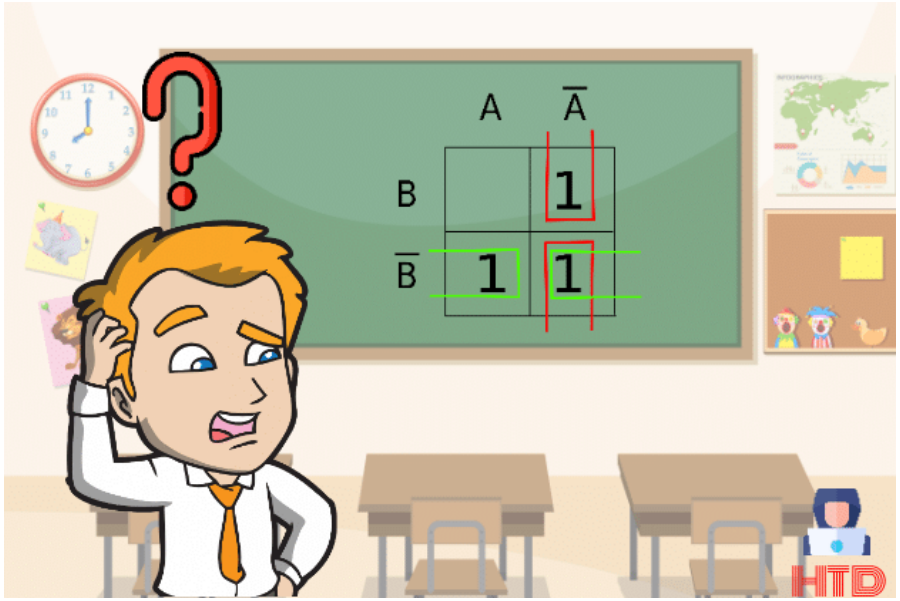
EE2000 Logic Circuit Design

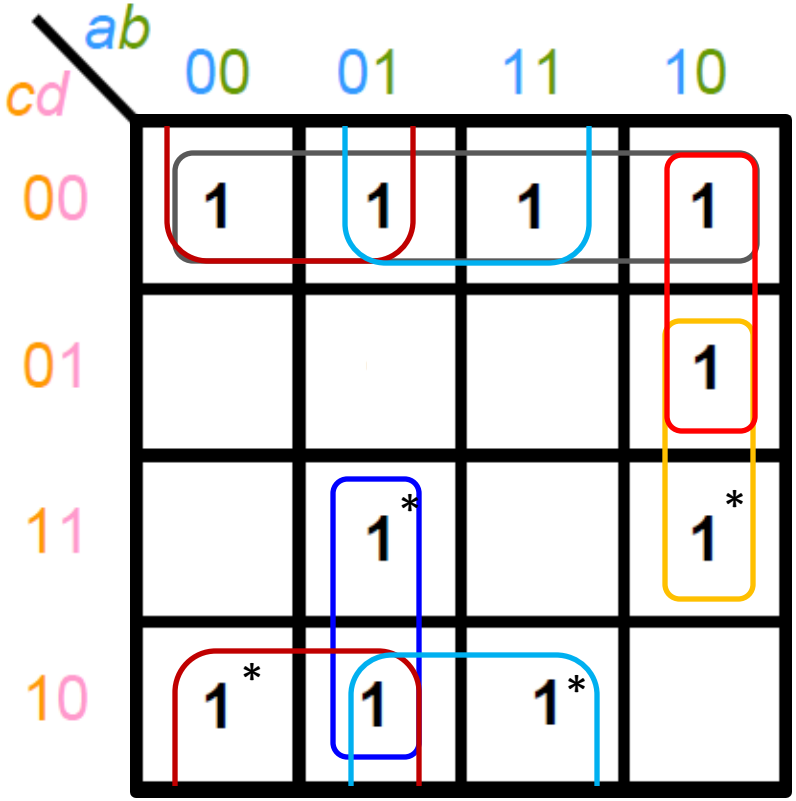
Lecture 2 – Karnaugh Map and Quine-McCluskey (QM) Method



