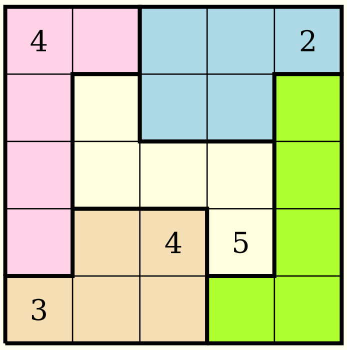
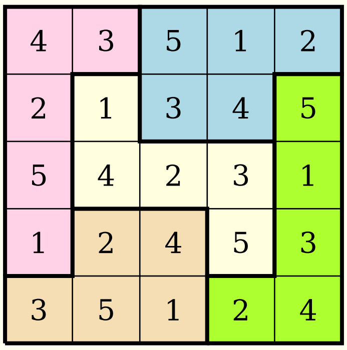
logicpuzzle.sty

v1.9

A style file for typesetting logic puzzles



4				2
		4	5	
3				



4	3	5	1	2
2	1	3	4	5
5	4	2	3	1
1	2	4	5	3
3	5	1	2	4

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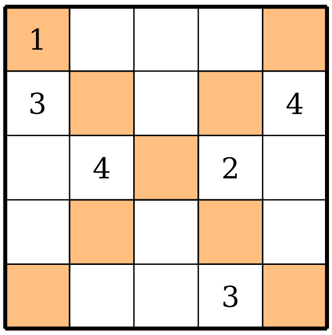
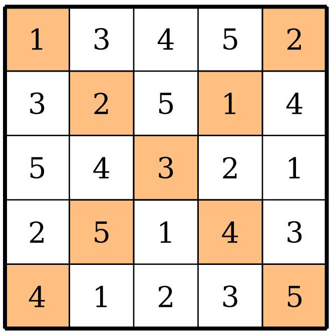
`https://bitbucket.org/kleberj/logicpuzzle/`

1 Supported puzzles

1.1 2D-Sudoku

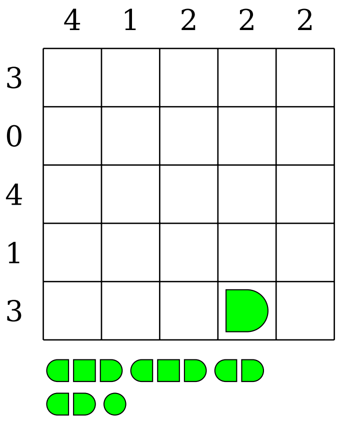


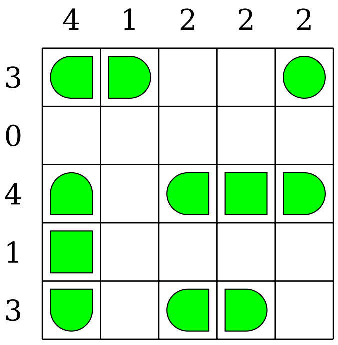
1				
3				4
	4		2	
			3	



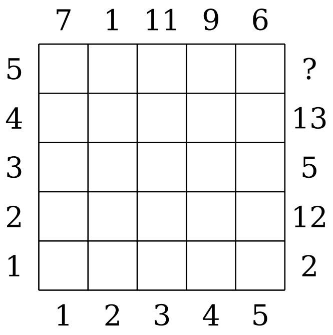
1	3	4	5	2
3	2	5	1	4
5	4	3	2	1
2	5	1	4	3
4	1	2	3	5

