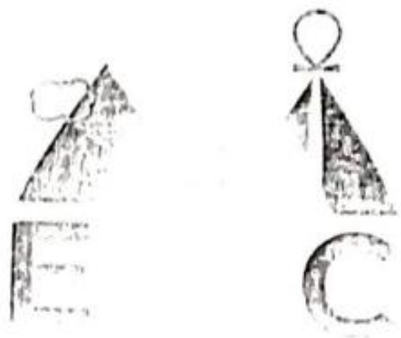


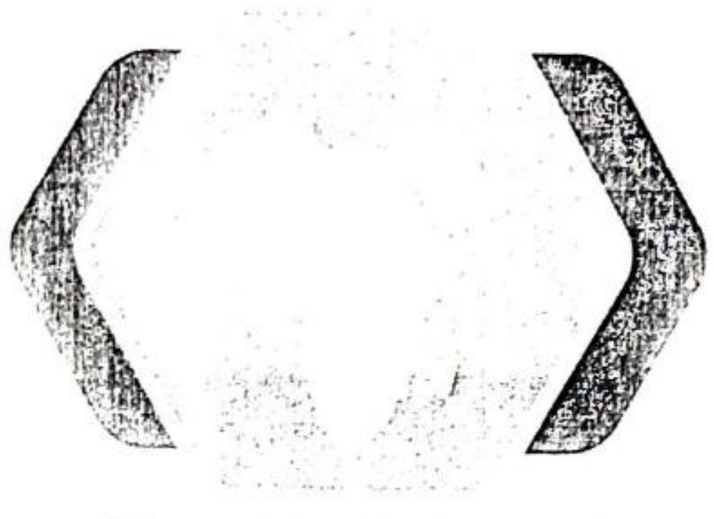
International Collegiate Programming Contest

ECPC 2019 Qualifications Round

Arab Academy for Science and Technology and Maritime Transportation

October 24th 2019

The International Collegiate Programming Contest
Sponsored by ICPC Foundation



ECPC 2019 Qualifications Round

(Contest Problems)

Arab Academy for Science and Technology and Maritime Transportation

Alexandria

October 2019

Problem A. Even Segments

Input file: `segments.in`
Output file: `standard output`
Balloon Color: `Red`

Magdy loves even numbers more than odd numbers.
One day, Magdy found an array $A_1, A_2, \cdots, A_N$ of length N.

Magdy decided to divide the array into an even number of contiguous non-empty subsegments so that each of these subsegments begins and ends with an even number.

For Example, If the array is $[2, 3, 4, 5, 6, 4, 1, 2, 8, 9, 10]$, He should divide it to $[2, 3, 4, 5, 6]$, $[4, 1, 2, 8, 9, 10]$ or to $[2, 3, 4, 5, 6, 4, 1, 2]$, $[8, 9, 10]$.

Now Magdy is trying to divide the array he found. You have to tell him if he can divide it or not.

Input

First line of input contains a single integer T. the number of test cases.

Following T tests. The first line of each test contains a non-negative integer N ($1 \leq N \leq 10^5$). the length of the array.

The second line contains N space-separated integers $A_1, A_2, \cdots, A_N$ ($-10^9 \leq A_i \leq 10^9$), the numbers of the array.

Output

Print T lines. Each line contains a single word "YES" if the array can be divided or "NO" if the array cannot be divided.

Example

segments.in	standard output
4 4 1 3 2 5 6 2 6 4 8 0 12 6 0 0 0 0 0 0 6 1 1 1 1 1 1	NO YES YES NO

Problem B. Penalty Kicks

Input file:	`kicks.in`
Output file:	`standard output`
Balloon Color:	`White`

Some football match ended in a draw, so each team plays N penalties to determine a winner.

The early ending rule is when a team is a winner anyway even if it lost all the remaining penalty kicks. For example, when five kicks are given to each team, the final result can be $4-4, 4-5$ or $5-4$ but never $5-0$. The first three results are Possible whereas the last result is Impossible because of the early ending rule mentioned above.
Note that we don't care if the penalty kicks ended with a tie.

A final result of the kicks is **Possible** if there is at least one scenario leads to this result without violating the early ending rule, otherwise, it is **Impossible**.

