

CS100J Prelim 1 25 September 2006

This 90-minute exam has 6 questions (numbered 0..5) 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 points): Write your name and NetID, legibly, at the top of each page.

Question 1 (18 points): Answer the following questions concisely:

(a) What is an argument? A parameter?

(b) Consider class C that appears to the right; its lines have been numbered. There are several variables named x. In the table below, the first column contains line numbers. Consider one of them, say line number 5. To its right, in the second column, write the number of the line that contains the variable x that can be referenced or used on line 5. In the third column, write the scope of that variable x — the lines on which that x can be referenced. For example, the scope of variable y declared on line 4 is 4..6.

At line no:	x refers to the variable declared on line:	The scope of that variable x is:
5		
8		
10		
15		

Q 0		/02
Q 1		/18
Q 2		/15
Q 3		/20
Q 4		/25
Q 5		/20
Total		/100

```

1. public class C {
2.     private int x;
3.     public void m(int x) {
4.         int y= x;
5.         int z= 5;
6.     }
7.     public void p(int y) {
8.         if (y == 4) {
9.             int x;
10.            x= y;
11.            y= 5;
12.        } else {
13.            int x;
14.            x= 6;
15.            y= 7;
16.        }
17.    }
18.}

```

(c) For each assignment below, write the value of the variable being assigned (e.g. variable i for row 1). Write ILLEGAL if the assignment is illegal and explain the reason for the illegality.

int i; i= 3.2;	double e; e= (int) 6.9 * 6;
double d; d= 3;	String s; s= "u" + "s" + "a";
boolean b; b= true (5/0 == 1);	String t; t= 4 + "2" / 1;

Question 2 (15 points). At the bottom of the page are two class definitions. Draw one folder (object, instance) of each. Do not show the partition for superclass Object.

```
public class MemberOfCongress {
    // Member of Congress' name
    private String name= null;

    /** Number of members created */
    public static int count = 0;

    /** = number of members created */
    public static int getCount() {
        return count;
    }

    /** Constructor: Member named n */
    public MemberOfCongress(String n) {
        setName(n);
        count= count + 1;
    }

    /** Set this member's name to n */
    public void setName (String n) {
        name= n;
    }

    /** = this member's name */
    public String getName() {
        return name;
    }

    /** = String repr of this Member */
    public String toString() {
        return "Member of Congress " +
            getName();
    }
}
```

```
public class Senator extends
    MemberOfCongress {
    /** Senator's state --2 letters,
        e.g. NY */
    private String state= null;

    /** Constructor: senator of state
        s, named n */

    public Senator(String n, String s) {
        super(n);
        state= s;
    }

    /** Set name to n, preceded by
        "Senator " */
    public void setName(String n) {
        super.setName("Senator " + n);
    }

    /** = this senator's state */
    public String getState() {
        return state;
    }

    /** = a repr of this instance */
    public String toString() {
        return getName() + " of " +
            getState();
    }
}
```

Question 3 (20 points). Answer the following questions about classes `MemberOfCongress` and `Senator` that are defined in Question 2.

- (a) Is `Senator` a superclass or subclass of `MemberOfCongress`?
- (b) Name one method that class `Senator` overrides from `MemberOfCongress`.
- (c) Suppose the following two statements have been executed in the Interactions Pane of DrJava.

```
Senator clinton= new Senator("Hillary Clinton", "NY");
MemberOfCongress mccain= new MemberOfCongress("John McCain");
```

Assume the following expressions and statements are evaluated and executed in the Interactions Pane in DrJava. To the right of each, write the value of the expression. Write "bad" if an error is generated and explain why.

<code>MemberOfCongress.count</code>	
<code>mccain.toString()</code>	
<code>clinton.toString();</code>	
<code>mccain.name</code>	
<code>clinton.setName("Sen. Hillary R. Clinton");</code> <code>clinton.getName()</code>	
<code>MemberOfCongress.count= 0;</code> <code>MemberOfCongress.getCount()</code>	

- (d) Explain how a new expression of the form `new <class name> <constructor call>` is evaluated.

Question 4 (25 points):

(a) This question refers to classes `MemberOfCongress` and `Senator` defined in Question 2. On the next page, write a subclass `Representative` of class `MemberOfCongress`. Below are some details.

(a1) Subclass `Representative` should contain a field for the district of the Representative: a string of the form "nxx" where "n" is the district number (in the range 1..99, so it can be 1 or 2 digits) and "xx" is the two-letter abbreviation of the representative's state. The district "8CA" is legal; "123NY" and "1234FL" are legal. Do not check for illegal districts.

Class `Representative` should contain a field for the party affiliation of the representative. This is one of: "D" (for democrat), "R" (for Republican), and "I" (for independent).

(a2) The constructor should allow one to the name of the person, their district, and their party affiliation.

(a3) Method `getParty()` of the class returns the full name of the Representative's party. For a democrat, return "Democrat" (not just 'D'); for a republican, return "Republican"; and for an independent, return "independent".

(a4) Method `toString()` returns a `String` with the following, in order and with suitable spacing: the title "Representative"; the name of the representative; the representative's party symbol in parenthesis; the string "of xx", where xx is the district. Hence for Nancy Pelosi, method `toString` returns, "Representative Nancy Pelosi (D) of 8CA".

(b) Complete the code below to make an appropriate JUnit test case for your constructor and two methods of part (a). Your test cases, embedded in `assertEquals` procedure calls, should ensure your methods produce the correct results.

```
public void testRep() {
    Representative a= new Representative("Pelosi", "8CA", "D");
    Representative b= new Representative("Who-2", "10NY", "R");
    Representative c= new Representative("Who-3", "6CA", "I");

}
```

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Question 5: (20 pts) This question pertains to class Representative of Question 4. Below, write a method `formatDistrict()` to be put in class Representative that returns the representative's district as a string formatted as “n district of yy”. Here is an example: for Representative Nancy Pelosi, `formatDistrict()` should return the string

“8th district of CA”

In the format as “n district of yy”,

n stands for the district number (1 or 2 chars) followed by the appropriate digraph —e.g. 1st, 2nd, 3rd, 4th— see the chart to the right; and

yy stands for the state abbreviation.

You can use the following methods (you may not need them all).

1st	21st	31st
2nd	22nd	32nd
3rd	23rd	33rd
4th	24th	34th
5th	25th	35th
...
10th	30th	40th
11th		
...		
20th	digraphs	

Return	Method	Purpose
char	<code>s.charAt(i)</code>	= the character at position <code>i</code> of <code>s</code>
int	<code>s.length()</code>	= the number of characters in <code>s</code>
int	<code>s.indexOf(n)</code>	= the index within <code>s</code> of the first occurrence of String <code>n</code> (-1 if none)
String	<code>s.substring(h, k)</code>	= a String consisting of characters in <code>s[h..k-1]</code> , ie. <code>s[h]</code> , <code>s[h+1]</code> , ..., <code>s[k-1]</code>
String	<code>s.substring(h)</code>	= a String consisting of characters <code>s[h..s.length()-1]</code>
boolean	<code>s1.equals(s2)</code>	= “String <code>s1</code> and <code>s2</code> are the same—they contain the same sequence of characters.
boolean	<code>s1.endsWith(s2)</code>	= “String <code>s1</code> ends with the string “ <code>s2</code> ”