Title: Karnaugh Mapping

# Karnaugh Mapping (K-mapping)

K-maps are a graphical technique used to simplify a logic equation.

K-maps are procedural and much clearer than boolean simplification.

K-maps can be used for any number of input variables, but are only practical for two, three, and four variables

## K-map format

Each minterm in a truth table corresponds to a cell in the k-map

k-map cells are labeled where horizontical and vertical movement steps change by one variable.

This allows simpler term grouping in a sum-of-products expression

The SOP expression of the logic function can be obtained by OR-ing together cells or cell groups that contain 1s.

### Adjacent Cell Simplification



$\overline{X}$

### Two Variable k-Map



Groups of one —— 4 possibilities
Groups of two —— 4 possibilities
Groups of four —— 1 possibility

## Procedure

1. Construct a table for the k-map
2. Place 1's in cells that correspond to 1's in the truth tables
3. Place 0's in other cells
4. Identify and group all isolated 1's
5. Group any that...
6. Group any octet, the even if it contains 1's already grouped but not enclosed
7. Group any quad,
8. Group any pair
9. Or together all terms to generate the SOP equation.

**(1)**

| | $\bar{J}$ | $J$ |
|---|---|---|
| $\bar{K}$ | 1 | 0 |
| $K$ | 1 | 0 |

$\bar{J}$

**(2)**

| | $\bar{Y}$ | $Y$ |
|---|---|---|
| $\bar{W}X$ | 1 | 0 |
| $\bar{W}x$ | 0 | 0 |
| $W\bar{X}$ | 0 | 1 |
| $WX$ | 1 | 0 |

**(3)**

| | $\bar{G}$ | $G$ |
|---|---|---|
| $\bar{E}\bar{F}$ | 0 | 1 |
| $\bar{E}F$ | 1 | 0 |
| $EF$ | 0 | 1 |
| $EF$ | | |

$F\bar{G}$        $F\bar{G} + \bar{F}G$

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