hackthedeveloper.com

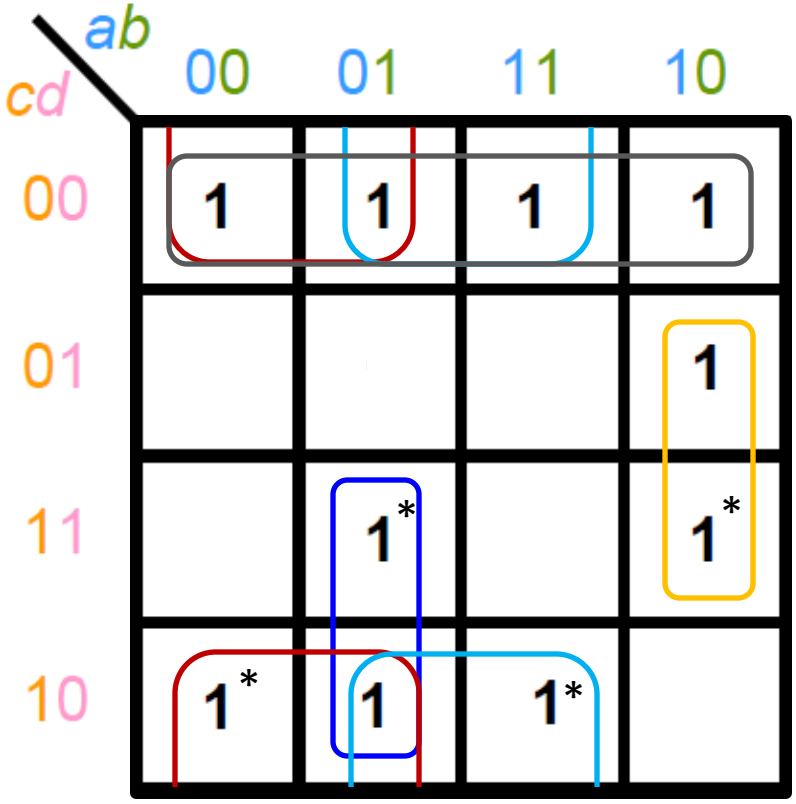
Exercise

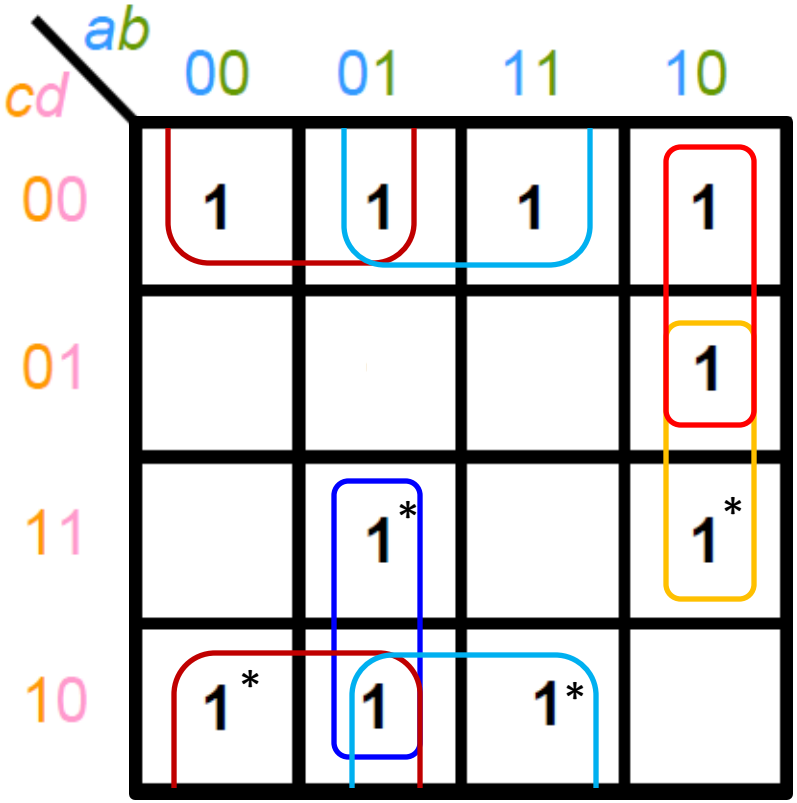
1. Identify all PIs.
2. Select all EPIs.
3. Add PIs of remaining minterms.



