Programación Competitiva

Semana i (2018) – Contest #2

Problema 1 - Divisibility by Eight

You are given a non-negative integer n, its decimal representation consists of at most 100 digits and doesn't contain leading zeroes.

Your task is to determine if it is possible in this case to remove some of the digits (possibly not remove any digit at all) so that the result contains at least one digit, forms a non-negative integer, doesn't have leading zeroes and is divisible by 8. After the removing, it is forbidden to rearrange the digits.

If a solution exists, you should print it.

Input

The single line of the input contains a non-negative integer n. The representation of number n doesn't contain any leading zeroes and its length doesn't exceed 100 digits.

Output

Print "NO" (without quotes), if there is no such way to remove some digits from number n.

Otherwise, print "YES" in the first line and the resulting number after removing digits from number n in the second line. The printed number must be divisible by 8.

If there are multiple possible answers, you may print any of them.

Examples

Input
```
3454
```
Output
```
YES
344
```

Input
```
10
```
Output
```
YES
0
```

Input
```
111111
```
Output
```
NO
```

Problema 2 - Unusual Sequences

Count the number of distinct sequences $a_1, a_2, ..., a_n$ $(1 \le a_i)$ consisting of positive integers such that $gcd(a_1, a_2, ..., a_n) = x$ and $\sum_{i=1}^{n} a_i = y$. As this number could be large, print the answer modulo $10^9 + 7$.

gcd here means the greatest common divisor.

Input

The only line contains two positive integers x and y $(1 \le x, y \le 10^9)$.

Output

Print the number of such sequences modulo $10^9 + 7$.

Examples

Input
```
3 9
```
Output
```
3
```

Input
```
5 8
```
Output
```
0
```

Note

There are three suitable sequences in the first test: $(3, 3, 3)$, $(3, 6)$, $(6, 3)$.

There are no suitable sequences in the second test.

Problema 3 - Jon and Orbs

Jon Snow is on the lookout for some orbs required to defeat the white walkers. There are k different types of orbs and he needs at least one of each. One orb spawns daily at the base of a Weirwood tree north of the wall. The probability of this orb being of any kind is equal. As the north of wall is full of dangers, he wants to know the minimum number of days he should wait before sending a ranger to collect the orbs such that the probability of him getting at least one of each kind of orb is at least $\frac{p_i - \epsilon}{2000}$, where $\varepsilon < 10^{-7}$.

To better prepare himself, he wants to know the answer for q different values of p_i. Since he is busy designing the battle strategy with Sam, he asks you for your help.

Input

First line consists of two space separated integers k, q ($1 \le k, q \le 1000$) — number of different kinds of orbs and number of queries respectively.

Each of the next q lines contain a single integer p_i ($1 \le p_i \le 1000$) — i-th query.

Output

Output q lines. On i-th of them output single integer — answer for i-th query.

Examples

Input
```
1 1
1
```
Output
```
1
```

Input
```
2 2
1
2
```
Output
```
2
2
```

Problema 4 - Berzerk

Rick and Morty are playing their own version of Berzerk (which has nothing in common with the famous Berzerk game). This game needs a huge space, so they play it with a computer.

In this game there are n objects numbered from 1 to n arranged in a circle (in clockwise order). Object number 1 is a black hole and the others are planets. There's a monster in one of the planet. Rick and Morty don't know on which one yet, only that he's not initially in the black hole, but Unity will inform them before the game starts. But for now, they want to be prepared for every possible scenario.

Each one of them has a set of numbers between 1 and n - 1 (inclusive). Rick's set is s_1 with k_1 elements and Morty's is s_2 with k_2 elements. One of them goes first and the player changes alternatively. In each player's turn, he should choose an arbitrary number like x from his set and the monster will move to his x-th next object from its current position (clockwise). If after his move the monster gets to the black hole he wins.

Your task is that for each of monster's initial positions and who plays first determine if the starter wins, loses, or the game will stuck in an infinite loop. In case when player can lose or make game infinity, it more profitable to choose infinity game.

Input
The first line of input contains a single integer n ($2 \le n \le 7000$) — number of objects in game.
The second line contains integer k_1 followed by k_1 distinct integers $s_{1,1}, s_{1,2}, ..., s_{1,k1}$ — Rick's set.
The third line contains integer k_2 followed by k_2 distinct integers $s_{2,1}, s_{2,2}, ..., s_{2,k2}$ — Morty's set
$1 \le k_i \le n - 1$ and $1 \le s_{i,1}, s_{i,2}, ..., s_{i,ki} \le n - 1$ for $1 \le i \le 2$.

Output
In the first line print n - 1 words separated by spaces where i-th word is "Win" (without quotations) if in the scenario that Rick plays first and monster is initially in object number $i + 1$ he wins, "Lose" if he loses and "Loop" if the game will never end.

Similarly, in the second line print n - 1 words separated by spaces where i-th word is "Win" (without quotations) if in the scenario that Morty plays first and monster is initially in object number $i + 1$ he wins, "Lose" if he loses and "Loop" if the game will never end.