1.2 Battleship

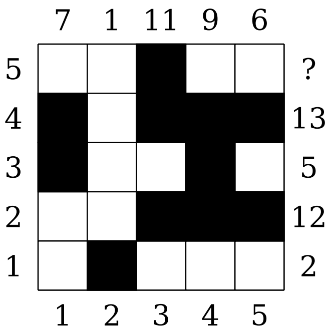




1.3 Bokkusu

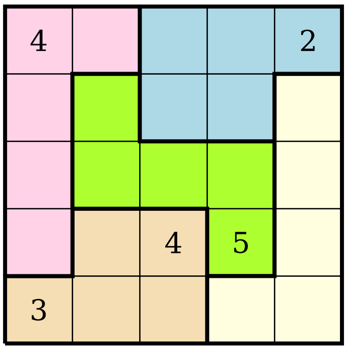


	7	1	11	9	6	
5						?
4						13
3						5
2						12
1						2
	1	2	3	4	5	

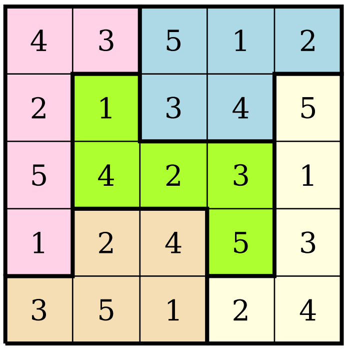


	7	1	11	9	6	
5			■			?
4	■		■	■	■	13
3	■			■		5
2			■	■	■	12
1		■				2
	1	2	3	4	5	

1.4 Chaos Sudoku

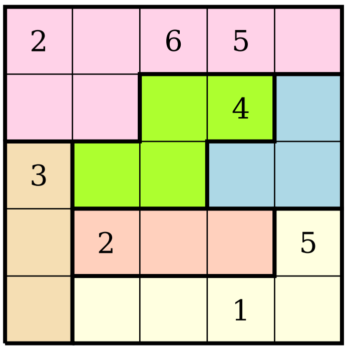


4				2
		4	5	
3				

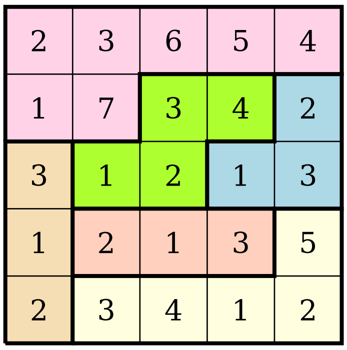


4	3	5	1	2
2	1	3	4	5
5	4	2	3	1
1	2	4	5	3
3	5	1	2	4

1.5 Hakyuu

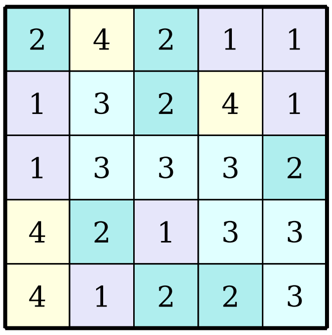


2		6	5	
			4	
3				
	2			5
			1	

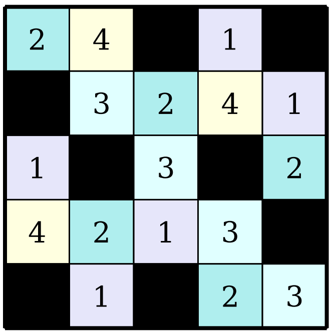


2	3	6	5	4
1	7	3	4	2
3	1	2	1	3
1	2	1	3	5
2	3	4	1	2

1.6 Hitori

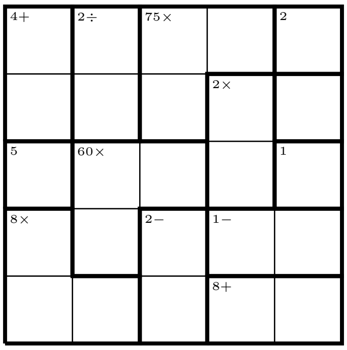


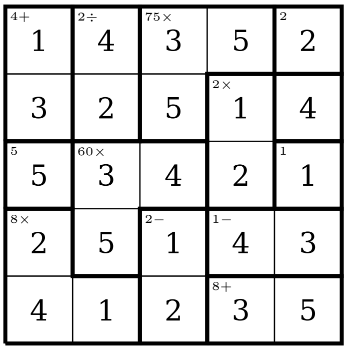
2	4	2	1	1
1	3	2	4	1
1	3	3	3	2
4	2	1	3	3
4	1	2	2	3



