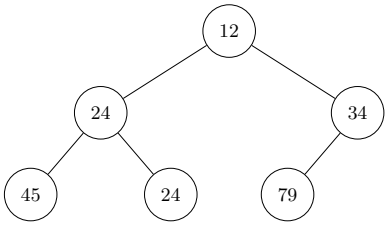
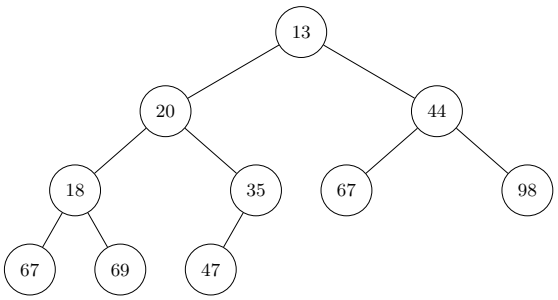
XJTLU | Computing

Heap

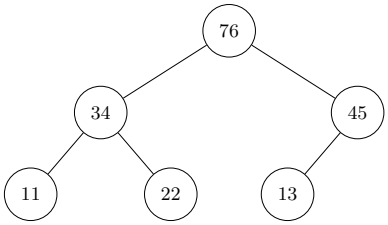
Questions

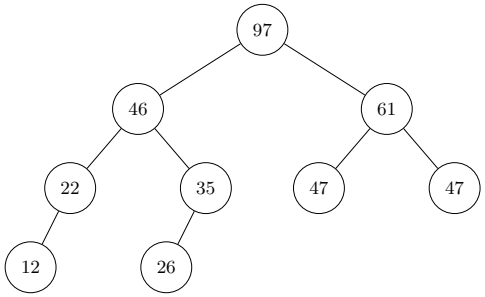
Problem 1. State if the following binary tree are min-heaps or not and why.





Problem 2. State if the following binary tree are max-heaps or not and why.

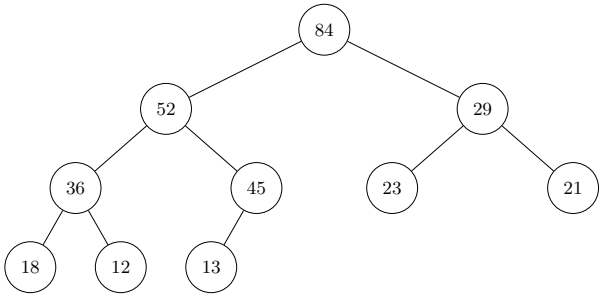




Problem 3. Starting from an empty min-heap, insert one after the other the following numbers: 45, 67, 23, 46, 89, 65, 12, 34, 98, 76.

Problem 4. Starting from an empty max-heap, insert one after the other the following numbers: 45, 67, 23, 46, 89, 65, 12, 34, 98, 76.

Problem 5. Starting from the following max-heap, eliminate one after the other the maximum element until it becomes an empty max-heap.



Problem 6. Given the following min-heap implemented as a table,

7	11	9	23	41	27	12	29

draw the tree represented by the table and draw the evolution of the table and the represented tree, when applying one after the other the operations of inserting the element 3 and removing the minimum.

Problem 7. Convert the following table to a min-heap.

45	53	27	21	11	97	34	78

Problem 8. Validate or refute the following statements:

(a) "A table with its elements sorted from lowest to highest is a min-heap."

(b) "Inserting to max-heap with n elements has a cost of $\Theta(\lg n)$ in the worst-case scenario."

(c) "Finding the maximum element in a min-heap has cost of $O(\sqrt{n})$."

(d) "Eliminating the maximum element of a max-heap with n different elements has a cost of $\Theta(1)$ in the best case."

References

Atserias, Albert et al. (2022). *Data Structure and Algorithms Problem Set*. Universitat Politécnica de Catalunya.