The homeworkassignment*class†

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Contents

*The name was changed with version v3.0, to become compatible with CTANs guidlines and to maintain a degree of backwards compatibility. The class was called HomeworkAssignment prior to v3.0

†This document corresponds to homeworkassignment v4.1b, dated 2019/05/03.

1 Abstract

This class provides a relative simple document–type for homework, mainly created for assignments at the University This class is inherited from `article`, it is not perfect, but I am trying my verry best.

2 Dependencies

2.1 Mandatory Dependencies

This class is build uppon article, so of course the first dependency is:

`article` 1992 LESLIE LAMPORT, 1994-97 FRANK MITTELBACH JOHANNES BRAAMS, THE LaTeX-TEAM, `https://www.ctan.org/pkg/kvoptions`,

Because I am very lazy, the `homeworkassignment` is "a little bit" bloated. These are all required packages:

`kvoptions` HEIKO OBERDIEK, `https://www.ctan.org/pkg/kvoptions`, for `key=value`–style options

`suffix` DAVID KASTRUP, `https://www.ctan.org/pkg/suffix`, Makes it easy to define `\macro*` commands

`xifthen` JOSSELIN NOIREL, `https://www.ctan.org/pkg/xifthen`,
For if–else–structures

`translations` CLEMENS NIEDERBERGER, `https://www.ctan.org/pkg/translations`,
Implements an easy method of translations.

`amsmath` THE LATEX–TEAM, FRANK MITTELBACH RAINER SCHÖPF, ET AL.,
`https://www.ctan.org/pkg/amsmath`,
For better math-typesetting

`amssymb` AMERICAN MATHEMATICAL SOCIETY, `mirror.ctan.org/fonts/amsfonts/doc/amssymb.pdf`,
For more mathematical symbols

`etoolbox` PHILIPP LEHMAN (INACTIVE), JOSEPH WRIGHT, `https://www.ctan.org/pkg/etoolbox`,
The package is a toolbox of programming facilities geared primarily towards LATEXclass and package authors

`array` FRANK MITTELBACH, DAVID CARLISLE, THE LATEX–TEAM, `https://www.ctan.org/pkg/array`,
A new implementations for tables and arrays

array possibly can be removed

`xparse` FRANK MITTELBACH, CHRIS ROWLEY, DAVID CARLISLE, THE LATEX3 PROJECT, `https://ctan.org/pkg/xparse`,
The package provides a high-level interface for producing documentlevel commands. In that way, it offers a replacement for LATEX 2ε's `\newcommand` macro, with significantly improved functionality.

`gillius` BOB TENNENT, `https://ctan.org/pkg/gillius`,
A Gillian Sans inspired font, used for all sans serifes fonts

`hyperref` HTTPS://CTAN.ORG/PKG/HYPERREF, `SebastianRahtz,HeikoOberdiek`,
For hyperrefs, obviously

`xcolor` DR. UWE KERN, `https://www.ctan.org/pkg/xcolor`,
For coloring of ToDos

2.2 Recommended Dependencies

These are not loaded automatically, but require a switch as option (see section 3). The switch is typically the name of the package.

`tikz` TILL TANTAU, MARK WIBROW, CHRISTIAN FEUERSÄNGER ET AL., `https://www.ctan.org/pkg/pgf`,
An incredible powerfull image tool. When loading TikZ, the homeworkassignment automatically loads a shipload of TikZ–librarys and own styles. See section 3 for more informations

I intend to move these styles to a own package, so that they are usable without the homeworkassignment

`listings` CARSTEN HEINZ, BROOKS MOSES, JOBST HOFFMANN, `https://www.ctan.org/pkg/listings`,
For source–code. Sourcecode in the homeworkassignment is automatically framed, printed in `scriptsize`, and linebeals will be introduced

Loads required Packages

```
\RequirePackage{suffix}
\RequirePackage{fancyhdr}
\RequirePackage{xifthen}
\RequirePackage{translations}
\PassOptionsToPackage{fleqn}{amsmath}
\RequirePackage{amsmath}
\RequirePackage{amssymb}
\RequirePackage{etoolbox}
\RequirePackage{array}
\RequirePackage{xparse}
\RequirePackage{ifxetex}

\RequirePackage{wasysym}
\RequirePackage{adjustbox}

\RequirePackage{eso-pic}

\RequirePackage{xcolor}
```

3 Options

KV-Options is essential for this.

```
\RequirePackage{kvoptions}
\SetupKeyvalOptions{ family=hwa,
  prefix=hwa@ }
\DeclareDefaultOption{\PassOptionsToClass{\CurrentOptionKey}{article}}
```

`problemstyle=<1>` `subproblemstyle=<1>` `subsubproblemstyle=<1>`
These options allow the customizatuion of the displayed numbers. For Example, if `problemstyle=Roman, subproblemstyle=arabic, subsubproblemstyle=roman` is passed, The first subsubproblem of the first subproblem of the first problem would be labled as **i)** of **Problem I.1**.
Available options are `arabic`, `Alph`, `alph`, `Roman`, and `roman`. Standard values are: `problemstyle=arabic, subproblemstyle=alph, subsubproblemstyle=roman`.

```
\DeclareStringOption[arabic]{problemsty}
\DeclareStringOption[alph]{subproblemsty}
\DeclareStringOption[roman]{subsubproblemsty}
```

`tikz` Loads TikZ-Package and a couple of styles, useful for papers in computer science and mathematics. See 3 for more informations

```
\DeclareBoolOption[false]{tikz}
```

`helvet` Helvet replaces the standard TeX Gyre sans serif font with a Helvetica clone. See 4.3

```
\DeclareBoolOption[false]{helvet}
```

`listings` Loads listings package and sets listing layout to use a small fontsize. Adds indication for linebreaks.

```
\DeclareBoolOption[false]{listings}
```

`oneside, twoside` Changes layout. oneside is the complementary option to `twoside`
Standard layout is twopaged.

```
\DeclareBoolOption[true]{twoside}
\DeclareComplementaryOption{oneside}{twoside}
```

