Code Jam 2022 - Qualification Round

d1000000

Problem

While the most typical type of dice have 6 sides, each of which shows a different integer 1 through 6, there are many games that use other types. In particular, a dk is a die with k sides, each of which shows a different integer 1 through k. A $d6$ is a typical die, a $d4$ has four sides, and a $d1000000$ has one million sides.

In this problem, we start with a collection of $\mathbf{N}$ dice. The i-th die is a $d\mathbf{S_i}$, that is, it has $\mathbf{S_i}$ sides showing integers 1 through $\mathbf{S_i}$. A straight of length ℓ starting at x is the list of integers $x, x+1, \ldots, x+(\ell-1)$. We want to choose some of the dice (possibly all) and pick one number from each to form a straight. What is the longest straight we can form in this way?

Input

The first line of the input gives the number of test cases, $\mathbf{T}$. $\mathbf{T}$ test cases follow. Each test case is described in two lines. The first line of a test case contains a single integer $\mathbf{N}$, the number of dice in the game. The second line contains $\mathbf{N}$ integers $\mathbf{S_1}, \mathbf{S_2}, \ldots, \mathbf{S_N}$, each representing the number of sides of a different die.

Output

For each test case, output one line containing `Case #`x`:` y, where x is the test case number (starting from 1) and y is the maximum number of input dice that can be put in a straight.

Limits

Memory limit: 1 GB.
$1 \leq \mathbf{T} \leq 100$.

Test Set 1 (Visible Verdict)

Time limit: 5 seconds.
$1 \leq \mathbf{N} \leq 10$.
$4 \leq \mathbf{S_i} \leq 20$, for all i.

Test Set 2 (Visible Verdict)

Time limit: 15 seconds.
$1 \leq \mathbf{N} \leq 10^5$.

$4 \leq \mathbf{S_i} \leq 10^6$, for all i.

Sample

Sample Input

```
4
4
6 10 12 8
6
5 4 5 4 4 4
10
10 10 7 6 7 4 4 5 7 4
1
10
```

Sample Output

```
Case #1: 4
Case #2: 5
Case #3: 9
Case #4: 1
```

In Sample Case #1, there are multiple ways to form a straight using all 4 dice. One possible way is shown in the image above.

In Sample Case #2, since none of the dice can show an integer greater than 5, there is no way to have a straight with more than 5 dice. There are multiple ways to form a straight with exactly 5 dice. For example, pick the integers 4 and 5 for both $d5$'s and then integers $1, 2$, and 3 for three of the $d4$'s to form $1, 2, 3, 4, 5$.

In Sample Case #3, it is possible to form the straight $1, 2, 3, 4, 5, 6, 7, 8, 9$ by discarding one $d4$ and using the $d4$'s, $d5$, and $d6$ to get 1 through 4; the $d7$'s to get 5 through 7; and the $d10$'s to get 8 and 9. There is no way to form a straight of length 10, so this is the best that can be done.

In Sample Case #4, we can only form a straight of length 1, but we can do so by picking any integer for the $d10$ we are given.