

# Quine–McCluskey algorithm

The function that is minimized can be entered via a truth table that represents the function  $y = f(x_n, \dots, x_1, x_0)$ . You can manually edit this function by clicking on the gray elements in the  $y$  column. Alternatively, you can generate a random function by pressing the "Random example" button.

Random example

Number of input variables: 7 ▼

Allow Don't-Care: no ▼

Truth table:

Implicants (Order 0):

	$x_6$	$x_5$	$x_4$	$x_3$	$x_2$	$x_1$	$x_0$	$y$
0:	0	0	0	0	0	0	0	0
1:	0	0	0	0	0	0	1	0
2:	0	0	0	0	0	1	0	0
3:	0	0	0	0	0	1	1	0
4:	0	0	0	0	1	0	0	0
5:	0	0	0	0	1	0	1	0
6:	0	0	0	0	1	1	0	0
7:	0	0	0	0	1	1	1	1
8:	0	0	0	1	0	0	0	0
9:	0	0	0	1	0	0	1	0
10:	0	0	0	1	0	1	0	0
11:	0	0	0	1	0	1	1	0
12:	0	0	0	1	1	0	0	0
13:	0	0	0	1	1	0	1	0
14:	0	0	0	1	1	1	0	0
15:	0	0	0	1	1	1	1	0
16:	0	0	1	0	0	0	0	0
17:	0	0	1	0	0	0	1	1
18:	0	0	1	0	0	1	0	0
19:	0	0	1	0	0	1	1	0
20:	0	0	1	0	1	0	0	0
21:	0	0	1	0	1	0	1	0
22:	0	0	1	0	1	1	0	0
23:	0	0	1	0	1	1	1	1
24:	0	0	1	1	0	0	0	0
25:	0	0	1	1	0	0	1	0
26:	0	0	1	1	0	1	0	0
27:	0	0	1	1	0	1	1	0
28:	0	0	1	1	1	0	0	0
29:	0	0	1	1	1	0	1	0
30:	0	0	1	1	1	1	0	0
31:	0	0	1	1	1	1	1	1
32:	0	1	0	0	0	0	0	0
33:	0	1	0	0	0	0	1	0
34:	0	1	0	0	0	1	0	0
35:	0	1	0	0	0	1	1	0
36:	0	1	0	0	1	0	0	0
37:	0	1	0	0	1	0	1	0
38:	0	1	0	0	1	1	0	0
39:	0	1	0	0	1	1	1	0
40:	0	1	0	1	0	0	0	0
41:	0	1	0	1	0	0	1	1
42:	0	1	0	1	0	1	0	0
43:	0	1	0	1	0	1	1	0

	$x_6$	$x_5$	$x_4$	$x_3$	$x_2$	$x_1$	$x_0$	
7:	0	0	0	0	1	1	1	→
17:	0	0	1	0	0	0	1	✓
23:	0	0	1	0	1	1	1	→
31:	0	0	1	1	1	1	1	→
41:	0	1	0	1	0	0	1	✓
71:	1	0	0	0	1	1	1	→
73:	1	0	0	1	0	0	1	→
79:	1	0	0	1	1	1	1	→
89:	1	0	1	1	0	0	1	→
97:	1	1	0	0	0	0	1	→
103:	1	1	0	0	1	1	1	→
113:	1	1	1	0	0	0	1	→
127:	1	1	1	1	1	1	1	✓

