

# Two Pointers, Sliding Window & Binary Search

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# Two Pointers

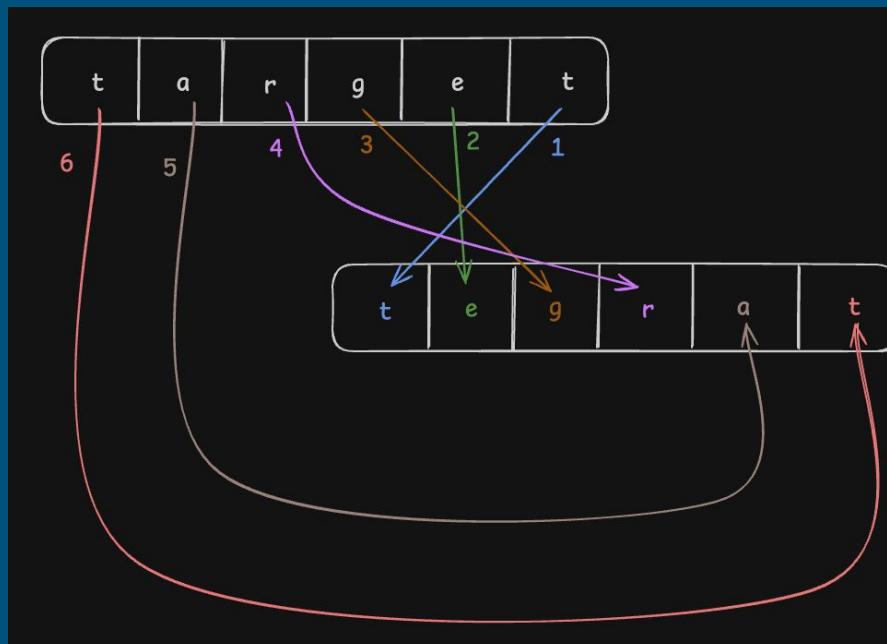
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Two-Pointers Technique is a strategy where you use two indices (pointers) that traverse a data structure, such as an array, list, or string.



# Two Pointer Example - Reverse String

<https://leetcode.com/problems/reverse-string>



Approach 1 (time =  $O(n)$ , space =  $O(n)$ )

1. create a new str array with same size,
2. loop through input\_str starting from back
3. add characters to the start of new str array

# Two Pointer Example - Reverse String

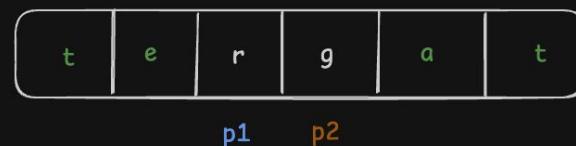
Approach 2 (time =  $O(n)$ , space =  $O(1)$ )

1. use two pointers where p1 (pointer 1) starts from the front, and p2 starts from the back.
2. swap characters from p1 and p2
3. increment p1 and decrement p2

Step 1



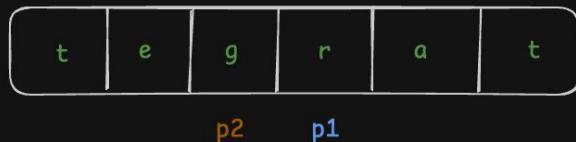
Step 3



Step 2



Step 4



Step 5

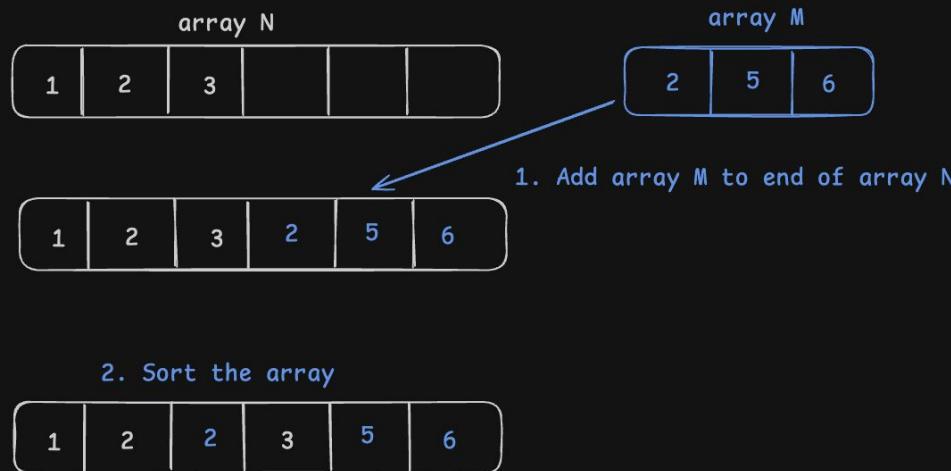
Stop, string is now reversed

# Two Pointer Example - Merge Sorted Array

<https://leetcode.com/problems/merge-sorted-array/>

Approach 1: time =  $O((n + m) * \log(n + m))$ , space =  $O(1)$

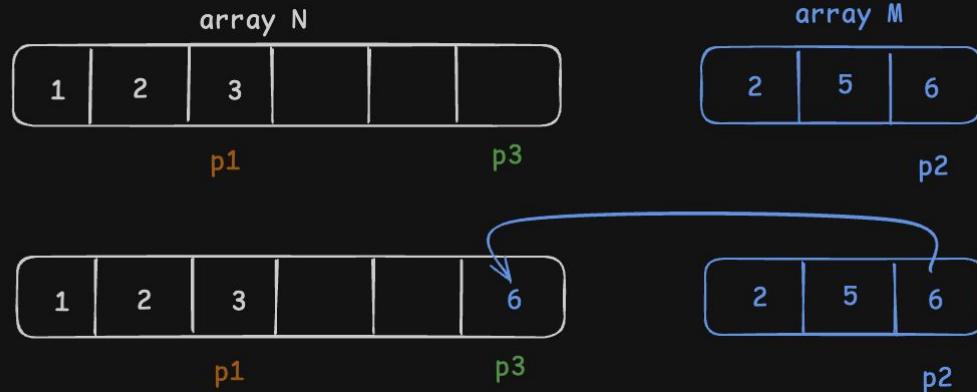
1. Add array M to the end of array N
2. Sort the array



