unioeste

Maratoninha

2ª Competição – 21 Julho 2023

8h30 – 13h00

Maratona de Programação

PROBLEMA A

CSES Problem Set

Increasing Array

TASK | STATISTICS

Time limit: 1.00 s **Memory limit:** 512 MB

You are given an array of n integers. You want to modify the array so that it is increasing, i.e., every element is at least as large as the previous element.

On each move, you may increase the value of any element by one. What is the minimum number of moves required?

Input

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

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

Output

Print the minimum number of moves.

Constraints

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

Example

Input:
```
5
3 2 5 1 7
```

Output:
```
5
```

PROBLEMA B

E - Knapsack 2 Editorial

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 100 points

Problem Statement

There are N items, numbered $1, 2, \ldots, N$. For each i $(1 \leq i \leq N)$, Item i has a weight of w_i and a value of v_i.

Taro has decided to choose some of the N items and carry them home in a knapsack. The capacity of the knapsack is W, which means that the sum of the weights of items taken must be at most W.

Find the maximum possible sum of the values of items that Taro takes home.

Constraints

- All values in input are integers.
- $1 \leq N \leq 100$
- $1 \leq W \leq 10^9$
- $1 \leq w_i \leq W$
- $1 \leq v_i \leq 10^3$

Input

Input is given from Standard Input in the following format:

$$
\begin{array}{ll}
N & W \\
w_1 & v_1 \\
w_2 & v_2 \\
: & \\
w_N & v_N
\end{array}
$$

Output

Print the maximum possible sum of the values of items that Taro takes home.

PROBLEMA B parte 2

Sample Input 1 Copy

```
3 8
3 30
4 50
5 60
```

Sample Output 1 Copy

```
90
```

Items 1 and 3 should be taken. Then, the sum of the weights is $3 + 5 = 8$, and the sum of the values is $30 + 60 = 90$.

Sample Input 2 Copy

```
1 1000000000
1000000000 10
```

Sample Output 2 Copy

```
10
```

Sample Input 3 Copy

```
6 15
6 5
5 6
6 4
6 6
3 5
7 2
```

Sample Output 3 Copy

```
17
```

Items 2, 4 and 5 should be taken. Then, the sum of the weights is $5 + 6 + 3 = 14$, and the sum of the values is $6 + 6 + 5 = 17$.

PROBLEMA C

CSES Problem Set

Grid Paths

TASK | STATISTICS

Time limit: 1.00 s **Memory limit:** 512 MB

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

- $1 \leq n \leq 1000$

Example

Input:
```
4
....
.*..
...*
*...
```

Output:
```
3
```

PROBLEMA D

E. Cyclic Components

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

You are given an undirected graph consisting of n vertices and m edges. Your task is to find the number of connected components which are cycles.

Here are some definitions of graph theory.

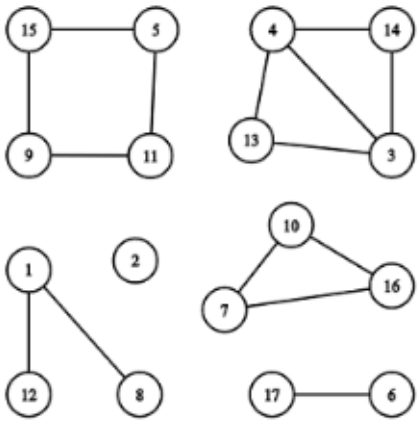
An undirected graph consists of two sets: set of nodes (called vertices) and set of edges. Each edge connects a pair of vertices. All edges are bidirectional (i.e. if a vertex a is connected with a vertex b, a vertex b is also connected with a vertex a). An edge can't connect vertex with itself, there is at most one edge between a pair of vertices.

Two vertices u and v belong to the same connected component if and only if there is at least one path along edges connecting u and v.

A connected component is a cycle if and only if its vertices can be reordered in such a way that:

- the first vertex is connected with the second vertex by an edge,
- the second vertex is connected with the third vertex by an edge,
- ...
- the last vertex is connected with the first vertex by an edge,
- all the described edges of a cycle are distinct.

A cycle doesn't contain any other edges except described above. By definition any cycle contains three or more vertices.



There are 6 connected components, 2 of them are cycles: $[7, 10, 16]$ and $[5, 11, 9, 15]$.

Input

The first line contains two integer numbers n and m ($1 \le n \le 2 \cdot 10^5$, $0 \le m \le 2 \cdot 10^5$) — number of vertices and edges.

