Problem A. Reverse

Time Limit	2000 ms
Mem Limit	1048576 kB
OS	Linux

Jóna needs a program. The program should read in integers and print them in reverse order. Jóna asks for your help.

Input

The first line contains the integer n. Then there is a list of n integers, each on their own line. Each integer will be between 0 and 10^9.

Output

Print the list in the reverse order compared to the input.

Scoring

Group	Points	Constraints
1	25	$n = 1$
2	25	$1 \leq n \leq 5$
3	25	$1 \leq n \leq 10^3$
4	25	$1 \leq n \leq 2 \cdot 10^5$

Sample 1

Input	Output
5 1 2 3 4 5	5 4 3 2 1

Sample 2

Input	Output
3 10 12 9	9 12 10

Problem B. Weird Algorithm

Time Limit 1000 ms
Mem Limit 524288 kB

Consider an algorithm that takes as input a positive integer n. If n is even, the algorithm divides it by two, and if n is odd, the algorithm multiplies it by three and adds one. The algorithm repeats this, until n is one. For example, the sequence for $n = 3$ is as follows:

$$3 \to 10 \to 5 \to 16 \to 8 \to 4 \to 2 \to 1$$

Your task is to simulate the execution of the algorithm for a given value of n.

Input

The only input line contains an integer n.

Output

Print a line that contains all values of n during the algorithm.

Constraints

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

Example

Input	Output
3	3 10 5 16 8 4 2 1

Problem C. Missing Number

Time Limit 1000 ms
Mem Limit 524288 kB

You are given all numbers between $1, 2, \ldots, n$ except one. Your task is to find the missing number.

Input

The first input line contains an integer n.

The second line contains $n - 1$ numbers. Each number is distinct and between 1 and n (inclusive).

Output

Print the missing number.

Constraints

- $2 \leq n \leq 2 \cdot 10^5$

Example

Input	Output
5 2 3 1 5	4

Problem D. No Duplicates

Time Limit	1000 ms
Mem Limit	1048576 kB
OS	Linux

There is a game in which you try not to repeat a word while your opponent tries to see if you have repeated one.

"THE RAIN IN SPAIN" has no repeats.

"IN THE RAIN AND THE SNOW" repeats THE.

"THE RAIN IN SPAIN IN THE PLAIN" repeats THE and IN.

Write a program to test a phrase.

Input

Input is a line containing words separated by single spaces, where a word consists of one or more uppercase letters. A line contains no more than 80 characters.

Output

The output is "yes" if no word is repeated, and "no" if one or more words repeat.

Sample 1

Input	Output
THE RAIN IN SPAIN	yes

Sample 2

Input	Output
IN THE RAIN AND THE SNOW	no

Sample 3

Input	Output
THE RAIN IN SPAIN IN THE PLAIN	no

Problem E. I've Been Everywhere, Man

Time Limit	1000 ms
Mem Limit	1048576 kB
OS	Linux

Alice travels a lot for her work. Each time she travels, she visits a single city before returning home.

Someone recently asked her "how many different cities have you visited for work?" Thankfully Alice has kept a log of her trips. Help Alice figure out the number of cities she has visited at least once.

Input

The first line of input contains a single positive integer $T \leq 50$ indicating the number of test cases. The first line of each test case also contains a single positive integer n indicating the number of work trips Alice has taken so far. The following n lines describe these trips. The ith such line simply contains the name of the city Alice visited on her ith trip.

Alice's work only sends her to cities with *simple* names: city names only contain lowercase letters, have at least one letter, and do not contain spaces.

The number of trips is at most 100 and no city name contains more than 20 characters.

Output

For each test case, simply output a single line containing a single integer that is the number of distinct cities that Alice has visited on her work trips.

Sample 1

Input	Output
2 7 saskatoon toronto winnipeg toronto vancouver saskatoon toronto 3 edmonton edmonton edmonton	4 1

Problem F. Good Sequence

Time Limit 2000 ms

Problem Statement

You are given a sequence of positive integers of length N, $a = (a_1, a_2, ..., a_N)$. Your objective is to remove some of the elements in a so that a will be a **good sequence**.

Here, an sequence b is a **good sequence** when the following condition holds true:

- For each element x in b, the value x occurs exactly x times in b.

