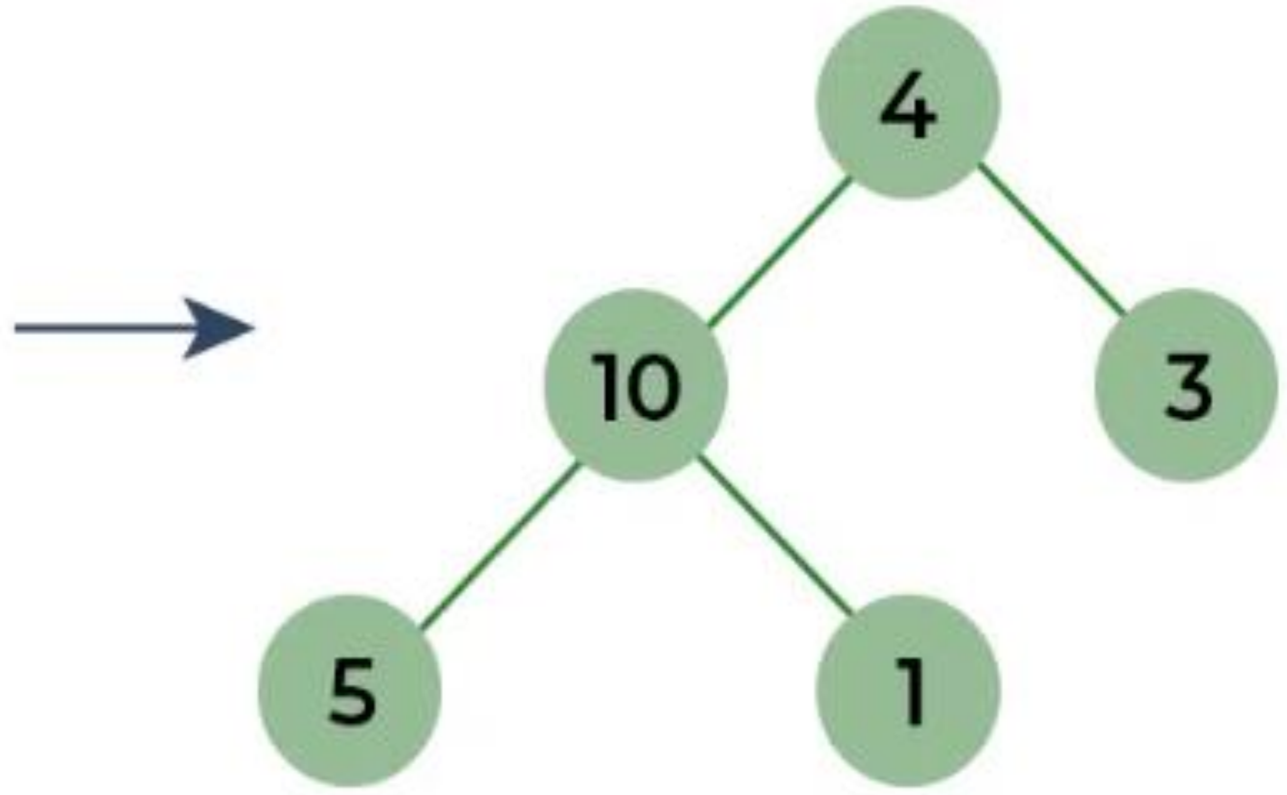
Heap Sort Algorithm

STEP 01

Build Complete Binary Tree from given Array

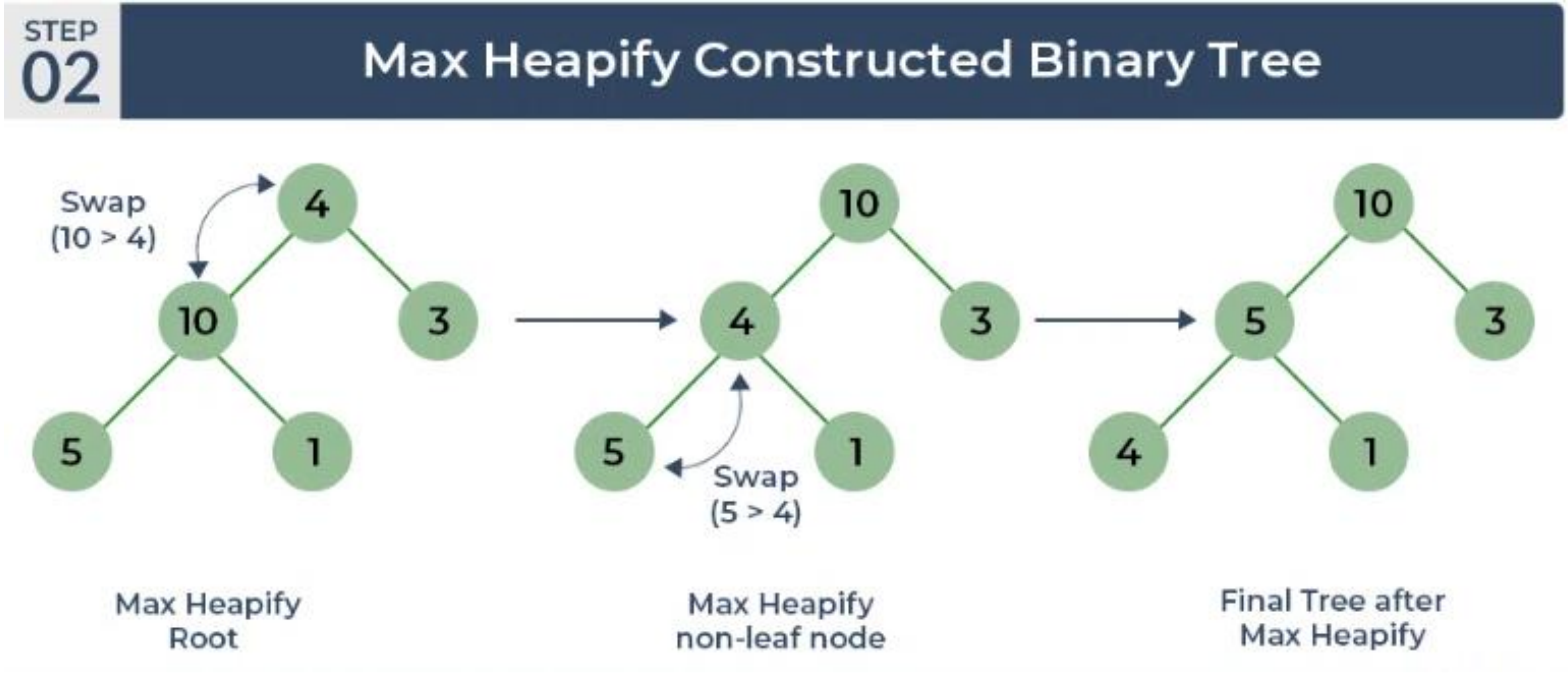
Arr = {4, 10, 3, 5, 1)



After that, the task is to construct a tree from that unsorted array and try to convert it into max heap.
To transform a heap into a max-heap, the parent node should always be greater than or equal to the child nodes

