CSE1100 – Introduction to Computer Engineering
Homework 1 (Due 12/10/2018 16:00)

1. When you say the following sentences, is it an abstraction or not? If yes, can you deconstruct it? (i.e., break it down into a few of its component parts). If no, explain why it cannot be deconstructed.

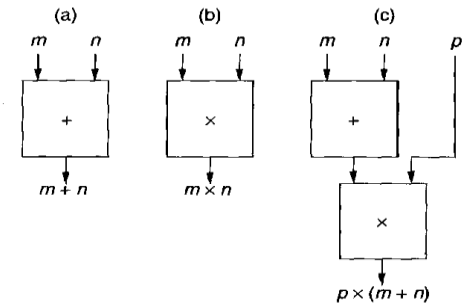
a. "I had my breakfast"

b. "I wrote the letter 'A' to a piece of paper"

Why is the abstraction useful for you?

2. Say we had a "black box", which takes two numbers as input and outputs their sum (Figure (a)). Say we had another box capable of multiplying two numbers together (Figure (b)). Assume we have an unlimited number of these boxes. We can connect these boxes together to calculate p*(m+n) as in Figure (c).

Show how to connect them together to calculate the following. Try to use <u>minimum number of boxes.</u>



"Black boxes" capable of (a) addition, (b) multiplication, and (c) a combination of addition and multiplication

a. $2a+b$

b. $a^2 - 2ab + b^2$

c. a^4

3. Assume you will use 1 byte (8-bits) to represent integer numbers. Fill in the table below with the binary representations of -121 and 121 in the given format:

	Unsigned	2's complement
-121		
121		

4. Convert the following decimal numbers into 11-bit 2's complement binary numbers.

a. 245

b. -382

5. What is the minimum number of bits needed to represent the given decimal numbers in 2's complement binary form?

a. 1247

b. -185

6. Convert the following 2's complement binary numbers into decimal and hexadecimal.

a. 010000111
Decimal: **Hexadecimal:**

b. 1100010
Decimal: **Hexadecimal:**

7. Compute the following operations. Assume each operand is a 2's complement binary number. Which operation(s) generate an overflow? Why?

a. 01011 + 01101

b. 1010 – 0110

c. 1111 + 1100

8. Convert the following IEEE floating point representations to their decimal equivalent:

a. 0 10000011 01010000000000000000000

b. 1 01111010 01000000000000000000000

9. Convert the following decimal number into its IEEE floating point representation:
-16.53125

10. Convert the following hexadecimal representations of 2's complement binary numbers to decimal numbers.

a. x82C

b. x6A

11. Compute the following. Write your results in binary.

a. 11010101 **OR** 11000111

b. 10111 **AND** 01101

c. **NOT** (**NOT** (001) **OR** (100))

12. Using 8-bit ASCII, represent the following string in hexadecimal and binary

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