The following m lines contains edges: edge i is given as a pair of vertices v_i, u_i ($1 \le v_i, u_i \le n$, $u_i \ne v_i$). There is no multiple edges in the given graph, i.e. for each pair (v_i, u_i) there no other pairs (v_i, u_i) and (u_i, v_i) in the list of edges.

Output

Print one integer — the number of connected components which are also cycles.

PROBLEMA D parte 2

Examples

input Copy

```
5 4
1 2
3 4
5 4
3 5
```

output Copy

```
1
```

input Copy

```
17 15
1 8
1 12
5 11
11 9
9 15
15 5
4 13
3 13
4 3
10 16
7 10
16 7
14 3
14 4
17 6
```

output Copy

```
2
```

Note

In the first example only component $[3, 4, 5]$ is also a cycle.

The illustration above corresponds to the second example.

PROBLEMA E

D - Sum of difference

Editorial

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 400 points

Problem Statement

Given are N integers $A_1, \ldots, A_N$.

Find the sum of $|A_i - A_j|$ over all pairs i, j such that $1 \leq i < j \leq N$.

In other words, find $\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} |A_i - A_j|$.

Constraints

- $2 \leq N \leq 2 \times 10^5$
- $|A_i| \leq 10^8$
- A_i is an integer.

Input

Input is given from Standard Input in the following format:

$$N$$
$$A_1 \ \ldots \ A_N$$

Output

Print the answer.

Sample Input 1

Copy

```
3
5 1 2
```

Copy

Sample Output 1

Copy

```
8
```

Copy

We have $|5 - 1| + |5 - 2| + |1 - 2| = 8$.

Sample Input 2

Copy

```
5
31 41 59 26 53
```

Copy

Sample Output 2

Copy

```
176
```

Copy

PROBLEMA F

CSES Problem Set

Binomial Coefficients

TASK | STATISTICS

Time limit: 1.00 s **Memory limit:** 512 MB

Your task is to calculate n binomial coefficients modulo 10^9+7.

A binomial coefficient $\binom{a}{b}$ can be calculated using the formula $\frac{a!}{b!(a-b)!}$. We assume that a and b are integers and $0 \leq b \leq a$.

Input

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

After this, there are n lines, each of which contains two integers a and b.

Output

Print each binomial coefficient modulo 10^9+7.

Constraints

- $1 \leq n \leq 10^5$
- $0 \leq b \leq a \leq 10^6$

Example

Input:
```
3
5 3
8 1
9 5
```

Output:
```
10
8
126
```

PROBLEMA G

Nim Game I

TASK | STATISTICS

Time limit: 1.00 s **Memory limit:** 512 MB

There are n heaps of sticks and two players who move alternately. On each move, a player chooses a non-empty heap and removes any number of sticks. The player who removes the last stick wins the game.

Your task is to find out who wins if both players play optimally.

Input

The first input line contains an integer t: the number of tests. After this, t test cases are described:

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

The next line has n integers $x_1, x_2, \ldots, x_n$: the number of sticks in each heap.

Output

For each test case, print "first" if the first player wins the game and "second" if the second player wins the game.

Constraints

- $1 \leq t \leq 2 \cdot 10^5$
- $1 \leq n \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$
- the sum of all n is at most $2 \cdot 10^5$

Example

Input:
```
3
4
5 7 2 5
2
4 1
3
3 5 6
```

Output:
```
first
first
second
```

PROBLEMA H

CSES Problem Set

Palindrome Reorder

TASK | STATISTICS

Time limit: 1.00 s **Memory limit:** 512 MB

Given a string, your task is to reorder its letters in such a way that it becomes a palindrome (i.e., it reads the same forwards and backwards).

Input

The only input line has a string of length n consisting of characters A–Z.

Output

Print a palindrome consisting of the characters of the original string. You may print any valid solution. If there are no solutions, print "NO SOLUTION".

Constraints

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

Example

Input:
AAAACACBA

Output:
AACABACAA

PROBLEMA I

C. Present

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

Little beaver is a beginner programmer, so informatics is his favorite subject. Soon his informatics teacher is going to have a birthday and the beaver has decided to prepare a present for her. He planted n flowers in a row on his windowsill and started waiting for them to grow. However, after some time the beaver noticed that the flowers stopped growing. The beaver thinks it is bad manners to present little flowers. So he decided to come up with some solutions.

