CS 61B Lab 11
April 10-12, 2002

Please make sure you have a partner for this lab.

Copy the Lab 11 directory by doing the following, starting from your home directory. Don't forget the "-r" switch in the cp command.

```
mkdir lab11
cd lab11
cp -r $master/lab/lab11/* .
```

All the code is in the dict package. You can compile it from your lab11 directory with

```
javac -g dict/*.java
```

Some test code is provided and can be run with

```
java dict.BinaryTree
```

Familiarize yourself with the fields and methods of the BinaryTree and BinaryTreeNode classes. BinaryTree is an implementation of the Dictionary interface (which you also used in Homework 6). Note that BinaryTree uses Comparable objects as keys (since it is an ordered dictionary), while in the Dictionary abstract class keys are declared as plain Objects. Thus you will occasionally need to cast Objects to Comparables.

Part I: Finding an Element in a Binary Tree (2 points)

Complete the implementation of the findElement() method in dict/BinaryTree.java by filling in the body of findElementHelper(). findElement() takes a key as its single parameter, and returns an element associated with that key, or NO_SUCH_ELEMENT if there is none. (If there are several elements associated with a key, it doesn't matter which one is returned.) findElementHelper() helps by recursively finding and returning a node that contains the key, or null if no such node exists.

Take a look at insertItemHelper() for inspiration. findElement() should run in O(d) time if the depth of the tree is d.

Part II: Removing an Element with a Given Key (2 points)

Fill in the body of remove() method in BinaryTree.java. remove() takes a key as its single parameter, and removes one item having that key if the tree contains one. (If there are several elements associated with a key, it doesn't matter which one is returned.) remove() returns the same value that findElement() returns, but should not call findElement(). However, remove() SHOULD use the findElementHelper() method you wrote for Part I.

remove() should run in O(d) time if the depth of the tree is d.

Check-off

Show your TA or Lab Assistant the code you have written, and run the test program. You'll receive points for each part that runs correctly.

2 points: If findElement() works correctly.
1 point: If remove() works for nodes that have no child or one child.
1 point: If remove() works for nodes that have two children.