Problem A. Filled Subgrid Count I

Time Limit 1000 ms
Mem Limit 524288 kB

You are given a grid of letters. Your task is to calculate, for each letter, the number of *square* subgrids whose each letter is the same.

Input

The first line has two integers n and k: the size of the grid and the number of letters. The letters are the first k uppercase letters.

After this, there are n lines that describe the grid. Each line has n letters.

Output

Print k lines: for each letter, the number of subgrids.

Constraints

- $1 \leq n \leq 3000$
- $1 \leq k \leq 26$

Example

Input	Output
5 3 ABBBC BBBBC BCAAA AAAAA AAAAA	21 10 3

Problem B. Filled Subgrid Count II

Time Limit 1000 ms
Mem Limit 524288 kB

You are given a grid of letters. Your task is to calculate, for each letter, the number of *rectangular* subgrids whose each letter is the same.

Input

The first line has two integers n and k: the size of the grid and the number of letters. The letters are the first k uppercase letters.

After this, there are n lines that describe the grid. Each line has n letters.

Output

Print k lines: for each letter, the number of subgrids.

Constraints

- $1 \le n \le 3000$
- $1 \le k \le 26$

Example

Input	Output
5 3 ABBBC BBBBC BCAAA AAAAA AAAAA	64 24 4

Problem C. All Letter Subgrid Count I

Time Limit 1000 ms
Mem Limit 524288 kB

You are given a grid of letters. Your task is to calculate the number of *square* subgrids that contain all the letters.

Input

The first line has two integers n and k: the size of the grid and the number of letters. The letters are the first k uppercase letters.

After this, there are n lines that describe the grid. Each line has n letters.

Output

Print the number of subgrids.

Constraints

- $1 \leq n \leq 3000$
- $1 \leq k \leq 26$

Example

Input	Output
5 3 ABBBC BBBBC BCAAA AAAAA AAAAA	15

Problem D. All Letter Subgrid Count II

Time Limit 1000 ms
Mem Limit 524288 kB

You are given a grid of letters. Your task is to calculate the number of *rectangle* subgrids that contain all the letters.

Input

The first line has two integers n and k: the size of the grid and the number of letters. The letters are the first k uppercase letters.

After this, there are n lines that describe the grid. Each line has n letters.

Output

Print the number of subgrids.

Constraints

- $1 \leq n \leq 500$
- $1 \leq k \leq 26$

Example

Input	Output
5 3 ABBBC BBBBC BCAAA AAAAA AAAAA	70

Problem E. Border Subgrid Count I

Time Limit 1000 ms
Mem Limit 524288 kB

You are given a grid of letters. Your task is to calculate, for each letter, the number of *square* subgrids whose border consists of that letter.

Input

The first line has two integers n and k: the size of the grid and the number of letters. The letters are the first k uppercase letters.

After this, there are n lines that describe the grid. Each line has n letters.

Output

Print k lines: for each letter, the number of subgrids.

Constraints

- $1 \le n \le 3000$
- $1 \le k \le 26$

Example

Input	Output
5 3 ABBBC ABABC ABBBC ABBBC CCCCC	5 14 9

Problem F. Border Subgrid Count II

Time Limit 1000 ms
Mem Limit 524288 kB

You are given a grid of letters. Your task is to calculate, for each letter, the number of *rectangular* subgrids whose border consists of that letter.

Input

The first line has two integers n and k: the size of the grid and the number of letters. The letters are the first k uppercase letters.

After this, there are n lines that describe the grid. Each line has n letters.

Output

Print k lines: for each letter, the number of subgrids.

Constraints

- $1 \leq n \leq 500$
- $1 \leq k \leq 26$

Example

Input	Output
5 3 ABBBC ABABC ABBBC ABBBC CCCCC	11 38 29

Problem G. Raab Game II

Time Limit 1000 ms
Mem Limit 524288 kB

Consider a two player game where each player has n cards numbered $1, 2, \ldots, n$. On each turn both players place one of their cards on the table. The player who placed the higher card gets one point. If the cards are equal, neither player gets a point. The game continues until all cards have been played.

