

# CS 264 Integer Representation Lab

Fall 2020

## 1 Intro

In this activity, you will experiment with integer representation in Java.

## 2 Number Representation

Below is a Java program that displays the decimal number 5 in hex notation. Modify it to print decimal 48,879 in hex.

```
public class Main {  
    public static void main(String[] args) {  
        int y = 5;  
        System.out.println(String.format("%d",y) + " in hex is " + String.format("0x%x", y));  
    }  
}
```

What is the hex representation of  $48,879_{10}$ ?

What is the hex representation of  $-48,879_{10}$  (i.e.  $2's(102)$ )?

## 3 Multiplying and Dividing

Here we're going to use bit shifts to multiply and divide numbers. The bit shift operator in Java is  $\gg$  and  $\ll$  (for right and left shift respectively). Modify the program from the previous section to calculate  $48,879_{10}/16$  using both bit shifts and the divide operator.

What is the hex representation of  $48,879/16$ ?

What is the decimal representation of  $48,879/16$ ?

What is the hex representation of  $-48,879/16$ ?

What is the decimal representation of  $-48,879/16$ ?

Do you get a different result when you use the divide operator vs bit shift operator?

Does the divide operator round toward zero, negative infinity, or positive infinity?

Does the bit shift operator round toward zero, negative infinity, or positive infinity?

## 4 Signed and Unsigned Compares

Below is a Java program that sets an `int` to a sequence of all 1's and then uses (1) a signed compare to check if it is larger or smaller than  $+5_{10}$  and (2) an unsigned compare to check if it's larger or smaller than  $+5_{10}$ . Type this program in and see what results you get. WTF?

```
public class Main {
    public static void main(String[] args) {
        int y = -1;

        // Signed Compare
        if(y < 5) {
            System.out.println("(signed compare) y is less than 5");
        } else if (y > 5) {
            System.out.println("(signed compare) y is greater than 5");
        } else {
            System.out.println("(signed compare) y is equal to 5");
        }

        // Unsigned compare
        if(Long.compareUnsigned(y,5) < 0) {
            System.out.println("(unsigned compare) y is less than 5");
        } else if(Long.compareUnsigned(y,5) > 0){
            System.out.println("(unsigned compare) y is greater than 5");
        } else {
            System.out.println("(unsigned compare) y is equal to 5");
        }
    }
}
```