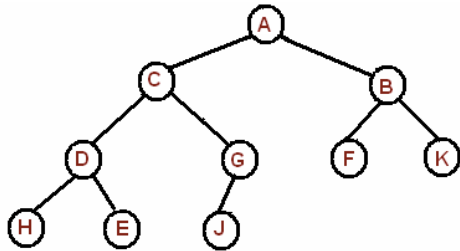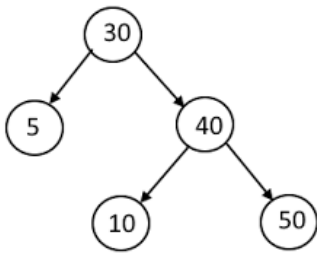Tyler Citrin

CSCI-343 Midterm Review Part 2

IV. Heaps

4.1 Draw a simple heap of size 8 nodes

4.2 Draw an <u>INVALID</u> heap of size 8 nodes, breaking the left-fill-first rules


4.3 Given an array that is supposed to represent a heap, write a function to determine whether or not it maintains the heap ordering property

```
bool isHeap(int arr[],  int n)
{
    for (int i=0; i<=(n-2)/2; i++)
    {
        // If left child is greater, return false
        if (arr[2*i +1] > arr[i])
            return false;

        // If right child is greater, return false
        if (arr[2*i+2] > arr[i])
                return false;
    }
    return true;
}
```

V. Binary Trees

**5.1 Fill in the following properties below of the binary tree**
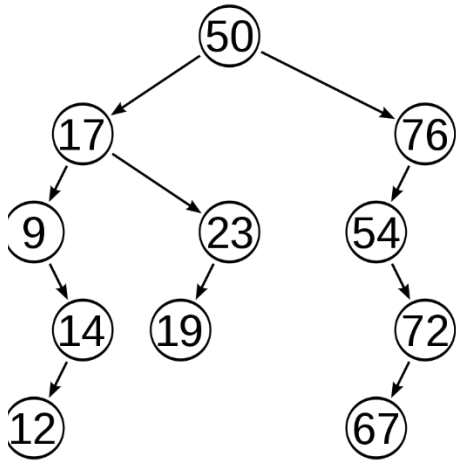
Height = 4

Levels = 5

Size *(Total Number of nodes)* = 11

Diameter *(longest distance between nodes)* =8

Width *(longest distance between nodes on same level including null*

nodes) = **9 (**12, null,   null null (from 19), null null (from 23's right),

null null (from 54's left), 67

5.2 Given a simple binary tree, draw the mirror reflection of it. (hint: draw one and then the transformation of it)
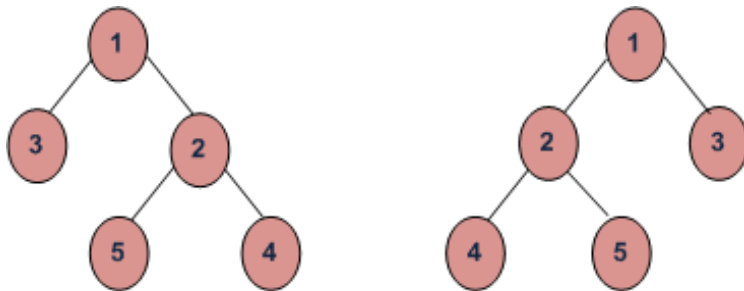
Mirror Trees

5.3 Write a recursive function to accomplish the above.

public Node mirror(Node root) {

    if (root == null) return null;

    mirrorHelper(root);

    return root;

  }

```
public void mirrorHelper(Node root) {

    if (root == null) return;

    Node left = root.left;

    root.left = root.right;

    root.right = left;

    mirrorHelper(root.right);

    mirrorHelper(root.left);
}
```

BIG O Calculations

What is the runtime of binary search?

$O(\log n)$

What is the runtime of heap-sort?

$O(n \log n)$

What is the runtime of merge sort?

$O(n \log n)$

Thought: what do all the above have in common that give them the similar run time?

Other

What is the difference between recursion and iteration? When would use one over the other?

Tips

Know when to use one data structure over the other

Know which algorithms work with which data structure