Sort Colors - LeetCode

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Premium

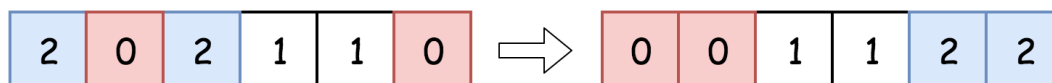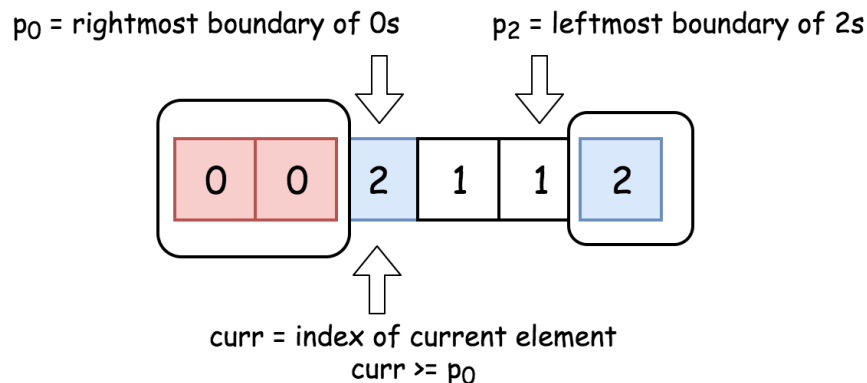# Solution

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Approach 1: One Pass

Intuition

The problem is known as Dutch National Flag Problem and first was proposed by Edsger W. Dijkstra. The idea is to attribute a color to each number and then to arrange them following the order of colors on the Dutch flag.

Dutch National Flag Problem

Let's use here three pointers to track the rightmost boundary of zeros, the leftmost boundary of twos and the current element under the consideration.


The idea of solution is to move curr pointer along the array, if nums[curr] = 0 - swap it with nums[p0], if nums[curr] = 2 - swap it with nums[p2].

Algorithm

- Initialise the rightmost boundary of zeros : p0 = 0. During the algorithm execution nums[idx < p0] = 0.
- Initialise the leftmost boundary of twos : p2 = n - 1. During the algorithm execution nums[idx > p2] = 2.
- Initialise the index of current element to consider : curr = 0.
- While curr <= p2 :

  - If nums[curr] = 0 : swap currth and p0th elements and move both pointers to the right.
  - If nums[curr] = 2 : swap currth and p2th elements. Move pointer p2 to the left.
  - If nums[curr] = 1 : move pointer curr to the right.

Implementation
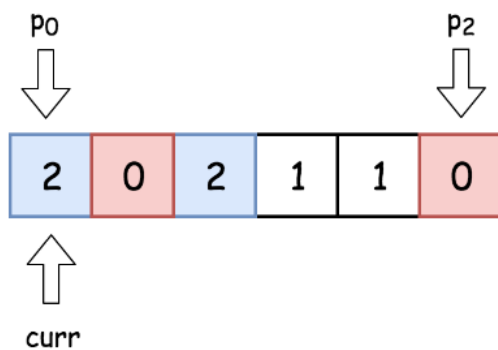
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Complexity Analysis

- Time complexity : O(N) since it's one pass along the array of length N.
- Space complexity : O(1) since it's a constant space solution.