

Base-10 Counter:

ABCD	A*B*C*D*	
	x = 0	x = 1
0000	0001	1001
0001	0010	0000
0010	0011	0001
0011	0100	0010
0100	0101	0011
0101	0110	0100
0110	0111	0101
0111	1000	0110
1000	1001	0111
1001	0000	1000

Handwritten Karnaugh maps and Boolean expressions for a Base-10 Counter.

A* (x=0 and x=1):

For x=0, the K-map shows 1s at (0,0,1,0), (0,1,0,1), (1,0,0,1), and (1,1,0,1). The expression is $A^* = x'(AD + BCD) + x(AD + A'B'C'D')$.

B* (x=0 and x=1):

For x=0, the K-map shows 1s at (0,0,0,1), (0,0,1,0), (0,1,0,1), (0,1,1,0), (1,0,0,1), (1,0,1,0), (1,1,0,1), and (1,1,1,0). The expression is $B^* = x'(BC' + BD' + B'CD) + x(BD + BC + AD')$.

C* (x=0 and x=1):

For x=0, the K-map shows 1s at (0,0,0,1), (0,0,1,0), (0,1,0,1), (0,1,1,0), (1,0,0,1), (1,0,1,0), (1,1,0,1), and (1,1,1,0). The expression is $C^* = x'(CD' + A'C'D) + x(CD + AD' + BC'D')$.

D* (x=0 and x=1):

For x=0, the K-map shows 1s at (0,0,0,1), (0,0,1,0), (0,1,0,1), (0,1,1,0), (1,0,0,1), (1,0,1,0), (1,1,0,1), and (1,1,1,0). The expression is $D^* = x(D') + x'(D') = D'$.

Base-6 Counter:

ABC	A*B*C*	
	x = 0	x = 1
000	001	101
001	010	000
010	011	001
011	100	010
100	101	011
101	000	100

Handwritten Karnaugh maps and Boolean expressions for a Base-6 Counter.

Map 1: A (x=0, x=1)

AB \ C	00	01	11	10
0	0	0	1	1
1	1	1	0	0

$$A = x'(AC' + BC) + x(AC + A'B'C')$$

Map 2: B (x=0, x=1)

AB \ C	00	01	11	10
0	0	1	1	0
1	1	0	0	1

$$B = x'(BC' + A'B'C) + x(AC' + BC)$$

Map 3: C* (x=0, x=1)

AB \ C	00	01	11	10
0	1	1	1	1
1	0	0	0	0

$$C^* = x'(C') + x(C') = C'$$

Small Table:

0	2	6	4
1	3	7	5