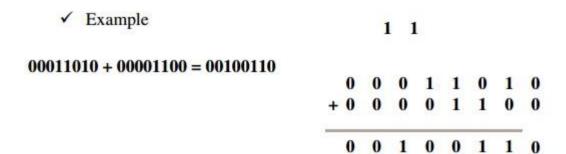
#### 1.2 BOOLEAN ARITHMETIC

### **Binary Addition**

Rules of Binary Addition

- ✓ Binary Addition
- ✓ Rules of Binary Addition
- 0 + 0 = 0
- 0+1=1
- 1 + 0 = 1
- 1 + 1 = 0, and carry 1 to the next more significant bit



Note: The rules of binary addition (without carries) are the same as the truths of the XOR gate.

## **Binary Subtraction**

Rules of Binary Subtraction

$$0 - 0 = 0$$

0 - 1 = 1, and borrow 1 from the next more significant bit

$$1 - 0 = 1$$

$$1 - 1 = 0$$

### **Example**

00100101 - 00010001 = 00010100

### **Binary Multiplication**

# **Rules of Binary Multiplication**

$$0 \times 0 = 0$$

$$0 \times 1 = 0$$

$$1 \times 0 = 0$$

 $1 \times 1 = 1$ , and no carry or borrow bits

### **Example**

00101001	×	00000110 = 11110110	×	0	0	1 0	0	1 0	0	0 1	1 0
			0	0	0	0	0	0	0	0	0
			0	1	0	1	0	0	1	1	
			0	1	1	1	1	0	1	1	0

Note: The rules of binary multiplication are the same as the truths of the AND gate.

# **Binary Division**

Binary division is the repeated process of subtraction, just as in decimal division.

Example 1:  $00101010 \div 00000110 = 00000111$ 

Example 2: 10000111 ÷ 00000101 = 00011011 1.3 1.4 1.5