Name (print): ________________________________

• 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 notes, 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 multiple 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, an F grade in the course, and/or other disciplinary action that may be applied by the Emory Honor Council.

• Time: This exam has 7 questions on 8 pages including the title page. Please check to make sure all pages are included. You will have 75 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</th>
<th>6</th>
<th>7</th>
<th>Total</th>
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<td>12</td>
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1. Parameter Passing:
   
   (a) (3 points) Explain the difference between “pass by reference” and “pass by value” for method calls.

   (b) Consider the following code:

   ```java
   public class Parameters {
       public static int p(int a, int b) {
           a = a + 4;
           b = b - 2;
           return a*b;
       }
   }
   public static void main(String[] args) {
       int x = 1;
       int y = 3;
       int z = p(x, y);
       System.out.println("x: "+ x);
       System.out.println("y: "+ y);
       System.out.println("z: "+ z);
   }
   }
   
   (a) (3 points) What would the code print if the parameters were passed by value?

   (b) (3 points) What would the code print if the parameters were passed by reference?
2. Consider the function **Mystery** which is given below. This function has limitations on
its input: **number** must be greater than 0 and contain no 0s as digits. **value** must be
greater than 0 but less than 10.

```java
public int Mystery(int number, int value) {
    int count = 0;
    int dig = number % 10;
    while (dig > 0) {
        if (dig == value) {
            count++;
        }
        number = number/10;
        dig = number % 10;
    }
    return count;
}
```

Answers the following questions.
(a) (1 point) What type is the return type of **Mystery**?

(b) (1 point) How many local variables does **Mystery** have and what is/are their names?

(c) (1 point) How many parameter variables does **Mystery** have and what is/are their
names?

(d) (2 points) What is the return value for the call **Mystery(376646, 6)**?

(e) (2 points) What is the return value for the call **Mystery(376646,5)**?

(f) (2 points) Describe in words what the method **Mystery** does.
3. (10 points) Write the output that the following code will generate. You may assume the code compiles as written.

```java
public class ExamQuestion {
    public static int a = 10;

    public static int method1(double d) {
        System.out.println("Location3");
        if (a < 10 && d < 5) {
            return a + 4;
        } else {
            a = a + 2;
        }
        System.out.println("a in method1: "+ a);
        return a;
    }

    public static int method2(int a) {
        System.out.println("Location2");
        a = a + 10;
        System.out.println("a in method2: "+ ExamQuestion.a);
        return a;
        System.out.println("Location3");
    }

    public static void method3() {
        for(int i = 0; i < 6; i++) {
            int a = i + 6;
            if(i == 4) {
                System.out.println(a);
            }
        }
        System.out.println("a in method3: "+ a);
    }

    public static void main(String[] args) {
        System.out.println("a1: "+ a);
        int a = method1(3.14);
        System.out.println("a2: "+ a);
        int b = method2(4);
        System.out.println("b: "+ b);
        method3();
    }
}
```
4. Draw the array that would result after the following code is executed.

(a) (4 points) int[] data = new int[8];
data[0] = 3;
data[7] = -18;
data[4] = 5;
data[1] = data[0];

int x = data[4];
data[4] = 6;
data[x] = data[0] * data[1];

(b) (6 points) int[] list = {2, 18, 6, -4, 5, 1};
for (int i = 0; i < list.length; i++) {
    list[i] = list[i] + (list[i] / list[0]);
}

(c) (6 points) Consider the function below:
public static void mystery(int[] a) {
    for(int i = 0; i < a.length - 1; i++) {
        if(a[i] < a[i+1]) {
            a[i] = a[i+1];
        }
    }
}
Draw the array a2 after the code below executes.
int[] a2 = {2, 4, 6, 3, 7, 9};
mystery(a2);
5. Professor Summet wrote the following method to reverse the data in an array.

```java
public static void reverse(int[] a) {
    for (int i = 0; i < a.length; i++) {
        int temp = a[i];
        int swapIndex = a.length - 1 - i;
        a[i] = a[swapIndex];
        a[swapIndex] = temp;
    }
}
```

However, she wasn’t careful and her code contains a logical error. That is, it compiles and runs, but doesn’t do what she intended. In fact, she can see no change in her array at all after the method executes!

(a) (4 points) Explain the logical error in this code. You can draw pictures if it helps your explanation.

(b) (4 points) Rewrite the method to fix Professor Summet’s logical error.
6. (11 points) Write a function no29 which takes an array of single digit integers as a parameter. The function should return a boolean value. The function returns true if the array contains no 2s or it contains no 9s. Examples of function calls and return values:

no29({1,2,3}) returns true
no29({1,2,8,9}) returns false
no29({7,8,9}) returns true
7. (12 points) Write a function `indexOutOfOrder`. The function should take an array of integers as an input parameter. That array is supposed to be in increasing order. The function should return the index of the first number in the array that is out of order. If none of the numbers are out of order, it should return -1. For example, if the array below was the input parameter, a call to `indexOutOfOrder` should return 3 since 7 (which is in position 3) is out of order.

\[
\begin{array}{cccccccc}
3 & 4 & 9 & 7 & 12 & 11 & 18 & 10 \\
\end{array}
\]