Practice Midterm Examination

revision 1: corrected 7/5 at 3:10 PM
CMSC 10200, University of Chicago, Summer 2005

Abbreviations. In your responses, feel free to use `pr` to mean `System.out.println` and `IAE` to mean `throw new IllegalArgumentException`.

General Knowledge of Java

1. What is the output type of a function that returns no value?

2. Briefly explain the difference between `=` and `==`.

3. How do the names of Java's primitive types and reference types differ?

4. What operation is `+` performing in the following code snippet?

```
String destination = "Bermuda";
System.out.println("I'm off to " + destination + ".");
```

Look Closely

1. (corrected, revision 1) Assume `n` is an integer. Something is wrong in this test:

   ```
   if (0 <= n <= 255) { /* ... */ }
   ```

   What must you write instead?

2. This function won't do quite what its name suggests. What's the problem?

   ```
   static void countToTen() {
      for (int i=1; i>=1; i=i+1) {
         System.out.println(i);
      }
   }
   ```

3. Identify the mistake in this function.

   ```
   static void show(double[] ds) {
      for (int i=0; i<=ds.length; i=i+1) {
         System.out.println(ds[i]);
      }
   }
   ```

Understanding Functions

State in plain language what each of the following functions does, and suggest a better name for each one.

1.
```
static boolean f1(int a, int b) {
   return (((a<0) && (b>0)) || ((a>0) && (b<0)));
}
```

2.
```
static int f2(int[] ms, int[] ns) {
   int mL = ms.length;
   int nL = ns.length;
   if (mL > nL) {return mL;}
   else         {return nL;}
}
```

3.
```
static boolean f3(int lo, int hi, int[] ns) {
   int L = ns.length;
   int c = 0;
   for (int i=0; i<ns.length; i=i+1) {
      if ((lo <= ns[i]) && (ns[i] <= hi)) {
         c = c + 1;
      }
   }
   return (c == L);
}
```

Creating Functions

1. Write a function to test whether a given `double` is within 0.005 of zero.

2. Write a function to test whether or not a given `String` contains the character `'@'`.

3. Write a function whose input is an array of integers and whose output is the number of positive integers in the array.

Class Implementation

Here is an interface for a class representing a pair of positive integers.

```
public interface PositivePair {
   public int first();
   public int second();
   public int largerComponent();
   public String toString();
}
```

Here is an example of a use of a `PositivePair`:

```
PositivePair p = new XYZPositivePair(10,12);
System.out.println(p.first());           /* will print 10 */
System.out.println(p.second());          /* will print 12 */
System.out.println(p.largerComponent()); /* will print 12 */
System.out.println(p);                   /* will print "(10,12)" */
```

Implement this class in the space below. Your class should ensure in its constructor that it is indeed a pair of *positive* integers.

Inheritance

```
public class Course {
   private int department;
   private int courseNumber;
   private char[] lectureDays;
   public Course(...) {/* constructor omitted */}
   public int department() {return this.department;}
   public int courseNumber() {return this.courseNumber;}
   public char[] lectureDays {return this.lectureDays;}
   public boolean equals(Object o) {/* omitted */}
}

public class LabCourse extends Course {
   char labDay;
   /* the rest omitted */
}
```

1. Two `Course`s will be considered equal if they have the same department and course number. Write an `equals` method for `Course`.

2. Assume that `C` is a `LabCourse`. What is the value of `(C instanceof Course)`?

3. Is the following a legal declaration? If not, why not?

```
Course CS102 = new LabCourse(...);
```

JSP Web Application

Fill in the following sketch of a simple JSP web application. The application will convert kilometers to miles. It will consist of one `html` page where a user enters a number of kilometers, and a `jsp` page which shows how many miles that number of kilometers is. Assume in your calculations that one kilometer is 0.62 miles.

```
<!-- this is the file convert.html -->
<html>
<head> ... </head>
<body>
<h1>Kilometer to Mile Converter: Input</h1>
<form method="post" action="convert.jsp">









</form></body></html>
```

```
<!-- this is convert.jsp -->
<html>
<head> ... </head>
<body>
<h1>Kilometer to Mile Converter: Output</h1>









</body></html>
```