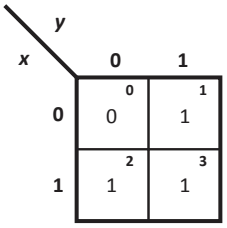
- Find groups of 1s.
- A group of 1s is called an *implicant*.
- An implicant always – always contains a group of cells where the number of cells is a **power of two**. For example, an implicant can be a group containing a single cell, two cells, four cells, eight cells, etc. An implicant can never be a group where the number of cells is not a power of two.
- A *prime implicant* is a group of 1s that isn't contained in any other group of 1s.
- An *essential prime implicant* is a group of 1s that contains at least one 1 that is not part of any prime implicant.
- Essential prime implicants are important because they must be part of the final result.

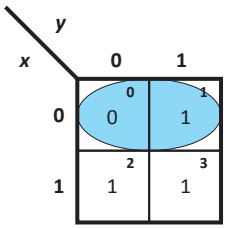
Consider the Example 3.11 in the previous lecture where $F(x, y) = x + y$.

m_i	x	y	$F(x,y) = xy$
m_0	0	0	0
m_1	0	1	1
m_2	1	0	1
m_3	1	1	1

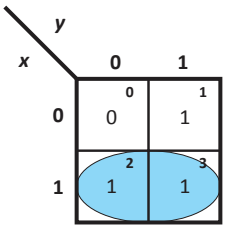
Truth Table for $(x, y) = x + y = \sum(1, 2, 3)$



Kmap for $F(x, y) = x + y = \sum(1, 2, 3)$

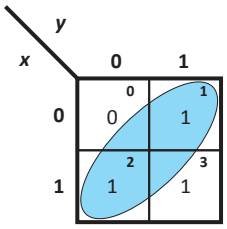


(a) Incorrect – The group contains a 0

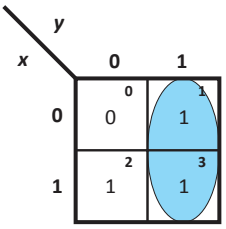


(b) Correct

FIGURE 3.12 Groups Contain Only 1s



(a) Incorrect



(b) Correct

FIGURE 3.13 Groups Cannot Be Diagonal

(a) Incorrect (b) Correct

FIGURE 3.14 Groups Must Be Powers of 2

(a) Incorrect (b) Correct

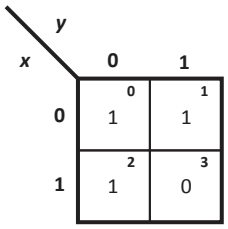
$\boldsymbol{F(x,y) = x'y + xy' + xy}$ $\boldsymbol{F(x,y) = x + y}$

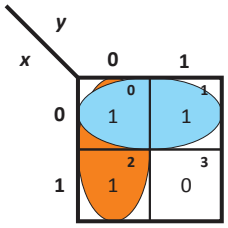
FIGURE 3.14 Groups Must Be as Large as Possible

In class exercise: Draw the truth table, Kmap, and minimize the expression for the Boolean function $f(x,y) = \sum(0,1,2)$.

Solution:

m_i	x	y	$F(x,y) = \sum(0,1,2)$
m_0	0	0	1
m_1	0	1	1
m_2	1	0	1
m_3	1	1	0





$$f(x,y) = x' + y'$$