Study questions set #1

*2C stands for “two’s complement.”

1. State the full terms that are abbreviated below and explain what they mean.
   a. CPU
   b. RAM
   c. CVS
   d. IDE

2. Convert the following (unsigned) binary numbers to base 10:
   a. 0b1000_0001
   b. 0b1011_1101
   c. 0b1111_1111

3. Convert the following (unsigned) base 10 numbers to binary.
   a. 99
   b. 199
   c. 999

4. A “nibble” is a 4-bit binary number, just as a “byte” is an 8-bit binary number.
   a. How many possible values can be represented with a nibble?
   b. Suppose we want half of the possible values to represent negative numbers, and the other half non-negative numbers. We’ll use the 4-bit 2C representation. In one column, write each possibility for the nibble, from 0000 to 1111. In the other column, write the associated signed number (in base 10).
   c. 0b1111_0111 is the 8-bit 2C representation of -9. Suppose we cast this to a nibble, by throwing away the 4 leftmost bits and keeping the 4 rightmost. What is the resulting (unsigned) nibble? What signed number does it represent in 4-bit 2C?

5. For each pair of (unsigned) bytes below, perform the binary addition. Ignore any carries beyond the left-most bit. Next, state (in base 10) the associated signed number, using 8-bit 2C, for each addend and sum. Are the results consistent?

\[
\begin{array}{c}
1111\_1110 \\
+0000\_0100 \\
\end{array}
\quad
\begin{array}{c}
1111\_1010 \\
+0000\_0100 \\
\end{array}
\]

6. Which typecasts are required by Java?
   a. int x = (int) 3.3
   b. int x = (int) 3.0
   c. int x = (int) 3L
   d. int x = (int) 0b111
7. State the full console output produced by the following code:

```java
int i = 0;
System.out.println(0b0110 & 0b0101);
System.out.println(8 & 7);
System.out.println(i > 2 | 3*(i = 3) == 9);
System.out.println(i);
System.out.println(++i > 3 || ++i > 4);
System.out.println(i);
if(i > 4) {
    System.out.println("i>4");
} else {
    System.out.println("i<=4");
}
```

8. Write a method max that returns the maximum of three int values. For example, the calls in main should print “2” followed by “3.”

```java
public class Study01 {
    public static void main(String[] args) {
        System.out.println( max(-1, 2, 2) );
        int a = 1;
        int b = 2;
        int c = 3;
        System.out.println( max(c, a, b) );
    }

    public static int max(int a, int b, int c) {
    }
}
```