`onecolumn,twocolumn` Changes layout. onecolumn is the complementary option to `twocolumn`.
Standard Layout has one columns

```
\DeclareBoolOption[false]{twocolumn}
\DeclareComplementaryOption{onecolumn}{twocolumn}
```

`punchmark` Adds a mark for an hole puncher. Standard Layout has no marking.

```
\DeclareBoolOption[false]{punchmark}
```

`hlines=<1>` KeyValue-option. Takes the level of hlines. Available are `all`,`decreased`,`header`, `none`, with decreasing number of lines; none displays none, header only the one under headers and decreased adds the big line in the title, while all displays all.

```
\DeclareStringOption[all]{hlines}
```

`todos=<1>` KeyValue-option. Takes which ToDos shall be displayed. Available are `all` (default),`nolist`,`none`. See subsubsection 5.4.5 for explanation of the levels.

```
\DeclareStringOption[all]{todos}
```

`unicode-math` Loads the unicode–math–package and overwrites the damn `\QED`–Command unicode–math introduces, that creates a filled out box and only works in math–mode, but not telling you that it only works in math–mode or overwrites an already existing command. For a reason, that currently (06$^{\text{th}}$ of December 2018) slips my mind completly, `unicode-math` needs to be loaded after `article`, because it needs to be defined

> ATTENTION: Please do never, never, never, never, never ever load unicode-math your self, because this breaks **everything**[1]

```
\end{rant}
```

If XeTeX is used, the default option for this is `true`, otherwise it is false.
For the handling of the option, see 5.4.1

```
\ifxetex
\DeclareBoolOption[true]{unicodemath}
\else
\DeclareBoolOption[false]{unicodemath}
\fi
```

Loads article and processes the options

```
\ProcessKeyvalOptions*
\ifhwa@twoside
\PassOptionsToClass{twoside}{article}
\else
\PassOptionsToClass{oneside}{article}
\fi
\ifhwa@twocolumn
\PassOptionsToClass{twocolumn}{article}
\else
\PassOptionsToClass{onecolumn}{article}
\fi
\LoadClass{article}

\newboolean{hwa@todos@inplace}
\newboolean{hwa@todos@list}
\setboolean{hwa@todos@inplace}{true}
\setboolean{hwa@todos@list}{true}
\ifthenelse{\equal{\hwa@todos}{all}}{
}{
  \ifthenelse{\equal{\hwa@todos}{nolist}}{
      \ClassWarning{homeworkassignment}{You specified todos=none,
        there will be no list of TODO}
      \setboolean{hwa@todos@list}{false}
  }{
    \ifthenelse{\equal{\hwa@todos}{none}}{
      \ClassWarning{homeworkassignment}{You specified todos=none,
        there will be no TODOs printed in the final document}
      \setboolean{hwa@todos@list}{false}
      \setboolean{hwa@todos@inplace}{false}
    }{
      \ClassError{homeworkassignment}{\hwa@todos is not a valid value
        for the option ‘todos‘}
    }
  }
}
```

Load Hyperref (breaks if it is loaded before article

```
\RequirePackage{hyperref}
```

Loads listings, if wanted

```
\ifhwa@listings
\RequirePackage{listings}
\lstset{
  frame = single,
  breaklines = true,
  postbreak=\raisebox{0ex}[0ex][0ex]{\ensuremath{\hookrightarrow\space}},
  basicstyle=\scriptsize
}
\else
```

```
\empty
\fi
```

`\hwa@hline@L...` Defines new commands to output desired lines and change the constant \hwa@headrulewidth

> ATTENTION: \hwa@hline@LONE breaks the line automatically, in opposite to \hwa@hline@LTWO

```

\newcommand{\hwa@hline@LONE}{\vspace{.25cm} {\hrule height 2pt}
  \vspace{.25cm}}
\newcommand{\hwa@hline@LTWO}{\vspace{.5cm} \hrule \vspace{.25cm}}
\newcommand{\hwa@headrulewidth}{.7pt}
\ifthenelse{\equal{\hwa@hlines}{all}}{
  \renewcommand{\hwa@hline@LONE}{\vspace{.25cm} {\hrule height 2pt}
    \vspace{.25cm}}
  \renewcommand{\hwa@headrulewidth}{.7pt}
  \renewcommand{\hwa@hline@LTWO}{\vspace{.5cm} \hrule \vspace{.25cm}}
}{
  \ifthenelse{\equal{\hwa@hlines}{decreased}}{
    \renewcommand{\hwa@hline@LONE}{ \vspace{.25cm} {\hrule height 2pt}
      \vspace{.25cm}}
    \renewcommand{\hwa@headrulewidth}{.7pt}
  }{\ifthenelse{\equal{\hwa@hlines}{header}}{
      \renewcommand{\hwa@headrulewidth}{.7pt}
    }{\ifthenelse{\equal{\hwa@hlines}{none}}{
        \renewcommand{\hwa@headrulewidth}{0pt}
      }{
        \ClassError{homeworkassignment}{Value '\hwa@lines' for key 'hlines'
          is not known}{The option hlines takes an argument to set which
          hlines are drawn. Possible values are 'all','decreased' , 'header', and
          'none'. 'all' is standard.}
      }
    }
    \renewcommand{\hwa@hline@LONE}{~\\\vspace{.5cm}}
  }
  \renewcommand{\hwa@hline@LTWO}{\vspace{.75cm}}
}
```

If TikZ is wanted, load useful styles

```
\ifhwa@tikz
\RequirePackage{tikz}
\usetikzlibrary{shapes,arrows,positioning,decorations,
  automata,backgrounds,petri,bending,
  shapes.multipart}
\tikzset{
  treenode/.style = {shape=circle, rounded corners,
    draw, align=center},
```

```
  graynode/.style = {fill=gray},
  normalnode/.style     = {treenode, font=\Large, bottom color=white},
  array/.style = {rectangle split,
    rectangle split horizontal,
    rectangle split,
    draw}
}
\fi
```

Make sure that this is the last Package loaded

```
\RequirePackage{geometry}
\ifhwa@twocolumn
\geometry{top=2cm, bottom=2cm, left=2cm,
    headsep=14pt,hmarginratio={1:1}}
\else
\geometry{top=2cm, bottom=2cm, width=35em,
  headsep=14pt,hmarginratio={4:3}}
\fi
```

4 Layout

Initially, the homeworkassignment had a verry *special* appereance, which became much more customizable with version 3.0, see **??** if you want to know how.

