

The homeworkassignment*class[†]

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

[†]This document corresponds to `homeworkassignment` v3.2b, dated 2019/04/16.

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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 very 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 L^AT_EX-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 L^AT_EX-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 \LaTeX class and package authors

`array` FRANK MITTELBACH, DAVID CARLISLE, THE \LaTeX -TEAM, <https://www.ctan.org/pkg/array>,
A new implementations for tables and arrays

`xparse` FRANK MITTELBACH, CHRIS ROWLEY, DAVID CARLISLE, THE \LaTeX 3 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 2 ϵ 's `\newcommand` macro, with significantly improved functionality.

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

`hyperref` [HTTPS://CTAN.ORG/PKG/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

`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

```
1 \RequirePackage{suffix}
2 \RequirePackage{fancyhdr}
3 \RequirePackage{xifthen}
4 \RequirePackage{translations}
```

array possibly can be removed

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

```

5 \PassOptionsToPackage{fleqn}{amsmath}
6 \RequirePackage{amsmath}
7 \RequirePackage{amssymb}
8 \RequirePackage{etoolbox}
9 \RequirePackage{array}
10 \RequirePackage{xparse}
11 \RequirePackage{ifxetex}
12
13 \RequirePackage{wasysym}
14 \RequirePackage{adjustbox}
15
16 \RequirePackage{eso-pic}
17
18 \RequirePackage{xcolor}

```

3 Options

KV-Options is essential for this.

```

19 \RequirePackage{kvoptions}
20 \SetupKeyvalOptions{ family=hwa,
21   prefix=hwa@ }
22 \DeclareDefaultOption{\PassOptionsToClass{\CurrentOptionKey}{article}}

```

`problemstyle=<1>` These options allow the customization of the displayed numbers. For Example, if
`subproblemstyle=<1>` `problemstyle=Roman`, `subproblemstyle=arabic`, `subsubproblemstyle=roman`
`subsubproblemstyle=<1>` is passed, The first subsubproblem of the first subproblem of the first problem
would be labeled as **i) of Problem I.1.**

Available options are `arabic`, `Alph`, `alph`, `Roman`, and `roman`. Standard values are:
`problemstyle=arabic`, `subproblemstyle=alph`, `subsubproblemstyle=roman`.

```

23 \DeclareStringOption[arabic]{problemsty}
24 \DeclareStringOption[alph]{subproblemsty}
25 \DeclareStringOption[roman]{subsubproblemsty}

```

`tikz` Loads TikZ-Package and a couple of Styles, usefull for Papers in Computer-Science
and mathematics. See 3 for more informations

```

26 \DeclareBoolOption[false]{tikz}

```

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

```

27 \DeclareBoolOption[false]{listings}

```

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

```

28 \DeclareBoolOption[true]{twoside}
29 \DeclareComplementaryOption{oneside}{twoside}

```

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

```

30 \DeclareBoolOption[false]{twocolumn}
31 \DeclareComplementaryOption{onecolumn}{twocolumn}

```

punchmark Adds a mark for an hole puncher. Standard Layout has no marking.
`32 \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.
`33 \DeclareStringOption[all]{hlines}`

todos=<1> KeyValue-option. Takes which ToDos shall be displayed. Available are **all** (default), **nolist**, **none**. See subsection 5.4.5 for explanation of the levels.
`34 \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 (06th of December 2018) slips my mind completely, **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

```

35 \ifxetex
36 \DeclareBoolOption[true]{unicodemath}
37 \else
38 \DeclareBoolOption[false]{unicodemath}
39 \fi

  Loads article and processes the options
40 \ProcessKeyvalOptions*
41 \ifhwa@twoside
42 \PassOptionsToClass{twoside}{article}
43 \else
44 \PassOptionsToClass{oneside}{article}
45 \fi
46 \ifhwa@twocolumn
47 \PassOptionsToClass{twocolumn}{article}
48 \else
49 \PassOptionsToClass{onecolumn}{article}
50 \fi
51 \LoadClass{article}
52
53 \newboolean{hwa@todos@inplace}