Examples

Input
```
5
2 3 2
3 1 2 3
```
Output
```
Lose Win Win Loop
Loop Win Win Win
```

Input
```
8
4 6 2 3 4
2 3 6
```
Output
```
Win Win Win Win Win Win Win
Lose Win Lose Lose Win Lose Lose
```

Problema 5 - Functions again

Something happened in Uzhlyandia again... There are riots on the streets... Famous Uzhlyandian superheroes Shean the Sheep and Stas the Giraffe were called in order to save the situation. Upon the arriving, they found that citizens are worried about maximum values of the Main Uzhlyandian Function *f*, which is defined as follows:

$$f(l,r) = \sum_{i=l}^{r-1} |a[i] - a[i+1]| \cdot (-1)^{i-l}$$

In the above formula, $1 \le l < r \le n$ must hold, where n is the size of the Main Uzhlyandian Array a, and $|x|$ means absolute value of x. But the heroes skipped their math lessons in school, so they asked you for help. Help them calculate the maximum value of f among all possible values of l and r for the given array a.

Input

The first line contains single integer n ($2 \le n \le 10^5$) — the size of the array a.

The second line contains n integers $a_1, a_2, ..., a_n$ ($-10^9 \le a_i \le 10^9$) — the array elements.

Output

Print the only integer — the maximum value of f.

Examples

Input
```
5
1 4 2 3 1
```
Output
```
3
```

Input
```
4
1 5 4 7
```
Output
```
6
```

Note

In the first sample case, the optimal value of f is reached on intervals $[1, 2]$ and $[2, 5]$.

In the second case maximal value of f is reachable only on the whole array.

Problema 6 - Reberland Linguistics

First-rate specialists graduate from Berland State Institute of Peace and Friendship. You are one of the most talented students in this university. The education is not easy because you need to have fundamental knowledge in different areas, which sometimes are not related to each other.

For example, you should know linguistics very well. You learn a structure of Reberland language as foreign language. In this language words are constructed according to the following rules. First you need to choose the "root" of the word — some string which has more than 4 letters. Then several strings with the length 2 or 3 symbols are appended to this word. The only restriction — it is not allowed to append the same string twice in a row. All these strings are considered to be suffixes of the word (this time we use word "suffix" to describe a morpheme but not the few last characters of the string as you may used to).

Here is one exercise that you have found in your task list. You are given the word *s*. Find all distinct strings with the length 2 or 3, which can be suffixes of this word according to the word constructing rules in Reberland language.

Two strings are considered distinct if they have different length or there is a position in which corresponding characters do not match.

Let's look at the example: the word *abacabaca* is given. This word can be obtained in the following ways: $\overline{abacabaca}$, $\overline{abacaba}\widehat{ca}$, $\overline{abacab}\widehat{aca}$, $\overline{abaca}\widehat{ba}\widehat{ca}$, where the root of the word is overlined, and suffixes are marked by "corners". Thus, the set of possible suffixes for this word is $\{aca, ba, ca\}$.

Input

The only line contains a string s ($5 \le |s| \le 10^4$) consisting of lowercase English letters.

Output

On the first line print integer k — a number of distinct possible suffixes. On the next k lines print suffixes.

Print suffixes in lexicographical (alphabetical) order.

Examples
Input
```
abacabaca
```
Output
```
3
aca
ba
ca
```

Input
```
abaca
```
Output
```
0
```

Note

The first test was analysed in the problem statement.

In the second example the length of the string equals 5. The length of the root equals 5, so no string can be used as a suffix.

Problema 7 - Kyoya and Colored Balls

Kyoya Ootori has a bag with n colored balls that are colored with k different colors. The colors are labeled from 1 to k. Balls of the same color are indistinguishable. He draws balls from the bag one by one until the bag is empty. He noticed that he drew the last ball of color i before drawing the last ball of color $i + 1$ for all i from 1 to $k - 1$. Now he wonders how many different ways this can happen.

Input

The first line of input will have one integer k ($1 \leq k \leq 1000$) the number of colors.

Then, k lines will follow. The i-th line will contain c_i, the number of balls of the i-th color ($1 \leq c_i \leq 1000$).

The total number of balls doesn't exceed 1000.

Output

A single integer, the number of ways that Kyoya can draw the balls from the bag as described in the statement, modulo 1 000 000 007.

Examples

Input
```
3
2
2
1
```
Output
```
3
```

Input
```
4
1
2
3
4
```
Output
```
1680
```

Note

In the first sample, we have 2 balls of color 1, 2 balls of color 2, and 1 ball of color 3. The three ways for Kyoya are:

```
1 2 1 2 3
1 1 2 2 3
2 1 1 2 3
```

Problema 8 - Sereja and Suffixes

Sereja has an array a, consisting of n integers $a_1, a_2, ..., a_n$. The boy cannot sit and do nothing, he decided to study an array. Sereja took a piece of paper and wrote out m integers $l_1, l_2, ..., l_m$ ($1 \le l_i \le n$). For each number l_i he wants to know how many distinct numbers are staying on the positions l_i, $l_i + 1$, ..., n. Formally, he want to find the number of distinct numbers among $a_{li}, a_{li+1}, ..., a_n$.?

Sereja wrote out the necessary array elements but the array was so large and the boy was so pressed for time. Help him, find the answer for the described question for each l_i.

Input

The first line contains two integers n and m ($1 \le n, m \le 10^5$). The second line contains n integers $a_1, a_2, ..., a_n$ ($1 \le a_i \le 10^5$) — the array elements.

Next m lines contain integers $l_1, l_2, ..., l_m$. The i-th line contains integer l_i ($1 \le l_i \le n$).

Output

Print m lines — on the i-th line print the answer to the number l_i.

Examples

Input
```
10 10
1 2 3 4 1 2 3 4 100000 99999
1
2
3
4
5
6
7
8
9
10
```

Output
```
6
6
6
6
6
5
4
3
2
1
```