

Ting Lai Wang

Question 1.

Inorder traversal: CFEJKIMNVRROSU

Preorder traversal: IFCAJENMRKOSU

Postorder traversal: CEKJFMRNSUOI

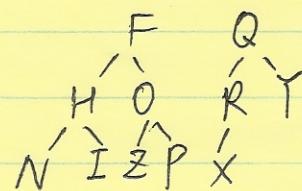
Question 2.

(1) Q, F, Y, I, O, R, A, N, H, Z, P, X.

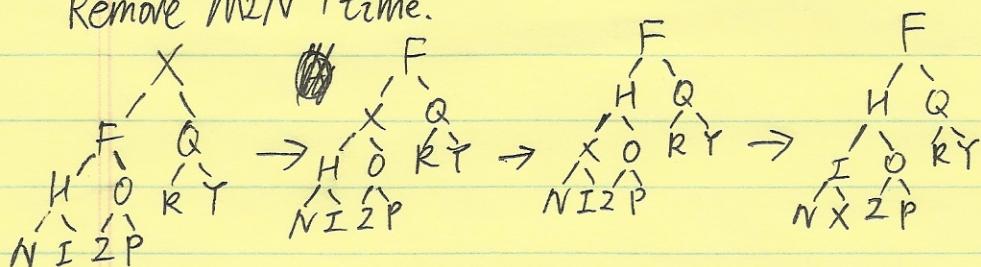
Origin:



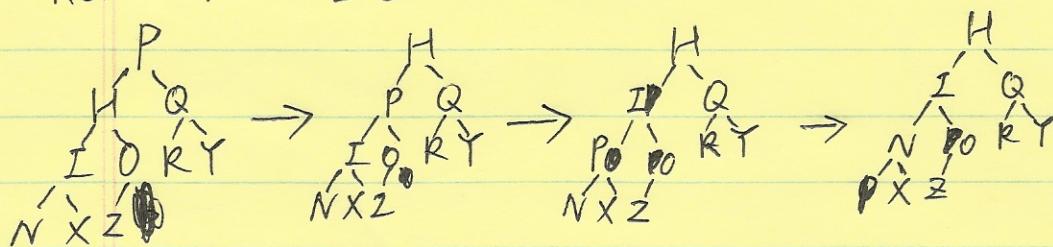
Min PQ:



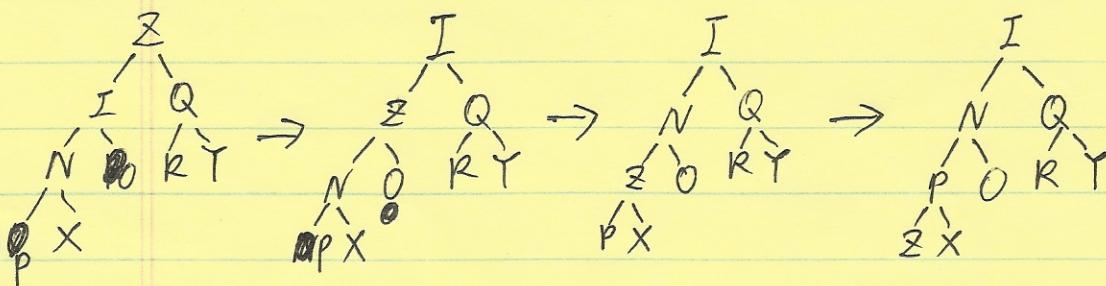
Remove MIN 1 time:



Remove MIN 2 times:



Remove MIN 3 times:



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0 1 2 3 4 5 6 7 8 9 10 11 ~~12~~

(2) a. AFQHORTNI~~Z~~ P X

b. INQPOR~~T~~ Z X

~~RECORDED~~

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Question 3.

```
import java.util.Iterator;
import java.util.NoSuchElementException;
import java.util.Stack;

public class hw3 {
    static Stack<Object> s;
    public Node root;
    public Node current;
    public hw3(Node root){
        this.root = root;
        current = getExternal(root);
        s = new Stack<Object>();
    }

    public Node getExternal(Node root){
        if(root == null)
            return null;
        else if(root.left == null && root.right == null){
            current = root;
            s.push(root);
            return root;
        }
        else{
            getExternal(root.left);
            getExternal(root.right);
        }
        return root;
    }
    public class BSTIterator implements Iterator<Object> {

        public void remove(){
            throw new UnsupportedOperationException();
        }
        public boolean hasNext(){
            return !s.isEmpty();
        }
        public Object next(Node current){
            if(!hasNext())
                throw new NoSuchElementException();
            current = getExternal(current);
            return s.pop();
        }
    }
}
```

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Question 4

Height of a binary heap with N keys: $\log N$

Height of a BST with N keys: N

Number of comparisons to sort N equal keys using our standard version of quicksort: N^2

Number of comparisons to sort N equal keys using ~~3-way~~ 3-way quick sort: N^2

Time to iterate over the keys in a BST using inorder traversal: N

Number of array access to insert a key into a BinarySearchST of size N : N

Question 5.

~~the code~~

mystery(key) will return floor.

Floor: the largest key in the symbol table \leq the search key.