Problem A. Ale

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

A *chetree* is a rooted labeled tree in which for every vertex, the order of its children is fixed. We can obtain several chetrees from a single rooted tree by changing the order of children for some vertices. For example, from the rooted tree with root 1 and edges $(1, 2)$, $(1, 3)$ one can obtain two different chetrees, changing the order of children of vertex 1: $(2, 3)$ or $(3, 2)$.

We consider two chetrees with n vertices equal if for every $i = 1, 2, \ldots, n$, the sets of children of i-th vertices are equal, and their order is the same.

You are given an integer n and an array a of size n.

Count the number of different chetrees with n vertices marked with labels $1, 2, \ldots, n$ such that for each i, vertex number i is on the level with number not greater than a_i. We define the level of the vertex as its distance from the root.

Since the answer can be very large, you must print it modulo $10^9 + 7$.

Input

The first line contains an integer n ($1 \le n \le 100$): the number of vertices.

The second line contains n integers $a_1, a_2, \ldots, a_n$ ($0 \le a_i < n$).

Output

Output the only integer: the answer to the problem modulo $10^9 + 7$.

Examples

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

Problem B. Banana Sambuca

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds
Memory limit:	256 mebibytes

You are given a string s consisting of digits and a prime number K. Let us define string w as concatenation of infinitely many strings s ($w := s + s + s + \ldots$). Your task is to find the minimal nonnegative integer which is a multiple of K such that its decimal representation is a substring of w, or detect that such a number does not exist.

Input

The first line of input contains a non-empty string s that consists of not more than $4 \cdot 10^5$ digits.

The second line contains a prime number K ($1 \leq K \leq 4 \cdot 10^5$).

Output

Print one line with a single integer on it: the answer to the problem (without leading zeroes) if it exists and -1 otherwise.

Example

standard input	standard output
74 3	474

Problem C. Chivas

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

This is an interactive problem.

You need to open a combination lock. The code to this combination lock is the string of n (n is odd) lowercase or/and uppercase Latin characters.

You may do three possible operations:

- Decide that it is impossible to determine the code reliably.
- Try to guess the code. You are not allowed to make an incorrect guess.
- Check some code that contains n Latin characters. You will get a response as described below. You are allowed to make at most 1000 such queries.

Let s be the right code and t be the code given by you for a check. Let a be the number of such i that $t_i < s_i$ and b is the number of such i that $t_i \geq s_i$. The response is "<" if $a > b$ and ">=" otherwise.

Characters are compared by their ASCII codes.

You need to guess the code or determine that it is impossible.

Input

The first line contains an odd integer number n ($1 \leq n < 100$): the length of the code. Each of the next lines contains a response to your check query ("<" or ">=").

Note that the answers are printed only after your queries.

Output

You may output:

- "`? {n Latin characters}`" — your query.
- "`! {n Latin characters}`" — your guess. After you print that, your program must terminate immediately.
- "`Impossible`" — if you think that it is impossible to determine the code reliably. After you print that, your program must terminate immediately.

Don't forget to **flush** the output after each query.

Example

standard input	standard output
1	? Z
>=	? Y
>=	? X
>=	? B
<	? W
<	! X

Note

Note that the code is known before your solution runs and it can not be changed. Still, you are not allowed to guess the code (even correctly) if it is impossible to determine the right code reliably.

Problem D. Dewar's

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Your need to find a positive integer A in base n such that the concatenation of A with itself is a perfect square, or determine that such number does not exist.

Input

You are given one line with integer n ($2 \le n \le 10^7$).

Output

If such number A does not exist or has more than 3000 digits in base n, print only two lines with zeroes.

In the other case, on the first line, print the number of digits of integer A in base n, and on the second line, print its digits. Represent each digit by a decimal number from 0 to $n-1$. Separate consecutive digits by spaces. Note that A must not contain **leading zeroes**. The number of n-based digits in this number must not exceed 3000.

On the third and fourth line, print $\sqrt{\overline{AA}}$ in base n in the same format, where $\overline{AA}$ is a number in base n obtained from concatenation of A with itself. This number also must not contain leading zeroes.

