

Preferred Name: _____

UBIT: _____

CSE 115: Computer Science I
Spring 2017
Sample Final Exam

DIRECTIONS:

- Closed Notes. Closed Book. No Electronics.
- Time Limit: 3 hours
- Make sure you write your NAME and UBIT above.
- Note that your UBIT is not your person number.
- Each question is worth 1 point unless otherwise noted

C1	/5
C2	/5
C3	/5
C4	/5
C5	/5
C6	/5
C7	/5
C8	/5
C9	/5
C10	/5
C11	/5
C12	/5
Q1	/10
Q2	/10
Q3	/10
Q4	/10
Total	/100

C1 - Variables

For all sections: Answer the following question about the state of the program after the following code is executed. You can assume all the necessary `import` statements and class structure have been added.

```
1 | int number = 10;  
2 | double number2 = 2.5;  
3 | String word = "Hello";  
4 | number2 = 1.5;
```

1. What is the type of the variable named number?
2. What is the type of the variable named word?
3. What is the value of the variable named number?
4. What is the value of the variable named number2?
5. What is the type of the variable named word?

C2 - Control Flow

```
1 | int number = 5;
2 | int n;
3 |
4 | if(number < 10){
5 |     n = 2*number;
6 | } else if(number < 20){
7 |     n = 3*number;
8 | } else{
9 |     n = 0;
10 | }
11 |
12 | for(int i=0; i<number; i++){
13 |     System.out.println("hello");
14 | }
15 |
16 | int j=3;
17 | while(j <= number){
18 |     System.out.println("goodbye");
19 |     j = j+2;
20 | }
```

1. What is the value of n?
2. (2 points) How many times is "hello" printed?
3. (2 points) How many times is "goodbye" printed?

C3 - Methods

```
1 public int method1(int input){
2     return input * 3;
3 }
4
5 public double method2(double x, double y){
6     return (x+y)/(y-x);
7 }
8
9 public String method3(String input, int n){
10     String toReturn = "";
11     for(int i=0; i<n; i++){
12         toReturn += input;
13     }
14     return toReturn;
15 }
```

1. Give the value of method1(4)
2. Give the value of method2(0.5, 1.5)
3. Break method2. (Provide a call of method2 that will cause an error)
4. Give the value of method3("words ", 3)
5. Give the value of method3("soi", 5)

C4 - Data Structures

```
1 ArrayList<Integer> numbers = new ArrayList<>();
2 numbers.add(5);
3 numbers.add(10);
4 numbers.add(3);
5
6 int counter = 4;
7 for(int i=0; i<numbers.size(); i++){
8     counter += numbers.get(i);
9 }
10
11 HashMap<String, Double> map = new HashMap<>();
12 map.put("Exam", 8.9);
13 map.put("Project", 5.4);
14
15 for(String key : map.keySet()){
16     System.out.println(map.get(key));
17 }
```

1. Give the value of `numbers.size() + map.size()`
2. What is printed when this code is executed?
3. What is the value of `counter`?
4. Give the value of `map.values()`
5. Give the value of `numbers.get(1)`

C5 - Files

sounds.txt

```
1 ANIMATIER AE0 T AY0 M AE1 T ER0
2 COUNTERTOPS K AW1 N T ER0 T AA2 P S
3 ROADS R OW1 D Z
4 SIMMERED S IH1 M ER0 D
```

```
1 ArrayList<String> strings = new ArrayList<>();
2 try {
3     String chars = "";
4     for (String line : Files.readAllLines(Paths.get("sounds.txt"))) {
5         String[] splits = line.split(" ");
6         System.out.println(splits[0]);
7         String[] soundsArray = splits[1].split(" ");
8         chars += soundsArray[0];
9         for (int i=0; i<soundsArray.length; i++) {
10             strings.add(soundsArray[i]);
11         }
12         Files.write(Paths.get("output.txt"), chars.getBytes());
13     }
14 } catch (IOException e) {
15     e.printStackTrace();
16 }
```

1. What is printed when this code is executed?
2. Give the value of strings.get(3)
3. Give the value of strings.size()
4. Write the content of output.txt
5. Provide a line that will crash this program if it were added to sounds.txt

C6 - Algorithms

```
1 public int method1(ArrayList<Integer> numbers){
2     int ans = numbers.get(0);
3     for(int i : numbers){
4         if(Math.abs(i) < ans){
5             ans = Math.abs(i);
6         }
7     }
8     return ans;
9 }
10
11 public int method2(HashMap<Integer, Double> map){
12     int ans = -1;
13     double best = 0.0;
14     for(int i : map.keySet()){
15         if(map.get(i) > best){
16             best = map.get(i);
17             ans = i;
18         }
19     }
20     return ans;
21 }
```

1. Give the value of method1(numbersList) if numbersList = [3, 2, 6, 4]
2. Give the value of method1(numbersList) if numbersList = [5, -10, -5, 7]
3. Break method1 (Provide a call of method1 that will cause an error)
4. Give the value of method2(map) if map = 1=5.5, 67=1.4, 9=7.8, 24=-6.4
5. Break method2. The intent of method2 is to return the key of the highest value. Provide a call to method2 where this is not correctly returned.