4.1 Headers & Footers

Sets the page-headers.
All headers are cleared before they get any Text — just to be sure.

The headers have the date on the subject and the author on the right side, the tutorial, sheat-title and deadline on the left side, the pagenumber is displayed in the right footer.
If the document is twopaged, the informations in the headers are splittet, so that author and subject are displayed only on odd pages and the title on even, the pagenumber is displayed on the right side on odd pages and on the left side on even pages.
On the first page, only the date and tutorial will be displayed in the header, the rest of infomration should be in the title.

```
\fancypagestyle{firstpage}{
  %
  \fancyhf{}
  % clear all six fields
  \renewcommand{\headrulewidth}{\hwa@headrulewidth}
  \renewcommand{\footrulewidth}{0pt}
  \fancyfoot[R]{\thepage}
  \fancyhead[L]{\hwa@tutorium}
  \fancyhead[R]{\@date } }
```

```
\fancypagestyle{followingpage}{
  \fancyhf{}
  \ifhwa@twoside % IF
  \fancyhead[RO]{\@author}
  \fancyhead[LO]{\hwa@kurs\\
    \hwa@tutorium}
  \fancyhead[LE]{
    \ifthenelse{\equal{\hwa@sheetTitle}{}}{}{\hwa@sheetTitle\\}
    \GetTranslation{abgabe}: \hwa@abgabe
  }
  \fancyfoot[RO,LE]{\thepage}

  \else %ELSE

  \fancyhead[R]{\hwa@kurs\\
    \@author}
  \fancyhead[L]{\hwa@tutorium\\
    \ifthenelse{\equal{\hwa@sheetTitle}{}}{}{\hwa@sheetTitle\\}
    \GetTranslation{abgabe}: \hwa@abgabe}
  \fancyfoot[R]{\thepage}
  \fi %ENDIF
  \renewcommand{\headrulewidth}{\hwa@headrulewidth}
  \renewcommand{\footrulewidth}{0pt}
}
\pagestyle{followingpage}
```

4.2 Enhance Math Environments

A couple of things to make math environments more beautiful and compact.

`\theequation` Displays equation-numbers as upper-case roman numbers.

```
\renewcommand{\theequation}{\Roman{equation}}
```

`\allowdisplaybreaks` Allow pagebreaks in mathmode

```
\allowdisplaybreaks
```

4.3 Fonts

4.4 Serife (Default)

The default font for text in HWA is the TeX Gyre clone of Palatino, Pagella.

4.5 Sans Serif

`helvet` The default sans serif font is TeX Gyre Adventor. Including `helvet` in the class options will replace the default sans serif font Aventor with the Helvetica equivalent of TeX Gyre, Heros, for a more metric appereance.

```
\ifthenelse{\boolean{xetex}}{
```

```
  \RequirePackage{fontspec}
  \ifhwa@helvet
    \setsansfont{TeX Gyre Heros}
  \else
    \setsansfont{TeX Gyre Adventor}
  \fi
  \setmainfont{TeX Gyre Pagella}
  \setmonofont{Fira Mono}
}{
  \ifhwa@helvet
    \RequirePackage{tgheros}
  \else
    \RequirePackage{tgadventor}
  \fi
  \RequirePackage{tgpagella}
  \RequirePackage{FiraMono}
}
```

4.5.1 Monospace

5 Commands

5.1 Constants

Defines some constants

`\hwa@pointboxsize` Explains it self.

```
\newcommand{\hwa@pointboxsize}{3em}
```

5.2 Document Informations

`\subject, \kurs` Sets the subject of the document. Takes the subject as argument. Standard Value is “Kein Kurs”
`\kurs` is deprecated.

```
\newcommand{\hwa@kurs}{?\GetTranslation{subject}?} % To store the value
\newcommand{\subject}[1]{\renewcommand{\hwa@kurs}{#1}}
\newcommand{\kurs}[1]{\subject{#1}}
```

`\tutorial, \tutorium` Sets the tutorial of the author. Takes it as an argument. Stamdard Value is empty, so that this command can be omitted.
`\tutorium` is deprecated.

```
\newcommand{\hwa@tutorium}{?\GetTranslation{uebungsgruppe}?} % To store the value
\newcommand{\tutorial}[1]{\renewcommand{\hwa@tutorium}{#1}}
\newcommand{\tutorium}[1]{\tutorial{#1}}
```

\deadline, \abgabe Sets the deadline of the document. Takes it as an argument. Standard value is \today.
\abgabe is deprecated

```
\newcommand{\hwa@abgabe}{\today} % To store the value
\newcommand{\deadline}[1]{\def\hwa@abgabe{#1}}
\newcommand{\abgabe}[1]{\deadline{#1}}
```

\sheetTitle Sets a descriptional Title of the Sheet, will be written in the header of every page.

```
\newcommand{\hwa@sheetTitle}{}
\newcommand{\sheetTitle}[1]{\def\hwa@sheetTitle{#1}}
```

5.2.1 Inherited from `article`

\author Sets the author of the document.
\date Sets the date of the document.

5.3 Sectioning

Because the class is designed for Assignments, the sectioning-commands are different from Article, as layed out in the following.