Given the number of penalties and the final score, determine whether the result of this final kick is **Possible** or **Impossible**.

Input

First line of the input contains a single integer T, the number of test cases.

Each test case will consist of two lines. The first line will contain a single integer N ($1 \leq N \leq 10^3$).

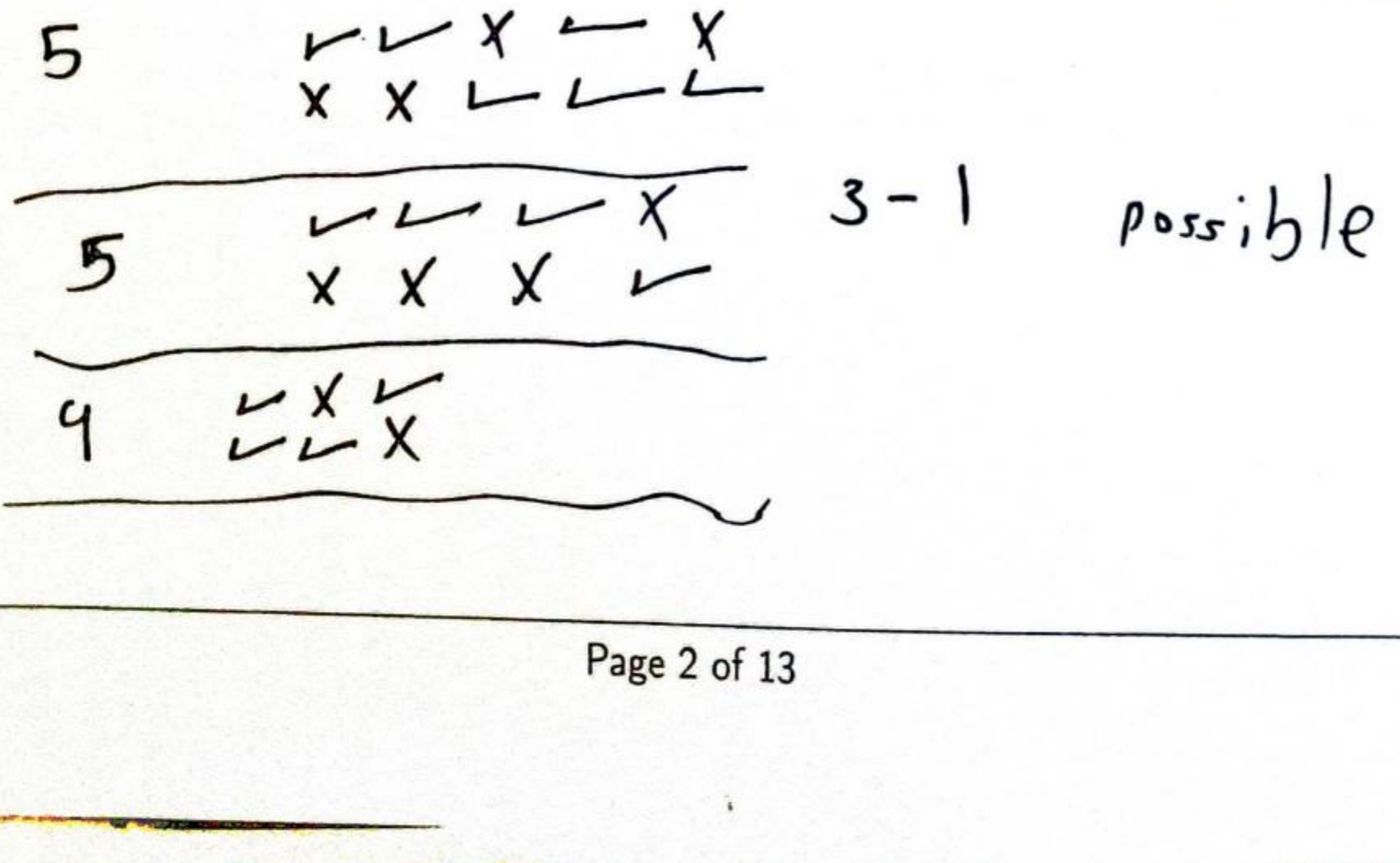
The second line will contain two space-separated integers X and Y ($0 \leq X, Y \leq 10^3$), the final result of the penalty kicks.