C7 - Classes

```
1 public class SampleClass{
2
3     private int x;
4
5     public SampleClass(){
6         this.x = 0;
7     }
8
9     public SampleClass(int x){
10         this.x = x;
11     }
12
13     public int getX(){
14         return this.x;
15     }
16
17     public void setX(int x){
18         this.x = x;
19     }
20
21     public static void alterX(SampleClass instance){
22         instance.x *= 2;
23     }
24 }
```



```
1 SampleClass instance1 = new SampleClass();
2 SampleClass instance2 = new SampleClass(5);
3 SampleClass instance3 = new SampleClass(10);
4 SampleClass instance4 = new SampleClass(3);
5 SampleClass instance5 = new SampleClass(1);
6 instance3.setX(instance3.getX() + instance2.getX());
7 SampleClass.alterX(instance4);
8 instance5.setX(27);
```

1. Give the value of instance1.getX()
2. Give the value of instance2.getX()
3. Give the value of instance3.getX()
4. Give the value of instance4.getX()
5. Give the value of instance5.getX()

C8 - Libraries

```
1 public class Library{
2
3     public static int libraryMethod1(int n){
4         int ans = 0;
5         for(int i=0; i <= n; i++){
6             for(int j = 0; j < i; j++){
7                 ans++;
8             }
9         }
10        return ans;
11    }
12
13    public static int libraryMethod2(int n){
14        return (n*(n+1))/2;
15    }
16 }
```

1. Give the value of `Library.libraryMethod1(0)`
2. Give the value of `Library.libraryMethod1(5)`
3. Give the value of `Library.libraryMethod2(0)`
4. Give the value of `Library.libraryMethod2(5)`
5. Give an input `int` such that `Library.libraryMethod1(input) != Library.libraryMethod2(input)`

C9 - Networking

1. "https://www.youtube.com/watch?v=5jmN_tBS0t4" What is the query string in this url
2. "https://www.google.com/search?q=cats&as_filetype=gif&lr=lang_ja" What is the query string in this url
3. What are the 2 different type of HTTP requests we used in this course?
4. (2 points) Name at least 1 difference between the 2 types of requests

C10 - JSON

```
1 | JsonObject data1 = new JsonObject();
2 | data1.add("department", "cse");
3 | data1.add("course", 115);
4 |
5 | JsonArray data2 = new JsonArray();
6 | data2.add(2);
7 | data2.add(7.7);
8 | data2.add("string");
```

1. Give the value of `data1.toString()`
2. Give the value of `data2.toString()`
3. Give the value of `data1.get("course")`
4. Give the value of `data2.get(1)`
5. What is the type of this JSON String: `"title":"Roar", "artist":"Katy Perry"`

C11 - GUI

```
1 JLabel label = new JLabel("hello!");
2 JTextField textField = new JTextField(5);
3 JButton button = new JButton("Click Me!");
4 button.addActionListener(new ActionListener(){
5     @Override
6     public void actionPerformed(ActionEvent e){
7         String input = textField.getText();
8         label.setText(input.toLowerCase());
9     }
10 });
```

1. What text is displayed on the JLabel before the button is pressed?
2. What text is displayed on the JLabel after the user enters "This is Text" in the text field then clicks the button?
3. What is the meaning of the 5 used in the constructor of JTextField?
4. What text is displayed on the button?
5. What text is displayed on the JLabel after the user clicks the button while the text field is empty?

C12 - OOP

```
1 public abstract class Thing{
2     protected double score;
3
4     public double getScore(){
5         return score;
6     }
7
8     public void setScore(double score){
9         this.score = score;
10    }
11
12    public abstract double compute();
13 }
```

```
1 public class ThingA extends Thing{
2     public ThingA(double score){
3         this.score = score;
4     }
5
6     @Override
7     public double compute(){
8         return this.score * 100.0;
9     }
10 }
```

```
1 public class ThingB extends Thing{
2     @Override
3     public double compute(){
4         this.score *= 2;
5         return this.score;
6     }
7 }
```

```
1 Thing instance1 = new ThingA(5);
2 Thing instance2 = new ThingB(10);
3 Thing instance3 = new ThingB(15);
4 instance3.compute();
```