Examples

standard input	standard output
2	3 1 0 0 3 1 1 0
3	1 1 1 2
32	2 20 16 2 25 20

Note

First example: $100100_2 = 36_{10} = 6^2$.

Problem E. Espumoso

Input file:	*standard input*
Output file:	*standard output*
Time limit:	5 seconds
Memory limit:	256 mebibytes

You are given two different strings a and b of the same length. You are asked to check if there is some substring s of string a such that after cyclic rotation of s in its place, string a could become equal to string b.

A cyclic rotation of string $s_1 s_2 \ldots s_n$ with shift i is a string of the form $s_{n-i+1} s_{n-i+2} \ldots s_n s_1 s_2 \ldots s_{n-i}$.

Input

The first line contains string a which consists of lowercase Latin letters.

The second line contains string b which also consists of lowercase Latin letters.

Both strings have the same length not exceeding $5 \cdot 10^5$ and not less than 2.

Output

On the first line, print "YES" or "NO".

If you printed "YES", then in the second line, print three integer numbers: l, the index of the beginning of substring (1-indexed), len, the length of substring, and num, the shift of rotation ($1 \le num \le len - 1$).

If there are multiple solutions, output any one of them which satisfies these constraints.

Examples

standard input	standard output
abacaba aaaabbc	NO
abca acba	YES 2 2 1

Problem F. Fraisette

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

You are given a directed graph with n vertices and m edges. It may contain loops and multiple edges. Your task is to find if it is possible to change direction of some edges to make the graph an Eulerian graph. If it is possible, you also have to find the minimum possible number of direction changes.

A directed graph is called Eulerian if there exists a directed cycle that uses every edge exactly once.

Input

First line contains one integer T ($1 \le T \le 1000$), the number of test cases. T test cases follow.

The first line of each test case contains two integers n and m ($1 \le n \le 1000$, $0 \le m \le 5000$).

Each of next m lines contains description of one edge: two integers $from$ and to ($1 \le from, to \le n$).

It is guaranteed that the sum of n in all test cases isn't greater than 1000.

It is guaranteed that the sum of m in all test cases isn't greater than 5000.

Output

For each test case, print one number on a separate line: the minimum number of edges which need to have their direction changed, or -1 if it is impossible to obtain an eulerian graph regardless of the number of changes.

Example

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

Problem G. Garrafeira

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Let's define $f(a_1, a_2, \ldots, a_n)$ as follows:

1. Consider all 2^n subsequences of sequence $\{a_1, a_2, \ldots, a_n\}$;
2. For every subsequence, calculate the bitwise XOR of all its elements;
3. Define f as the sum of 2^n bitwise XORs we got in previous stage.

For example, $f(1, 2, 3) = 0 + 1 + 2 + 3 + (1 \oplus 2) + (1 \oplus 3) + (2 \oplus 3) + (1 \oplus 2 \oplus 3) = 12$. Here, $a \oplus b$ is the bitwise XOR of the integers a and b.

Consider values of $f(a_1, \ldots, a_n)$ for all possible arguments where $l \le a_i \le r$. How many different numbers are present among these values?

Input

You are given an integer T ($1 \le T \le 10^5$) on the first line: the number of test cases.

Each of the following T lines contains integers n, l and r ($1 \le n \le 100$, $0 \le l \le r \le 10^{18}$).

Output

For each test case, print a single line with one integer: the answer to the problem modulo $10^9 + 7$.

Example

standard input	standard output
3 2 10 11 3 1 3 3 3 4	2 3 3

Problem H. Horilka

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 seconds
Memory limit:	256 mebibytes

Let us define n_2 for every non-negative integer n as the binary representation of n with infinitely many leading zeroes. Then for every integer $n \geq 0$, let us write n_2 on a new line. Now we have an infinite board like that:

$$
\begin{array}{ccccccccc}
\dots & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\dots & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\
\dots & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\
\dots & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\
\dots & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\
\dots & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 \\
\dots & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 0 \\
\dots & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 \\
 & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots
\end{array}
$$

Let f be such function that $f(n)$ is a number in which k-th bit is equal to the k-th bit of $n+k$ for every $k \geq 0$. For example, $f(0) = 0$ and $f(3) = 5$. In other words, if we rotate our board at 45° clockwise, then the binary representation of $f(n)$ will be written on n-th row (if 0-th row ends by 0 in the upper-right corner).

