Exp. No. 1: Half and Full Adder

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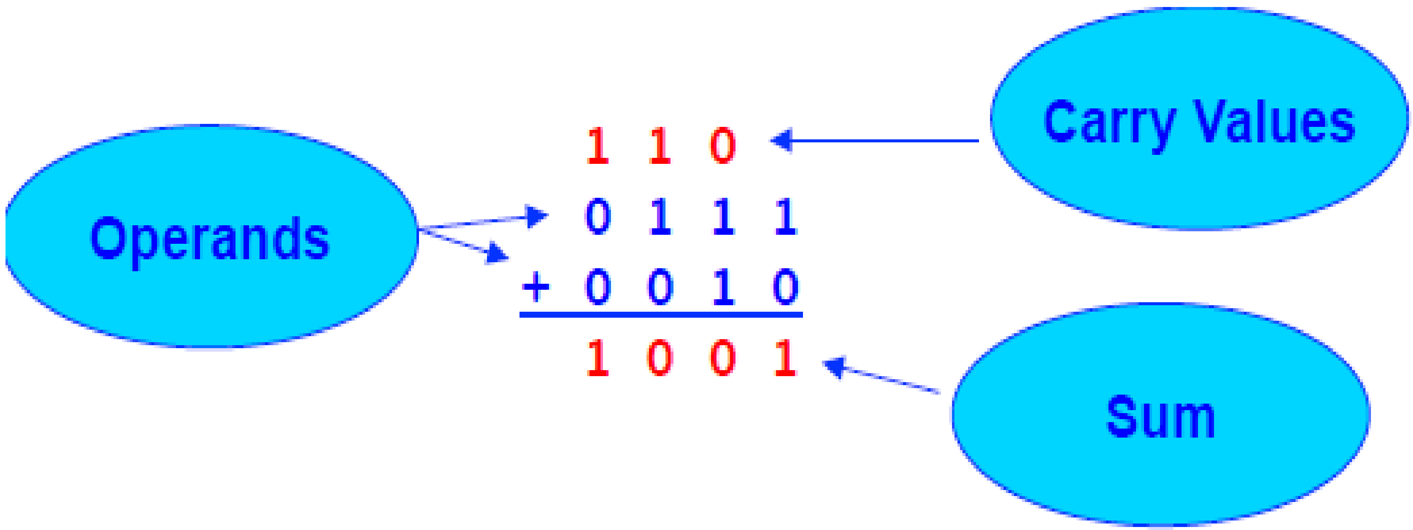
Binary addition

- 0 + 0 is a sum of 0 with a carry of 0
- 1 + 0 is a sum of 1 with a carry of 0
- 0 + 1 is a sum of 1 with a carry of 0
- 1 + 1 is a sum of 0 with a carry of 1



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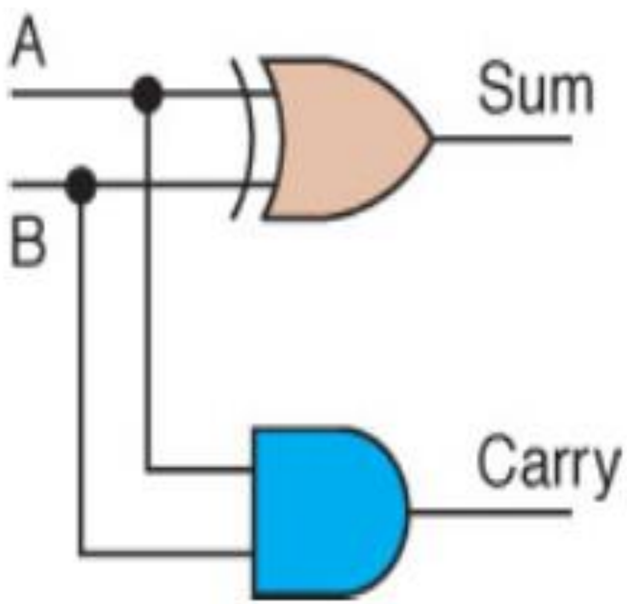
Half adder Circuit

