# American Style Karnaugh Maps

The Karnaugh maps for one variable

| a \ S | 0 | 1 |
|---|---|---|
| | 1 | 0 |

| a \ S | 0 | 1 |
|---|---|---|
| | 0 (0) | 1 (1) |

The Karnaugh maps for two variables

| b \ a \ S | 0 | 1 |
|---|---|---|
| 0 | 1 | 1 |
| 1 | 0 | 0 |

| b \ a \ S | 0 | 1 |
|---|---|---|
| 0 | 1 (0) | 1 (2) |
| 1 | 0 (1) | 0 (3) |

The Karnaugh maps for three variables

| c \ ab \ S | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 0 | 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 | 0 |

| $x^n$ \ ab \ S | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 0 | 0 (0) | 1 (2) | 1 (6) | 1 (4) |
| 1 | 0 (1) | 1 (3) | 0 (7) | 0 (5) |

The Karnaugh maps for three variables (alternate style)

| bc \ a \ S | 0 | 1 |
|---|---|---|
| 00 | 0 | 1 |
| 01 | 0 | 0 |
| 11 | 1 | 0 |
| 10 | 1 | 1 |

| bd \ a \ S | 0 | 1 |
|---|---|---|
| 00 | 0 (0) | 1 (4) |
| 01 | 0 (1) | 0 (5) |
| 11 | 1 (3) | 0 (7) |
| 10 | 1 (2) | 1 (6) |

The Karnaugh maps for four variables

| cd \ ab \ S | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 1 | 1 | 1 | 0 |
| 01 | 1 | 0 | 1 | 0 |
| 11 | 0 | 1 | 1 | 1 |
| 10 | 0 | 0 | 0 | 0 |

| cd \ ab \ S | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 1 (0) | 1 (4) | 1 (12) | 0 (8) |
| 01 | 1 (1) | 0 (5) | 1 (13) | 0 (9) |
| 11 | 0 (3) | 1 (7) | 1 (15) | 1 (11) |
| 10 | 0 (2) | 0 (6) | 0 (14) | 0 (10) |

The Karnaugh maps for five variables

| de \ abc | 000 | 001 | 011 | 010 | 110 | 111 | 101 | 100 |
|---|---|---|---|---|---|---|---|---|
| 00 | 0 (0) | 0 (4) | 1 (12) | 1 (8) | 1 (24) | 1 (28) | 0 (20) | 0 (16) |
| 01 | 1 (1) | 1 (5) | 0 (13) | 0 (9) | 0 (25) | 0 (29) | 1 (21) | 1 (17) |
| 11 | 1 (3) | 1 (7) | 0 (15) | 0 (11) | 0 (27) | 0 (31) | 1 (23) | 1 (19) |
| 10 | 0 (2) | 0 (6) | 1 (14) | 1 (10) | 1 (26) | 1 (30) | 0 (22) | 0 (18) |

S

Or you can split the 5-map into two 4-maps with additional information at the bottom...

| de \ bc | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 0 (0) | 0 (4) | 1 (12) | 1 (8) |
| 01 | 1 (1) | 1 (5) | 0 (13) | 0 (9) |
| 11 | 1 (3) | 1 (7) | 0 (15) | 0 (11) |
| 10 | 0 (2) | 0 (6) | 1 (14) | 1 (10) |

S

a = 0

| de \ bc | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 0 (0) | 0 (4) | 1 (12) | 1 (8) |
| 01 | 1 (1) | 1 (5) | 0 (13) | 0 (9) |
| 11 | 1 (3) | 1 (7) | 0 (15) | 0 (11) |
| 10 | 0 (2) | 0 (6) | 1 (14) | 1 (10) |

S

a = 1

You can also do math things by using the known $ signs...

| $a_0$ \ $a_1$ | 0 | 1 |
|---|---|---|
| 0 | 1 | 1 |
| 1 | 0 | 0 |

$S_0$

You can do math thing in roman font...

| $\mathrm{M}_0^{\mathrm{n}}$ \ $\mathrm{M}_2^{\mathrm{n}}\mathrm{M}_1^{\mathrm{n}}$ | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 0 | 1 | 1 | 1 | 0 |
| 1 | 1 | 0 | 1 | 1 |

$\mathrm{M}_0^{\mathrm{n+1}}$

You can do things with don't cares...

| b \ a | 0 | 1 |
|---|---|---|
| 0 | 0 | 1 |
| 1 | 1 | - |

S

| c \ ab | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 0 | 0 | 1 | 0 | - |
| 1 | 0 | - | - | 1 |

S

| cd \ ab | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 1 (0) | - (4) | 1 (12) | - (8) |
| 01 | 1 (1) | 0 (5) | - (13) | 0 (9) |
| 11 | - (3) | 1 (7) | 1 (15) | 0 (11) |
| 10 | 0 (2) | 0 (6) | 1 (14) | 0 (10) |

S

You can use colors and empty function values and variables as values too...

