

## Step 1: Study [88. Merge Sorted Array](#)

```
class Solution:
    def merge(self, nums1: List[int], m: int, nums2: List[int], n: int) -> None:
        """
        Do not return anything, modify nums1 in-place instead.
        """
        pointer, a, b = m+n-1, m-1, n-1

        while b >= 0:
            if a >= 0 and nums1[a] > nums2[b]:
                nums1[pointer] = nums1[a]
                a -= 1
            else:
                nums1[pointer] = nums2[b]
                b -= 1
            pointer -= 1
```

Console ^


Run Submit

10:01 PM 6/12/2023

Step 2: Ask ChatGPT: "How to implement LeetCode question: '88 Merge Sorted Array', with the test data: Input: nums1 = [1,2,0,0], m = 2, nums2 = [2,3], n = 2; Output: [1,2,2,3]"

To implement the LeetCode question '88 Merge Sorted Array' with the given test data, you can use the following code:

python

 Copy code

```
def merge(nums1, m, nums2, n):
    pointer = m + n - 1
    a = m - 1
    b = n - 1

    while a >= 0 and b >= 0:
        if nums1[a] > nums2[b]:
            nums1[pointer] = nums1[a]
            a -= 1
        else:
            nums1[pointer] = nums2[b]
            b -= 1
        pointer -= 1

    # Copy the remaining elements from nums2 to nums1
    while b >= 0:
        nums1[pointer] = nums2[b]
        b -= 1
        pointer -= 1

    return nums1
```

You can call the `merge` function with the provided test data as follows:

```
python Copy code

nums1 = [1, 2, 0, 0]
m = 2
nums2 = [2, 3]
n = 2

result = merge(nums1, m, nums2, n)
print(result)
```

The output will be:

```
csharp Copy code

[1, 2, 2, 3]
```

This code follows the same approach as the previous implementations. It uses three pointers: `pointer` to keep track of the current position in the merged array, `a` to traverse `nums1` in reverse order, and `b` to traverse `nums2` in reverse order.

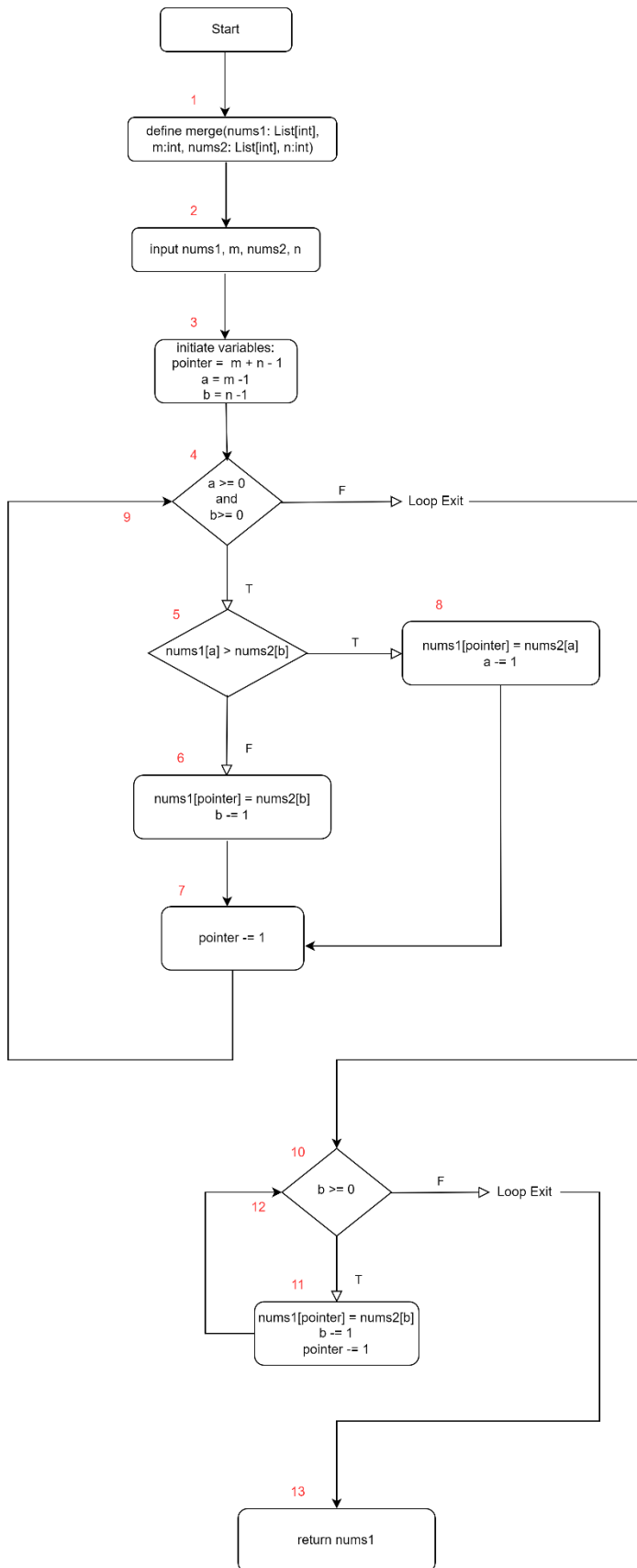
The code merges the elements from `nums1` and `nums2` by comparing the values at `nums1[a]` and `nums2[b]`. It starts from the end of the arrays and places the larger element in the correct position indicated by `pointer`. The pointers and `pointer` are updated accordingly.

