Tree traversals: Visiting all nodes in a tree (and practicing recursion)

Recursive methods

- Check for base case

- Otherwise, break the problem into 1 or more smaller problem instances. Solve them by calling the same method and use the results to solve the original problem.

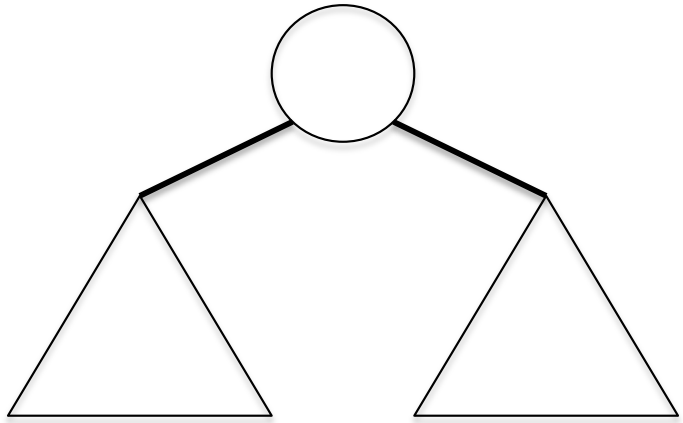
Example from text: countDown

```
public static void countDown(int n) {
    //prints numbers from n down to 1
    System.out.println(n);
    if(n  > 1)
        countDown(n-1);
}
```

Examples we've seen

- Mergesort
- Quicksort
- Arguably, binary search
- BST operations

Problem: Visit all nodes of a binary tree

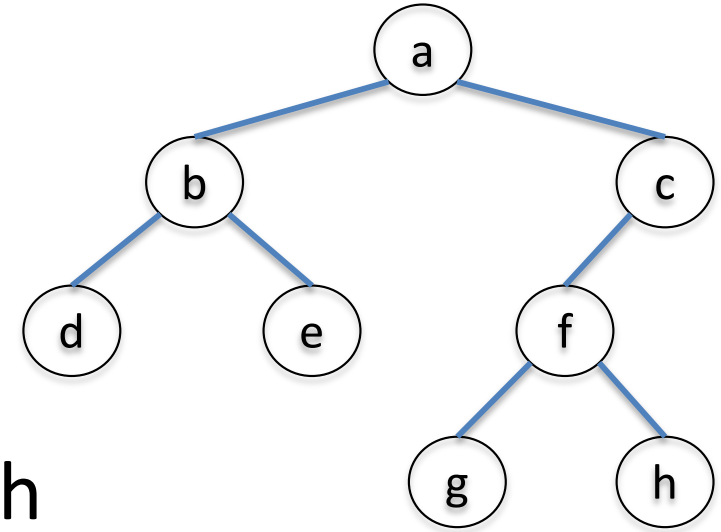


- Useful for printing the tree contents (for debugging, to store in a file, etc)
- Sometimes also need to visit all nodes to set flags, add the values, count something, …

Tree traversals

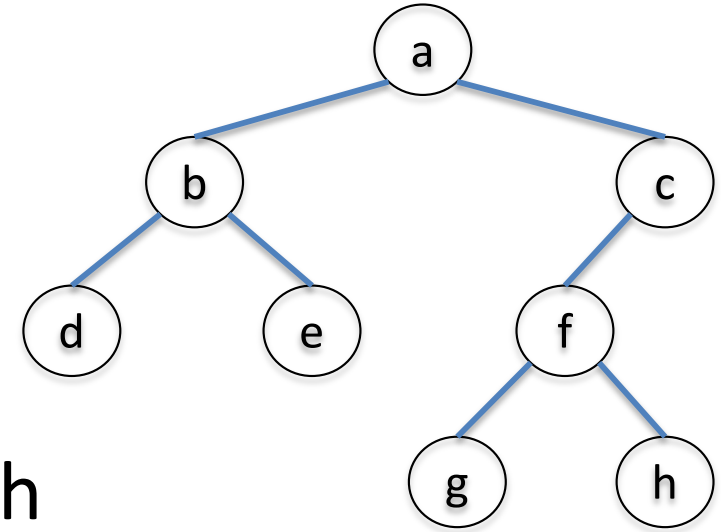
```
void traverse(Node n) {
        if(n == null)  return;
        //preorder: print here
        traverse(n.left);
        //inorder: print here
        traverse(n.right);
        //postorder: print here
}
```

Which of the following is a preorder traversal of the tree below?



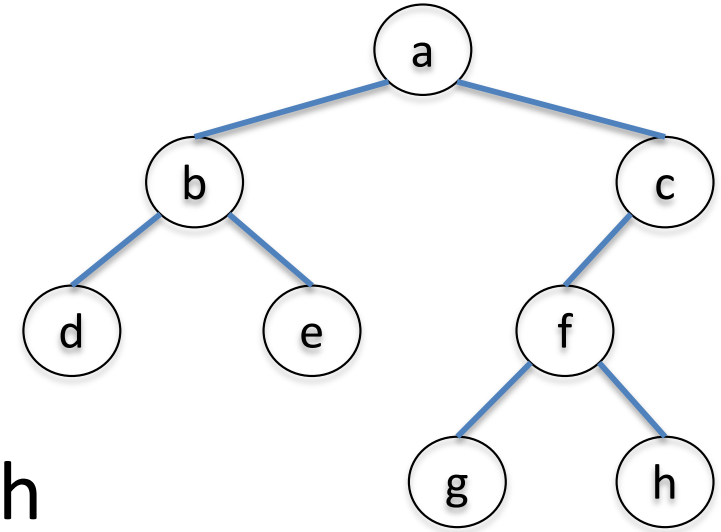
A. a,b,c,d,e,f,g,h
B. a,b,c,d,f,e,g,h
C. a,b,d,e,c,f,g,h
D. a,c,b,d,f,e,g,h
E. None of the above

Which of the following is a preorder traversal of the tree below?