Here, in this example, as the parent node **4** is smaller than the child node **10,** thus, swap them to build a max-heap.

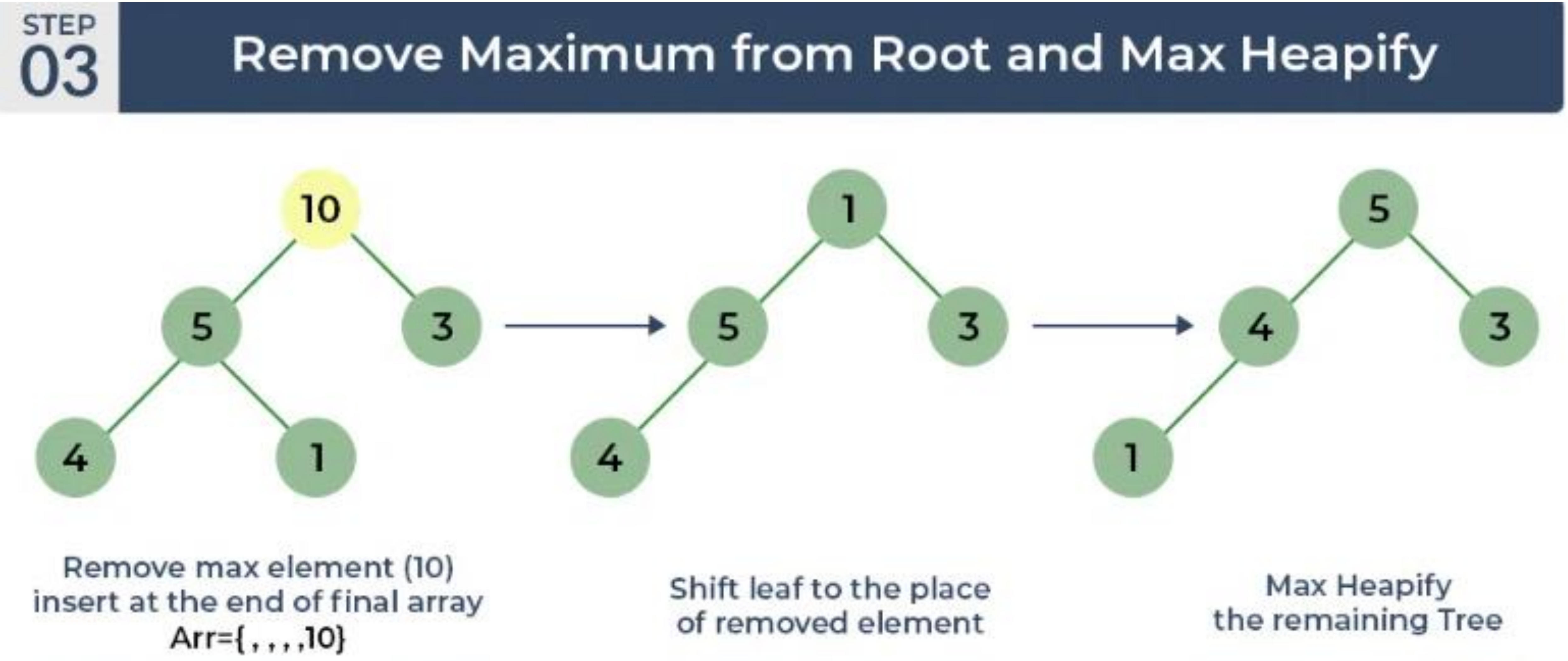
Now, **4** as a parent is smaller than the child **5**, thus swap both of these again and the resulted heap and array should be like this:



