The International Collegiate Programming Contest
Sponsored by ICPC Foundation

The 2020 Lebanese Collegiate Programming Contest

(Contest Problems)

Lebanon
February 2021

Problem A. Good Grid

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

You are given a grid of N rows and M columns, where each cell is either a 0 or 1. A grid is considered *good* if: for each row, the number of zeros in this row is equal to the number of ones.

If you are allowed to do **at most** one operation in each row, can you make the given grid *good*?

The operation you are allowed to do in each row is: to flip exactly one number from that row.

Flipping the value of x means applying the operation $x = 1 - x$.

Input

The first line of the input contains two integers N and M ($1 \leq N, M \leq 50$) - the number of rows and columns, respectively.

The following N lines contain M integers $a_{i,j}$, which is the number written in the j^{th} cell of the i^{th} row ($0 \leq a_{i,j} \leq 1$).

Output

Print "YES"(without the quotes) if you can make the given grid *good*. Otherwise, print "NO"(without the quotes).

Examples

grid.in	standard output
2 2 1 1 0 0	YES
3 4 1 0 1 1 0 1 1 1 0 0 0 0	NO

Problem B. Game

Input file:	`game.in`
Output file:	`standard output`
Balloon Color:	`Brown`

Mike and Jack are close friends and they like playing games together. One day, they came up with a new game.

The rules of the game are as follows:

- They will make a list of N numbers to play with.
- Mike plays first and the two players make moves in alternating turns.
- In a single move, a player chooses the maximum number in the list and removes it as well as all the other elements to its right. If there are multiple elements with the maximum value, the player chooses the leftmost element.
- The first player who is unable to make a move, loses the game.

You will be given a list of N numbers. Can you tell who will win this round according to the rules?

Input

The first line contains a single integer T the number of test cases ($1 \leq T \leq 10$).

The first line of each test case contains one integer N ($1 \leq N \leq 100$) - denoting the number of elements in the list.

The second line of each test case contains N numbers a_1,a_2,..,a_N. ($1 \leq a_i \leq 10^5$).

Output

For each test case, print the name of the winner either "Mike" or "Jack" (both without quotations).

Example

game.in	standard output
2 4 4 1 2 4 5 4 2 5 3 6	Mike Mike

Problem C. Lucky numbers

Input file:	`lucky.in`
Output file:	`standard output`
Balloon Color:	`Orange`

Mark love playing with numbers, a number is said to be X-lucky if you can rearrange its digit in a way such that the maximum difference between any two consecutive digits is not greater than X.

Now Greg decided to test Mark, he will ask him Q questions, in each question he will give him three integers L,R and X,($1 <= L <= R <= 10^6, 0 <= X <= 10^3$). and Mark should tell Greg how many X-lucky numbers that are not smaller than L and not bigger than R.

But Mark is having a hard time answering Greg's questions, can you help him?

If the number consists of a single digit then it can be considered as 0-lucky number.

Input

The first line contains a single integer Q ($1 <= Q <= 10^5$). the number of questions.

Then Q lines follow, each line contains 3 integers L,R and X,($1 <= L <= R <= 10^6, 0 <= X <= 10^3$).

Output

Print Q lines, each line containing the answer to this problem.

Example

lucky.in	standard output
3 4 9 5 10 15 1 10 15 3	6 3 5

Problem D. Digits

Input file:	digits.in
Output file:	standard output
Balloon Color:	Yellow

You are given a digits string S, every character in S is a digit from 0 to 9.

You are asked to remove all duplicate digits in the string S, but you can't remove all the occurrences of a digit, in another way(every digit that appeared more than once in the string S, must appear exactly once at the end).

out of all possible strings you can obtain after applying the above rule, you are asked to print the lexicographical minimum string.

String p is lexicographically smaller than string q, if p is a prefix of q, is not equal to q or there exists i, such that $p_i < q_i$ and for all $j < i$ it is satisfied that $p_j = q_j$. For example, abc is lexicographically smaller than abcd , abd is lexicographically smaller than abec, afa is not lexicographically smaller than ab and a is not lexicographically smaller than a.

