the `k-mapper` package 1.1.0

introduction

`k-mapper` is a Typst package for adding customizable Karnaugh maps of 2 by 2, 2 by 4, and 4 by 4 grid sizes to your Typst projects.

This Manual has been typeset in Typst, using the `k-mapper` package, and is intended for the 1.1.0 version of `k-mapper`. See the source code on the Github repository for the project here.

See the changelog for the package here.

using `karnaugh()`

The main function of this package is the `karnaugh()` function, which allows you to create and customize all sizes of Karnaugh maps.

gray code position

The position of implicants in `k-mapper` are declared via *Gray code position*. This is similar to Karnaugh map packages in LaTeX.

The Gray code position of a cell in a Karnaugh map can be determined by looking at the Gray code labels of the Karnaugh map: the Gray code position is the decimal equivalent of the binary number formed from the number(s) on the left and the number(s) on the top.

The empty maps shown in Table 1 show each cell's Gray code position. Note that the Gray code position for a cell differs depending on the Karnaugh map's grid size.

For example, the Gray code position (`14`) of the shaded cell in Table 1 can be determined by concatenating the binary numbers to its left on the y-axis (`11`) and above it on the x-axis (`10`), giving `1110` which equals `14` in decimal.

Gray code position allows you to input minterms and maxterms using `manual-terms` simply by copying your truth table in that order.

	0	1
0	0	1
1	2	3

	0	1
00	0	1
01	2	3
11	6	7
10	4	5

	00	01	11	10
00	0	1	3	2
01	4	5	7	6
11	12	13	15	14
10	8	9	11	10

Table 1: Gray Code positions for three sizes of Karnaugh maps.

function arguments

name	default	description	example values

`grid-size`
`int`
	required	The size of the Karnaugh map's grid. This value can be only `4` (2 by 2), `8` (2 by 4), or `16` (4 by 4). Any other values will throw an error.	`4`
			`8`
			`16`

`x-label` `content`	`$$`	The label (usually a variable name) to go on the top (x-axis) of the Karnaugh map.	`$A$` `[foo]`
`y-label` `content`	`$$`	The label (usually a variable name) to go on the left (y-axis) of the Karnaugh map.	`$B$` `[bar]`

`minterms`
`(int)`
`none`
	`none`	The `array` of Gray code positions[1] where at that position is a minterm (`0`).
		Mutually exclusive with `maxterms` and `manual-terms`.
			`(3, 4, 6)`
			`(1, )`

`maxterms`
`(int)`
`none`
	`none`	The array of Gray code positions[1] where at that position is a maxterm (`1`).
		Mutually exclusive with `minterms` and `manual-terms`.
			`(0, 1, 2, 3, 5, 11, 12`
			`(7, )`

`manual-terms`
`(content)`
`none`
	`none`	The `array` of `content` in each cell in order of Gray-code position[1]. The length of this `array` *must* equal the `grid-size`.
		Mutually exclusive with `minterms` and `maxterms`.
			`// Grid-size 4`
			`(0, "X", 1, 1)`

[1] See p. 1.

name	default	description	example values

`implicants`
`((int, int), )`
	`()`	An `array` where each element is an `array` of two `int`s, where each `int` is a Gray code position[1] corner of a *rectangular* implicant.	`((0, 3), (1, 1))`
			
			`((0, 2), )`

`horizontal -implicants` `((int, int), )`	`()`	An `array` where each element is an `array` of two `int`s, where each `int` is a Gray code position[1] corner of a *horizontal split* implicant — that is, one which wraps around the vertical edges of the Karnaugh map.	`// Grid-size 16` `((0, 6), (8, 10))`

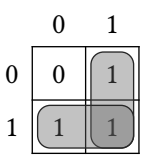
`vertical -implicants`
`((int, int), )`
	`()`	An `array` where each element is an `array` of two `int`s, where each `int` is a Gray code position[1] corner of a *vertical split* implicant — that is, one which wraps around the horizontal edges of the Karnaugh map.	`// Grid-size 8`
			`((0, 4), )`
			
			`// Grid-size 16`
			`((0, 9), (2, 10))`

`corner -implicants` `bool`	`false`	A `bool` which indicates whether the Karnaugh map contains a `corner split` implicant — that is, one which wraps around both vertical and horizontal edges of the Karnaugh map.	`true`
`cell-size` `length`	`20pt`	The size of an individual cell in the Karnaugh map.	`1cm`
`stroke-width` `length`	`0.5pt`	The stroke width of the Karnaugh map grid.	`0.2pt`
`colors` `(color)`	array of: red	An array of RGBA `colors` to be used in displaying implicants. The	`// Grayscale K-map` `(rgb(`

