

CS 152
Computer Programming
Fundamentals
Recursive Data Types

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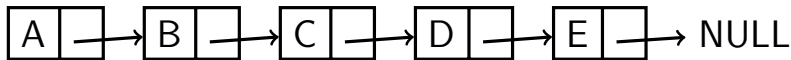
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What is Recursion?

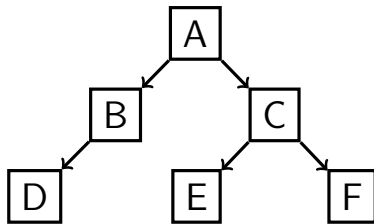
- Defining something in terms of itself.
- A *recursive definition* is one that uses the concept or thing that is being defined as part of the definition.
 - For example: An “ancestor” is either a parent or an ancestor of a parent.
- A *recursive method* is a method that calls itself, either directly or indirectly.
- A *recursive data type* is a data type that is defined in terms of itself

Linked List



```
public class ListNode {  
    private String data;  
    private ListNode next;  
  
    public ListNode(String data) {  
        this.data = data;  
        this.next = null;  
    }  
  
    // setters, getters, etc.  
}
```

Binary Tree



Binary Tree Node

```
public class Node {
    private String data;
    private Node left;
    private Node right;

    public Node(String data) {
        this.data = data;
        this.left = null;
        this.right = null;
    }

    // getters, setters, etc.
}
```

Questions Game

- Computer will ask you think of an animal
- It will ask you yes/no questions, then guess the animal
- If correct, good for the computer
- If wrong, it will ask you to provide a yes/no question to distinguish your animal from the wrong guess.
- Play again and the computer will use what it has learned to make better guesses.

How to implement?

- We'll use a binary tree to hold the information.
 - Animal names will be data at the leaves.
 - Questions will be data for internal nodes.
- Walk the tree asking questions and going left/right based on answers.
- At leaf, guess that animal.
- If wrong, add update tree with new info.