Problem A. SUN YAT-SEN University

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

SUN YAT-SEN University is a world-class university. All college students at SYSU love their university, especially ITcarrot.

He wrote down a string only containing lowercase English letters.

A string T is called **good** if and only if the string `sysu` is a subsequence of the string T.

He wants to find out the number of **good** substrings of the string he had written down.

Noted that:

- a subsequence of a string S can be obtained by deleting some(including 0) characters from S without changing the order of the remaining characters.
- a substring of a string S is some contiguous characters in S. **Two substrings are different if and only if their positions are different.**

Input

One line, a string $S (4 \leq |S| \leq 10^6)$ only contains lowercase English letters, denoting the string that ITcarrot wrote down.

Output

A single integer, denoting the number of **good** substrings.

Examples

standard input	standard output
`sunyatsenuniversity`	`10`
`syysuu`	`2`

Problem B. Lowest Common Ancestor

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	512 megabytes

Malzahar loves the trees. One day, He found a tree with n vertices rooted in 1 in SYSU.

He wants to know the expectations of the depth of the LCA if he chooses k different vertices randomly for all k in $\{1, 2, \cdots, n\}$.

Noted that:

- A tree is an undirected connected graph with n vertices and $n-1$ edges.
- The depth of a vertex x is defined as the number of vertices in the shortest path from x to 1.
- A vertex y is x's ancestor if and only if y is in the shortest path from x to 1.
- The lowest common ancestor(LCA) of some vertices $x_1, x_2, \cdots, x_k (k \geq 1)$ is a vertex z such that the depth of z is largest and z is all the ancestors of $x_1, x_2, \cdots, x_k$ in the tree.

Since the answer may be large, print it after modulo 998244353.

It can be shown that the expectation can be expressed as an irreducible fraction $\frac{p}{q}$, where p and q are integers and $q \not\equiv 0 \pmod{998244353}$. You should output the integer equal to $p \times q^{-1} \bmod 998244353$. In other words, output such an integer x that $0 \leq x < 998244353$ and $x \cdot q \equiv p \pmod{998244353}$.

Input

The first line contains two integers n $(1 \leq n \leq 5 \times 10^5)$ - the number of vertices of the tree.

The second line to the n-th line, each line contains two integers x, y $(1 \leq x, y \leq n, x \neq y)$, denoting an edge in the tree.

Output

Output n integers and the k-th integer denotes the expectation (modulling 998244353) of the depth of the LCA if Malzahar chooses k different vertices randomly.

Examples

standard input	standard output
7 1 2 1 3 4 5 5 6 1 4 4 7	570425347 332748119 484861544 370776475 1 1 1
4 1 2 1 3 3 4	2 166374060 1 1

Problem C. Triangle

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

You have n right triangles with three sides of 3cm, 4cm and 5cm in length.

Is it possible to place these n triangles on a plane without overlapping, forming an axisymmetric shape?

Input

One line, a positive integer $n(1 \leq n \leq 10^9)$.

Output

If the answer is yes, please output `YES`; otherwise, please output `NO`.

Examples

standard input	standard output
1	NO
2	YES
3	NO
4	YES

Problem D. Cross the Storm

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

The *wulala* kingdom is located on the ocean, which consists of n islands in a line, numbered from 1 to n. *brz* lives in island 1.

For every island $i \in [1, n)$, there is a **directed** route from i to $i+1$ island with length w_i. There is also an air island above the ocean. For every island $i \in [1, n]$, there is an **undirected** route between island i and the air island with length W_i.

On the i-th day, *Mandy* will be on the island i, and *brz* is always longing to visit her. However, every day there will be a storm in the kingdom. On the i-th day, the storm will destroy all the **directed** route $(x, x+1)$, where $x \in [l_i, r_i)$, and l_i, r_i is uniformly chosen among all the possible pair (l, r) that satisfies $1 \le l \le r \le i$.

For all $i \in [1, n]$, *brz* wants to know the expectation of the length of the shortest path from island 1 to island i on the i-th day.

Note that due to the advanced technology that *wulala* kingdom possesses, the destroyed route will be rebuilt immediately at the end of the i-th day.

Input

The first line contains one integer n ($1 \le n \le 5 \times 10^5$).

The second line contains $n-1$ integers $w_1, w_2 \cdots w_{n-1}$ ($1 \le w_i \le 10^9$).