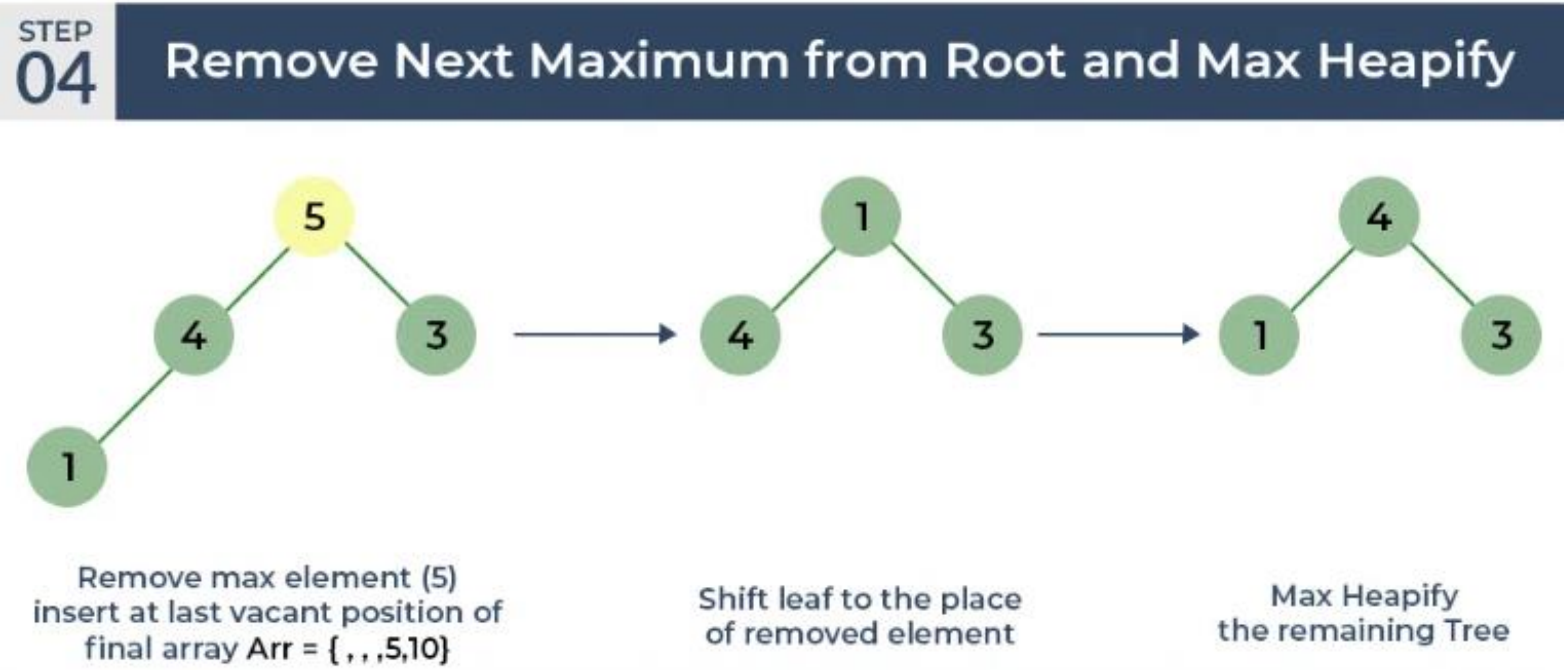
- Remove the maximum element in each step (i.e., move it to the end position and remove that) and then consider the remaining elements and transform it into a max heap.
- Delete the root element **(10)** from the max heap. In order to delete this node, try to swap it with the last node, i.e. **(1).**

After removing the root element, again heapify it to convert it into max heap.

