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 9 pages including the title page. Please check to make sure all pages are included. You will have 50 minutes to complete this exam.

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*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>
</tr>
</thead>
<tbody>
<tr>
<td>Points:</td>
<td>6</td>
<td>20</td>
<td>14</td>
<td>12</td>
<td>12</td>
<td>16</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>Score:</td>
<td></td>
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</tr>
</tbody>
</table>

1
1. (6 points) Definitions
   For each of the following give a basic definition of the term. You do not need to give a
   formal definition.
   
   • break keyword
   
   • Unsafe conversion
   
   • String

2. (20 points) Outputs and syntax problems
   The following code snippets could have syntax problems (syntax problems mean that
   the code will not compile). For those which are correct, print the output of the code. For
   those with an error, indicate what the error is and correct the code.
   
   • Snippet 1

   ```java
   Scanner scanner = new Scanner(System.in);
   String s;
   s = scanner.next();
   // Now, user enters: 45.44
   double d = s * 2;
   System.out.println(d);
   ```

   Output or error:

   • Snippet 2

   ```java
   double d = 3.14;
   int c = 12;
   int f = c * d;
   System.out.println(f);
   ```

   Output or error:
• Snippet 3

1 double d = 4.0;
2 if (d == 2){
3     System.out.println("First");
4 } else if (d == 3){
5     System.out.println("Second");
6 } else if (d > 4 && d < 10){
7     System.out.println("Third");
8 } else {
9     System.out.println("Else");
10 }

Output or error:

• Snippet 4

1 int d = 0;
2 while (d <= 20){
3     System.out.println(d);
4     d = (d * 2) + 1;
5 }

Output or error:

• Snippet 5

1 double d = 3.14;
2 int g = 10;
3 int res = (((int) d * 4) % g) + 1;
4 System.out.println(res);

Output or error:
3. (14 points) Evaluation table
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 (means not in sequence). In the third column indicate the datatype of the result. The first row has been done for you. If the expression cannot be evaluated, you may write "error".

You have the following variables declared and initialized:

```java
boolean b = true;
double d = 2.0, e = 4.0;
int i = 3, j = 15;
char c = 'x';
char d = 'd';
String str1 = "Hello world!"
```

<table>
<thead>
<tr>
<th>Java expression</th>
<th>Result</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>d + i</code></td>
<td>5.0</td>
<td>Double</td>
</tr>
<tr>
<td><code>(double)(str1.length() + j)</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td><code>++i + j - (3 * 4 % 2)</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td><code>(char)('c' + 2*3)</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td><code>str1 + &quot;45&quot; + '6'</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td><code>str1.substring(6, 11)</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td>`! (e &gt; d</td>
<td></td>
<td>i &gt; j)`</td>
</tr>
<tr>
<td><code>(char)(str1.charAt(10) - 3)</code></td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>
4. (12 points) Problem 4
The Java code below runs on the machine. What will the output be if the user types:

**Enter a number: 6**

```java
int userInt;
int encoded_value;
Scanner input = new Scanner(System.in);
System.out.print("Enter a number: ");
userInt = input.nextInt();
switch (userInt){
    case 0: 
    case 1: 
    case 2: 
        encoded_value = 1;
        break;
    case 3: 
    case 4: 
        encoded_value = 10;
        break;
    case 5: 
        encoded_value = 100;
        break;
    case 6: 
        encoded_value = 500;
    case 7: 
        System.out.println("Case 7 has been processed");
    case 8: 
        encoded_value = 1000;
        break;
    case 9: 
        encoded_value = 10000;
        break;
    default: 
        encoded_value = -1;
        break;
}
System.out.println("Between main two");
String message = "";
if (encoded_value <= 10000){
    if (encoded_value == -1){
        message = "Error in input";
    }
    else{
        if (encoded_value <= 100){
            message = "Value is in <0; 100> range";
        }
        else if (encoded_value == 1000 || encoded_value == 1001){
            message = "Value is in the <1000; 1001> range";
        }
        else{
            message = "Value greater than 1001";
        }
    }
}
else{
    message = "Error in decoding your value";
}
System.out.println("End of choices");
System.out.println("Message is: " + message);
```
5. (12 points) Problem 5

Consider the code below with logical errors that should calculate the sum of even numbers from the range provided by user. For instance, for numbers 4 and 12, it should sum up numbers: 4, 6, 8, 10, 12 and print the sum, which is 40.

```
import java.util.Scanner;

public class SumEven{
    public static void main(String [] args){
        int start_number, end_number;
        int sum = 0;
        Scanner input = new Scanner(System.in);

        System.out.print("Enter start number: ");
        start_number = input.nextInt();
        System.out.print("Enter end number: ");
        end_number = input.nextInt();

        while(start_number <= end_number){
            sum = sum + start_number;
            start_number++;
        }

        System.out.println("Sum of even numbers is: " + sum);
    }
}
```

What does the code output for input: 5 and 9 (start/end number)?

