

# Qualification Round 2022 - Code Jam 2022

## 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  $N$  dice. The  $i$ -th die is a  $dS_i$ , that is, it has  $S_i$  sides showing integers 1 through  $S_i$ . A straight of length  $\ell$  starting at  $x$  is the list of integers  $x, x+1, \dots, x+(\ell-1)$ . 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,  $T$ .  $T$  test cases follow. Each test case is described in two lines. The first line of a test case contains a single integer  $N$ , the number of dice in the game. The second line contains  $N$  integers  $S_1, S_2, \dots, S_N$ , 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.

$1 \leq T \leq 100$ .

### Test Set 1 (Visible Verdict)

Time limit: 5 seconds.

$1 \leq N \leq 10$ .

$4 \leq S_i \leq 20$ , for all  $i$ .

### Test Set 2 (Visible Verdict)

Time limit: 15 seconds.

$1 \leq N \leq 10^5$ .

$4 \leq S_i \leq 10^6$ , 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.

