List, Array, Set Operation.

Question C DIFFICULT (1) | Sample Test 1 Test 2 | Conditional 9 11/9 11/11

Qualification Round 2022 - Code Jam 2022

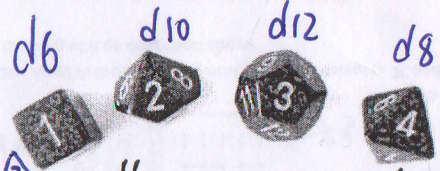
Score 20/20pts

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.

Assume min(dice) ⇒ d4



← the smallest dices shall be at rear of array.

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?

because they don't have ability to form larger number in straight, vise versa.

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)

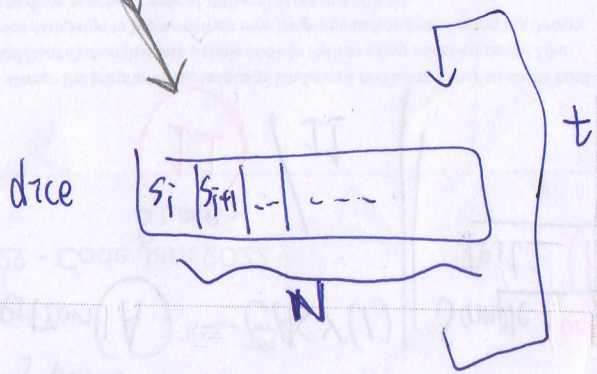
Time limit: 5 seconds.
$1 \leq \mathbf{N} \leq 10$.
$4 \leq \mathbf{S_i} \leq 20$, for all i.

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

Input → Sort (reverse) → T4 → return 1



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.

T1
6 10 12 8
12 10 8 6
4 3 2 1
output ⇒ 4

T2
5 4 5 4 4 4
5 4 4 4 4
since only 5 face discard
5 4 3 2 1
output ⇒ 5
face = straight d's card

8
6 6 6 6 6 6 4 4
return 6 //

T3
10 10 7 6 7 4 4 5 7 4
10 10 7 7 6 5 4 4 4
9 8 7 6 5 4 3 2 1
"d's card discard"
start = 1
output ⇒ 9

T4
10
10
1
output ⇒ 1

Name _____ ( )

Class _____ Date _____

Knowledge Management

Opened Date: 2 Apr 2022 Reg ID : Filing Date:

Registered Date: 02 APR 2022

Type: Implementations

Topic: Code Jam 2023 - Qualification Round

Question 3 - D1000000

Discipline of Learning:

- Computer Science
  - Programming (1)
    - Array Operation
    - List Operation
    - Set Operation

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Content (Modifiers)

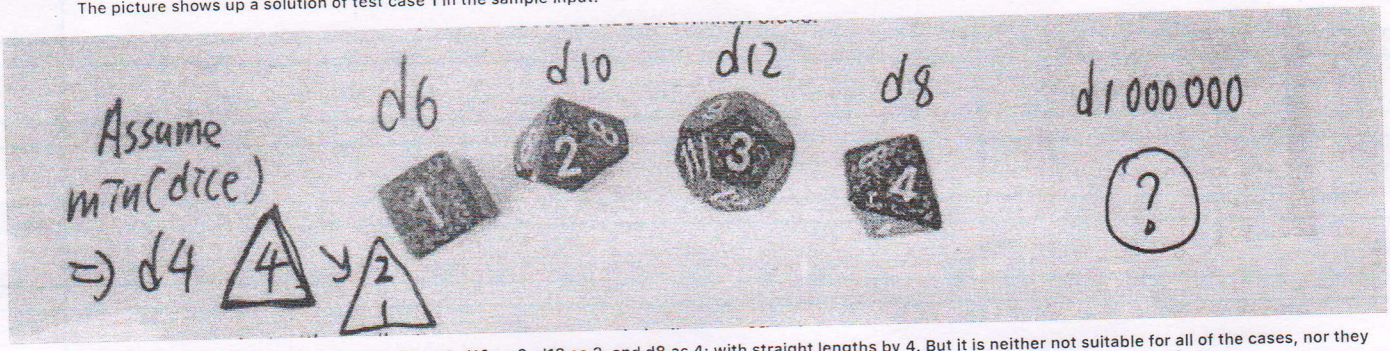
- **This kind of "knowledge registration" will merge into the sub-directory.**

Code Jam Qualification Round Question C

This is an intermediary difficulty problem to progress further away from the basic knowledge in programming, but it remains a window, a gap to take down the question in a slice of bread.

In this question, the participants should form a straight of dice from small to large numbers, which needs to pick up the number from a certain amount of dice in different specific faces.

The picture shows up a solution of test case 1 in the sample input.



D6, D10, D12, and D8, and they formed d6 as 1, d10 as 2, d12 as 3, and d8 as 4; with straight lengths by 4. But it is neither not suitable for all of the cases, nor they are not perfectly optimized.

The solution is interesting, but you need to think outside of boxes. Rather than rolling the dice to get a specific number from each dice, or doing your flipping in orderly in your inputting arrays.

You just need to flip it to the largest number per each dice at first.
For example, the largest face in each test case is d1000000, which meant the largest number is 1000000. D4 is 4 and so on.....

Secondly, then sort the input array reversely if acceptable, directions are never minded.

Thirdly, in each iteration, two numbers will be checked between the current straight and the faces array element which pointed index.

When the element is larger than or equal to straight, the pointed indices (different face dice) will flip the face number up to the current straight number. Then, the straight number will be added 1.
When the element is smaller than straight, it meant this dice shall be discarded, it will end the current iteration of the loop. But the element is still on the list.

Finally, bypassing the array into the python set() function to eliminate the redundant elements. Then pass back to the list as final counting with a straightforward lens() function.

Each test case will return an integer number, which is the length of the final list. That it.