

# Coding Practice with Kick Start Session #1 - Kick Start 2022

## H-index

### PROBLEM

### ANALYSIS

## Problem

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Jorge is a physicist who has published many research papers and wants to know how much impact they have had in the academic community. To measure impact, he has developed a metric, **H-index**, to score each of his papers based on the number of times it has been cited by other papers. Specifically, the *H-index score* of a researcher is the largest integer **H** such that the researcher has **H** papers with at least **H** citations each.

Jorge has written **N** papers in his lifetime. The  $i$ -th paper has  $C_i$  citations. Each paper was written sequentially in the order provided, and the number of citations that each paper has will never change. Please help Jorge determine his *H-index score* after each paper he wrote.

## Input

The first line of the input gives the number of test cases, **T**. **T** test cases follow. Each test case begins with a line containing **N**, the number of papers Jorge wrote. The second line contains **N** integers. The  $i$ -th integer is  $C_i$ , the number of citations that the  $i$ -th paper has.

## 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 a space-separated list of **N** integers. The  $i$ -th integer is Jorge's *H-index* score after writing his  $i$ -th paper.

## Limits

Time limit: 50 seconds.

Memory limit: 1 GB.

$$1 \leq T \leq 100$$

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

$$1 \leq C_i \leq 10^9$$

## Test Set 1

$$1 \leq N \leq 1000$$

## Test Set 2

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

## Sample

### Sample Input



```
2
3
5 1 2
6
1 3 3 2 2 15
```

### Sample Output



```
Case #1: 1 1 2
Case #2: 1 1 2 2 2 3
```

The input contains 2 test cases. In Sample Case #1, Jorge wrote  $N = 3$  papers.

- After the 1st paper, Jorge's *H-index* score is 1, since he has 1 paper with at least 1 citation.
- After the 2nd paper, Jorge's *H-index* score is still 1.
- After the 3rd paper, Jorge's *H-index* score is 2, since he has 2 papers with at least 2 citations (the 1st and 3rd papers).

In Sample Case #2, Jorge wrote  $N = 6$  papers.

- After the 1st paper, Jorge's *H-index* score is 1, since he has 1 paper with at least 1 citation.
- After the 2nd paper, Jorge's *H-index* score is still 1.
- After the 3rd paper, Jorge's *H-index* score is 2, since he has 2 papers with at least 2 citations (the 2nd and 3rd papers).
- After the 4th paper, Jorge's *H-index* score is still 2.
- After the 5th paper, Jorge's *H-index* score is still 2.
- After the 6th paper, Jorge's *H-index* score is 3, since he has 3 papers with at least 3 citations (the 2nd, 3rd and 6th papers).