Output

Print T lines each contains single word "Possible" or "Impossible".

Example

kicks.in	standard output
3 5 4 4 5 5 4 5 5 0	Possible Possible Impossible



Problem C. Sherlock and Password

Input file:	`sherlock.in`
Output file:	`standard output`
Balloon Color:	`Gold`

Sherlock is trying to guess the password of Moriarty's mobile phone.
Moriarty's password consists of N characters. Each character can either be a lowercase English letter, an uppercase English letter, or a digit.

Moriarty likes to play with Sherlock so, his password contains exactly M substrings of Sherlock's signature SH.

Sherlock already knew the previous facts about Moriarty's password. He just wants your help to count how many possible passwords are satisfying these facts to show Moriarty how genius is he when he unlocks the phone using just three trials.

As the answer could be very large, print it **modulo** $10^9 + 7$

Input

First line of input contains a single integer T. The number of test cases.

Each test consists of one line that contains two space-separated integers N and M $(1 \leq N \leq 10^4)$, $(0 \leq M \leq \min\left(100, \left\lfloor \frac{n}{2} \right\rfloor\right))$.

Output

Print T lines each contains a single integer, the number of possible passwords **modulo** $10^9 + 7$.

Example

sherlock.in	standard output
7 1 0 5 1 10000 100 10000 0 10000 1 200 100 3 1	62 952940 131867479 716746027 165711702 1 124

Note

In the first example, $N = 1$ and $M = 0$. That is, The password consists only of 1 character that can be a lowercase/uppercase English letter or a digit. Thus the answer is $26 + 26 + 10 = 62$.

Problem D. Make It Palindrome

Input file:	`palindrome.in`
Output file:	`standard output`
Balloon Color:	`Blue`

Luffy wants to be the pirate's king and find one piece.

To find one piece, he has to open the secret gate. The password of the secret gate is any palindrome string. Luffy found an initial string of lower-case English letters on the gate.
In one operation, Luffy can change one character of the string to the next or the previous character in the alphabet.
For Example, string "abcz" can be "accz", "abbz", "zbcz" or "abca" in one operation.

Luffy wants to make the string palindrome in the minimum number of operations. Could you help him?

Input

First line of input is single integer T the number of test cases.

Each of the following T lines contains a string S of lower-case English letters.

The sum of lengths of all strings in the input will not exceed 10^6 and all characters in the string are lower-case English letters.

Output

Print T line each contains a single integer, the minimum number of operations needed to make the initial string palindrome.

Example

palindrome.in	standard output
4 luffy pirate king anna	24 31 9 0

Note

The next character of z is a and the previous character of a is z as illustrated in the example.

Problem E. Azooz

Input file:	azooz.in
Output file:	standard output
Balloon Color:	Orange

There are 2 members of AOU programming team called AbdulAziz (aka Azooz). To distinguish between them, Mr Aly, their coach, called the first one Azooz.jo (since he is Jordanian) and the second one Azooz.sy (since he is Syrian).

After the last session, the following discussion happened between them:

Azooz.jo: Do you know the Fibonacci sequence?

Azooz.sy: Of course, it is a sequence started by 2 ones and each number after that is computed by summing the previous 2 numbers (i.e. 1, 1, 2, 3, 5, 8, 13, ...). In addition, each number has an index where the first number in the sequence has index 1.

Azooz.jo: Do you know the first 3 prime numbers?

Azooz.sy: Sure, they are 2, 3 and 5.

Azooz.jo: If I give you 2 indexes (say A and B) for 2 numbers in the Fibonacci sequence and give you one of the first 3 prime numbers (say P), can you count how many numbers in the Fibonacci sequence between the indexes A and B (inclusive) is divisible by P?

Azooz.sy: Could you give me an example!

Azooz.jo: if $A = 4, B = 7$ and $P = 2$; we will have the following Fibonacci numbers 3, 5, 8, 13 (3 at index 4 (A), and 13 at index 7 (B)). There is only 1 number (which is 8) that is divisible by 2 (P).

Giving A, B and P, could you help Azooz.sy answer the question of Azooz.jo.

Input

The first line of the input contains an integer T, the number of test cases.

