

How to Simplify a Function Using a K-Map

We will focus on the **Sum-of-Products (SOP)** method, which involves looking for **1s** in the map.

Step 1: Create and Fill the Map

Draw the correct K-Map for your number of variables. Look at your function's truth table or list of minterms. Place a **1** in every cell that corresponds to an output of **1**. If there are "don't care" conditions, place an **X** in those cells. Leave all other cells blank (or you can think of them as **0s**).

Variabel		Y	
		0	1
X	0	1	X
	1	1	

Step 2: Group the 1s

This is the most important step. You need to draw loops around groups of adjacent **1s**. Follow these rules:

- **Group Size:** Groups must contain a power-of-two number of cells (1, 2, 4, 8, or 16). You cannot have a group of 3, 5, or 6 cells.
- **Adjacency:** You can only group cells that are adjacent, either horizontally or vertically. Remember the "wrap-around" rule for the edges.
- **Make Groups as Large as Possible:** Always try to make the biggest groups you can. A single group of four is better than two separate groups of two.
- **Cover All 1s:** Every 1 on the map must be included in at least one group. A 1 can be part of multiple groups if it helps to make other groups larger.
- **Use Fewest Groups:** Your final goal is to cover all the 1s using the smallest number of groups possible.

- **Using "Don't Cares" (X):** You can include an X in a group if it helps you make a larger group of 1s. If an X doesn't help create a bigger group, just ignore it and treat it as a 0.

Variabel		Y	
		0	1
X	0	1	X
	1	1	

Step 3: Write the Simplified Function

Each group you created will become one term in your final simplified function. To find the term for each group:

1. Look at the variables along the rows and columns for that group.
2. Find the variable(s) that do not change their value inside the group.
3. If a variable stays as 1 for the entire group, include it as is (e.g., A).
4. If a variable stays as 0 for the entire group, include it with a NOT (e.g., A').
5. If a variable changes its value (it is both 0 and 1) within the group, it is eliminated from that term.

The final simplified function is the OR (sum) of all the terms you derived from each group.

Revision #1

Created 2025-09-19 13:17:18 UTC by DY

Updated 2025-09-19 13:28:56 UTC by DY