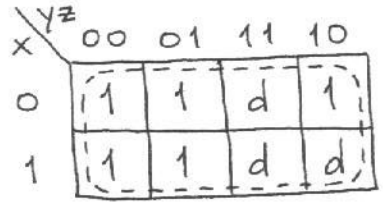
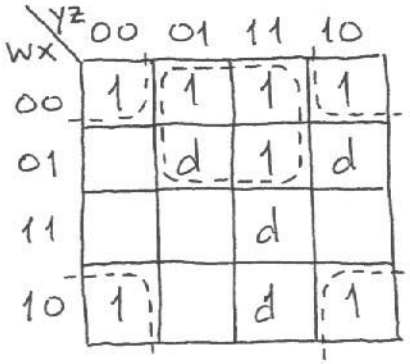
Solution Set 2

1.



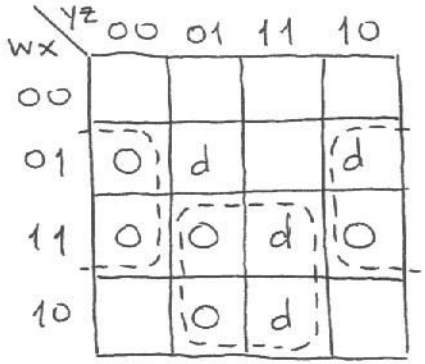
$F = 1$
$= \sum(0,1,2,3,4,5,6,7)$ ◀

2.



$F = \bar{x}\bar{z} + \bar{w}z$ (sum of products)

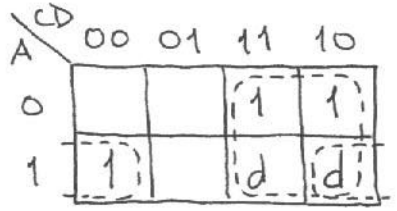
2. cont'd.



$\bar{F} = x\bar{z} + wz$

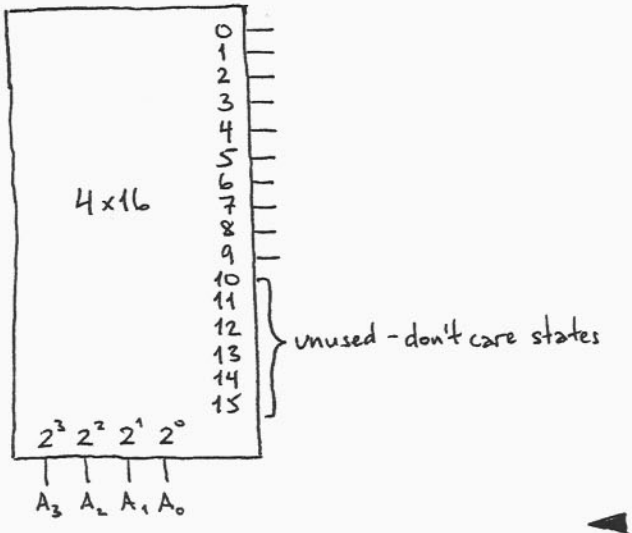
$\therefore F = \overline{x\bar{z} + wz} = \overline{x\bar{z}}\,\overline{wz} = (\bar{x}+z)(\bar{w}+\bar{z})$
(product of sums) ◀

3.

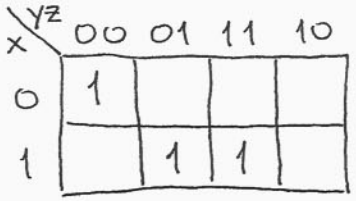


$F = A\bar{D} + C$ ◀

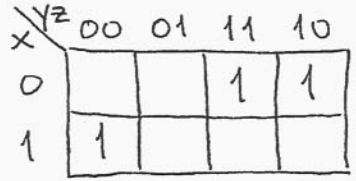
4. BCD is identical to binary except for the binary values 1010 through 1111, which are don't care states in BCD, so we can use a 4x16 decoder.