Each case is specified on a single line which includes three integers A, B and P ($1 \leq A, B \leq 10^7$), $P \in \{2, 3, 5\}$

Output

Print T lines each contains a single integer, the answer of Azooz.jo's question.

Example

azooz.in	standard output
1 4 7 2	1

Problem F. Black Friday

Input file:	`care.in`
Output file:	`standard output`
Balloon Color:	`Yellow`

Black Friday is the last Friday of November. Many stores offer highly promoted sales on Black Friday and open very early, such as at midnight.

One of the best offers on Black Friday is the **Buy N Get M Free** offer. In this offer, for each $N + M$ items you buy you only pay for the N higher price and get the other M for free.

For example, consider the case of **Buy 2 Get 1 Free** and suppose you bought 7 items with prices: $[10, 6, 8, 2, 1, 12, 5]$. The minimum price is 34 when you pay for $[12, 10, 6, 5, 1]$ and get $[8, 2]$ for free.

You should find the price you will pay if you bought K items.

Input

First line of input contains a single integer T, the number of test cases.

First Line of each test contains three integers separated by spaces N, M and K $(1 \leq N, M \leq 1000)$. $(1 \leq K \leq 10^5)$.

Next line contains K integers separated by spaces $(1 \leq P_i \leq 10^4)$. The prices of the items you want to buy.

Output

Print T lines each contains a single integer, the minimum price to buy all items.

Example

care.in	standard output
3 2 1 7 10 6 8 2 1 12 5 1 1 3 12 4 9 1 1 4 6 8 10 2	34 16 16

Problem G. Dr. Evil's city

Input file:	`cities.in`
Output file:	`standard output`
Balloon Color:	`Cyan`

Dr Evil lives in a country that consists of N cities numbered from 1 to n and M bidirectional roads between the cities. Each road has an integer associated value V.

He wants to destroy some cities and some roads in his country (He can also leave everything as it is) but the resulting country must have 3 conditions:

- The remaining cities must be connected.
- There must remain at least K cities.
- the bitwise AND (&) between the remaining edges is maximum possible.

Could you help Dr Evil in his **EVIL** plan and tell him the maximum value he can obtain by destroying some cities and roads.

Input

First line of the input contains a single integer T. the number of test cases.

First line of each test contains three integers N, M and K $(2 \leq N \leq 2 * 10^5)$, $(N - 1 \leq M \leq 2 * 10^5)$, $(2 \leq K \leq N)$.

Then M lines follow describing the roads in the city in the form $X_i\ Y_i\ V_i$ $(1 \leq X_i, Y_i \leq N)$, $(0 \leq V_i < 2^{30})$, $(X_i \neq Y_i)$. This means there is a road between cities X_i and Y_i with value V_i

No road will appear in the input twice.

It's guaranteed that the initial country is connected.

Output

Print T lines each contains a single integer, the maximum value Dr Evil can obtain.

Example

cities.in	standard output
5 4 3 4 1 2 1 1 3 4 2 4 5 6 6 3 1 2 7 2 3 3 3 1 11 3 4 5 4 5 0 4 6 12 6 7 5 1 2 10 2 3 100 3 4 10 4 5 100 5 6 1 6 3 0 1 3 99 2 1 2 2 1 503341119 3 2 3 1 2 503341120 2 3 503341119	0 4 0 503341119 503341056

Problem H. Dr. Evil's school

Input file:	`squares.in`
Output file:	`standard output`
Balloon Color:	`Black`

Dr Evil is the new teacher in the evil school. His class now is learning geometry. Dr Evil gave them 4 sticks with lengths A, B, C, D and asked them to construct a square from them.

Some students told Dr Evil that it's impossible to do so and as Dr Evil is **EVIL** it may be the case. Given the lengths A, B, C, D can you find out if they can construct the square?

Input

First line of the input contains a single integer T, the number of test cases.

Then T lines follow each contain four integers separated by spacs A, B, C and D ($1 \leq A, B, C, D \leq 100$)

Output

Print T lines each contains a single word, "YES" if they can make a square using the sticks or "NO" if impossible to do so.

