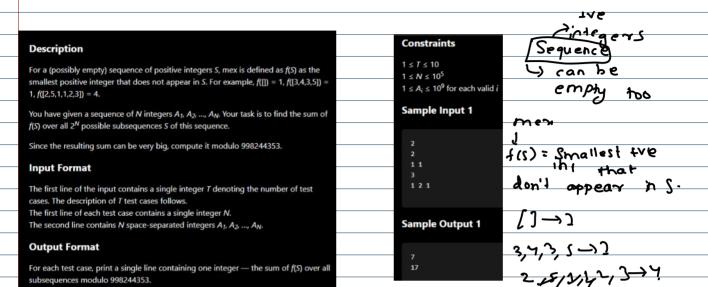
Supreduevcer

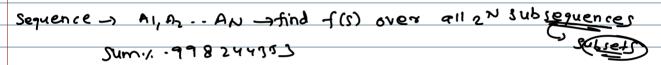


this simple concept has some forcy name inclusion - exclusion principle · Note: for subsequences questions never use permutation or choices concept Always use combination concept as subsequence means order is fixed! Tough Mex

Ask Doubt

rom < https://www.learning.algozenith.com/problems/Tough-Mex-186>







Mex + order don't motted

NZ105

Incrementation

Incrementation

Smallest int that can if we.

Smallest int mex

Smallest int that can if we.

Smallest int that can if we.

Smallest int mex

Smallest int that can if we.

1 2 3 mex=4

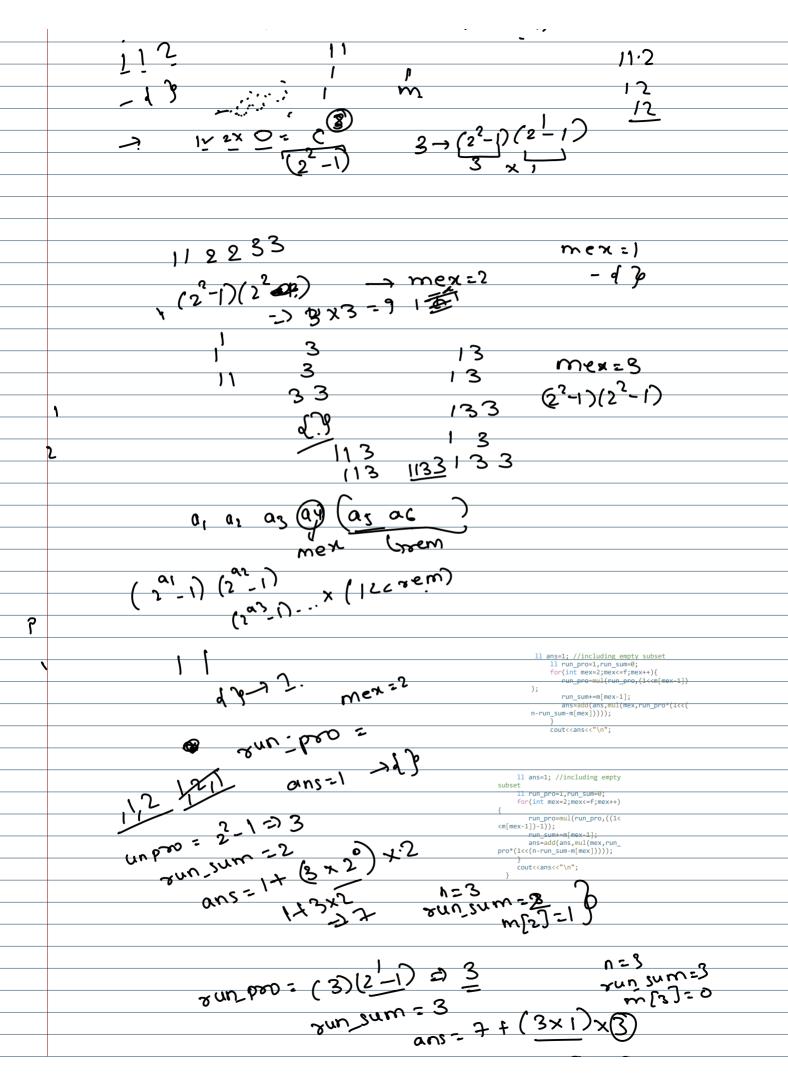
1 2 mex = 3 a[i]>N

12/0 - mex= 3 124 - mex=3

13/64 2

Tor (Mex =1; mex (=N+1; mex++)

11.2



zun sum = 7 + (3×1)×3 \ ~ Solution: Souting causes no problem as in calculation of mex order don't matter Why sort? Mex > lowest possible non present integers if we find up no where series is with lowest integers (1,2/3---) and where is breaking it will be used continous Series 1,2,3...f-1, x₁,x₂,x₃-... x₁ + f in sorted excep then for all Subsequences formed by x1223--we found mex for 2,72,73--. and we know mexif

Now we will find each mex (1; mexit) has how many

Subsequences. for that we maintain frequency map J-> 11 2 - fo $3 \longrightarrow \sqrt{3}$ No. of subsequences with mex = 1 =) Consider all subsequences that don't have] No. of Jubsequences with mex=2 () I should be there, 2 should n't be there from 3 it is optional similary for mex=3 f_{1} f_{2} f_{1} f_{2} f_{3} f_{4} f_{5} f_{5 on till mexit

	(2 -1)(2	-11 12 mex=f	
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