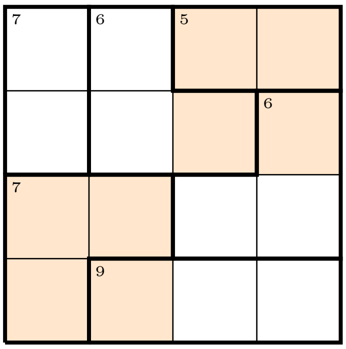
2	4	■	1	■
■	3	2	4	1
1	■	3	■	2
4	2	1	3	■
■	1	■	2	3

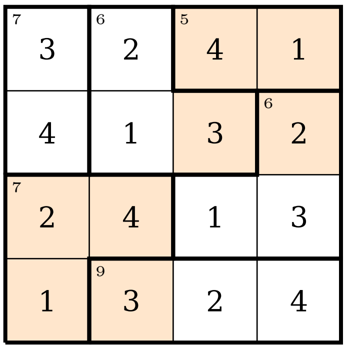
1.7 Kendoku



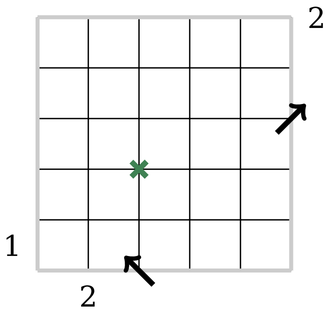


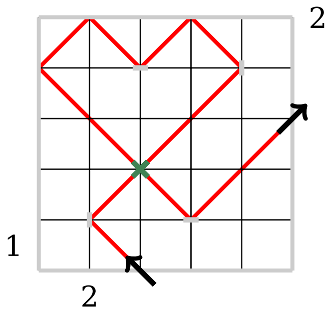
1.8 Killer Sudoku





1.9 Laser Beam



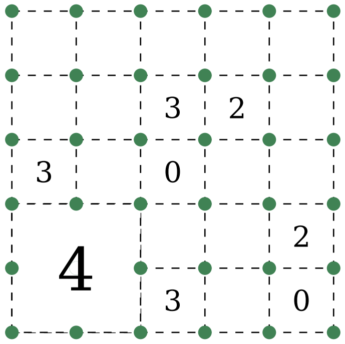


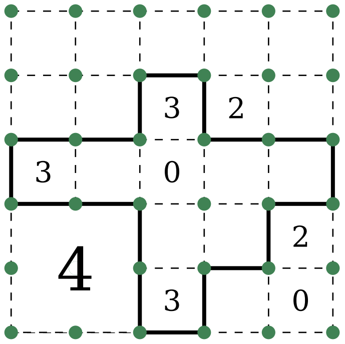
1.10 Skyline

			2		3	
3	2					3
4				3		1
	3		3	1		

			2		3	
	5	4	3	1	2	
	4	5	1	2	3	
3	2	3	5	4	1	3
4	1	2	4	3	5	1
	3	1	2	5	4	
	3		3	1		

1.11 Slitherlink





1.12 Sudoku

	2	6						
						1	7	
		3	1		6			
	6			5		8		3
		9	2	6	1	7		
5		4		8			6	
			8		4	3		
	4	8						
						9	4	

1	2	6	5	7	8	4	3	9
4	8	5	9	3	2	1	7	6
7	9	3	1	4	6	5	8	2
2	6	1	4	5	7	8	9	3
8	3	9	2	6	1	7	5	4
5	7	4	3	8	9	2	6	1
6	5	2	8	9	4	3	1	7
9	4	8	7	1	3	6	2	5
3	1	7	6	2	5	9	4	8

2 Roll out your own grid-based logic puzzle

As an example we take a look at the `bokkusu.sty` package. First, we ignore the LPPL license stuff.

```
\ProvidesPackage{bokkusu}[2013/03/25 bokkusu.sty v1.2 - Josef Kleber (C) 2013]%
\RequirePackage{logicpuzzle}%
```

