

M.Sc. CS / AI & CS – Term 1
Computer Systems
Additional Exercises # 1 – Numbers [Solutions]

Question #1: Complete the following table, doing the necessary conversions.

Decimal	Binary	Octal	Hexadecimal
175	1010 1111	257	AF
204	11001100	314	CC
503	1 1111 0111	767	1F7
3995	1111 1001 1011	7633	F9B

Question #2: Compute the 2's complement (in 8 bits) for the following decimal numbers:

Decimal	Binary	1's Complement	2's Complement
27	0001 1011	1110 0100	1110 0101
80	0101 0000	1010 1111	1011 0000
123	0111 1011	1000 0100	1000 0101
128	1000 0000	0111 1111	1000 0000

Question #3: Evaluate the expression $Z = A + B - C$ in binary, where the values of A, B & C are given in the table below:

Z	A	B	C
1 0010 1010	0001 1001	0010 0011	0001 0010
1 0001 1000	0100 0001	0011 1111	0110 1000



Question #4: Convert the following decimal numbers to equivalent Fixed point notation or vice versa, using 1 sign bit, 9 bits for the real part and 6 bits for the fractional part?

Decimal Number	Fixed Point Representation (16 bits)		
141.8125	0	0 1000 1101	11 0100
-412.21875	<p>Firstly, we find the value in binary (assuming it's +ve): 412.21875 => 0 110011100.001110</p> <p>Now, we take 2's complement of it: 0 110011100.001110 => 1 001100011.110001 + 1</p> <p>which gives us the following representation:</p>		
	1	0 0110 0011	11 0010
-465.09375	<p>Firstly, we find the value in binary (assuming it's +ve): 465.09375 => 0 111010001.000110</p> <p>Now, we take 2's complement of it: 0 111010001.000110 => 1 000101110.111001 + 1</p> <p>which gives us the following representation:</p>		
	1	0 0010 1110	11 1010