

CSE1030 Test 1

Tuesday, July 15, 2014
20:30–22:00 (90 minutes)

Introduction

This test consists of a short programming question and some short-answer written questions. I recommend budgeting 50 minutes for the programming question and 30 minutes for the written questions.

Please follow the instructions given in the test.

Setting Up

In eclipse:

1. Create a new Java Project (perhaps called `test1`)
2. In your project, create a new Package called `cse1030.test1`
3. In the package you just created, create an empty text file named `answers.txt` for your answers to the written questions:
 1. select the `File` menu
 2. select `New`
 3. select `File`
 4. type `answers.txt` for the file name and press `Finish`

Programming Question

It is expected that your program (1) compiles, (2) meets the specifications given in the API, and (3) follows the style guidelines for CSE1030. **Javadoc comments are not required.**

For this part you are to implement a class that stores book information: book author, book title, and book's ISBN (a unique international number used to identify books).

Complete a mutable class called `LibBook` that implements the API given (`...1030/labtest/Test1/LibBook.html`)

You must create and complete the following fields, constructors, and methods:

- `public` constant fields in the API (if any)
- a `private int` method representing the current number of `LibBook` instances.
- 3 accessor and 3 mutator methods
- 2 constructors
- a `toString` method

All of your constructors and methods should be short (up to 4 lines of code or so).

Written Questions

Type the answers to the written questions into the file `answers.txt` that you were instructed to create earlier. Make sure that you number your answers to match the questions.

1. Consider the following Java class where all of its fields are shown:

```
import cse1030.test1;
import java.util.Date;

public class Z {

    public static final double TEMP = 20.0;           // standard temperature

    public static final LibBook EX_BOOK = new LibBook (1234567890L, "Title", "John Doe");

    public static final Date TEST1 = new Date(1405467506025L);    // July 15, 2014

    private Date now;

    public Z() {
        this.recentBook = new LibBook();
    }

    public static void main(String[] args) {
        Z bob = new Z();
        Z alice = new Z();    // ???

        // more code here not shown
    }
}
```

(a) [2 marks] In general, what are `public static final` fields (written in all capital letters) supposed to represent?

Constant values (i.e., constant primitive values or constant immutable reference types).

(b) [2 marks] Given your answer to (a), list all of the `public static final` fields in `Z` that are acceptable; explain your answer.

`public static final double TEMP` is acceptable because it is a primitive type.

(c) [2 marks] Given your answer to (a), list all of the `public static final` fields in `Z` that are *not* acceptable; explain your answer.

`LibBook EX_BOOK` and `Date TEST1` are not acceptable because they are mutable reference types.

(d) [2 marks] After the line marked ??? in the main method runs, how many LibBook objects are in memory? Explain your answer.

There are 2 z objects and each z object has 1 LibBook object. There is also one static LibBook object that belongs to the z class. In total, there are 3 LibBook objects.

2. Suppose that we have a utility class named Q2.

a) [2 marks] Suppose that Q2 has the following method API:

```
/**
 * doubles the value of x
 * Increases the value of the parameter k by 1.
 * When the client uses this method like so:
 *
 * Q2.twice(x);
 *
 * the value of x will double.
 */
public static void twice (double k)
```

Is it possible to implement such a method? Explain why or why not.

No. Java uses pass by value to transfer the value of the argument to the method; the method never sees the original variable named x.

b) [2 marks] Suppose that Q2 has the following static attribute:

```
private static int k = 1;
```

Inside of the method `twice` from part a), what name do you use to refer to the static attribute named `k`?

Q2.k

c) [2 marks] Suppose that Q2 has the following method API:

```
/**
 * Changes the radius of c to 100. When the client uses this
 * method like so:
 *
 * Q2.changeRadius(someCircle);
 *
 * the width of someCircle will be 100.
 */
public static void changeRadiusWidth(Circle c)
```

Is it possible to implement such a method? Explain why or why not. Assume that Circle has a public method named `setRadius` that sets the radius of the circle, and that 100 is a valid radius for a circle.

Yes. Java uses pass by value to transfer the value of the reference `someCircle`, which is the address of `someCircle`. `c.setRadius` is effectively the same as `someCircle.setRadius`

d) [2 marks] Suppose that Q3 has the following method API:

```
/**
 * Makes r refer to a new circle. When the client uses this
 * method like so:
 *
 * Rectangle original = someCircle;
 * Q2.referToNew(someCircle);
 *
```

```
* someCircle will refer to a new circle; that is
*
* original == someCircle
*
* will now be false.
*/
public static void referToNew(Circle c)
```

Is it possible to implement such a method? Explain why or why not.

No. Java uses pass by value to transfer the value of the reference `someCircle`, which is the address of `someCircle`.

If `referToNew` does something like:

```
c = new Circle();
```

then the value of `c` changes to the address of the new `Circle`, but nothing happens to the reference `someCircle`.

3. Suppose that you made the `long` that stores the ISBN of the book `public` in your implementation of the `LibBook` class. We say that such an implementation has *poor encapsulation*.

(a) **[2 marks]** In one or two sentences, explain what you think the term *poor encapsulation* means.

Poor encapsulation means that the implementation details of the class are visible to clients.

(b) was missing

(c) **[2 marks]** State one negative consequence of making the `long` that stores the ISBN of the book `public` in the `LibBook` class. (*Note*: stating that the client can change the ISBN number is not an acceptable answer as it has been asked above).

client be able to change the value of ISBN (partial mark maybe?)

Clients can see how the ISBN is implemented.

The field cannot be made `private` without breaking all existing client code that currently uses the public field.

Submit

Submit your answers to the written questions and your Java program when you are finished:

```
submit 1030 Test1 LibBook.java answers.txt
```