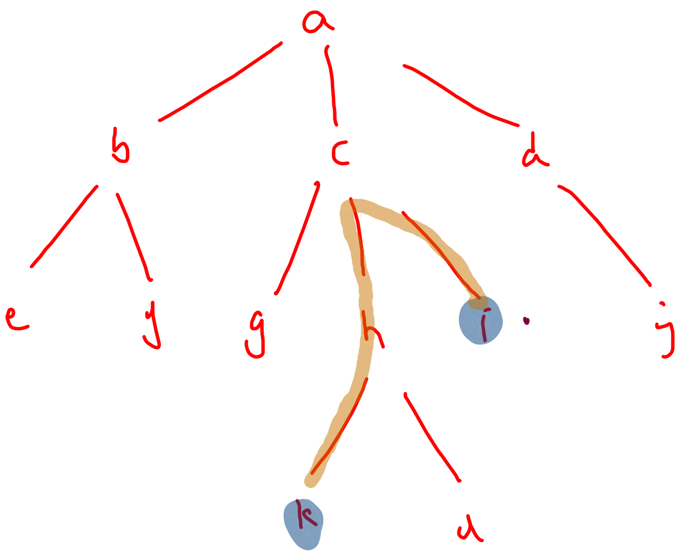
Distance Between Two Nodes In A Generic Tree



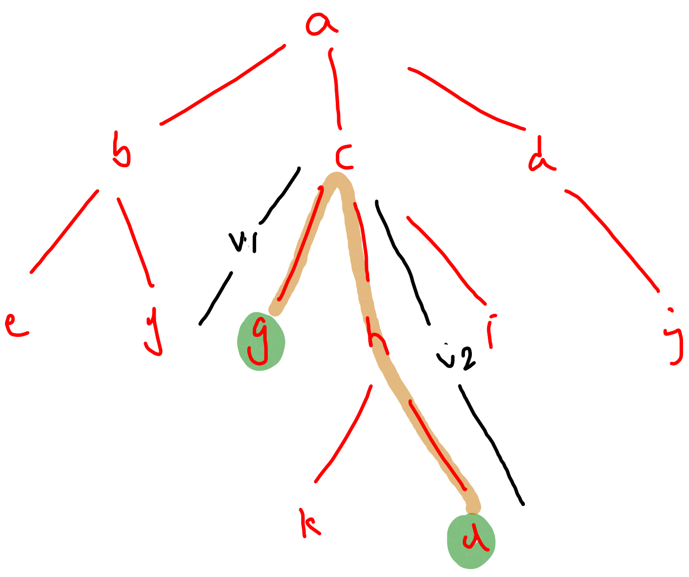
p1 : [i , c , a]
i ~~j~~ ~~j~~

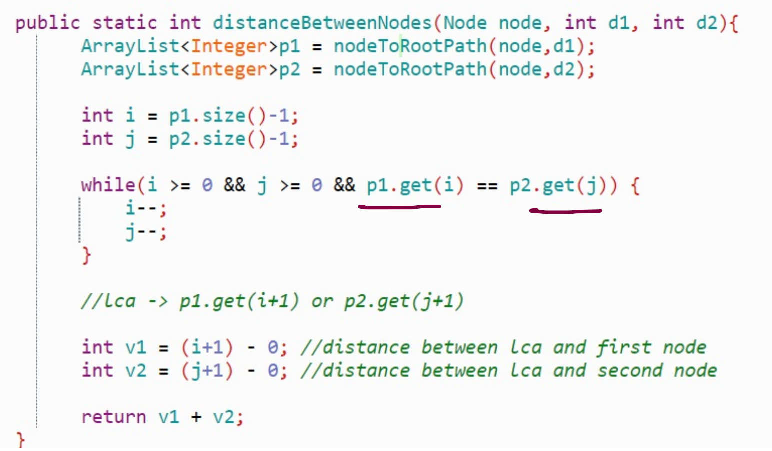
p2 : [k , h , c , a]
j ~~j~~ ~~j~~

d1 : i+1 → 1

d2 : j+1 → 2

ans: d1+d2





```
public static int distanceBetweenNodes(Node node, int d1, int d2){
        ArrayList<Integer>p1 = nodeToRootPath(node,d1);
        ArrayList<Integer>p2 = nodeToRootPath(node,d2);

        int i = p1.size()-1;
        int j = p2.size()-1;

        while(i >= 0 && j >= 0 && p1.get(i) == p2.get(j)) {
            i--;
            j--;
        }

        //lca -> p1.get(i+1) or p2.get(j+1)

        int v1 = (i+1) - 0; //distance between lca and first node
        int v2 = (j+1) - 0; //distance between lca and second node

        return v1 + v2;
}
```

→ lca

p1 = [g , c , a]

0 1 2

i ~~i~~ ~~i~~

v1 = 1

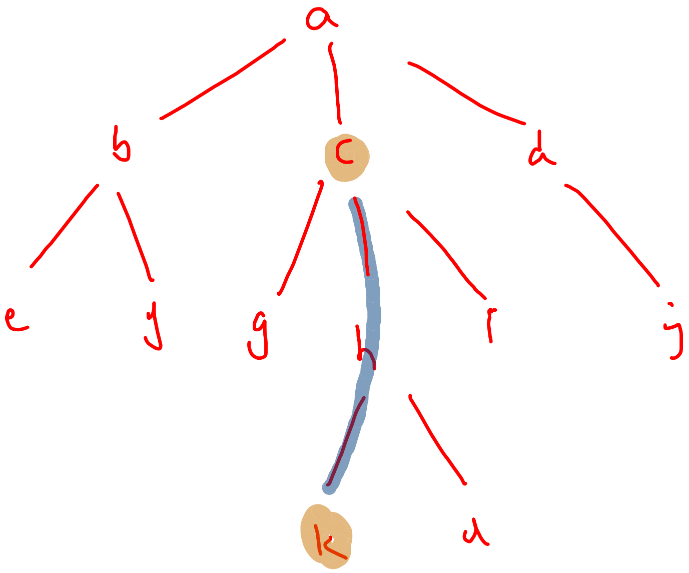
v2 = 2

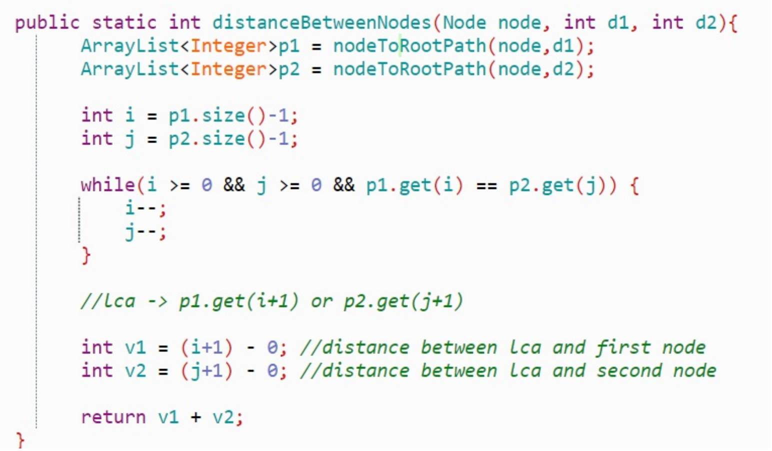
p2 = [l , h , c , a]