Input

The First line contains a digit string S consists of digits, ($1 <= |S| <= 10^5$).

Output

Output a single line containing the answer to this problem.

Examples

digits.in	standard output
042241	0241
85018	5018

Problem E. Diffonacci

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

Fibonacci numbers form the well-known Fibonacci sequence $F_0, F_1, F_2, \ldots$ where $F_0 = 0$ and $F_1 = 1$. And for $n > 1$, $F_n = F_{n-1} + F_{n-2}$.

Recall that a subsequence is a sequence that can be derived from the given sequence by deleting zero or more elements without changing the order of the remaining elements.

Now let us define "Diffonacci subsequence" as a subsequence where the difference between any two consecutive elements in the subsequence is any Fibonacci number $0, 1, 2, 3, 5, 8, \ldots$

Given an array a of size n, find the longest Diffonacci subsequence.

Input

The first line of the input contains an integer T ($1 \leq T \leq 10^5$) — the number of test cases. Then T test cases follows.

The first line of each test case contains an integer n ($1 \leq n \leq 10^5$) — The size of the array. The second line of the test case contains n space-separated integers, where the i^{th} integer is $a[i]$ ($1 \leq a[i] \leq 10^9$).

It is guaranteed that the summation of n over all test cases will not exceed 10^5.

Output

For each test case given in the input, print the longest Diffonacci subsequence that can be derived from the given array a.

Example

diff.in	standard output
2 5 9 3 17 12 12 4 7 23 14 15	4 2

Problem F. Good String

Input file:	`good.in`
Output file:	`standard output`
Balloon Color:	`Green`

A string is called $k-good$ if there exists some character that appears at least k consecutive times in that string.

Your task is to find if a given string S is a $k-good$ string or not and if it is find the first character that satisfies the condition.

Input

The input consists of one line. You will be given string S consisting only of lowercase English letters ($1 \leq |S| \leq 10^3$) and an integer K ($1 \leq K \leq 10^3$) separated by a space.

Output

If the string is a $k-good$ string print `"YES"` (without the quotes and case insensitive) and the first character that satisfies the condition separated by a space.

If not, print `"NO"` (without the quotes and case insensitive).

Examples

good.in	standard output
abcaa 5	NO
helloo 2	YES l
eefaa 2	YES e

Problem G. Stock Market

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

Mark has decided to invest some money in the stock market, he bought one stock, the stock's price was X dollars and he waited so he can sell this stock at a higher price than the price he bought it in.

One day the price of this stock became Y dollars and Mark decided to sell it in this day.

Can you tell him how much profit he made from this investment?.

Input

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

Each test case consists of one line that contains two integers X and Y ($1 \leq X < Y \leq 100$), the price the stock was bought in and the price the stock was sold in.

Output

For each test case print in a single line one integer, the profit earned from this stock

Example

stock.in	standard output
4 4 10 1 100 2 86 18 50	6 99 84 32

Problem H. Gifts

Input file:	`fair.in`
Output file:	`standard output`
Balloon Color:	`Rose`

Jack and Greg are brothers, Their father Mark gave each of them N presents.

The price of the gifts Jack received are given to you as a_1,a_2,...,a_n and The price of the gifts Greg received are given to you as b_1,b_2,...,b_n.

Now Mark wants to know if he is a fair father or not, he will be fair if the sum of prices of gifts of both his children is the same.

Can you help Mark and tell him if he is a fair father or not?.

Input

The first line contains an integer N ($1 \leq N \leq 100$) the number of gifts each one got.

Next line contains N integers separated by a single space a_1,a_2,...,a_n ($1 \leq a_i \leq 100$). a_i represent the price of the $i-$th gift Jack received.

Next line contains N integers separated by a single space b_1,b_2,...,b_n ($1 \leq b_i \leq 100$). b_i represent the price of the $i-$th gift Greg received.

