BCD (digital display)

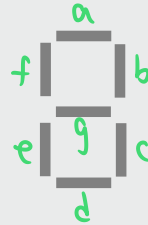A digital clock face is a grid of lights:

⇒ A clock face with all lights turned off

⇒ 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

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 a
f   b
 g
e   c
 d
```

Problem statement:

Find the simplified expression of a

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

To represent the number 0, we want to turn on all lights except for light g

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

K-map:

$I_3 I_2$ \ $I_1 I_0$

	00	01	11	10
00	1		1	1
01		1	1	1
11	X	X	X	X
10	1	1	X	X

$$\boxed{I_2' I_0' + I_2 I_0 + I_3 + I_1}$$

↳ Simplified expression of a