

# Homework Sheet 6

**Author**

Abdullah Oğuz Topçuoğlu  
Ahmed Waleed Ahmed Badawy Shora  
Yousef Mostafa Farouk Farag

**Matriculation Number**

7063561  
7069708  
7073030

**Tutor**

Maryna Dernovaia  
Jan-Hendrik Gindorf  
Thorben Johr

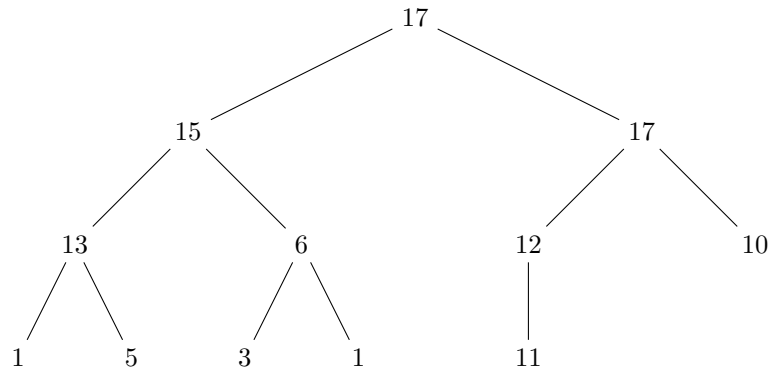
## Exercise 1

(a)

We are given the array

$$A = [17, 15, 17, 13, 6, 12, 10, 1, 5, 3, 1, 11].$$

The heap tree would be



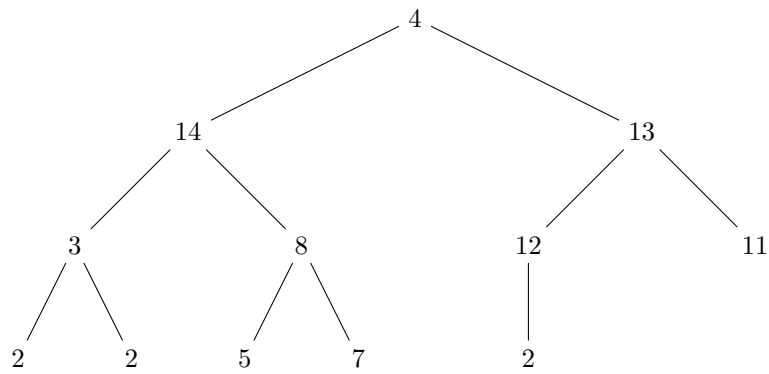
This is a heap since all nodes satisfy the max heap property.

(b)

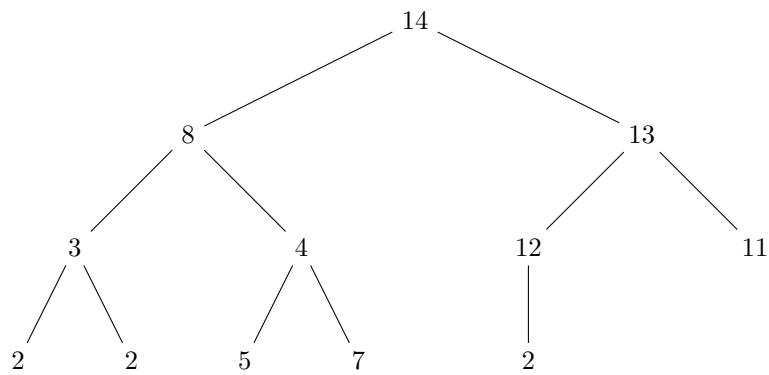
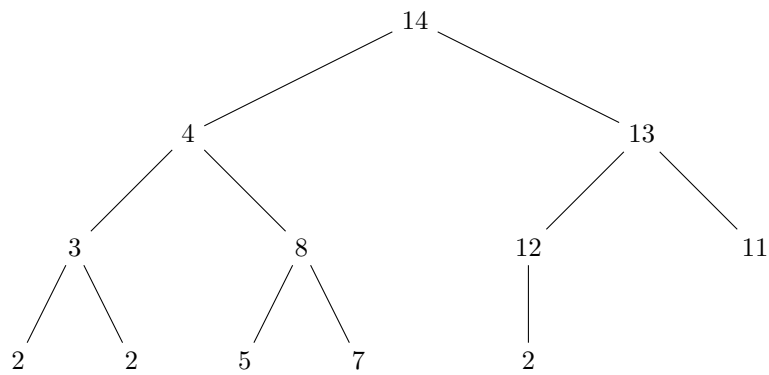
We are given the array

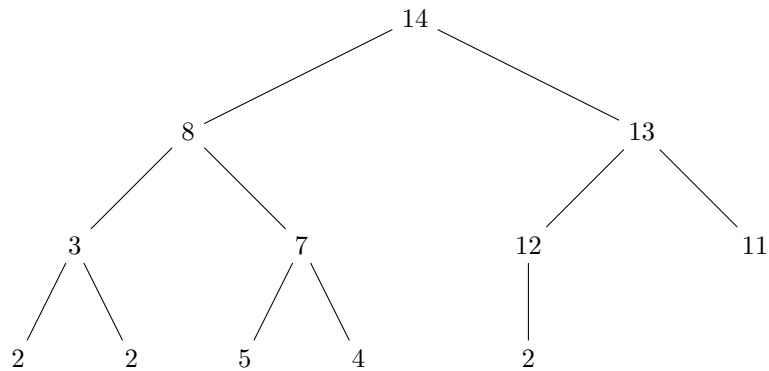
$$A = [4, 14, 13, 3, 8, 12, 11, 2, 2, 5, 7, 2].$$

The heap tree would be



This is a near heap because only the root node (4) violates the max heap property. Every other node satisfies it.  
Steps of heapify operation:



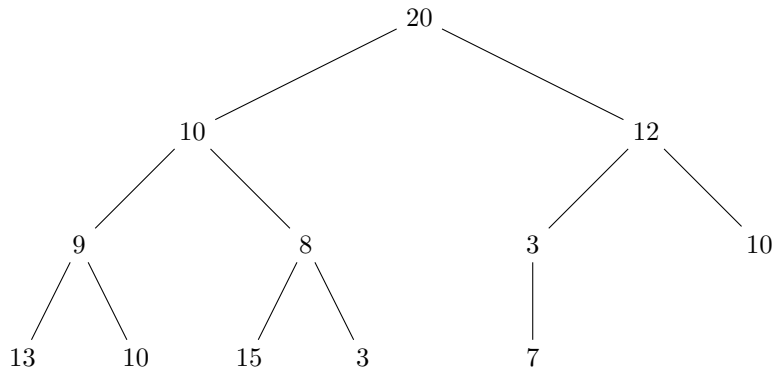


**(c)**

We are given the array

$$A = [20, 10, 12, 9, 8, 3, 10, 13, 10, 15, 3, 7].$$

The heap tree would be



This is not a heap also not a near heap because multiple nodes violate the max heap property. For example the node with the value 9 and the node with the value 8 both violates the max heap property and they are not descendants of each other.