

Diagram illustrating a 4-variable Karnaugh map (K-map) for variables X_1, X_2, X_3, X_4 . The map is a 4x4 grid with rows labeled X_3X_4 and columns labeled X_1X_2 . The output Y_1 is indicated by a line pointing to the top-left cell.

The K-map shows the output values (0 or 1) for each combination of X_1, X_2, X_3, X_4 . The output is 1 for all combinations where $X_1 = 1$ (the right half of the map, highlighted in red). The output is 0 for all combinations where $X_1 = 0$ (the left half of the map).

| | | X_1X_2 | | X_2 | | X_1 | |
|----------|----|-----------|-----------|-----------|-----------|-------|--|
| | | 00 | 01 | 11 | 10 | | |
| X_3X_4 | 00 | 0 0000 | 0 0100 | 1 1100 | 1 1000 | | |
| | 01 | 0 0001 | 0 0101 | 1 1101 | 1 1001 | | |
| | 11 | 0 0011 | 0 0111 | 1 1111 | 1 1011 | | |
| | 10 | 0 0010 | 0 0110 | 1 1110 | 1 1010 | | |

Vertical groupings on the left indicate X_4 (rows 00 and 01) and X_3 (rows 11 and 10).

$$Y_1 = \underline{X_1}$$