Congratulations! You passed!
TO PASS 1% or higher

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100%

Interview Questions: Radix Sorts (ungraded)

TOTAL POINTS 3

1. **2-sum.** Given an array a of n 64-bit integers and a target value T, determine whether there are two distinct integers i and j such that $a_i + a_j = T$. Your algorithm should run in linear time in the worst case. **1 / 1 point**

   2 sum problem

   Correct
   Hint: sort the array in linear time.

2. **American flag sort.** Given an array of n objects with integer keys between 0 and $R - 1$, design a linear-time algorithm to rearrange them in ascending order. Use extra space at most proportional to R. **1 / 1 point**

   An American flag sort is an efficient, in-place variant of radix sort that distributes items into buckets. Non-comparative sorting algorithms such as radix sort and American flag sort are typically used to sort large objects such as strings, for which comparison is not a unit-time operation.

   Correct
   Hint: first compute the frequency counts for each integer, which tells you where the keys need to go. Then cyclically permute the keys into their proper places.

3. **Cyclic rotations.** Two strings s and t are *cyclic rotations* of one another if they have the same length and s consists of a suffix of t followed by a prefix of t. For example, "suffixsort" and "sortsuffix" are cyclic rotations. **1 / 1 point**

   Given n distinct strings, each of length L, design an algorithm to determine whether there exists a pair of distinct strings that are cyclic rotations of one another. For example, the following list of $n = 12$ strings of length $L = 10$ contains exactly one pair of strings ("suffixsort" and "sortsuffix") that are cyclic rotations of one another.

   ```
   1  algorithms polynomial sortsuffix boyermoore
   2  structures minimumcut suffixsort stackstack
   3  binaryheap digraphdfs stringsort digraphbfs
   ```

   The order of growth of the running time should be nL^2 (or better) in the worst case. Assume that the alphabet size R is a small constant.

   Signing bonus. Do it in NnL time in the worst case.

   Cyclic rotations problem.
   What does this `N` mean in `NnL`

   Correct
   Hint: define a fingerprint of a string in such a way that two strings are cyclic rotations of one another if and only if they have the same fingerprint.

   Signing bonus: design an algorithm to find the fingerprint of a string of length L in time proportional to L in the worst case.