We wrote a package `bokkusu.sty` with version number v1.2 and date 2013/03/25 and added a copyright remark. We need to load the code base package `logicpuzzle.sty`.

```
\newcommand*\LP@BK@init@prefix{LP@BK}%
\newcommand*\LP@BK@init@package{bokkusu}%
\LP@define@key{\LP@BK@init@prefix}{\LP@BK@init@package}{rows}{5}%
\LP@define@key{\LP@BK@init@prefix}{\LP@BK@init@package}{columns}{5}%
\LP@define@key{\LP@BK@init@prefix}{\LP@BK@init@package}{scale}{1}%
\LP@define@key{\LP@BK@init@prefix}{\LP@BK@init@package}{counterstyle}{none}%
\LP@define@key{\LP@BK@init@prefix}{\LP@BK@init@package}{color}{black}%
\LP@define@key{\LP@BK@init@prefix}{\LP@BK@init@package}{bgcolor}{}%
\LP@define@key{\LP@BK@init@prefix}{\LP@BK@init@package}{width}{6.7cm}%
\LP@define@key{\LP@BK@init@prefix}{\LP@BK@init@package}{cvoffset}{-38pt}%
\LP@define@key{\LP@BK@init@prefix}{\LP@BK@init@package}{title}{}%
\LP@define@key{\LP@BK@init@prefix}{\LP@BK@init@package}{titleindent}{0.75cm}%
\LP@define@key{\LP@BK@init@prefix}{\LP@BK@init@package}{titlewidth}{5.85cm}%
\LP@define@choicekey@fontsize{\LP@BK@init@prefix}{\LP@BK@init@package}{Large}%
\ExecuteOptionsX{rows,columns,width,fontsize,scale,color,bgcolor,cvoffset,
                 counterstyle,title,titleindent,titlewidth}%
\ProcessOptionsX\relax%
\LP@init@counter{\LP@BK@init@prefix}%
```

We save the package prefix and name in a macro for easy change. Then we define the options for package `bokkusu.sty` and the environment `bokkusu`, which are executed afterwards to create the macros for the option values. In the end, we need to initialize the package counters.

```
\let\valueH\LP@bottomrow%
\let\valueV\LP@leftcolumn%
\let\sumH\LP@toprow%
\let\sumV\LP@rightcolumn%
```

We need numbers around the grid. Therefore, we define some aliases for the existing generic commands.

```
\newcommand*\bokkususetup[1]%
{%
  \setkeys{bokkusu.sty}{#1}%
}%
```

We define `\bokkususetup` for resetting the global package options.

Finally, we define the `bokkusu` environment.

```
\newenvironment{bokkusu}[1][]%
{%
  \setkeys{bokkusu}{#1}%
  \LP@set@package{bokkusu}%
  \LP@set@env@prefix{LP@BK}%
  \setcounter{LP@BK@rows}{\LP@BK@rows}%
  \setcounter{LP@BK@columns}{\LP@BK@columns}%
  \stepcounter{LP@BK@rows}%
  \stepcounter{LP@BK@columns}%
```

We locally set the environment options and the prefix and name of the current puzzle environment. We need to reset the counters for `rows` and `columns`, as they might have been altered.

```
  \begin{minipage}[t]{\LP@BK@width}%
    \ifthenelse{\equal{\LP@BK@title}{}}%
    {\par\enspace\par}% empty
    {\enspace\par\noindent\hspace{\LP@BK@titleindent}\parbox{\LP@BK@titlewidth}
      {\strut\LP@titleformat\LP@BK@title}\vspace{3mm}\par}%
    \begin{tikzpicture}[scale=\LP@BK@scale]%
      \LP@drawbackground{1}{1}{\LP@BK@columns}{\LP@BK@rows}{\LP@BK@bgcolor}%
      \LP@drawgrid{1}{1}{\LP@BK@columns}{\LP@BK@rows}{1cm}%
}%
```

We start a minipage with width ⟨*width*⟩. If the user defined a title, we typeset the title and add a vertical space. Then, we draw the puzzle with the help of `tikz.sty`. We start drawing the background and the grid.

```
{%
    \end{tikzpicture}%
    \LP@drawcounter{\LP@BK@counterstyle}%
    \stepcounter{LP@puzzlecounter}%
  \end{minipage}%
}%
```

Finally, we just end the picture for the puzzle. We draw and step the counter. As last action, we need to close the `minipage` environment. That's it. Easy, isn't it? You just need to copy this skelton and change or add some code for your specific puzzle.