5.3.1 Obsoledation of `\section etc.`

```
\renewcommand{\section}[1]{\ClassError{homeworkassignment}{The
    Section-Command is disabled by homeworkassignment, please use one
  of the improved mechanisms for new Exercises}}
\renewcommand{\subsection}[1]{\ClassError{homeworkassignment}{The
    Subsection-Command is disabled by homeworkassignment, please use one
  of the improved mechanisms for new Exercises}}
\renewcommand{\subsubsection}[1]{\ClassError{homeworkassignment}{The
    Subsubsection-Command is disabled by homeworkassignment, please use one
  of the improved mechanisms for new Exercises}}
```

5.3.2 internal Sectioning

\hwa@problem
\hwa@subproblem
\hwa@subsubproblem
These commands work like their counterpart in article, except that there will be no number, nor will they increase a counter. Nevertheless, they will be shown in the table of contents. With version 4.0 they were made private, because I figured that they are not usefull enough and I am now able to introduce environments with the old names

```
\DeclareDocumentCommand\hwa@problem{m o}{\@startsection{problem}%Name
  {1}%Level
  {\z@}%indent
  {-2em \@plus -1em \@minus -1em}%beforeskip
```

```
  {1ex \@plus .5ex}%afterskip
  {\normalfont\Large \sffamily\bfseries}%style
  *{#1
    \IfNoValueF{#2}{
      \hfill
     \frame{\framebox[\hwa@pointboxsize]{
         \hfill \normalfont{\large/\small{#2}}}}
    }
  }
  \addcontentsline{toc}{section}{#1}
}

\DeclareDocumentCommand\hwa@subproblem{m o}{\@startsection{subproblem}%Name
  {2}%Level
  {\z@}%indent
  {-1em \@plus -.5em \@minus -.5em}%beforeskip
  {.5ex \@plus .5ex}%afterskip
  {\normalfont\large \sffamily\bfseries}%style
  *{#1
    \IfNoValueF{#2}{
      \hfill \framebox[\hwa@pointboxsize]{
        \hfill\normalfont\large/\small{#2}}
    }
  }
  \addcontentsline{toc}{subsection}{#1}
}

\DeclareDocumentCommand\hwa@subsubproblem{m o}{\@startsection{subsubproblem}%Name
  {3}%Level
  {\z@}%indent
  {-.5em}%beforeskip
  {.5em}%afterskip
  {\normalfont \sffamily\bfseries}%style
  *{#1
    \IfNoValueF{#2}{
      \hfill \framebox[\hwa@pointboxsize]{
        \hfill\normalfont\large/\scriptsize{#2}}
    }
  }
}

```

`\keyword` Creates a new Paragraph ,which will start with the Argument in Bold, followed by two non-breaking spaces.

```
\newcommand{\keyword}[1]{\@startsection{keyword}%Name
  {4}%Level
  {\parindent}%indent
  {-.1em}%beforeskip
  {\z@}%afterskip
```

```
  {\normalfont \sffamily\bfseries}%style
  *{#1~~}
}
```

The following Macros make use of `\keyword`, so it is suggested to use them instead.

`\solution` `\proof` `\given` `\toShow` `\toDisprove` `\assumption` `\supposeThat`

They work like `\keyword`, but take only an optional Argument print out "Solution", "Proof" "Given", "To show", "Assumption", and "Suppose that", respectively [2], via `\keyword`. If an argument is passed, they print out this argument after the keyword. They are not mentioned in the table of contents.

```
\newcommand{\solution}[1][]{\keyword{\GetTranslation{loesung}\ifstrempty{#1}{}{~#1}:}}
\newcommand{\toShow}[1][]{\keyword{\GetTranslation{zuZeigen}\ifstrempty{#1}{}{~#1}:}}
\newcommand{\toDisprove}[1][]{
  \keyword{\GetTranslation{zuWiderlegen}\ifstrempty{#1}{}{~#1}:}}
\newcommand{\given}[1][]{\keyword{\GetTranslation{gegeben}\ifstrempty{#1}{}{~#1}:}}
\newcommand{\assumption}[1][]{\keyword{\GetTranslation{Annahme}\ifstrempty{#1}{}{~#1}:}}
\newcommand{\supposeThat}[1][]{\keyword{\GetTranslation{Angenommen-dass}\ifstrempty{#1}{}{~#1}}
```

5.3.3 'better' Sectioning

The following commands are an augmented version of the "plain" commands.

`\newproblem` `\newproblem*` `\newsubproblem` `\newsubsubproblem`

These commands require no argument, and automatically create a numbered title. They have two optional arguments: `\newproblem[#1]{#2}` where `#1` is the (sub(sub))problem-number and `#2` are the points. If there is a number of Points assigned to a (sub(sub))problem, then the command will generate a box to write the reched number of points down next to it.

Normally, `\newproblem` adds the new Created Problem to the grading–table (see subsection 5.5), `\newproblem*` does not do this.

They use coutners, of course:

```
\newcounter{problem} \setcounter{problem}{0}
\newcounter{subproblem}[problem] \setcounter{subproblem}{0}
\newcounter{subsubproblem}[subproblem] \setcounter{subsubproblem}{0}

\DeclareDocumentCommand\newproblem{O{} g}{
  \stepcounter{problem}% to reset the lower counters
  \ifthenelse{\equal{#1}{}}{
    % empty
  }{
    \setcounter{problem}{#1}
  }
```

[2] As of v1.6, Translations are added, depending on the choosen Language, there may be an other Text displayed.
See section 9 for all Translations

```
  \IfNoValueTF{#2}{
    \hwa@problem{\GetTranslation{aufgabe} \hwa@problemno}
    \addToGradingTable{\# \hwa@problemno}
  }{
    \hwa@problem{\GetTranslation{aufgabe} \hwa@problemno}[#2]
    \addToGradingTable{\# \hwa@problemno}{/#2}
  }
}

\WithSuffix\newcommand\newproblem*[1][]{\stepcounter{problem}
  \ifthenelse{\equal{#1}{}} { } {
    \stepcounter{problem}% to reset the lower counters
    \setcounter{problem}{#1}}
  \hwa@problem{\GetTranslation{aufgabe} \hwa@problemno}
}

\DeclareDocumentCommand\newsubproblem{O{} g}{
  \stepcounter{subproblem}
  \ifthenelse{\equal{#1}{}} { } {
    \setcounter{subproblem}{#1}}
  \IfNoValueTF{#2}{
    \hwa@subproblem{\GetTranslation{aufgabe}
      \hwa@problemno{}.\hwa@subproblemno}
  }
  {
    \hwa@subproblem{\GetTranslation{aufgabe}
      \hwa@problemno{}.\hwa@subproblemno}[#2]
  }
}

\DeclareDocumentCommand\newsubsubproblem{O{} g}{
  \stepcounter{subsubproblem}
  \ifthenelse{\equal{#1}{}} { } {\setcounter{subsubproblem}{#1}}
  \IfNoValueTF{#2}{
    \hwa@subsubproblem{\hwa@subsubproblemno)}
  }
  {
    \hwa@subsubproblem{\hwa@subsubproblemno)}[#2]
  }
}

