

SC1005 Digital Logic Tutorial 3

Digital arithmetic

1. Perform the following unsigned binary addition and subtraction.

a.
$$\begin{array}{r} 1100110 \\ + 1111001 \\ \hline \end{array}$$

b.
$$\begin{array}{r} 11100011 \\ - 1011101 \\ \hline \end{array}$$

2. Perform the following two's complement additions. Clearly indicate whether or not an overflow occurs.

a.
$$\begin{array}{r} 11010100 \\ + 11101011 \\ \hline \end{array}$$

c.
$$\begin{array}{r} 01011101 \\ + 00110001 \\ \hline \end{array}$$

b.
$$\begin{array}{r} 10111111 \\ + 11011111 \\ \hline \end{array}$$

d.
$$\begin{array}{r} 01100001 \\ + 00011111 \\ \hline \end{array}$$

3. Perform the following two's complement subtractions. Clearly indicate whether or not an overflow occurs. Check by converting to decimal values.

a.
$$\begin{array}{r} 00110110 \\ - 01000101 \\ \hline \end{array}$$

c.
$$\begin{array}{r} 11010111 \\ - 11101100 \\ \hline \end{array}$$

b.
$$\begin{array}{r} 01110101 \\ - 11010110 \\ \hline \end{array}$$

d.
$$\begin{array}{r} 10000011 \\ - 10001111 \\ \hline \end{array}$$

4. Perform the following unsigned binary multiplications. Verify with decimal values.

a.
$$\begin{array}{r} 110101 \\ \times 1110 \\ \hline \end{array}$$

b.
$$\begin{array}{r} 010110 \\ \times 1101 \\ \hline \end{array}$$

5. Perform the following signed 2's complement binary multiplications. Verify with decimal values.

a.
$$\begin{array}{r} 110101 \\ \times 1110 \\ \hline \end{array}$$

b.
$$\begin{array}{r} 010110 \\ \times 1101 \\ \hline \end{array}$$

Answers

1.

- a. 11011111
- b. 10000110

2.

- a. 10111111 (no overflow)
- b. 10011110 (no overflow)
- c. 10001110 (overflow)
- d. 10000000 (overflow)

3.

- a. 11110001 (no overflow)
- b. 10011111 (overflow)
- c. 11101011 (no overflow)
- d. 11110100 (no overflow)

4.

- a. 1011100110
- b. 100011110

5.

- a. 000010110
- b. 110111110