Minimization I

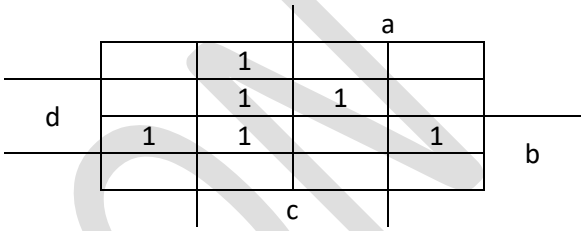
Please do the following exercises individually.

1. Creating Truth Tables

You have got the numbers 0 to 15. Which one are prime numbers?

n	a	b	c	d	ϕ(a,b,c,d)
0	0	0	0	0	0
1	0	0	0	1	0
2	0	0	1	0	**1**
3	0	0	1	1	**1**
4	0	1	0	0	0
5	0	1	0	1	**1**
6	0	1	1	0	0
7	0	1	1	1	**1**
8	1	0	0	0	0
9	1	0	0	1	0
10	1	0	1	0	0
11	1	0	1	1	**1**
12	1	1	0	0	0
13	1	1	0	1	**1**
14	1	1	1	0	0
15	1	1	1	1	0

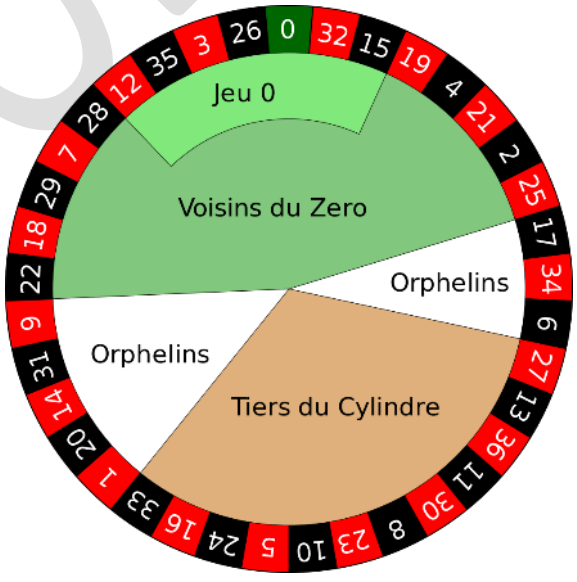
Solution of Minimization II:



$\varphi(a,b,c,d) = (\neg a \wedge \neg b \wedge c) \vee (\neg a \wedge c \wedge d) \vee (\neg b \wedge c \wedge d) \vee (b \wedge \neg c \wedge d)$

2. Creating Truth Tables

Which numbers of a French roulette[1] are red?



[1] Source: https://commons.wikimedia.org/wiki/File:European_roulette_wheel.svg

n	a	b	c	d	e	f	ϕ(a,b,c,d)
0	0	0	0	0	0	0	0
1	0	0	0	0	0	1	**1**
2	0	0	0	0	1	0	0
3	0	0	0	0	1	1	**1**
4	0	0	0	1	0	0	0
5	0	0	0	1	0	1	**1**
6	0	0	0	1	1	0	0
7	0	0	0	1	1	1	**1**
8	0	0	1	0	0	0	0
9	0	0	1	0	0	1	**1**
10	0	0	1	0	1	0	0
11	0	0	1	0	1	1	0
12	0	0	1	1	0	0	**1**
13	0	0	1	1	0	1	0
14	0	0	1	1	1	0	0
15	0	0	1	1	1	1	0

n	a	b	c	d	e	f	ϕ(a,b,c,d)
16	0	1	0	0	0	0	**1**
17	0	1	0	0	0	1	0
18	0	1	0	0	1	0	**1**
19	0	1	0	0	1	1	**1**
20	0	1	0	1	0	0	0
21	0	1	0	1	0	1	**1**
22	0	1	0	1	1	0	0
23	0	1	0	1	1	1	**1**
24	0	1	1	0	0	0	0
25	0	1	1	0	0	1	**1**
26	0	1	1	0	1	0	0
27	0	1	1	0	1	1	**1**
28	0	1	1	1	0	0	0
29	0	1	1	1	0	1	0
30	0	1	1	1	1	0	**1**
31	0	1	1	1	1	1	0

n	a	b	c	d	e	f	ϕ(a,b,c,d)
32	1	0	0	0	0	0	**1**
33	1	0	0	0	0	1	0
34	1	0	0	0	1	0	**1**
35	1	0	0	0	1	1	0
36	1	0	0	1	0	0	1
37	1	0	0	1	0	1	X
38	1	0	0	1	1	0	X
…	…	…	…	…	…	…	…
63	1	1	1	1	1	1	X

NB: Truth table has been broken into three parts. Minimization by Karnaugh map is too complex.