For example, $(3, 3, 3)$, $(4, 2, 4, 1, 4, 2, 4)$ and $()$ (an empty sequence) are good sequences, while $(3, 3, 3, 3)$ and $(2, 4, 1, 4, 2)$ are not.

Find the minimum number of elements that needs to be removed so that a will be a good sequence.

Constraints

- $1 \leq N \leq 10^5$
- a_i is an integer.
- $1 \leq a_i \leq 10^9$

Input

Input is given from Standard Input in the following format:

```
N
a_1 a_2 ... a_N
```

Output

Print the minimum number of elements that needs to be removed so that a will be a good sequence.

Sample 1

Input	Output
4 3 3 3 3	1

We can, for example, remove one occurrence of 3. Then, $(3, 3, 3)$ is a good sequence.

Sample 2

Input	Output
5 2 4 1 4 2	2

We can, for example, remove two occurrences of 4. Then, $(2, 1, 2)$ is a good sequence.

Sample 3

Input	Output
6 1 2 2 3 3 3	0

Sample 4

Input	Output
1 1000000000	1

Remove one occurrence of 10^9. Then, $()$ is a good sequence.

Sample 5

Input	Output
8 2 7 1 8 2 8 1 8	5

Problem G. Jolly Jumpers

Time Limit	1000 ms
Mem Limit	1048576 kB
OS	Linux

A sequence of $n > 0$ integers is called a jolly jumper if the absolute values of the difference between successive elements take on all the values 1 through $n - 1$. For instance,

```
1 4 2 3
```

is a jolly jumper, because the absolutes differences are 3, 2, and 1 respectively. The definition implies that any sequence of a single integer is a jolly jumper. You are to write a program to determine whether or not each of a number of sequences is a jolly jumper.

Input

Each line of input contains an integer $n \leq 3000$ followed by n integers representing the sequence. The values in the sequence are at most 300 000 in absolute value. Input contains at most 10 lines.

Output

For each line of input, generate a line of output saying "`Jolly`" or "`Not jolly`".

Sample 1

Input	Output
4 1 4 2 3 5 1 4 2 -1 6	Jolly Not jolly

Problem H. Two Sets

Time Limit 1000 ms
Mem Limit 524288 kB

Your task is to divide the numbers $1, 2, \ldots, n$ into two sets of equal sum.

Input

The only input line contains an integer n.

Output

Print "YES", if the division is possible, and "NO" otherwise.

After this, if the division is possible, print an example of how to create the sets. First, print the number of elements in the first set followed by the elements themselves in a separate line, and then, print the second set in a similar way.

Constraints

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

Example 1

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

Example 2

Input	Output
6	NO

Problem I. Boxes Packing

Time Limit 1000 ms
Mem Limit 262144 kB

Mishka has got n empty boxes. For every i ($1 \le i \le n$), i-th box is a cube with side length a_i.

Mishka can put a box i into another box j if the following conditions are met:

- i-th box is not put into another box;
- j-th box doesn't contain any other boxes;
- box i is smaller than box j ($a_i < a_j$).

Mishka can put boxes into each other an arbitrary number of times. He wants to minimize the number of *visible* boxes. A box is called *visible* iff it is not put into some another box.

Help Mishka to determine the minimum possible number of *visible* boxes!

Input

The first line contains one integer n ($1 \le n \le 5000$) — the number of boxes Mishka has got.

The second line contains n integers a_1, a_2, ..., a_n ($1 \le a_i \le 10^9$), where a_i is the side length of i-th box.

Output

Print the minimum possible number of *visible* boxes.

Examples

Input	Output
3 1 2 3	1

Input	Output
4 4 2 4 3	2

Note

In the first example it is possible to put box 1 into box 2, and 2 into 3.

In the second example Mishka can put box 2 into box 3, and box 4 into box 1.

Problem J. Number Spiral

Time Limit 1000 ms
Mem Limit 524288 kB

A number spiral is an infinite grid whose upper-left square has number 1. Here are the first five layers of the spiral:

1	2	9	10	25
4	3	8	11	24
5	6	7	12	23
16	15	14	13	22
17	18	19	20	21

Your task is to find out the number in row y and column x.

Input

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

After this, there are t lines, each containing integers y and x.

Output

For each test, print the number in row y and column x.

Constraints

- $1 \le t \le 10^5$
- $1 \le y, x \le 10^9$

Example

Input	Output
3 2 3 1 1 4 2	8 1 15