44:	0	1	0	1	1	0	0	0
45:	0	1	0	1	1	0	1	0
46:	0	1	0	1	1	1	0	0
47:	0	1	0	1	1	1	1	0
48:	0	1	1	0	0	0	0	0
49:	0	1	1	0	0	0	1	0
50:	0	1	1	0	0	1	0	0
51:	0	1	1	0	0	1	1	0
52:	0	1	1	0	1	0	0	0
53:	0	1	1	0	1	0	1	0
54:	0	1	1	0	1	1	0	0
55:	0	1	1	0	1	1	1	0
56:	0	1	1	1	0	0	0	0
57:	0	1	1	1	0	0	1	0
58:	0	1	1	1	0	1	0	0
59:	0	1	1	1	0	1	1	0
60:	0	1	1	1	1	0	0	0
61:	0	1	1	1	1	0	1	0
62:	0	1	1	1	1	1	0	0
63:	0	1	1	1	1	1	1	0
64:	1	0	0	0	0	0	0	0
65:	1	0	0	0	0	0	1	0
66:	1	0	0	0	0	1	0	0
67:	1	0	0	0	0	1	1	0
68:	1	0	0	0	1	0	0	0
69:	1	0	0	0	1	0	1	0
70:	1	0	0	0	1	1	0	0
71:	1	0	0	0	1	1	1	1
72:	1	0	0	1	0	0	0	0
73:	1	0	0	1	0	0	1	1
74:	1	0	0	1	0	1	0	0
75:	1	0	0	1	0	1	1	0
76:	1	0	0	1	1	0	0	0
77:	1	0	0	1	1	0	1	0
78:	1	0	0	1	1	1	0	0
79:	1	0	0	1	1	1	1	1
80:	1	0	1	0	0	0	0	0
81:	1	0	1	0	0	0	1	0
82:	1	0	1	0	0	1	0	0
83:	1	0	1	0	0	1	1	0
84:	1	0	1	0	1	0	0	0
85:	1	0	1	0	1	0	1	0
86:	1	0	1	0	1	1	0	0
87:	1	0	1	0	1	1	1	0
88:	1	0	1	1	0	0	0	0
89:	1	0	1	1	0	0	1	1
90:	1	0	1	1	0	1	0	0
91:	1	0	1	1	0	1	1	0
92:	1	0	1	1	1	0	0	0
93:	1	0	1	1	1	0	1	0
94:	1	0	1	1	1	1	0	0
95:	1	0	1	1	1	1	1	0
96:	1	1	0	0	0	0	0	0
97:	1	1	0	0	0	0	1	1
98:	1	1	0	0	0	1	0	0
99:	1	1	0	0	0	1	1	0

100:	1	1	0	0	1	0	0	0
101:	1	1	0	0	1	0	1	0
102:	1	1	0	0	1	1	0	0
103:	1	1	0	0	1	1	1	1
104:	1	1	0	1	0	0	0	0
105:	1	1	0	1	0	0	1	0
106:	1	1	0	1	0	1	0	0
107:	1	1	0	1	0	1	1	0
108:	1	1	0	1	1	0	0	0
109:	1	1	0	1	1	0	1	0
110:	1	1	0	1	1	1	0	0
111:	1	1	0	1	1	1	1	0
112:	1	1	1	0	0	0	0	0
113:	1	1	1	0	0	0	1	1
114:	1	1	1	0	0	1	0	0
115:	1	1	1	0	0	1	1	0
116:	1	1	1	0	1	0	0	0
117:	1	1	1	0	1	0	1	0
118:	1	1	1	0	1	1	0	0
119:	1	1	1	0	1	1	1	0
120:	1	1	1	1	0	0	0	0
121:	1	1	1	1	0	0	1	0
122:	1	1	1	1	0	1	0	0
123:	1	1	1	1	0	1	1	0
124:	1	1	1	1	1	0	0	0
125:	1	1	1	1	1	0	1	0
126:	1	1	1	1	1	1	0	0
127:	1	1	1	1	1	1	1	1

Implicants (Order 1):

	$x_6$	$x_5$	$x_4$	$x_3$	$x_2$	$x_1$	$x_0$	
7, 23:	0	0	-	0	1	1	1	✓
7, 71:	-	0	0	0	1	1	1	✓
23, 31:	0	0	1	-	1	1	1	✓
71, 79:	1	0	0	-	1	1	1	✓
71, 103:	1	-	0	0	1	1	1	✓
73, 89:	1	0	-	1	0	0	1	✓
97, 113:	1	1	-	0	0	0	1	✓

Prime implicant chart:

