

Name	<u>SOLUTION</u>	ID	Final Score	<u>15/15</u>
			Extra Credit	<u>/0.5</u>
Lecture Section (circle one):	TTh 8:00-9:20	TTh 9:30-10:50	TTh 11:00-12:20	

CSCI 201L Written Exam #1
Spring 2018
15% of course grade

*The exam is one hour and 50 minutes and is closed book, closed note with one 8.5"x11" double-sided paper of **hand-written** notes allowed.*

1. **AJAX** – AJAX sometimes uses a callback function. Explain what a callback function is. When do you need to have a callback function? (0.5% + 0.5%)

A callback function is executed when the response from an asynchronous function call is made.

A callback function is needed with an AJAX call that is made asynchronously. After the server responds to the asynchronous call, the callback function will be executed with the `responseText` variable populated.

2. **Front-End vs Back-End** – Explain the difference between front-end code and back-end code by defining each. What languages did we learn in the class that fit into each one? (0.5% + 0.5%)

Front-End

Front-end code runs within the client, which is the browser with web development. We learned HTML, CSS, and JavaScript.

Back-End

Back-end code runs on the server, which is within Tomcat for the Java web development we are doing in class. Java is the language, but PHP, ASP, Python, and C# are also used. We wrote our Java code in servlets and JSPs.

3. **Garbage Collection** – Java doesn't have pointers available for the programmer, but the JVM obviously has to implement pointer functionality. When the garbage collector runs, what is actually happening? (1.0%)

The JVM iterates through all of the locations in main memory that were allocated to the JVM from the operating system. If there are any locations that are no longer referenced by a variable (i.e., no pointers referencing that location in memory), the JVM marks the memory location for deletion so it can be reallocated by the JVM. Compacting happens as well when memory gets fragmented.

4. **Multi-Threading** – Answer the questions below and on the next page based on the following program.

```

1 public class Question4 {
2     public static void main(String [] args) {
3         System.out.println("Starting main");
4         Thread t1 = null;
5         Thread t2 = null;
6         for (int i=0; i < 5; i++) {
7             if (i != 0) {
8                 t1 = new T4(i, t2);
9             }
10            else {
11                t1 = new T4(i, null);
12            }
13            t1.start();
14            t2 = t1;
15        }
16        System.out.println("Ending main");
17    }
18 }
19 class T4 extends Thread {
20     private int n;
21     private Thread t;
22     T4(int n, Thread t) {
23         this.n = n;
24         this.t = t;
25     }
26     public void run() {
27         System.out.println(n + "-start");
28         try {
29             if (t != null) {
30                 t.join();
31             }
32         } catch (InterruptedException ie) {
33             System.out.println(ie.getMessage());
34         }
35         System.out.println(n + "-end");
36     }
37 }

```

a. Give two possible outputs. (0.5% + 0.5%)

Output #1

Starting main
Ending main
0-start
0-end
1-start
1-end
2-start
3-start
2-end
3-end
4-start
4-end

Output #2

Starting main
0-start
0-end
1-start
1-end
Ending main
4-start
2-start
3-start
2-end
3-end
4-end

Starting main is first line

Ending main will be somewhere after Starting main

x-start before x-end

Once a subsequent thread starts, it will not end before the thread that was started immediately before it ends. In other words, the threads will end in order.



- b. Looking at the following output, fill in the table showing the number of the thread with which each thread joined. (0.5%)

```
Starting main
Ending main
1-start
0-start
0-end
1-end
2-start
2-end
4-start
3-start
3-end
4-end
```

Thread	Joined Thread
0	None
1	0
2	1
3	2
4	3

NOTE: The output does not determine the threads that are joined. Thread 0 is not joined with any other thread, Thread 1 is joined with Thread 0 (meaning that Thread 0 must end before Thread 1 can end), etc.



- c. Comment out lines 28-34. Give two outputs that would not have been possible with lines 28-34 uncommented. (0.5% + 0.5%)

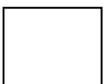
Output #1

```
Starting main
Ending main
0-start
0-end
1-start
1-end
2-start
3-start
3-end
2-end
4-start
4-end
```

Output #2

```
Starting main
Ending main
0-start
1-start
1-end
0-end
3-start
3-end
2-start
2-end
4-start
4-end
```

A thread that was started later than another thread ends before the earlier thread ends.



5. Threads – Threads do not always need to be concerned with an `InterruptedException`.

- a. In what state(s) will a thread be if it needs to worry about handling an `InterruptedException`? (0.5%)

Waiting or Sleeping

- b. How does an `InterruptedException` get thrown? (0.5%)

By another thread explicitly calling the `interrupt()` method on a thread.

6. **Polymorphism** – Does the following code compile? If so, what is the output? If not, correct the error(s) so that it does compile. (NOTE: You are not allowed to comment or remove any lines.) (0.5% + 1.0%)

```
1 class A {
2     void m1() {
3         System.out.println("A.m1");
4     }
5     void m2() {
6         System.out.println("A.m2");
7     }
8     void m3() {
9         System.out.println("A.m3");
10    }
11 }
12 abstract class B extends A {
13     void m2() {
14         System.out.println("B.m2");
15     }
16 }
17 class C extends B {
18     void m1() {
19         System.out.println("C.m1");
20     }
21     void m2() {
22         System.out.println("C.m2");
23     }
24     void m3() {
25         super.m3();
26     }
27 }
28 public class Question6 {
29     public static void main(String [] args) {
30         A a1 = new A();
31         A a2 = new C();
32         B b1 = new C();
33         a1.m1();
34         a2.m1();
35         b1.m1();
36         a1.m2();
37         a2.m2();
38         b1.m2();
39         a1.m3();
40         a2.m3();
41         b1.m3();
42     }
43 }
```

The code DOES compile.