3 The code

3.1 PGF layers

The `logicpuzzle.sty` package defines the PGF layers: `LPdump`, `LPbgcolor`, `LPbackgroundtwo`, `LPbackground`, `LPforeground` and `LPforegroundtwo`

Without specifying a special layer, the standard `main` layer is used. The `LPbackground` and `LPforeground` layers can be accessed with the `puzzlebackground` [see: 3.2.1] and `puzzleforeground` [see: 3.2.2] environments. The `LPbgcolor` is and should only be used for the background color of the grid.

All layers can also be accessed with the generic PGF method:

```
\begin{pgfonlayer}{layer}
  ...
\end{pgfonlayer}{layer}
```

Order: `LPdump` → `LPbgcolor` → `LPbackgroundtwo` → `LPbackground` → `main` → `LPforeground` → `LPforegroundtwo`

So, if you are in the need to place something behind `LPbackground` or in front of `LPforeground`, you can use the `LPbackgroundtwo` and `LPforegroundtwo` layers. You can hide elements like help nodes behind the background color on the `LPdump` layer.

3.2 Environments

3.2.1 `puzzlebackground`

```
\begin{puzzlebackground}
...
\end{puzzlebackground}
```

The `puzzlebackground` environment allows you to place elements behind the `main` layer on the `LPbackground` layer [see: 3.1]. This is for example usefull for the `\fillarea` [see: 3.3.3.17] command.

3.2.2 `puzzleforeground`

```
\begin{puzzleforeground}
...
\end{puzzleforeground}
```

The `puzzleforeground` environment allows you to place elements in front of the `main` layer on the `LPforeground` layer [see: 3.1]. This is for example usefull for the `\framearea` [see: 3.3.3.16] command.

3.3 Commands

3.3.1 Initialization

3.3.1.1 `\LP@define@key`

`\LP@define@key`{⟨*prefix*⟩}{⟨*package*⟩}{⟨*option*⟩}{⟨*default*⟩}

With the `\LP@define@key` command, you can define the options of the package ⟨*package*⟩ **and** of the environment ⟨*package*⟩. A ⟨*prefix*⟩ is needed for creating different name spaces.

```
\LP@define@key{LP@BS}{battleship}{rows}{5}
```

This code snippet defines the option `rows` as global option for `battleship.sty` and as local option for environment `battleship` with the default value 5. This value is stored in `\LP@BS@rows`.

3.3.1.2 `\LP@define@choicekey@fontsize`

\LP@define@choicekey@fontsize {⟨*prefix*⟩}{⟨*package*⟩}{⟨*default*⟩}

With the `\LP@define@choicekey@fontsize` command, you can define the choice key option `fontsize` of the package ⟨*package*⟩ **and** of the environment ⟨*package*⟩. Possible keys are: tiny, scriptsize, footnotesize, small, normalsize, large, Large, LARGE, huge, Huge

3.3.1.3 `\LP@init@counter`

\LP@init@counter{⟨*prefix*⟩}

The command `\LP@init@counter` defines the counters ⟨*prefix*⟩@rows and ⟨*prefix*⟩@columns, initialize them with \⟨*prefix*⟩@rows and \⟨*prefix*⟩@columns and steps the counters.

3.3.2 Drawing grids

3.3.2.1 `\LP@drawgrid`

\LP@drawgrid{⟨*xmin*⟩}{⟨*ymin*⟩} {⟨*xmax*⟩}{⟨*ymax*⟩}{⟨*step*⟩}

With the `\LP@drawgrid` command, you can draw the grid (⟨*xmin*⟩,⟨*ymin*⟩) to (⟨*xmax*⟩,⟨*ymax*⟩) with step ⟨*step*⟩. For drawing the standard puzzle grid the step must be 1cm.

