CSI 2110 Tutorial (Section A)

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Place: STE 5000G

8.22 Draw a binary tree T that simultaneously satisfies the follows:

1) Each internal node of T stores a single character
2) A preorder traversal of yields EXAMFUN.
3) An inorder traversal of yields MAFXUEN.

inorder preorder Root is the first element of preorder

MAFXU | E | N — E is the parent of X and N

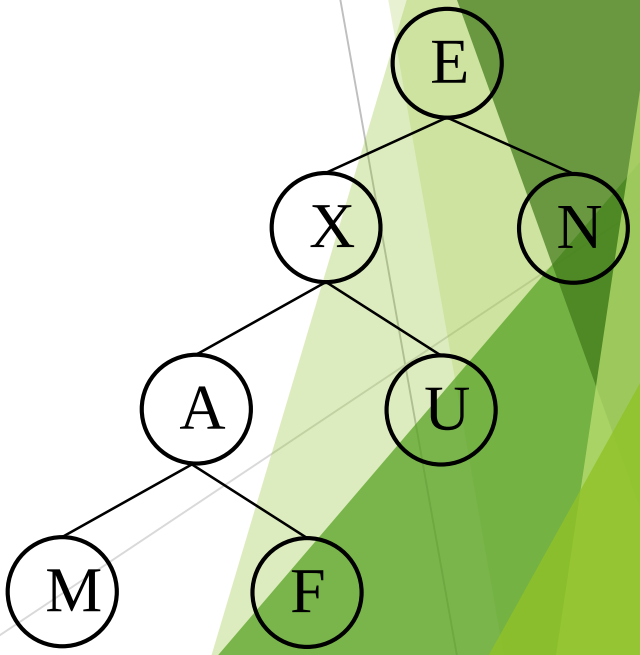
left right

MAF | X | U — X is the parent of A and U

left right

M | A | F — A is the parent of M and F

left right



Extra 1. Guess the tree:

Inorder traversal: FBCDGAKPF

Postorder traversal: FBDGCPKFA

inorder postorder Root is the last element of postorder

FBCDG | A | KPF A is the parent of F (right)

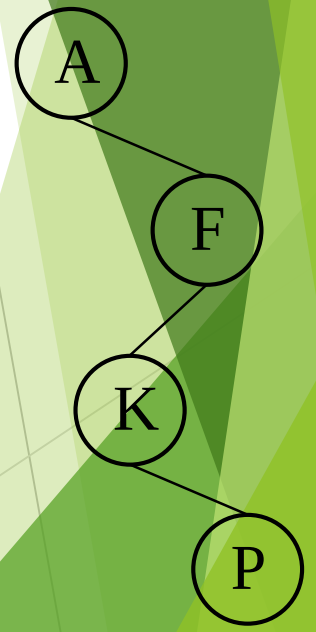
left right

FBCDG | A | KP | F F is the parent of K (left)

left

FBCDG | A | K | P | F K is the parent of P (right)

right



Remove the node that has ready been connected (except for A)

Remove the node that has ready been connected from postorder (except for A)

Inorder: FBCDGAKPF

Postorder: FBDGCPKFA

C is the left child of A

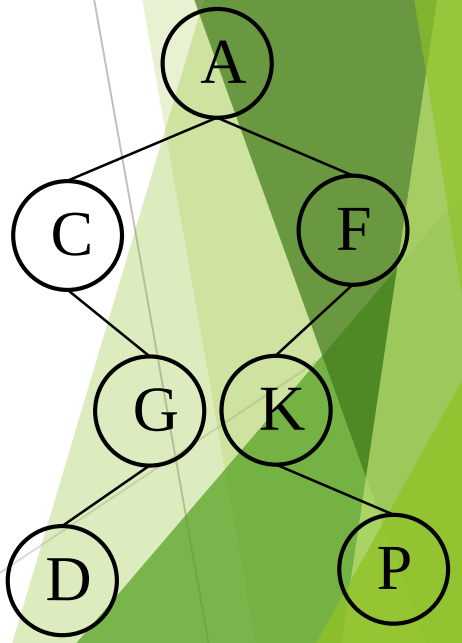
inorder postorder

FB | C | DG | A | K | P | F C is the parent of G (right)

left right

FB | C | D | G | A | K | P | F G is the parent of D (left)

left



Remove the node that has ready been connected from postorder (except for C)

Inorder: FBCDGAKPF

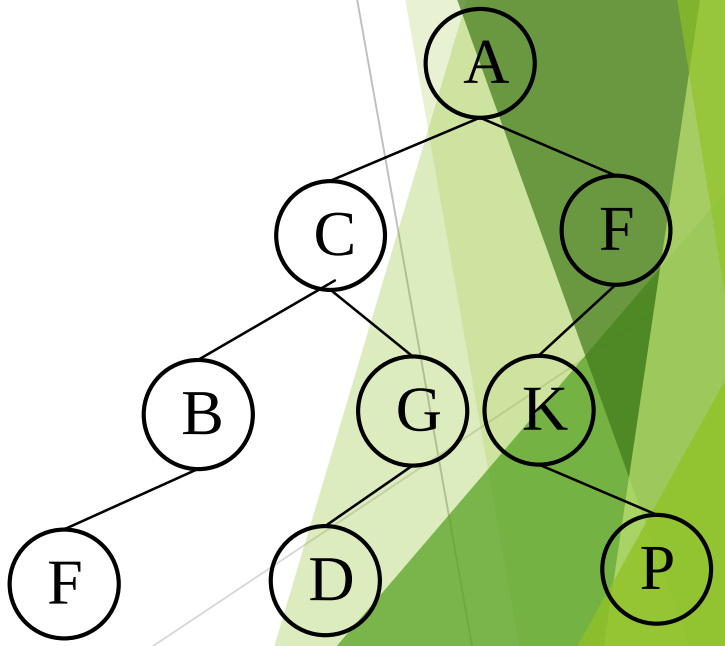
Postorder: FBDGCPKFA

B is the left child of C

inorder postorder

F | B | C | DG | A | K | P | F B is the parent of F (left)

left



7.8:

Suppose we are maintaining a collection C of elements such that, each time we add a new element to the collection, we copy the contents of C into a new array list of just the right size. What is the running time of adding n elements to an initially empty collection C in this case?

Add Nth Element	Num of ele to copy	Cost
First	0	1
Second	1	2
Third	2	3
…	…	…
Nth	N-1	N

Tot cost = 1 + 2 + … + N = (1+N)N/2

Complexity: $O(n^2)$

7.18:

The java.util.Collection interface includes a method, contains(o), that returns true if the collection contains any object that equals Object o. Implement such a method in the ArrayList class of Section 7.2.

```
public class ArrayList<E> implements List<E> {
  // instance variables
  public static final int CAPACITY=16;
  private E[ ] data;
  private int size = 0;
  // constructors
  public ArrayList( ) { this(CAPACITY); }
  public ArrayList(int capacity) {
    data = (E[ ]) new Object[capacity];
  }
```

```
public boolean contains(Object o){
    for(int k=0; k<size; k++)
        if(data[k].equals(o))
            return true;
    return false;
}
```

Exercise:

8.45 Design algorithms for the following operations for a binary tree T:

preorderNext(p): Return the position visited after p in a preorder traversal of T (or null if p is the last node visited).

inorderNext(p): Return the position visited after p in an inorder traversal of T (or null if p is the last node visited).

postorderNext(p): Return the position visited after p in a postorder traversal of T (or null if p is the last node visited).

What are the worst-case running times of your algorithms?