

# Addition and Multiplication

1st	2nd	and	or
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	1

## Complement

1's Complement of -8: 1111 0111

2's Complement of -8: 1111 1000

1's Complement of 8: 0000 0111

2's Complement of 8: 0000 1000

1's Complement of -36: 1101 1011

2's Complement of -36: 1101 1100

1's Complement of 36: 0010 0111

2's Complement of 36: 0010 0100

Maximum negative and minimum positive remain unchanged

sign bit extension	
↓	↑
011	3
010	2
001	1
000	0
111	-1
110	-2
101	-3
100	-4

→ the most significant bits to the next bit of least significant bit set reversed turns out the negative of its value

$$\begin{array}{r} 0100 + 0100 = 1000 \\ \uparrow \quad \uparrow \quad \uparrow \\ 1000 + 1000 = 0000 \end{array} \quad \text{overflow}$$

$$5 \rightarrow 0101 \quad 7 \rightarrow 0111 \quad 1111 \times 1111 = 1110001$$

$$\begin{array}{r} \times \quad 1011 \\ 1111011 \\ 1111011 \\ 1111011 \\ 1101101 \end{array}$$

$$0101 \times 0011 = 1001101 \leftarrow \text{the lower offset bits from source are not affected by sign bit extension}$$

$$\begin{array}{r} \times \quad 0101 \\ 00000101 \\ 00000000 \\ 00000000 \\ 1101101 \end{array}$$

$$0010 \times 0100 = 101101 \leftarrow \text{no matter the leftmost bit in the lower offset bits from source is treated as either a sign or digit bit, processor constraining the same binary interpretation}$$