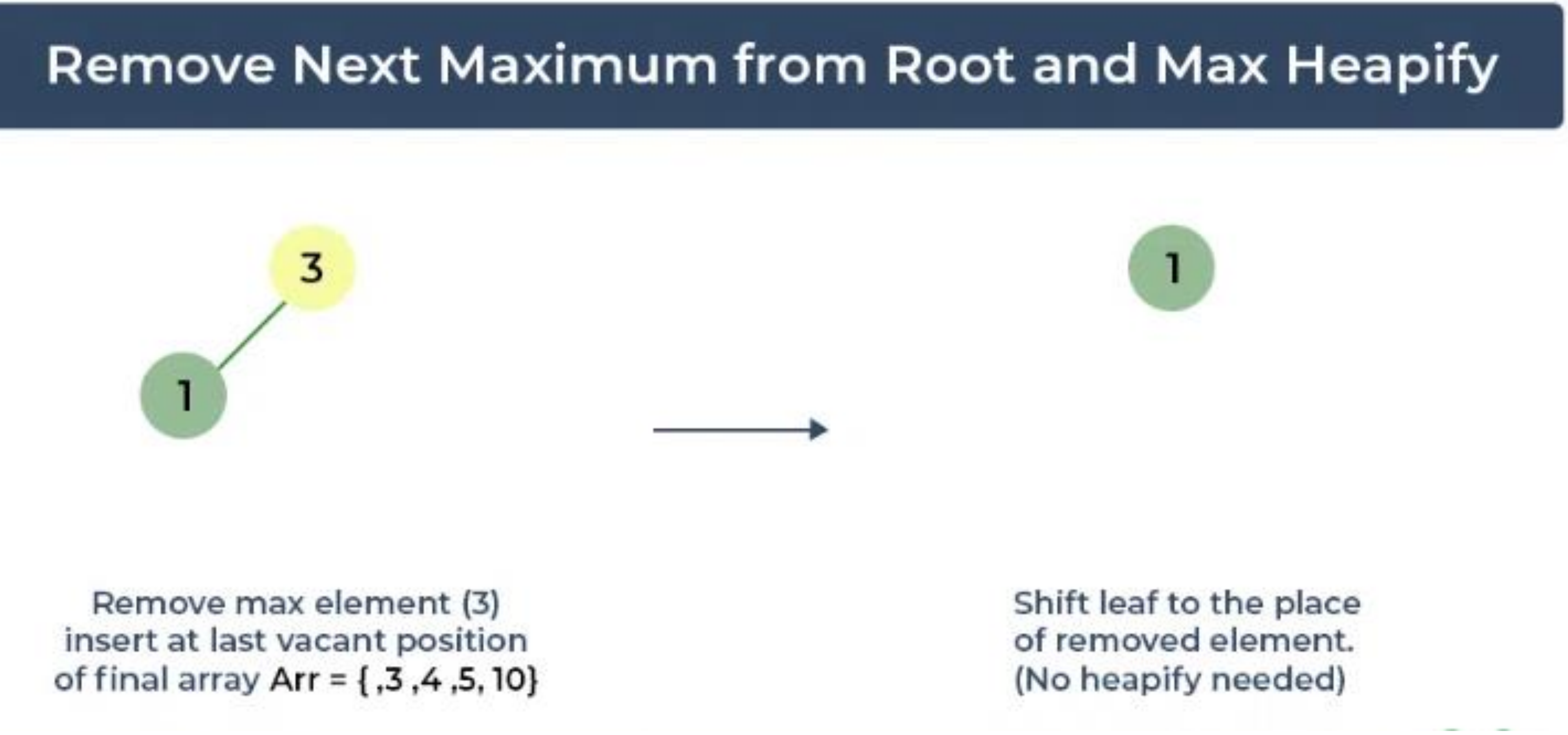
Resulted heap and array should look like this:


STEP 03
Remove Maximum from Root and Max Heapify
10
5
3
4
1
1
5
3
4
5
4
3
1
Remove max element (10) insert at the end of final array Arr={ , , , ,10}
Shift leaf to the place of removed element
Max Heapify the remaining Tree

