CS201   **Name:** _____
Midterm Exam, 100 Points Total

Please write neatly and show as much of your work as possible for partial credit. Scan through all problems first, and attack the easiest problems first. Use the back if you need more space. This exam is open book and open notes but not open computer.

1. (15 pts) Short Answer. Provide brief (1-3 sentence) answers to the following:

a) Given the following variable declaration:
       String str = "I love Java";
   How would you use the substring method to extract "Java" from str?

b) Why is it unpredictable to directly compare two variables of type `float` or `double` to see if they are equal?

c) Why does the Java expression 4 / 8 * 2 result in the value 0, while the expression 4 * 2 / 8   results in the value 1?

d) How do you compile and run a Java program named "foo.java" under Unix?

e) How could you use Java to generate a random integer that is either 2, 3, 4, or 5?

2. (8 pts) Java Operators

Show the output of the following code fragment:

```
System.out.println(14 % 3);
System.out.println(((3<4) && !(2>4)) || (5<4));
int x=0;
System.out.println(4*(x++));
System.out.println(x);
```

3. (12 pts) Find the Bugs

All of the following code snippets have a bug. Identify each one and fix the bug. Assume the necessary code is in place to make a working program (e.g. a main method, a class, etc.). You should not have to completely re-write the code.

a) The following code should add $2 to the price if the user answers 'y':

```
Scanner keyboard = new Scanner(System.in);
double price = 10;
String s;
System.out.println("Extra pepperoni with your pizza? (y or n)");
s = keyboard.next();
if (s == "y")
   price = price + 2;
```

b) The following should sum the numbers from 1 to 10 (including both 1 and 10):

```
int i, sum=0;
for (i = 1; i <= 10; i++)
{
   sum = sum + i;
   i = i + 1;
}
```

c) The following code should output the person's name and age:

```
String name;
int age;
Scanner keyboard = new Scanner(System.in);
System.out.println("Enter age");
age = keyboard.nextInt();
System.out.println("Enter name");
name = keyboard.nextLine();
System.out.println("You're a " + age + " year old " + name);
```

4. (20 pts) If-Then Statements

In a distant land, far, far, away, the income tax rate schedule is as follows:

If your income is between:	Then the tax you must pay is:
$0 and $5999.99	10% of the amount over $0
$6000 and $67,699.99	$600 + 15% of the amount over $6,000
$67,700 and higher	$14,625 + 27% of the amount over $67,700

Complete the code below so that it computes the amount of tax to pay and stores this value in *taxToPay*.

```
import java.util.Scanner;
class Taxes
{
  public static void main(String[] args)
  {
      Scanner keyboard = new Scanner(System.in);
      double taxToPay;
      double income;

      System.out.println("Enter your income:");
      income = keyboard.nextDouble();

      // Complete code here to calculate taxes and store it in taxToPay




  }
}
```

5. (15 pts) Loops.

a) The following code loops until the user enters "y" or "n":

```
String s;
Scanner keyboard = new Scanner(System.in);
do
{
    System.out.println("Enter y or n.");
    s = keyboard.nextLine();
}
while (!s.equals("y") && !s.equals("n"));
```

Rewrite the code such that the functionality remains the same, but use a **while** loop instead of a do-while loop.

6. (15 pts) Nested Loops

Give the output of the following program.

```
class NestedLoop
{
  public static void main(String[] args)
  {
      String s = "JAVA";
      int i,j;

      for (i = 1; i <= s.length(); i++)
      {
          for (j = 0; j < i; j++)
          {
              System.out.print(s.charAt(j));
          }
          System.out.println();
      }
  }
}
```

7. (15 pts). Assigning Grades

Grading assignments and exams is tough work. To make his job easier, your professor has decided to randomly pick 3 students and give them "A's". There are 30 students in the class and each student is numbered from 1 to 30.

   a) Describe an algorithm to randomly select the numbers of 3 students to receive an "A". Make sure not to pick the same number twice. For example, picking students 3, 15, 29 would be valid but picking 3, 3, 31 would be invalid because student 3 is listed twice and 31 is not a valid student number.

       Describe your algorithm either in English or pseudocode.

   b) Write code that could go into the main method below to select and output the students to receive A's.

```
public class EasyGrader {
  public static void main(String[] args) {




    }
}
```