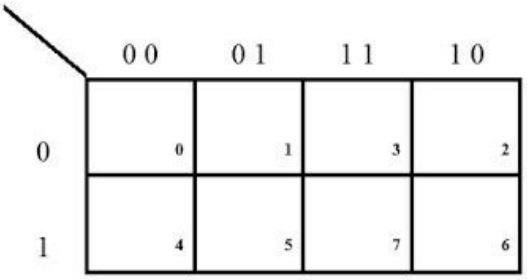
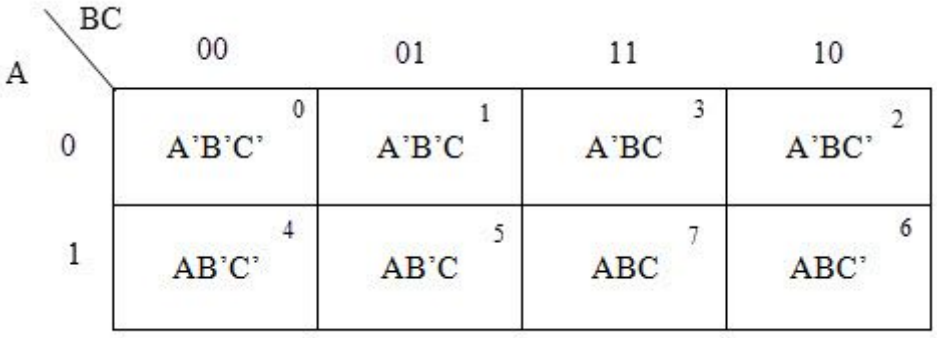
These exercises will focus primarily on the Karnaugh Maps type of exercise.

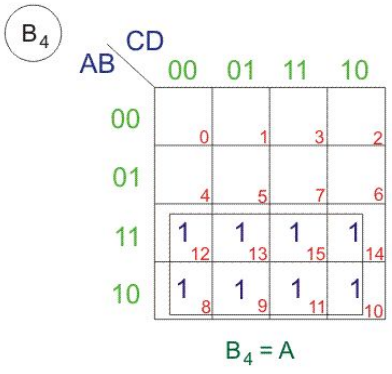
Please remember that all K-maps respect the Gray code arrangement which in essence means that nearest neighbours in the **K-map** differ from one-another by only one bit. This means that the images of products of predicates (A and B and ...) on the **K-map** are connected subsets of the **K-map** as long as you define the **K-map** on the surface of a torus - so you can spot these factors easily.
For example:



And



And if we considered more inputs



And always remember if you see a zero (0) inside one of the cells of a K-map you are to ignore the inputs of that cell! You are only considered what leads to one (1).

1.

Obtain a simplified expression for a Boolean function F(X, Y, Z), the Karnaugh map for which is given bellow :

X \ YZ	00	01	11	10
0		1	1	
1		1	1	

2.

Using the Karnaugh technique obtain the simplified expression as sum of products for the following map.

X \ YZ	00	01	11	10
0			1	1
1			1	1

3.

Obtain the simplified expression in the sum of products form, for the Boolean function F(X, Y, Z), Karnaugh map for which is given below :

X \ YZ	00	01	11	10
0				1
1	1			1

4.

Minimize the following function using a Karnaugh map : F(W, X, Y, Z) = ∑(0, 4, 8, 12).

WX \ YZ	[00]Y'Z'	[01]Y'Z	[11]YZ	[10]YZ'
[00]W'X'	1 (0)	0 (1)	0 (3)	0 (2)
[01]W'X	1 (4)	0 (5)	0 (7)	0 (6)
[11]WX	1 (12)	0 (13)	0 (15)	0 (14)
[10]WX'	1 (8)	0 (9)	0 (11)	0 (10)

5.

Draw and simplify the Karnaugh Maps of X, Y, Z for :

(a) $m_0 + m_1 + m_5 + m_7$ (b) $F = \sum(1, 3, 5, 4, 7)$ (c) $m_0 + m_2 + m_4 + m_6$

6.

Using K-map, derive minimal product of sums expression for the F(X, Y, Z) whose truth table is given below :

X	Y	Z	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

7.

Using map, simplify the following expression, using sum-of-products form :

(a) A'B'C'+ AB'C'+ ABC + A'B'C

(b) ABCD + A'B'C'D + A'BCD + A'B'CD + ABCD'

8.

A truth table has four input variables. The first eight outputs are 0s, and the last eight outputs are 1s. Draw the Karnaugh map.

9.

Draw logic circuit for the following using k-maps :

(i) F(A, B, C, O) = ∑(1, 3, 5, 9, 10) **(ii) F(A, B, C) = π(0, 2, 4, 5)**

(iii) F(A, B, C) = ∑(1, 2, 4, 6, 7) **(iv) F(A, B, C) = π(1, 3, 5, 7)**

10.

Reduce the following Boolean expression using K-map

F(A, B, ,C, D) = ∑(0,2,3,4,5,6,7,8,10,12)