After the while loop, the code handles the case where there are remaining elements in `nums2` that need to be copied to `nums1`.

Finally, the merged `nums1` array is returned as the output.

Step 3: Convert ChatGPT's Python code into a [flowcharts](#).

- The syntax of [flowchart](#)
- [Flowchart and Trace Table](#)
- [Single/Double Loops and Flow Chart](#)
- [Flowchart and Trace Table for Recursive Function](#)



Step 4: Verify the flowchart with a trace tables. You only need to trace the test data:  
 Input: nums1 = [1,2,0,0], m = 2, nums2 = [2,3], n = 2; Output: [1,2,2,3]. Please refer

- [Flowchart and Trace Table](#)
- [Single/Double Loops and Flow Chart](#)
- [Flowchart and Trace Table for Recursive Function](#)

Step	define function	RAM										screen
		nums1	m	nums2	n	pointer	a	b	a >= 0 and b >= 0	nums1[a] > nums2[b]	b >= 0	
1	merge(nums1: List[int], m: int, nums2: List[int], n: int)											
2		[1,2,0,0]	2	[2,3]	2							
3						3	1	1				
4									T			
5										F		
6		[1,2,0,3]						0				
7						2						
9									T			
5										F		
6		[1,2,2,3]						-1				
7						1						
9									F			
10											F	
13												[1,2,2,3]

Step 5: Implement the Python code created by ChatGPT





```
flowchart.drawio test.py w2 test.py w4 X
w4 > test.py > ...
1 def merge(nums1, m, nums2, n):
2     pointer = m + n - 1
3     a = m - 1
4     b = n - 1
5
6     while a >= 0 and b >= 0:
7         if nums1[a] > nums2[b]:
8             nums1[pointer] = nums1[a]
9             a -= 1
10        else:
11            nums1[pointer] = nums2[b]
12            b -= 1
13        pointer -= 1
14
15    # Copy the remaining elements from nums2 to nums1
16    while b >= 0:
17        nums1[pointer] = nums2[b]
18        b -= 1
19        pointer -= 1
20
21    return nums1
22
23    nums1 = [1]
24    m = 1
25    nums2 = []
26    n = 0
27
28    result = merge(nums1, m, nums2, n)
29    print(result)
30
31
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
Python + - [ ] ... ^ X
• PS D:\MSCS\CS455 Algorithm> & C:/Users/odody/AppData/Local/Programs/Python/Python311/python.exe "d:/MSCS/CS455 Algorithm/w4/test.py"
[1]
○ PS D:\MSCS\CS455 Algorithm>
Column Selection Ln 26, Col 6 Spaces: 4 UTF-8 CRLF Python 3.11.3 64-bit Go Live 9:44 PM 6/12/2023
```





Helptest.py - CS455 Algorithm - Visual Studio Code

flowchart.drawio test.py

w4 > test.py > ...

```
1 def merge(nums1, m, nums2, n):
2     pointer = m + n - 1
3     a = m - 1
4     b = n - 1
5
6     while a >= 0 and b >= 0:
7         if nums1[a] > nums2[b]:
8             nums1[pointer] = nums1[a]
9             a -= 1
10        else:
11            nums1[pointer] = nums2[b]
12            b -= 1
13        pointer -= 1
14
15    # Copy the remaining elements from nums2 to nums1
16    while b >= 0:
17        nums1[pointer] = nums2[b]
18        b -= 1
19        pointer -= 1
20
21    return nums1
22
23    nums1 = [2,0]
24    m = 1
25    nums2 = [1]
26    n = 1
27
28    result = merge(nums1, m, nums2, n)
29    print(result)
30
31
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

Python + - [ ] ... ^ X

- PS D:\MSCS\CS455 Algorithm> & C:/Users/odody/AppData/Local/Programs/Python/Python311/python.exe "d:/MSCS/CS455 Algorithm/w4/test.py"
- [1, 2]
- PS D:\MSCS\CS455 Algorithm>

Column Selection Ln 26, Col 6 Spaces: 4 UTF-8 CRLF Python 3.11.3 64-bit Go Live

9:46 PM 6/12/2023