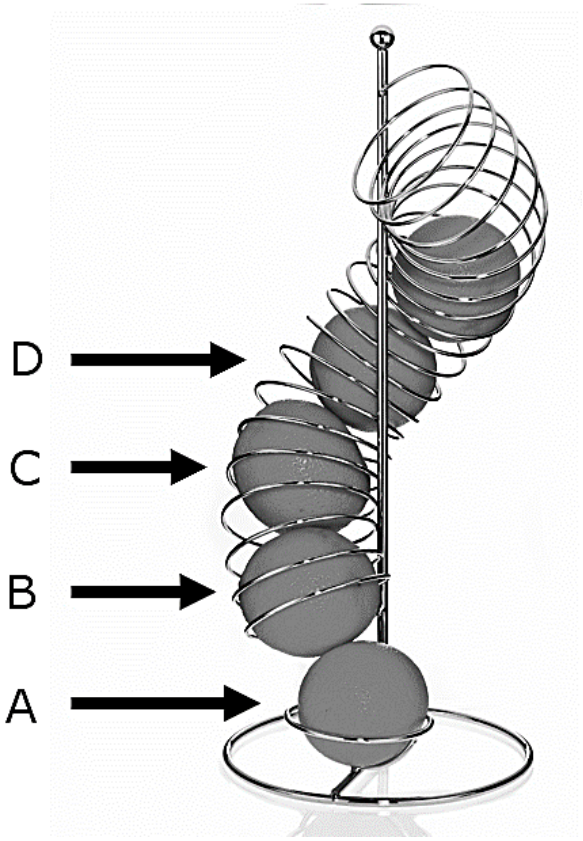
You've been asked to design some logic to monitor a fancy new orange dispenser, similar to the one shown here. Oranges are loaded in the top, roll down, and get removed from the bottom.



Positions marked A, B, C, and D are equipped with sensors that indicate whether or not an orange is present ('1' = orange present).

Your logic should take signals A, B, C, and D, and produce a signal T that is active when exactly three oranges are present.

You should assume that oranges never get stuck, so e.g. an orange can't be at location D without one also being at C. Use that fact to simplify your logic.

Provide your answer as a Boolean expression.

There are many sets of inputs that are impossible. If a set of inputs is impossible, the output (at least for something as non-critical as an orange indicator) doesn't matter.

D	C	B	A	T
0	0	0	0	0
0	0	0	1	0
0	0	1	0	X
0	0	1	1	0
0	1	0	0	X
0	1	0	1	X
0	1	1	0	X
0	1	1	1	1
1	0	0	0	X
1	0	0	1	X
1	0	1	0	X
1	0	1	1	X
1	1	0	0	X
1	1	0	1	X
1	1	1	0	X
1	1	1	1	0

A K-map could be used to derive

$T = C \cdot \overline{D}$

and if you think about that for a second, it should make sense.