CMSC 313 Spring 2024
Homework 1
due Monday, February 12, 11:59pm

For every exercise, show your work. Not showing complete work will result in penalties. For exercises that require you to change a base within the problem, you must show your work for the conversion, regardless of how short the number is, unless specified. If you have an opportunity to use the conversion shortcut taught in class/on the slides, you can use it. For exercises that require you to change a base within the problem, you must identify the base in your final solution. "0x" counts as base identification for hexadecimal. Box your final answer.

Exercise 1. Convert 101001000.1010101_2 to decimal (base 10).

Exercise 2. Convert 2540_{10} to binary (base 2).

Exercise 3. Convert 42069_{16} to octal (base 8).

Exercise 4. Convert `0xDEADBEEF` to binary (base 2)

Exercise 5. Convert $11001010111111101011000010111010_2$ to hexadecimal (base 16).

Exercise 6. Convert 1022.36_{10} to base 6. Use bar notation to describe repeating fractional components if needed.

Exercise 7. Compute the following using 2's complement with 8 bits. Leave your answer in 2's complement form. You may need to first convert to binary. If the result needs more than 8 bits to compute, write "`OVERFLOW`". If a computation will overflow, show either a) why the sum is out of bounds (using > or < sign) or b) that the Positive+Positive=Negative or Negative+Negative=Positive rule holds.

a) $00010110_2 + 00010011_2$

b) $-01111000_2 - 00101000_2$

c) `0x43` $-$ `0x22`

d) $-$`0x5A` $-$ `0x17`

Exercise 8. Represent 876.35_{10} in the 32-bit IEEE 754 floating-point standard. You need to show your work converting the integer-part (characteristic) and the fractional part (mantissa) of the number to binary. The number may be truncated to fit in the 32-bit IEEE 754 floating-point standard.