Is a combinational circuit that adds two bits



Sum = A XOR B
Carry = A AND B

A	B	Sum	Carry
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

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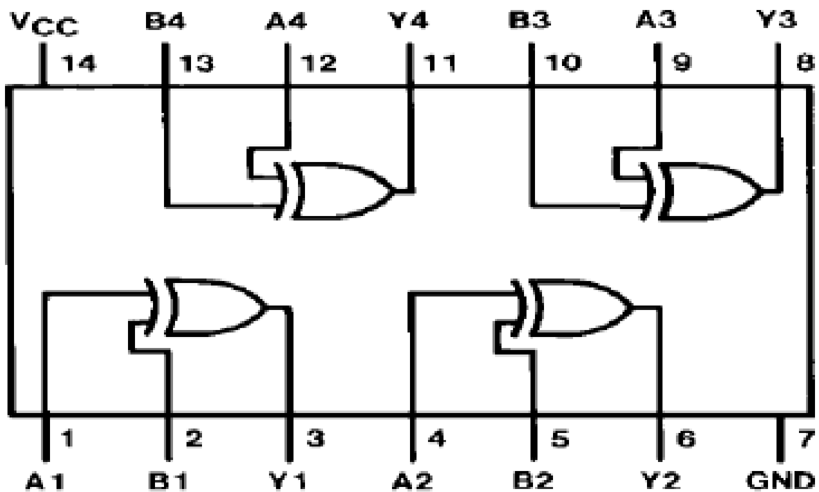
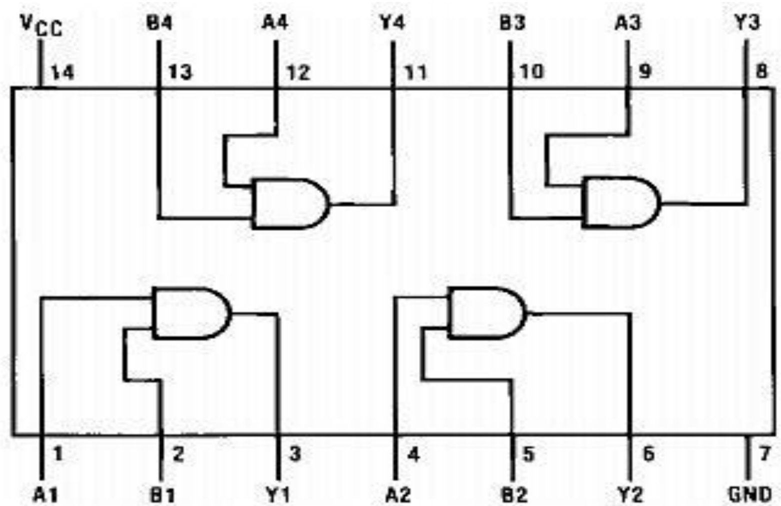


Pin diagram of 7486 XOR



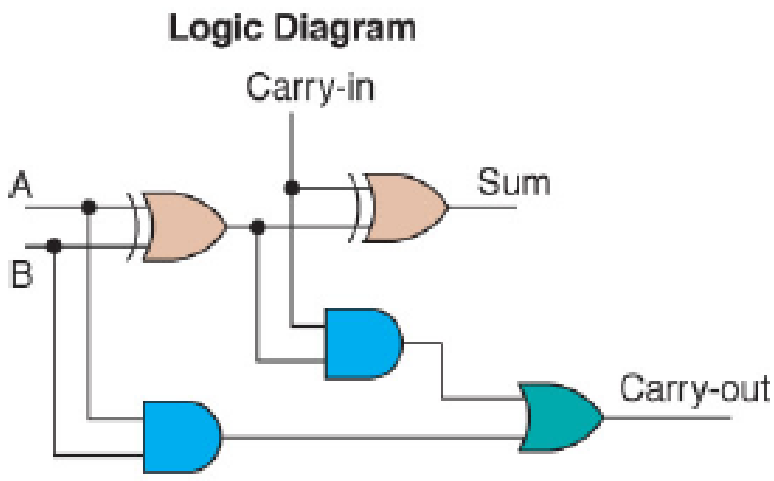
Pin diagram of 7408
Quad 2-input AND gates