0 1 2 3

j ~~j~~ ~~j~~

ans : 3





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        int j = p2.size()-1;

        while(i >= 0 && j >= 0 && p1.get(i) == p2.get(j)) {
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            j--;
        }

        //lca -> p1.get(i+1) or p2.get(j+1)

        int v1 = (i+1) - 0; //distance between lca and first node
        int v2 = (j+1) - 0; //distance between lca and second node

        return v1 + v2;
}
```

i ~~i~~ ~~i~~

p1 : [c , a]

0 1

j ~~j~~ ~~j~~

p2 : [k , h , c , a]

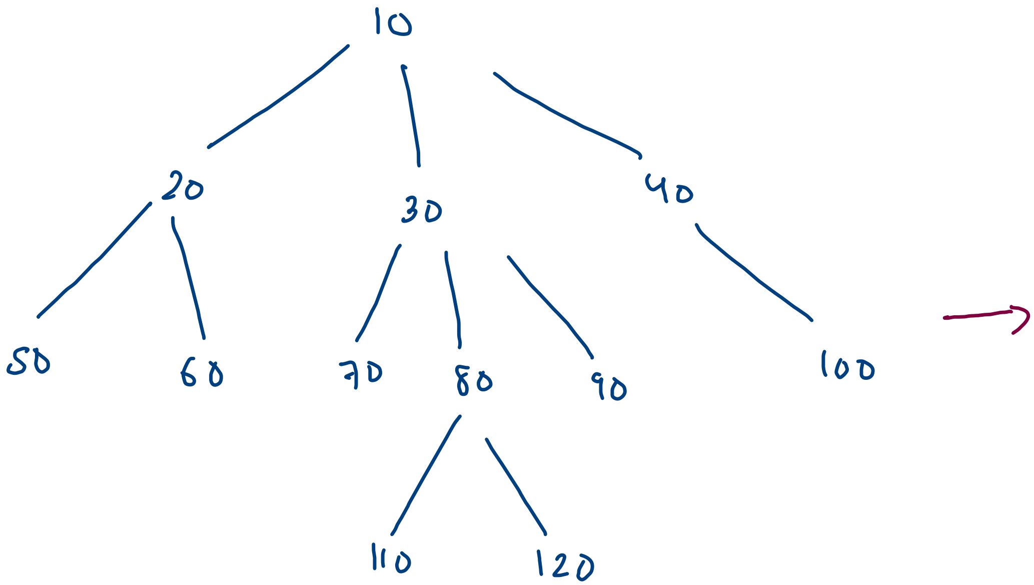
0 1 2 3

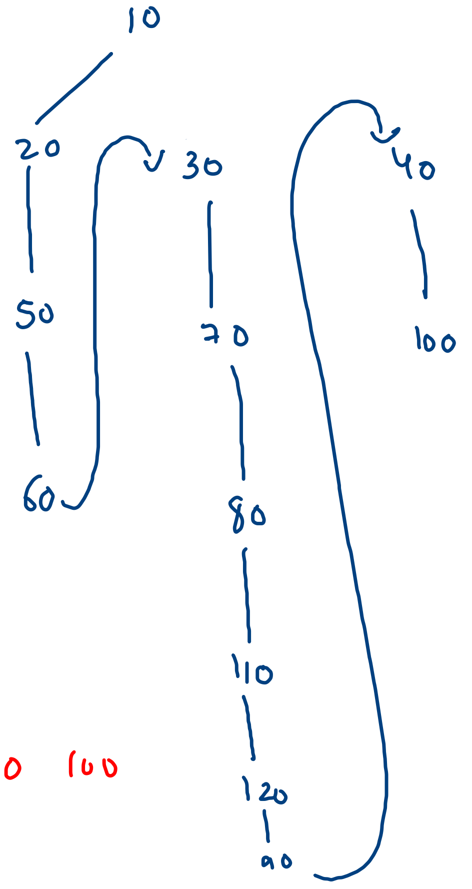
v1 = 0

v2 = 2

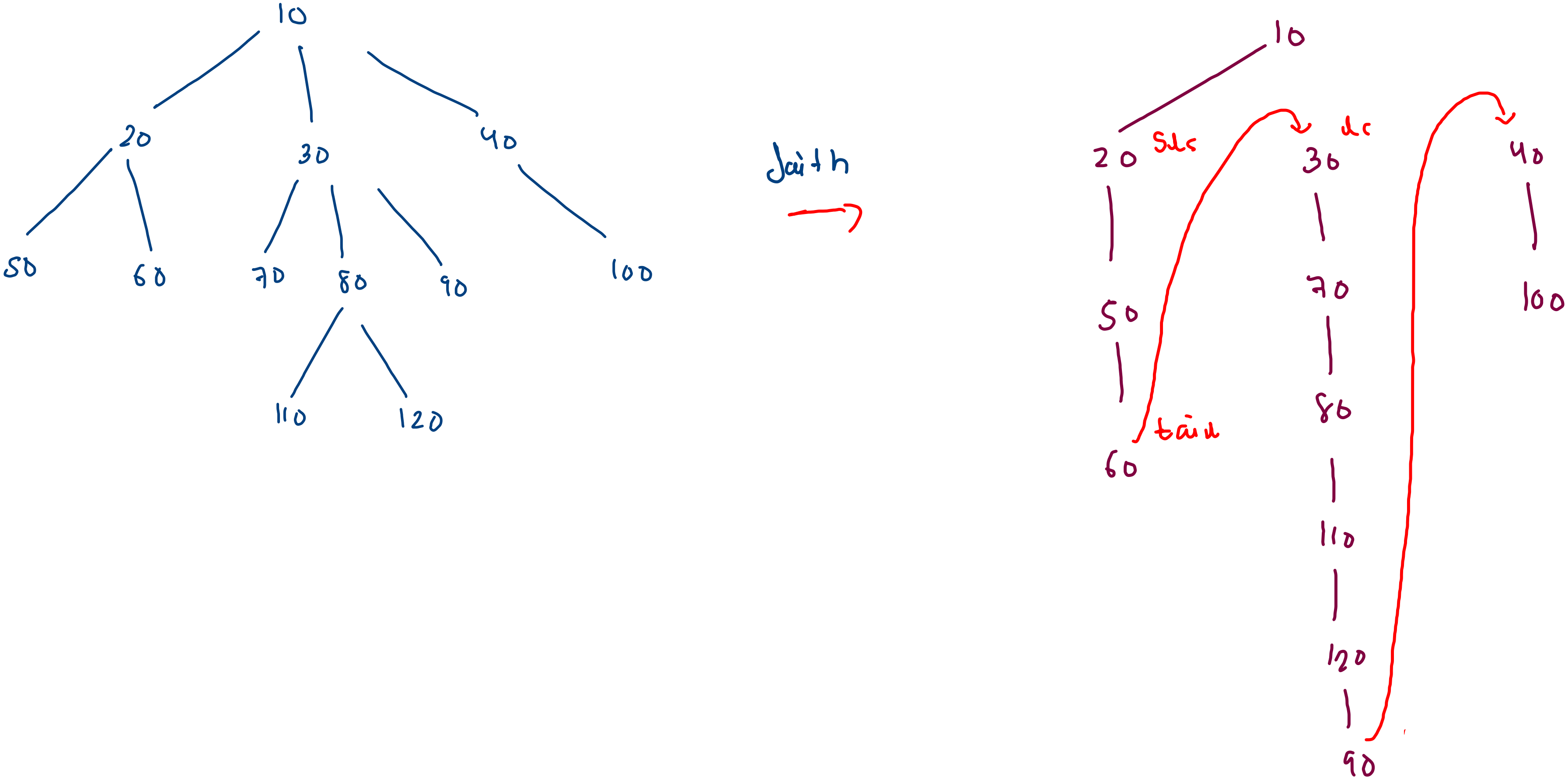
ans: 2

Linearize A Generic Tree





Pre: 10 20 50 60 30 70 80 110 120 90 40 100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100
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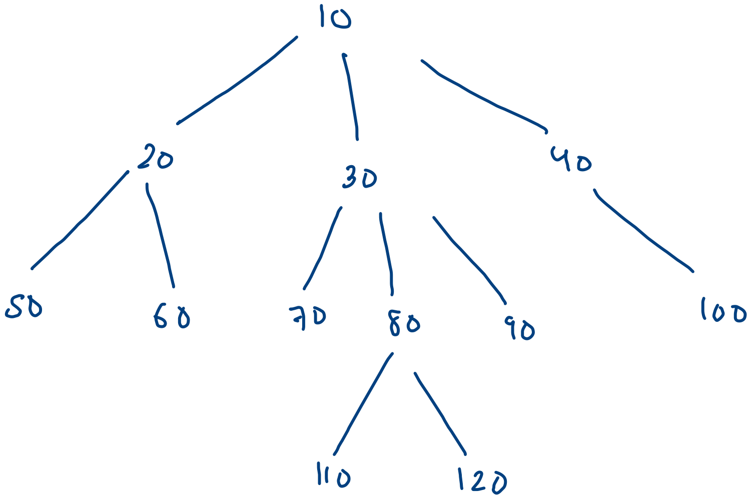
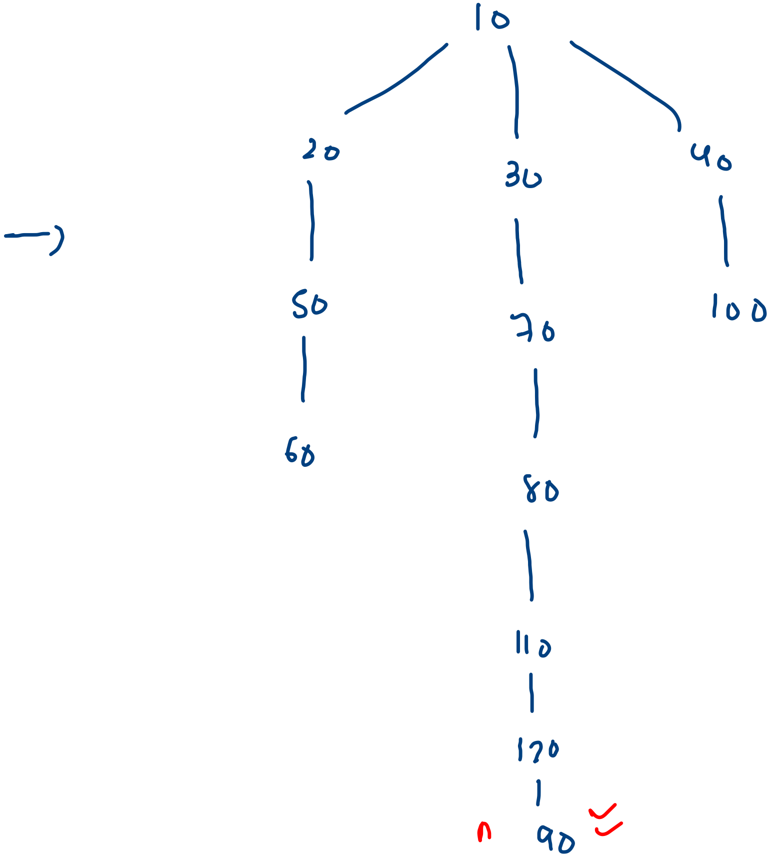
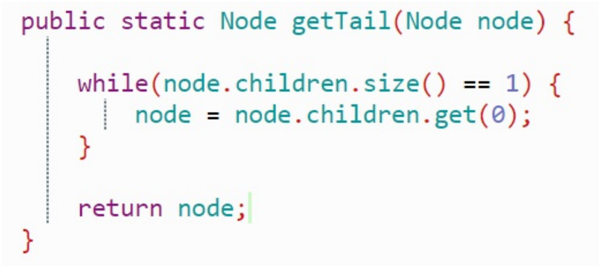


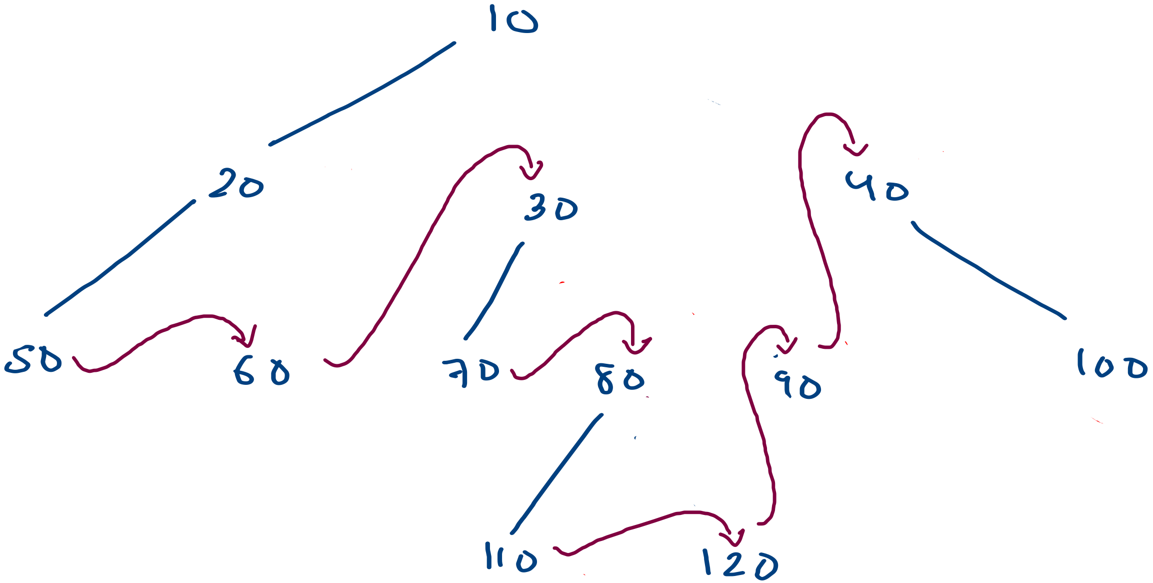


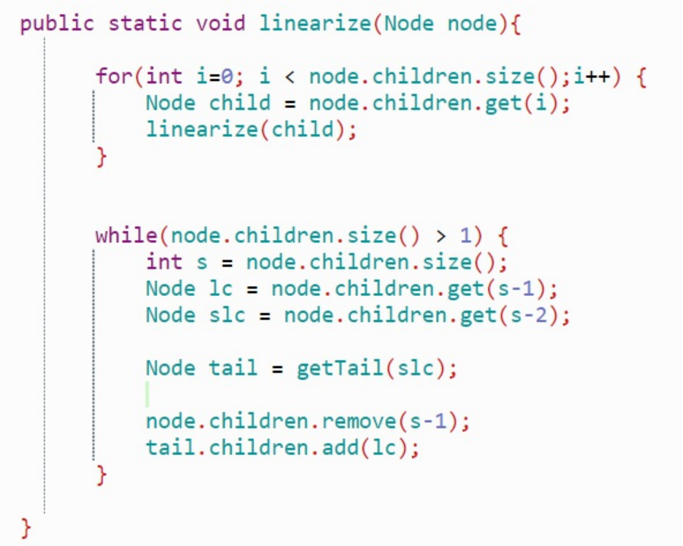