Exercise

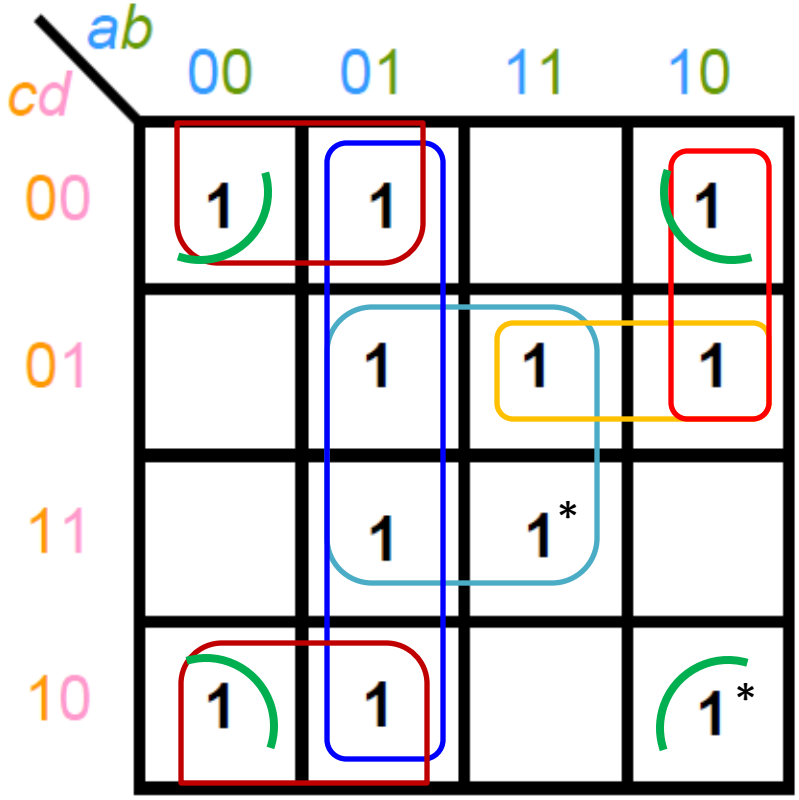
1. Identify all PIs.
2. Select all EPIs.
3. Add PIs of remaining minterms.



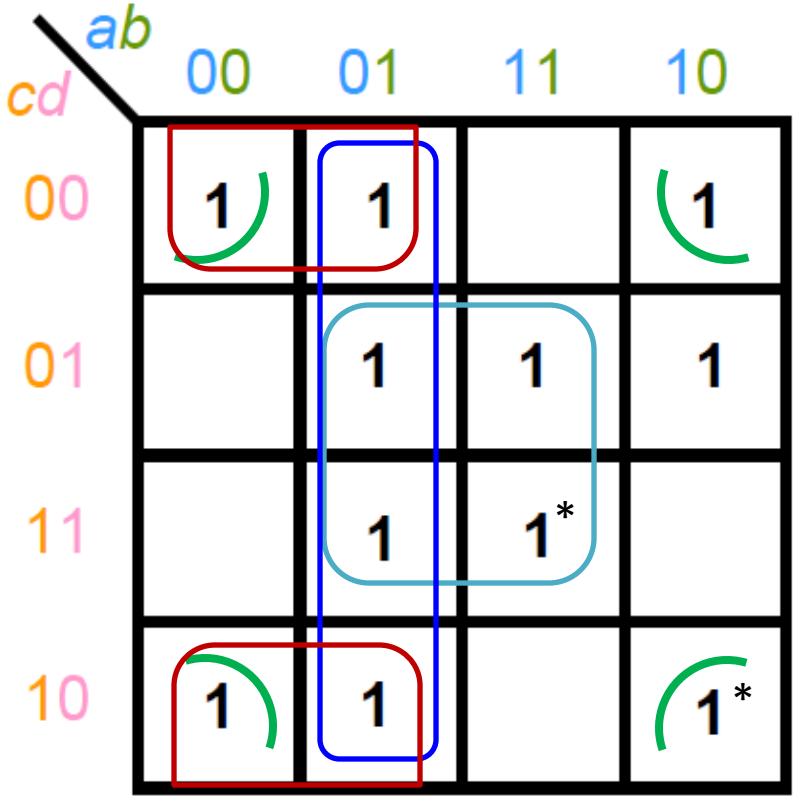


Exercise

Find all minimum sum of products expressions for the following K-map.