Full adder circuit

- Is a combinational circuit that adds three bits (A, B, Carry-in (Ci))

The full adder takes 3 inputs:

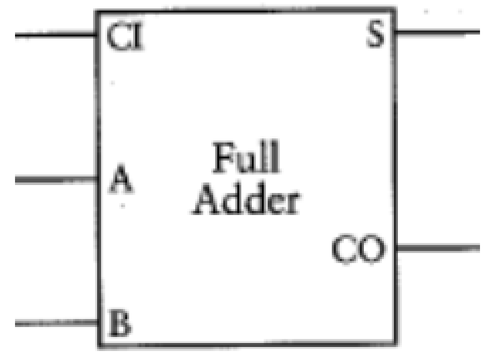
- A, B, and a carry-in value

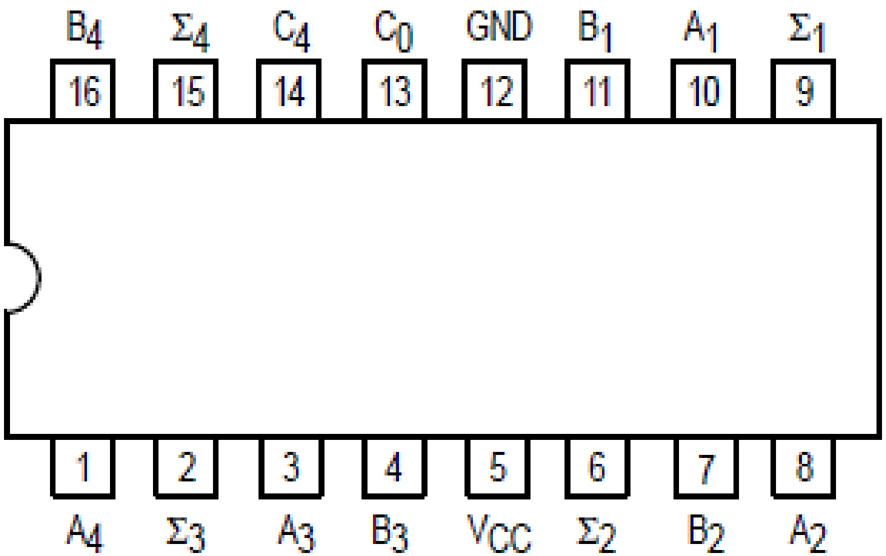


Truth Table

A	B	Carry-in	Sum	Carry-out
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

- inputs are A, B, and CI.
- outputs are S and CO





Pin diagram of 7483 4-bit Full adder

$A_1 - A_4$	Operand A Inputs
$B_1 - B_4$	Operand B Inputs
C_0	Carry Input
$\Sigma_1 - \Sigma_4$	Sum Outputs
C_4	Carry Output

