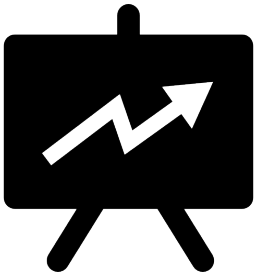
Problem A — limit 1 second

Zigzag



Your Ph.D. thesis on properties of integer sequences is coming along nicely. Each chapter is on a different type of sequence. The first covers arithmetic sequences. Subsequently you cover binomial sequences, computable sequences, decreasing sequences, and so on. You have one more chapter to write, on zigzagging sequences.

A sequence is *zigzagging* if adjacent elements alternate between strictly increasing and strictly decreasing. The first pair of numbers can be either strictly increasing or strictly decreasing.

For a given sequence, find the length of its longest zigzagging subsequence.

Input

The first line of input contains a single integer n ($1 \leq n \leq 50$), the length of the sequence.

The second line contains n space-separated integers, describing the sequence.

Every number in the sequence is guaranteed to be between 1 and 50, inclusive.

Output

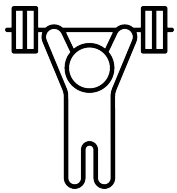
Print, on a single line, the length of a longest zigzagging subsequence of the input sequence.

Sample Input	**Sample Output**
5 2 1 3 4 2	4

Sample Input	**Sample Output**
10 1 1 1 1 1 1 1 1 1 1	1

Problem B — limit 1 second

Barbells



Your local gym has n barbells and m plates. In order to prepare a weight for lifting, you must choose a single barbell, which has two sides. You then load each side with a (possibly empty) set of plates. For safety reasons, the plates on each side must sum to the same weight. What weights are available for lifting?

For example, suppose that there are two barbells weighing 100 and 110 grams, and five plates weighting 1, 4, 5, 5, and 6 grams, respectively. Then, there are six possible weights available for lifting. The table below shows one way to attain the different weights:

Barbell	Left side	Right side	Total
100	0	0	100
100	5	5	110
100	$1+5$	6	112
110	5	5	120
110	$1+5$	6	122
110	$5+5$	$4+6$	130

Input

The first line of input contains the space-separated integers n and m ($1 \leq n, m \leq 14$).

The second line of input contains n space-separated integers $b_1, \ldots, b_n$ ($1 \leq b_i \leq 10^8$), denoting the weights of the barbells in grams.

The third line of input contains m space-separated integers $p_1, \ldots, p_m$ ($1 \leq p_i \leq 10^8$), denoting the weights of the plates in grams.

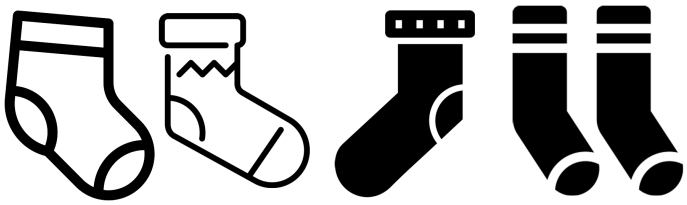
Output

Print a sorted list of all possible distinct weights in grams, one per line.

Sample Input	Sample Output
2 5 100 110 5 5 1 4 6	100 110 112 120 122 130

Problem C — limit 1 second

Mismatched Socks



Fred likes to wear mismatched socks. This sometimes means he has to plan ahead.

Suppose his sock drawer has 1 red, 1 blue, and 2 green socks. If he wears the red with the blue, he is stuck with matching green socks the next day. Given the contents of his sock drawer, how many pairs of mismatched socks can he put together?

Input

The first line of input contains a single integer n ($1 \leq n \leq 1{,}000$), the number of different colors of socks in Fred's drawer.

The ith of the next n lines contains a single integer k_i ($1 \leq k_i \leq 10^9$), the number of socks of the ith color.

Output

Print, on a single line, the maximum number of mismatched pairs of socks that Fred can make with the contents of his sock drawer.

Sample Input	Sample Output
3 1 2 1	2

Sample Input	Sample Output
5 1 2 1 10 3	7

Problem D — limit 4 seconds

Contest Strategy

You are participating in the Association for Computing Machinery's Intercollegiate Programming Competition (ACM ICPC). You must complete a set of n problems. Since you are an experienced problem solver, you can read a problem and accurately estimate how long it will take to solve it, in a negligible amount of time.