Output

print "fair"if the sum of prices of the gifts that Jack and Greg received is equal, and "not fair"otherwise.

Examples

fair.in	standard output
4 1 10 5 6 1 2 3 5	not fair
2 4 2 3 3	fair

Problem I. Minimum X

Input file:	`min.in`
Output file:	`standard output`
Balloon Color:	`Violet`

One day Phoenix was with his friend Brim playing a game, the game is simple, talking turns they challenge each other with problems to solve, now the turn is on Phoenix he has a math problem that he thinks he is the only one who can solve it, so he gave it to Brim.

The problem was simple, Given integer A, find the minimum integer X that satisfy the following conditions:

1) $X < A$.

2) $X \mid A$ has the maximum number of ones in its binary representation (where $\mid$ is the bitwise or operator).

Brim find this challenge so hard for him but phoenix will make fun of him if he didn't solve it so he asked for your help, can you help him?

Input

You will be given in the first line an integer T ($1 \leq T \leq 1024$) the number of test cases.

Each test contains one integer A the number given by Phoenix ($1 \leq A \leq 10^9$).

Output

Print in each test case one Integer X the answer to the problem.

Example

min.in	standard output
2 4 8	3 7

Problem J. Magic Gates

Input file:	gates.in
Output file:	standard output
Balloon Color:	White

Khaled is interested in logic circuits and he thought that any logic circuit could be represented as a tree where all its leaves are $(0, 1)$ switches and its logic gates are some nodes in the tree while the gate that releases the final output is the root of the tree.

Each switch has a probability p_i to be 1.

The nodes of the tree have 3 types:

1. AND gate.
2. OR gate.
3. Switch, it is guaranteed that all leaves in the tree are switches and all switches are leaves.

Lets define a function $F(u)$ such that u is any node in the tree (*i.e.* gate or switch). $F(u)$ holds the probability of node u to be 1 if we want to test the final output at u (the final output is released from node u).

It is required to compute $F(u)$ for all nodes.

Input

You will be given a set of test cases T.

For each test case:

The first line contains n $(1 \leq n \leq 10^5)$ number of nodes in the tree.

The next $n - 1$ lines contain the undirected edges of the tree each has u, v $(1 \leq u, v \leq n)$ and $(u \neq v)$.

The next n lines contain the nodes types, each line i has t_i the type of node i, if $t_i = 3$, it will be followed by p_i $(0 < p_i < 10^6)$ − the probability of the i-th switch to be 1.

All the given p_i are divided by 10^6

Output

For each test case, Output n lines each contain a single number $F(u_i)$ as $P * Q^{-1}$ modulo $10^9 + 7$.

Example

gates.in	standard output
1 5 1 2 1 3 3 4 3 5 2 3 500000 1 3 200000 3 800000	60000001 500000004 560000004 400000003 600000005

Note

It's guaranteed that total n won't exceed 10^6.

Problem K. Dice Game

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

Kemo who is a great player in rolling the dice has invented a new game. The game goes as follows:

- It consists of n players ordered from 1 to n, and a **fair dice** of r faces.
- P_1 plays at first. Each player P_i in his turn guesses a face then he rolls the dice. If his guess was right the game ends and he wins. If it was wrong, then the next player $P_i + 1$ has the turn to guess and roll the dice and so on till we reach P_n the next player will be P_1.

This Process proceeds till one of the players has a right guessing then the game ends with his victory. If each player played m times (i.e. m rounds took place in the game), then the game ended with a tie.

Sayed is going to participate in this game in the K^{th} position of the n players and he is wondering about the probability of his victory modulo $10^9 + 7$.

Input

You will be given a set of test cases $T(1 \leq T \leq 10^4)$. Each line have n, k, r, m $(1 \leq n, r, m \leq 10^9)$, $(1 \leq k \leq n)$ – where n number of players, k sayed position, r number of sides in the dice, m number of rounds

Output

Output for every test case one integer, the probability of victory as $P * Q^{-1}$ modulo $10^9 + 7$.

