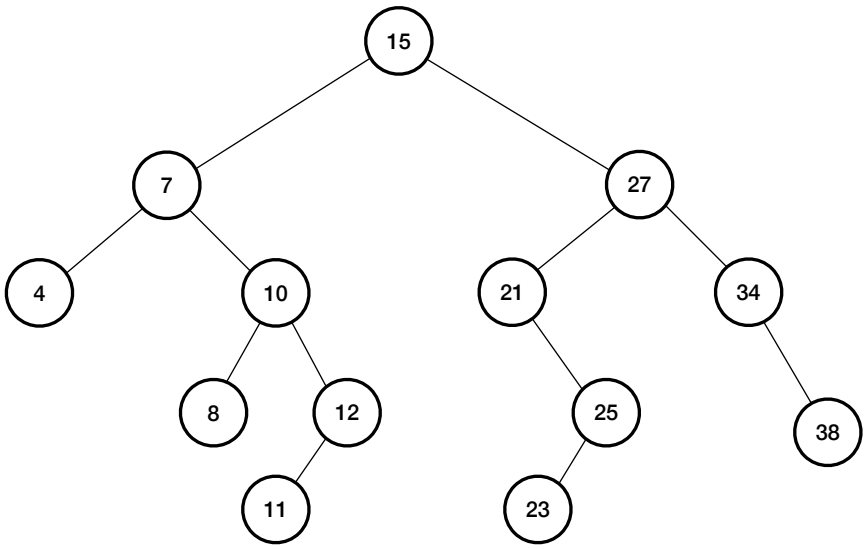
Algorithms and Data Structures - 20 June 2020

Ex 1. Choose the correct statement:

A☐. $n^5 \log^7 n \in O(n^5)$ **B☐.** $2^{n \log_2 n} \in O(n^{2n})$ **C☐.** $\sqrt{n} \log n \in \Omega(\sqrt[3]{n})$ **D☐.** $n \log^2 n \in O(n \log n)$

Ex 2. Starting from the Binary Search Tree shown in the picture below, show the tree obtained after deletion of element 15, without performing any balancing or rotation—there are two possible solutions, show at least one.



Ex 3. Describe algorithm **Heap sort**, and prove its computational complexity.

Ex 4. Develop an implementation of a dynamic stack data structure using, as underlying data structure, a Python list. The code must be encapsulated in a Python class named **DynamicStack** and featuring the canonical **push** and **pop** methods. Moreover, when running the **push** method on a full stack, the code must replace the existing list with a new list having a size that is twice the size of the original list and the same content. Then, the **push** operation has to be executed on the new list.

Note 1: it is possible to use in the solution only the following list operators: **[], len, *.**
Note 2: to create a new empty list of a fixed size s using the following syntax: **[None]*s**.