Standard form:-

$x + y'z$

three variable are used in this statement/ expression.

x, y, z

$x + y'z$

$x(y+y')(z+z') + (x+x')y'z$

$x(yz + yz' + y'z + y'z') + xy'z + x'y'z$

$xyz + xyz' + xy'z + xy'z' + xy'z + x'y'z$

$xyz + xyz' + xy'z + xy'z' + x'y'z$

if $x=1$ $y=1$ $z=1$ | $x=1$ $y=1$ $z=0$ | $x=1$ $y=0$ $z=1$ | $x=1$ $y=0$ $z=0$ | $x=0$ $y=0$ $z=1$

X	Y	Z	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

SoP:- (Sum of Product).

Minterm:- Each minterm is obtained from the AND term of the n variables with each variable being primed if the corresponding bit of the primary number is a zero (0) and unprimed if a (1).

PoS:- (Product of Sum)

Maxterm:- Each maxterm is obtained from OR Term of the n variable, with each variable being unprimed if the correspond bit is a zero (0) and primed if a (1)

			Minterms		Maxterm	
X	Y	Z	Term	Designation	Term	Designation
0	0	0	$x'y'z'$	m_0	$x+y+z$	M_0
0	0	1	$x'y'z$	m_1	$x+y+z'$	M_1
0	1	0	$x'yz'$	m_2	$x+y'+z$	M_2
0	1	1	$x'yz$	m_3	$x+y'+z'$	M_3
1	0	0	$xy'z'$	m_4	$x'+y+z$	M_4
1	0	1	$xy'z$	m_5	$x'+y+z'$	M_5
1	1	0	xyz'	m_6	$x'+y'+z$	M_6
1	1	1	xyz	m_7	$x'+y'+z'$	M_7

→ $F = \Sigma(3, 7, 9, 12, 14, 15)$.

Sop = ?

Pos = ?

Minterm = ?

Maxterm = ?

$F = \Sigma(3, 7, 9, 12, 14, 15)$ → values greater than 7 used 4 variables. (w, x, y, z)

Minterm) $F_{sop} = m3, m7, m9, m12, m14, m15$

$F_{pos} = \pi(0, 1, 2, 4, 5, 6, 8, 10, 11, 13)$

Maxterm) $F_{pos} = M0, M1, M2, M4, M5, M6, M8, M10, M11, M13$.

→ K- Mapping:-

Making a table of cells.

No. of cell in table = 2^n.

n is the number of variables.

Suppose variables are two, x, y.

$2^2 = 4$ → cells.

x \ y	0	1
0	00	01
1	10	11

n = 2.

$n = 3$.

$2^3 = 8$. x, y, z

x \ yz	00	01	11	10
0	000	001	011	010
1	100	101	111	110

xy \ z	0	1
00	000	001
01	010	011
11	110	111
10	100	101

} Same

$F = \Sigma(0,2,4,5,6,7)$ (Minterm)

$F_{sop} = m0, m2, m4, m5, m6, m7$.

X	Y	Z	F	
0	0	0	1	m0
0	0	1	0	m1
0	1	0	1	m2
0	1	1	0	m3
1	0	0	1	m4
1	0	1	1	m5
1	1	0	1	m6
1	1	1	1	m7

$x = 1$.
$x' = 0$

Boolean Expression

$$x'y'z' + x'yz' + xy'z' + xy'z + xyz' + xyz$$

$$= x'z'(y' + y) + xy'(z' + z) + xy(z' + z)$$

$$= x'z'(1) + xy'(1) + xy(1)$$

$$= x'z' + xy' + xy$$

$$= x'z' + x(y' + y)$$

$$= x'z' + x(1)$$

$$\boxed{= x'z' + x}$$

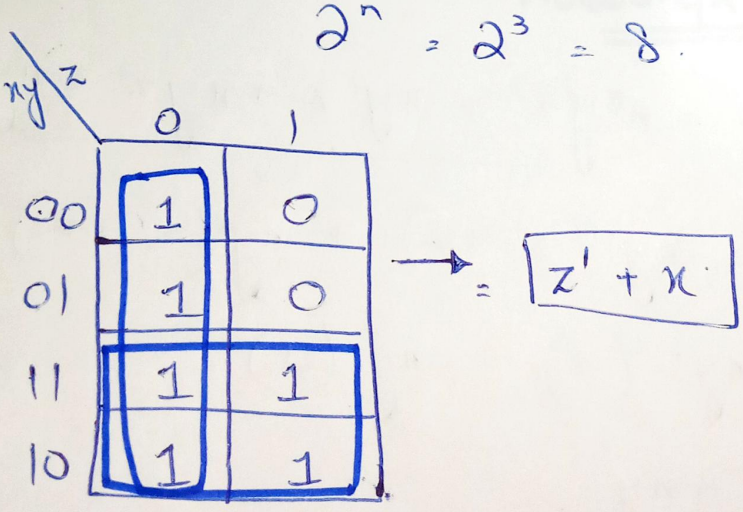
x	y	z	x'	z'	x'z'	x'z' + x
0	0	0	1	1	1	1
0	0	1	1	0	0	0
0	1	0	1	1	1	1
0	1	1	1	0	0	0
1	0	0	0	1	0	1
1	0	1	0	0	0	1
1	1	0	0	1	0	1
1	1	1	0	0	0	1

K-Mapping :-

Use three variables.

x, y, z.

$2^n = 2^3 = 8$.



x	y	z	z'	z' + x (OR)
0	0	0	1	1
0	0	1	0	0
0	1	0	1	1
0	1	1	0	0
1	0	0	1	1
1	0	1	0	1
1	1	0	1	1
1	1	1	0	1

Boolean expression and k-mapping expression are same. So, the resulting output are true.

→ $F = \Sigma(0, 2, 4, 5, 6, 7)$ (Maxterm)

$F_{pos} = \pi(1, 3)$

$F_{pos} = M_1 \cdot M_3$

x	y	z	F	
0	0	0	1	M_0
0	0	1	0	M_1
0	1	0	1	M_2
0	1	1	0	M_3
1	0	0	1	M_4
1	0	1	1	M_5
1	1	0	1	M_6
1	1	1	1	M_7

$= (x + y + z') \cdot (x + y' + z')$

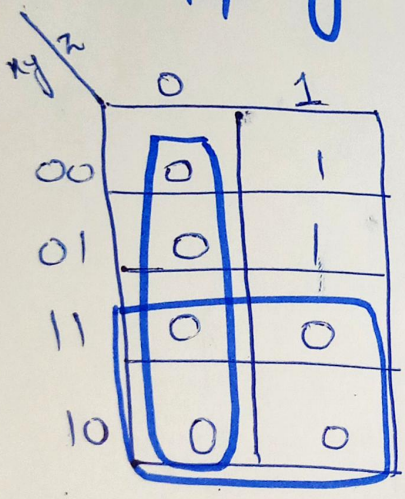
$= (x + z')(y + y')$

$= x + z'(1)$

$= x + z'$

x	y	z	z'	x + z' (OR)
0	0	0	1	1
0	0	1	0	0
0	1	0	1	1
0	1	1	0	0
1	0	0	1	1
1	0	1	0	1
1	1	0	1	1
1	1	1	0	1

→ **K-Mapping:-**



→ = z + x'

= z . x'

x	y	z	x'	x'.z (And)	x' + z (OR)
0	0	0	1	0	1
0	0	1	1	1	1
0	1	0	1	0	1
0	1	1	1	1	1
1	0	0	0	0	0
1	0	1	0	0	1
1	1	0	0	0	0
1	1	1	0	0	1