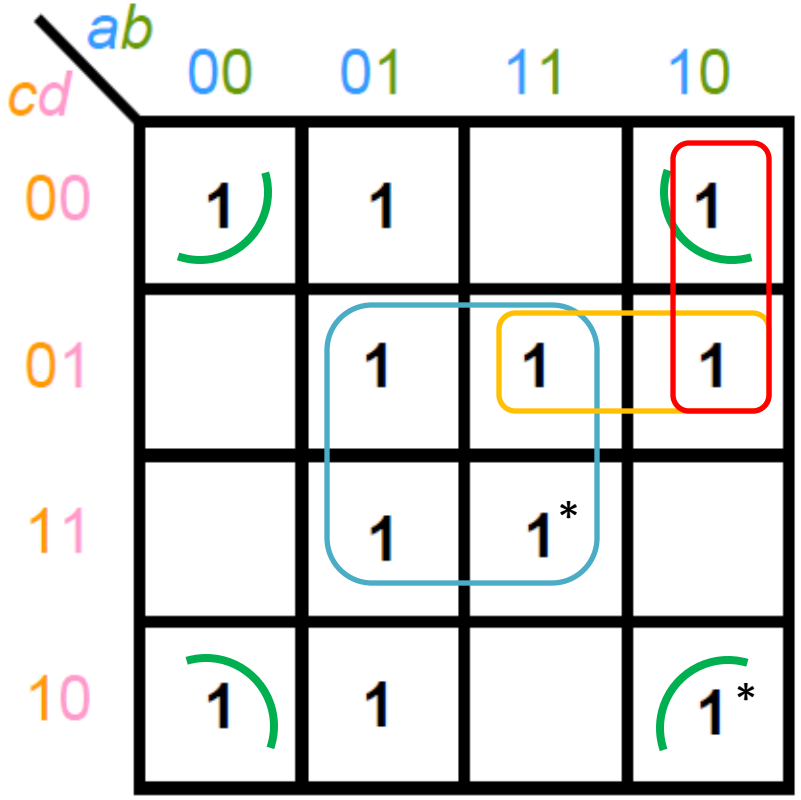


Exercise



$f = bd + b'd' + a'd' + ac'd$

$f = bd + b'd' + a'b + ac'd$



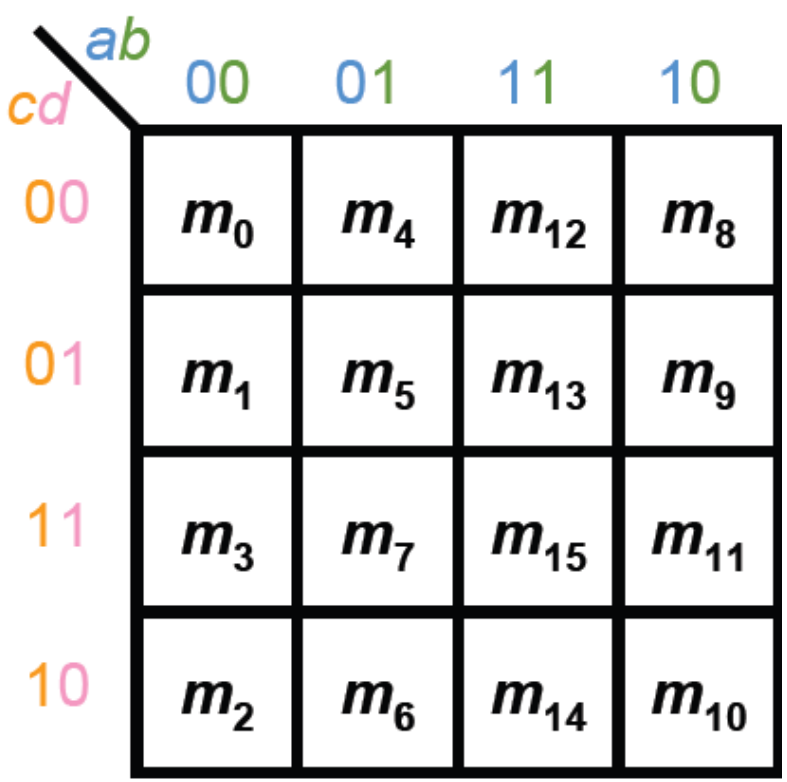
$f = bd + b'd' + a'd' + ab'c'$

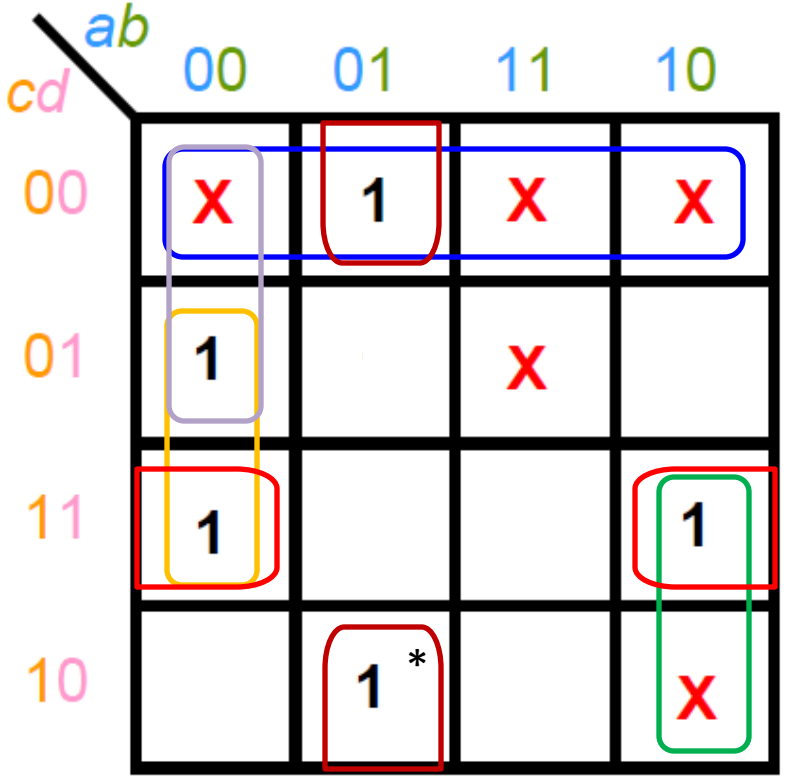
$f = bd + b'd' + a'b + ab'c'$

