pathrise

Study Guide: Two Pointers

What is this Guide:

The following is a Study Guide covering "Two Pointers" Problem Solving approach from a technical interview perspective. It serves to familiarize candidates with Two Pointer related problems asked during interviews. This brief guide takes a no-frills approach and seeks to get the point across as directly as possible using concrete examples.

Who you are:

This study guide is aimed at motivated individuals who already have basic programming proficiency and are willing to work hard and push their understanding of complex programming concepts.

Introduction

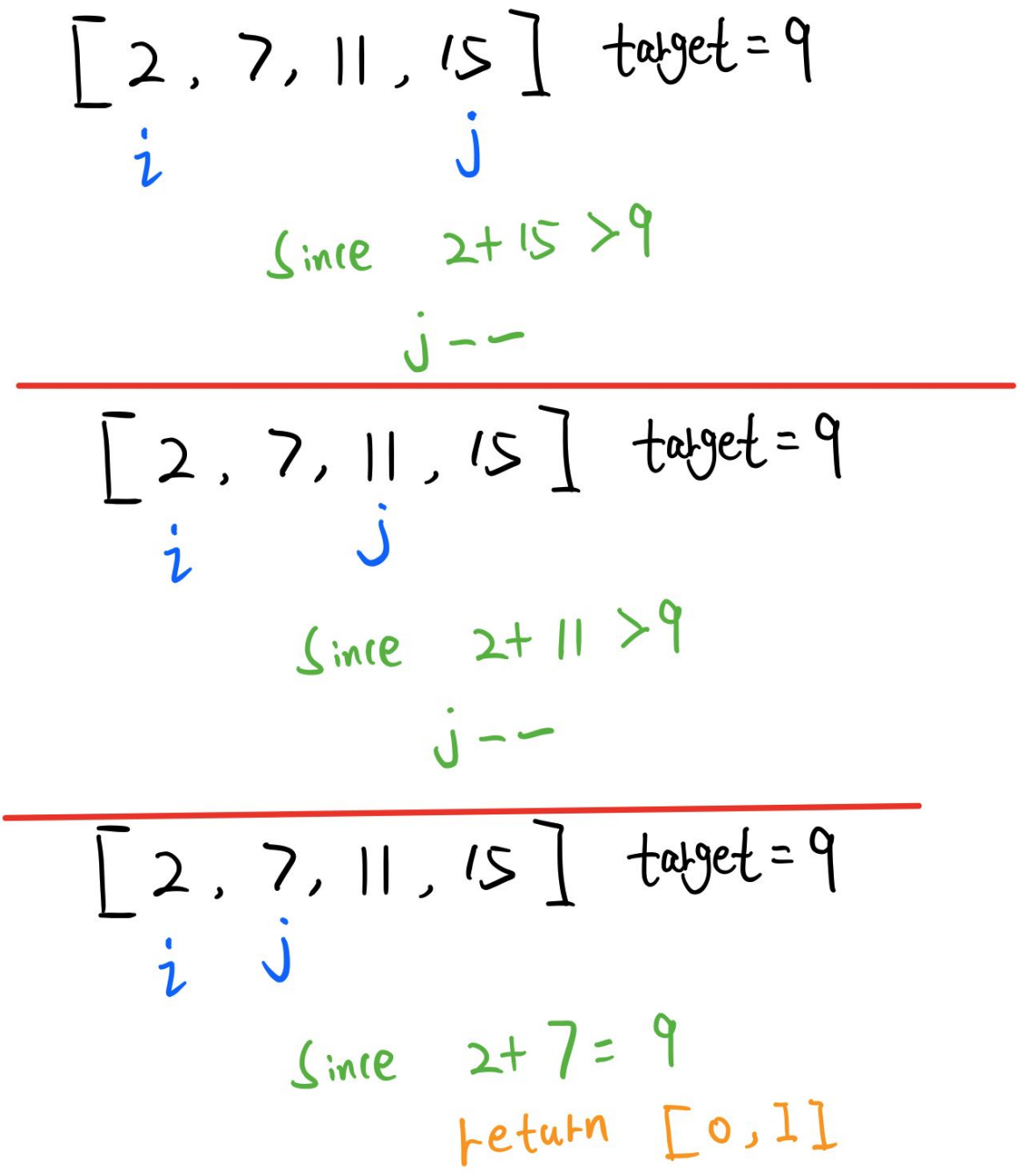
Two pointers is really an easy and effective technique that is typically used for searching pairs in a sorted array. Two pointers in Array / String could either move toward the same direction or move toward the opposite direction.

Two Pointers --- Moving toward each other

```
Given a sorted array of integers, return indices of the two numbers such
that they add up to a specific target. If there are no such two numbers,
return [-1, -1]
```

```
Example:

Input: arr = [2, 7, 11, 15] target = 9
Output: [0,1]
```



Code:

Let's see how to use two pointers to find two numbers that sum to target in code similar to the above illustration:

```
# The main reason that we can use two pointer method here is because the
# array is sorted
class Solution:
    def Sum(self, arr, target):
        l = 0
        r = len(arr) - 1
        while l < r:
            sum = arr[l] + arr[r]
            if sum == target:
                return [l,r]
            elif sum < target:
                l += 1
            else:
                r -= 1
        return [-1, -1]
```

Two Pointers --- Chasing each other

```
Given an array nums, write a function to move all 0's to the end of it
while maintaining the relative order of the non-zero elements.

Example:

Input: [0,1,0,3,12]
Output: [1,3,12,0,0]
```

nums = [0, 1, 0, 3, 12]

i

j

nums[j] = 0

j++

---

nums = [0, 1, 0, 3, 12]

i j

nums[j] ≠ 0

swap(nums[i], nums[j])

i++

j++

---

nums = [1, 0, 0, 3, 12]

i

j

nums[j] = 0

j++

nums = [1, 0, 0, 3, 12]

i j

nums[j] ≠ 0

Swap(nums[i], nums[j])

i++

j++

---

nums = [1, 3, 0, 0, 12]

i j

nums[j] ≠ 0

Swap(nums[i], nums[j])

i++

j++

---

nums = [1, 3, 12, 0, 0]

i j

Since j = len(nums)

We are done!!!

Code:

```python
class Solution:
    def moveZeroes(self, nums: List[int]) -> None:
        """
        Do not return anything, modify nums in-place instead.
        """
        i = 0
        for j in range(len(nums)):
            if nums[j] != 0:
                nums[j], nums[i] = nums[i], nums[j]
                i += 1
```

Questions for practice

3 Sum

Reverse String

Merge Sorted Array

Sort Colors

If you need any help with the above practice problems, feel free to reach out to our TAs for assistance😀.

We recommend solving all problems from the above list, before your next Advising Session.

Please fill out this Form to include problems you've solved:
https://docs.google.com/forms/d/e/1FAIpQLSekaVDNPsdtVqUo2fFjMiI-pkI_jHzzXi54IDXI_0K7JeUrdQ/viewform