Let t_i be the time it will take to solve the ith problem. Your strategy for the contest is as follows:

1. Read k random problems.
2. Choose a problem that you have read that will take the shortest time to solve (if there are ties, choose any of them arbitrarily).
3. Solve the problem, and read a random unread problem (if there is any).
4. If there are still unsolved problems, go back to step 2.

Your penalty time for the contest is defined by the sum of submission times for all the problems. Of course, your penalty time depends on the order in which the problems are read. What is the sum of penalty times, over all $n!$ possible different orders you read the problems in? Since the result can be very large, find the answer modulo $10^9 + 7$.

Input

The first line of input contains two space-separated integers n and k ($1 \leq k \leq n \leq 300$).

The ith line of the next n lines contains a single integer t_i ($1 \leq t_i \leq 1{,}000{,}000$).

Output

Print, on a single line, a single integer representing the sum of penalty times over all possible orders you read the problems in, modulo $10^9 + 7$.

Sample Input	Sample Output
4 3 1 3 2 1	336

Sample Input	Sample Output
10 2 1000000 2 152 49 93064 438953 438 9238 9065 1274	513850896

Problem E — limit 2 seconds

Maximum Islands

You are mapping a faraway planet using a satellite.

Your satellite has captured an image of the planet's surface. The photographed section can be modeled as a grid. Each grid cell is either land, water, or covered by clouds. Clouds mean that the surface could either be land or water, but we can't tell.

An island is a set of connected land cells. Two cells are considered connected if they share an edge.

Given the image, determine the maximum number of islands that is consistent with the given information.

Input

The first line of input contains two space-separated integers n and m ($1 \leq n, m \leq 40$).

Each of the next n lines contains m characters, describing the satellite image. Land cells are denoted by '`L`', water cells are denoted by '`W`', and cells covered by clouds are denoted by '`C`'.

Output

Print, on a single line, a single integer indicating the maximum number of islands that is consistent with the given grid.

Sample Input	Sample Output
5 4 LLWL CCCC CCCC CCCC LWLL	8

F. Vera And LCS

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Vera is learning about the longest common subsequence problem.

A string is a (possibly empty) sequence of lowercase letters. A subsequence of a string S is a string obtained by deleting some letters of S (possibly none or all). For example "vra", "a", "", and "$vera$" are all subsequences of "$vera$". The longest common subsequence (LCS) of two strings A, B is a string that is a subsequence of A and B and has the maximum length among all strings that are a subsequence of A and B. There could be multiple LCS for two given strings. For example a LCS of "$vera$" and "$eats$" is "ea".

For homework she was given two strings A, B, both of length N and she had to determine the length of the LCS of A and B. She determined the answer to be K but lost B. Given A and K, help her find a possible value of B. It's possible that Vera may have made a mistake and no such B exists, in that case output "$WRONGANSWER$" (without quotes).

Constraints:

$1 \leq N \leq 2000$

$0 \leq K \leq 2000$

N, K are integers

A consists of N lowercase letters

Input
The input will be in the format:

$N\ K$

A

Output
Output one line consisting of the string B of N lowercase letters, or "$WRONGANSWER$" if no B is valid. If there are multiple correct B output any of them.

Examples

input
4 2 vera
output
eats

input
4 5 vera
output
WRONGANSWER

Note
For the first example, another possible answer is "$uber$".

Problem G — limit 2 seconds

Enclosure

In the Dark Forest, the territory you control is defined by the smallest convex polygon that contains all trees you control. Your power is defined by the area of the territory you control.

You currently control k out of n trees in the Dark Forest. What is the highest power you can achieve by gaining control over a single additional tree somewhere in the forest?

Input

The first line of input consists of two space-separated integers n and k ($3 \leq k < n \leq 100{,}000$).

Next follow n lines each with two space-separated integers x_i and y_i ($|x_i|, |y_i| \leq 10^9$) specifying the locations of the n trees. You control the first k trees given in the list; the other $n - k$ trees do not belong to you. (Note that some of these may still be inside your territory.)

It is guaranteed that no three trees have collinear locations.

Output

Print, on a single line, the maximum power you can achieve by gaining control over a single additional tree. The output should be rounded and displayed to exactly one decimal place.

Sample Input	Sample Output
5 3 -5 -5 -5 5 5 -5 -4 6 5 5	100.0