```

```

54 \newboolean{hwa@todos@list}
55 \setboolean{hwa@todos@inplace}{true}
56 \setboolean{hwa@todos@list}{true}
57 \ifthenelse{\equal{hwa@todos}{all}}{
58 }{
59   \ifthenelse{\equal{hwa@todos}{nolist}}{
60     \ClassWarning{homeworkassignment}{You specified todos=none,
61       there will be no list of TODO}
62     \setboolean{hwa@todos@list}{false}
63   }{
64     \ifthenelse{\equal{hwa@todos}{none}}{
65       \ClassWarning{homeworkassignment}{You specified todos=none,
66         there will be no TODOs printed in the final document}
67       \setboolean{hwa@todos@list}{false}
68       \setboolean{hwa@todos@inplace}{false}
69     }{
70       \ClassError{homeworkassignment}{hwa@todos is not a valid value
71         for the option 'todos'}
72     }
73   }
74 }

Load Hyperref (breaks if it is loaded before article
75 \RequirePackage{hyperref}

Loads listings, if wanted
76 \ifhwa@listings
77 \RequirePackage{listings}
78 \lstset{
79   frame = single,
80   breaklines = true,
81   postbreak=\raisebox{0ex}[0ex][0ex]{\ensuremath{\hookrightarrow}\space}},
82   basicstyle=\scriptsize
83 }
84 \else
85 \empty
86 \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`

```

87
88 \newcommand{\hwa@hline@LONE}{\vspace{.25cm} {\hrule height 2pt}
89   \vspace{.25cm}}
90 \newcommand{\hwa@hline@LTWO}{\vspace{.5cm} \hrule \vspace{.25cm}}
91 \newcommand{\hwa@headrulewidth}{.7pt}

```

```

92 \ifthenelse{\equal{\hwa@hlines}{all}}{
93   \renewcommand{\hwa@hline@LONE}{\vspace{.25cm} {\hrule height 2pt}
94     \vspace{.25cm}}
95   \renewcommand{\hwa@headrulewidth}{.7pt}
96   \renewcommand{\hwa@hline@LTWO}{\vspace{.5cm} \hrule \vspace{.25cm}}
97 }{
98   \ifthenelse{\equal{\hwa@hlines}{decreased}}{
99     \renewcommand{\hwa@hline@LONE}{\vspace{.25cm} {\hrule height 2pt}
100       \vspace{.25cm}}
101     \renewcommand{\hwa@headrulewidth}{.7pt}
102   }{\ifthenelse{\equal{\hwa@hlines}{header}}{
103     \renewcommand{\hwa@headrulewidth}{.7pt}
104   }{\ifthenelse{\equal{\hwa@hlines}{none}}{
105     \renewcommand{\hwa@headrulewidth}{0pt}
106   }{
107     \ClassError{homeworkassignment}{Value '\hwa@lines' for key 'hlines'
108       is not known}{The option hlines takes an argument to set which
109       hlines are drawn. Possible values are 'all','decreased' , 'header', and
110       'none'. 'all' is standard.}
111   }
112 }
113 \renewcommand{\hwa@hline@LONE}{~\vspace{.5cm}}
114 }
115 \renewcommand{\hwa@hline@LTWO}{\vspace{.75cm}}
116 }

```

If tikz is Wanted, load Usefull Styles

```

117 \ifhwa@tikz
118 \RequirePackage{tikz}
119 \usetikzlibrary{shapes,arrows,positioning,decorations,
120   automata,backgrounds,petri,bending,
121   shapes.multipart}
122 \tikzset{
123   treenode/.style = {shape=circle, rounded corners,
124     draw, align=center},
125   graynode/.style = {fill=gray},
126   normalnode/.style = {treenode, font=\Large, bottom color=white},
127   array/.style = {rectangle split,
128     rectangle split horizontal,
129     rectangle split,
130     draw}
131 }
132 \fi

```

Make sure that this is the last Package loaded

```

133 \RequirePackage{geometry}
134 \ifhwa@twocolumn
135 \geometry{top=2cm, bottom=2cm, left=2cm,
136   headsep=14pt,hmarginratio={1:1}}
137 \else

```

```

138 \geometry{top=2cm, bottom=2cm, width=35em,
139   headsep=14pt,hmarginratio={4:3}}
140 \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.

```

141 \fancypagestyle{firstpage}{
142   %
143   \fancyhf{}
144   % clear all six fields
145   \renewcommand{\headrulewidth}{\hwa@headrulewidth}
146   \renewcommand{\footrulewidth}{0pt}
147   \fancyfoot[R]{\thepage}
148   \fancyhead[L]{\hwa@tutorium}
149   \fancyhead[R]{\@date } }
150 \fancypagestyle{followingpage}{
151   \fancyhf{}
152   \ifhwa@twoside % IF
153   \fancyhead[RO]{\@author}
154   \fancyhead[LO]{\hwa@kurs\
155     \hwa@tutorium}
156   \fancyhead[LE]{
157     \ifthenelse{equal{\hwa@sheetTitle}{}}{\hwa@sheetTitle\}
158     \GetTranslation{abgabe}: \hwa@abgabe
159   }
160   \fancyfoot[R0,LE]{\thepage}
161
162   \else %ELSE
163
164   \fancyhead[R]{\hwa@kurs\