Example

squares.in	standard output
3 1 2 3 4 1 1 1 2 3 3 3 3	NO NO YES

Problem I. Dr. Evil's array

Input file:	`unsorted.in`
Output file:	`standard output`
Balloon Color:	`LightGreen`

Anany was preparing test cases for a problem in a contest.
The input of the problem is an array of length N. He noticed that some wrong solutions pass if the given array is sorted either in non-decreasing or non-increasing order.

He wants to change the order of the elements of the array (or leave it if it's already not sorted) to make it not sorted.

Could you help Anany finding an order of the array to make it not sorted, or determine that it is impossible to make it not sorted?

Input

First line of input contains a single integer T, the number of test cases.

The first line of each test contains N the number of elements in the array. ($1 \leq N \leq 10^5$)

Then a line containing N integers $A_1, A_2, \cdots, A_N$ ($1 \leq A_i \leq 10^5$) which are the elements of the array.

Output

For each test, print "NO" if it's impossible to do so.

Print "YES" if you can make the array not sorted and then print N integers which are the array after changing (or leaving) its order. If there are multiple answers you are allowed to print any of them.

Example

unsorted.in	standard output
3 4 1 2 3 4 2 1 2 3 1 2 2	YES 2 1 3 4 NO YES 2 1 2

Problem J. The social network

Input file:	`social.in`
Output file:	`standard output`
Balloon Color:	`Purple`

Your friend has implemented a simple social network that consists only of N users and friendship relations between them.
The relations between users in the network can be represented as a tree where nodes represent the users and edges represent the relations.

Each user has a name (consisting only of lowercase English characters) and ID between 1 and N. IDs are unique but names may be duplicated. The service also allows users to update their names by adding one or more characters to the old name.

Now your friend wants to add a search engine that helps users to search for other users. The engine should be able to satisfy the following functionality: if user U wrote the query string S in the search box, the engine should return the ID of the closest user (according to the tree topology) that has S as a prefix of his name, where the distance between two nodes is measured by the number of edges between them.

Your friend implemented the engine but he found out that his implementation is not efficient at all, So he offered you a lot of money to implement an efficient search engine that can handle any queries.

Input

The first line of the input contains a single integer T the number of test cases.

Each test case starts with 2 integers ($1 \leq N, Q \leq 50000$) where N is the number of users and Q is the number of queries.

The next N lines represent the names of users in the network where the i_{th} line of them contains the name of the user with ID i. The sum of lengths of all names will not exceed 50000.

After that, there are $N-1$ lines representing the edges in the tree, each line contains 2 integers U and V which means that there is an edge between the user with ID U and user with ID V.

The last Q lines of each case represent the queries which are either a word submitted to the search engine by some user or a user updating his name.

Each query consists of 2 integers ($1 \leq type \leq 2$), ($1 \leq U \leq N$) and string S, the type of the query, the ID of the user and the used string respectively.

If *type* is 1 you need to update the name of user U by adding S to the end of his name.

Otherwise, you need to answer the query word S submitted by user U. The sum of lengths of all query strings will not exceed 10^5.

Output

For each test case output the answer of each query of type 2 in a new line.
Each line contains the ID of the closest user or -1 if no user name starts with the given query string.
If there are multiple possible users on the same shortest distance output the minimum valid ID.

Example

social.in	standard output
1 4 5 axc ab abcx b 1 2 1 3 2 4 2 4 abcd 2 4 abc 2 4 b 1 2 cd 2 4 abcd	-1 3 4 2

Problem K. MEX summation

Input file:	`mex.in`
Output file:	`standard output`
Balloon Color:	Pink

Badry read about the MEX value of an array. He found out that MEX is the minimum non-negative value that doesn't exist in the array.

Badry wanted to calculate MEX value of all sub-arrays of a permutation P of length N to test his skills in calculating the MEX.
You should help Badry by calculating the sum of all MEX values of all possible sub-arrays of P.

Input

The first line of the input contains a single integer T, the number of test cases.

The first line of each test case consists of a single integer N representing the length of the premutation, $(1 \leq N \leq 10^5)$.

The following line will contain N space seperated distinct Integers P_i representing permutation, $(0 \leq P_i \leq N-1)$.

Output

Print T lines each contains a single integer, the answer to the problem.

Example

mex.in	standard output
2 4 2 1 0 3 7 4 5 6 3 0 1 2	13 37

Note

Permutation P of length N is an arrangement of all number from 0 to $N-1$