

Interview Questions: Radix Sorts

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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.

a



Thank you for your response.

Hint: sort the array in linear time.



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2.

American flag sort. Given an array with n distinct values between 0 and $R - 1$, rearrange them in ascending order in linear time and with extra space at most proportional to R .

a



Thank you for your response.

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



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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.

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
2 polynomial
3 sortsuffix
4 boyermoore
5 structures
6 minimumcut
7 suffixsort
8 stackstack
9 binaryheap
10 digraphdfs
11 stringsort
12 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 nL time in the worst case.

a



Thank you for your response.

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.