```



```

165     \@author}
166   \fancyhead[L]{\hwa@tutorium\
167     \ifthenelse{\equal{\hwa@sheetTitle}{}}{\hwa@sheetTitle\}
168     \GetTranslation{abgabe}: \hwa@abgabe}
169   \fancyfoot[R]{\thepage}
170   \fi %ENDIF
171   \renewcommand{\headrulewidth}{\hwa@headrulewidth}
172   \renewcommand{\footrulewidth}{0pt}
173 }
174 \pagestyle{followingpage}

```

4.2 Enhance Mathenvironments

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

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

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

`\allowdisplaybreaks` Allow pagebreaks in Mathmode

```
176 \allowdisplaybreaks
```

4.3 fonts

I fancy the Gillius-Font-Family, so that is the default Sans-Serif font, when using XeTeX. The template does default to Gillius ADF, which is available for free, licensed under the GNU License.

```

177
178 \ifthenelse{\boolean{xetex}}{
179   \RequirePackage{fontspec}
180   \setsansfont{Gillius ADF}
181 }{
182   \RequirePackage{gillius2}
183 }

```

5 Commands

5.1 Constants

Defines some constants

`\hwa@pointboxsize` Explains it self.

```
184 \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.

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

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

```
188 \newcommand{\hwa@tutorium}{?\GetTranslation{uebungsgruppe}??} % To store the value
189 \newcommand{\tutorial}[1]{\renewcommand{\hwa@tutorium}{#1}}
190 \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

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

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

```
194 \newcommand{\hwa@sheetTitle}{}
195 \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

5.3.1 ‘plain’ Sectioning

`\problem`
`\subproblem` These commands work like their counterpart in article, except that there will be
`\subsubproblem` no number, nor will they increase a counter. Nevertheless, they will be shown in the table of contents.

```
196 \DeclareDocumentCommand\problem{m o}{\@startsection{problem}%Name
197 {1}%Level
198 {\z@}%indent
```

```

199 {-2em \@plus -1em \@minus -1em}%beforeskip
200 {1ex \@plus .5ex}%afterskip
201 {\normalfont\Large\sffamily\bfseries}%style
202 *{#1
203   \IfNoValueF{#2}{
204     \hfill
205     \frame{\framebox[\hwa@pointboxsize]{
206       \hfill \normalfont{\large/\small{#2}}}}
207   }
208 }
209 \addcontentsline{toc}{section}{#1}
210 }
211
212 \DeclareDocumentCommand\subproblem{m o}{\@startsection{subproblem}%Name
213   {2}%Level
214   {\z@}%indent
215   {-1em \@plus -.5em \@minus -.5em}%beforeskip
216   {.5ex \@plus .5ex}%afterskip
217   {\normalfont\large\sffamily\bfseries}%style
218   *{#1
219     \IfNoValueF{#2}{
220       \hfill \framebox[\hwa@pointboxsize]{
221         \hfill \normalfont\large/\small{#2}}
222     }
223   }
224   \addcontentsline{toc}{subsection}{#1}
225 }
226
227 \DeclareDocumentCommand\subsubproblem{m o}{\@startsection{subsubproblem}%Name
228   {3}%Level
229   {\z@}%indent
230   {-.5em}%beforeskip
231   {.5em}%afterskip
232   {\normalfont\sffamily\bfseries}%style
233   *{#1
234     \IfNoValueF{#2}{
235       \hfill \framebox[\hwa@pointboxsize]{
236         \hfill \normalfont\large/\scriptsize{#2}}
237     }
238   }
239 }
240

```

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

```

241 \newcommand{\keyword}[1]{\@startsection{keyword}%Name
242   {4}%Level
243   {\parindent}%indent
244   {-.1em}%beforeskip

```

```

245 {\z@}%afterskip
246 {\normalfont \sffamily\bfseries}%style
247 *{#1~~}
248 }

```

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