Exercise

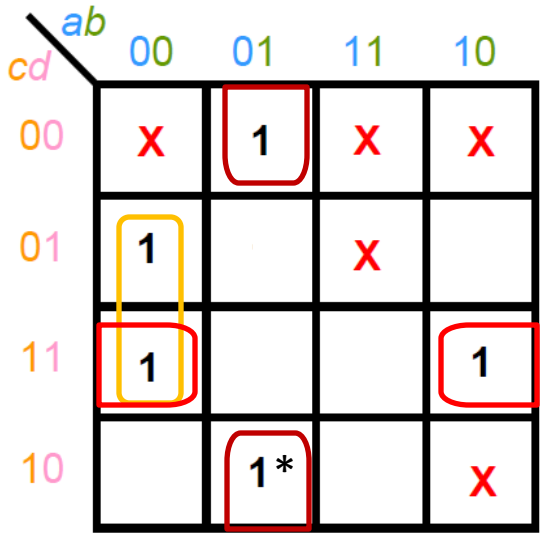
Find all minimum sum of products and all minimum product of sums expressions for the following Boolean Function.

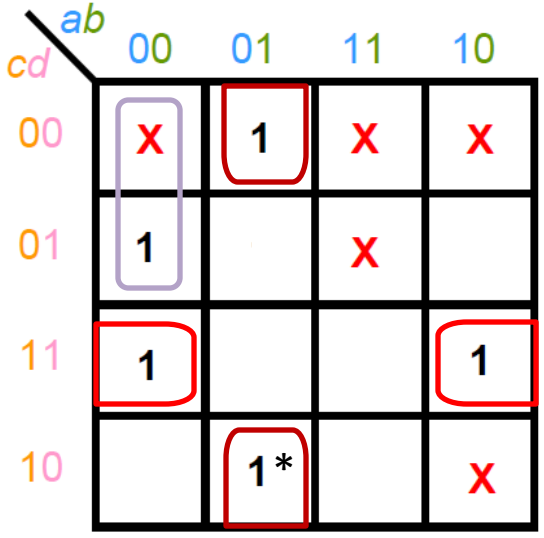
$$f(a,b,c,d) = \sum m(1,3,4,6,11) + \sum d(0,8,10,12,13)$$

