

Minimization I

Please do the following exercises individually.

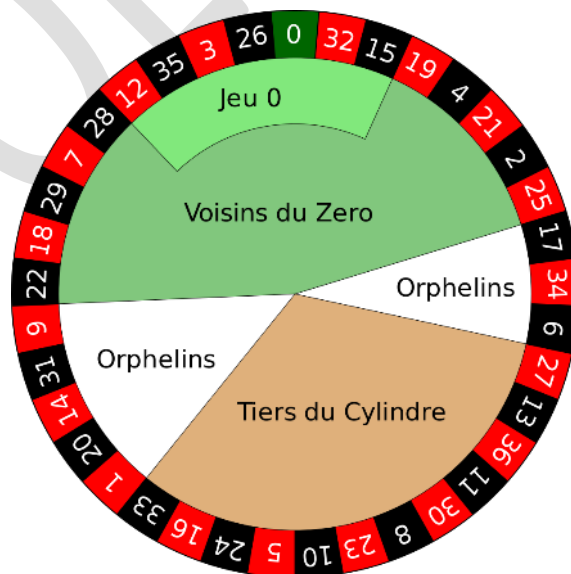
Creating Truth Tables

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

n	a	b	c	d	$\varphi(a,b,c,d)$
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

Creating Truth Tables

Which numbers of a French roulette¹ are red?



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

n	a	b	c	d	e	f	$\varphi(a,b,c,d)$
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	$\varphi(a,b,c,d)$
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	$\varphi(a,b,c,d)$
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.

Creating Truth Tables

Which one of these dolls¹ is taller than the green one?



n	A	b	c	$\varphi(a,b,c,d)$
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

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

Minimization II

Please do the following exercises individually.

Karnaugh Maps

Please try to make your own nonstandard Karnaugh maps for two, three and four propositional variables without using your notes.

Karnaugh Maps

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

	a		
	1	1	
	1	1	
	c		b

	a			
1	1	1	1	
			1	
	c			b

		A		
		1	1	
D		1	1	
		c		b

	a			
	1			1
		1		
D			1	
	1			1
	c			b

Minimization

Please minimize the following Karnaugh maps.

	a		
	1	1	
	1	1	
	c		b

	a		
	1		1
	1		1
	c		b

	a			
	1	1		1
	1	1		
	c			b

	a			
	1	1		
	1	1	1	
d		1	1	1
		1	1	1
		c		b

	a			
		1	1	
	1	1	1	1
d	1			1
	1			1
	c			b

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

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

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

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

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