```

\solution      They work like \keyword, but take only an optional Argument print out “Solu-
\proof         tion”, “Proof” “Given”, “To show”, “Assumption”, and “Suppose that”, respectively
\given         2, via \keyword. If an argument is passed, they print out this argument after the
\toShow        keyword. They are not mentioned in the table of contents.
\toDisprove    249 \newcommand{\solution}[1] [] {\keyword{\GetTranslation{loesung}\ifstrempy{#1}{~}{~#1}:}}
\assumption    250 \newcommand{\toShow}[1] [] {\keyword{\GetTranslation{zuZeigen}\ifstrempy{#1}{~}{~#1}:}}
\supposeThat   251 \newcommand{\toDisprove}[1] [] {
                252   \keyword{\GetTranslation{zuWiderlegen}\ifstrempy{#1}{~}{~#1}:}}
                253 \newcommand{\given}[1] [] {\keyword{\GetTranslation{gegeben}\ifstrempy{#1}{~}{~#1}:}}
                254 \newcommand{\assumption}[1] [] {\keyword{\GetTranslation{Annahme}\ifstrempy{#1}{~}{~#1}:}}
                255 \newcommand{\supposeThat}[1] [] {\keyword{\GetTranslation{Angenommen-dass}\ifstrempy{#1}{~}{~#1}:}}

```

5.3.2 ‘better’ Sectioning

The following commands are an augmented version of the “plain” commands.

```

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

```

256 \newcounter{problem} \setcounter{problem}{0}
257 \newcounter{subproblem}[problem] \setcounter{subproblem}{0}
258 \newcounter{subsubproblem}[subproblem] \setcounter{subsubproblem}{0}
259
260 \DeclareDocumentCommand\newproblem{0{ } g}{
261   \stepcounter{problem}% to reset the lower counters
262   \ifthenelse{\equal{#1}{}}{
263     % empty
264   }{
265     \setcounter{problem}{#1}

```

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

```

266 }
267
268 \IfNoValueTF{#2}{
269   \problem{\GetTranslation{aufgabe} \hwa@problemno}
270   \addToGradingTable{\# \hwa@problemno}
271 }{
272   \problem{\GetTranslation{aufgabe} \hwa@problemno}[#2]
273   \addToGradingTable{\# \hwa@problemno}{/#2}
274 }
275 }
276
277 \WithSuffix\newcommand\newproblem*[1][\stepcounter{problem}
278   \ifthenelse{\equal{#1}{}}{ } {
279     \stepcounter{problem}% to reset the lower counters
280     \setcounter{problem}{#1}}
281   \problem{\GetTranslation{aufgabe} \hwa@problemno}
282 }
283
284 \DeclareDocumentCommand\newsubproblem{0}{ g}{
285   \stepcounter{subproblem}
286   \ifthenelse{\equal{#1}{}}{ } {
287     \setcounter{subproblem}{#1}}
288   \IfNoValueTF{#2}{
289     \subproblem{\GetTranslation{aufgabe}
290       \hwa@problemno}{.\hwa@subproblemno}
291   }
292   {
293     \subproblem{\GetTranslation{aufgabe}
294       \hwa@problemno}{.\hwa@subproblemno}[#2]
295   }
296 }
297
298 \DeclareDocumentCommand\newsussubproblem{0}{ g}{
299   \stepcounter{subsubproblem}
300   \ifthenelse{\equal{#1}{}}{ } {\setcounter{subsubproblem}{#1}}
301   \IfNoValueTF{#2}{
302     \subsubproblem{\hwa@subsubproblemno)}
303   }
304   {
305     \subsubproblem{\hwa@subsubproblemno)}[#2]
306   }
307 }
308

```

5.4 Useful Macros

5.4.1 QUOD ERAT DEMUNSTRANDUM, End of Proof

`\QED`

`\EOP` Display a flushed-right *QED*, \square , or \blacksquare , respectively. `\qed` is not implemented, to

`\eop`

keep compatibility to several Math-packages, which define the later.

```

309 \newcommand{\hwa@QED}{\begin{flushright}
310   \textsc{Qed}
311 \end{flushright}
312 }
313 \newcommand{\QED}{\hwa@QED}
314
315 \ifhwa@unicodemath
316 \RequirePackage{unicode-math}
317 \AtBeginDocument{\let\QEDSymbol\QED
318   \renewcommand{\QED}{\hwa@QED}
319 }
320 \fi
321
322 \newcommand{\EOP}{\begin{flushright}
323   \(\square\)
324 \end{flushright}
325 }
326 \newcommand{\eop}{\hfill\(\blacksquare\)}
```