```
public static Node getTail(Node node) {

    while(node.children.size() == 1) {
        node = node.children.get(0);
    }

    return node;
}
```





```
public static void linearize(Node node){

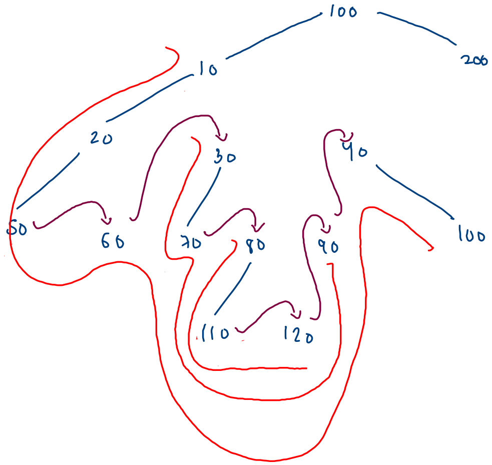
    for(int i=0; i < node.children.size();i++) {
        Node child = node.children.get(i);
        linearize(child);
    }

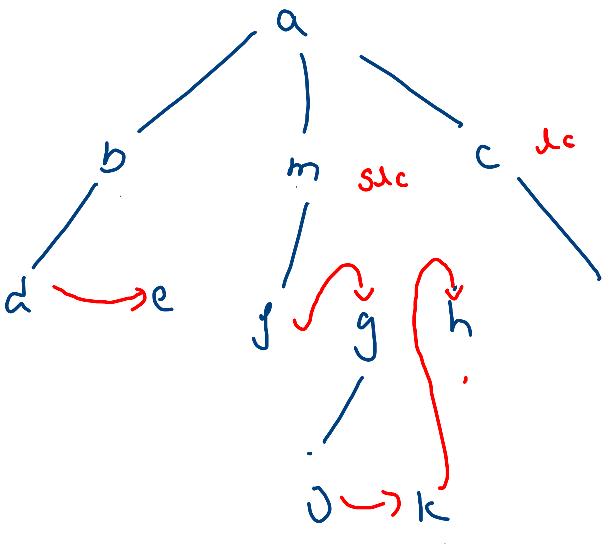

    while(node.children.size() > 1) {
        int s = node.children.size();
        Node lc = node.children.get(s-1);
        Node slc = node.children.get(s-2);

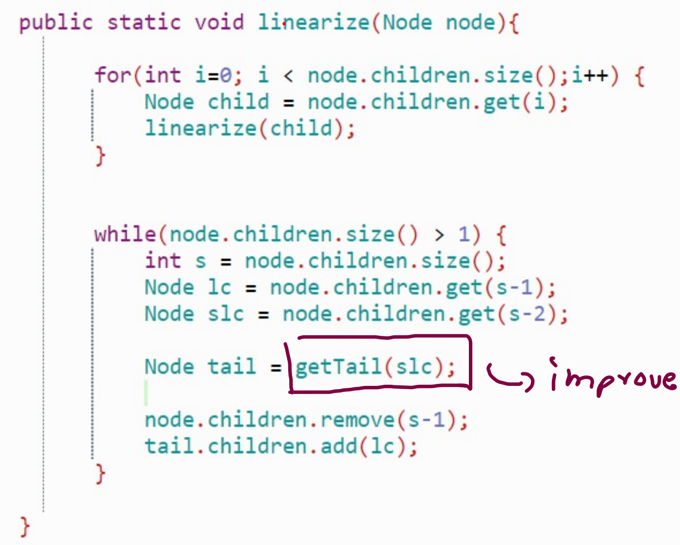
        Node tail = getTail(slc);

        node.children.remove(s-1);
        tail.children.add(lc);
    }

}
```







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        Node slc = node.children.get(s-2);

        Node tail = getTail(slc);

        node.children.remove(s-1);
        tail.children.add(lc);
    }
}
```
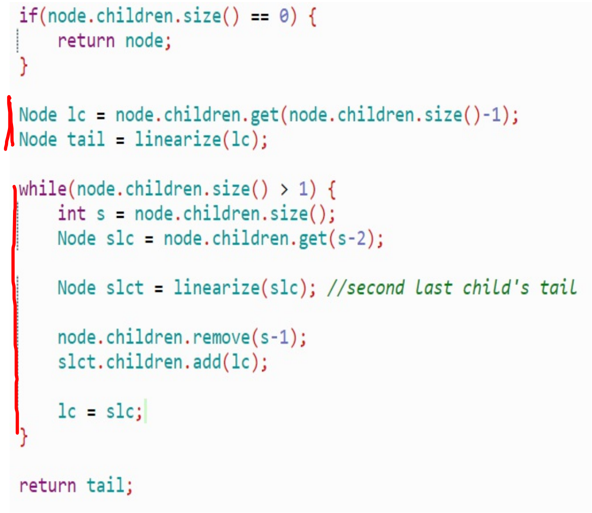
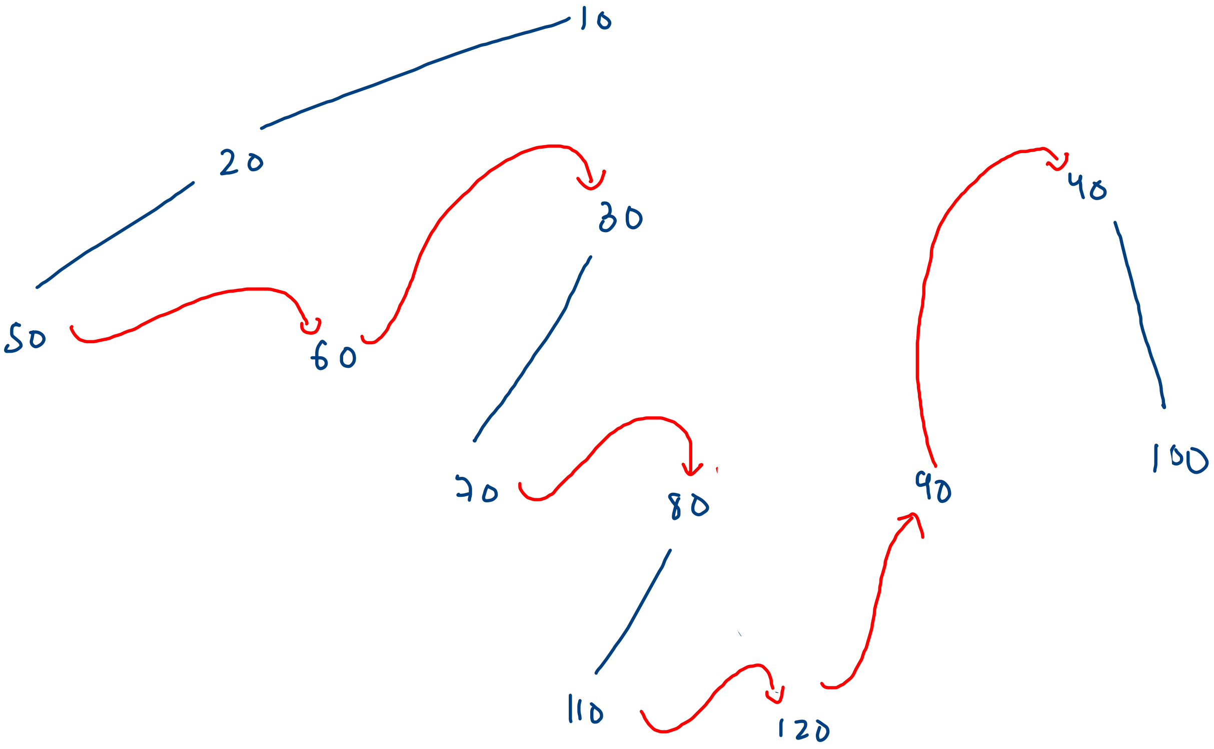