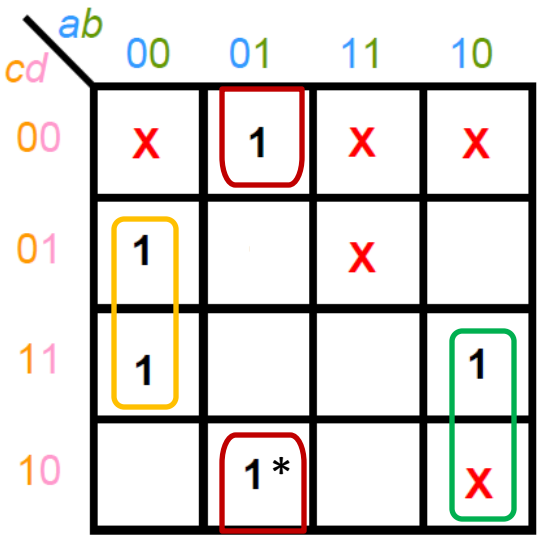




Exercise







$$f = a'bd' + a'b'd + b'cd$$

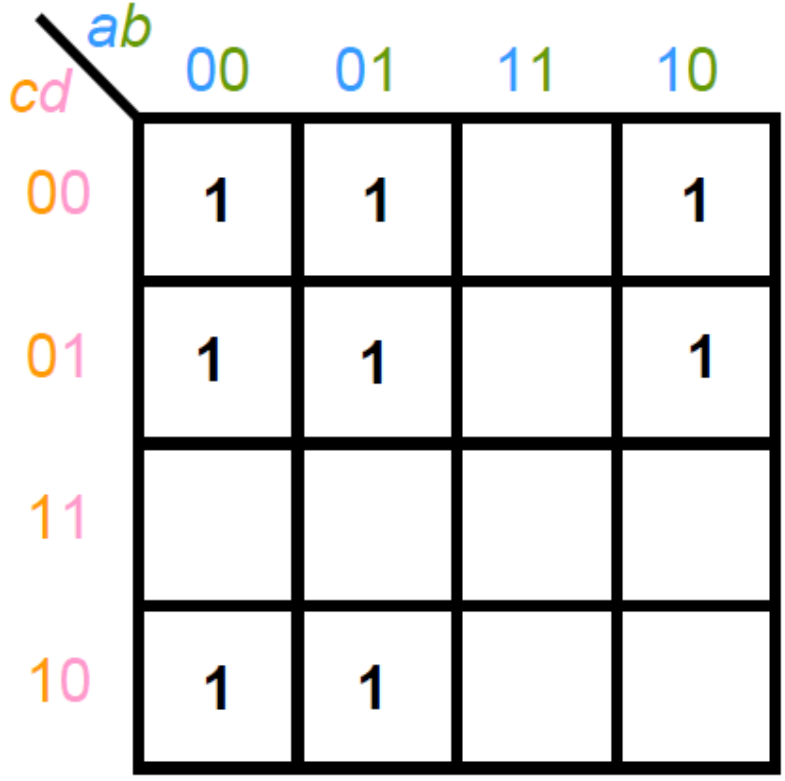
$$f = a'bd' + a'b'c' + b'cd$$

$$f = a'bd' + a'b'd + ab'c$$

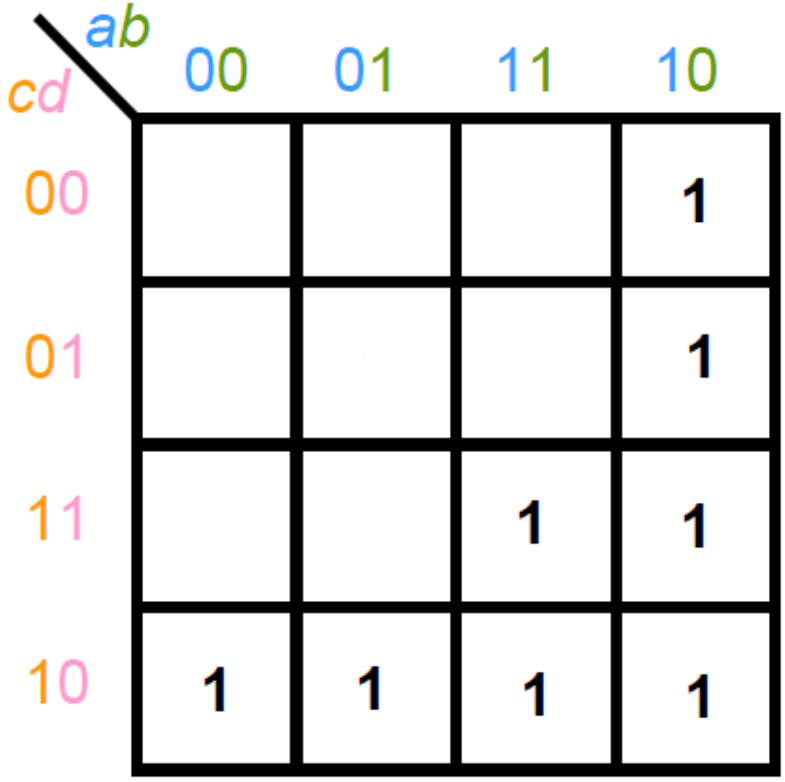
Exercise

Reduce the following functions that will use the least number of gates and gate inputs.

