CS1110, Fall 2008. Sample answer to Final Gries djg17

1 .
```
int h= b.length;
int k= 0;
// inv: c[0..k-1] contains the odd elements of
//       b[h..b.length-1], in reverse order.
while (h != 0) {
   h= h-1;
   if (b[h] % 2 == 1) {
      c[k]= b[h];
      k= k+1;
   }
}
// post: c[0..k-1] contains the odd elements of b,
//         in reverse order.
```

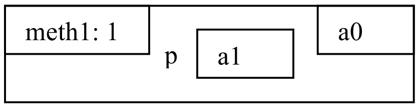
2. (a)
```
public class NotLowerCaseLetterException
            extends RuntimeException{
   /** Constructor: instance with empty detail message */
   public NotLowerCaseLetterException() {
   }

   /** Constructor: an instance with detail message s*/
   public NotLowerCaseLetterException(String s) {
      super(s);
   }
}
```

(b)
```
/** An instance maintains a list of Strings that
     contain only letters in a..z. */
public class LettersStringList {

   // The list of Strings. Each String contains only
   //  letters in 'a'..'z'
   private Vector<String> list;

   /** Throw a NotLowerCaseLetterException with a
        suitable detail message if s contains a char that is
        not in 'a'..'z'. */
   private static void check(String s) {
      for (int k= 0; k != s.length(); k= k+1) {
         if (s.charAt(k) < 'a' || s.charAt(k) > 'z') {
            throw new NotLowerCaseLetterException(
                     "Char " + s.charAt(k) + " not in a..z");
         }
      }
   }

   /** Constructor: instance with empty list of Strings. */
   public LettersStringList() {
      list= new Vector<String>();
   }

   /** Append s to the list. If all the letters of s are not
       in 'a'..'z', throw a NotLowerCaseLetterException. */
   public void append(String s) {
      check(s);
      list.add(s);
   }

   /** If s contains only chars in 'a'..'z', append s to the
       list; else print "Mistake in parameter." */
   public void appendMessage(String s) {
      try { append(s); }
      catch (NotLowerCaseLetterException e) {
         System.out.println("Mistake in parameter.");
      }
   }
}
```

3. (a) Make a class abstract so that instances of it can not be created. To make the class abstract, insert keyword **abstract** between **public** and **class**.

(b) Evaluate expression e and store its value in variable x.

(c)



Argument of first call: a0
Argument of second call: a1

4.
```
Power of Now: 28
Item@58d6b0  [this is the one given byDrJava]
Truth Wins Out: 10
Cost of Item: 78
Book is: 10
Book is: Power of Now
Are books the same?false
Are books the same?false
```

5.
```
/** = if s is "", 0;
    otherwise: the number of times the first
    char of s appears at the beginning of s.
    E.g. for s = "xxxyxxxxz", the answer is 3. */
public static int numberOfFirst (String s) {
   if (s.length() == 0)
       return 0;
   if (s.length() == 1 || s.charAt(0) != s.charAt(1))
        return 1;
   return 1 + number(s.substring(1));
}

/** = the compression of s. */
public static String compress(String s) {
   if (s.length() == 0) {
        return "";
   }
   int c= numberOfFirst (s);
   return "" + s.charAt(0) + c + compress(s.substring(c));
}
```

6. Note: In this answer, we omit the conventional getter methods for fields. If you omitted them too, that is OK.

```
/** An instance contains info about a Passport */
public class Passport {
   /** number of passports created thus far */
   private static int numberOfPassports= 0;

   /** Contains all Passports ever created */
   private static Vector v= new Vector<Passport>();

   private String p; /** The name of the person */
   private String s; /** State in which p lives (two
                         char state designation, like NY */
   private int n; /** p's passport number */

   /** = a Passport for person p (null if there is none). */
   public Passport getPassport(String p) {}

   /** Constructor: an instance for person p with
             passport number n. The person lives in state s.
       Precondition. No passport exists for p.
       Precondition: s is a two-char state desig., e.g. NY.*/
   private Passport(String p, String s, String n) {}

   /** = the existing Passport for person p in state s, or, if
           there is none, a newly created one for p in state s.
       Precondition: s is a two-char state desig., e.g. NY.*/
   public Passport assign(String p, String s) {}

   /** = representation of the Passport */
   public String toString() {}
}
```

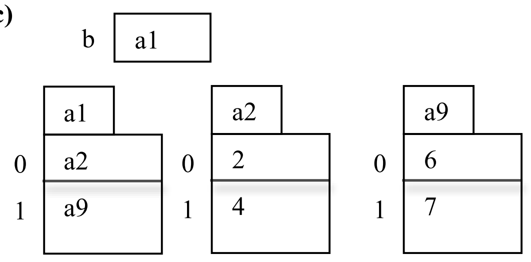
7. (a) A JPanel is associated with a FlowLayout manager. It lays out the components in a horizontal row, in the order in which they were added to the JPanel. However, if the window is too narrow to contain all the components, they flow into successive rows.

(b) The value of keyword **this** is the name (on the tab of) the object in which is appears. So, if the call

jbutton.addActionListener(**this**) ;

appears in an object named a0, the value of the argument in the call is a0.

(c)



8. Selection sort. We give assertions as formulas; you can translate them easily into diagrams.

```
/** Sort b[p..q] (so the postcondition is:  b[p..q] is sorted)
*/
public static void sort(int[] b, int p, int q) {
    int k= p;
    // inv: b[p..k-1] is sorted and
    //      b[p..k-1] <= b[k..q]
    while (k < q) {
       int m= index of min of b[k..q];
       Swap b[k] and b[m];
       k= k+1;
    }
    // post: b[p..q] is sorted
}
```