

Note: Here signed binary, octal, or hex values implies usage of 2's complement encoding.

1. Complete this sum bit table and carry table for binary addition process. The number to put in the cell is the sum (a+b) of the row (a bit values) and column (b bit values) bit shown, and for the Carry Bit table, the carry generated by the addition of the two bits. These two are the half-adder logic tables.

Sum Bit		
+	0	1
0	0	1
1	1	0

Carry Bit		
+	0	1
0	0	0
1	0	1

2. A full adder is an extension of the half adder in that it adds three bits and produces a sum bit and a carry bit. Its table is a little more complicated than that of #1. Complete the following table by showing the resulting sum bit and carry out bit produced by adding the bits a+b+ci shown in each row.

Full Adder Logic Table				
a	b	ci	s	co
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

3. Complete this table by performing the indicated operation on each of the pairs of 5-bit signed binary values. Record the 5-bit sum converted to a signed decimal and the resulting state of the overflow flag (OF) where OF=1 indicates overflow occurred, otherwise OF=0. Also indicate the decimal value range when using 5-bits. For example: 01010+10001=11011 (-5) OF=0

5-Bit 2's Complement Addition										Range: [-16] to [15]	
Binary Addend A					Binary Addend B					Sum S=A+B (decimal)	OF
0	1	1	0	1	0	1	0	0	1	10110 (-10)	1
0	0	1	1	1	0	1	1	1	0	10101 (-11)	1
1	0	0	1	1	1	1	1	0	0	01111 (15)	1
1	0	0	0	0	0	1	1	1	1	11111 (-1)	0
0	1	0	0	1	1	1	0	0	0	00001 (1)	1

4. The decimal value d of a signed N-bit binary value ($b_{N-1}...b_1b_0$) is often found by using the following formula:

$$d = 2^N(-1)^{b_{N-1}} + \sum_{i=0}^{i=N-1} 2^i b_i$$

Use this formula to find d for the 8-bit signed binary value (10110111): d= ____ -73 ____