improve

100

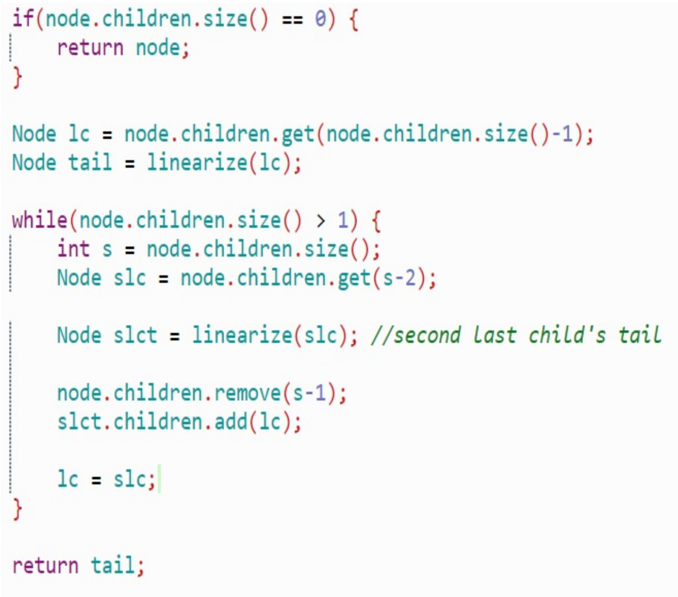
improvised



```
if(node.children.size() == 0) {
    return node;
}

Node lc = node.children.get(node.children.size()-1);
Node tail = linearize(lc);

while(node.children.size() > 1) {
    int s = node.children.size();
    Node slc = node.children.get(s-2);

    Node slct = linearize(slc); //second last child's tail

    node.children.remove(s-1);
    slct.children.add(lc);

    lc = slc;
}

return tail;
```



o(n)



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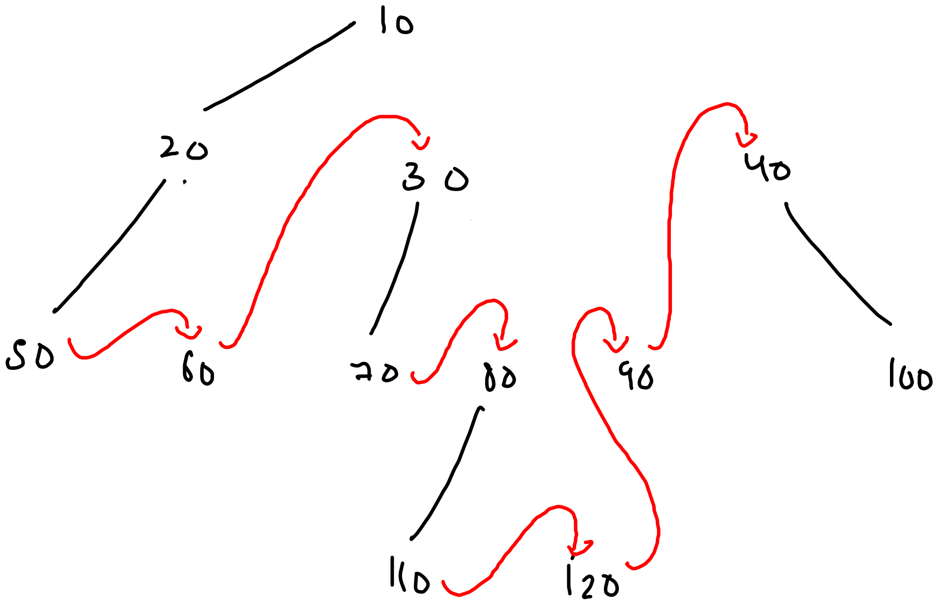
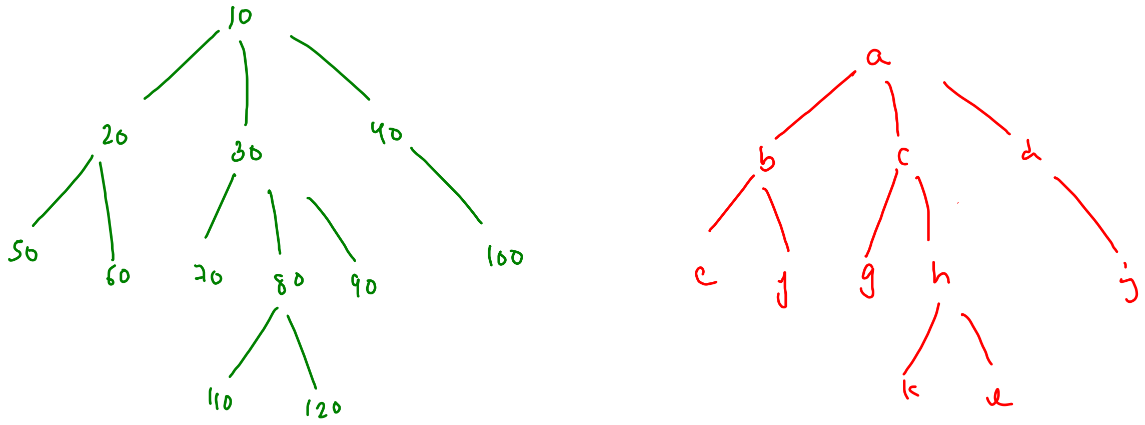
    slct.children.add(lc);