```

5.3.4 Even Better Sectioning-Environments

h jk

```
\NewDocumentEnvironment{problem}{O{} g}{
  \newproblem[#1]{#2}
  \newcommand{\task}[1]{
```

```
    \begin{framed}
      \keyword{Problem:} ##1
    \end{framed}
  }
}{}
\NewDocumentEnvironment{problem*}{O{} g}{
  \newproblem*[#1]{#2}
  \newcommand{\task}[1]{
    \begin{framed}
      \keyword{Problem:} ##1
    \end{framed}
  }
  \NewDocumentEnvironment{subproblem}{O{} g}{
    \newsubproblem[#1]{#2}
    \NewDocumentEnvironment{subsubproblem}{O{} g}{
      \newsubsubproblem[#1]{#2}
    }{}
  }{}
}{}
```

5.4 Useful Macros

5.4.1 QUOD ERAT DEMUNSTRANDUM, End of Proof

\QED
\EOP
\eop

Display a flushed-right *QED*, □, or ■, respectively. \qed is not implemented, to keep compatibility to several Math-packages, which define the later.

```
\newcommand{\hwa@QED}{\begin{flushright}
    \textsc{Qed}
  \end{flushright}
}
\newcommand{\QED}{\hwa@QED}

\ifhwa@unicodemath
 \RequirePackage{unicode-math}
\AtBeginDocument{\let\QEDSymbol\QED
  \renewcommand{\QED}{\hwa@QED}
}
\fi

\newcommand{\EOP}{\begin{flushright}
    \(\square\)
  \end{flushright}
}
\newcommand{\eop}{\hfill\(\blacksquare\)}
```

5.4.2 QUOD NON ERAT DEMUNSTARNDUM AT IUCUNDUM EST

\QNED
\qned

Display a right-flushed *triangle*. \QNED displays it in a new line, \qned at the end of the same line.
In Mathematical proofs this symbol is used to mark things, which we did not intend to proof, but are interesting anyway or things wich are not proofed mathematically, but are explained in a way which lets no doubt on their correctness.

```
\newcommand{\QNED}{\begin{flushright} \(\triangle\)
  \end{flushright}
}
\newcommand{\qned}{\hfill\(\triangle\)}
```

5.4.3 Stolen Goods

»Das ist alles nur geklaut«

∼Tobias Künzel

These Commands are not mine, they are all stolen from Alexander Bartolomey's[3] amath-Class[4]

\N
\Z
\R
\Q
\Compl
\F
\Primes

Defines a set of mathematical sets, which are verry usefull (see Table 1)

Command	Output	Description
\N	$\mathbb{N}$	Natural Numbers
\Z	$\mathbb{Z}$	Whole Numbers
\Q	$\mathbb{Q}$	Rational Numbers
\R	$\mathbb{R}$	Real Numbers
\Compl	$\mathbb{C}$	Complex Numbers
\F_n	$\mathbb{F}_n$	Prime Field to base n
\Primes[5]	$\mathbb{P}$	Set of all Primes

Table 1: Field-Commands

```
\newcommand{\N}{\ensuremath{\mathbb{N}}}
\newcommand{\Z}{\ensuremath{\mathbb{Z}}}
\newcommand{\R}{\ensuremath{\mathbb{R}}}
\newcommand{\Q}{\ensuremath{\mathbb{Q}}}
\newcommand{\Compl}{\ensuremath{\mathbb{C}}}
\newcommand{\F}{\ensuremath{\mathbb{F}}}
% The last one is mine
```

[3] "Occloxium" on GitHub:https://github.com/occloxium

[4] amath.sty is part of Alexander Bartolomey's Alphabet Classes: https://github.com/occloxium/AlphabetClasses

[5] Has to be \Primes, because \P is already in use

```
\newcommand{\Primes}{\ensuremath{\mathbb{P}}}
```

\GL
\id
\Var
\Perm
\MComb
\Comb
\Pot
\Map
\Hom
\Ker
\Intpol
\Pol
\Sol
\Bin
\charakteristik
\fo
\first
\la
\diff
\partdiff
\dx
\divides
\property
\dim
\Im
\excup
\falls

Output useful plaintext operators and functions. See table 2. Require math-mode

Command	Output
`\GL`	GL
`\id`	id
`\Var`	Var
`\Perm`	Perm
`\Comb`	Comb
`\MComb`	MComb
`\Pot`	Pot
`\Map`	Map
`\Hom`	Hom
`\Intpol`	Intpol
`\Pol`	Pol
`\Sol`	Sol
`\Bin`	Bin
`\charakteristik`	char
`\diff{<1>}`	$\frac{d}{d<1>}$
`\partdiff{<1>}`	$\frac{\partial}{\partial<1>}$
`\divides` and `property`	Prints a vertical line
`\dx`	dx
`\excup`	$\dot{\cup}$
`\fo`	fo
`\first`	fi
`\la`	la

Table 2: Common Functions

`\falls` prints out »falls«[6]

```
\DeclareMathOperator{\GL}{GL}
\DeclareMathOperator{\id}{id}
\DeclareMathOperator{\Var}{Var}
\DeclareMathOperator{\Perm}{Perm}
\DeclareMathOperator{\MComb}{MComb}
\DeclareMathOperator{\Comb}{Comb}
\DeclareMathOperator{\Pot}{Pot}
\DeclareMathOperator{\Map}{Map}
\DeclareMathOperator{\Hom}{Hom}
\DeclareMathOperator{\Ker}{Ker}
\DeclareMathOperator{\Intpol}{Intpol}
```

