Critical Thinking Chapter 4

1. Use a decision structure to write an appropriate statement for each of the following:
   a. Display *Great job!* when *grade* is *90* or higher
   ```
   if (grade > 90) {
           System.out.print("Great job!");
   }
   ```
   b. Display *Error* when number is less than *20* or greater than *50*
   ```
   if (grade < 20 || grade > 50) {
           System.out.print("Error");
   }
   ```
   c. Add *2* to the value of *y* when *y* is less than *100*
   ```
   if (y < 100) {
           y += 2;
   }
   ```

2. Assume *num1* and *num2* contain integer values. Write an *if-else if* statement that displays one of the following messages as appropriate:
   First number is larger.
   Second number is larger.
   Numbers are equal

   ```
   if (num1 > num2) {
           System.out.print("First number is larger");
   } else if (num1 < num2) {
           System.out.print("Second  number is larger");
   } else {
           System.out.print("Numbers are equal");
   }
   ```

3.
   a. Which is the appropriate word, *odd* or *even* for the blanks below
   ```
   if (num % 2 == 0) {
           System.out.print("____ number");
   } else {
           System.out.print("____ number");
   }
   ```

   1st blank is *even*, second is *odd*

    b. Rewrite the *if-else* as a *switch* statement

```
switch(num % 2 + 1) {
case 1: System.out.print("Even number");
        break
default: System.out.print("Odd number");
        break
}
```

4. Write statements that use Math.random() to generate random numbers for each of the following situations:
    a. Generate a random integer between 1 and 50
       int num = (int)(50 - 1 + 1) * Math.random() + 1);
    b. Generate a random integer between 20 and 100
       int num = (int)(100 - 20 + 1) * Math.random() + 20);
    c. Generate a random double between 10 and 20, inclusive
       double num = (10 - 20 + 1) * Math.random() + 10);

5. Identify the logic errors in the statements below, which should display a single appropriate message for any value of age:

```
if (age < 18) {
        System.out.println("child");
} else if (age > 18 && age < 65) {
        System.out.println("adult");
} else if (age > 65) {
        System.out.println("senior");
}
```

The statements do not account for someone being aged 18, or 65, and an else can be used in replacement of the final else if. A better version of the code would be:

```
if (age < 18) {
        System.out.println("child");
} else if (age > 17 && age < 66) {
        System.out.println("adult");
} else {
        System.out.println("senior");
}
```

6. Given the following assignments, determine if each of the following expressions evaluates to true or false:
       size = 100   weight = 50   value = 75
    a. size > 50 && weight == 50

True
b. value < 100 && !(weight == 50)
False

c. size >= 100 || value >= 100
True
d. weight < 50 || size > 50
True
e. !(value < 75)
True
f. !(size > 100 && weight > 50 && value > 75)
True
g. (value < 125 || weight < 76) && size == 100
True

7. Determine if each of the following are true or false. If false, explain why.
   a. The condition of an if statement must be a Boolean expression.
      True
   b. A nested if statement and an if-else if statement are the same.
      False, nested if statements are if statements within each other that can operate independently, whereas if-else if statements can only result in 1 answer.
   c. The expression in a switch statement must evaluate to a double.
      False, the expression must evaluate to an integer
   d. Numbers generated by a computer program are actually pseudorandom.
      True
   e. The (double) case is needed to generate a random integer.
      False, you do not need to case double to generate an integer, you can instead type cast to an int
   f. A compound Boolean expression can contain more than two Boolean expressions.
      True
   g. In a logical And expression, both operands must be true for the expression to evaluate to true.
      True
   h. In logical expressions, && is evaluated before !.
      False, ! takes precedence over &&, and || is last. You can change precedence by utilizing parentheses
   i. The pow() method in the Math class is used for exponentiation.
      True
   j. The statement x = abs(-3); will return the value 3.
      True