The third line contains n integers $W_1, W_2 \cdots, W_n$ ($1 \le W_i \le 10^9$).

Output

Print n lines. The i-th line contains the answer of the i-th day module 998 244 353.

Examples

standard input	standard output
2 1 1 1	0 332748119
5 1 2 3 4 5 6 7 8 9	0 332748122 499122184 598946622 665496248

Problem E. Travel

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Another vacation is coming. *Mandy* and *brz* plan to travel in some cities this time. They have T plans.

In each plan, they have n cities as alternatives. There are m **directed** roads between cities, and all the cities and roads form a **DAG** (Directed acyclic graph). Every city has a charm a_i. They expect to travel from city 1 to city n. *Mandy* thinks if they visit three cities x, y, z consecutively and $a_x + a_y + a_z \le k$, it would be a **terrible** route.

Thus *brz* needs to find a route from city 1 to city n **which is not terrible**. Since it is too hard for him, he turns to you for help. And you only need to tell him whether the route exists or not.

Input

The first line contains one integer T $(1 \le T \le 10^3)$——the number of plans.

In each plan, the first line contains three integer n, m, k $(2 \le n \le 3 \times 10^5, 0 \le m \le 3 \times 10^5, 1 \le k \le 10^9)$.

The second line contains n integers $a_1, a_2, \cdots, a_n$ $(1 \le a_i \le 10^9)$.

Each of the following m lines contains two integer u_i, v_i $(1 \le u_i, v_i \le n)$, denoting a directed road from u_i to v_i.

It is guaranteed that the given graph is a DAG and every road is distinct (in one plan), and $\sum n \le 3 \times 10^5, \sum m \le 3 \times 10^5$.

Output

Print T lines. If there exists a route that is not terrible, print `Yes`. Otherwise print `No`.

Example

standard input	standard output
2 3 2 5 1 2 3 1 2 2 3 3 2 6 1 2 3 1 2 2 3	Yes No

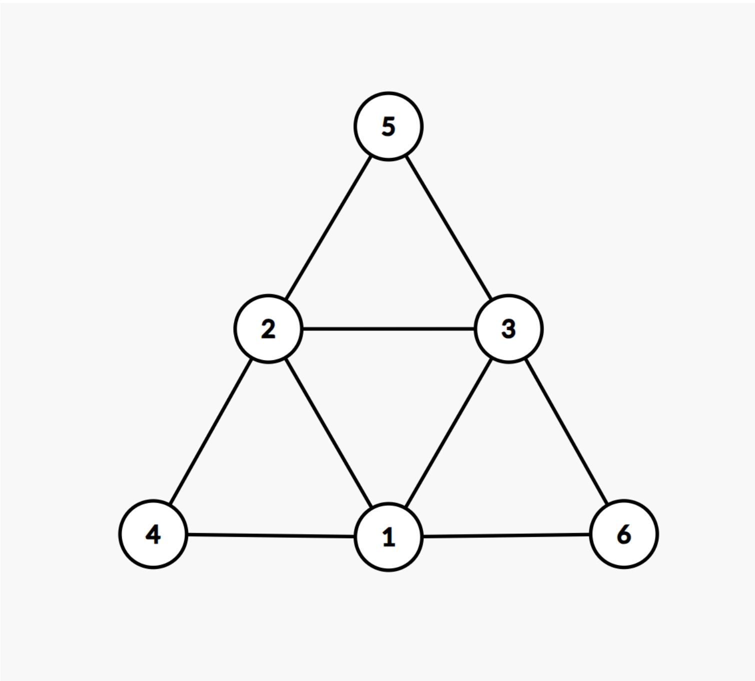
Problem F. Four K3

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	512 megabytes

You are given an undirected graph $G = (V, E)$ with n vertices and m edges. Note that the graph has no multiple edges or self-loops.

A graph $H = (V', E')$ is a subgraph of G if and only if $V' \subseteq V$ and $E' \subseteq E$.

A graph G' is **good** if and only if G' is isomorphic to the graph below:



Count the **good** subgraph in G, modulo $10^9 + 7$.

Input

The first line contains a single integer $T (1 \le T \le 10^5)$, denoting the number of test cases.

For each test case, the first line contains two integers $n, m (1 \le n \le 10^5, 0 \le m \le 10^5)$, denoting the number of vertices and edges of the graph.

