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Datenstrukturen & Algorithmen Blatt P7 HS 17

Hand-in: Bis Sonntag, 19. November 2017, 23:59 Uhr via Online Judge (nur Source Code). Fragen zur Aufgabenstellung oder Übersetzung werden wie üblich im Forum beantwortet.

Exercise P7.1 *Inversions.*

Consider an array $A = \langle a_0, a_1, \ldots, a_{n-1} \rangle$ containing n distinct integers between 0 and 50000. An *inversion* is a pair of indices i, j with $0 \leq i < j < n$ such that $a_i > a_j$. Your task is to design an algorithm that, given A, computes the total number of inversions in A.

Input The input consists of a set of instances, or *test-cases*, of the previous problem. The first line of the input contains the number C of test-cases, and each test case consists of 2 lines. The first line of each test-case contains the integer n. The second line of the test-case contains the n integers $a_0, \ldots, a_{n-1}$ in A, separated by a space.

Output The output consists of C lines, each containing a single integer. The i-th line is the answer to the i-th test-case, i.e., it contains the number of inversions in the corresponding input array A.

Grading You get 3 bonus points if your program works for all inputs. Your algorithm should have an asymptotic time complexity of $O(n \log n)$ with reasonable hidden constants. Submit your `Main.java` at `https://judge.inf.ethz.ch/team/websubmit.php?cid=18997&problem=DA17P4.3`. The enrollment password is “`asymptotic`”.

Example

Input:

```
2
5
4 6 12 8 20
7
2 12 8 43 1 7 3
```

Output:

```
1
12
```

Notes For this exercise we provide an archive on the lecture website containing a program template that will load the input and write the output for you. The archive also contains additional test cases (which differ from the ones used for grading). Importing any additional Java class is **not allowed** (with the exception of the already imported `java.util.Scanner` class).