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.

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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>
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<tbody>
<tr>
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<td>15</td>
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</table>
1. (10 points) Define 5 of the 6 terms below. You do not need a formal definition, just a good description. Limit your answers to less than 50 words per term. You may use an example if it would be helpful. Clearly mark the term you do not wish to include; otherwise, I will discard the last term.

(a) encoding

(b) algorithm

(c) binary number (or binary number system)

(d) concatenate

(e) overflow error

(f) nested statements
2. (15 points) Evaluate each expression. Then give the result of the evaluation and the data type of the result. If the expression cannot be evaluated or is not proper Java syntax, you may simply write "error" for the value. The first row has been done for you.

<table>
<thead>
<tr>
<th>Expression</th>
<th>Value</th>
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<tr>
<td>4+1</td>
<td>5</td>
<td>int</td>
</tr>
<tr>
<td>4+2.0*5</td>
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<td></td>
</tr>
<tr>
<td>3*2/4</td>
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<tr>
<td>3-4/8.0</td>
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<td>(int)3-4/8.0</td>
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<td>(int)(3-4/8.0)</td>
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<td>3-4%8</td>
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<tr>
<td>&quot;CS170&quot; - &quot;170&quot;</td>
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<td></td>
</tr>
<tr>
<td>&quot;Hello&quot; + 6 * 2.0</td>
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<tr>
<td>&quot;Hello&quot; + 6 + 2.0</td>
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<tr>
<td>&quot;Hello&quot; + &quot;6 + 2.0&quot;</td>
<td></td>
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<tr>
<td>true</td>
<td></td>
<td>4==3</td>
</tr>
<tr>
<td>3 &lt; 4 &lt;= 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>!(4 == 5)</td>
<td></td>
<td>6 &gt; 5 &amp;&amp; 4 &gt; 5</td>
</tr>
<tr>
<td>‘m’ - 4</td>
<td></td>
<td></td>
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<tr>
<td>(char)(‘m’ - 4)</td>
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3. (10 points) Indicate the output of each of the println statements below. If the statement would generate an error, simply write “error”. Indicate spaces in your answer by writing “_”. Be clear in your answers, and do not use quotation marks unless the computer would print them.

```java
String word = "CS170 class";
int num = 6;

System.out.println("Hello" + word.charAt(1) + word.charAt(8));

System.out.println(word.substring(4, 9));

System.out.println(9 + Integer.parseInt("9") + "+ 6 + 2 * num + "+");

System.out.println(word.length() + "+ " + num + 6);

System.out.println(word.charAt(word.length()));
```
4. (12 points) Assume the statements below are part of a Java program which compiles and runs. What is the output if the user types 35?

```java
Scanner in = new Scanner(System.in);
int num = in.nextInt();

if (num > 10) {
    System.out.println("one");
} else if (num > 20) {
    System.out.println("two");
} else if (num > 40) {
    System.out.println("try");
} else {
    System.out.println("fry");
}

System.out.println("sly");
if (num > 40) {
    System.out.println("one");
} else if (num > 20) {
    System.out.println("two");
} else if (num > 10) {
    System.out.println("try");
} else {
    System.out.println("fry");
}

System.out.println("sly");
if (num > 10) {
    System.out.println("one");
}
if (num > 20) {
    System.out.println("two");
}
if (num > 40) {
    System.out.println("try");
} else {
    System.out.println("fry");
}
```
5. Consider the following program (with the lines numbered for convenient reference).

```
1: public class Bugs {
2:   public static void main(String args[]) {
3:       int limit = 100;
4:       int oddnum = 1;
5:       while (oddnum != limit) {
6:           System.out.println(oddnum + " is a number under " + limit);
7:           oddnum += 2;
8:       }
9:   }
10: }
```

The intent of the program was to print out the odd numbers between 1 and 100. However, there is a bug in the program as written and it generates the (abbreviated) output shown below:

```
1 is a number under 100
3 is a number under 100
...
97 is a number under 100
99 is a number under 100
101 is a number under 100
103 is a number under 100
... (forever)
```

(a) (2 points) Explain what the error is in the program.

(b) (4 points) What line(s) of code would you change to eliminate this error? Change the line(s) to make the program function correctly, assuming that limit is any valid positive integer.
6. (10 points) Consider the program below which reads in two integers from the user. These integers are stored in the variables a and b. Write code so that the program prints "YES! 10!" if either a or b is the number 10 or if their sum is 10. Otherwise, it should print "NO! Not 10!". You may assume the user always enters valid integers.

```java
import java.util.Scanner;

public class SumTwo {
    public static void main(String args[]) {
        Scanner in = new Scanner(System.in);

        int a = in.nextInt();
        int b = in.nextInt();

        /*---------- Your code here -----------*/
    }
}
```
7. (12 points) The following program allows the user to enter an integer. The program should then sum up the even numbers between 0 and the number the user entered (inclusive) and print out the result. For example, if the user entered 10, the program should sum up the numbers 0, 2, 4, 6, 8, and 10 and print out the sum of 30. If the user entered 7, the program would sum up 0, 2, 4, and 6 and print the sum of 12. However, your program should work for any valid integer the user types. You may assume the user enters a valid, positive integer.

```java
import java.util.Scanner;

public class SumUp {
    public static void main(String args[]) {
        Scanner in = new Scanner(System.in);
        int limit = in.nextInt();

        /*------------------Your code here----------------*/
    }
}
```
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