3.3.2.2 `\LP@drawsudokugrid`

\LP@drawsudokugrid

The command `\LP@drawsudokugrid` draws the stnadard Sudoku grid, but just the thicker lines. You will have to overlay the standard grid to get a full Sudoku grid.

3.3.2.3 `\LP@drawbackground`

\LP@drawbackground{⟨*xmin*⟩} {⟨*ymin*⟩}{⟨*xmax*⟩}{⟨*ymax*⟩}{⟨*color*⟩}

With the `\LP@drawbackground` command, you can draw the background color of the grid.

3.3.3 In the grid

3.3.3.1 `\setcell`

`\setcell{`{⟨*column*⟩}{⟨*row*⟩} {⟨*element*⟩}

With the `\setcell` command, you can set ⟨*element*⟩ into cell ⟨*column*⟩⟨*row*⟩ as central node. It is aware of the current values of the surrounding environment options `rows`, `columns`, `scale` and `fontsize`. Furthermore, a check if ⟨*element*⟩ is within the grid is applied.

3.3.3.2 `\setbigcell`

`\setbigcell[`⟨*fontsize*⟩]{{⟨*column*⟩} {⟨*row*⟩}{⟨*element*⟩}

With the `\setbigcell` command, you can set ⟨*element*⟩ into a big (2×2) cell ⟨*column*⟩⟨*row*⟩ as central node. The optional argument ⟨*fontsize*⟩ is set to

'Huge' by default.

3.3.3.3 `\LP@setcellcontent`

\LP@LP@setcellcontent{⟨*column*⟩}{⟨*row*⟩}{⟨*element*⟩}

The command `\LP@setcellcontent` is the generic command to set an arbitrary ⟨*element*⟩.

3.3.3.4 `\LP@setcellcontentC`

\LP@LP@setcellcontentC{⟨*column*⟩}{⟨*row*⟩}{⟨*element*⟩}

The command `\LP@setcellcontentC` is the generic command to set an arbitrary ⟨*element*⟩ in a centered node in the bottom left corner.

3.3.3.5 `\setrow`

`\setrow`{⟨*row*⟩}{⟨*csv list*⟩}

With the `\setrow` command, you can set the contents of a ⟨*row*⟩. These may be numbers or letters.

3.3.3.6 `\LP@setrowcontents`

\LP@setrowcontents{⟨*csv list*⟩}{⟨*column*⟩}{⟨*row*⟩}

The command `\LP@setrowcontents` is the generic command to set row contents. It does not necessarily start with ⟨*column*⟩ 1!

3.3.3.7 `\setcolorrow`

`\setcolorrow`{⟨*row*⟩}{⟨*csv list*⟩}

With the `\setcolorrow` command, you can set the contents of a ⟨*row*⟩. Furthermore, the background of the cell is filled with color `LP@c@romannumber` [see: 3.3.3.22]. With the number 0, you can black out the grid cell.

3.3.3.8 `\setcolumn`

`\setcolumn`{⟨*column*⟩}{⟨*csv list*⟩}

With the `\setcolumn` command, you can set the contents of a ⟨*column*⟩. These may be numbers or letters.

3.3.3.9 `\LP@setcolumncontents`

\LP@setcolumncontents{⟨*csv list*⟩}{⟨*column*⟩}{⟨*row*⟩}

The command `\LP@setcolumncontents` is the generic command to set column contents. It does not necessarily start with ⟨*row*⟩ 1!

3.3.3.10 `\setcolorcolumn`

`\setcolorcolumn`{⟨*column*⟩}{⟨*csv list*⟩}

With the `\setcolorcolumn` command, you can set the contents of a ⟨*column*⟩. Furthermore, the background of the cell is filled with color `LP@c@romannumber` [see: 3.3.3.22].

3.3.3.11 `\setrule`

`\setrule{{`⟨*column*⟩`}{`⟨*row*⟩`}{`⟨*rule*⟩`}` With the `\setrule` command, you can set a calculation rule ⟨*rule*⟩ into the top left corner of cell ⟨*column*⟩⟨*row*⟩. The rule is typeset in inline math mode. You might consider using the `\times` and `\div` commands.