Example

dice.in	standard output
2 1 1 100 1 5 3 1 1	570000004 0

Problem L. Mahmoud and Unique list

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

During a normal day in **Mahmoud**'s life as an engineer during his work in FECU (**F**antastic **E**ntertainment **C**orporation for **U**ndergrads), Mahmoud's project supervisor noticed that he is free and has really nothing to do which is opposing their lore of always keeping the engineers busy by whatever, so he decided to give him some long interesting task to keep him busy for some long time.

The supervisor was to give Mahmoud a long **Fantastic list** of n customers full names each of those names consists of an arbitrary number of words, and he asked him to rewrite this list with the **minimum** number of words.

The supervisor allowed him to skip any number of words from the back of any name in the list such that the resulted list should be a **Fantastic list**. From Mahmoud's supervisor perspective, names can be in the **Fantastic list**, if no one of them is a prefix of the other.

As Mahmoud has to immediately attend a meeting, he asked for your help with this task.

Input

The first line contain an integer n ($1 \leq n \leq 10^5$) − the number of names in the list.

Then n lines follows each represents a customer name in the list each line contains one or more words separated by a white space.

It's guaranteed that the given list doesn't have any name as a prefix of other one and all letters are uppercase or lowercase.

Output

Print n lines each with the minimum words that identify the student.

Example

list.in	standard output
2 Hamoda Pasta Hamoda Hamoda Hamoda	Hamoda Pasta Hamoda Hamoda

Note

it's guaranteed that the total number of characters doesn't exceed $2 * 10^6$

Problem M. Instaduck

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

Hemdan and Sayed are Software Engineers at Instaduck who have access to all Instaduck machines, they love to share memes with each other while they are working from the office.

Instaduck's office has N machines that are connected with M **directed** connections Formally, a connection (u, v) $(1 \leq u, v \leq N)$ $(u \neq v)$ means that you can send memes from machine u to machine v and not vice versa.

Each connection (u, v) has a laugh score of sending a meme from machine u to machine v equal to c which may be a **negative value** if the meme is that bad.

Hemdan is angry with Sayed as Sayed didn't react love to his last message in the Zagel messaging app, so Hemdan decided to punish him.

Hemdan will choose a machine X and ask **Sayed** to connect to a machine Y to receive a meme sent by Hemdan from machine X to machine Y. Hemdan gets to choose the two machines (X and Y) such that the **laugh score will be as minimum as possible** (he wants to make Sayed miserable) The path the meme takes between machines X and Y is allowed to visit the same machine any number of times.

Hemdan is so busy finishing his tasks, so he asked you to find **the lowest possible laugh score** by choosing machines X and Y as explained above

Formally, let $F(u, v)$ be the lowest laugh score between any two machines u and v, find the minimum $F(u, v)$ for **all pairs (u, v)** $(1 \leq u, v \leq N)$ $(u \neq v)$.

Input

The first line of input contains a single integer T $(1 \leq T \leq 100)$, the number of test cases.

The first line of each test case contains two integers N and M $(2 \leq N \leq 2000)$ $(1 \leq M \leq 5000)$, where N is the number of machines in Instaduck's office, and M is the number of connections.

Each of the following M lines contains three integers u, v, and c $(1 \leq u, v \leq N)$ $(u \neq v)$ $(-10^6 \leq c \leq 10^6)$, representing that there is a directed connection from machine u to machine v with a laugh score of sending memes equal to c.

Note: there may be multiple connections between the same pair of machines in the same direction.

Output

For each test case, print the minimum laugh score in the graph, or the string `broken heart` if the minimum laugh score is negative infinity (he wants to make Sayed miserable, but not kill him).

Example

insta.in	standard output
2 3 3 1 2 -1 2 3 -3 3 1 -5 4 5 1 3 0 1 2 -2 2 3 3 3 4 1 4 1 -1	broken heart -3