

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?

$$\begin{array}{r} 1111_1110 \\ + 0000_0100 \\ \hline \end{array}$$

$$\begin{array}{r} 1111_1010 \\ + 0000_0100 \\ \hline \end{array}$$

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:

```
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."

```
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) {

    }

}
```