You are given the number of cards n and the players' scores at the end of the game, a and b. Your task is to count the number of possible games with that outcome.

Input

The first line contains one integer t: the number of tests.

Then there are t lines, each with three integers n, a and b.

Output

For each test case print the number of possible games modulo $10^9 + 7$.

Constraints

- $1 \leq t \leq 1000$
- $1 \leq n \leq 5000$
- $0 \leq a, b \leq n$

Example

Input	Output
5 3 1 2 2 0 1 5 2 2 9 3 5 4 4 1	6 0 4200 976757050 0

Problem H. Empty String

Time Limit 1000 ms
Mem Limit 524288 kB

You are given a string consisting of n characters between a and z.

On each turn, you may remove any two adjacent characters that are equal. Your goal is to construct an empty string by removing all the characters.

In how many ways can you do this?

Input

The only input line has a string of length n.

Output

Print one integer: the number of ways modulo $10^9 + 7$.

Constraints

- $1 \leq n \leq 500$

Example

Input	Output
aabccb	3

Problem I. Permutation Inversions

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to count the number of permutations of $1, 2, \ldots, n$ that have exactly k inversions (i.e., pairs of elements in the wrong order).

For example, when $n = 4$ and $k = 3$, there are 6 such permutations:

- $[1, 4, 3, 2]$
- $[2, 3, 4, 1]$
- $[2, 4, 1, 3]$
- $[3, 1, 4, 2]$
- $[3, 2, 1, 4]$
- $[4, 1, 2, 3]$

Input

The only input line has two integers n and k.

Output

Print the answer modulo $10^9 + 7$.

Constraints

- $1 \le n \le 500$
- $0 \le k \le \frac{n(n-1)}{2}$

Example

Input	Output
4 3	6

Problem J. Counting Bishops

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to count the number of ways k bishops can be placed on an $n \times n$ chessboard so that no two bishops attack each other.

Two bishops attack each other if they are on the same diagonal.

Input

The only input line has two integers n and k: the board size and the number of bishops.

Output

Print one integer: the number of ways modulo $10^9 + 7$.

Constraints

- $1 \le n \le 500$
- $1 \le k \le n^2$

Example

Input	Output
5 4	2728

Problem K. Counting Sequences

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to count the number of sequences of length n where each element is an integer between $1 \ldots k$ and each integer between $1 \ldots k$ appears at least once in the sequence.

For example, when $n = 6$ and $k = 4$, some valid sequences are $[1, 3, 1, 4, 3, 2]$ and $[2, 2, 1, 3, 4, 2]$.

Input

The only input line has two integers n and k.

Output

Print one integer: the number of sequences modulo $10^9 + 7$.

Constraints

- $1 \le k \le n \le 10^6$

Example

Input	Output
6 4	1560

Problem L. Grid Paths II

Time Limit 1000 ms
Mem Limit 524288 kB

Consider an $n \times n$ grid whose top-left square is $(1, 1)$ and bottom-right square is (n, n).

Your task is to move from the top-left square to the bottom-right square. On each step you may move one square right or down. In addition, there are m traps in the grid. You cannot move to a square with a trap.

What is the total number of possible paths?

Input

The first input line contains two integers n and m: the size of the grid and the number of traps.

After this, there are m lines describing the traps. Each such line contains two integers y and x: the location of a trap.

You can assume that there are no traps in the top-left and bottom-right square.

Output

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

Constraints

- $1 \le n \le 10^6$
- $1 \le m \le 1000$
- $1 \le y, x \le n$

Example

Input	Output
3 1 2 2	2

Problem M. Counting Permutations

Time Limit 1000 ms
Mem Limit 524288 kB

A permutation of integers $1, 2, \ldots, n$ is called *beautiful* if there are no adjacent elements whose difference is 1.

Given n, your task is to count the number of beautiful permutations.

Input

The only input line contains an integer n.