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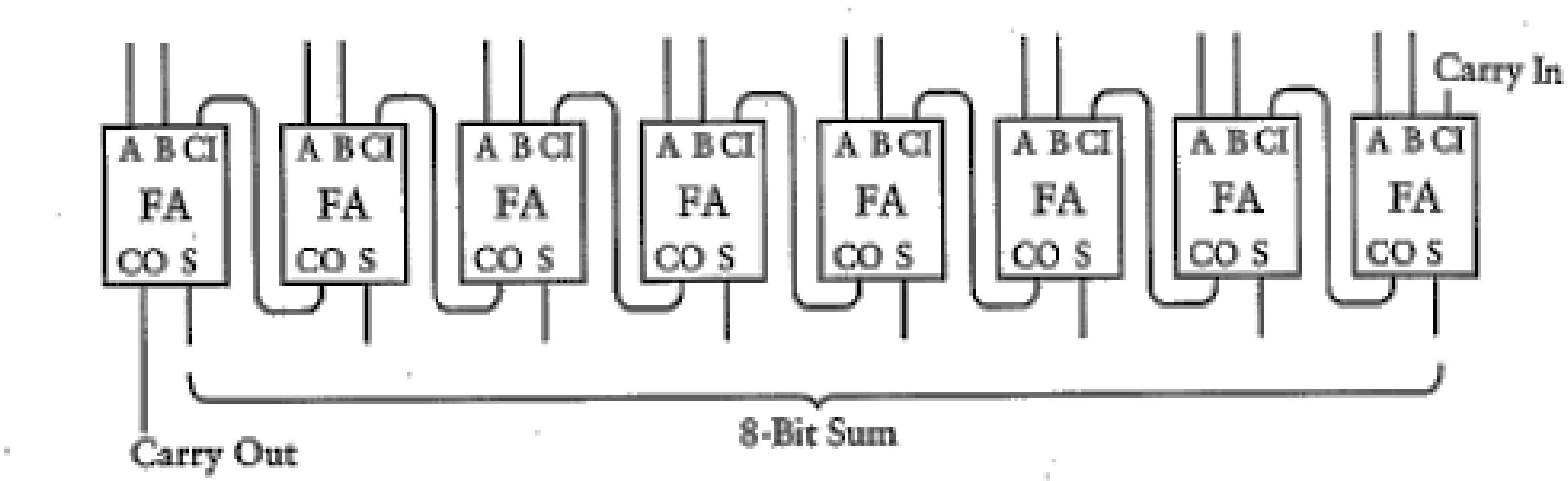
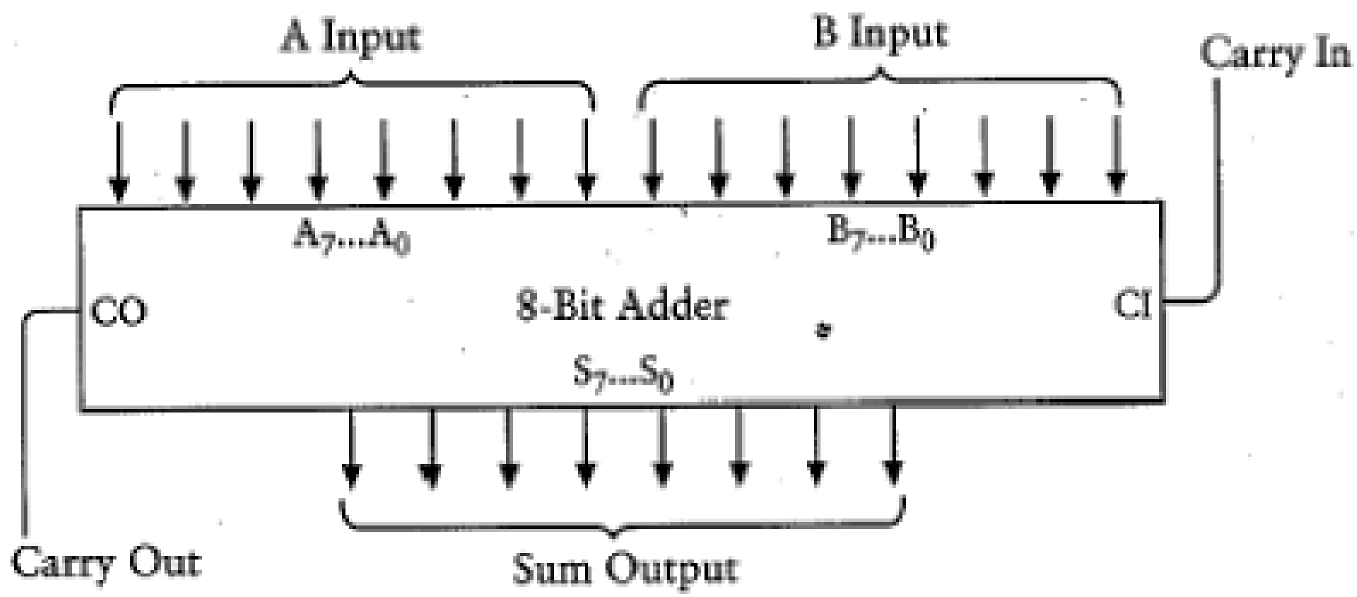
- Example: Add two 8-bit binary numbers
- Solution: we need an 8-bit adder



Notice how the carry out from one bit's adder becomes the carry-in to the next adder


A Input
B Input
Carry In
A7...A0
B7...B0
CO
8-Bit Adder
CI
S7...S0
Carry Out
Sum Output