Quine-McCluskey with Don't Cares (G)

When "**don't cares**" are added to a function to be solved by the Quine-McCluskey Tabular

Reduction, the designer begins the problem solution in the same manner as with non-don't care problems.

The "**don't cares**" are **treated just like min-terms up until**

the creation of the Prime Implicant table.

At this point, the solution method changes slightly. The min-terms are listed along the top of the **PI** table

as before, but the "**don't cares**" **are NOT listed**. They are treated as if they never existed. I repeat:

> You don't list Don't Cares from the given function expression along the top of the PI table. PI's that consist of ONLY Don't Cares are indicated by empty rows in the table and are lined out.

Quine-McCluskey Don't Care Example:

Problem Statement: Minimize the following expression into an SOP expression.

$$f(A,B,C,D,E) = \sum m(5,7,11,12,27,29) + \sum d(14,20,21,22,23)$$

2−1s	5 √	5,7(2)	
	12 √	5,21(16)	
	20 √	12,14(2)	
		20,21(1)	
		20,22(2)	
3−1s	7 √	7,23(16)	
	11 √	11,27(16)	
	14 √	21,23(2)	
	21 √	21,29(8)	
	22 √	22,23(1)	
4−1s	23 √		
	27 √	✗	
	29 √		

The **min-terms** and **Don't Cares** are ordered by their **# of 1's** as usual.

Note that the source of the term, **min-term or Don't Care**, is not visible in this part of the problem.

2−1s	5 √	5,7(2) √		20,21,22,23(1,2) **PI**
	12 √	5,21(16) √		5,7,21,23(2,16) **PI**
	20 √	12,14(2) **PI**		~~20,22,21,23(2,1)~~
		20,21(1) √		~~5,21,7,23(16,2)~~
		20,22(2) √		
3−1s	7 √	7,23(16) √		**Don't** forget that if it did not get checked off then it has to go into the PI table (unless it turns out to be completly made up of Don't Cares)
	11 √	11,27(16) **PI**		
	14 √	21,23(2) √		
	21 √	21,29(8) **PI**		
	22 √	22,23(1) √		
4−1s	23 √			
	27 √	✗		
	29 √			

Example Continues on the Next Page)

Example Continues)

PI Table

			√	√	√	√	√	√
			5	7	11	12	27	29
Don't Cares Only	~~20,21,22,23~~	(1,2)						
EPI	5,7,21,23	(2,16)	☒	☒				
EPI	12,14	(2)				☒		
EPI	11,27	(16)			☒		☒	
EPI	21,29	(8)						☒

As promised, the Don't Cares were left off from the top of the PI Table. Along with that, the term that had an empty row was indicative of being made up of ONLY DON'T CARES. It was lined out.

			16	8	4	2	1	
			A	B	C	D	E	Boolean
EPI	5,7,21,23	(2,16)	–	0	1	–	1	$\bar{B}CE$
EPI	12,14	(2)	0	1	1	–	0	$\bar{A}BC\bar{E}$
EPI	11,27	(16)	–	1	0	1	1	$B\bar{C}DE$
EPI	21,29	(8)	1	–	1	0	1	$AC\bar{D}E$

$$f(A,B,C,D,E) = \bar{B}CE + \bar{A}BC\bar{E} + B\bar{C}DE + AC\bar{D}E$$