SubsetMex

Problem Name	Subset Mex
Input file	standard input
Output file	standard output
Time limit	1 second
Memory limit	256 megabytes

A *multiset* is a collection of elements similar to a set, where elements can repeat multiple times. For example, the following is a multiset:

{0, 0, 1, 2, 2, 5, 5, 5, 8}

Given a multiset S defined on non-negative integers, and a target non-negative integer value n such that n does not belong to S, your goal is to insert n into S by using the following 3-step operation, repeatedly:

1. Choose a (possibly empty) subset T of S. Here, T is a set of distinct numbers that appear in S.
2. Erase elements of T from S. (Remove only one copy of each element.)
3. Insert **mex**(T) into S, where **mex**(T) is the smallest non-negative integer that does not belong to T. The name **mex** stands for “minimum excluded” value.

Your goal is to find the minimum number of operations to perform so that n becomes part of S.

Since the size of S may be large, it will be given in the form of a list $(f_0, \ldots, f_{n-1})$ of size n, where f_i represents the number of times that the number i appears in S. (Recall that n is the integer we are trying to insert into S.)

Input

The first line contains a single integer t ($1 \le t \le 200$) — the number of test cases. Each two of the following lines describe a test case:

- The first line of each test case contains a single integer n ($1 \le n \le 50$), representing the integer to be inserted into S.

- The second line of each test case contains n integers $f_0, f_1, \ldots, f_{n-1}$ ($0 \le f_i \le 10^{16}$), representing the multiset S as mentioned above.

Output

For each test case, print a single line containing the minimum number of operations needed to satisfy the condition.

Scoring

Subtask #1 (5 points): $n \le 2$

Subtask #2 (17 points): $n \le 20$

Subtask #3 (7 points): $f_i = 0$

Subtask #4 (9 points): $f_i \le 1$

Subtask #5 (20 points): $f_i \le 2000$

Subtask #6 (9 points): $f_0 \le 10^{16}$ and $f_j = 0$ (for all $j \neq 0$)

Subtask #7 (10 points): There exists a value i for which $f_i \le 10^{16}$ and $f_j = 0$ (for all $j \neq i$)

Subtask #8 (23 points): No additional constraints

Examples

standard input	standard output
2 4 0 3 0 3 5 4 1 0 2 0	4 10

Note

In the first example, initially, $S = \{1, 1, 1, 3, 3, 3\}$ and our goal is to have 4 in S. We can do the following:

1. choose $T = \{\}$ then S becomes $\{0, 1, 1, 1, 3, 3, 3\}$

2. choose $T = \{0, 1, 3\}$ then S becomes $\{1, 1, 2, 3, 3\}$

3. choose $T = \{1\}$ then S becomes $\{0, 1, 2, 3, 3\}$

4. choose $T = \{0, 1, 2, 3\}$ then S becomes $\{3, 4\}$