5.4.2 QUOD NON ERAT DEMUNSTARNDUM AT IUCUNDUM EST

`\QED`

`\qned` Display a flushed-right *triangle*. `\QED` 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 ay, whcih lets no doubt on their correctness.

```

327 \newcommand{\QED}{\begin{flushright} \(\triangle\)
328   \end{flushright}
329 }
330 \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's³ `amath-Class`⁴

<code>\N</code>	
<code>\Z</code>	Defines a set of mathematical sets, which are verry usefull (see Table 1)
<code>\R</code>	
<code>\Q</code>	
<code>\Compl</code>	³ “Occloxiium” on GitHub: https://github.com/occloxiium
<code>\F</code>	⁴ <code>amath.sty</code> is part of Alexander Bartolomey's Alphabet Classes: https://github.com/occloxiium/AlphabetClasses
<code>\Primes</code>	

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

Table 1: Field-Commands

```

331 \newcommand{\N}{\ensuremath{\mathbb{N}}}
332 \newcommand{\Z}{\ensuremath{\mathbb{Z}}}
333 \newcommand{\R}{\ensuremath{\mathbb{R}}}
334 \newcommand{\Q}{\ensuremath{\mathbb{Q}}}
335 \newcommand{\Compl}{\ensuremath{\mathbb{C}}}
336 \newcommand{\F}{\ensuremath{\mathbb{F}}}
337 % The last one is mine
338 \newcommand{\Primes}{\ensuremath{\mathbb{P}}}
```

<code>\GL</code>		
<code>\id</code>	Output usefull Plaintext-Operators and Functions. See table 2. Require	
<code>\Var</code>	Mathmode	
<code>\Perm</code>		
<code>\MComb</code>		
<code>\Comb</code>	Command	Output
<code>\Pot</code>	<code>\GL</code>	GL
<code>\Map</code>	<code>\id</code>	id
<code>\Hom</code>	<code>\Var</code>	Var
<code>\Ker</code>	<code>\Perm</code>	Perm
<code>\Intpol</code>	<code>\Comb</code>	Comb
<code>\Pol</code>	<code>\MComb</code>	MComb
<code>\Sol</code>	<code>\Pot</code>	Pot
<code>\Bin</code>	<code>\Map</code>	Map
<code>\charakteristik</code>	<code>\Hom</code>	Hom
<code>\fo</code>	<code>\Intpol</code>	Intpol
<code>\first</code>	<code>\Pol</code>	Pol
<code>\la</code>	<code>\Sol</code>	Sol
<code>\diff</code>	<code>\Bin</code>	Bin
<code>\partdiff</code>	<code>\charakteristik</code>	char
<code>\dx</code>	<code>\diff{<1>}</code>	$\frac{d}{d<1>}$
<code>\divides</code>	<code>\partdiff{<1>}</code>	$\frac{\partial}{\partial<1>}$
<code>\property</code>	<code>\divides and property</code>	Prints a vertical line
<code>\dim</code>	<code>\dx</code>	dx
<code>\Im</code>	<code>\excup</code>	$\dot{\cup}$
<code>\excup</code>		
<code>\falls</code>		

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

$\backslash\mathrm{fo}$ fo
 $\backslash\mathrm{first}$ fi
 $\backslash\mathrm{la}$ la

Table 2: Common Functions

$\backslash\mathrm{falls}$ prints out »falls«⁶

```

339 \DeclareMathOperator{\GL}{GL}
340 \DeclareMathOperator{\id}{id}
341 \DeclareMathOperator{\Var}{Var}
342 \DeclareMathOperator{\Perm}{Perm}
343 \DeclareMathOperator{\MComb}{MComb}
344 \DeclareMathOperator{\Comb}{Comb}
345 \DeclareMathOperator{\Pot}{Pot}
346 \DeclareMathOperator{\Map}{Map}
347 \DeclareMathOperator{\Hom}{Hom}
348 \DeclareMathOperator{\Ker}{Ker}
349 \DeclareMathOperator{\Intpol}{Intpol}
350 \DeclareMathOperator{\Pol}{Pol}
351 \DeclareMathOperator{\Sol}{Sol}
352 \DeclareMathOperator{\Bin}{Bin}
353 \DeclareMathOperator{\charakteristik}{char}
354 \DeclareMathOperator{\fo}{fo}
355 \DeclareMathOperator{\first}{fi}
356 \DeclareMathOperator{\la}{la}
357
358 \newcommand{\diff}[1]{\ensuremath{\frac{d}{d\#1}}}
359 \newcommand{\partdiff}[1]{\ensuremath{\frac{\partial}{\partial\#1}}}
360 \newcommand{\dx}{\mathrm{d}x}
361 \newcommand{\divides}{\mathrm{divides}}
362 \newcommand{\property}{\mathrm{property}}
363
364 \renewcommand{\dim}[1][\mathrm{dim}]{\text{\text{\dim}_{\#1}}}
365 \renewcommand{\Im}{\mathrm{Im}}
366
367 \newcommand{\excup}{\mathrm{excup}}
368 \newcommand{\falls}{\text{\text{\GetTranslation{falls}}}}

```

5.4.4 Rounding

Require Mathmode

Command	Output	Meaning
$\backslash\mathrm{floor}\{<1>\}$	$\lfloor <1> \rfloor$	floor $<1>$
$\backslash\mathrm{ceil}\{<1>\}$	$\lceil <1> \rceil$	ceil $<1>$
$\backslash\mathrm{roundHU}\{<1>\}$	$\lceil <1> \rceil$	Round $<1>$ “half up” ($\lfloor <1> + \frac{1}{2} \rfloor$)
$\backslash\mathrm{roundHD}\{<1>\}$	$\lfloor <1> \rfloor$	Round $<1>$ “half down” ($-\lfloor <1> - \frac{1}{2} \rfloor$)

⁶In German, actual Translation may differ

Table 3: Rounding Functions