The next m lines contains two positive integer $u_i, v_i (1 \le u_i, v_i \le n, u_i \ne v_i)$, denoting an edge.

It is guaranteed that $\sum n, \sum m \le 10^5$.

Output

For each test cases, output a line with a single integer, the answer moduling $10^9 + 7$.

Example

standard input	standard output
2 6 9 1 2 2 3 1 3 5 1 5 2 1 6 6 3 4 2 3 4 3 3 1 2 1 3 2 3	1 0

Problem G. Polynomial

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Recently *brz* has fallen for polynomials. He thinks if a polynomial $f(x)$ satisfies $f(a) = b$, it would be cool!

One day *Mandy* buy him a magic sequence c. He can't wait to apply his new polynomial theory to the sequence. Let polynomial $f(x) = a_0 + a_1x + a_2x^2 + \cdots$. He defines $G(f(x))$ as the number of pairs (i, j) satisfying the following conditions:

1. $1 \le i, j \le n$,$i \ne j$
2. $f(c_i) = c_j$
3. for all non-negative integer k, $a_k < c_i$.

Now he wants to know the sum of $G(f(x))$ where $f(x)$ satisfies that for all non-negative integer k, $a_k \ge 0$.

However, the magic sequence can change itself. It will change one single element in it by m times. *brz* wants to know the sum of $G(f(x))$ after every operation of the sequence.

Formally speaking, Let's say set S contains all the polynomial that $\forall k, a_k \ge 0$. You need to calculate $\sum_{f(x)\in S} G(f(x))$. Note that $|S| = \infty$.

Since the answer may be too large, you only need to find the answer module 998 244 353.

Input

The first line contains two integers n $(1 \le n \le 2 \times 10^5), q$ $(1 \le q \le 2 \times 10^5)$, representing the length of c and the number of operations of the sequence respectively.

The second line contains n integers c_i $(0 \le c_i \le 10^9)$.

Each of the following m lines contains two integer x $(1 \le x \le n), y$ $(0 \le y \le 10^9)$, representing an operation that change the value of c_x to y.

Output

Print m lines. Each line contains the sum of $G(f(x))$ after the previous operations.

Example

standard input	standard output
2 3 2 3 2 2 1 1 2 1	2 1 0

Problem H. Polygon

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

tiger2005 has n sticks, numbered from 1 to n. The i-th stick has a positive integer length a_i.

ITcarrot wants tiger2005 to select k sticks, and these k sticks can form a simple polygon.

ITcarrot wonders tiger2005 can find at least one way to do that.

Noted that a simple polygon is a closed geometric shape with straight sides that encloses **a non-zero area**.

Input

The first line contains two positive integers $n, k (3 \le k \le n \le 3000)$, denoting the number of sticks and the number of sticks which tiger2005 needs to select respectively.

The second line contains n integers $a_1, a_2, \cdots, a_n (\forall i \in [1, n], 1 \le a_i \le 10^9)$. The i-th of which is the length of the i-th stick.

Output

Output `Yes` if tiger2005 can find a way to form a simple polygon, otherwise please output `No`.

Examples

standard input	standard output
3 3 1 2 3	No
6 4 1 1 4 5 1 4	Yes

Problem I. Dislike

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

brz is a beginning ACMer. One day he came across a problem like this:

> There is a sequence with length n. Now you are required to find the maximum number in it.

He thought that was so easy for him. So with great confidence, he started to strengthen this problem. Here is what he was thinking:

- I don't like focusing on the sequence itself, and how about studying all its continuous subsequences? (Subsequently let $F(S)$ be the maximum number in sequence S)
- I don't like to find the maximum number, and how about calculating the sum of the maximum numbers in all continuous subsequences?
- I don't like only to find the answer, and how about focusing on whether we can adjust the sequence to make the answer smaller?
- I don't like to play with one sequence or messy sequences, and how about playing with all the permutations?