•Repeat the above steps and it will look like the following:


STEP 04
Remove Next Maximum from Root and Max Heapify
5
4
3
1
1
4
3
4
1
3
Remove max element (5) insert at last vacant position of final array Arr = { , , ,5,10}
Shift leaf to the place of removed element
Max Heapify the remaining Tree

•*Now remove the root (i.e. 3) again and perform heapify.*

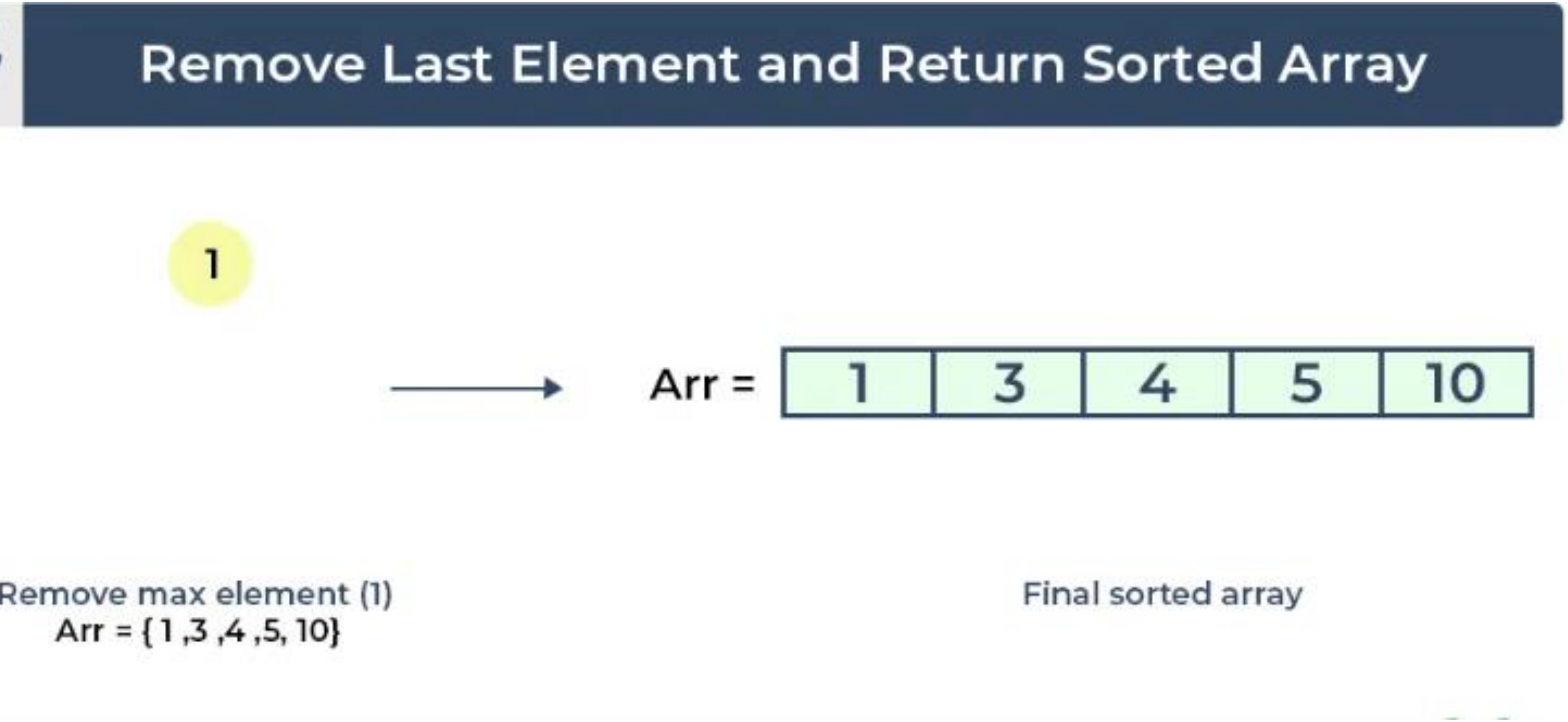


Remove Next Maximum from Root and Max Heapify

Remove max element (3) insert at last vacant position of final array Arr = { ,3 ,4 ,5, 10}

Shift leaf to the place of removed element. (No heapify needed)

•*Now when the root is removed once again it is sorted.*
*and the sorted array will be like **arr[] = {1, 3, 4, 5, 10}**.*


Remove Last Element and Return Sorted Array
1
Arr =
1
3
4
5
10
Remove max element (1)
Arr = {1 ,3 ,4 ,5, 10}
Final sorted array