ICS Homework Week 6

October 15, 2019

1 Two's-Complement Encodings

Assume we have an integer type of **8 bits**.

1.1

Fill in the table below.

Value	2's Complement
-1	
-37	
	1010 1101
	0101 0101

1.2

Please write the **numaric range** for the integer type with unsigned encoding(UMIN,UMAX) and 2's complement encoding(TMIN,TMAX) respectively.

2 Type Casting

2.1

Assume we are using **64-bit machine**. Consider the following program.

```
1 char a = -9;
2 unsigned char b = a;
3 unsigned short c = a;
4 int d = a;
5 short e = 0xa251;
6 unsigned char f = e;
```

Write the value of variables below in decimal.

Variable	Value
a	-9
b	
c	
d	
e	
f	

2.2

Assume int value is encoded using **16 bits**. Please fill in the following table with "<","=" or ">". U means the constant is unsigned.

Constant A	Constant B	A ? B
-2U	-1U	
-1	1	
-1	100U	
-1	65535U	
-32767	32768U	

3 Arithmetic Operations

3.1

Implement 2 functions with the following prototype. The function should determine whether arguments can be added without overflow. If arguments x and y can be added without casting overflow, return 1. Otherwise return 0.

```
1 int uadd_ok(unsigned x, unsigned y);
2 int tadd_ok(int x, int y);
```

3.2

Assume x and y are both 4 bit signed integers. Fill the following table. Truncate all the results to 4 bits with 2's complement and write their value in decimal.

	$x+y$	$x-y$	$x*y$	$-y$
$x=\ \ 4, y=7$				
$x=-6, y=-8$				
$x=\ \ 5, y=-1$				
$x=-3, y=6$				