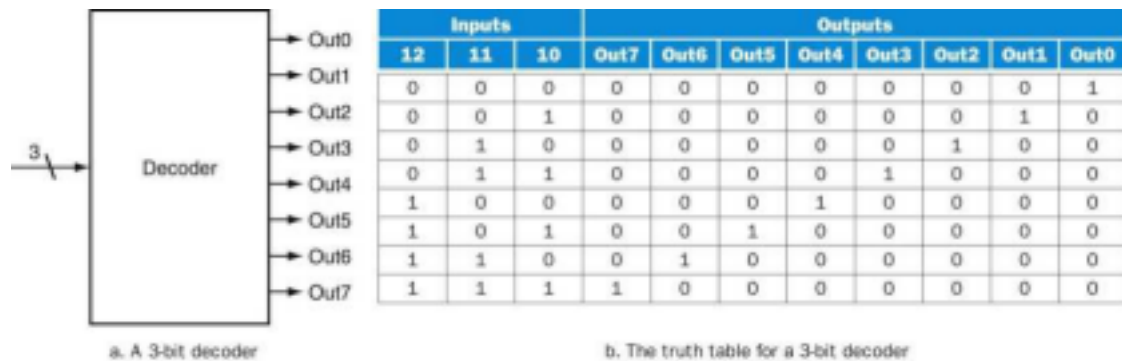# decoder

A logic block that has an *n*-bit input and 2*n* outputs, where only one output is asserted for each input combination.

Inputs			Outputs							
12	11	10	Out7	Out6	Out5	Out4	Out3	Out2	Out1	Out0
0	0	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	1	0
0	1	0	0	0	0	0	0	1	0	0
0	1	1	0	0	0	0	1	0	0	0
1	0	0	0	0	0	1	0	0	0	0
1	0	1	0	0	1	0	0	0	0	0
1	1	0	0	1	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0

a. A 3-bit decoder

b. The truth table for a 3-bit decoder

FIGURE A.3.1 A 3-bit decoder has three inputs, called 12, 11, and 10, and $2^3 = 8$ outputs, called Out0 to Out7.
Only the output corresponding to the binary value of the input is true, as shown in the truth table. The label 3 on the input to the decoder says that the input signal is 3 bits wide.