- Explain the logical error in the code.

- Propose a fix.
6. (16 points) CalculateCharacter
Assume that you are given a string and a character in Java. Write a program that will count the number of occurrences of the character in the string. For instance, if user enters "Hello world!" as a string and character 'l', the program should output: There is 3 characters 'l' in string Hello World!

```java
public class CalculateCharacter{
    public static void main(String [] args){
        String str;
        Character c;
        Scanner input = new Scanner(System.in);

        System.out.print("Enter a string: ");
        str = input.next();
        System.out.print("Enter a character: ");
        c = input.next().charAt(0);
        /*-------- YOUR CODE HERE -------->
    }
}
```
7. (20 points) DivisorsAverage
Write a program using a while loop that finds an average of all divisors of a number entered by user. For instance, for input 12, all the divisors are: 1, 2, 3, 4, 6, 12 and they sum up to 28. Then, 28/6 (number of divisors) will give a value of 4.6667, so the output of program should look as follows:

Enter a number: 12
Average of all divisors: 4.6667

```java
public class DivisorsAverage{
    public static void main(String [] args){
        int start, end;
        Scanner input = new Scanner(System.in);

        System.out.print("Enter a number: ");
        number = scanner.nextInt();

        /*-------- YOUR CODE HERE -------->
```

```java
}
```
### ASCII Table

<table>
<thead>
<tr>
<th>0 NUL</th>
<th>1 SOH</th>
<th>2 STX</th>
<th>3 ETX</th>
<th>4 EOT</th>
<th>5 ENQ</th>
<th>6 ACK</th>
<th>7 BEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 BS</td>
<td>9 HT</td>
<td>10 NL</td>
<td>11 VT</td>
<td>12 NF</td>
<td>13 FF</td>
<td>14 DLE</td>
<td>15 DC1</td>
</tr>
<tr>
<td>16 DC2</td>
<td>17 DC3</td>
<td>18 DC4</td>
<td>19 DC5</td>
<td>20 NAK</td>
<td>21 SYN</td>
<td>22 ETB</td>
<td>23 BS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>24 CAN</th>
<th>25 EM</th>
<th>26 SUB</th>
<th>27 ESC</th>
<th>28 FS</th>
<th>29 GS</th>
<th>30 RS</th>
<th>31 US</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>32 SP</th>
<th>33 !</th>
<th>34 &quot;</th>
<th>35 #</th>
<th>36 $</th>
<th>37 %</th>
<th>38 &amp;</th>
<th>39 '</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 (</td>
<td>41 )</td>
<td>42 *</td>
<td>43 +</td>
<td>44 ,</td>
<td>45 -</td>
<td>46 .</td>
<td>47 /</td>
</tr>
<tr>
<td>48 0</td>
<td>49 1</td>
<td>50 2</td>
<td>51 3</td>
<td>52 4</td>
<td>53 5</td>
<td>54 6</td>
<td>55 7</td>
</tr>
<tr>
<td>56 8</td>
<td>57 9</td>
<td>58 :</td>
<td>59 ;</td>
<td>60 &lt;</td>
<td>61 =</td>
<td>62 &gt;</td>
<td>63 ?</td>
</tr>
<tr>
<td>64 @</td>
<td>65 A</td>
<td>66 B</td>
<td>67 C</td>
<td>68 D</td>
<td>69 E</td>
<td>70 F</td>
<td>71 G</td>
</tr>
<tr>
<td>72 H</td>
<td>73 I</td>
<td>74 J</td>
<td>75 K</td>
<td>76 L</td>
<td>77 M</td>
<td>78 N</td>
<td>79 O</td>
</tr>
<tr>
<td>80 P</td>
<td>81 Q</td>
<td>82 R</td>
<td>83 S</td>
<td>84 T</td>
<td>85 U</td>
<td>86 V</td>
<td>87 W</td>
</tr>
<tr>
<td>88 X</td>
<td>89 Y</td>
<td>90 Z</td>
<td>91 [</td>
<td>92 \</td>
<td>93 ]</td>
<td>94 ^</td>
<td>95 _</td>
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<td>96 `</td>
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<td>98 b</td>
<td>99 c</td>
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<td>106 j</td>
<td>107 k</td>
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<td>109 m</td>
<td>110 n</td>
<td>111 o</td>
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<tr>
<td>112 p</td>
<td>113 q</td>
<td>114 r</td>
<td>115 s</td>
<td>116 t</td>
<td>117 u</td>
<td>118 v</td>
<td>119 w</td>
</tr>
<tr>
<td>120 x</td>
<td>121 y</td>
<td>122 z</td>
<td>123 {</td>
<td>124</td>
<td>125 }</td>
<td>126 ~</td>
<td>127 DEL</td>
</tr>
</tbody>
</table>

Note that uppercase: 65 <= x <= 90
Note that lowercase: 97 <= x <= 122

Difference between A (65) and a (97) is 32!
Difference between Q (81) and q (113) is 32!