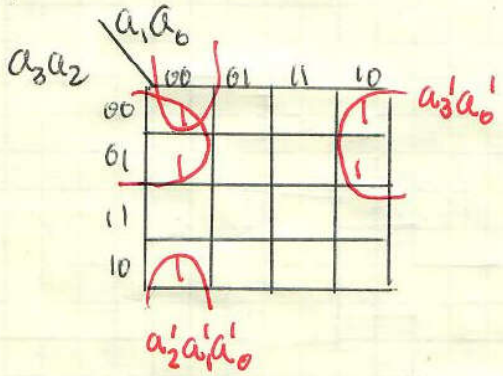
Don't cares

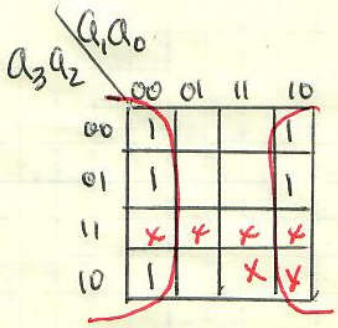
Determine the SOP min expression for a boolean function w/ 4-bits of input representing a decimal number between 0 and 9. The 1-bit output equals 1 when the input is an even number.

$A = a_3a_2a_1a_0$ Ex: $a_3a_2a_1a_0 = 0101$ $F = 0$



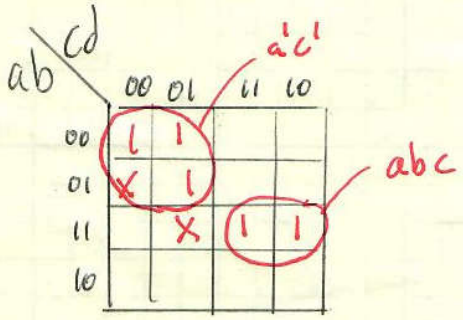
$F(a_3a_2a_1a_0) = a_3'a_0' + a_2'a_1'a_0'$

- Since the inputs 10-15 will "never" be applied, we don't care what the output is for these inputs.
- Consequently we can make the output equal values which help reduce the complexity of the output.
- Denote this freedom by placing "X" in cells where we don't care what the output equals.



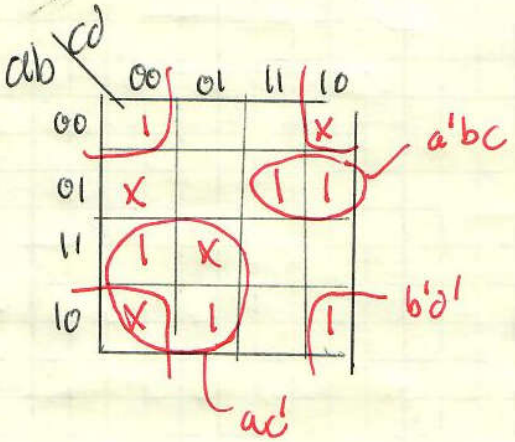
$F(a_3a_2a_1a_0) = a_0'$

$F(a,b,c,d) = \sum m(0,1,5,14,15) + \sum \partial(4,13)$



$F(abcd) = a'c' + abc$

$G(abcd) = \sum m(0,6,7,9,10,12) + \sum \partial(2,4,8,13)$



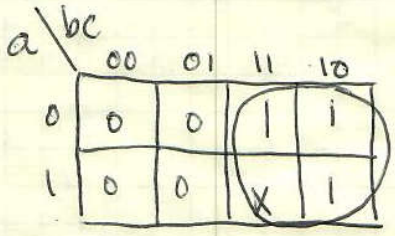
$G(abcd) = b'd' + ac' + a'bc$

Dont Cares on inputs

We can use dont cares on inputs to reduce the size of a truth table. Replace dont cares with all combination of bits.

Ex:

a	b	c	F
x	0	x	0
x	1	0	1
0	1	1	1
1	1	1	X



Find SOP_{min}

$f = b$