

CS1110 Prelim 1 19 February 2009

This 90-minute exam has 5 questions (numbered 0..4) worth a total of 100 points. Scan the whole test before starting. Budget your time wisely. Use the back of these pages if you need more space. You can tear the pages apart; we have a stapler at the front of the room.

Question 0 (2 pts). Write your name and NetId, legibly, at the top of each page.

Question 1: (28 pts) Miscellaneous points.

(a) Below, write a sequence of statements that exchanges the values of **int** variables `b` and `c`. If other variables are needed, just declare them (this sequence would appear in a method body, so declared variables would be local variables):

```
// Swap b and c
```

(b) What are the four kinds of variables that can occur in a Java program, and where are they declared?

(c) Suppose `b` and `c` are **int** variables. Is it possible to write a procedure with the specification given below that, for the call

```
swap(b, c);    or the call    swap(c, b);
```

exchanges the values of variables `b` and `c`? Explain your answer. [*You do NOT have to write any code.*]

```
/** Swap the values of variables x and y */  
public static void swap(int x, int y) { int k= ...; ... }
```

(d) Suppose variables `b` and `c` contain 5 and 6, respectively, and consider the procedure declared in part (c). Assume that procedure `swap` has a local variable `k`, as shown. Do the first step of executing the procedure call `swap(b, c)`; —draw the frame for the call. Don't do anything else. Assume procedure `swap` is declared in a class `Cornellian`.

Question 2 (35 pts). Use the back of the previous page for answers, except for part (a), where you will write the answers write in the classes in the boxes below.

(a) **15 pts.** On this page are two class definitions. The bodies of the methods have been not been written. Write them in the space provided. Do not write any other methods.

(b) **2 pts.** Name the methods that Student inherits and those that it overrides.

(c) **2 pts.** Which fields of an object should be initialized first, inherited ones or newly defined ones?

(d) **6 pts.** State the three steps involved in evaluating a new-expression like:

```
new Student("Bill Gates", 2.54);
```

(e) **10 pts.** Draw one folder (object, instance) of each class. Don't draw anything else. Do not show the partition for superclass Object.

```
/** An instance maintains info
    about a Cornellian */
public class Cornellian {
    private String name; // student's
                        // name
    private static int nextID= 0;
    /** Constructor: a Cornellian
        with name name */
    public Cornellian(String name) {

    }
    /** = String repr. of Cornellian,
        giving just the name. */
    public String toString() {

    }
}
```

```
/** An instance maintains info about
    a student */
public class Student extends Cornellian {
    private double gpa; // student's GPA
    /** Constructor: a student with name n
        and GPA g */
    public Student(String n, double g) {

    }
    /** = this student's GPA */
    public double getGPA() {

    }
    /** = "student's GPA is >= 3.5" */
    public boolean isOnDeansList() {

    }
    /** = Repr. of this student, in the
        Form: student's name, followed by
        ". Dean's List" if GPA >= 3.5.*/
    public String toString() {

    }
}
```

Question 3 (10 pts).

(a) Class `Cornellian` of question 2 contains static variable `nextID`. We now ask you to write a function that will be placed in class `Cornellian` and that will use this static variable; your function will be the only one in class `Cornellian` to change `nextID`, and *you* get to define what variable `nextID` means.

Below, write a function definition that can be called from other classes. The purpose of this function is to compute and return a new `int` each time it is called, to be used, for example, in constructing `netIds`.

Thus, two different calls of this function will return two different `ints`. Indicate with proper syntax whether the function should be public or private, static or non-static, etc.

Make sure you write a specification for your function.

0 _____	out of 02
1 _____	out of 35
2 _____	out of 10
3 _____	out of 25
4 _____	out of 28
Total _____	out of 100

(b) Consider the following class—we show only a little bit of it. In the body of procedure `meth`, write an initializing declaration that declares a variable `v` and assigns to it a value that results from calling the function you wrote in part (a).

```
public class C {  
    public void meth() {  
  
    }  
}
```

Question 4 (25 pts). Write a function, to be placed in class `Cornellian`, that converts a name into a netID. The name is in the form given by the box on the right. The netID has the following properties:

1. The netID is made up of two or three letters and a positive integer. Each netID has a different positive integer.
2. For a person with a first, middle, and last name, the netID has three letters: the first letter of the first, middle, and last names, in that order. For a person without a middle name, the netID has two letters: the first letter of the first and last names.
3. All letters in the netID must be lowercase, even if they are in upper case in the name.

Examples are:

- “Obama , Barack Hussein” will have the netId `bho1`
- “Bush, George ” will have the netId `gb2`

In writing this function, assume that it is being declared in class `Cornellian`. You will have to figure out how to get a new, unique, positive integer every time the function is called. Look at question 3 for this. The table at the bottom of the page describes String functions that you can use. If you want, write the function on the back of another page.

`/** = a netid for name s. Precondition: s has the form given in the box above and to the right.*/`

```
public static String netId(String s) {
```

Form of a name

`<last name> , <first name>`

or

`<last name> , <first name> <middle name>`

There may be spaces (blank characters) before and after each name and before and after the comma.

There is at least one blank before the `<middle name>`.

Return	Method	Purpose
<code>char</code>	<code>s.charAt(i)</code>	= the character at position <code>i</code> of <code>s</code>
<code>int</code>	<code>s.length()</code>	= the number of characters in <code>s</code>
<code>int</code>	<code>s.indexOf(n)</code>	= the index within <code>s</code> of the first occurrence of String <code>n</code> (<code>-1</code> if none)
<code>String</code>	<code>s.trim()</code>	= a copy of <code>s</code> with beginning and ending spaces removed
<code>String</code>	<code>s.substring(h,k)</code>	= a String consisting of characters in <code>s[h..k-1]</code> , i.e. <code>s[h], s[h+1], ..., s[k-1]</code>
<code>String</code>	<code>s.substring(h)</code>	= a String consisting of characters <code>s[h..s.length()-1]</code>
<code>String</code>	<code>s.toLowerCase()</code>	= a copy of String <code>s</code> , with all its letters in lower case.

```
}
```