Output

A.m1
C.m1
C.m1
A.m2
C.m2
C.m2
A.m3
A.m3
A.m3

7. **JavaScript** – Write a code snippet to allow JavaScript to modify the content of an HTML tag. You do not need to include the entire HTML page. (0.5% + 0.5%)

JavaScript code

```
<html>
  <head>
    <script>
      function foo() {

          document.getElementById("mytag").innerHTML =
              "<h1>Hello World</h1>";

      }
    </script>
  </head>
  <body>
    <button onclick="foo()" />

    <div id="mytag"></div>

  </body>
</html>
```

8. **Software Engineering** – Give two reasons why a project manager would choose to use the waterfall methodology on a project. (0.5% + 0.5%)

Reasons (NOTE: Other answers may be acceptable)

If a lot of documentation is needed.

If the system has very defined requirements.

If the system has a long expected lifetime.

If the development team is organized in a hierarchical fashion.

If the designers and programmers are not very experienced.

If the system is subject to external regulation.

Plan-based projects *could* be more profitable than agile-based projects if the project is completed efficiently with a high initial bid. Plan-based projects are typically bid as a whole as opposed to bid as time-and-material (i.e., hourly) as agile projects typically are done.



9. **HTML** – HTML forms can be submitted as a GET or a POST. Show an example of the URL after submitting the form for both based on the following form. Assume the user selects the “cardinal” option in the select field. **(0.5% + 0.5%)**

```
<form action="/Validate" method="<GET or POST>">
  <select name="color">
    <option value="cardinal" />
    <option value="gold" />
  </select>
  <input type="text" name="fname" value="donald" />
  <input type="text" name="lname" value="duck" />
  <input type="submit" name="submit" value="Validate" />
</form>
```

GET URL

/Validate?color=cardinal&fname=donald&lname=duck&submit=Validate

POST URL

/Validate



10. **Networking** – Why do we need both IP addresses and ports? **(0.5%)**

The IP address uniquely identifies the device.

The port uniquely identifies the application on the device.



11. CSS – CSS can be included in an HTML page in three different locations. Explain the three locations and give a code snippet for each showing the following CSS tag used on an h1 tag. (0.5% + 0.5% + 0.5%)

```
font-size: 12pt;
```

Location #1

External stylesheet

Code Snippet for Location #1

```
<link rel="stylesheet" type="text/css" href="test.css" />
```

Test.css

```
h1 {  
    font-size: 12pt;  
}
```

Location #2

Inside the <head> tag of the HTML file

Code Snippet for Location #2

```
<head>  
    <style>  
        h1 {  
            font-size: 12pt;  
        }  
    </style>  
</head>
```

Location #3

In the style attribute of the <h1> tag

Code Snippet for Location #3

```
<h1 style="font-size: 12pt;">Hello World</h1>
```



12. Networking – Given the following IP address and subnet mask (which are provided in dotted decimal and binary notations), answer the questions below. **(0.25% + 0.25% + 0.25% + 0.25%)**

167.58.201.94 = 1010 0111 . 0011 1010 . 1100 1001 . 0101 1110
 255.255.255.192 = 1111 1111 . 1111 1111 . 1111 1111 . 1100 0000

a. What is the network address in dotted decimal notation? **(0.25%)**

167.58.0.0

b. What is the network/subnet address combination in dotted decimal notation? **(0.25%)**

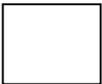
167.58.201.64

c. How many assignable IP addresses are available on the network? (Do not provide the answer as a power of 2 but instead as a base 10 value.) **(0.25%)**

$2^{16} - 2 = 65534$

d. How many assignable IP addresses are available on the subnet? (Do not provide the answer as a power of 2 but instead as a base 10 value.) **(0.25%)**

$2^6 - 2 = 62$



13. Networking – Provide two *temporary* solutions that were developed to deal with running out of IPv4 addresses. (NOTE: IPv6 is not a temporary solution.) Explain your answers. **(0.5% + 0.5%)**

Solutions

NAT (Network Address Translation)/Private IP addresses

Subnetting

DHCP (Dynamic Host Control Protocol)

Extra Credit Question

Extra credit is applied after the curve so does not affect other students.



14. This is the first semester I have required attendance as part of the grade in CSCI 201. Please answer the following questions as I would like some feedback on this new policy. **(0.5%)**

a. Because attendance is part of your grade, are you more likely to attend lecture? (Circle one)

Yes	No
121 (87.7%)	17 (12.3%)

b. Do you feel you are learning more from the class because attendance is required or do you think you would learn just as much if it wasn't? (Circle one)

Learning More	Not Learning More
89 (64.5%)	49 (12.3%)

Explain your answer.

The majority of students who answered "Not Learning More" said they would have attended lecture regardless of whether it was required, so they don't feel as if they are learning more but are learning the same amount.

c. Do you have any better solutions for how we can take attendance in class each day rather than using Arkaive (for those of you who come to the 9:30a.m. or 11:00a.m. sections)?

There were some creative answers here, but the majority of students said that Arkaive is working fine. They would like a reminder towards the beginning of class so they don't forget to check in though.