C212 Early Evaluation Exam Mon Feb 10 2014 Name: _____

Please provide brief (common sense) justifications with your answers below.

1. What is the type (and value) of this expression:

   ```
   5 * (7 + 4 / 2)
   ```

2. What is the type (and value) of this expression:

   ```
   1 != 1
   ```

3. What is the type (and value) of this expression:

   ```
   'C' - 'A'
   ```

4. What is the type (and value) of this expression:

   ```
   Math.sqrt(3)
   ```

5. What is the value of this expression:

   ```
   (9 / 4) * 4 + 9 % 4
   ```

6. What is the value of this expression:

   ```
   9 % 4 == 7 % 2
   ```

7. What is the type (and value) of this expression:

   ```
   false || (true && ! true)
   ```

8. What is the type (and value) value of this expression:

   ```
   1 + 2 + "3" + 4 + 5
   ```

9. What is the type (and value) of this expression:

   ```
   "automaton".length()
   ```

10. What is the type (and value) of this expression:

    ```
    "automaton".charAt(5)
    ```

11. What is the type (and value) of this expression:

```
"automaton".substring(2, "automaton".length() - 1)
```

12. Write the following Java expression in mathematical notation:

```
Math.sqrt(a + Math.sqrt(b))
```

13. Write the following mathematical expression in Java notation:

$$\sqrt{\left(\sqrt{\left(\sqrt{2}\right)^2}\right)^2}$$

14. What is the value of the following expression:

```
2 * 3 / 2 * 3
```

15. Write the following mathematical expression in Java:

$$s = s_0 + v_0 t + \frac{1}{2} g t^2$$

16. Write the following Java expression in mathematical notation:

```
dm = m * ((Math.sqrt(1 + v / c) / Math.sqrt(1 - v / c)) - 1);
```

17. What is the type (and value) of the following Java expression:

```
1 / 2 * 3.0
```

18. What is the type (and value) of the following Java expression:

```
1 / 2.0 * 3
```

19. What is the type (and value) of the following Java expression:

```
(int) Math.sqrt( 15 );
```

20. What is the output of the following line of code:

```
System.out.println("\\\"");
```

21. Write a Java statement that prints the following:

```
\n"\b\t
```

22. What is the output produced by the following code when embedded in a complete program? Please explain.

```java
boolean x;
if (true)
  System.out.print(0);
else
  System.out.print(1);
x = (1 < 2) && (4 < 3);
if (x)
  System.out.print(2);
else
  System.out.print(3);
```

23. What is the output produced by the following code when embedded in a complete program? Please explain.

```java
boolean x;
if (true)
  System.out.print(3);
else
  System.out.print(2);
x = (1 < 2) || (4 < 3);
if (x)
  System.out.print(1);
else
  System.out.print(0);
```

What if you erased the second `else` keyword?

```java
boolean x;
if (true)
  System.out.print(3);
else
  System.out.print(2);
x = (1 < 2) || (4 < 3);
if (x)
  System.out.print(1);

  System.out.print(0);
```

What if you erased them both? Please explain.

24. What is the output produced by the following code when embedded in a complete program? Please explain.

```
boolean x = false;
if (true)
  System.out.print(0);
else
  System.out.print(1);
x = x || !x;
if (x)
  System.out.print(2);
else
  System.out.print(3);
```

25. What is the output produced by the following code when embedded in a complete program? Please explain.

```
if (false && false || true) {
  System.out.print(false);
} else {
  System.out.print(true);
}
```

26. What is the output produced by the following code when embedded in a complete program? Please explain.

```
if (false && (false || true)) {
  System.out.print(false);
} else {
  System.out.print(true);
}
```

27. What does the following Java statement print? Why?

```
System.out.println( 1 > 2 ? "what" : false );
```

28. Assume two integer variables n and m.

Write a boolean expression that reads like this:

  m is greater than n or (m + n) is divisible by 19

29. Assume that x is an integer variable.

Simplify the following boolean expression:

  (x < 5) && (x < 25)

30. Assume that x is an integer variable.

    Simplify the following boolean expression:

    ```
    (x < 5) || (x < 25)
    ```

31. Assume that x is an integer variable.

    Simplify the following boolean expression.

    Explain your simplification.

    ```
    (x > 3) || (x < 5)
    ```

32. Assume that x is an integer variable.

    Simplify the following boolean expression.

    Explain your simplification.

    ```
    (x > 3) && (x < 5)
    ```

33. Consider the following code fragment when embedded in a complete program:

    ```
    if (x > 3) {
      if (x <= 5)
        y = 1;
      else if (x != 6)
        y = 2;
    } else
        y = 3;
    ```

    Assume that x has a value of 6 at the beginning of the fragment.

    What value does the variable y hold after the fragment gets executed? Why?

34. Assume `int j = 3;`.

    What happens when the following expression is executed?

    ```
    j = ++j + j++;
    ```

35. What is wrong with the following `for` loop? Why?

    ```
    for (int i = 0; i < 10; i = i++) {
      System.out.println( "Hi there." );
    }
    ```

36. Write the following as a `for` loop:

```
int count = 0;
count = count + 1;
while (! (count > 0)) {
  System.out.println( count );
  count = count - 1;
}
```

37. What is the output of the following program? Explain.

```
class One {
  public static void main(String[] args) {
    int x = 3, y = 5;
    int b = x++ + y++ - ++y - ++x;

    System.out.println( x + " " + y + " " + b );
  }
}
```

38. What's wrong with the following code? Explain your answer:

```
if (2 < 1) ; {
  System.out.println( "Oops." );
}
```

39. What's wrong with the following code? Explain your answer:

```
int i = 0;
while (i < 10) ; {
  i = i + 1;
}
System.out.println (i);
```

40. Write a loop that computes:

The sum of all even numbers between 2 and 100 (inclusive).

41. Write a loop that computes:

The sum of all odd numbers between a and b (inclusive).

42. Rewrite the following do loop into a while loop. Explain your answer.

```
int n = 1;
double x = 0;
double s;
do {
  s = 1.0 / (n * n);
  x = x + s;
  n++;
} while (s > 0.01);
```

43. What does the following code print? Why?

```
for (int i = 0; i < 3; i++) {
  for (int j = 0; j < 3; j++)
    System.out.print(i * j % 3);
  System.out.println();
}
```

44. Rewrite the following `for` loop into a `while` loop.

```
int s = 0;
for (int i = 1; i <= 10; i++) s = s + 1;
```

45. What is the output produced by the following code when embedded in a complete program? Why?

```
int x = 10, y = 3;
while (x > 0 && y > 0) {
  x = x - y;
}
System.out.print(x);
```

46. What gets printed when you compile and run the following program? Why?
(You could try rewriting the line marked `//` [1] using just the operator – and
the numbers 1, 2, 3, 4 and 5.)

```
public class A {
  public static void main(String[] args) {
    System.out.println(nuf(fun(5, nuf(fun(4, 3), 2)), 1)); // [1]
  }
  public static int fun(int a, int b) {
    return a - b;
  }
  public static int nuf(int b, int a) {
    return a - b;
  }
}
```

47. What is the output produced by the following code when embedded in a
complete program? Why?

```
int x = 10, y = 3;
while (x > 0 && y > 0) {
  x = x - y;
  y = y + 1;
}
System.out.print(x);
```

48. What happens when you try to compile and run this code? Why?

```
class One {
  public static void main(String[] args) {
    { int i = 5, j = 2;
      System.out.println( i + j );
    }
    { String i = "5";
      char j = '2';
      System.out.println( i + j );
    }
  }
}
```