

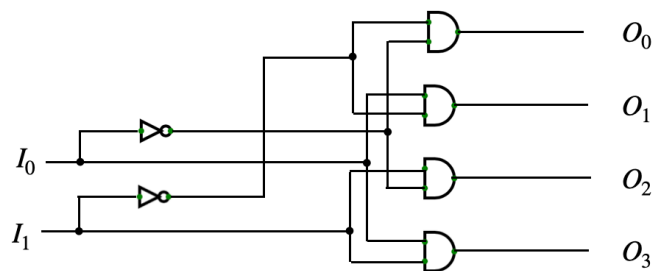
Circuits (III)

Useful Combinational Circuits

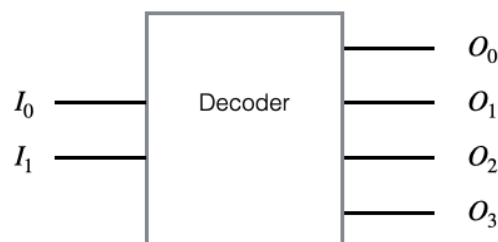
- Let's take a look at another truth table and see how to design a circuit based on it.
- The truth table is

I_1	I_0	O_0	O_1	O_2	O_3
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

- In this truth table, I_0 and I_1 are inputs, and O_0 to O_3 are outputs.
- When drawing the circuit, the circuit has four outputs and two inputs.



- We can tell from the truth table that the **each combination of the inputs activates a different output** and the **remaining output signals are low**. Therefore, which output is high identifies the binary code represented at the inputs. So, it's kind of decoding the binary inputs.
- This type of circuit is used so often, so we name it **Decoder**.
- A decoder **Converts binary information from N inputs to 2^N outputs**.
- So the above is a 2:4 decoder, with 2 inputs and 4 outputs. We can also have 1:2 decoder and 3:8 decoder.
- If we use a graphical symbol to represent the above 2:4 decoder, it looks like



- Example:

- Use decoder to control the traffic lights based on the following table.

Input Value	Light
0-1	Red
2	Amber
3	Green

