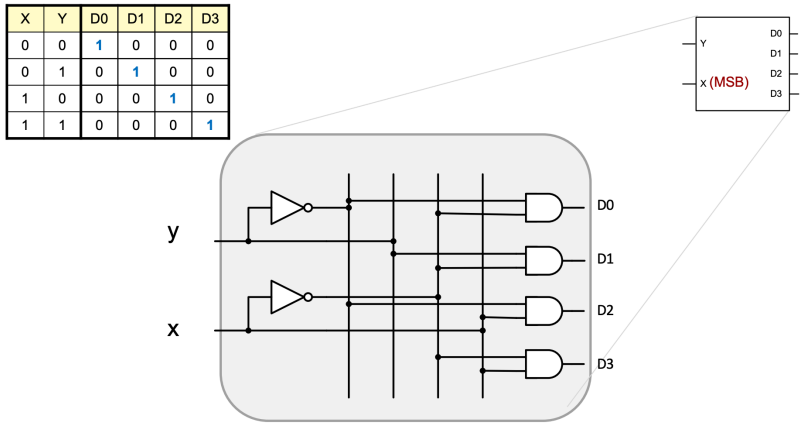
Terminology for K-maps
- Implicant: A product term (grouping of 1's) that covers a subset of cases where F=1
  – the product term is said to "imply" F because if the product term evaluates to '1' then F='1'
- Prime Implicant: The largest grouping of 1's (smallest product term) that can be made
- Essential Prime Implicant: A prime implicant (product term) that is needed to cover all the 1's of F

Common Logic Structures
- Decoder
- Multiplexer
- Adder
- Register

Decoder
- Takes in an n-bit binary number as input
- Decodes that binary number and activates the corresponding output
- Individual outputs for ALL 2^n input combinations

- Complete the design of a 2-to-4 decoder

X	Y	D0	D1	D2	D3
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1



Enables
- In a normal decoder exactly one output is active at all times
- It may be undesirable to always have an active output
- We can add an extra input (called an enable) that can independently force all the outputs to their inactive values

General Tree Decoder Approach
- Step 1: Outputs of one stage should connect to the enables of the next stage
- Step 2: All decoders in a stage (level) should decode the same bit(s)
  – Usually, the MSB is connected to the first stage and LSB to the last stage

Multiplexer
- Multiplexers are one of the most common digital circuits
- Anatomy: n data inputs, log2n select bits, 1 output
- A multiplexer ("mux" for short) selects one data input and passes it to the output

Exercise: Build a 4-to-1 mux

- Complete the 4-to-1 mux to the right by drawing wires between the 2-to-4 decode and the AND gates