INSTRUCTIONS:

- Keep your eyes on your own paper and do your best to prevent anyone else from seeing your work.
- Do NOT communicate with anyone other than the professor/proctor for ANY reason in ANY language in ANY manner.
- This exam is closed note, closed books, and no calculator.
- Turn all mobile devices off and put them away now. You cannot have them on your desk.
- Write neatly and clearly indicate your answers. What I cannot read, I will assume to be incorrect.
- Stop writing when told to do so at the end of the exam. I will take 5 points off your exam if I have to tell you multiples times.
- Academic misconduct will not be tolerated. Suspected academic misconduct will be immediately referred to the Emory Honor Council. Penalties for misconduct will be a zero on this exam, and F grade in the course, and/or other disciplinary action that may be applied by the Emory Honor Council.

TIME: This exam has 5 questions. Please check to make sure no page is missing. You will have 50 minutes to complete this exam.

I commit to uphold the ideals of honor and integrity by refusing to betray the trust bestowed upon me as a member of the Emory community. I have also read and understand the requirements and policies outlined above.

Signature:_______________________________

<table>
<thead>
<tr>
<th>Question:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 (Bonus)</th>
<th>Total</th>
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<tbody>
<tr>
<td>Points:</td>
<td>25</td>
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</table>
1. (25 pts) Write down the output of the following program according to the order of execution. The first row has been completed for you.

```java
public class question1 {
    public static int a = 1;
    public static int a() {
        return 2;
    }
    public static int a(int a) {
        System.out.println(question1.a);
        return 3;
    }
    public static int a(String a) {
        System.out.println(a);
        return 4;
    }
    public static void main(String[] args) {
        System.out.println(a);
        String a = "5";
        System.out.println(a);
        System.out.println(a(6));
        System.out.println(a(a));
    }
}
```

<table>
<thead>
<tr>
<th>Line number</th>
<th>Output</th>
</tr>
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<tbody>
<tr>
<td>3</td>
<td>1</td>
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</table>
2. (25 pts) State whether the code is correct or has an error. Explain where and how the error occurs if any. The first row has been completed for you.

<table>
<thead>
<tr>
<th>Code</th>
<th>Error?</th>
<th>Why</th>
</tr>
</thead>
<tbody>
<tr>
<td>String a = &quot;hello&quot;; for(int i = 0; i &lt; a.length; i++) System.out.print(a.charAt(i));</td>
<td>Yes.</td>
<td>a.length is incorrect. It should be a.length().</td>
</tr>
<tr>
<td>public static void function1() { double[] a; if(a.length &gt;= 0) return; }</td>
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<tr>
<td>double[][] a = new double[10][];</td>
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<tr>
<td>public static double[] function2() { double[] a = {0.0}; return a; }</td>
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<tr>
<td>public class question2 {</td>
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<tr>
<td>public static int a(int a) { return 1; }</td>
<td></td>
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<tr>
<td>public static String a(int b) { return &quot;1&quot;; }</td>
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<tr>
<td>}</td>
<td></td>
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<tr>
<td>public class question2 {</td>
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</tr>
<tr>
<td>public int a(int a) { return 1; }</td>
<td></td>
<td></td>
</tr>
<tr>
<td>public static int b(int a) { return question2.a(2); }</td>
<td></td>
<td></td>
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</tbody>
</table>
3. (25 pts) Complete the following Java program named “count.java” to calculate how many times the integers (1–5) appear in a given array. countArray[i] counts the occurrences of number i in the given array where i is an integer between 1 and 5, and countArray[0] counts the occurrences of all other numbers.

```java
public class count {
    public static int[] countArray;

    public static void counting(int[] a) {
        if(countArray == ________ ) // initialize countArray if necessary
            countArray = new int[ ________ ];

        if(a == null) // check if array "a" is valid.
            return;

        for(int i = 0; i < ________ ; i++) {
            if(a[i] >= 1 && a[i] <= 5) {
                countArray[ ________ ]++;
            }
            else
                countArray[0]++;
        }
    }

    public static void printCount() {
        for(int i = 1; i < ________ ; i++)
            System.out.println("Number" + i + "count:" + countArray[i]);

        System.out.println("Other numbers count:" + countArray[0]);
    }

    public static void main(String[] args) {
        int[] a = {2, 3, 4, 3, 3, 5, 4, 10, 9, 1, 9, 11, 15};
        counting(a);
        printCount();
    }
}
```

The correct output is:

```
Number 1 count: 1
Number 2 count: 1
Number 3 count: 3
Number 4 count: 2
Number 5 count: 1
Other numbers count: 5
```
4. (25 pts) Selection sort.

Complete the following function which sorts integers in the given array “a” in DESCENDING order, and return the sorted array as result.

```java
public static int[] selectionSort(int[] a) {
    // Your implementation here
}
```
5. (10 pts) Matrix transpose.

Complete the following function which takes a 2-dimensional array as a parameter and return the transposed form of the array. It should work as below:

We assume the “shape” of two-dimensional array “a” is rectangle, which means each row of “a” has the same number of entries. Therefore the number of columns in “a” can be represented as a[0].length, and number of rows is a.length.

```java
public static int[][] transpose(int[][] a) {
    // Transpose function implementation goes here
}
```