[6] In German, actual Translation may differ

```
\DeclareMathOperator{\Pol}{Pol}
\DeclareMathOperator{\Sol}{Sol}
\DeclareMathOperator{\Bin}{Bin}
\DeclareMathOperator{\charakteristik}{char}
\DeclareMathOperator{\fo}{fo}
\DeclareMathOperator{\first}{fi}
\DeclareMathOperator{\la}{la}

\newcommand{\diff}[1]{\ensuremath{\frac{d}{d#1}}}
\newcommand{\partdiff}[1]{\ensuremath{\frac{\partial}{\partial#1}}}
\newcommand{\dx}{\:dx}
\newcommand{\divides}{\ensuremath{\ |\ }}
\newcommand{\property}{\ensuremath{\ |\ }}

\renewcommand{\dim}[1][]{\ensuremath{\text{dim}_{#1}\ }}
\renewcommand{\Im}{\ensuremath{\text{Im}\ }}

\newcommand{\excup}{\ensuremath{\stackrel{.}{\cup}}}
\newcommand{\falls}{\text{\ \GetTranslation{falls}}\ }
```

5.4.4 Rounding

Require mathmode

Command	Output	Meaning
`\floor{<1>}`	$\lfloor < 1 > \rfloor$	floor <1>
`\ceil{<1>}`	$\lceil < 1 > \rceil$	ceil <1>
`\roundHU{<1>}`	$\lceil < 1 > \rfloor$	Round <1> "half up" ($\left\lfloor < 1 > +\frac{1}{2} \right\rfloor$)
`\roundHD{<1>}`	$\lfloor < 1 > \rceil$	Round <1> "half down" ($- \left\lfloor < 1 > -\frac{1}{2} \right\rfloor$)

Table 3: Rounding Functions

```
\newcommand{\floor}[1]{\ensuremath{\left\lfloor #1 \right\rfloor}}
\newcommand{\ceil}[1]{\ensuremath{\left\lceil #1 \right\rceil}}
\newcommand{\roundHU}[1]{\ensuremath{\left\lceil #1 \right\rfloor}}
\newcommand{\roundHD}[1]{\ensuremath{\left\lfloor #1 \right\rceil}}
```

`\bigforall`
`\bigexists` Redefines big versions of quantors, adds an h-skip to normal version.

```
\let\oforall\forall
\let\oexists\exists
\renewcommand{\forall}{\ensuremath{\hskip 2pt \oforall \hskip 2pt}}
\renewcommand{\exists}{\ensuremath{\hskip 2pt \oexists \hskip 2pt}}
\newcommand{\bigforall}{\mbox{\raisebox{-2pt}[\height][\depth]{\Large $\mathsurround4pt\forall$}
\newcommand{\bigexists}{\mbox{\raisebox{-2pt}[\height][\depth]{\Large $\mathsurround4pt\exists$}
```

5.4.5 ToDos

Utility for the Documentation of ToDos

`\todo` Creates a todo at the location of the command, highlighted in red. The ToDos will be listed after maketitle, unless the option `todos=nolist` or `todos=none` is specified.

```
\DeclareDocumentCommand\todo{G{}}{
  \ifthenelse{\boolean{hwa@todos@inplace}}{
    {\color{red}\textbf{~\label{TODO\alph{todoNum}}TODO~}#1~}
    \xdef\hwa@todoList@aux{\hwa@todoList@aux
      \string\item\string\hyperref[TODO\alph{todoNum}]{TODO #1}
    }
    \stepcounter{todoNum}
  }{}
}
```

Uses the internal `hwa@todo`-counter

```
\newcounter{todoNum} \setcounter{todoNum}{1}
```

`\hwa@tableOfTodos` Prints all ToDos

```
\DeclareDocumentCommand\hwa@tableOfTodos{}{
  \ifthenelse{\boolean{hwa@todos@list}}{
    \ifthenelse{\equal{\hwa@todoList }{\empty}}{%Nothing
    }{
      {\color{red}
        \hwa@problem{Table of ToDos}
        \begin{itemize}
          \hwa@todoList
        \end{itemize}}
    }
  }{}
}
```

5.5 Grading Table

This Document-Class is still mainly designed for Homework, so it would be nice, if there was a table to write Grades into, wouldn't it?

`\addToGradingTable` Adds the given parameter as an excercise to the Grading-Table. All Problems, created with `\newproblem` are added automatically.

```
\DeclareDocumentCommand\addToGradingTable{m g}{
  \xdef\hwa@gradingtbl@aux@defs{\hwa@gradingtbl@aux@defs|p{\hwa@pointboxsize}}
  \xdef\hwa@gradingtbl@aux@lineOne{\hwa@gradingtbl@aux@lineOne{#1} &}
  \IfNoValueTF{#2}{
    \xdef\hwa@gradingtbl@aux@lineTwo{\hwa@gradingtbl@aux@lineTwo &}
  }{
    \xdef\hwa@gradingtbl@aux@lineTwo{\hwa@gradingtbl@aux@lineTwo\vfill\hfill
```

```
      {\string\small #2} &}
  }
}
```

`\makeGradingTable` Outputs a table to fill in the reached Points. Only shows Problems created by `\newproblem`.
Displays the according number of maximum points for each problem, if specified.
Displays the total number of maximum Problems, if given by Argument Like `\tableofcontent`, it needs a second run of LaTeX, until all are added.
It will never overflow the Line-Width, thanks to an `adjustbox`. `[#1]`: *Optional.*
The total number of points reachable.

```
\DeclareDocumentCommand\makeGradingTable{o}{
  \begin{table}[hb]
    \centering
    \large
    \begin{adjustbox}{max width=\linewidth}
      \expandafter\tabular\expandafter{\hwa@gradingtbl@defs ||p{\hwa@pointboxsize}|}\hline
      \hwa@gradingtbl@lineOne  \(\Sigma\)       \\\hline\small
      \hwa@gradingtbl@lineTwo  \IfNoValueTF{#1}{~}{\vfill\hfill/#1}\vspace{.15cm}\\\hline
      \endtabular
    \end{adjustbox}
  \end{table}
  }
```

See example documents fot output

5.5.1 Internal commands

`\hwa@gradingtbl@...` Defines macros whose contents will be written to the AUX-File and read in the next run, and the usable commands. The later will contain the information, but have to be defined (incase the aux-file does not exist)

```
\edef\hwa@gradingtbl@aux@defs{}
\newcommand{\hwa@gradingtbl@aux@lineOne}{}
\newcommand{\hwa@gradingtbl@aux@lineTwo}{}

\edef\hwa@gradingtbl@defs{}
\newcommand{\hwa@gradingtbl@lineOne}{}
\newcommand{\hwa@gradingtbl@lineTwo}{}
```

