

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.

$$1 \leq T \leq 100$$

$$1 \leq C_i \leq 10^5$$

Test Set 1

$$1 \leq N \leq 1000$$

Test Set 2

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

Sample

Sample Input	Sample Output
<pre>2 3 5 1 2 6 1 3 3 2 2 15</pre>	<pre>Case #1: 1 1 2 Case #2: 1 1 2 2 2 3</pre>

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).