Critical Thinking

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.println(“Great job!”);
}
```

b) Display *Error* when *number* is less than *20* or greater than *50.*

```
if ( (number<20)||(number>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 (num1 < num2) {
        System.out.print(“Second number is larger.”);
}
else (num1 == num2) {
        System.out.print(“Numbers are equal.”);
}
```

3. a) Which is the appropriate word, *odd* and *even* for the blanks below?

```
if (num % 2 == 0) {
        System.out.println(“__ number”); ⇒ Even
} else {
        System.out.println(“__ number”); ⇒ Odd
}
```

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

```
switch (num % 2 == ) {
case 0:
        System.out.println(“Even number”);
        break;
case 1:
        System.out.println(“Odd number”);
        break;
}
```

4. Write statements that use Math.random() to generate random numbers for each the following situations:

a) Generate a random integer between 1 and 50.

```
int randomNum = (int)(50+Math.random()+1);
System.out.print(randomNum);
```

b) Generate a random integer between 20 and 100.

```
int randomNum = (int)(81+Math.random()+20);
System.out.print(randomNum);
```

c) Generate a random double between 10 and 20, inclusive.

```
int randomNum = (int)(11+Math.random()+10);
System.out.print(randomNum);
```

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”);
}
```

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

8. 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. The If statement is placed inside the other If. An if- else if statement is checks multiple conditions sequentially within the same level
c) The expression in a switch statement must be evaluated to a double. ⇒ FALSE. The expression in the switch statement must evaluate to an integral type (int) or String in Java. double types cannot be used in a switch statement due to precision issues
d) Numbers generated by a computer program are actually pseudorandom. ⇒ TRUE
e) The (double) cast is needed to generate a random integer. ⇒ FALSE. A cast to double is not needed to generate the random integer. Typically, random integers can be generated directly using methods like Random.nextInt(), and casting to double in unnecessary for this purpose

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. The logical NOT operator ! has higher precedence than the logical AND operator &&. This means ! is evaluated before && in logical expressions.
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