    lc = slc;
}

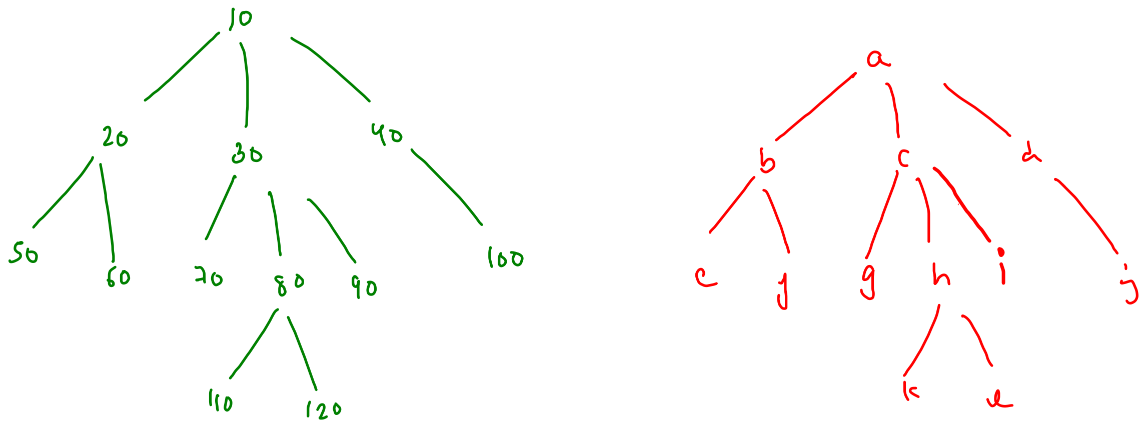
return tail;
```



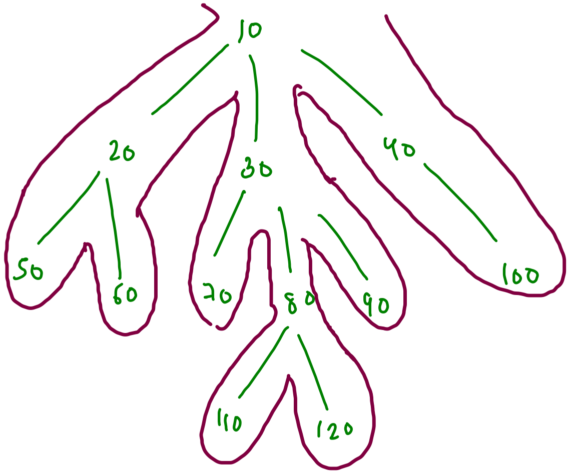
Are Trees Similar In Shape

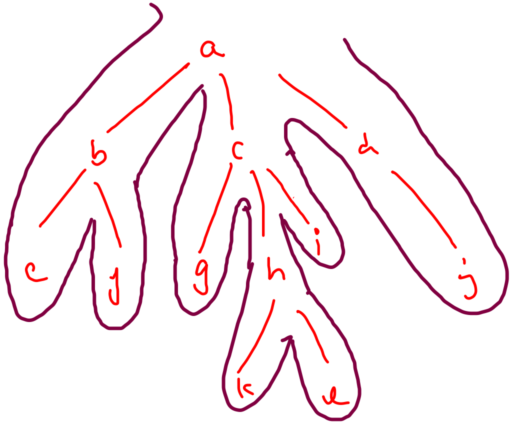


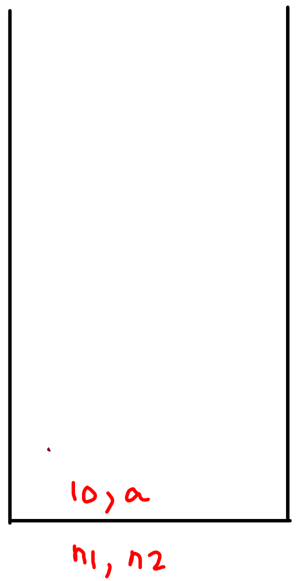
→ false

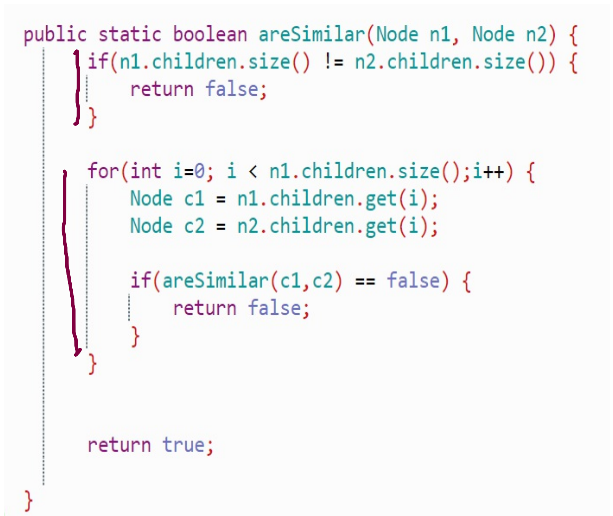


→ true









```
public static boolean areSimilar(Node n1, Node n2) {
    if(n1.children.size() != n2.children.size()) {
        return false;
    }

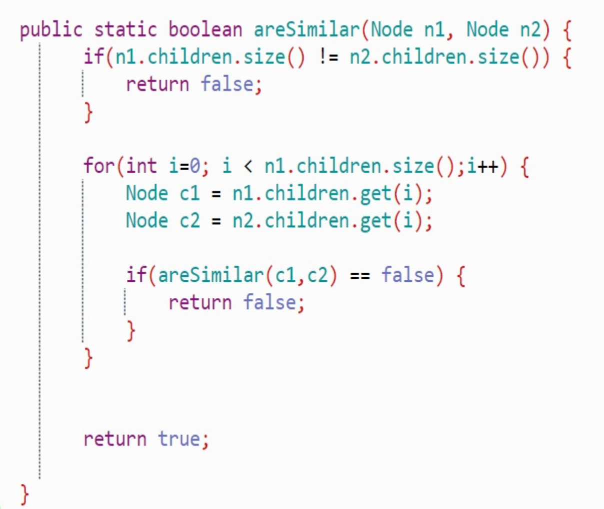
    for(int i=0; i < n1.children.size();i++) {
        Node c1 = n1.children.get(i);
        Node c2 = n2.children.get(i);

        if(areSimilar(c1,c2) == false) {
            return false;
        }
    }


    return true;

