

CS4410 Homework 1

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==== Questions ====

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Due Saturday, January 27th, 11:59pm (but check CMSX always)

Question	#Points	Percentage
1. Tell Us About Yourself	6	11.1%
2. Practice Your Arithmetic	32	59.3%
3. Multiple Choice	16	29.6%
Total	54	100.0%

Question 1: Tell Us About Yourself (6 points)

- (1.1) What is your NetID?
- (1.2) What are your preferred pronouns?
- (1.3) Tell us a bit more about yourself in a few lines?

Question 2: Practice Your Arithmetic (32 points)

Answer the following questions. This homework will not count for much, so answer the questions by yourself for practice. Try to do them without a calculator—you won't have access to one at an exam.

Question 2.1: first exercise (16 points)

- (2.1.1) What is $2^0 \times 2^3$? Only provide the exponent.
- (2.1.2) What is the binary number 00011001000011 in hexadecimal?
- (2.1.3) What is 2^{26} in hexadecimal?
- (2.1.4) What is $2^{30} - 1$ in hexadecimal?
- (2.1.5) If a computer has 39 address lines, what is the maximal byte address in hexadecimal?
- (2.1.6) If the stack pointer is 0xFFFF59200 and the computer pushes 4 4-byte words onto the stack (which is growing down), what is the resulting stack pointer in hexadecimal?
- (2.1.7) How many 2048-byte blocks are there on a 1TB disk in 2^x notation? (Provide only the exponent.)
- (2.1.8) What is 10001001 XOR 11010010 in binary?

Question 2.2: another exercise (16 points)

- (2.2.1) What is $2^6 \times 2^4$? Only provide the exponent.
- (2.2.2) What is the binary number 11100011101000 in hexadecimal?
- (2.2.3) What is 2^{25} in hexadecimal?
- (2.2.4) What is $2^{20} - 1$ in hexadecimal?
- (2.2.5) If a computer has 38 address lines, what is the maximal byte address in hexadecimal?
- (2.2.6) If the stack pointer is 0xFFFB5C90 and the computer pushes 3 4-byte words onto the stack (which is growing down), what is the resulting stack pointer in hexadecimal?
- (2.2.7) How many 1024-byte blocks are there on a 16TB disk in 2^x notation? (Provide only the exponent.)
- (2.2.8) What is 11111010 XOR 01101101 in binary?

Question 3: Multiple Choice (16 points)

Review the material in <https://www.cs.cornell.edu/courses/cs4410/2024sp/resources/background.pdf>. Then answer the following questions. For each question, check *one* of the boxes. These are randomized—do not be concerned if you see unlikely patterns.

(3.1) Which of the following statements is *correct*?

Divide-by-zero is an example of an asynchronous, maskable signal.

On an x86 processor, when you push a value onto the stack, the stack pointer is decremented.

For efficiency, different cores of the same CPU can access each other's registers.

(3.2) Which of the following statements is *correct*?

Using a computer's LOAD and STORE machine instructions, it is possible to directly read and write words on a disk in much the same way as words in RAM.

“Direct Memory Access” (DMA) means that devices can directly access the RAM of a computer.

A disk controller is a program that controls access to a disk.

(3.3) Which of the following statements is *wrong*?

Each register of a CPU has its own memory address.

The “stack” of a computer is important for keeping track of the control flow of a computer program.

The “heap” of a computer is where data objects are allocated dynamically.

(3.4) Which of the following statements is *wrong*?

In 2's complement encoding of an 8-bit integer, -128 is the minimum value.

ASCII encoding uses 16 bits per character.

There are 4 bits in a hexadecimal digit.