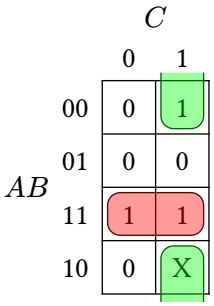
name	default	description	example values
	green blue cyan magenta yellow	first implicant uses the first `color` in the array, the second implicant the second color, etc. If there are more implicants than there are colors, each subsequent implicant will use the least recently used color (i.e. it wraps around). By default, all `colors` in `colors` have alpha values of `100`.	`200, 200, 200, 100 ), )`
`implicant-inset` `length`	`2pt`	The inset of implicants within each cell.	`3pt`
`edge-implicant -overflow` `length`	`5pt`	How much *split implicants* (horizontal, vertical, corner) overflow the bounds of the grid.	`2mm`
`implicant-radius` `length`	`5pt`	The corner radius of implicants.	`3mm`
`implicant-stroke -transparentize` `ratio`	`#-100%`	The ratio to transparentize the stroke color of implicants by. If set to `0%`, the stroke color of implicants are the same as the fill color, darked by the factor set in `implicant-stroke-darken` (`60%` by default). Negative values mean the stroke color becomes more opaque.	`-50%`
`implicant-stroke -darken` `ratio`	`60%`	The ratio to darken the stroke color of implicants by.	`100%`

name	default	description	example values
`implicant-stroke-width` `length`	`0.5pt`	The stroke width of implicants.	`1pt`

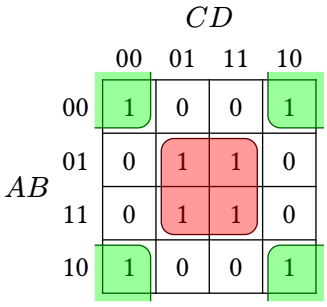
examples



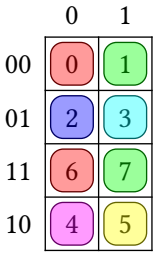

```
// Grayscale Karnaugh map
#karnaugh(
  4,
  minterms: (0, ),
  implicants: ((1, 3), (2, 3)),
  colors: (rgb(100, 100, 100, 100), ) // <-
)
```



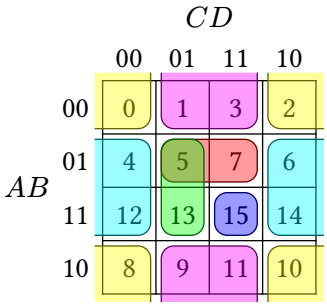

```
#karnaugh(
  8,
  x-label: $C$,
  y-label: $A B$,
  manual-terms: (0, 1, 0, 0, 0, "X", 1, 1),
  implicants: ((6, 7), ),
  vertical-implicants: ((1, 5), )
)
```



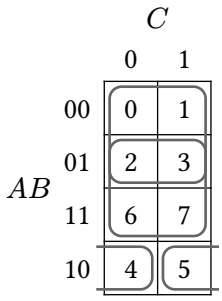

```
#karnaugh(
  16,
  x-label: $C D$,
  y-label: $A B$,
  maxterms: (0, 2, 5, 7, 13, 15, 8, 10),
  implicants: ((5, 15), ),
  corner-implicants: true
)
```




```
#karnaugh(
  8,
  manual-terms: (0, 1, 2, 3, 4, 5, 6, 7),
  implicants: (
    (0, 0), (1, 1), (2, 2), (3, 3),
    (4, 4), (5, 5), (6, 6), (7, 7)
  )
)
```




```
#karnaugh(
  16,
  x-label: $C D$,
  y-label: $A B$,
  manual-terms: (
    0, 1, 2, 3, 4, 5, 6, 7, 8,
    9, 10, 11, 12, 13, 14, 15
  ),
  implicants: ((5, 7), (5, 13), (15, 15)),
  vertical-implicants: ((1, 11), ),
  horizontal-implicants: ((4, 14), ),
  corner-implicants: true,
)
```




```
// No fill Karnaugh map
#karnaugh(
  8,
  x-label: $C$,
  y-label: $A B$,
  manual-terms: (0, 1, 2, 3, 4, 5, 6, 7),
  implicants: ((0, 3), (2, 7)),
  horizontal-implicants: ((4, 5), ),
  colors: (rgb(255, 255, 255, 0), ),
  implicant-stroke-width: 1pt
)
```