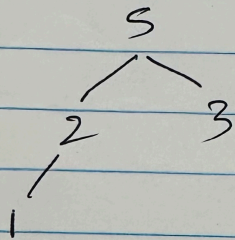


Week9-Q2

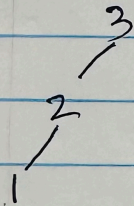
5 2 3 1  
Max Heap



After max heap  $arr = [5, 2, 3, 1]$

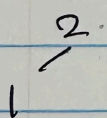
Solution

Replace 5 with 3 and 5 goes to end position in array



$arr = [3, \dots, 5]$

Replace 3 with 2 & 3, it goes to second last



$arr = [2, 3, 5]$

2 is in root position

$arr = [2, 3, 5]$

$\Rightarrow [1, 2, 3, 5]$

```

def heapify(nums, n, i):
    largest = i # Initialize largest as root
    left = 2 * i + 1 # Left child position
    right = 2 * i + 2 # Right child position

    # Check if left child exists and is greater than the root
    if left < n and nums[i] < nums[left]:
        largest = left

    # Check if right child exists and is greater than the root or left child
    if right < n and nums[largest] < nums[right]:
        largest = right

    # Swap the root if necessary
    if largest != i:
        nums[i], nums[largest] = nums[largest], nums[i]
        heapify(nums, n, largest)

def heapSort(nums):
    n = len(nums)

    # Build a max heap
    for i in range(n // 2 - 1, -1, -1):
        heapify(nums, n, i)

    # Extract elements one by one
    for i in range(n - 1, 0, -1):
        nums[0], nums[i] = nums[i], nums[0] # Swap the root with the current element
        heapify(nums, i, 0) # Heapify the reduced heap

    return nums

# Test data
nums = [5, 2, 3, 1]
output = heapSort(nums)
print(output)

```

The screenshot shows a macOS IDE window with the following components:

- Menu Bar:** Apple logo, Code, File, Edit, Selection, View, Go, Run, Terminal, Window, Help.
- Toolbar:** Icons for undo, redo, save, run, search, and other IDE functions.
- File Explorer:** Shows the file structure with 'week9\_q2.py' selected.
- Code Editor:** Contains the following Python code:
 

```

22 # Build a max heap
23 for i in range(n // 2 - 1, -1, -1):
24     heapify(nums, n, i)
25
26 # Extract elements one by one
27 for i in range(n - 1, 0, -1):
28     nums[0], nums[i] = nums[i], nums[0] # Swap the root with the current element
29     heapify(nums, i, 0) # Heapify the reduced heap
30
31 return nums
32
33 # Test data
34 nums = [5, 2, 3, 1]
35 output = heapSort(nums)
36 print(output)
37

```
- Terminal:** Shows the command to run the script and its output:
 

```

(base) rakesh_kasha@Rakesh-kashas-MacBook-Pro ~ % /usr/local/bin/python3 /Users/rakesh_kasha/Desktop/week9_q2.py
[1, 2, 3, 5]

```
- Status Bar:** Shows the current cursor position (Ln 23, Col 40), encoding (UTF-8), and other details.