3.3.3.12 `\fillcell`

`\fillcell{{`⟨*column*⟩`}{`⟨*row*⟩`}` With the `\fillcell` command, you can fill cell ⟨*column*⟩⟨*row*⟩ with the color defined with environment option `color`[1]. It is aware of the current values of the surrounding envionment options `rows`, `columns`, `scale` and `color`. Furthermore, a check if the cell is within the grid is applied.

3.3.3.13 `\fillrow`

`\fillrow{`⟨*row*⟩`}{`⟨*csv list*⟩`}` With the `\fillrow` command, you can fill a ⟨*row*⟩. In ⟨*csv list*⟩ ’1’ means ’fill’ and ’0’ means ’don’t fill’. Internally, `\fillrow` uses `\fillcell` [see: 3.3.3.12].

3.3.3.14 `\fillcolumn`

`\fillcolumn{`⟨*column*⟩`}{`⟨*csv list*⟩`}` With the `\fillcolumn` command, you can fill a ⟨*column*⟩. In ⟨*csv list*⟩ ’1’ means ’fill’ and ’0’ means ’don’t fill’. Internally, `\fillcolumn` uses `\fillcell` [see: 3.3.3.12].

3.3.3.15 `\filldiagonals`

`\filldiagonals[`⟨*color*⟩`]` With the `\filldiagonals` command, you can fill the diagonals with the color specified with the optional argument ⟨*color*⟩ (default: yellow!20). Furthermore, it checks for a quadratic grid, otherwise an error message is issued.

3.3.3.16 `\framearea`

`\framearea{`⟨*color*⟩`}{`⟨*tikz path*⟩`}` The command `\framearea` frames the area given by ⟨*tikz path*⟩ with color ⟨*color*⟩. The reference for coordinates is the bottom left corner of the cell.

```
\framearea{green}{(2,2)--(2,3)--(3,3)--(3,2)--(2,2)}
```

This command will color the frame of the grid cell `(2,2)` green. You should consider using this command in the `puzzleforeground` [see: 3.2.2] environment.

3.3.3.17 `\fillarea`

`\fillarea{`⟨*color*⟩`}{`⟨*tikz path*⟩`}` The command `\fillarea` fills the area given by ⟨*tikz path*⟩ with color ⟨*color*⟩. The reference for coordinates is the bottom left corner of the cell. You should

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[1] Therefore, you must define an option `color` in the style file you want to use fill commands

consider using this command in the `puzzlebackground` [see: 3.2.1] environment.

3.3.3.18 `\colorarea`

`\colorarea{`⟨*color*⟩`}{`⟨*tikz path*⟩`}`

The command `\colorarea` fills the area given by ⟨*tikz path*⟩ with color ⟨*color*⟩ – just like `\framearea` without frame.

3.3.3.19 `\framepuzzle`

`\framepuzzle[`⟨*color*⟩`]`

With the `\framepuzzle` command, you can frame the grid (thicker line) with the color specified with the optional argument ⟨*color*⟩ (default: black).

3.3.3.20 `\tikzpath`

`\tikzpath{`⟨*column*⟩`}{`⟨*row*⟩`}`
`{`⟨*csv list*⟩`}`

With the `\tikzpath` command, you can easily construct a `\tikz` path. You just need to define a starting point ⟨*column*⟩⟨*row*⟩ (bottom left corner) and a ⟨*csv list*⟩ with direction indicators relative to the current position.

7:	up left	8:	up	9:	up right
4:	left	5:	no change	6:	right
1:	down left	2:	down	3:	down right

```
\framearea{green}{\tikzpath{2}{2}{8,6,2,4}}
```

This command will frame grid cell `(2,2)` green.

3.3.3.21 `\LP@ingrid`

`\LP@ingrid`
`{`⟨*column*⟩`}{`⟨*row*⟩`}{`⟨*max column*⟩`}`
`{`⟨*max row*⟩`}{`⟨*package*⟩`}`

With the `\LP@ingrid` command, you can check if an element – that should be placed – is within the grid. Otherwise an error message is issued.

