CS 120: Intro to Computer Programming II

In-Class Activity - 06 Trees - Day 1

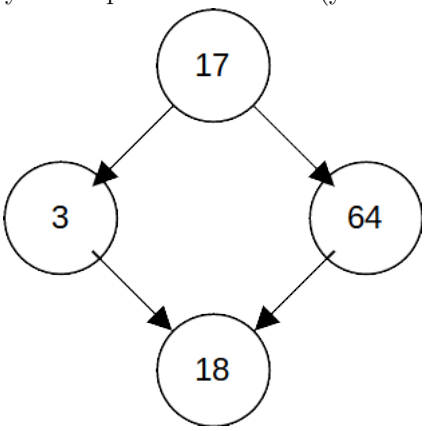
Activity 1 - Turn in this one

Discuss the following tree-related terms with your group. Give the definition for each one. Turn in your definitions; if your group has any interesting discussion or difference of opinion about these, report that as well.

- root
- leaf
- child
- parent
- node
- **binary** tree

Activity 2 - Turn in this one

Why is this picture not a tree (you can notice something about its **shape**)?



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Activity 3 - Turn in this one

Draw a **binary** tree containing 7 nodes; make it as "wide" as you can, so that it will be as short as possible. Turn in this picture.

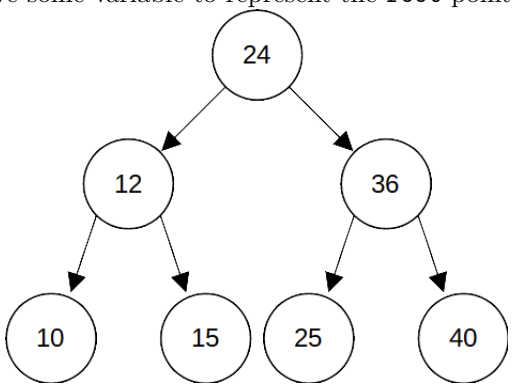
Consider the tree you just drew: how many node were there at each "level" of the tree? How many nodes would you need to add, in order to fill up another level? Discuss this with the group, and turn in your observations.

Now, draw a tree that contains the **same 7 values** - but which is now as **tall** as you can make it. What do you observe about its structure? Turn in your picture, and also you observations.

Activity 4 - Turn in this one

In the video (and the slides) we showed you a `TreeNode` class, which is nothing more than a slightly-more complex version of `ListNode`.

Create a bunch of `TreeNode` objects, and link them together as follows. Remember, you will need to have some variable to represent the `root` pointer, just like you needed a `head` pointer with linked lists!



Activity 5 - Optional

OPTIONAL. Complete this if you have time, and turn it in. If you don't have time, you may report to your TA that you ran out of time.

Draw an example tree with a few nodes (give it an interesting shape, so that the code we're about to run has to handle a number of different cases). Then, run the following recursive function on the tree, and report what it returns.

Can you see what this function does? If not, draw a couple more trees and see if you can understand it better.

Once you think you understand, draw a couple more to prove that you're correct. Try to achieve some challenging goals: for instance, can you draw a large tree where this function will return 1? Can you draw a tree with relatively few nodes, where this returns a high number?

```
def mystery(root):
    if root is None:
       return 0

    if root.left is None and root.right is None:
        return 1
    else:
        return mystery(root.left) + mystery(root.right)
```