	$x_6$	$x_5$	$x_4$	$x_3$	$x_2$	$x_1$	$x_0$	7	17	23	31	41	71	73	79	89	97	103	113	127	
7, 23:	0	0	-	0	1	1	1	○		○											$(\bar{x}_6\bar{x}_5\bar{x}_3x_2x_1x_0)$
7, 71:	-	0	0	0	1	1	1	○					○								$(\bar{x}_5\bar{x}_4\bar{x}_3x_2x_1x_0)$
23, 31:	0	0	1	-	1	1	1			○	●										$(\bar{x}_6\bar{x}_5x_4x_2x_1x_0)$
71, 79:	1	0	0	-	1	1	1						○		●						$(x_6\bar{x}_5\bar{x}_4x_2x_1x_0)$
71, 103:	1	-	0	0	1	1	1						○						●		$(x_6\bar{x}_4\bar{x}_3x_2x_1x_0)$
73, 89:	1	0	-	1	0	0	1							●		●					$(x_6\bar{x}_5x_3\bar{x}_2\bar{x}_1x_0)$
97, 113:	1	1	-	0	0	0	1										●		●		$(x_6x_5\bar{x}_3\bar{x}_2\bar{x}_1x_0)$
17:	0	0	1	0	0	0	1		●												$(\bar{x}_6\bar{x}_5x_4\bar{x}_3\bar{x}_2\bar{x}_1x_0)$
41:	0	1	0	1	0	0	1					●									$(\bar{x}_6x_5\bar{x}_4x_3\bar{x}_2\bar{x}_1x_0)$
127:	1	1	1	1	1	1	1													●	$(x_6x_5x_4x_3x_2x_1x_0)$

Extracted essential prime implicants:  $(\bar{x}_6\bar{x}_5x_4\bar{x}_3\bar{x}_2\bar{x}_1x_0)$ ,  $(\bar{x}_6\bar{x}_5x_4x_2x_1x_0)$ ,  $(\bar{x}_6x_5\bar{x}_4x_3\bar{x}_2\bar{x}_1x_0)$ ,  $(x_6\bar{x}_5x_3\bar{x}_2\bar{x}_1x_0)$ ,  $(x_6\bar{x}_5\bar{x}_4x_2x_1x_0)$ ,  $(x_6x_5\bar{x}_3\bar{x}_2\bar{x}_1x_0)$ ,  $(x_6\bar{x}_4\bar{x}_3x_2x_1x_0)$ ,  $(x_6x_5x_4x_3x_2x_1x_0)$

Reduced prime implicant chart (Iteration 0):

	$x_6$	$x_5$	$x_4$	$x_3$	$x_2$	$x_1$	$x_0$	7	
7, 23:	0	0	-	0	1	1	1	●	$(\bar{x}_6\bar{x}_5\bar{x}_3x_2x_1x_0)$

Extracted essential prime implicants:  $(\bar{x}_6\bar{x}_5\bar{x}_3x_2x_1x_0)$

**Minimal boolean expression:**

$$y = (\bar{x}_6\bar{x}_5x_4\bar{x}_3\bar{x}_2\bar{x}_1x_0) \vee (\bar{x}_6\bar{x}_5x_4x_2x_1x_0) \vee (\bar{x}_6x_5\bar{x}_4x_3\bar{x}_2\bar{x}_1x_0) \vee (x_6\bar{x}_5x_3\bar{x}_2\bar{x}_1x_0) \vee (x_6\bar{x}_5\bar{x}_4x_2x_1x_0) \vee (x_6x_5\bar{x}_3\bar{x}_2\bar{x}_1x_0) \vee (x_6\bar{x}_4\bar{x}_3x_2x_1x_0) \vee (x_6x_5x_4x_3x_2x_1x_0) \vee (\bar{x}_6\bar{x}_5\bar{x}_3x_2x_1x_0)$$

**Legend:**

Don't-care: ×

Implicant (non prime): →

Prime implicant: ✓

Essential prime implicant: ●

Prime implicant but covers only don't-care: (×)

The JavaScript source code can be found here: [qmc.js](https://www.mathematik.uni-marburg.de/~thormae/lectures/ti1/code/qmc.js).

This website is part of the lecture [Technical Computer Science](#).

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