3.3.3.22 `\LP@definecolor`

`\LP@definecolor`
`{`⟨*name*⟩`}{`⟨*rgb color*⟩`}`

With the `\LP@definecolor` command, you can define named rgb colors, especially for defining background colors of numbers used in `\setcolorrow` [see: 3.3.3.7] and `\setcolorcolumn` [see: 3.3.3.10].

The background color names follow the pattern: `LP@c@romannumber`

```
\LP@definecolor{LP@c@iv}{.55,1,.88}
```

This command will define the new background color of number 4 !

3.3.4 Around the grid

3.3.4.1 `\LP@leftcolumn`

\LP@leftcolumn{{⟨*csv list*⟩}

With the `\LP@leftcolumn` command, you can set the contents of the column left to the grid. The `skyline.sty` package uses for example:

```
\let\skylineL\LP@leftcolumn
```

3.3.4.2 `\LP@rightcolumn`

\LP@rightcolumn{{⟨*csv list*⟩}

With the `\LP@rightcolumn` command, you can set the contents of the column right to the grid.

3.3.4.3 `\LP@toprow`

\LP@toprow{{⟨*csv list*⟩}

With the `\LP@toprow` command, you can set the contents of the row above the grid.

3.3.4.4 `\LP@bottomrow`

\LP@bottomrow{{⟨*csv list*⟩}

With the `\LP@bottomrow` command, you can set the contents of the row below the grid.

3.3.5 Presentation

3.3.5.1 `\titleformat`

`\titleformat{{`⟨*format*⟩}

With the `\titleformat` command, you can define the ⟨*format*⟩ of the title. By default, the definition is as follows:

```
\titleformat{\centering\Large\color{blue}}
```

3.3.5.2 `\puzzlecounter`

`\puzzlecounter`

The command `\puzzlecounter` provides the counter in textual form to use it for example in `\definecounterstyle`.

3.3.5.3 `\setpuzzlecounter`

`\setpuzzlecounter{`⟨*number*⟩}

With the command `\setpuzzlecounter`, you can reset the puzzle counter, for example before the solutions.

3.3.5.4 `\definecounterstyle`

`\definecounterstyle{`⟨*name*⟩`}{`⟨*definition*⟩`}`

The command `\definecounterstyle` allows you to define your own styles. For example, the style `left` is defined as follows:

```
\definecounterstyle{left}{
  \begingroup\reversemarginpar\marginnote{
  \tikz\node[shape=rectangle,fill=yellow!40,inner sep=7pt,
             draw,rounded corners=3pt,thick]
  {\Huge\puzzlecounter};}[\LP@cvoffset]\endgroup}
}
```

To typeset the counter into the margin we use the command `\marginnote`. We need to use the command `\reversemarginpar` to set the counter into the left margin. Of course, we must use this command in a group for local scope. Finally we use `\puzzlecounter` in a `\tikz` node with a vertical offset set with the option `cvoffset`.

3.3.5.5 `\setgridlinestyle`

`\setgridlinestyle{`⟨*style*⟩`}`

The command `\setgridlinestyle` sets the style of lines used in the grid. By default, the style is set to `solid`, whereas `slitherlink.sty` uses `dashed`.

3.3.5.6 `\setnormallinewidth`

`\setnormallinewidth{`⟨*dimension*⟩`}`

With the command `\setnormallinewidth`, you can set the width of the standard lines (default: `0.5pt`)

3.3.5.7 `\setthicklinewidth`

`\setthicklinewidth{`⟨*dimension*⟩`}`

With the command `\setthicklinewidth`, you can set the width of the 'thicker' lines (default: `1.5pt`)

3.3.5.8 `\LP@drawcounter`

`\LP@drawcounter{`⟨*name*⟩`}`

The command `\LP@drawcounter` draws the counter with counter style ⟨*name*⟩.

4 Examples

You can download application examples and their solutions from the project page. The puzzles are originally licensed under 🅭🅯🄏🄎.