KARNAUGH MAP (K-MAP)

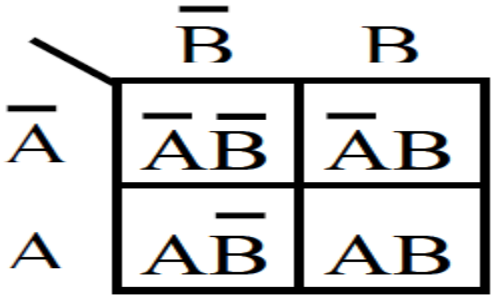
This map provides a systematic method of simplifying a Boolean function to produce the simplest **sum of products** expression

KARNAUGH MAP FORMAT:

For N variables we have $\mathbf{2^N}$ combination , each combination is contained in a **Karnaugh cell**

FOR 2 VARIABLES A, B:

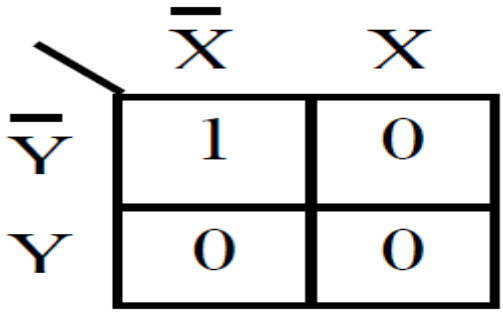
2^2 = 4 ***PRODUCTS >>*** *4 CELLS (*$\bar{A}\bar{B}$, $\bar{A}B$, $A\bar{B}$ ***AND*** AB***)***



The Karnaugh Map is filled in by putting (1) in each cell that leads to (1) output. (0) is placed in all the other cells .

Ex1:

F= $\bar{X}.\bar{Y}$



$$F = \overline{X}Y + X\overline{Y}$$

	$\overline{X}$	X
$\overline{Y}$	0	1
Y	1	0

FOR 3 VARIABLES A,B,C:

2^3 **= 8** PRODUCT TERMS >> **8 CELLS**

	$\overline{B}\overline{C}$	$\overline{B}C$	BC	$B\overline{C}$
$\overline{A}$	$\overline{A}\overline{B}\overline{C}$	$\overline{A}\overline{B}C$	$\overline{A}BC$	$\overline{A}B\overline{C}$
A	$A\overline{B}\overline{C}$	$A\overline{B}C$	ABC	$AB\overline{C}$

EX2:

$F = \overline{A}\overline{B}C + A\overline{B}\overline{C} + A\overline{B}C$

	$\overline{B}\overline{C}$	$\overline{B}C$	BC	$B\overline{C}$
$\overline{A}$	0	1	0	0
A	1	1	0	0

FOR 4 VARIABLES A,B,C,D:

2^4 = 16 PRODUCT TERMS >> 16 CELLS

	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	$\bar{A}\bar{B}\bar{C}\bar{D}$	$\bar{A}\bar{B}\bar{C}D$	$\bar{A}\bar{B}CD$	$\bar{A}\bar{B}C\bar{D}$
$\bar{A}B$	$\bar{A}B\bar{C}\bar{D}$	$\bar{A}B\bar{C}D$	$\bar{A}BCD$	$\bar{A}BC\bar{D}$
AB	$AB\bar{C}\bar{D}$	$AB\bar{C}D$	$ABCD$	$ABC\bar{D}$
$A\bar{B}$	$A\bar{B}\bar{C}\bar{D}$	$A\bar{B}\bar{C}D$	$A\bar{B}CD$	$A\bar{B}C\bar{D}$

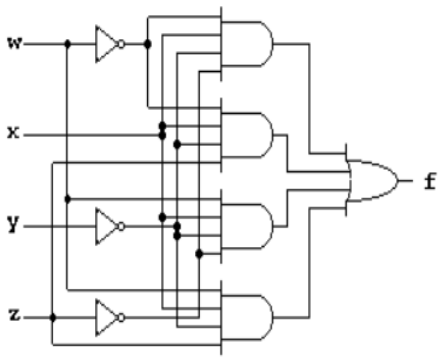
EX3:

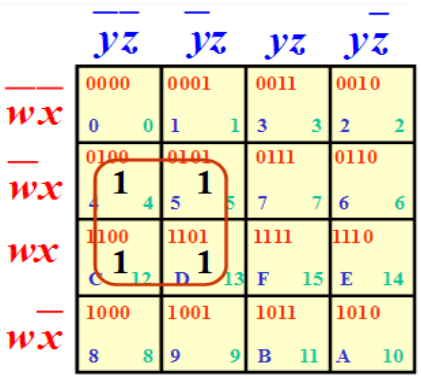
F = $\bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}D + \bar{A}B\bar{C}D + \bar{A}BC\bar{D} + A\bar{B}\bar{C}D + A\bar{B}C\bar{D} + ABCD$

AB \ CD	0 0	0 1	1 1	1 0
0 0	1	1	0	0
0 1	0	1	0	1
1 1	0	0	1	0
1 0	0	1	0	1

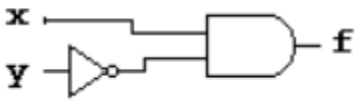
EX1:
SIMPLIFY BY USING K- map

$$f = \bar{w}\bar{x}yz + \bar{w}x\bar{y}z + \bar{w}xyz + w\bar{x}yz$$



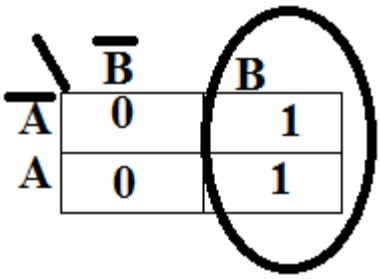


$$f = x\bar{y}$$



EX2: SIMPLFY THE TRUTH TUBLE

A	B	F
1	1	1
1	0	0
0	1	1
0	0	0



F=B