1. Give the value of `instance1.getScore()`;
2. Give the value of `instance1.compute()`;

3. Give the value of `instance2.getScore()`;
4. Give the value of `instance2.compute()`;
5. Give the value of `instance3.getScore()`;

Q1

```
1 public static int Q1(int n){
2     int k=n*n;
3     int t=0;
4     int j=0;
5     if(k > 20){
6         t += 110;
7     } else if(k > 10){
8         t += 50;
9     } else{
10        t += 20;
11    }
12    for(int i=0; i<t; i++){
13        k += 1;
14    }
15    while(Math.pow(j, 2.0) < t){
16        j = Q1b(j);
17    }
18    return k+j;
19 }
20
21 private static int Q1b(int input){
22     return input + 5;
23 }
```

1. (2 points) Give the value of Q1(1)
2. (2 points) Give the value of Q1(2)
3. (2 points) Give the value of Q1(3)
4. (2 points) Give the value of Q1(4)
5. (2 points) Give the value of Q1(5)

Q2

```
1 public static int Q2(HashMap<Integer, Integer> map, boolean switch){
2     ArrayList<Integer> keys = new ArrayList<>();
3     for(int key : map.keySet()){
4         keys.add(key);
5     }
6     Collections.sort(keys);
7     if(switch){
8         return map.get(Q2b(keys, switch));
9     }else{
10        return Q2b(keys, switch);
11    }
12 }
13
14 private static int Q2b(ArrayList<Integer> numbers, boolean switch){
15     int index = -1;
16     int max = Integer.MIN_VALUE;
17     for(int i=0; i<numbers.size(); i++){
18         if(numbers.get(i) > max){
19             max = numbers.get(i);
20             index = i;
21         }
22     }
23     if(switch){
24         return index;
25     }else{
26         return max;
27     }
28 }
```

1. (2 points) Give the value of Q2(map, false) when map is 5=3, 2=8, 9=0
2. (2 points) Give the value of Q2(map, true) when map is 5=3, 2=8, 9=0
3. (2 points) Give the value of Q2(map, false) when map is 10=2, 6=2, 1=2, 7=3
4. (2 points) Give the value of Q2(map, true) when map is 10=2, 6=2, 1=2, 7=3
5. (2 points) Break Q2. Provide an input to Q2 that will cause an error.

Q3

```
1 | [{"title":"The One Moment","artist":"OK Go","ratings":[5],"youtubeID":"QvW61K2s0tA"},
2 | {"title":"The Kill ", "artist":"Thirty Seconds To Mars","ratings":[5,5,1], "
3 | youtubeID":"8yvGCAv0AfM"}]]

1 | public static ArrayList<String> Q3(String jsonString){
2 |     ArrayList<String> ans = new ArrayList<>();
3 |     JsonArray array = Json.parse(jsonString).asArray();
4 |     for(JsonValue value : array){
5 |         JsonObject obj = value.asObject();
6 |         ans.add(obj.get("title").asString());
7 |         ans.add(obj.get("artist").asString());
8 |     }
9 |     return ans;
10 | }
```

1. (2 points) Give the value of Q3(jsonString) with the String provided above
2. (2 points) Give the value of Q3(jsonString) with only the first song from the String above
3. (2 points) Give the value of Q3(jsonString) with only the second song from the String above
4. (2 points) Give the value of Q3(jsonString) with the String "[{}]"
5. (2 points) Break Q3. Provide an input to Q3 that will cause an error.

Q4

```
1 public static double Q4(int n){
2     ArrayList<Thing> things = new ArrayList<>();
3     for(int i=0; i<n; i++){
4         things.add(new ThingA((double)i));
5         things.add(new ThingB());
6     }
7     double ans = 0.0;
8     for(Thing thing : things){
9         ans += thing.compute();
10    }
11    return ans;
12 }
```

```
1 public abstract class Thing{
2     protected double score;
3
4     public double getScore(){
5         return score;
6     }
7
8     public void setScore(double score){
9         this.score = score;
10    }
11
12    public abstract double compute();
13 }
```

```
1 public class ThingA extends Thing{
2     public ThingA(double score){
3         this.score = score;
4     }
5
6     @Override
7     public double compute(){
8         return this.score * 100.0;
9     }
10 }
```

```
1 public class ThingB extends Thing{
2     @Override
3     public double compute(){
4         this.score *= 2;
5         return this.score;
6     }
7 }
```

1. (2 points) Give the value of $Q_4(0)$
2. (2 points) Give the value of $Q_4(1)$
3. (2 points) Give the value of $Q_4(2)$
4. (2 points) Give the value of $Q_4(3)$
5. (2 points) Give the value of $Q_4(4)$