Having all the information above sorted, *brz* gets a problem like this:

> I want to know, how many permutations with length n are **good**.
> A **good** permutation should satisfy the following condition:
>
> - For a permutation A (1-indexed), the **rotate** operation is defined as: take A_1 out, move all the rest elements left by one place, and place A_1 to the rightmost place of the sequence. After **rotate** once, the sequence is just like $A_2A_3...A_nA_1$.
> - let $K = \min_{S\in U} G(S)$, where U is a set consisting of all the permutations with length n, and $G(S) = \sum_{l=1}^{n}\sum_{r=l}^{n} F(S[l,r])$, where $S[l,r]$ refers to the subsequence of S forming with all the elements from S_l to S_r continuously.
> - A permutation S is **good** if and only if: After any times of **rotate** (possibly zero), $G(S)$ can be equal to K.

However, after being strengthened, the problem now is far beyond what he can solve. He asked *Mandy* for help, only to get a "No response" for it was more than easy for her and she thought *brz* could solve it on his own.

Now *brz* turns to you for help. Can you solve the problem for him?

Input

The first line contains one integer $T (1 \le T \le 10^5)$, the number of test cases.

Each of the following T lines contains one integer $n (1 \le n \le 10^5)$.

Output

Print T lines. The i-th line contains one integer, which is the answer of the i-th test case.

Since the answer may be too large, you only need to find the answer module 998 244 353.

Example

standard input	standard output
2 2 3	2 6

Problem J. Count

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	512 megabytes

Let $S(n)$ be the set of all trees with n vertices labelled from 1 to n.

For a tree $T \in S(n)$, we define $H(T) = \sum_{i=1}^{n} \sum_{j=i+1}^{n} dis(i, j)$, where $dis(i, j)$ is defined as the minimum number of edges that need to pass from vertice i to vertice j on the tree.

Please count how many numbers x satisfying $\exists T \in S(n), H(T) = x$, and output them in order from small to large.

Input

One line, a positive integer $n (1 \le n \le 20)$.

Output

The first line contains a single integer cnt representing how many numbers x satisfy the condition.

The second line contains cnt integers from small to large, representing x.

Example

standard input	standard output
4	2 9 10

Problem K. Nim X2

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

After 114^{514} times of playing the nim game, *Mandy* and *brz* are now tired of it. So they invent a **nim x2** game with similar rules. The only difference between **nim x2** game and common nim game is: After every operation by one, the number of every pile of stones doubles.

Formally speaking, there are n piles of stones initially, where the i-th pile contains a_i stones. *Mandy* and *brz* take turns to play, with *Mandy* first. In one operation, one can choose a non-empty pile, and take some stones away (cannot be zero). After the operation, for all $i \in [1, n]$, a_i becomes $2 \times a_i$. The one who takes the last stone wins.

Now given the initial situation, can you secretly tell *brz* who will win if both of them play optimally?

In addition, if the game continues after 514^{114} rounds of operation, you just need to tell him `draw`.

Input

The first line contains one integer $T (1 \le T \le 10^5)$, indicating the number of test cases.

Each of the test cases contains two lines. The first line contains one integer $n (1 \le n \le 10^5)$. The second line contains n integers $a_1, a_2, \cdots, a_n (1 \le a_i \le 10^9)$.

It is guaranteed that the sum of n over all test cases does not exceed 10^6.

Output

print T lines. If *brz* will win, print `brz`, or if *Mandy* will win, print `Mandy`. Otherwise print `draw`.

Example

<table>
<tr><th>standard input</th><th>standard output</th></tr>
<tr><td><pre>3
1
3
2
1 1
4
114 514 1919 817</pre></td><td><pre>Mandy
brz
draw</pre></td></tr>
</table>

Problem L. Function

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Given a positive integer a, we call a function $f : \mathbb{Z}^+ \to \mathbb{Z}^+$ is good if and only if it satisfies:

- $\forall x, f(f(x)) = ax$;
- $\forall x < y, f(x) < f(y)$.

Consider the smallest good function g in lexicographical order, please calculate $g(x)$ for a given x.

Formally, the unique function g with given a satisfies:

- g is good.
- For any good function h, there does not exist a positive integer N satisfies $\forall i < N, g(i) = h(i)$ and $g(N) > h(N)$.

Input

The input contains several test cases, and the first line contains a positive integer $T (1 \le T \le 10^5)$ indicating the number of test cases.

For each test case, there is only one line containing two integers a, x $(3 \le a \le 10^9, 1 \le x \le 10^9)$.

Output

For each test case, output one line with one integer $g(x)$.

Example

standard input	standard output
5 3 1 3 2 3 3 4 5 11 4514	2 3 6 12 16493