

# CMSC 313 Spring 2024

## Quiz 1

Full Name \_\_\_\_\_ Student ID \_\_\_\_\_

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.** (10 pts) Convert  $1010.101_2$  to decimal (base 10).

$$\begin{aligned} &= 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 + 1 \times 2^{-1} + 0 \times 2^{-2} + 1 \times 2^{-3} \\ &= 8 + 2 + 0.5 + 0.125 \end{aligned}$$

$10.625_{10}$

**Rubric:**

- (-2 pts) 5/8 fraction instead of decimal
- (-3 pts) no base or wrong base subscript
- (-5 pts) whole number (left of decimal) incorrect
- (-5 pts) fractional number (right of decimal) incorrect

**Exercise 2.** (10 pts) Convert  $189.4_{10}$  to binary (base 2).

$$189/2 = 94 \text{ R } 1 \text{ (LSB)}$$

$$94/2 = 47 \text{ R } 0$$

$$47/2 = 23 \text{ R } 1$$

$$23/2 = 11 \text{ R } 1$$

$$11/2 = 5 \text{ R } 1$$

$$5/2 = 2 \text{ R } 1$$

$$2/2 = 1 \text{ R } 0$$

$$1/2 = 0 \text{ R } 1 \text{ (MSB)}$$

$$0.4 \times 2 = 0.8 \mid 0 \text{ (MSB)}$$

$$0.8 \times 2 = 1.6 \mid 1 \text{ (MSB)}$$

$$0.6 \times 2 = 1.2 \mid 1 \text{ (MSB)}$$

$$0.2 \times 2 = 0.4 \mid 0 \text{ (MSB)}$$

$10111101.\overline{0110}_2$

**Rubric:**

- (-2 pts) fractional part correct, but bar over wrong part

- (-3 pts) no base or wrong base subscript
- (-5 pts) whole number (left of decimal) incorrect
- (-5 pts) fractional number (right of decimal) incorrect

**Exercise 3.** (10 pts) Convert  $10001011101011011111000000001101_2$  to hexadecimal (base 16).

0x8BADFOOD

**Rubric:**

- (-3 pts) missing base (0x or \_16) or wrong base subscript
- (-1 pts) each wrong digit
- (-10 pts) if all digits wrong

**Exercise 4.** Compute the following using 2's complement with 8 bits. Leave your answer in 2's complement form. You may need to convert to 2s complement. 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) (5pts)  $00110100_2 + 01010110_2$

OVERFLOW

**Rubric:**

- (-5 pts) does not say overflow
- (full pts) says overflow anywhere
- no partial credit

b) (5pts)  $00110100_2 - 01010110_2$

11011110<sub>2</sub>

**Rubric:**

- (full pts) no need for base
- no partial credit