

February 13, 2026

* Simplifying Boolean Expressions

$$\begin{aligned} \text{Q.1} \quad & A + AB \\ &= A(1+B) \\ &= A1 \\ &= A \end{aligned}$$

$$\begin{aligned} \text{Q.2} \quad & AB + A\bar{B} \\ &= A(B + \bar{B}) \\ &= A1 \\ &= A \end{aligned}$$

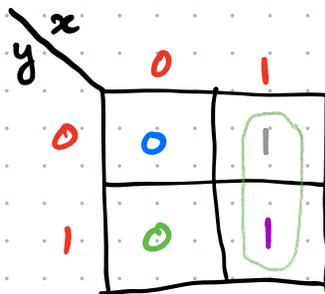
$$\begin{aligned} \text{Q.3} \quad & A + \bar{A}B \\ &= (A + \bar{A})(A + B) \\ &= 1(A + B) \\ &= A + B \end{aligned} \quad \left. \begin{aligned} &= AA + AB + \bar{A}A + \bar{A}B \\ &= A + (\bar{A} + A)B \end{aligned} \right\} \begin{aligned} & \text{?} \\ & \cdot \end{aligned}$$

$$\begin{aligned} \text{Q.4} \quad & ABC + AB\bar{C} \\ &= AB(C + \bar{C}) \\ &= AB \end{aligned}$$

$$\text{Q.5} \quad XY + \bar{X}Z + YZ$$

* Karnaugh Maps

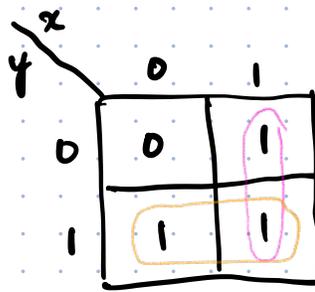
(i)	x	y	$xy + x\bar{y}$
	0	0	0
	0	1	0
	1	0	1
	1	1	1



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

(ii)

x	y	$xy + x'y + xy'$
0	0	0
0	1	1
1	0	1
1	1	1



$$xy + x'y + xy' = x + y$$

(iii) Expressions involving 3 variables: x, y, z

Gray Code

0 0
0 1
1 1
1 0

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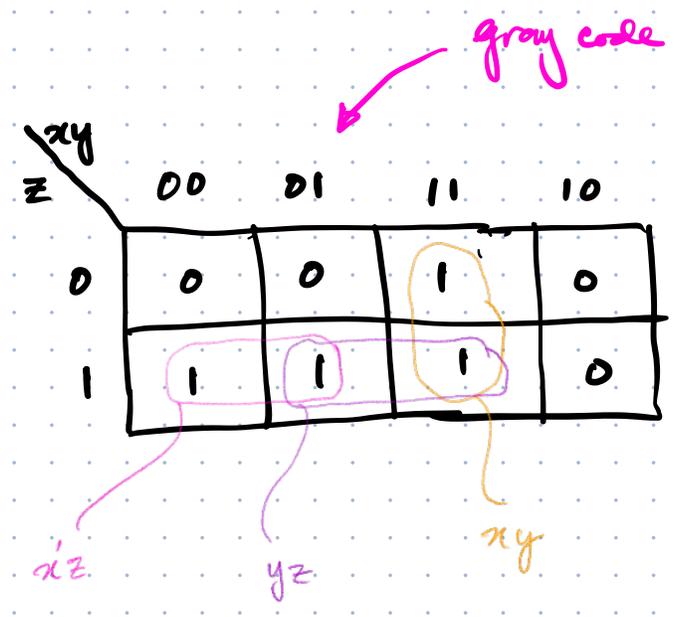
Between any two consecutive numbers (binary patterns) only 1 bit flips.

Gray Code

0 0 0
0 0 1
0 1 1
0 1 0
1 1 0
1 1 1
1 0 1
1 0 0

(iv)

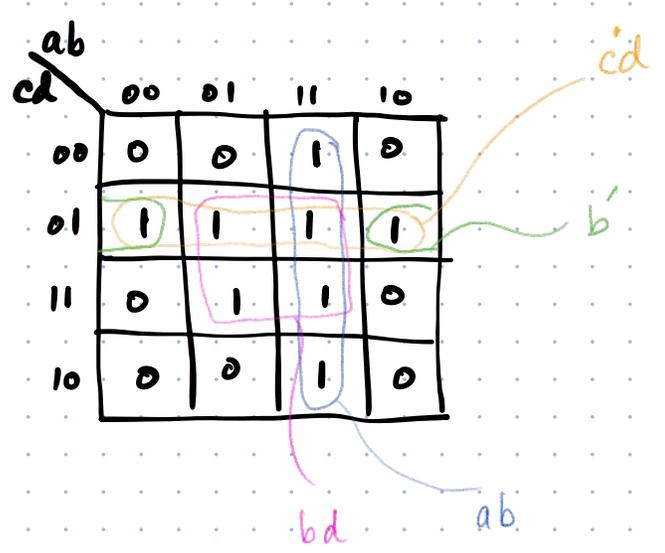
x	y	z	$xy + x'z + yz$
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1



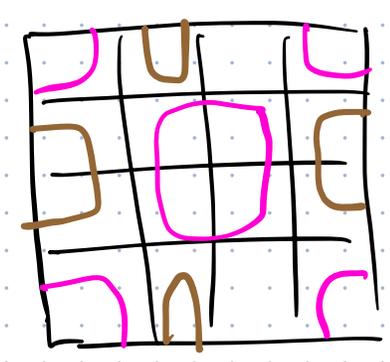
$$xy + x'z + yz = x'z + xy$$

(v) K-map for 4-variables.

$$f(a,b,c,d) = abc'd' + abc'd + abcd + abcd' + a'b'c'd + a'b'cd + a'b'c'd' + a'b'cd' = bd + ab + b'$$



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* Exercise

ab \ cd	00	01	11	10
00	1	0	0	1
01	0	0	0	1
11	0	0	0	1
10	1	0	0	1

$b'd'$ (green)
 abc' (red)
 ab' (pink)

$b'd' + ab'$

acd'

ab \ cd	00	01	11	10
00	0	1	1	0
01	0	1	1	0
11	0	1	1	0
10	0	1	1	0

b (pink)

ab \ cd	00	01	11	10
00	1	0	1	1
01	1	0	0	1
11	1	0	0	1
10	1	0	0	1

b' (pink)