Week 10 - Assignment (2 marks)

Note: All programs must use the appropriate C++ features.

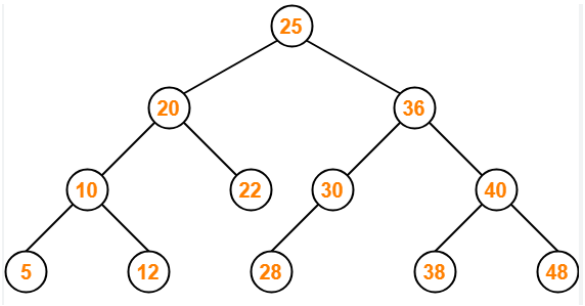
Objective:

Enhance the provided Treap class to incorporate additional functionalities that will help in understanding the use of augmented data structures in tree-based algorithms and OOP principles.

Tasks:

You are provided with a basic implementation of a Treap class that includes methods for insertion, deletion, search, etc. Your task is to modify the Treap class so that

1. each node can keep track of the sum of keys of nodes under this node, including itself. **Then, print the sum for each node.**
   For example, nodes under node 20 include node 10, 22, 5 and 12.



2. each node can keep track of the count of all nodes under this node, including itself. **Then, print the count for each node.**
3. Add a new function to **the Treap class** to return the count of nodes without children (leaf nodes). **Then, print this count.**
4. Add a new function to **the Treap class** to return the count of nodes with only one child. **Then, print this count.**
5. Add a new function to **the Treap class** to return the count of nodes with two children. **Then, print this count.**

Input & Output:

You need to provide test cases in the main function to test each additional functionality.

Submit:

1, **all C++ source code**

2, **week10.txt**: a txt file contains all the source code.

3, **week10.docx or week10.pdf, this document should include**

- **the screenshot of printing the treap, with key and priority**
- **the screenshots for each of these five tasks.**

Please refer to the submission page for the Marking Rubric.