| c \ ab | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 0 | 0 | 1 | 0 | |
| 1 | 0 | | | 1 |

S

| b \ a | 0 | 1 |
|---|---|---|
| 0 | $i_0$ | $i_2$ |
| 1 | $i_1$ | $i_3$ |

S

You can set the font to something else ... and use sans math font ...

| cd \ ab | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 0 | 1 | 0 | 1 |
| 01 | 1 | 1 | 0 | 1 |
| 11 | 0 | 0 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 |

S

| $q_1^n q_0^n$ \ $p_1^n p_0^n$ | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 0 | 1 | 0 | 1 |
| 01 | 1 | 1 | 0 | 1 |
| 11 | 0 | 0 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 |

$Q_0^{n+1}$

You can use the last parameter to create to your own picture commands...

| z \ xy | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 0 | 1 | 1 | 1 | 0 |
| 1 | 1 | 0 | 1 | 1 |

F

blabla

| y \ x | 0 | 1 |
|---|---|---|
| 0 | 0 | 1 |
| 1 | 1 | 1 |

F

| y \ x | 0 | 1 |
|---|---|---|
| 0 | 0 | 1 |
| 1 | 1 | 1 |

F

# Bounding Boxes around the Maps

| a \ S | 0 | 1 |
|---|---|---|
| | 0 (0) | 1 (1) |

| b \ a | 0 | 1 |
|---|---|---|
| 0 | 0 (0) | 1 (2) |
| 1 | 1 (1) | 1 (3) |

| c \ ab | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 0 | 0 (0) | 1 (2) | 1 (6) | 1 (4) |
| 1 | 1 (1) | 1 (3) | 1 (7) | 1 (5) |

| bc \ a | 0 | 1 |
|---|---|---|
| 00 | 0 (0) | 1 (4) |
| 01 | 1 (1) | 1 (5) |
| 11 | 1 (3) | 1 (7) |
| 10 | 1 (2) | 1 (6) |

| $x^n y^n$ \ ab | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | 0 (0) | 1 (4) | 1 (12) | 1 (8) |
| 01 | 1 (1) | 1 (5) | 1 (13) | 1 (9) |
| 11 | 1 (3) | 1 (7) | 1 (15) | 1 (11) |
| 10 | 1 (2) | 1 (6) | 1 (14) | 1 (10) |

| ll \ abc | 000 | 001 | 011 | 010 | 110 | 111 | 101 | 100 |
|---|---|---|---|---|---|---|---|---|
| 00 | 0 (0) | 1 (4) | 1 (12) | 1 (8) | 1 (24) | 1 (28) | 1 (20) | 1 (16) |
| 01 | 1 (1) | 1 (5) | 1 (13) | 1 (9) | 1 (25) | 1 (29) | 1 (21) | 1 (17) |
| 11 | 1 (3) | 1 (7) | 1 (15) | 1 (11) | 1 (27) | 1 (31) | 1 (23) | 1 (19) |
| 10 | 1 (2) | 1 (6) | 1 (14) | 1 (10) | 1 (26) | 1 (30) | 1 (22) | 1 (18) |

| $x_0x_1^n$ \ abc | 000 | 001 | 011 | 010 | 110 | 111 | 101 | 100 |
|---|---|---|---|---|---|---|---|---|
| 00 | a (0) | e (4) | m (12) | i (8) | y (24) | 2 (28) | u (20) | q (16) |
| 01 | b (1) | f (5) | n (13) | j (9) | z (25) | 3 (29) | v (21) | r (17) |
| 11 | d (3) | h (7) | p (15) | l (11) | 1 (27) | 5 (31) | x (23) | t (19) |
| 10 | c (2) | g (6) | o (14) | k (10) | 0 (26) | 4 (30) | w (22) | s (18) |

$S_{a,b,c,d}$

Text next to Karnaugh map

Next shows the use of `fbox` commands to show frameboxes.

This is text.

| $x_0x_1^n$ \ abc | 000 | 001 | 011 | 010 | 110 | 111 | 101 | 100 |
|---|---|---|---|---|---|---|---|---|
| 00 | 0 (0) | 0 (4) | 0 (12) | 1 (8) | 0 (24) | 1 (28) | 1 (20) | 0 (16) |
| 01 | 1 (1) | 0 (5) | 1 (13) | 0 (9) | 0 (25) | 1 (29) | 0 (21) | 1 (17) |
| 11 | 0 (3) | 0 (7) | 1 (15) | 1 (11) | 1 (27) | 1 (31) | 0 (23) | 0 (19) |
| 10 | 1 (2) | 1 (6) | 0 (14) | 0 (10) | 1 (26) | 1 (30) | 1 (22) | 0 (18) |

$M_1^{n+1}$

Test to see in kvindex macro is working...

| a \ 0 | 1 |
|---|---|
| a (0) | b (1) |

S

Test to see in kvnoindex macro is working...

| a \ 0 | 1 |
|---|---|
| a | b |

S

The unit length of the Karnaugh map squares is 25.03842pt