LeetCode Problems

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This is a collection of my notes on particularly difficult problems, and how I arrived at the solution.

Median of Two Sorted Arrays

Given two sorted arrays x and y of size m and n respectively, return the median of the two sorted arrays.

Solution

The sorted arrays are given by $x = [x_0, x_1, \cdots, x_{m-1}]$ and $y = [y_0, y_1, \cdots, y_{n-1}]$.

We can restate the problem: given two arrays x and y of size m and n respectively, find $\tilde{x}$ and $\tilde{y}$ such that when x is partitioned by $\tilde{x}$ into two components $x = [x^1\ x^2]$ and y is partitioned by $\tilde{y}$ into two components $y = [y^1\ y^2]$ and where $[x^1\ y^2]$ is a sorted array and $[y^1\ x^2]$ is also a sorted array. x^1, y^1, x^2, and y^2 can potentially be empty.

Since x and y are sorted arrays, the medians of the respective arrays are found in the middle. Let $i_1 = \frac{m-1}{2}$ be the index of the median for x (or the lower median if x is even), and let $j_1 = \frac{n-1}{2}$ be the index of the median for y (or the lower median likewise).

Now using binary search, find the index of the largest element of x that is partitioned by y_{j_1} and label it i_2, i.e. $x_{i_2} \leq y_{j_1}$ and $x_{i_2} \geq x_k \quad \forall x_k \leq y_{j_1}$.

Likewise, find the index of the largest element of y that is partitioned by x_{i_1} and label it j_2, i.e. $y_{j_2} \leq x_{i_1}$ and $y_{j_2} \geq y_k \quad \forall y_k \leq x_{i_1}$.

Problem 2