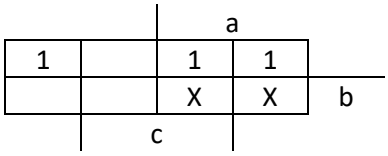
3. Creating Truth Tables

Which one of these dolls[1] is taller that the green one?

0 1 2 3 4 5

n	a	b	c	ϕ(a,b,c)
0	0	0	0	**1**
1	0	0	1	0
2	0	1	0	0
3	0	1	1	0
4	1	0	0	**1**
5	1	0	1	**1**
6	1	1	0	X
7	1	1	1	X

Solution of Minimization II:



$\varphi(a,b,c) = a \vee (\neg b \wedge \neg c)$

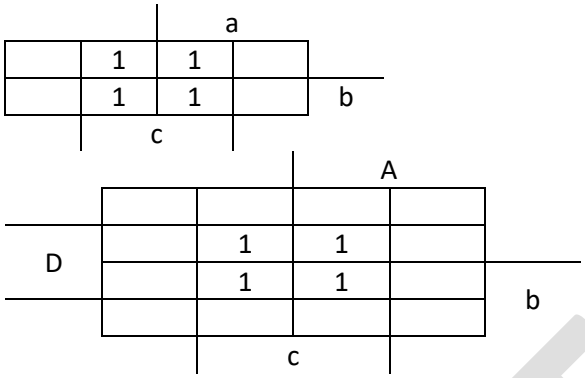
[1] Source: https://openclipart.org/detail/317624/matryoshka-dolls-by-maria-alberto

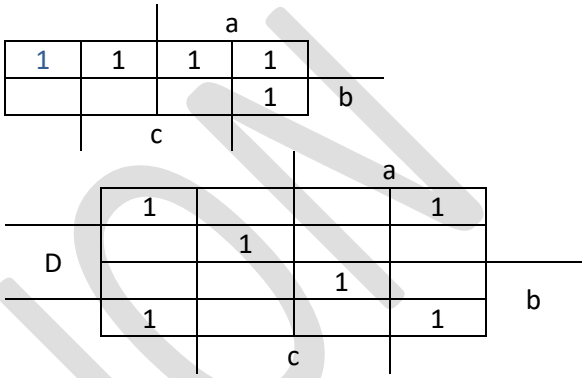
Minimization II

Please do the following exercises individually.

1. Karnaugh Maps

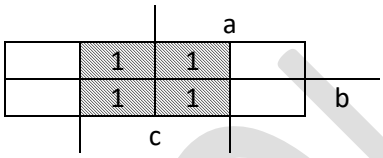
Please make standard Karnaugh maps for the follow disjunctive normal forms.

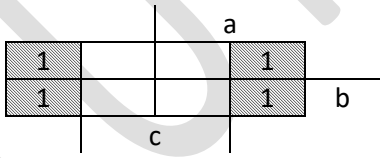


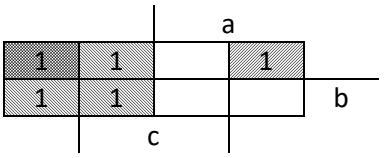


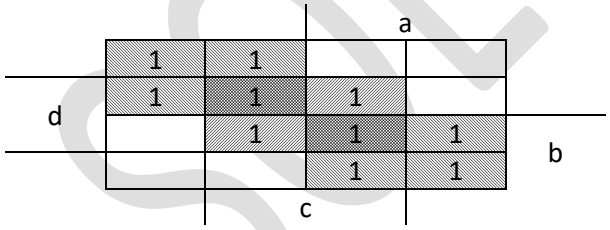
2. Finding Blocks

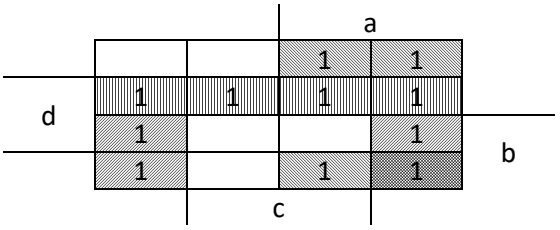
Please minimize the following Karnaugh maps.











$\phi(a,b,c) = c$

$\chi(ab,c) = \neg c$

$\psi(a,b,c) = \neg a \vee (\neg b \wedge \neg c)$

$\xi(a,b,c,d) = (\neg a \wedge \neg b) \vee (c \wedge d) \vee (a \wedge b)$

$\zeta(a,b,c,d) = (a \wedge \neg d) \vee (\neg b \wedge d) \vee (b \wedge \neg c)$