`\hwa@todoList@...` See `\hwa@gradingtlb@...`.

```
\newcommand{\hwa@todoList}{}
\newcommand{\hwa@todoList@aux}{}
% \end{macro}
% \begin{macro}{\write\@auxout}
%   Write to aux
%    \begin{macrocode}
\AtEndDocument{%
  \immediate\write\@auxout{%
```

```
    \gdef\string\hwa@gradingtbl@defs{\hwa@gradingtbl@aux@defs}
  }
  \immediate\write\@auxout{%
    \gdef\string\hwa@gradingtbl@lineOne{\hwa@gradingtbl@aux@lineOne}%
  }
  \immediate\write\@auxout{%
    \gdef\string\hwa@gradingtbl@lineTwo{\hwa@gradingtbl@aux@lineTwo}%
  }
  \immediate\write\@auxout{%
    \gdef\string\hwa@todoList{\hwa@todoList@aux}%
  }
}
```

5.6 Title

`\maketitle` Overrides maketitle.

```
\renewcommand{\maketitle} {
  \thispagestyle{firstpage}
  \ifhwa@twocolumn{
    \twocolumn[{
      \hwa@maketitletext
    }]
  }\else{
    \hwa@maketitletext
  }\fi
  \hwa@tableOfTodos
}
```

`\hwa@maketitletext` Prints out the title with author etc. Used to reduce code duplication for two- and onecolumn styles

```
\newcommand{\hwa@maketitletext}{
  \begin{centering}
    \huge{\textsf{\textbf{\hwa@kurs}}}\hwa@hline@LONE \large
    \ifthenelse{\equal{\hwa@sheetTitle}{}}{}{\textbf{\hwa@sheetTitle}\\}
    \GetTranslation{abgabe}: \hwa@abgabe\\
    \hwa@hline@LTWO
    \normalsize{\@author}\\
    \hwa@hline@LTWO \normalsize
  \end{centering}
}
\ifthenelse{\boolean{hwa@punchmark}}{
  \newcommand{\hwa@punchmarkRad}{3mm}
  \newcommand{\hwa@punchmarkDistanceX}{12mm}
  \newcommand{\hwa@punchmarkDistanceY}{40mm}
  \AtBeginDocument{
  % Where will the punch be?
  \AddToShipoutPictureBG*{\AtPageUpperLeft{
      \put(\LenToUnit{\hwa@punchmarkDistanceX-\hwa@punchmarkRad*2},\LenToUnit{-.5\paperheight-\
      \put(\LenToUnit{\hwa@punchmarkDistanceX-\hwa@punchmarkRad*2},\LenToUnit{-.5\paperheight+\
```

```
  % Punch-Positioningmark
  \AddToShipoutPictureBG*{\AtPageUpperLeft{
      \put(\LenToUnit{5mm},\LenToUnit{-.5\paperheight}){\tikz{\draw (0,0) -- (5mm,0);}}}}
  }
}{
}
```

5.7 Counters

The actual counters are defined in subsubsection 5.3.3.

`Counter-Commands` These are used to output the Exercise numbers in the desired style

```
\newcommand{\hwa@problemno}{\arabic{problem}}
\newcommand{\hwa@subproblemno}{\alph{subproblem}}
\newcommand{\hwa@subsubproblemno}{\roman{subsubproblem}}
```

`\hwa@parseCounterStyle` This takes a style-input (#1), one of the three previous defined commands (#2) and the coresponding counter (#3) to redefine #1, so that it corresponds to #2. See **??** for example usement.

```
\newcommand{\hwa@parseCounterStyle}[3]{
  \ifthenelse{\equal{#1}{arabic}}{ \renewcommand{#2}{\arabic{#3}} }{
    \ifthenelse{\equal{#1}{roman}}{ \renewcommand{#2}{\roman{#3}} }{
      \ifthenelse{\equal{#1}{alph}}{ \renewcommand{#2}{\alph{#3}} }{
        \ifthenelse{\equal{#1}{Alph}}{ \renewcommand{#2}{\Alph{#3}} }{
          \ifthenelse{\equal{#1}{Roman}}{
            \renewcommand{#2}{\Roman{#3}} }{
            \ClassError{homeworkassignment}{Invalid Value #1 for
              option Counter-Styling}{Possible Values are alph,
              arabic, Arabic, roman or Roman.}  } } } } } }
```

Redefines the three counter-commands:

```
\hwa@parseCounterStyle{\hwa@problemsty}{\hwa@problemno}{problem}
\hwa@parseCounterStyle{\hwa@subproblemsty}{\hwa@subproblemno}{subproblem}
\hwa@parseCounterStyle{\hwa@subsubproblemsty}{\hwa@subsubproblemno}{subsubproblem}
```

6 Environments

6.1 Proof

Used for proofes. Starts bth proof and ends with a End-Of-Proof symbol.

```
\NewDocumentEnvironment{proof}{G{\GetTranslation{beweis}} O{\QED}}
{
  \keyword{#1:~~}
}
{
  #2
}
```

6.2 Proof by contradiction

Used for proofes. Starts bth proof and ends with a End-Of-Proof symbol.

```
\NewDocumentEnvironment{contradiction}{}
{
  \begin{proof}{\GetTranslation{beweis}~\GetTranslation{per}~\GetTranslation{Widerspruch}}[\hfi
  }
  {
  \end{proof}
}
```

7 Development and support

The package is developed at *GitHub*:

`https://github.com/ACHinrichs/LaTeX-templates`

Please refer to that site for any bug report or development information.