```

369 \newcommand{\floor}[1]{\ensuremath{\left\lfloor\!#1\right\rfloor}}
370 \newcommand{\ceil}[1]{\ensuremath{\left\lceil\!#1\right\rceil}}
371 \newcommand{\roundHU}[1]{\ensuremath{\left\lceil\!#1\right\rfloor}}
372 \newcommand{\roundHD}[1]{\ensuremath{\left\lfloor\!#1\right\rceil}}

```

\bigforall

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

```

373 \let\forall\forall
374 \let\exists\exists
375 \renewcommand{\forall}{\hspace{2pt}\forall\hspace{2pt}}
376 \renewcommand{\exists}{\hspace{2pt}\exists\hspace{2pt}}
377 \newcommand{\bigforall}{\mbox{\raisebox{-2pt}{\Large $\mathsurround{4pt}\forall$}}}
378 \newcommand{\bigexists}{\mbox{\raisebox{-2pt}{\Large $\mathsurround{4pt}\exists$}}}

```

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.

```

379 \DeclareDocumentCommand\todo{G}{
380   \ifthenelse{\boolean{hwa@todos@inplace}}{
381     {\color{red}\textbf{\label{TODO\alph{todoNum}}TODO~\#1}}
382     \xdef\hwa@todoList@aux{\hwa@todoList@aux
383       \string\item\string\hyperref[TODO\alph{todoNum}]{TODO \#1}
384     }
385     \stepcounter{todoNum}
386   }{
387   }

```

Uses the internal hwa@todo-counter

```

388 \newcounter{todoNum} \setcounter{todoNum}{1}

```

\hwa@tableOfTodos Prints all ToDos

```

389 \DeclareDocumentCommand\hwa@tableOfTodos{}{
390   \ifthenelse{\boolean{hwa@todos@list}}{
391     \ifthenelse{\equal{hwa@tableOfTodos}{}}{\%Nothing
392     }{
393       {\color{red}
394         \problem{Table of ToDos}
395         \begin{itemize}
396           \hwa@todoList
397         \end{itemize}}
398       }
399     }{
400   }

```

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 exercise to the Grading-Table. All Problems, created with `\newproblem` are added automatically.

```
401 \DeclareDocumentCommand\addToGradingTable{m g}{
402   \edef\hwa@gradingtbl@aux@defs{\hwa@gradingtbl@aux@defs|p{\hwa@pointboxsize}}
403   \edef\hwa@gradingtbl@aux@lineOne{\hwa@gradingtbl@aux@lineOne{#1} &}
404   \IfNoValueTF{#2}{
405     \edef\hwa@gradingtbl@aux@lineTwo{\hwa@gradingtbl@aux@lineTwo &}
406   }{
407     \edef\hwa@gradingtbl@aux@lineTwo{\hwa@gradingtbl@aux@lineTwo\vfill\hfill
408       {\string\small #2} &}
409   }
410 }
```

`\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 L^AT_EX, until all are added.

It will never overflow the Line-Width, thanks to an `adjustbox`. [#1]: *Optional*.

The total number of points reachable.

