BCD (digital display)

Following the example covered in class, get the simplified of a

⇒ A clock face with all lights turned off

A digital clock face is a grid of lights:

⇒ A clock face representing the number 7 with 3 lights turned on

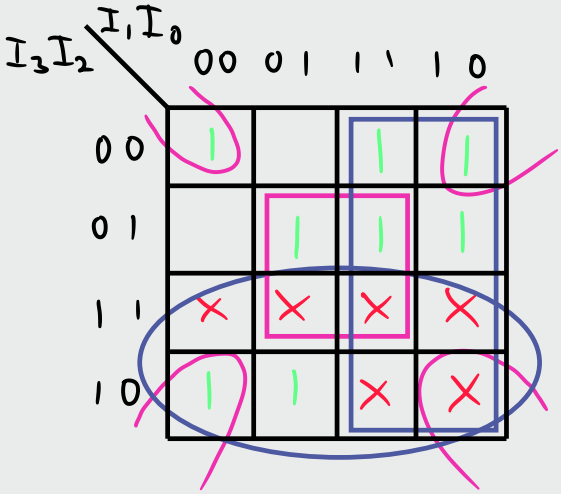
So we can assign a variable to each light to control which turns on to represent any number 0-9

I_3	I_2	I_1	I_0	Decimal number that we want to represent	a	b	c	d	e	f	g
0	0	0	0	0	1	1	1	1	1	1	0
0	0	0	1	1	0	1	1	0	0	0	0
0	0	1	0	2	1	1	0	1	1	0	1
0	0	1	1	3	1	1	1	1	0	0	1
0	1	0	0	4	0	1	1	0	0	1	1
0	1	0	1	5	1	0	1	1	0	1	1
0	1	1	0	6	1	0	1	1	1	1	1
0	1	1	1	7	1	1	1	0	0	0	0
1	0	0	0	8	1	1	1	1	1	1	1
1	0	0	1	9	1	1	1	0	0	1	1
1	0	1	0	X	X	X	X	X	X	X	X
⋮				⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
1	1	1	1	X	X	X	X	X	X	X	X

Don't Cares

we don't use these

Since we want the boolean expression that outputs a, we select select the entire column of a and feed it to a k-map



$$I_2'I_0' + I_2I_0 + I_3 + I_1$$

↳ Simplified expression of a

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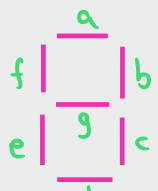
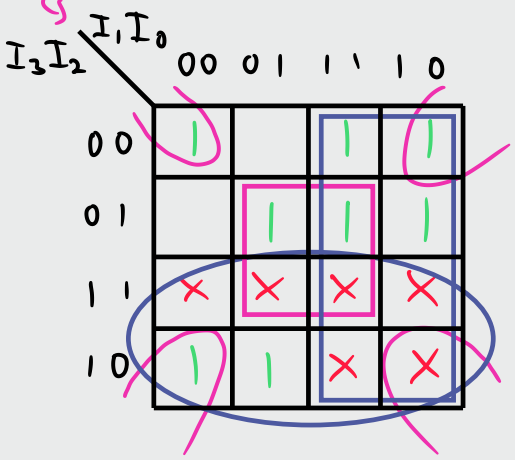


I_3	I_2	I_1	I_0	Decimal # that we want to represent	a	b	c	d	e	f	g
0	0	0	0	0	1	1	1	1	1	1	0
0	0	0	1	1	0	1	1	0	0	0	0
0	0	1	0	2	1	1	0	1	1	0	1
0	0	1	1	3	1	1	1	1	0	0	1
0	1	0	0	4	0	1	1	0	0	1	1
0	1	0	1	5	1	0	1	1	0	1	1
0	1	1	0	6	1	0	1	1	1	1	1
0	1	1	1	7	1	1	1	0	0	0	0
1	0	0	0	8	1	1	1	1	1	1	1
1	0	0	1	9	1	1	1	0	0	1	1
1	0	1	0	X	x	x	x	x	x	x	x
⋮				⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
1	1	1	1	X	x	x	x	x	x	x	x

Don't Cares

↳ we don't use these

Since we want the boolean expression that outputs g, we select the entire column of a and feed it to a K-map.



$$I_2'I_0' + I_2I_0 + I_3 + I_1$$

↳ simplified expression of a