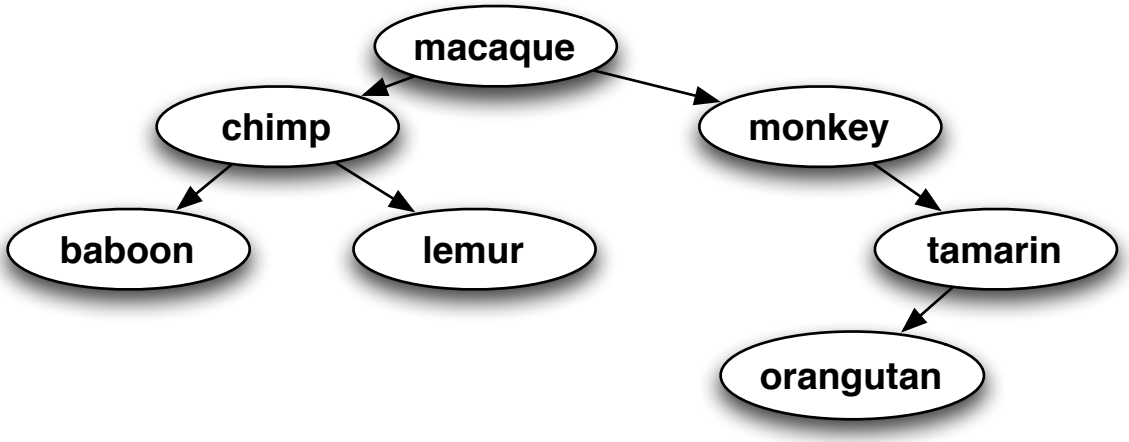
PROBLEM 1 : (*Oversees, Refugees, Guarantees, Search-trees (30 points)*)

The tree below is a search tree.

Part A (4 points)

What is the pre-order traversal of the tree? (The first value printed is *macaque*)



Part B (2 points)

Provide a word (it doesn't have to be a real word, it must contain at least four letters) that could be inserted as a left-child of monkey so that the tree is still a search tree.

Part C (2 points)

Show by drawing where a node with *gibbon* would be inserted into the tree.

Part D (4 points)

The tree above has a height of four and has three leaves. Draw a *search* tree with the same values, a height of four, and which has four leaves. Draw the tree on the previous page.

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Part E (4 points)

The method `printQ` below prints one line for every node in a tree. The first value printed when called with the tree above is the string *macaque*. What is the complete output?

```
public static void printQ(TreeNode root){
      Queue<TreeNode> q = new LinkedList<TreeNode>();
      if (root != null){
          q.add(root);
      }
      while (q.size() != 0){
          root = q.remove();
          System.out.println(root.info);
          if (root.left != null) q.add(root.left);
          if (root.right != null) q.add(root.right);
      }
  }
```

Part F (4 points)

The method `printS` below prints one line for every node in a tree. The first value printed when called with the tree above is the string *macaque*. What is the complete output?

```
  public static void printS(TreeNode root){
      Stack<TreeNode> st = new Stack<TreeNode>();
      if (root != null){
          st.push(root);
      }
      while (st.size() != 0){
          root = st.pop();
          System.out.println(root.info);
          if (root.right != null) st.push(root.right);
          if (root.left != null) st.push(root.left);
      }
  }
```

continued →