Problem A. Dice Combinations

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to count the number of ways to construct sum n by throwing a dice one or more times. Each throw produces an outcome between 1 and 6.

For example, if $n = 3$, there are 4 ways:

- $1 + 1 + 1$
- $1 + 2$
- $2 + 1$
- 3

Input

The only input line has an integer n.

Output

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

Constraints

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

Example

Input	Output
3	4

Problem B. Minimizing Coins

Time Limit 1000 ms
Mem Limit 524288 kB

Consider a money system consisting of n coins. Each coin has a positive integer value. Your task is to produce a sum of money x using the available coins in such a way that the number of coins is minimal.

For example, if the coins are $\{1, 5, 7\}$ and the desired sum is 11, an optimal solution is $5 + 5 + 1$ which requires 3 coins.

Input

The first input line has two integers n and x: the number of coins and the desired sum of money.

The second line has n distinct integers $c_1, c_2, \ldots, c_n$: the value of each coin.

Output

Print one integer: the minimum number of coins. If it is not possible to produce the desired sum, print -1.

Constraints

- $1 \le n \le 100$
- $1 \le x \le 10^6$
- $1 \le c_i \le 10^6$

Example

Input	Output
3 11 1 5 7	3

Problem C. Coin Combinations I

Time Limit 1000 ms
Mem Limit 524288 kB

Consider a money system consisting of n coins. Each coin has a positive integer value. Your task is to calculate the number of distinct ways you can produce a money sum x using the available coins.

For example, if the coins are $\{2, 3, 5\}$ and the desired sum is 9, there are 8 ways:

- $2 + 2 + 5$
- $2 + 5 + 2$
- $5 + 2 + 2$
- $3 + 3 + 3$
- $2 + 2 + 2 + 3$
- $2 + 2 + 3 + 2$
- $2 + 3 + 2 + 2$
- $3 + 2 + 2 + 2$

Input

The first input line has two integers n and x: the number of coins and the desired sum of money.

The second line has n distinct integers $c_1, c_2, \ldots, c_n$: the value of each coin.

Output

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

Constraints

- $1 \le n \le 100$
- $1 \le x \le 10^6$
- $1 \le c_i \le 10^6$

Example

Input	Output
3 9 2 3 5	8

Problem D. Coin Combinations II

Time Limit 1000 ms
Mem Limit 524288 kB

Consider a money system consisting of n coins. Each coin has a positive integer value. Your task is to calculate the number of distinct *ordered* ways you can produce a money sum x using the available coins.

For example, if the coins are $\{2, 3, 5\}$ and the desired sum is 9, there are 3 ways:

- $2 + 2 + 5$
- $3 + 3 + 3$
- $2 + 2 + 2 + 3$

Input

The first input line has two integers n and x: the number of coins and the desired sum of money.

The second line has n distinct integers $c_1, c_2, \ldots, c_n$: the value of each coin.

Output

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

Constraints

- $1 \le n \le 100$
- $1 \le x \le 10^6$
- $1 \le c_i \le 10^6$

Example

Input	Output
3 9 2 3 5	3

Problem E. Removing Digits

Time Limit 1000 ms
Mem Limit 524288 kB

You are given an integer n. On each step, you may subtract one of the digits from the number.

How many steps are required to make the number equal to 0?

Input

The only input line has an integer n.

Output

Print one integer: the minimum number of steps.

Constraints

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

Example

Input	Output
27	5

Explanation: An optimal solution is $27 \to 20 \to 18 \to 10 \to 9 \to 0$.

Problem F. Grid Paths

Time Limit 1000 ms
Mem Limit 524288 kB

Consider an $n \times n$ grid whose squares may have traps. It is not allowed to move to a square with a trap.

Your task is to calculate the number of paths from the upper-left square to the lower-right square. You can only move right or down.

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: `.` denotes an empty cell, and `*` denotes a trap.

Output

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

Constraints

- $1 \le n \le 1000$

Example

Input	Output
4 .... .*.. ...* *...	3

Problem G. Book Shop

Time Limit 1000 ms
Mem Limit 524288 kB

You are in a book shop which sells n different books. You know the price and number of pages of each book.

You have decided that the total price of your purchases will be at most x. What is the maximum number of pages you can buy? You can buy each book at most once.

Input

The first input line contains two integers n and x: the number of books and the maximum total price.

The next line contains n integers $h_1, h_2, \ldots, h_n$: the price of each book.

The last line contains n integers $s_1, s_2, \ldots, s_n$: the number of pages of each book.

Output

Print one integer: the maximum number of pages.

Constraints

- $1 \leq n \leq 1000$
- $1 \leq x \leq 10^5$
- $1 \leq h_i, s_i \leq 1000$

Example

Input	Output
4 10 4 8 5 3 5 12 8 1	13

Explanation: You can buy books 1 and 3. Their price is $4 + 5 = 9$ and the number of pages is $5 + 8 = 13$.

Problem H. Array Description

Time Limit 1000 ms
Mem Limit 524288 kB

You know that an array has n integers between 1 and m, and the absolute difference between two adjacent values is at most 1.

