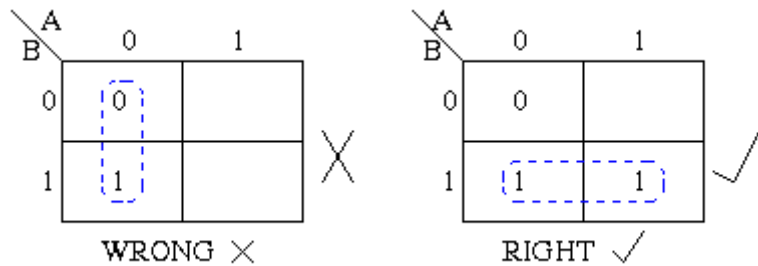


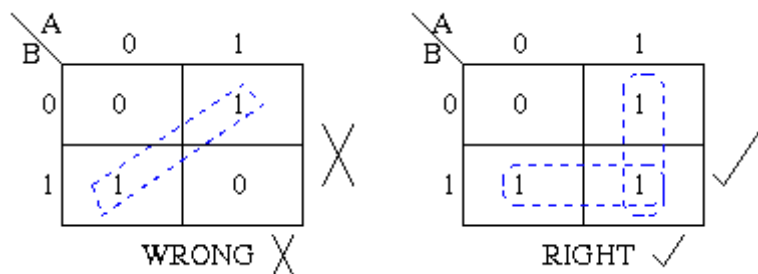
# Karnaugh Maps - Rules of Simplification

The Karnaugh map uses the following rules for the simplification of expressions by *grouping* together adjacent cells containing *ones*

- Groups may not include any cell containing a **zero**



- Groups may be horizontal or vertical, but not diagonal.



- Groups must contain 1, 2, 4, 8, or in general  $2^n$  cells.  
That is if  $n = 1$ , a group will contain two 1's since  $2^1 = 2$ .

If  $n = 2$ , a group will contain four 1's since  $2^2 = 4$ .

A \ B	0	1
	0	1
0	1	1
1	0	0

Group of 2

RIGHT ✓

AB \ C	00	01	11	10
	0	1	1	1
0	0	1	1	1
1	0	0	0	0

Group of 3

WRONG ✗

A \ B	0	1
	0	1
0	1	1
1	1	1

Group of 4

RIGHT ✓

AB \ C	00	01	11	10
	0	1	1	1
0	1	1	1	1
1	0	0	0	1

Group of 5

WRONG ✗

- Each group should be as large as possible.

AB \ C	00	01	11	10
	0	1	1	1
0	1	1	1	1
1	0	0	1	1

RIGHT ✓

AB \ C	00	01	11	10
	0	1	1	1
0	1	1	1	1
1	0	0	1	1

WRONG ✗

(Note that no Boolean laws broken,  
but not sufficiently minimal)

- Each cell containing a **one** must be in at least one group.

AB \ C	00	01	11	10
	0	1	1	1
0	0	0	1	1
1	0	0	0	1

Group I

Group II

1 present in at least one group.

- **Groups may overlap.**

AB \ C	00	01	11	10
0	1	1	1	1
1	0	0	1	1

Groups overlapping. ✓

RIGHT ✓

AB \ C	00	01	11	10
0	1	1	1	1
1	0	0	1	1

Groups not overlapping. ✗

WRONG ✗

- **Groups may wrap around the table. The leftmost cell in a row may be grouped with the rightmost cell and the top cell in a column may be grouped with the bottom cell.**

AB \ C	00	01	11	10
0	1	1	1	1
1	1		1	1

Top cell

Leftmost cell

Rightmost cell

Bottom cell

- **There should be as few groups as possible, as long as this does not contradict any of the previous rules.**

AB \ C	00	01	11	10
0	1	1	1	1
1	0	0	1	1

RIGHT ✓

AB \ C	00	01	11	10
0	1	1	1	1
1	0	0	1	1

WRONG ✗

## Summary:


1. No zeros allowed.

2. No diagonals.
3. Only power of 2 number of cells in each group.
4. Groups should be as large as possible.
5. Every one must be in at least one group.
6. Overlapping allowed.
7. Wrap around allowed.
8. Fewest number of groups possible.

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 Return

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To submit your questions and queries please click here: 

*Composed by David Belton - April 98*