```
411 \DeclareDocumentCommand\makeGradingTable{o}{
412   \begin{table}[hb]
413     \centering
414     \large
415     \begin{adjustbox}{max width=\linewidth}
416       \expandafter\table\expandafter{\hwa@gradingtbl@aux@defs ||p{\hwa@pointboxsize}}\hline
417       \hwa@gradingtbl@aux@lineOne \(\Sigma\) \\\hline\small
418       \hwa@gradingtbl@aux@lineTwo \IfNoValueTF{#1}{~}{\vfill\hfill/#1}\vspace{.15cm}\\\hline
419     \end{table}
420   \end{adjustbox}
421 \end{table}
422 }
```

See example documents for 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)

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

```

```

426
427 \edef\hwa@gradingtbl@defs{}
428 \newcommand{\hwa@gradingtbl@lineOne}{}
429 \newcommand{\hwa@gradingtbl@lineTwo}{}

\hwa@todoList@... See \hwa@gradingtbl@...
430 \newcommand{\hwa@todoList}{}
431 \newcommand\hwa@todoList@aux{}
432 % \end{macro}
433 % \begin{macro}{\write\@auxout}
434 % Write to aux
435 % \begin{macrocode}
436 \AtEndDocument{%
437 \immediate\write\@auxout{%
438 \gdef\string\hwa@gradingtbl@defs{\hwa@gradingtbl@aux@defs}
439 }
440 \immediate\write\@auxout{%
441 \gdef\string\hwa@gradingtbl@lineOne{\hwa@gradingtbl@aux@lineOne}%
442 }
443 \immediate\write\@auxout{%
444 \gdef\string\hwa@gradingtbl@lineTwo{\hwa@gradingtbl@aux@lineTwo}%
445 }
446 \immediate\write\@auxout{%
447 \gdef\string\hwa@todoList{\hwa@todoList@aux}%
448 }
449 }

```

5.6 Title

`\maketitle` Overrides maketitle.

```

450 \renewcommand{\maketitle} {
451 \thispagestyle{firstpage}
452 \ifhwa@twocolumn{
453 \twocolumn[{
454 \hwa@maketitletext
455 }]
456 } \else{
457 \hwa@maketitletext
458 } \fi
459 \hwa@tableOfTodos
460 }

```

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

```

461 \newcommand{\hwa@maketitletext}{
462 \begin{centering}
463 \huge{\textsf{\textbf{\hwa@kurs}}}\hwa@hline@LONE \large
464 \ifthenelse{\equal{\hwa@sheetTitle}{}}{\textsf{\hwa@sheetTitle}}{\}
465 \GetTranslation{abgabe}: \hwa@abgabe\}

```

```

466 \hwa@hline@LTWO
467 \normalsize{\@author}\\
468 \hwa@hline@LTWO \normalsize
469 \end{centering}
470 }
471 \ifthenelse{\boolean{hwa@punchmark}}{
472 \newcommand{\hwa@punchmarkRad}{3mm}
473 \newcommand{\hwa@punchmarkDistanceX}{12mm}
474 \newcommand{\hwa@punchmarkDistanceY}{40mm}
475 \AtBeginDocument{
476 % Where will the punch be?
477 \AddToShipoutPictureBG*{\AtPageUpperLeft{
478 \put(\LenToUnit{\hwa@punchmarkDistanceX-\hwa@punchmarkRad*2},\LenToUnit{-.5\paperheight-\hwa@punchmarkRad*2}){\tikz{\draw (0,0) -- (5mm,0);}}}
479 \put(\LenToUnit{\hwa@punchmarkDistanceX-\hwa@punchmarkRad*2},\LenToUnit{-.5\paperheight+\hwa@punchmarkRad*2}){\tikz{\draw (0,0) -- (5mm,0);}}}
480 % Punch-Positioningmark
481 \AddToShipoutPictureBG*{\AtPageUpperLeft{
482 \put(\LenToUnit{5mm},\LenToUnit{-.5\paperheight}){\tikz{\draw (0,0) -- (5mm,0);}}}
483 }
484 }{
485 }

```

5.7 Counters

The actual counters are defined in subsection 5.3.2.

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

```

486 \newcommand{\hwa@problemno}{\arabic{problem}}
487 \newcommand{\hwa@subproblemno}{\alph{subproblem}}
488 \newcommand{\hwa@subsubproblemno}{\roman{subsubproblem}}

```

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

```

489 \newcommand{\hwa@parseCounterStyle}[3]{
490 \ifthenelse{\equal{#1}{arabic}}{\renewcommand{#2}{\arabic{#3}}}{
491 \ifthenelse{\equal{#1}{roman}}{\renewcommand{#2}{\roman{#3}}}{
492 \ifthenelse{\equal{#1}{alph}}{\renewcommand{#2}{\alph{#3}}}{
493 \ifthenelse{\equal{#1}{Alph}}{\renewcommand{#2}{\Alph{#3}}}{
494 \ifthenelse{\equal{#1}{Roman}}{\renewcommand{#2}{\Roman{#3}}}{
495 \renewcommand{#2}{\Roman{#3}}}{
496 \ClassError{homeworkassignment}{Invalid Value #1 for
497 option Counter-Styling}{Possible Values are alph,
498 arabic, Arabic, roman or Roman.} } } } } }

```

Redefines the three counter-commands:

```

499 \hwa@parseCounterStyle{\hwa@problemsty}{\hwa@problemno}{problem}
500 \hwa@parseCounterStyle{\hwa@subproblemsty}{\hwa@subproblemno}{subproblem}
501 \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.