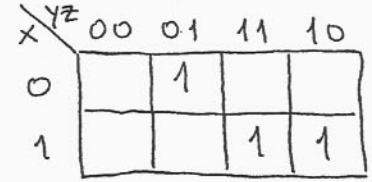
5.



$F_1 = \Sigma(0, 5, 7)$

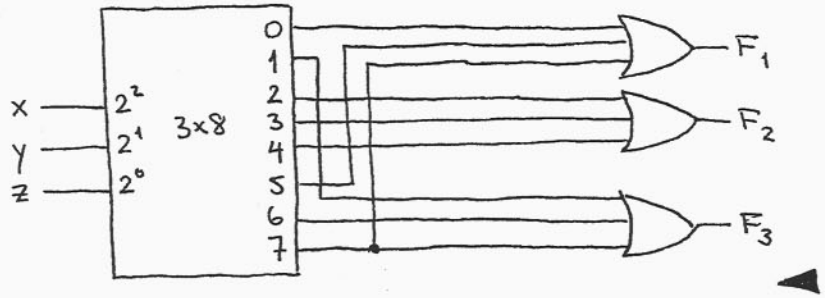


$F_2 = \Sigma(2, 3, 4)$

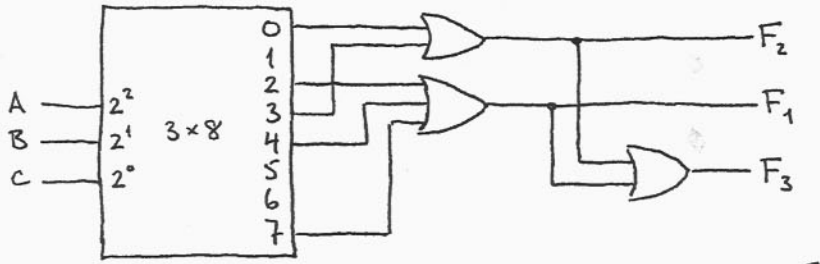


$F_3 = \Sigma(1, 6, 7)$

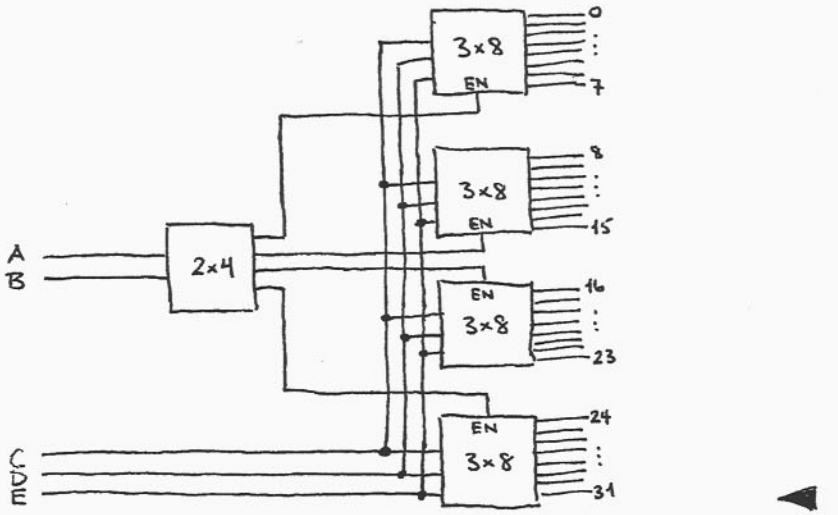
5. cont'd.



6.

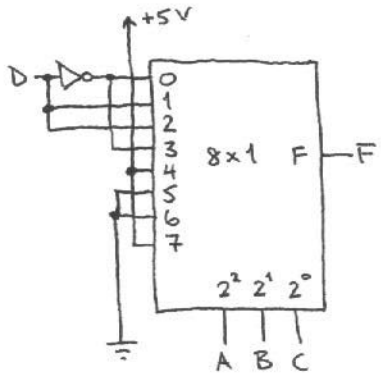


7.



