

## Binary Search (Array)

Input: An array (assumed to be unsorted)

Return: Boolean/String confirming whether or not a node with the query value exists.

Thought Process:

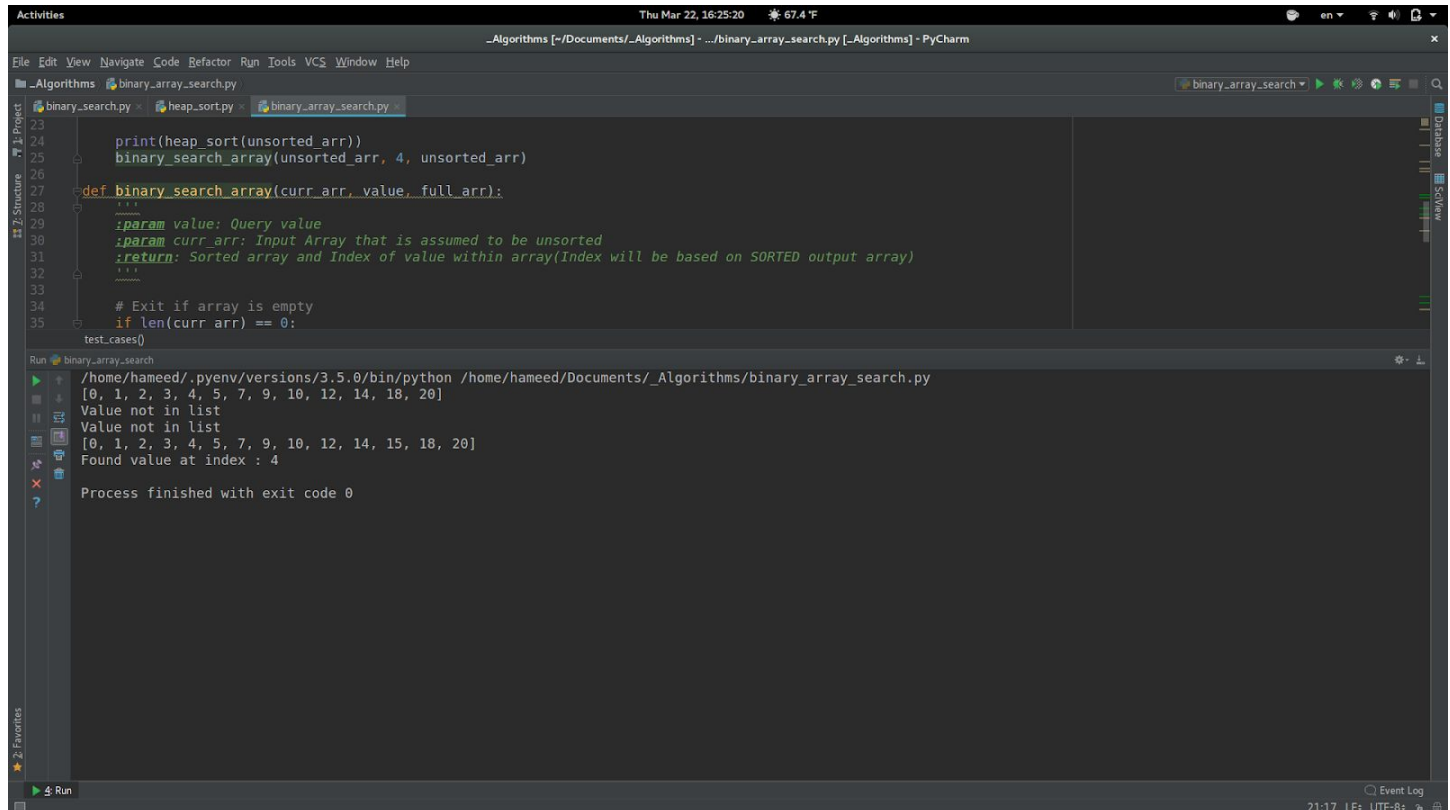
1. Create a binary tree
2. Heap Sort the input array
3. Populate the tree with the elements from the array. **(Goal is to make the tree as balanced as possible)**
4. Walk the tree in search for the a node that has the queried value

Turning a sorted array into a balanced tree:

Root : length of the array / 2

Left child : length of first element to root / 2

Right : length of (root + 1) to last element / 2



The screenshot shows a PyCharm IDE window titled "Algorithms [~/Documents/\_Algorithms] - .../binary\_array\_search.py - PyCharm". The editor displays the following Python code:

```
23
24 print(heap_sort(unsorted_arr))
25 binary_search_array(unsorted_arr, 4, unsorted_arr)
26
27 def binary_search_array(curr_arr, value, full_arr):
28     """
29     :param value: Query value
30     :param curr_arr: Input Array that is assumed to be unsorted
31     :return: Sorted array and Index of value within array(Index will be based on SORTED output array)
32     """
33
34     # Exit if array is empty
35     if len(curr_arr) == 0:
36         return
37
38     test_cases()
```

The Run console shows the output of the program:

```
Run binary_array_search
/home/hameed/.pyenv/versions/3.5.0/bin/python /home/hameed/Documents/_Algorithms/binary_array_search.py
[0, 1, 2, 3, 4, 5, 7, 9, 10, 12, 14, 18, 20]
Value not in list
Value not in list
[0, 1, 2, 3, 4, 5, 7, 9, 10, 12, 14, 15, 18, 20]
Found value at index : 4
Process finished with exit code 0
```

The status bar at the bottom indicates "Event Log" and "21:17 LF: UTF-8".