Given a description of the array where some values may be unknown, your task is to count the number of arrays that match the description.

Input

The first input line has two integers n and m: the array size and the upper bound for each value.

The next line has n integers $x_1, x_2, \ldots, x_n$: the contents of the array. Value 0 denotes an unknown value.

Output

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

Constraints

- $1 \leq n \leq 10^5$
- $1 \leq m \leq 100$
- $0 \leq x_i \leq m$

Example

Input	Output
3 5 2 0 2	3

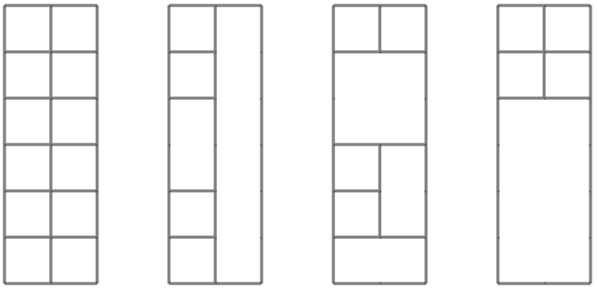
Explanation: The arrays $[2, 1, 2]$, $[2, 2, 2]$ and $[2, 3, 2]$ match the description.

Problem I. Counting Towers

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to build a tower whose width is 2 and height is n. You have an unlimited supply of blocks whose width and height are integers.

For example, here are some possible solutions for $n = 6$:



Given n, how many different towers can you build? Mirrored and rotated towers are counted separately if they look different.

Input

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

After this, there are t lines, and each line contains an integer n: the height of the tower.

Output

For each test, print the number of towers modulo $10^9 + 7$.

Constraints

- $1 \le t \le 100$
- $1 \le n \le 10^6$

Example

Input	Output
3 2 6 1337	8 2864 640403945

Problem J. Edit Distance

Time Limit 1000 ms
Mem Limit 524288 kB

The *edit distance* between two strings is the minimum number of operations required to transform one string into the other.

The allowed operations are:

- Add one character to the string.
- Remove one character from the string.
- Replace one character in the string.

For example, the edit distance between LOVE and MOVIE is 2, because you can first replace L with M, and then add I.

Your task is to calculate the edit distance between two strings.

Input

The first input line has a string that contains n characters between A–Z.

The second input line has a string that contains m characters between A–Z.

Output

Print one integer: the edit distance between the strings.

Constraints

- $1 \leq n, m \leq 5000$

Example

Input	Output
LOVE MOVIE	2

Problem K. Longest Common Subsequence

Time Limit 1000 ms
Mem Limit 524288 kB

Given two arrays of integers, find their longest common subsequence.

A subsequence is a sequence of array elements from left to right that can contain gaps. A common subsequence is a subsequence that appears in both arrays.

Input

The first line has two integers n and m: the sizes of the arrays.

The second line has n integers $a_1, a_2, \ldots, a_n$: the contents of the first array.

The third line has m integers $b_1, b_2, \ldots, b_m$: the contents of the second array.

Output

First print the length of the longest common subsequence.

After that, print an example of such a sequence. If there are several solutions, you can print any of them.

Constraints

- $1 \leq n, m \leq 1000$
- $1 \leq a_i, b_i \leq 10^9$

Example

Input	Output
8 6 3 1 3 2 7 4 8 2 6 5 1 2 3 4	3 1 2 4

Problem L. Rectangle Cutting

Time Limit 1000 ms
Mem Limit 524288 kB

Given an $a \times b$ rectangle, your task is to cut it into squares. On each move you can select a rectangle and cut it into two rectangles in such a way that all side lengths remain integers. What is the minimum possible number of moves?

Input

The only input line has two integers a and b.

Output

Print one integer: the minimum number of moves.

Constraints

- $1 \leq a, b \leq 500$

Example

Input	Output
3 5	3

Problem M. Minimal Grid Path

Time Limit 1000 ms
Mem Limit 524288 kB

You are given an $n \times n$ grid whose each square contains a letter.

You should move from the upper-left square to the lower-right square. You can only move right or down.

What is the lexicographically minimal string you can construct?

Input

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

After this, there are n lines that describe the grid. Each line has n letters between `A` and `Z`.

Output

Print the lexicographically minimal string.

Constraints

- $1 \leq n \leq 3000$

Example

Input	Output
4 AACA BABC ABDA AACA	AAABACA

Problem N. Money Sums

Time Limit 1000 ms
Mem Limit 524288 kB

You have n coins with certain values. Your task is to find all money sums you can create using these coins.

Input

The first input line has an integer n: the number of coins.

The next line has n integers $x_1, x_2, \ldots, x_n$: the values of the coins.

Output

First print an integer k: the number of distinct money sums. After this, print all possible sums in increasing order.

Constraints

- $1 \leq n \leq 100$
- $1 \leq x_i \leq 1000$

Example

Input	Output
4 4 2 5 2	9 2 4 5 6 7 8 9 11 13

Problem O. Removal Game

Time Limit 1000 ms
Mem Limit 524288 kB

There is a list of n numbers and two players who move alternately. On each move, a player removes either the first or last number from the list, and their score increases by that number. Both players try to maximize their scores.

