Homework #1

Number Systems and Binary Arithmetic (25 points)

Due date: Monday, March 13, 2023, in Gradescope at 9:00 AM.
Instructions: When possible, please put your answers in the boxes for Gradescope.

1) For the following table, fill in the missing representations (whether decimal, binary, octal, or hexadecimal). Show all work for full credit and do not use a calculator. **(6 points)**

Decimal	Binary	Octal	Hexadecimal
42_{10}			
	1011 0101		
		73_8	
			$3D_{16}$

2) How many unique values can be represented with 7 bits? **(1 point)**

3) How many bits are needed to represent the decimal value 737 using unsigned binary representation? **(1 point)**

4) What is the binary representation of 67.875? **(1 point)**

5) What is the decimal value of the binary number 1011.101? **(1 point)**

6) For the following table, fill in the missing representations (decimal or 2's complement). Show all work for full credit and do not use a calculator. **(2 points)**

Decimal	2's Complement
37_{10}	
	$110\ 0111_2$
-61_{10}	
	$011\ 1001_2$

7) Perform the following **unsigned** binary additions to produce an 8-bit result and indicate if there is a carry-out (C_N). Lastly, indicate if there is overflow. Show all work for full credit. **(4 points)**

	8-bit Binary Sum	Carry-Out?	Overflow?
0110 1011 + 1010 1101			
1010 1111 + 0011 1001			

8) Perform the following **2's complement** additions or subtractions to produce an 8-bit result and indicate if there is a carry-out (C_N). Lastly, indicate if there is overflow. Show all work for full credit. **(8 points)**

	8-bit Value	Carry-Out (C_N)?	Carry-in (C_{N-1})?	2's Compl. Overflow?
1101 0011 + 1110 1001				
0101 0010 + 0111 0111				
0110 1001 - 1101 0011				
0101 1010 - 0010 0011				

9) Although computers use a binary number system, humans (traditionally) use a decimal number system. Why? Give at least one reason. **(1 point)**