8.

A	B	C	D	F	
0	0	0	0	1	$F=\bar{D}$
0	0	0	1	0	
0	0	1	0	0	$F=D$
0	0	1	1	1	
0	1	0	0	0	$F=D$
0	1	0	1	1	
0	1	1	0	1	$F=\bar{D}$
0	1	1	1	0	
1	0	0	0	1	$F=1$
1	0	0	1	1	
1	0	1	0	0	$F=0$
1	0	1	1	0	
1	1	0	0	0	$F=0$
1	1	0	1	0	
1	1	1	0	1	$F=1$
1	1	1	1	1	



a type 1 implementation. ◀

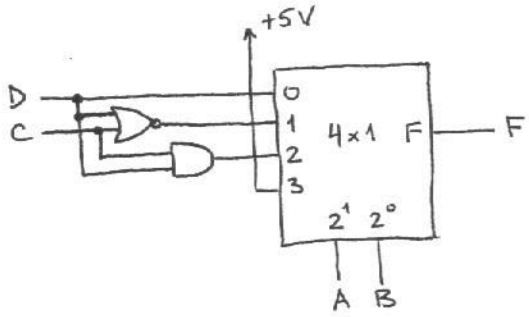
9.

A	B	C	D	F	
0	0	0	0	0	0
0	0	0	1	1	
0	0	1	0	0	1
0	0	1	1	0	
0	1	0	0	0	2
0	1	0	1	0	
0	1	1	0	1	3
0	1	1	1	1	
1	0	0	0	0	4
1	0	0	1	1	
1	0	1	0	1	5
1	0	1	1	1	
1	1	0	0	1	6
1	1	0	1	0	
1	1	1	0	0	7
1	1	1	1	0	

$F = \Sigma(1, 6, 7, 9, 10, 11, 12)$ ◀

10.

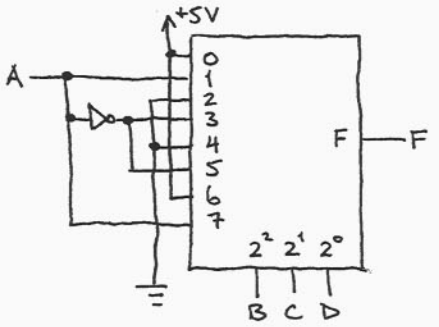
A	B	C	D	F	
0	0	0	0	0	
0	0	0	1	1	$F=D$
0	0	1	0	0	
0	0	1	1	1	
0	1	0	0	1	
0	1	0	1	0	$F=\overline{C+D}$
0	1	1	0	0	
0	1	1	1	0	
1	0	0	0	0	
1	0	0	1	0	$F=CD$
1	0	1	0	0	
1	0	1	1	1	
1	1	0	0	1	
1	1	0	1	1	$F=1$
1	1	1	0	1	
1	1	1	1	1	



a type 2 implementation. ◀

8.

$\bar{A}$	⓪	1	2	③	4	⑤	⑥	7
A	⑧	⑨	10	11	12	13	⑭	⑮
	1	A	0	$\bar{A}$	0	$\bar{A}$	1	A



Other solutions exist depending on the choice of select inputs.

9. $F(A,B,C,D) = \sum (1,6,7,9,10,11,12)$

$F(D,A,B,C) = \sum (3,5,6,8,11,12,13)$

The first form is preferable. When using any other order of variables (such as D, A, B, C) they must be explicitly stated.

10.

$\bar{A}\bar{B}$	0	①	2	③
$\bar{A}B$	④	5	6	7
$A\bar{B}$	8	9	10	⑪
AB	⑫	⑬	⑭	⑮
	B		AB	

$\bar{A}\bar{B}+AB$ $A+\bar{B}$ — you may know this as $A \rightarrow B$ in logic

$= A \odot B$