Programming Question - 6

Help Center

Warning: The hard deadline has passed. You can attempt it, but **you will not get credit for it**. You are welcome to try it as a learning exercise.

☐ **In accordance with the Coursera Honor Code, I (Alisa Zhou) certify that the answers here are my own work.**

Question 1

Download the text file here. (Right click and save link as).

The goal of this problem is to implement a variant of the 2-SUM algorithm (covered in the Week 6 lecture on hash table applications).

The file contains 1 million integers, both positive and negative (there might be some repetitions!).This is your array of integers, with the i^{th} row of the file specifying the i^{th} entry of the array.

Your task is to compute the number of target values t in the interval [-10000,10000] (inclusive) such that there are *distinct* numbers x, y in the input file that satisfy $x + y = t$. (NOTE: ensuring distinctness requires a one-line addition to the algorithm from lecture.)

Write your numeric answer (an integer between 0 and 20001) in the space provided.

OPTIONAL CHALLENGE: If this problem is too easy for you, try implementing your own hash table for it. For example, you could compare performance under the chaining and open addressing approaches to resolving collisions.

Question 2

Download the text file here.

The goal of this problem is to implement the "Median Maintenance" algorithm (covered in the Week 5 lecture on heap applications). The text file contains a list of the integers from 1 to 10000 in unsorted order; you should treat this as a stream of numbers, arriving one by one. Letting x_i denote the ith number of the file, the kth median m_k is defined as the median of the numbers $x_1, \ldots, x_k$. (So, if k is odd, then m_k is $((k+1)/2)$th smallest number among $x_1, \ldots, x_k$; if k is even, then m_k is the $(k/2)$th smallest number among $x_1, \ldots, x_k$.)

In the box below you should type the sum of these 10000 medians, modulo 10000 (i.e., only the last 4 digits). That is, you should compute $(m_1 + m_2 + m_3 + \cdots + m_{10000}) \bmod 10000$.

OPTIONAL EXERCISE: Compare the performance achieved by heap-based and search-tree-based implementations of the algorithm.

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You cannot submit your work until you agree to the Honor Code. Thanks!