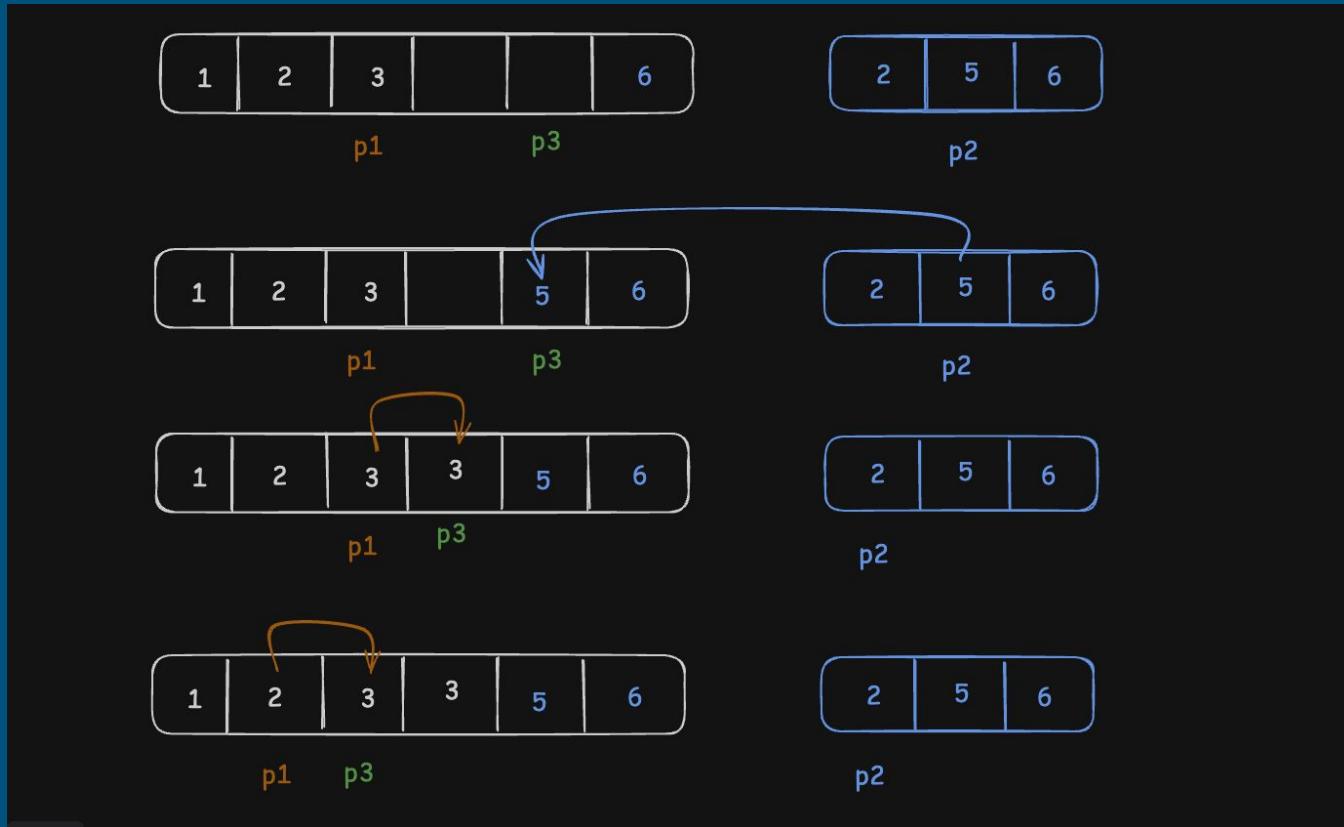
# Two Pointer Example - Merge Sorted Array

Approach 2: time =  $O(n + m)$ , space =  $O(1)$

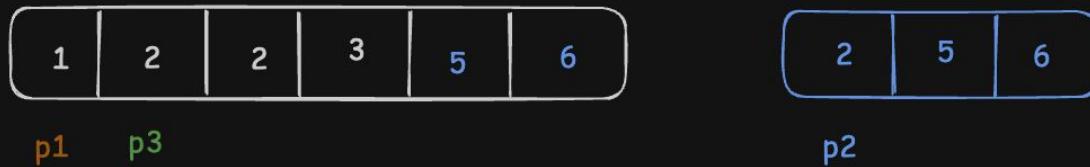
1. Use 3 pointers
  - p1 starts from end of array N
  - p2 starts from end of array M
  - p3 starts from end of array N + M
2. Get the max value among p1 and p2, set it to p3
  - Note: if p1 or p2 is less than 0, then automatically get the other pointer
3. Decrement the pointer that was the max in step 2
4. Decrement p3
5. Repeat step 2 - 4 until p1 and p2 is less than 0



# Two Pointer Example - Merge Sorted Array



# Two Pointer Example - Merge Sorted Array



# Thank You

