Example: $f = xyz' + xy'z' + x'yz + x'yz' + x'y'z'$ Put a 1 in the place of each minterm, as the value of f.
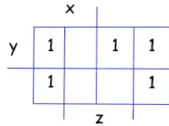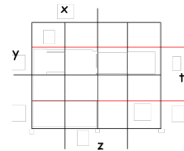
x

y	1		1	1
		1		1

z

---

4 variables

Same idea:

x

y

t

z

Example:

	m_0	m_1	m_3	m_2
	m_4	m_5	m_7	m_6
	m_{12}	m_{13}	m_{15}	m_{14}
	m_8	m_9	m_{11}	m_{10}

(a)

y

wx \ yz

	00	01	11	10
00	$w'x'y'z'$	$w'x'y'z$	$w'x'yz$	$w'x'yz'$
01	$w'xy'z'$	$w'xy'z$	$w'xyz$	$w'xyz'$
11	$wxy'z'$	$wxy'z$	$wxyz$	$wxyz'$
10	$wx'y'z'$	$wx'y'z$	$wx'yz$	$wx'yz'$

z

(b)
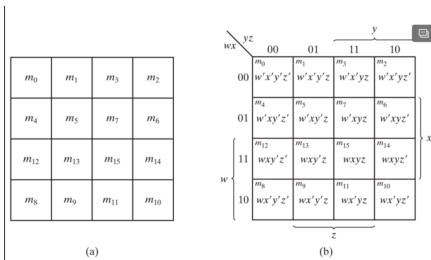
FIGURE 3.8

Example: $f = \sum(1, 2, 3, 4, 7, 8, 12, 15) + d\sum(0, 5, 9, 10, 14)$

Index	Impl. Binary	Impl. Dec.
0	0000	0 * d
	0001	1 *
	0010	2 *
1	0100	4 *
	1000	8 *
	0011	3 *
2	0101	5 * d
	1001	9 * d
	1010	10 * d
	1100	12 *
3	0111	7 *
	1110	14 * d
4	1111	15 *

Index	Impl. Binary	Impl. Dec.
0	000-	(0, 1) ★
	00-0	(0, 2) ★
	0-00	(0, 4) ★
	-000	(0, 8) ★
1	00-1	(1, 3) ★
	0-01	(1, 5) ★
	-001	(1, 9) ★
	001-	(2, 3) ★
	-010	(2, 10) ★
	010-	(4, 5) ★
	-100	(4, 12) ★
	100-	(8, 9) ★
	10-0	(8, 10) ★
	1-00	(8, 12) ★
	0-11	(3, 7) ★
	01-1	(5, 7) ★
2	1-10	(10, 14) ★
	11-0	(12, 14) ★
3	-111	(7, 15)	I
	111-	(14, 15)	H

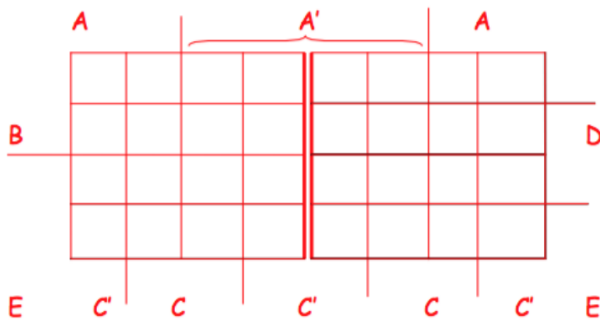| Index	Impl. Binary	Impl. Dec.	
0	00--	(0, 1, 2, 3)	G
	0-0-	(0, 1, 4, 5)	F
	-00-	(0, 1, 8, 9)	E
	-0-0	(0, 2, 8, 10)	D
	--00	(0, 4, 8, 12)	C
1	0--1	(1, 3, 5, 7)	B
	1--0	(8, 10, 12, 14)	A

We stop when we can no longer form larger ones and name the **prime implicants**.

Note: We can form larger implicants **only** by combining implicants of adjacent indices

Index = # of 1's in the string

We list all the minterms in binary and decimal form, grouped by their indices. **Note**: every size-4 implicant will be formed in 2 ways out of size-2 implicants:

We mark the d's. These are the size-1 implicants. We continue in ...

5-variable K map:

Use THIS map!

X	Y	Z	A	B	C
0	0	0	0	0	0
0	0	1	1	0	0
0	1	0	1	0	0
0	1	1	1	1	0
1	0	0	1	0	1
1	0	1	d	d	d
1	1	0	d	d	d
1	1	1	1	d	d

X	Y	Z	A	B	C

A)

$A = Y$

$B = X$

$C = Z$

$f(x) = X + Y + Z$

b) Next, using K-Maps find all minimal forms of the three functions.

$C = YZ$

$B = Y'Z)$

$f(C) = YZ + YZ)$

c) $B = Y'Z)$

$B + C = $

$f(x) = A$

$f(x) = X$
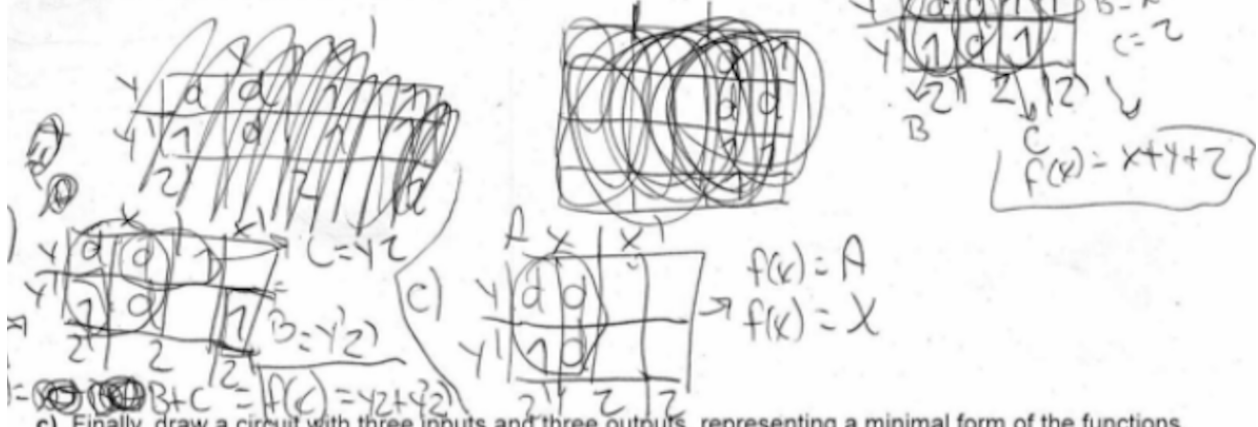
c) Finally, draw a circuit with three inputs and three outputs, representing a minimal form of the functions.

X
Y
Z

A
B
X

Hint. $D = A \cdot (B + Bin)$

A
B
Bin

HS1   HS2

D

Bout