Output

Print the number of beautiful permutations of $1, 2, \ldots, n$ modulo $10^9 + 7$.

Constraints

- $1 \leq n \leq 1000$

Example

Input	Output
5	14

Problem N. Grid Completion

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to create an $n \times n$ grid whose each row and column has exactly one A and B. Some of the characters have already been placed. In how many ways can you complete the grid?

Input

The first input line has an integer n: the size of the grid.

After this, there are n lines that describe the grid. Each line has n characters: `.` means an empty square, and `A` and `B` show the characters already placed.

You can assume that every row and column has at most one A and B.

Output

Print one integer: the number of ways modulo $10^9 + 7$.

Constraints

- $2 \le n \le 500$

Example

Input	Output
5 ....AB. ..... B.... ...A.	16

Problem O. Counting Reorders

Time Limit 1000 ms
Mem Limit 524288 kB

Calculate the number of ways you can reorder the characters of a string so that no two adjacent characters are the same.

For example, the answer for `aabc` is 6, because the possible orders are `abac`, `abca`, `acab`, `acba`, `baca`, and `caba`.

Input

The only input line has a string that consists of n characters between `a` – `z`.

Output

Print an integer: the answer modulo $10^9 + 7$.

Constraints

- $1 \leq n \leq 5000$

Example

Input	Output
aabc	6

Problem P. Tournament Graph Distribution

Time Limit 1000 ms
Mem Limit 524288 kB

A *tournament graph* is a directed graph where a single directed edge exists between every pair of nodes.

Given n, your task is to calculate for each $k = 1 \ldots n$ the number of tournament graphs that have n nodes and k strongly connected components.

Input

The only line has an integer n: the number of nodes.

Output

Print n lines: for each $k = 1 \ldots n$ the number of graphs modulo $10^9 + 7$.

Constraints

- $1 \leq n \leq 500$

Example

Input	Output
3	2 0 6

Problem Q. Collecting Numbers Distribution

Time Limit 1000 ms
Mem Limit 524288 kB

You are given an array that contains each number between $1 \ldots n$ exactly once. You collect the numbers in increasing order from 1 to n. On each round, you traverse the array from left to right and collect as many consecutive numbers as possible, starting from the smallest number that has not been collected yet.

Your task is to determine, for each $k = 1, 2, \ldots, n$, the number of arrays that require exactly k rounds to collect all the numbers.

Input

The only line has an integer n.

Output

Print n numbers: for each $k = 1, 2, \ldots, n$, the answer modulo $10^9 + 7$.

Constraints

- $1 \le n \le 5000$

Example

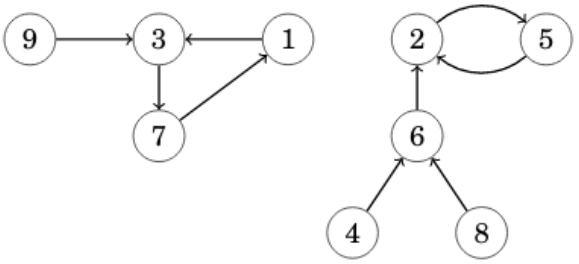
Input	Output
3	1 4 1

Explanation: The arrays are $[1, 2, 3]$ (1 round), $[1, 3, 2]$ (2 rounds), $[2, 1, 3]$ (2 rounds), $[2, 3, 1]$ (2 rounds), $[3, 1, 2]$ (2 rounds), and $[3, 2, 1]$ (3 rounds).

Problem R. Functional Graph Distribution

Time Limit 1000 ms
Mem Limit 524288 kB

A *functional graph* is a directed graph where each node has outdegree 1. For example, here is a functional graph that has 9 nodes and 2 components:



Given n, your task is to calculate for each $k = 1 \ldots n$ the number of functional graphs that have n nodes and k components.

Input

The only input line has an integer n: the number of nodes.

Output

Print n lines: for each $k = 1 \ldots n$ the number of graphs modulo $10^9 + 7$.

Constraints

- $1 \leq n \leq 5000$

Example

Input	Output
3	17 9 1