}
```

10, a → 20, b   30 , c   40, d



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        if(areSimilar(c1,c2) == false) {
            return false;
        }
    }


    return true;
}
```
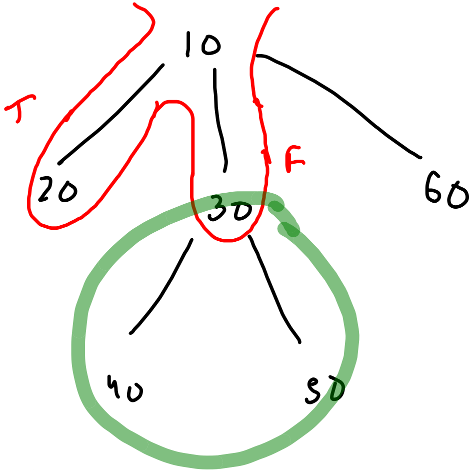
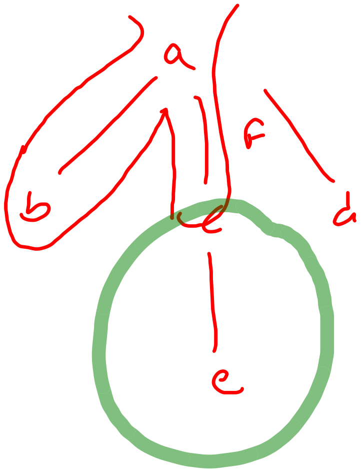
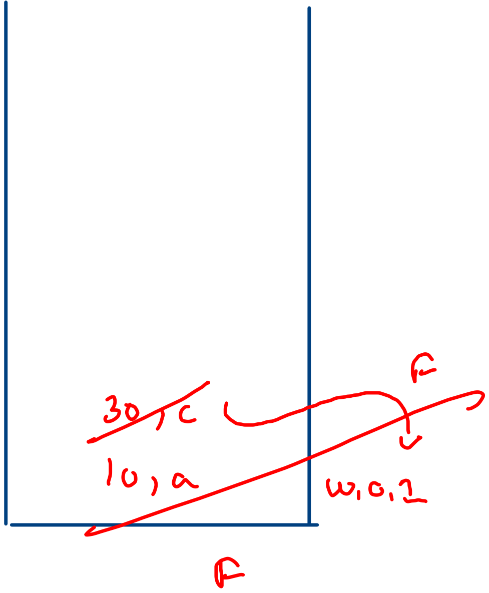
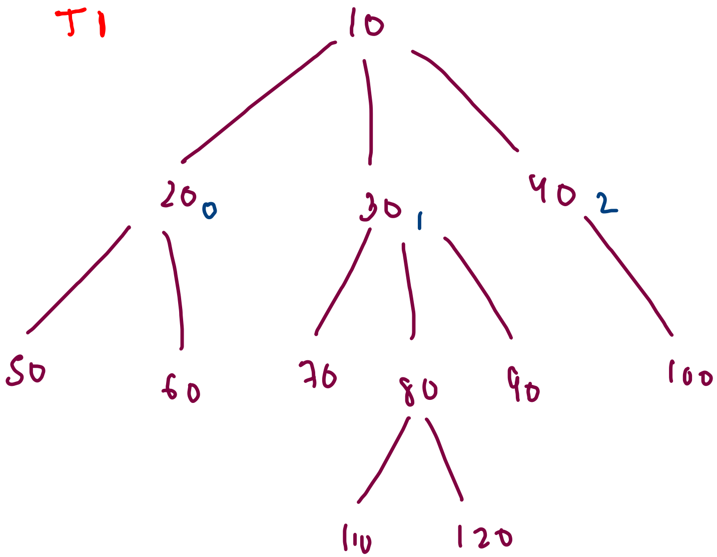
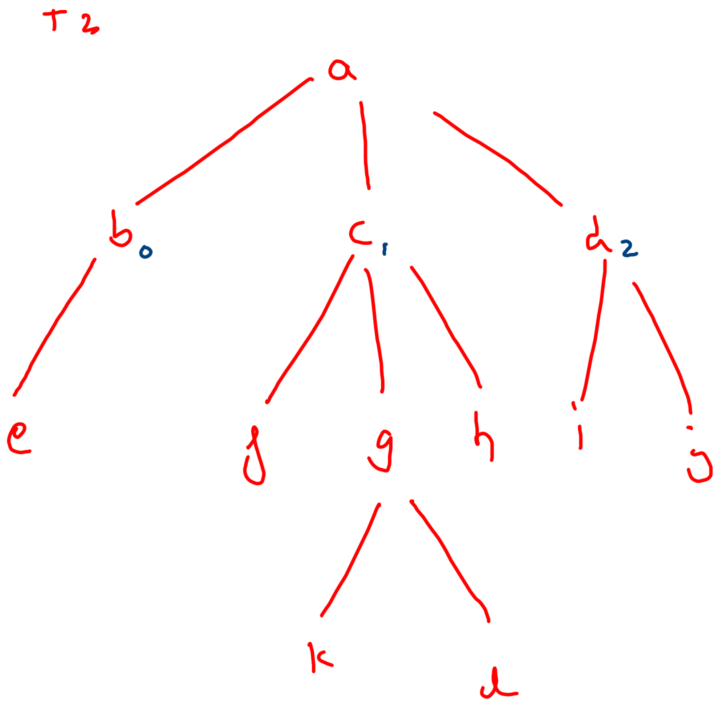