What is the maximum possible score for the first player when both players play optimally?

Input

The first input line contains an integer n: the size of the list.

The next line has n integers $x_1, x_2, \ldots, x_n$: the contents of the list.

Output

Print the maximum possible score for the first player.

Constraints

- $1 \le n \le 5000$
- $-10^9 \le x_i \le 10^9$

Example

Input	Output
4 4 5 1 3	8

Problem P. Two Sets II

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to count the number of ways numbers $1, 2, \ldots, n$ can be divided into two sets of equal sum.

For example, if $n = 7$, there are four solutions:

- $\{1, 3, 4, 6\}$ and $\{2, 5, 7\}$
- $\{1, 2, 5, 6\}$ and $\{3, 4, 7\}$
- $\{1, 2, 4, 7\}$ and $\{3, 5, 6\}$
- $\{1, 6, 7\}$ and $\{2, 3, 4, 5\}$

Input

The only input line contains an integer n.

Output

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

Constraints

- $1 \le n \le 500$

Example

Input	Output
7	4

Problem Q. Mountain Range

Time Limit 1000 ms
Mem Limit 524288 kB

There are n mountains in a row, each with a specific height. You begin your hang gliding route from some mountain.

You can glide from mountain a to mountain b if mountain a is taller than mountain b and all mountains between a and b.

What is the maximum number of mountains you can visit on your route?

Input

The first line has an integer n: the number of mountains.

The next line has n integers $h_1, h_2, \ldots, h_n$: the heights of the mountains.

Output:

Print one integer: the maximum number of mountains.

Constraints

- $1 \leq n \leq 2 \cdot 10^5$
- $1 \leq h_i \leq 10^9$

Example

Input	Output
10 20 15 17 35 25 40 12 19 13 12	5

Problem R. Increasing Subsequence

Time Limit 1000 ms
Mem Limit 524288 kB

You are given an array containing n integers. Your task is to determine the longest increasing subsequence in the array, i.e., the longest subsequence where every element is larger than the previous one.

A subsequence is a sequence that can be derived from the array by deleting some elements without changing the order of the remaining elements.

Input

The first line contains an integer n: the size of the array.

After this there are n integers $x_1, x_2, \ldots, x_n$: the contents of the array.

Output

Print the length of the longest increasing subsequence.

Constraints

- $1 \leq n \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$

Example

Input	Output
8 7 3 5 3 6 2 9 8	4

Problem S. Projects

Time Limit 1000 ms
Mem Limit 524288 kB

There are n projects you can attend. For each project, you know its starting and ending days and the amount of money you would get as reward. You can only attend one project during a day.

What is the maximum amount of money you can earn?

Input

The first input line contains an integer n: the number of projects.

After this, there are n lines. Each such line has three integers a_i, b_i, and p_i: the starting day, the ending day, and the reward.

Output

Print one integer: the maximum amount of money you can earn.

Constraints

- $1 \leq n \leq 2 \cdot 10^5$
- $1 \leq a_i \leq b_i \leq 10^9$
- $1 \leq p_i \leq 10^9$

Example

Input	Output
4 2 4 4 3 6 6 6 8 2 5 7 3	7

Problem T. Elevator Rides

Time Limit 1000 ms
Mem Limit 524288 kB

There are n people who want to get to the top of a building which has only one elevator. You know the weight of each person and the maximum allowed weight in the elevator. What is the minimum number of elevator rides?

Input

The first input line has two integers n and x: the number of people and the maximum allowed weight in the elevator.

The second line has n integers $w_1, w_2, \ldots, w_n$: the weight of each person.

Output

Print one integer: the minimum number of rides.

Constraints

- $1 \leq n \leq 20$
- $1 \leq x \leq 10^9$
- $1 \leq w_i \leq x$

Example

Input	Output
4 10 4 8 6 1	2

Problem U. Counting Tilings

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to count the number of ways you can fill an $n \times m$ grid using 1×2 and 2×1 tiles.

Input

The only input line has two integers n and m.

Output

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

Constraints

- $1 \leq n \leq 10$
- $1 \leq m \leq 1000$

Example

Input	Output
4 7	781

Problem V. Counting Numbers

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to count the number of integers between a and b where no two adjacent digits are the same.

Input

The only input line has two integers a and b.

Output

Print one integer: the answer to the problem.

Constraints

- $0 \le a \le b \le 10^{18}$

Example

Input	Output
123 321	171

Problem W. Increasing Subsequence II

Time Limit 1000 ms
Mem Limit 524288 kB

Given an array of n integers, your task is to calculate the number of increasing subsequences it contains. If two subsequences have the same values but in different positions in the array, they are counted separately.

Input

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

The second line has n integers $x_1, x_2, \ldots, x_n$: the contents of the array.

Output

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

Constraints

- $1 \leq n \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$

Example

Input	Output
3 2 1 3	5

Explanation: The increasing subsequences are $[2]$, $[1]$, $[3]$, $[2, 3]$ and $[1, 3]$.