```
502 \NewDocumentEnvironment{proof}{G{\GetTranslation{beweis}}}{Q{\QED}}
503 {
504   \keyword{#1:~~}
505 }
506 {
507   #2
508 }
```

6.2 Proof by contradiction

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

```
509 \NewDocumentEnvironment{contradiction}{}
510 {
511   \begin{proof}{\GetTranslation{beweis}~\GetTranslation{per}~\GetTranslation{Widerspruch}}[\hfi
512   }
513   {
514     \end{proof}
515 }
```

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 `\QNE`

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 - pending** • Make XeLaTeX-Compatible
- Rename `\C` to `\Comp1`, because of a `unicode-math` incompatibility
 - Fix `\newproblem` requiring a Problem-Number
 - Add `\toDisprove` macro similar to the `\toShow` macro

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 development 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 development, development-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. Unfortunately these two are the only Languages I am capable of translating reliable, so if you want to use an other language, I would be very happy if you would help me to translate homeworkassignment! Please open an issue, author a pull-request or send me an e-mail.

```
516 \DeclareTranslationFallback{aufgabe}{Aufgabe}
517 \DeclareTranslationFallback{loesung}{L\"osung}
518 \DeclareTranslationFallback{beweis}{Beweis}
519 \DeclareTranslationFallback{uebungsgruppe}{\"Ubungsgruppe}
520 \DeclareTranslationFallback{abgabe}{Abgabe}
521 \DeclareTranslationFallback{zuZeigen}{Zu zeigen}
522 \DeclareTranslationFallback{zuWiderlegen}{Zu widerlegen}
523 \DeclareTranslationFallback{gegeben}{Gegeben}
524 \DeclareTranslationFallback{falls}{falls}
525 \DeclareTranslationFallback{Annahme}{Annahme}
526 \DeclareTranslationFallback{Angenommen-dass}{Angenommen, dass}
527 \DeclareTranslationFallback{per}{per}
528 \DeclareTranslationFallback{Widerspruch}{Widerspruch}
529
530 \DeclareTranslation{German}{aufgabe}{Aufgabe}
531 \DeclareTranslation{German}{loesung}{L\"osung}
532 \DeclareTranslation{German}{beweis}{Beweis}
533 \DeclareTranslation{German}{uebungsgruppe}{\"Ubungsgruppe}
534 \DeclareTranslation{German}{abgabe}{Abgabe}
535 \DeclareTranslation{German}{zuZeigen}{Zu zeigen}
536 \DeclareTranslation{German}{zuWiderlegen}{Zu widerlegen}
537 \DeclareTranslation{German}{gegeben}{Gegeben}
538 \DeclareTranslation{German}{falls}{falls}
539 \DeclareTranslation{German}{Falls}{Falls}
540 \DeclareTranslation{German}{Annahme}{Annahme}
541 \DeclareTranslation{German}{Angenommen-dass}{Angenommen, dass}
542 \DeclareTranslation{German}{per}{per}
543 \DeclareTranslation{German}{Widerspruch}{Widerspruch}
544
545 \DeclareTranslation{English}{aufgabe}{Problem}
546 \DeclareTranslation{English}{loesung}{Solution}
547 \DeclareTranslation{English}{beweis}{Proof}
548 \DeclareTranslation{English}{uebungsgruppe}{Tutorial}
549 \DeclareTranslation{English}{abgabe}{Deadline}
550 \DeclareTranslation{English}{zuZeigen}{To show}
551 \DeclareTranslation{English}{zuWiderlegen}{To disprove}
552 \DeclareTranslation{English}{gegeben}{Given}
553 \DeclareTranslation{English}{falls}{if}
554 \DeclareTranslation{English}{Falls}{If}
555 \DeclareTranslation{English}{Annahme}{Assumption}
556 \DeclareTranslation{English}{Angenommen-dass}{Suppose that}
557 \DeclareTranslation{English}{per}{by}
```

558 \DeclareTranslation{English}{Widerspruch}{contradiction}

End

The End

559 \endinput