8 Changelog

v1.0 - 2016/10/23 Initial

v1.1 - 2016/11/02 ...

v1.2 - 2016/11/03 ...

v1.3 - 2016/12/01
- Provide the Class as .dtx file and more

v1.4 - 2017/04/29
- "Minor" bugfixes

v1.5 - 2017/04/29
- Problems are displayed in the table of contents. Type of numeration is now configurable.

v1.5.1 - 2017/04/29
- Bugfix

v1.5.2 - 2017/04/29
- Add version-number

v1.6 - 2017/05/02
- Add Translations (German and English)
- Add `\given` and `\toShow`
- Add `\QED`, `\EOP`, and `\eop`

v1.6.3 - 2017/05/05
- Bugfixes

v1.6.4 - 2017/05/09
- Change `\eop` to be in the same line

v1.7 - 2017/05/09
- Add `\QNED`

v2.0 - 2017/05/23 "Layout 2.0"
- Change Margins
- Add Option to select older Page-Style
- Change standardlayout to twocolumn and twoside
- ~~Steal~~ Use Macros by Alexander Bartolomey (See 5.4.3)
- Add some TikZ-Styles
- Add round functions

v2.2 - 2017/06/17
- Add Grading-table
- Add `\keyword`, `\assumption`, and `\supposeThat`

- Add `\newproblem*`
- Add `\sheetTitle`
- Change equation-numbering to uppercase roman

v2.2.1 - 2017/06/20
- Fix error with commands like `\solution` and `\keyword`.

v2.4 - 2017/04/07
- Fix math alignment
- Add option for flushed left equations
- Update amath port to use

v3.0 - 2017/12/26 "WS 2017"

- Rename to `homeworkassignment`
- Add Environment for various proofs
- Add points for exercises and a place to fill them in
- Add option to remove or decrease or remove the hlines
- Remove legacy styles
- Rework the documentation
- Beautify Maths
- Fix OneColumn-Maktitle-Bug
- Fix Subproblem-Counter not beeing reset
- Merry Christmas!

v3.2 - 2018/12/06 Nikolaus Release

- Make XeLaTex-Compatible
- Fix `\newproblem` requiring a Problem-Number
- Add `\toDisprove` macro similar to the `\toShow` macro
- Add option for punchmarks
- Add option to load unicode-math and work around a incompability

v4.0 - 2019/04/17 Pre-Easter Release

- Add option to use `unicode-math`
- Rename `\C` to `\Compl`, because of a `unicode-math` incompatibility
- Rework Fonts
- Make `onecolumn` the default
- Implement ToDos
- Replace `\problem`-commands by `problem` environments (which behave like `\newproblem`)
- Add Task-Command

v4.1 - 2019/05/03 Experimental Font Support

- Included `helvet` binary option for a more metric font support
- Language and grammar fixes

8.1 Version–Scheme

Since Version 2.0 the following version–scheme applies:

Major Version has to be increased, if

- there are changes, which create visible changes in the output of existing documents (except for bugfixes), or
- a command is removed or changed in a way, that existing documents do not compile with the new version.

Minor Version has to be increased, if

- new backwards compatible commands are introduced
  - Bugfixes may be introduced too.

The minor version of stable releases is always even, the minor version of developtment versions is always odd. (0 counts as even).

Patches May be introduced on Stable Branch. With every non-document-breaking bugfix, the patch–number has to be incremented.
Because Fixing Bugs is a part of developtment, developtment-versions do not have numeric patch–numbers, but alphabetic identifiers, directly after the minor–version.

9 Translations

Homeworkassignment currently supports English and German, fallback language is German. Unfortunatly these two are the only Languages I am capable of translating reliable, so if you want to use an other language, I would be verry happy if you would help me to translate homeworkassignment! Please open an issue, author a pull-request or send me an e-mail.

```
\DeclareTranslationFallback{aufgabe}{Aufgabe}
\DeclareTranslationFallback{loesung}{L\"osung}
\DeclareTranslationFallback{beweis}{Beweis}
\DeclareTranslationFallback{uebungsgruppe}{\"Ubungsgruppe}
\DeclareTranslationFallback{abgabe}{Abgabe}
\DeclareTranslationFallback{zuZeigen}{Zu zeigen}
\DeclareTranslationFallback{zuWiderlegen}{Zu widerlegen}
\DeclareTranslationFallback{gegeben}{Gegeben}
\DeclareTranslationFallback{falls}{falls}
\DeclareTranslationFallback{Annahme}{Annahme}
\DeclareTranslationFallback{Angenommen-dass}{Anngenommen, dass}
\DeclareTranslationFallback{per}{per}
\DeclareTranslationFallback{Widerspruch}{Widerspruch}

\DeclareTranslation{German}{aufgabe}{Aufgabe}
\DeclareTranslation{German}{loesung}{L\"osung}
\DeclareTranslation{German}{beweis}{Beweis}
\DeclareTranslation{German}{uebungsgruppe}{\"Ubungsgruppe}
\DeclareTranslation{German}{abgabe}{Abgabe}
\DeclareTranslation{German}{zuZeigen}{Zu zeigen}
\DeclareTranslation{German}{zuWiderlegen}{Zu widerlegen}
\DeclareTranslation{German}{gegeben}{Gegeben}
\DeclareTranslation{German}{falls}{falls}
\DeclareTranslation{German}{Falls}{Falls}
\DeclareTranslation{German}{Annahme}{Annahme}
\DeclareTranslation{German}{Angenommen-dass}{Anngenommen, dass}
\DeclareTranslation{German}{per}{per}
\DeclareTranslation{German}{Widerspruch}{Widerspruch}

\DeclareTranslation{English}{aufgabe}{Problem}
\DeclareTranslation{English}{loesung}{Solution}
\DeclareTranslation{English}{beweis}{Proof}
\DeclareTranslation{English}{uebungsgruppe}{Tutorial}
\DeclareTranslation{English}{abgabe}{Deadline}
\DeclareTranslation{English}{zuZeigen}{To show}
\DeclareTranslation{English}{zuWiderlegen}{To disprove}
\DeclareTranslation{English}{gegeben}{Given}
\DeclareTranslation{English}{falls}{if}
\DeclareTranslation{English}{Falls}{If}
\DeclareTranslation{English}{Annahme}{Assumption}
\DeclareTranslation{English}{Angenommen-dass}{Suppose that}
\DeclareTranslation{English}{per}{by}
```

```
\DeclareTranslation{English}{Widerspruch}{contradiction}
```

End

The End

```
\endinput
```