Midterm Exam #1
CS170000

Student Name______________________________
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</th>
<th>6(Bonus)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points:</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>120</td>
</tr>
<tr>
<td>Score:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Problem 1 (20 pts)**

Fill out the following table. Evaluate the Java expression in the first column and put the result in the second column. Assume that each expression is evaluated independently (i.e., not in sequence). There are no errors in these expressions.

```java
int i = 3, j = 7;
double a = 8.5, b = 1.0;
char c = 'Z';
```

<table>
<thead>
<tr>
<th>Expression</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>i = j</td>
<td></td>
</tr>
<tr>
<td>a - i</td>
<td></td>
</tr>
<tr>
<td>j / i</td>
<td></td>
</tr>
<tr>
<td>j % (j - 5)</td>
<td></td>
</tr>
<tr>
<td>i * i &gt; 10</td>
<td></td>
</tr>
<tr>
<td>i != j</td>
<td></td>
</tr>
<tr>
<td>Math.sqrt(b) &gt; a</td>
<td></td>
</tr>
<tr>
<td>(char)(c - 2)</td>
<td></td>
</tr>
<tr>
<td>c &gt;= 'X'</td>
<td></td>
</tr>
<tr>
<td>(char) (c + 'y' - 'z')</td>
<td></td>
</tr>
</tbody>
</table>
Problem 2 (20 pts)
Complete a program that computes and prints out the mean and the standard deviation of 5 numbers. Define new variables as necessary.

\[
\text{mean} = \frac{x_1 + x_2 + \cdots + x_n}{n}
\]

\[
\text{standard deviation} = \sqrt{\frac{(x_1 - \text{mean})^2 + (x_2 - \text{mean})^2 + \cdots + (x_n - \text{mean})^2}{n}}
\]

You need to implement these formulas for \( n = 5 \) without using loop statement.

```java
public class BasicStats {
    public static void main(String[] args) {
        // assume that x1 - x5 are initialized
        double x1, x2, x3, x4, x5;
    }
}
```
Problem 3 (20 pts)
Trace the program execution and write the output this program produces.

a. (10 pts)

```java
class IfElse {
    public static void main(String[] args) {
        int testscore = 76;
        char grade;

        if (testscore >= 90) {
            grade = 'A';
        } else if (testscore >= 80) {
            grade = 'B';
        } else if (testscore >= 70) {
            grade = 'C';
        } else if (testscore >= 60) {
            grade = 'D';
        } else {
            grade = 'F';
        }
        System.out.println("Grade = " + grade);
    }
}
```

Output: ________________________________
b. (10 pts)

class IfElse {
    public static void main(String[] args) {
        int month = 2;
        int year = 2000;
        int numDays = 0;

        switch (month) {
            case 1: case 3: case 5:
            case 7: case 8: case 10:
            case 12:
                numDays = 31;
                break;
            case 4: case 6:
            case 9: case 11:
                numDays = 30;
                break;
            case 2:
                if (((year % 4 == 0) &&
                    !(year % 100 == 0))
                    || (year % 400 == 0))
                    numDays = 29;
                else
                    numDays = 28;
                break;
            default:
                System.out.println("Invalid month.");
                break;
        }
        System.out.println("Number of Days = "+ numDays);
    }
}

Output: ______________________________________________
Problem 4 (20 pts)
The code fragment below generates two random integers that are stored in variables number1 and number2. Using these two variables you need to implement the following quiz for a user:

- Prompt the user to multiply the two numbers (number1 * number2)
- Check if answer is correct and give the user feedback about correctness of the answer.

Example of running the program (user answers incorrectly):

```
What is 7 * 7
2
7 * 7 = 2 is false
```

Example of running the program (user answers correctly):

```
What is 5 * 6
30
5 * 6 = 30 is true
```

`import java.util.*;
public class MultiplicationQuiz {
    public static void main(String[] args) {
        // generate two random integer numbers
        Random rnd = new Random(System.currentTimeMillis());
        int number1 = rnd.nextInt(10);
        int number2 = rnd.nextInt(10);

        // write your code here
    }
}``
Problem 5 (20 pts)
Write a program that converts miles to kilometers and displays the following table (note that 1 mile is 1.609 kilometers):

<table>
<thead>
<tr>
<th>Miles</th>
<th>Kilometers</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>16.09</td>
</tr>
<tr>
<td>20</td>
<td>32.18</td>
</tr>
<tr>
<td>30</td>
<td>48.27</td>
</tr>
<tr>
<td>40</td>
<td>64.36</td>
</tr>
<tr>
<td>50</td>
<td>80.45</td>
</tr>
<tr>
<td>60</td>
<td>96.54</td>
</tr>
<tr>
<td>70</td>
<td>112.63</td>
</tr>
<tr>
<td>80</td>
<td>128.72</td>
</tr>
<tr>
<td>90</td>
<td>144.81</td>
</tr>
<tr>
<td>100</td>
<td>160.90</td>
</tr>
</tbody>
</table>

You can use \t character to tabulate between columns, for example this code:

```java
System.out.println("Column1" + "\t" + "Column2");
System.out.println(1 + "\t" + 2);
```

Will generate the following printout:

<table>
<thead>
<tr>
<th>Column1</th>
<th>Column2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Problem 6 (Extra Credit, 20 pts)
Write a fragment of code that sorts three numbers in decreasing order and stores them in the three variables sortedX1, sortedX2 and sortedX3. That is, variable sortedX1 should have the maximum number and variable sortedX3 should have the minimum number after sorting.

```java
public class Sort3 {
    public static void main(String[] args) {
        // assume that x1 - x3 are initialized
        double x1, x2, x3;

        // assume sortedX1 will hold the maximum value
        // and sortedX3 will hold the minimal value
        double sortedX1, sortedX2, sortedX3;

        // print out in decreasing order:
        System.out.println(sortedX1 + "\t" + sortedX2 + "\t" + sortedX3);
    }
}
```