ETH Zurich Institut für Theoretische Informatik Prof. Dr. Angelika Steger

Prof. Dr. Emo Welzl Prof. Dr. Peter Widmayer

## **Algorithms Lab**

## **Exercise** – Even pairs

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You are part of a team to develop a new kind of pseudorandom number generator (PRNG). To gauge how good your algorithm is at producing random sequences of bits, you are running several different statistical tests.

For example, if  $x_1, \ldots, x_n$  was a truly random sequence of bits, then it would have the property that the sum  $x_i + \cdots + x_j$  is even for about half of the pairs  $1 \le i \le j \le n$  (and odd for the other half).

To check whether this is the case if  $x_1, \ldots, x_n$  are generated by your PRNG, you need to be able to count the number of pairs  $1 \le i \le j \le n$  for which the sum is even.

**Input** The first line of the input contains the number  $1 \le t \le 30$  of test cases. Each of the t test cases is described as follows:

- It starts with a line that contains an integer n such that  $1 \le n \le 50000$ .
- The next line contains n values  $x_1, \ldots, x_n$ , separated by spaces. Each value  $x_i$  is either 0 or 1.

**Output** For each test case output a line containing the number of pairs  $1 \le i \le j \le n$  such that the sum  $x_i + \cdots + x_j$  is even.

**Points** There are three test sets, worth 100 points in total.

- 1. For the first test set, worth 40 points, you may assume that  $1 \le n \le 200$ .
- 2. For the second test set, worth 30 points, you may assume that  $1 \le n \le 5000$ .
- 3. For the third test set, worth 30 points, there are no additional assumptions.

Corresponding sample test sets are contained in test i. in/out, for  $i \in \{1, 2, 3\}$ .

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