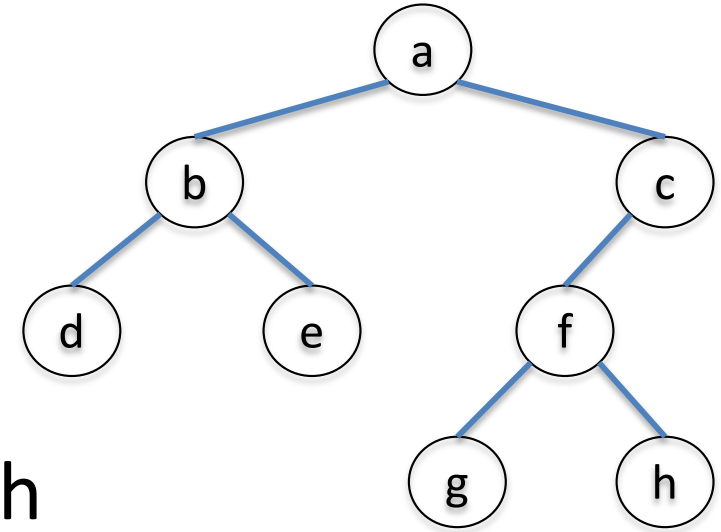
A. a,b,c,d,e,f,g,h
B. a,b,c,d,f,e,g,h
C. a,b,d,e,c,f,g,h
D. a,c,b,d,f,e,g,h
E. None of the above

Which of the following is an inorder traversal of the tree below?



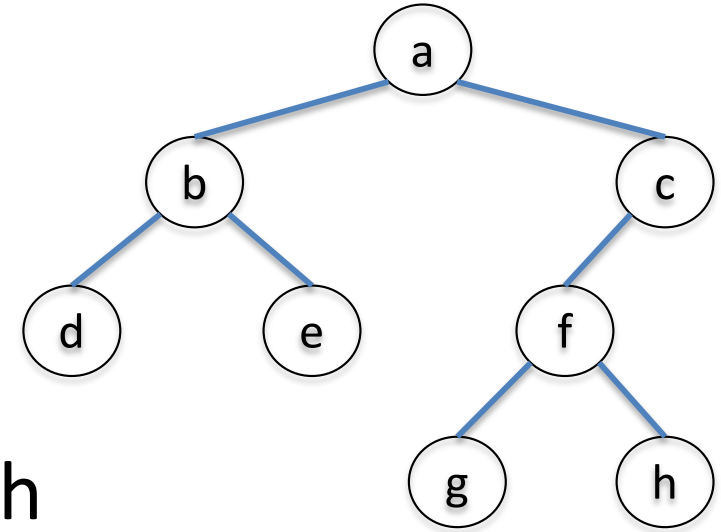
A. a,b,c,d,e,f,g,h
B. b,a,c,d,e,g,f,h
C. d,b,e,a,g,f,h,c
D. d,b,a,e,g,f,c,h
E. None of the above

Which of the following is an inorder traversal of the tree below?



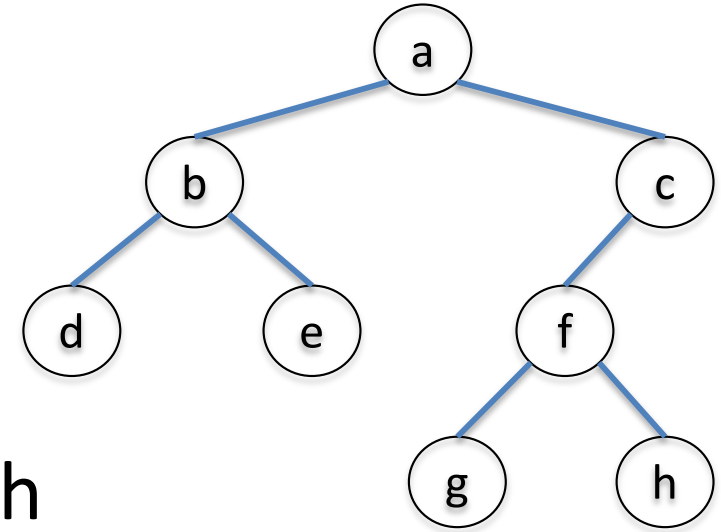
A. a,b,c,d,e,f,g,h
B. b,a,c,d,e,g,f,h
C. d,b,e,a,g,f,h,c
D. d,b,a,e,g,f,c,h
E. None of the above

Which of the following is a postorder traversal of the tree below?



A. b,d,e,a,f,c,g,h
B. b,d,e,g,h,f,c,a
C. d,e,b,a,g,h,f,c
D. d,e,b,g,h,f,c,a
E. None of the above

Which of the following is a postorder traversal of the tree below?



A. b,d,e,a,f,c,g,h
B. b,d,e,g,h,f,c,a
C. d,e,b,a,g,h,f,c
D. d,e,b,g,h,f,c,a
E. None of the above

Draw two trees with preorder traversal a,b,c,d,e,f,g,h

Draw two trees with inorder traversal a,b,c,d,e,f,g,h