## Binary Search Tree

Input : An array (Assumed to be unsorted)

Output : Index value, where the query value is stored in the array

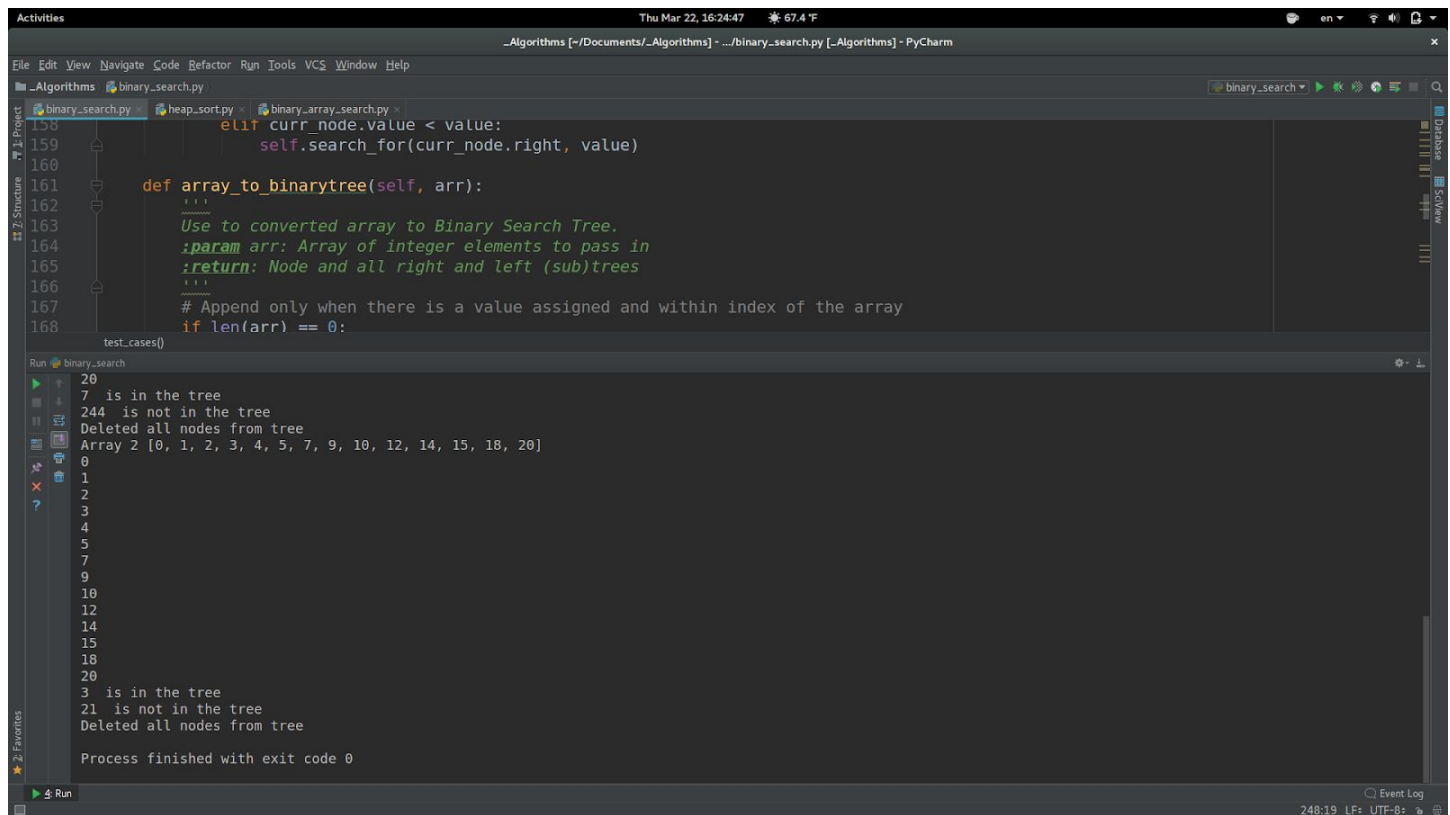
Thought process : **Same as previous just ditch the tree**

Turning a sorted array into a balanced tree:

Root : length of the array / 2

Left child : length of first element to root / 2

Right : length of (root + 1) to last element / 2



```
File Edit View Navigate Code Refactor Run Tools VCS Window Help
_Algorithms [~/Documents/_Algorithms] - .../binary_search.py [_Algorithms] - PyCharm
binary_search.py
158         elif curr_node.value < value:
159             self.search_for(curr_node.right, value)
160
161     def array_to_binarytree(self, arr):
162         """
163         Use to converted array to Binary Search Tree.
164         :param arr: Array of integer elements to pass in
165         :return: Node and all right and left (sub)trees
166         """
167         # Append only when there is a value assigned and within index of the array
168         if len(arr) == 0:
169             test_cases()
170
171 Run binary_search
20
7 is in the tree
244 is not in the tree
Deleted all nodes from tree
Array 2 [0, 1, 2, 3, 4, 5, 7, 9, 10, 12, 14, 15, 18, 20]
0
1
2
3
4
5
7
9
10
12
14
15
18
20
3 is in the tree
21 is not in the tree
Deleted all nodes from tree
Process finished with exit code 0
248:19 LF: UTF-8
```