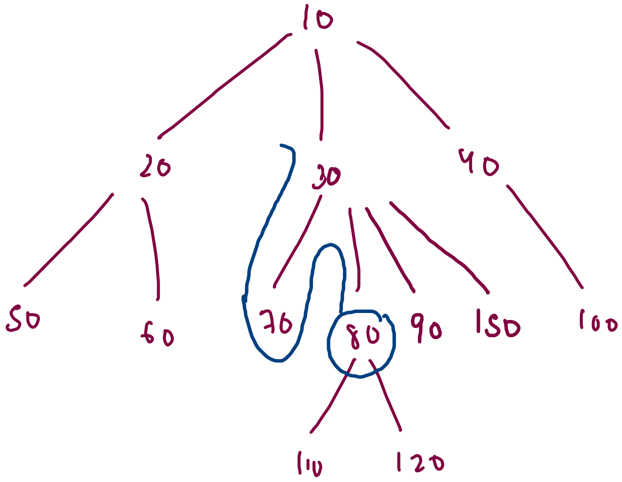


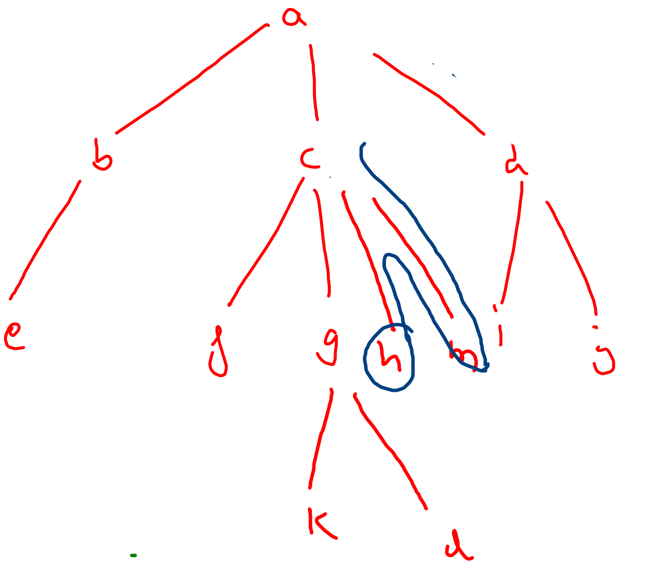


Are Trees Mirror In Shape

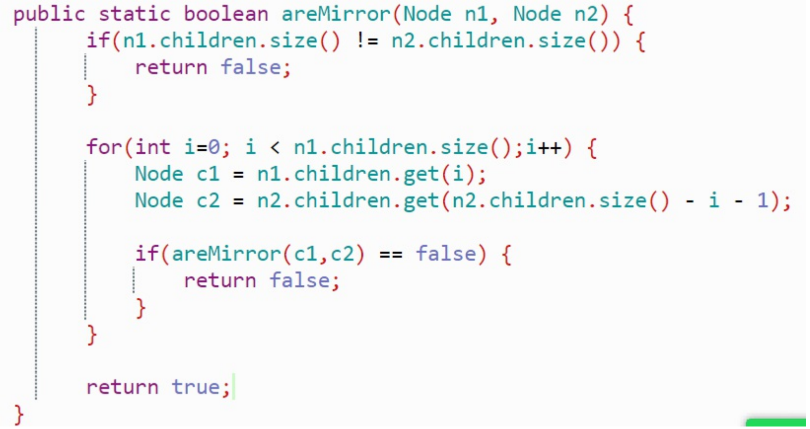








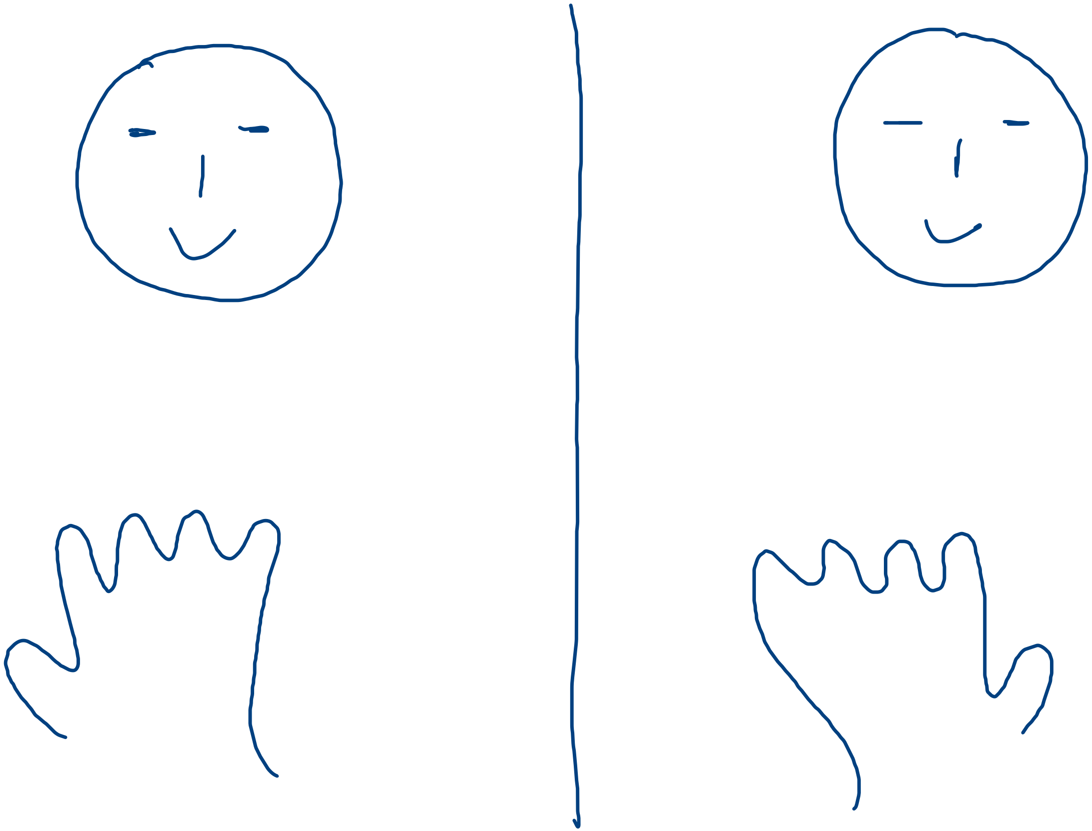
i=0



```
public static boolean areMirror(Node n1, Node n2) {
    if(n1.children.size() != n2.children.size()) {
        return false;
    }

    for(int i=0; i < n1.children.size();i++) {
        Node c1 = n1.children.get(i);
        Node c2 = n2.children.get(n2.children.size() - i - 1);

        if(areMirror(c1,c2) == false) {
            return false;
        }
    }

    return true;
}
```

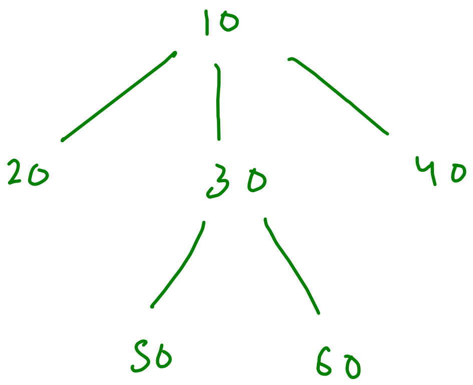
10, a → 20, d   30, c   40, b

Is Generic Tree Symmetric



symmetric

asymmetric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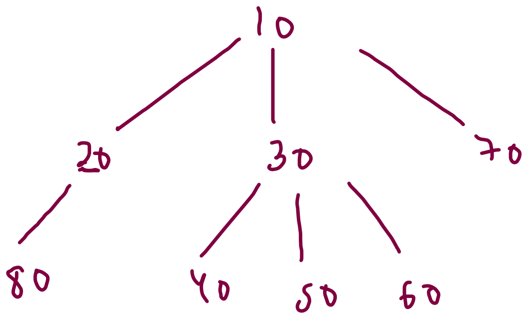
symm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70
80
40
50
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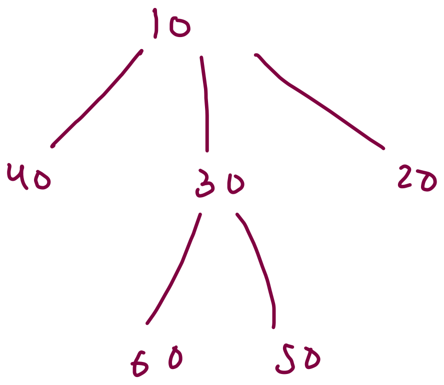
assym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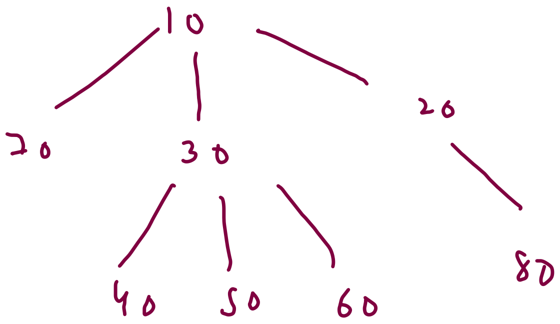
10
70
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40
50
60
80

isSymmetric (node) → areMirror (node, node)

areMirror (T1, T2)

true : mirror (T1) = T2

areMirror (T1, T1)

true : mirror(T1) = T1

(proves T1 is a symmetric shape)