A. Anomalous Arrays

time limit per test: 1 second
memory limit per test: 256 megabytes

Given m and n, count the number of possible arrays $a = (a_1, a_2, \ldots, a_n)$ such that

- $a_i \in \{1, 2, 3, \ldots, m\}$ for each $i \in \{1, 2, 3, \ldots, n\}$;
- There exists some $1 \leq i < n$ such that $a_i = a_{i+1}$.

Input
A single line which contains m $(1 \leq m \leq 10^8)$ and n $(1 \leq n \leq 10^{12})$.

Output
Display the number of possible arrays. Since the answer may be large, display it modulo 100003.

Example

input	output
2 3	6

B. Party Preparation

time limit per test: 1 second
memory limit per test: 256 megabytes

The professors were very happy about their party two weeks ago. Now they are already planning next year's party. The professors plan to buy exactly n units of beer for the party. They have k different brands of beer to choose from, but they are not sure how many of each they should buy. Help the professors determine the number of options they have.

Input
The input contains a single line consisting of two integers, n $(1 \leq n \leq 100,000)$ and k $(1 \leq k \leq 100,000)$.

Output
Display the number of ways in which the professors could buy beer for the party. Since the answer may be large, display it modulo $1,000,000,007$.

Examples

input	output
10 3	66

input	output
15 8	170544

Note
There may be some brands that the professors don't like, so they might purchase zero units of some brands.

C. Tenuous Triangles

time limit per test: 2 seconds
memory limit per test: 256 megabytes

You are given a directed graph $G = (V, E)$ with no self-loops. For each pair of vertices u, v such that $u \neq v$, exactly one of the edges (u, v) or (v, u) exists in the graph.

We say three vertices (u, v, w) form a triangle if there is an edge from u to v, an edge from v to w, and an edge from w to u.

Count the number of triangles in G. Notice that (u, v, w), (v, w, u) and (w, u, v) are regarded as the same triangle and should be counted only once.

Input

The first line contains a single integer n $(1 \leq n \leq 2000)$. Each of the following n lines contains n characters. The character in the i-th line and j-th column will be Y if there is an edge from i to j, will be N if there is an edge from j to i, and will be - if $i = j$.

Output

Display a single integer, the number of triangles.

Example

input

```
4
-YNN
N-YY
YN-Y
YNN-
```

output

```
2
```

D. Easy Equations

time limit per test: 5 seconds
memory limit per test: 256 megabytes

Given an equation $x_1 + x_2 + \ldots + x_n = m$, count the number of solutions to the equation such that

- x_i are all positive integers;
- $x_1 \leq a_1, x_2 \leq a_2, \ldots, x_p \leq a_p$;
- $x_{p+1} \geq a_{p+1}, x_{p+2} \geq a_{p+2}, \ldots, x_{p+q} \geq a_{p+q}$.

Input

The first line contains a single integer T $(1 \leq T \leq 100)$ which denotes the number of test cases. For each test case, the first line contains four integers n $(1 \leq n \leq 10^9)$, p $(0 \leq p \leq 8)$, q $(0 \leq q \leq 8)$ and m $(1 \leq m \leq 10^9)$. The second line contains $p + q$ integers, which denote $a_1, a_2, \ldots, a_{p+q}$. If $p + q = 0$, the second line is empty.

It is guaranteed that $a_i \leq m$ for all i, and that $p + q \leq n$. Note that $p + q$ might not be equal to n.

Output

For each test case, display the number of solutions modulo $10,007$.

Example

input

```
3
3 1 1 6
3 3
3 0 0 5

3 1 1 3
3 3
```

output

```
3
6
0
```

E. Creating a Connected Component

time limit per test: 2 seconds

memory limit per test: 256 megabytes

You are given a graph on n vertices. For each pair of vertices u and v such that $u \neq v$, you have $c_{u,v}$ different choices of undirected edges that you could add between u and v. For each pair of vertices u and v, you can choose no edge between u and v, or you can choose exactly one edge from the $c_{u,v}$ different options.

Count the number of ways to choose edges so that the resulting graph is connected.

Input

The first line contains a single integer n $(1 \leq n \leq 16)$. Each of the following n lines contains n integers, where the integer in the u-th row and v-th column denotes $c_{u,v}$ $(0 \leq c_{u,v} \leq 1000000007)$.

It is guaranteed that $c_{u,u} = 0$ for all u, and that $c_{u,v} = c_{v,u}$ for all u and v.

Output

Display the number of of ways to choose edges. Since the answer may be large, display it modulo $1,000,000,007$.

Example

input

```
3
0 2 3
2 0 4
3 4 0
```

output

```
50
```