CS 100J Prelim 2 Fall 2006 Answers

Question 1. (a) Local variable: A variable declared in the body of a method. It is created when the frame for a call is created, before execution of the method body.

(b)
```
// Store in c the number of positions k in Strings s1
    // and s2 such that s1[k] == s2[k]
    int n= Math.min(s1.length(), s2.length());
    int c= 0;
    // invariant: c = no. of positions i in s1[0..k-1] and
                        s2[0..k-1] such that s1[i] == s2[i]
    for (int k= 0; k < n; k= k+1) {
       if (s1.charAt(k) == s2.charAt(k))
          c= c+1;
    }
    // c = no. of positions i in s1[0..n-1] and s2[0..n-1]
    // such that s1[i] == s2[i]
```

Question 2. (a) c.Bigger(a) : **true**,

(b) a.getJob(): ERROR. Apparent class is Student.

(c) c.getJob(): “work-study”,

(d) d.getJob(): “Cabbie”,

(e) c.getSound(): “I'm new here.”,

(f) d.getSound(): “”,

(g) ((Frosh)a).getSound(): “I'm new here.”,

(h) ((Frosh)d).getSound(): ERROR,

(i) ((Senior)d).getSound(): “”,

(j) ((Senior)a).getSound(): ERROR.

Question 3.

```
/** Constructor: a Senior with major "CS",
    name m, and gpa of 3.8. */
public Senior(String m) {
    super(m, 3.8);       major= "CS";
}
/** = “ob is a non-null Senior with the same
       fields as this Senior” */
public boolean equals(Object ob) {
      if (ob == null) return false;
      if (!(ob instanceof Senior)) return false;
      Senior obs= (Senior) ob;
      return this.major.equals(obs.major) &&
          this.getName().equals(obs.getName()) &&
          this.getGpa() == obs.getGpa();
}
```

Question 4.
```
/** Edit string s as described in q. 4 */
public static String edit(String s) {
    String res= "";
    // inv: res contains the processed s[0..k-1]
    for (int k= 0; k != s.length(); k= k+1) {
       // If res is empty or ends in ". " (but not "i.e."),
       // append capitalized s[k] to res;
       // otherwise append s[k] to res.
       if ((res.length() == 0 || res.endsWith(". ")) &&
           !res.endsWith("i.e. ") ) {
              res= res +
                  Character.toUpperCase(s.charAt(k));
           }
       else res= res + s.charAt(k);
       if (res.endsWith(".\""))
          res= res.substring(0, res.length()-2) + "\".";
    }
    return res;
}
```

Question 5. (a)
```
/** = i as a string but with leading 0's,
       if necessary, so that it is 3 digits
       Precondition: 0 <= i < 1000 */
public static String digit3(int i) {
     if (i < 10)    return "00" + i;
     if (i < 100)    return "0" + i;
     return    "" + i;
}
/** = A string that contains a representation of i, but
    with a comma every three digits.
    Precondition: i > 0.
    Example: toString(5243642) is "5,243,642"*/
    public static String toString(int i) {
       if (i < 1000)    return    "" + i;
       return toString(i/1000) + "," + digit3(i%1000);
}
```

(b)
```
/** = no. elephants in this Elephant’s family tree */
public int treeSize() {
    int size= 1;    // for this elephant.
    if (father != null) size= size + father.treeSize();
    if (mother != null) size= size + mother.treeSize();
    return size;
}
```