The computer performs many arithmetic and logic operations. We will show one of them to illustrate some of the computation possible in the computer. We begin the design of an adder circuit with a simple subcircuit called a binary full adder, as shown in Figure 4.10. There are two binary data inputs *A*, *B*, and a carry input, C_{in}. There is one data output, S_{out}, and one carry output, C_{out}. As shown in Table 4.5, C_{in}, *A*, and *B* are three independent binary inputs each of which could be 0 or 1. These three inputs are added together (the sum could be 0, 1, 2, or 3), and the result is encoded in the two-bit binary result with C_{out} as the most significant bit and S_{out} as the least significant bit. C_{out} is true if the sum is 2 or 3, and S_{out} is true if the sum is 1 or 3.

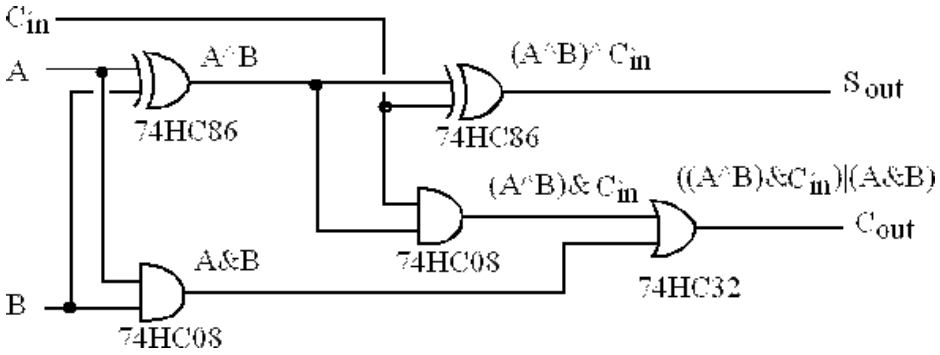

Figure 4.10. A binary full adder.

A	*B*	C_{in}	$A+B+C_{in}$	C_{out}	S_{out}
0	0	0	0	0	0
0	0	1	1	0	1
0	1	0	1	0	1
0	1	1	2	1	0
1	0	0	1	0	1
1	0	1	2	1	0
1	1	0	2	1	0

1	1	1	3	1	1

Table 4.5. Input/output response of a binary full adder.