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                              ...
       ...  0      0    0    0    0    0    0
   ...  0      0     0    0     0    0    0    0   ← f(0)
       ...  0      0    0    0    0    1    1       ← f(1)
           ...  0     0    0     1    1    0       ← f(2)
               ...  0    0    1    0    1          ← f(3)
                   ...  0    1     0    0          ← f(4)
                              ...
```

Let $g(k)$ be the k-th non-negative integer which does not occur in the sequence $f(0), f(1), f(2), \ldots$.

Your task is to find $g(k)$ and print it modulo $10^9 + 7$.

Input

The first line of input contains an integer t ($1 \leq t \leq 10^4$), the number of test cases.

Each of the following t lines specifies one test case and contains one integer k ($1 \leq k \leq 10^{18}$).

Output

Output t lines. The i-th line should contain the answer for the i-th test case.

Example

standard input	standard output
5 1 2 3 4 5	1 2 7 12 29

Problem I. Irish Whiskey

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

You are given an array A of n integers (1-indexed). Your task is to perform queries of two types:

1. Swap $A[l]$ and $A[r]$.
2. Find if subarray $A[l, \ldots, r]$ is sorted in non-decreasing order.

Input

The first line contains two integers n and q ($1 \le n \le 300\,000$, $1 \le q \le 200\,000$), the length of the array and the number of queries.

The second line contains n integers: the elements of the array ($1 \le A[i] \le 10^9$) separated by spaces.

The following q lines contain descriptions of the queries. Each line begins with integer *type* which equals 1 or 2 and specifies the type of query. It is followed by integers l and r separated by a space ($1 \le l \le r \le n$).

Output

For each query of the second type, output a single line with "`Ja`" or "`Nein`" (without quotes).

Example

standard input	standard output
3 3 1 2 3 2 1 3 1 2 3 2 1 3	Ja Nein

Problem J. Jagermeister

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Girth of an undirected graph is defined as the length of its shortest simple cycle.

A graph is k-*regular* if each of its vertices has degree equal to k.

You are given a prime number p. Construct a $(p+1)$-regular graph with girth no less than 6 having the minimal possible number of vertices.

Input

The only line of input contains a prime number p ($2 \le p \le 47$).

Output

On the first line of output, print one integer N: the number of vertices in the graph.

On each of the next N lines, print $p+1$ space-separated integers. The i-th line must contain the list of neighbors of vertex i. Vertices are enumerated starting from 1.

The described graph must have girth at least 6 and must not contain any loops or multiple edges. The value of N must be minimal possible among all such graphs. If there are several possible answers, output any one of them.

Example

standard input	standard output
2	14 7 10 11 5 6 10 5 7 14 9 10 14 2 3 12 2 8 13 1 3 8 6 7 9 4 8 12 1 2 4 1 12 13 5 9 11 6 11 14 3 4 13

Problem K. Kvass

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Alice and Bob play the game "Break the chocolate".

Initially, they have n rectangular pieces of chocolate. The i-th piece has size $w_i \times h_i$ and is divided into 1×1 squares by horizontal and vertical lines.

At her move, Alice may break some piece along some horizontal dividing line, creating two new pieces.

At his move, Bob may break some piece along some vertical dividing line, creating two new pieces.

The obtained pieces can not be rotated.

The player who can't make a move loses the game.

Who will win if Alice is the first player, they must alternate their moves and both are playing optimally?

Input

The first line contains the number of test cases T ($1 \le T \le 1000$). After that, T testcases follow.

The first line of each test case contains an integer n ($1 \le n \le 10^3$).

The next n lines contain the description of pieces (one per each line): integers w_i and h_i ($1 \le w_i, h_i \le 10^9$).

The sum of n over all test cases does not exceed 1000.

Output

Print the name of the winner for each test case on a separate lines: "`Alice`" or "`Bob`" (without quotes).

Example

standard input	standard output
1 1 2 2	Bob