Karnaugh Maps (Veitch diagram).

→ Simplification of the switching functions using Boolean laws and theorems becomes complex with the increase in the number of variables and terms.

→ It is the graphical representation of the given boolean function where each box represents one min term of the function.

min terms	3 variable
m_0	$\bar{A}\bar{B}\bar{C}$ ← SOP form
m_1	$\bar{A}\bar{B}C$
m_2	$\bar{A}B\bar{C}$
m_3	$\bar{A}BC$
⋮	⋮

POS form → max terms

$M_0 = \overline{m_0}$

ex: $M_0 = A+B+C$ etc

2 variable K-map

A \ B	0	1
0	m_0	m_1
1	m_2	m_3

3 variable K-map

A \ BC	00	01	11	10
0	0	1	3	2
1	4	5	7	6

4 variables

Gray code

AB \ CD	00	01	11	10
00	0	1	3	2
01	4	5	7	6
11	12	13	15	14
10	8	9	11	10

group of 8 → octet
group of 4 → quad
2 → pair
1 → single

ex 1:- minimize the following function using mapping.

$$f(A,B,C) = \Sigma m(0,1,2,4,5)$$

sol:

A \ BC	00	01	11	10
0	1	1		1
1	1	1		

search for quad & then pair

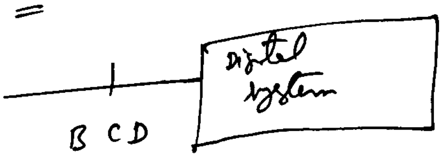
$$f = \bar{B} + \bar{A}\bar{C}$$

2) $f(A,B,C,D) = \Sigma m(0,1,2,5,7,8,9,10,14)$

AB \ CD	00	01	11	10
00	1	1		1
01		1	1	
11				1
10	1	1		1

$$f = \bar{B}\bar{C} + \bar{B}\bar{D} + \bar{A}BD + AC\bar{D}$$

Dont care conditions.



BCD

0 → 0000

⋮ ⋮

9 → 1001

other numbers are dont care terms. They can be represented as 1 (or) 0 ex: $f = \Sigma m(0,3,7) + d(2,4,6)$

A \ BC	00	01	11	10
0	1		1	X
1	X		1	X

$f = B + \bar{C}$.

ex:- $f(A,B,C) = \pi M(0,2,3,6,7)$ ← POS

A \ BC	00	01	11	10
0	0		0	0
1			0	0

$f = \bar{B} \cdot (\bar{A} + C)$

$= \bar{B} \cdot (A + C)$

ex. simplify the following functions using mapping

(a) $f(A,B,C,D) = \Sigma m(0,3,6,13,15) + d(4,7,9,12)$

(b) $f(w,x,y,z) = \pi M(2,3,6,8,12,15) \cdot d(0,4,7)$.

Sol: (a)

AB \ CD	00	01	11	10
00	1		1	
01	X		X	1
11	X	1	1	
10		X		

$f = ABD + \bar{A}BC + \bar{A}CD + \bar{A}\bar{C}\bar{D}$

(b)

wx \ yz	00	01	11	10
00	X		0	0
01	X		X	0
11	0		0	
10	0			

$f = (y+z)(w+\bar{y})(\bar{x}+\bar{y}+\bar{z})$