There are m days left to the birthday. The height of the i-th flower (assume that the flowers in the row are numbered from 1 to n from left to right) is equal to a_i at the moment. At each of the remaining m days the beaver can take a special watering and water w contiguous flowers (he can do that only once at a day). At that each watered flower grows by one height unit on that day. The beaver wants the height of the smallest flower be as large as possible in the end. What maximum height of the smallest flower can he get?

Input

The first line contains space-separated integers n, m and w ($1 \le w \le n \le 10^5$; $1 \le m \le 10^5$). The second line contains space-separated integers $a_1, a_2, ..., a_n$ ($1 \le a_i \le 10^9$).

Output

Print a single integer — the maximum final height of the smallest flower.

Examples

input	Copy
6 2 3 2 2 2 2 1 1	
output	Copy
2	

input	Copy
2 5 1 5 8	
output	Copy
9	

Note

In the first sample beaver can water the last 3 flowers at the first day. On the next day he may not to water flowers at all. In the end he will get the following heights: [2, 2, 2, 3, 2, 2]. The smallest flower has height equal to 2. It's impossible to get height 3 in this test.

PROBLEMA J

A - Echo

Editorial

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 100 points

Problem Statement

You are given a string S of length N consisting of lowercase English letters.
We denote the i-th character of S by S_i.
Print the string of length $2N$ obtained by concatenating $S_1, S_1, S_2, S_2, \ldots, S_N, S_N$ in this order.
For example, if S is `beginner`, print `bbeeggiinnnneerr`.

Constraints

- N is an integer such that $1 \leq N \leq 50$.
- S is a string of length N consisting of lowercase English letters.

Input

The input is given from Standard Input in the following format:

```
N
S
```

Output

Print the answer.

Sample Input 1

```
8
beginner
```

Sample Output 1

```
bbeeggiinnnneerr
```

It is the same as the example described in the problem statement.

Sample Input 2

```
3
aaa
```

Sample Output 2

```
aaaaaa
```

PROBLEMA K

A. Forbidden Integer

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

You are given an integer n, which you want to obtain. You have an unlimited supply of every integer from 1 to k, except integer x (there are no integer x at all).

You are allowed to take an arbitrary amount of each of these integers (possibly, zero). Can you make the sum of taken integers equal to n?

If there are multiple answers, print any of them.

Input

The first line contains a single integer t ($1 \le t \le 100$) — the number of testcases.

The only line of each testcase contains three integers n, k and x ($1 \le x \le k \le n \le 100$).

Output

For each test case, in the first line, print "YES" or "NO" — whether you can take an arbitrary amount of each integer from 1 to k, except integer x, so that their sum is equal to n.

If you can, the second line should contain a single integer m — the total amount of taken integers. The third line should contain m integers — each of them from 1 to k, not equal to x, and their sum is n.

If there are multiple answers, print any of them.

Example

input Copy

```
5
10 3 2
5 2 1
4 2 1
7 7 3
6 1 1
```

output Copy

```
YES
6
3 1 1 1 1 3
NO
YES
2
2 2
YES
1
7
NO
```

Note

Another possible answer for the first testcase is $[3, 3, 3, 1]$. Note that you don't have to minimize the amount of taken integers. There also exist other answers.

In the second testcase, you only have an unlimited supply of integer 2. There is no way to get sum 5 using only them.

In the fifth testcase, there are no integers available at all, so you can't get any positive sum.

PROBLEMA L

A. New Palindrome

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

A palindrome is a string that reads the same from left to right as from right to left. For example, `abacaba`, `aaaa`, `abba`, `racecar` are palindromes.

You are given a string s consisting of lowercase Latin letters. The string s is a palindrome.

You have to check whether it is possible to rearrange the letters in it to get **another** palindrome (not equal to the given string s).

Input

The first line contains a single integer t ($1 \le t \le 1000$) — the number of test cases.

The only line of each test case contains a string s ($2 \le |s| \le 50$) consisting of lowercase Latin letters. This string is a palindrome.

Output

For each test case, print `YES` if it is possible to rearrange the letters in the given string to get **another** palindrome. Otherwise, print `NO`.

You may print each letter in any case (`YES`, `yes`, `Yes` will all be recognized as positive answer, `NO`, `no` and `nO` will all be recognized as negative answer).

Example

input Copy

```
3
codedoc
gg
aabaa
```

output Copy

```
YES
NO
NO
```

Note

In the first test case, it is possible to rearrange the letters in the palindrome `codedoc` to obtain the string `ocdedco`, which is different from the given string, but also a palindrome.