$f(a, b, c, d)$

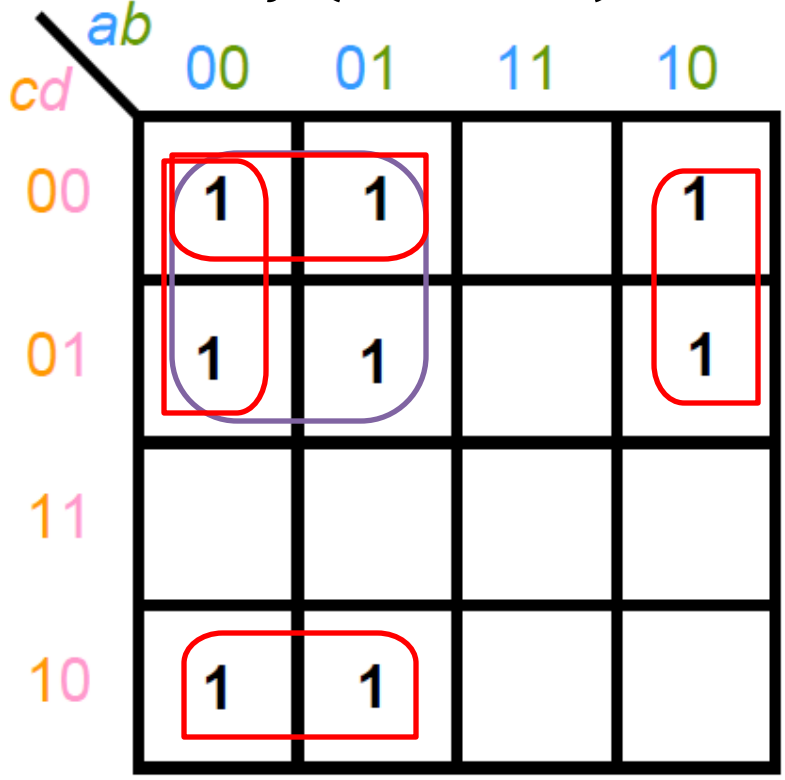


$g(a, b, c, d)$

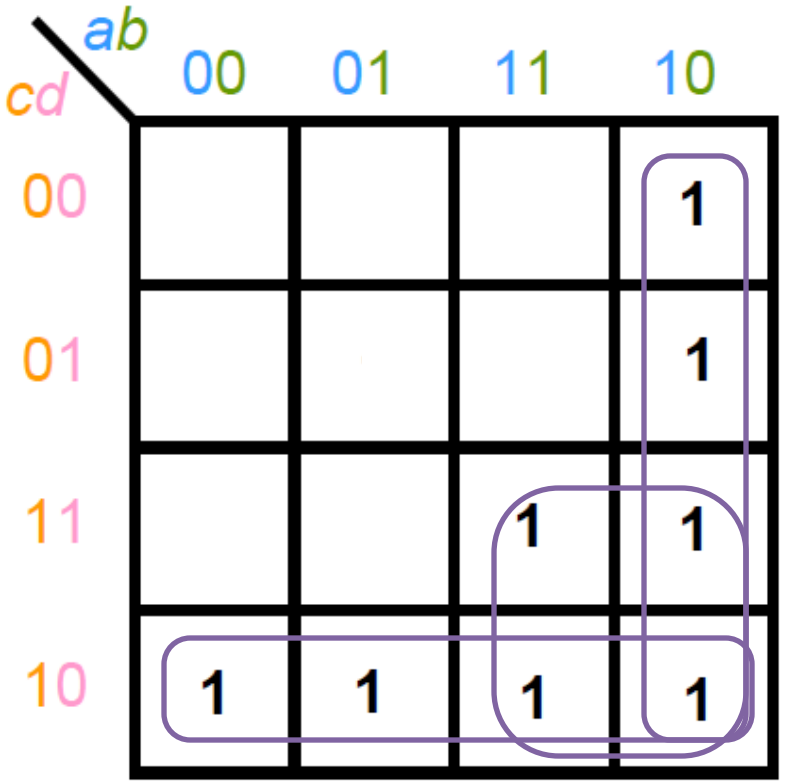


Exercise

$f(a,b,c,d)$



$g(a,b,c,d)$



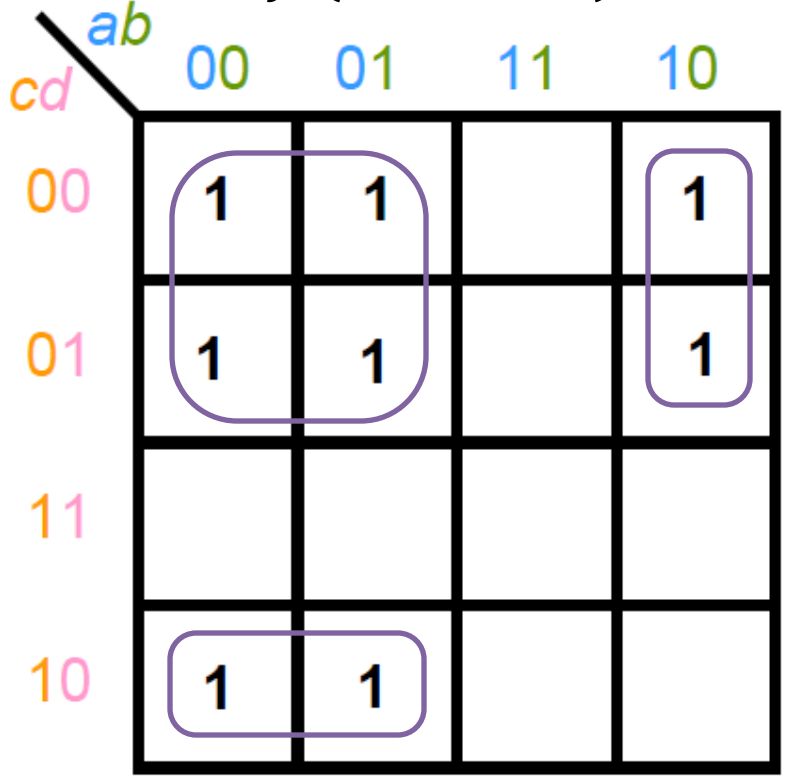
$$f(a,b,c,d) = a'c' + b'c' + a'd'$$

