x	y	f
0	0	A
0	1	B
1	0	C
1	1	D

x \ y	0	1
0	A	B
1	C	D

① Let $A=1$ $B=1$, $C=0$, $D=0$

		0	1
$\bar{x}$	0	1	1
x	1	0	0

$$BE = \bar{x}\bar{y} + \bar{x}y$$
$$= \bar{x}(\bar{y}+y) = \bar{x}$$

② Let $A=0$, $B=0$, $C=1$, $D=1$

		0	1
$\bar{x}$	0	0	0
x	1	1	1

$$BE = x\bar{y} + xy$$
$$= x(\bar{y}+y) = x$$

③ Let $A=1$, $C=1$, $B=D=0$

	0	1
0	1	0
1	1	0
	$\bar{y}$	y

$$BE = \bar{y}$$

④ $B=D=1$ $A=C=0$

0	1
0	1
	y

$$BE = y$$

(5)

	$\bar{y}$	y
$\bar{x}$	1	0
x	0	1

x	y	f
0	0	A
0	1	B
1	0	C
1	1	D

we cannot make a loop because A D are not adjacent.

BE = $\bar{x}\bar{y} + xy$. Also this cannot be simplified.

(6)

0	1
1	0

So this when B = C = 1

BE = $x\bar{y} + \bar{x}y$

observation: In the expression, only one literal can have one complimented.

check out ① $\bar{x}\underline{\bar{y}} + \bar{x}\underline{y}$ ✓

② $x\underline{\bar{y}} + x\underline{y}$ ✓

③ $\underline{\bar{x}}\bar{y} + \underline{x}\bar{y}$ ✓

⑤ $\bar{x}\bar{y} + xy$ ✗

(7) How about $A=0,\ B=C=D=1$

0	1
1	1

Groups must contain 1, 2, 4, ... 2^n cells
The cells must be adjacent.
So group of 3 is not allowed. we can split this as

0	1
1	1

WRONG

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

Two groups

$\bar{X}Y + XY$ (See 4)

$X\bar{Y} + XY$ (See 2)

By combining (2) and (4), we get $x+y$.

Cross check by simplifying $\bar{X}Y + \underline{XY} + X\bar{Y} + \underline{XY}$

$$= X\bar{Y} + XY + \bar{X}Y$$

$$= X(\bar{Y}+Y) + \bar{X}Y$$

$$= X + \bar{X}Y = (X+\bar{X})(X+Y) = X+Y.$$

(8) Let $A=1$, $B=1$, $C=1$, $D=0$

1	1
1	0

In this, we could group as

1	1
1	0

$$\bar{X}\bar{Y} + \bar{X}Y$$ and

$$\bar{X}\bar{Y} + X\bar{Y}$$

from (1) we have $\bar{x}$.

from (3) we have $\bar{y}$.

By combing (spell), we have $\bar{x} + \bar{y}$.

cross check $\bar{x}\bar{y} + \bar{x}y + \bar{x}\bar{y} + X\bar{Y}$

$= \bar{x}(\bar{y} + y) + \bar{y}(\bar{x} + x)$

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

we can group cells as large as possible, but it has to be adjacent to each other and can overlap, not diagonal, In case 3 variables, X Y Z our table is

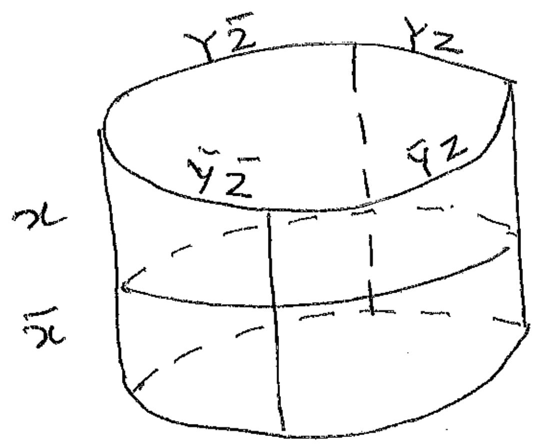
X	Y	Z	F
0	0	0	A
0	0	1	B
0	1	0	C
0	1	1	D
1	0	0	E
1	0	1	F
1	1	0	G
1	1	1	H

The corresponding map is

	$\bar{Y}\bar{Z}$	$\bar{Y}Z$	YZ	$Y\bar{Z}$
$\bar{x}$	A	B	D	C
x	E	F	H	G

Note how B and D are adjacent in the map, but not in the table. So is F and H.

The rules governing formation of groups still applies. Also, you have to visualize that the map wraps around making the first and last column as adjacent



⑨ let $A = B = D = C = 1$

	$\bar{Y}\bar{Z}$	$\bar{Y}Z$	YZ	$Y\bar{Z}$
$\bar{x}$	1	1	1	1
x	0	0	0	0

we can form a group

$\bar{X}$	1	1	1	1
X	0	0	0	0

Boolean expression $\bar{x}\bar{y}\bar{z} + \bar{y}z\bar{x} + \bar{x}yz + \bar{x}y\bar{z}$

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

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

$= \bar{x}\bar{y} + \bar{x}y = \bar{x}(\bar{y} + y) = \bar{x}$

In other words, the top row depends on $\bar{x}$ but not any values of $y, \bar{y}, z, \bar{z}$.

⑩ How about $E = F = H = G = 1$, $B = A = C = D = 0$

$\bar{x}$	0	0	0	0
x	1	1	1	1

As noted above, the value depends entirely on x, but not any values of $y, \bar{y}, z, \bar{z}$

11. Other possible groups are

$\bar{x}$	1	1	0	0
x	1	1	0	0

$\bar{y}$

12.

0	0	1	1
0	0	1	1

y

13.

0	1	1	0
0	1	1	0

z

14

1	0	0	1
1	0	0	1

$\bar{z}$

15.

$\bar{X}$	1	1	1	1
X			1	1

combine 9 and 12

$\bar{x} + y$

1	1	1	1
		1	1

incorrect because we need them as large as possible.

(16)

0	0	1	1
0	0	0	1

we need two overlapping groups

			YZ	$Y\bar{Z}$
$\bar{X}$	0	0	1	1
X	0	0	0	1

$\bar{x}yz + \bar{x}Y\bar{Z}$ and

$\bar{X}Y\bar{Z} + XY\bar{Z}$

which yields $\bar{x}y + Y\bar{Z} = y(\bar{x}+\bar{z})$

(17)

1	1	0	0
1	0	0	0

again we need two overlapping groups

	$\bar{Y}\bar{Z}$	$\bar{Y}Z$		
$\bar{X}$	1	1	0	0
X	1	0	0	0

$\bar{X}\bar{Y}\bar{Z} + \bar{X}\bar{Y}Z$ and

$\bar{X}\bar{Y}\bar{Z} + X\bar{Y}\bar{Z}$

which when combined

$= \bar{X}\bar{Y}\bar{Z} + \bar{X}\bar{Y}Z + \bar{X}\bar{Y}\bar{Z} + X\bar{Y}\bar{Z}$

$= \bar{X}\bar{Y} + \bar{Y}\bar{Z} = \bar{Y}(\bar{X}+\bar{Z})$