```java
import java.io.*;
import java.util.*;

/**
 * This class models a Binary Question Tree.
 *
 *  It first initialize a "computer" Answer Node as its root.
 *
 *  If previous game data exist, user can have the tree
 *   read that data and load that game
 *  When a game is finished, user can have the tree
 *   write down its structure
 *  When a game is played, the tree expands per lost game
 *   using data given by user
 *
 * <ul>
 * <li> Name: QuestionTree.java
 * <li> Description: Question Tree
 * <li> Class: Java 145
 * <li> Instructor: Ken Hang && Janet Ash
 * <li> Date: March 16 2015
 * </ul>
 * @author  Hai H Nguyen (Bill)
 * @version Winter 2015
 */
public class QuestionTree {
    private QuestionNode root;

    private Scanner user;

    /**
     * Constructor which initialize the QuestionNode
     * and the user Scanner
     */
    public QuestionTree(){
        root = new QuestionNode("computer");

        user = new Scanner(System.in);
    }

    /**
     * Play a complete guessing game
     * and rebuild the tree
     * as necessary
     */
    public void askQuestions() {
        root = playedNode(root);
    }

    private QuestionNode playedNode(QuestionNode node){
        if (node.isAnswer()) { // If a node is an Answer node
            if (yesTo ("Would your object happen to be " + node + "?")) {
                debugLog("Great, I got it right!\n"); // If user accepts the answer
            } else { // Else the machine learn a new question node
                node = learnedNode(node);
            }
        } else { // If node is a Question node
            if (yesTo (node.toString())) {
                node.yes = playedNode(node.yes);
            } else {
                node.no = playedNode(node.no);
            }
        }
        return node;
    }

    private QuestionNode learnedNode(QuestionNode node){
        debugLog("What is the name of your object? ");
```

```
69          // Make new answer node for the new object
70          QuestionNode newNode = new QuestionNode (user.nextLine());
71
72          debugLog("Please give me a yes/no question that\n" +
73                   "distinguishes between your object\n" +
74                   "and mine--> ");
75          // Get user's question
76          String query = user.nextLine();
77          // Make new Question Node per user's command
78          return yesTo("And what is the answer for your object?") ?
79                  new QuestionNode ( query, newNode, node ):
80                  new QuestionNode ( query, node, newNode );
81      }
82
83      /**
84       * Invokes the writeNodes Recursion and prints
85       * the Question Tree into the output Stream
86       * @param output        Output object to Stream data
87       */
88      public void write(PrintStream output){
89          write(output, root);
90      }
91
92      private void write(PrintStream out, QuestionNode node){
93          if (node.isAnswer()){
94              out.print("A:\n" + node);
95          } else {
96              out.println("Q:\n" + node);
97
98              write(out, node.yes);
99
100             out.println();
101             // Avoid new line at the end
102             write(out, node.no);
103         }
104     }
105
106     /**
107      * Invokes the readNode recursion and builds
108      * the Question Tree in a binary fashion
109      * @param input         Scanner Object to get Data
110      */
111     public void read (Scanner input){
112         root = readNode(input);
113     }
114
115     private QuestionNode readNode(Scanner input){
116         QuestionNode node = null; // Initialise a null node.
117
118         if (input.hasNextLine()){
119             if (input.nextLine().startsWith("A:")){// Create Answer node
120                 node = new QuestionNode(input.nextLine());
121             } else { // Else Create Question node
122                 node = new QuestionNode(input.nextLine(), readNode(input), readNode(input));
123             }
124         }
125
126         return node;
127     }
128
129     /**
130      * Asks the user a question, forcing an answer of "y " or "n";
131      * @param prompt    Message to print
132      * @return          True if the answer was yes, false otherwise
133      */
134     public boolean yesTo (String prompt){
135         debugLog(prompt + " (y/n)? ");
136
```

```
137         String response = user.nextLine().trim().toLowerCase();
138
139         if (!response.equals("y") && !response.equals("n")) {
140             debugLog ("Please answer y or n.\n");
141             // U know Recursion? Slow Stack, but No Loop...
142             return yesTo(prompt);
143         }
144
145         return response.equals("y");
146     }
147
148     private void debugLog(Object o){
149         if(o!= null) {
150             System.out.print(o.toString());
151         }
152     }
153 }//IS29
```