$$g(a,b,c,d) = ab' + ac + cd'$$

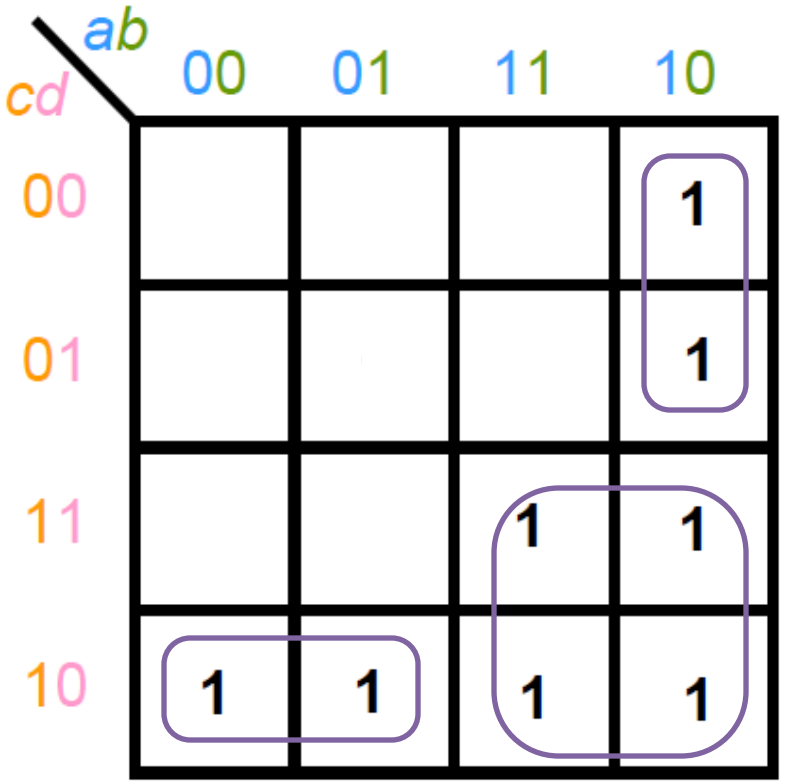
18 gate inputs
and 8 gates!!!

Exercise

$f(a,b,c,d)$



$g(a,b,c,d)$



$$f(a,b,c,d) = a'c' + ab'c' + a'cd'$$

$$g(a,b,c,d) = ac + ab'c' + a'cd'$$

16 gate inputs
and 6 gates!!!