

# The HomeworkAssignment class\*

Adrian C Hinrichs  
adrian.hinrichs@rwth-aachen.de

May 20, 2017

## 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 Options

<code>problemstyle=&lt;1&gt;</code>	These options allow the customization of the displayed numbers. For Example, if
<code>subproblemstyle=&lt;1&gt;</code>	<code>problemstyle=Roman</code> , <code>subproblemstyle=arabic</code> , <code>subsubproblemstyle=roman</code>
<code>subsubproblemstyle=&lt;1&gt;</code>	is passed, The first subsubproblem of the first subproblem of the first problem would be labeled as <b>i)</b> of <b>Problem I.1</b> .
	Available options are <code>arabic</code> , <code>Alph</code> , <code>alph</code> , <code>Roman</code> , and <code>roman</code> . Standard values are: <code>problemstyle=arabic</code> , <code>subproblemstyle=alph</code> , <code>subsubproblemstyle=roman</code> .
<code>design=&lt;1&gt;</code>	Allows the User to select an older page-style, for backwards compatibility. Recognized values are <code>v1</code> and <code>v2</code> . Everytime a version changes the default look, a new possible value will be added.
	Only set this if you really need to get an old look, <i>older styles are not going to be maintained!</i>

### 2.1 Inherited options

Because the class is inherited by `article`, every Option that can be passed to `article`, will be passed to `article`.

## 3 Commands

### 3.1 Document Informations

<code>\subject</code>	Sets the subject of the document. Takes the subject as argument. Standard Value
<code>\kurs</code>	<hr/> *This document corresponds to HomeworkAssignment v2.0,dated 2017/05/13.

is “Kein Kurs”  
`\kurs` is deprecated.

`\tutorial` 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.

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

### 3.1.1 Inherited from article

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

## 3.2 Sectioning

Because the class is designed for Assignments, the sectioning-commands are different from Article

### 3.2.1 ‘plain’ Sectioning

`\problem` 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.  
`\subproblem`  
`\subsubproblem`

`\solution` They work like Paragraph, but do not take an argument, instead they print out “Lösung”, “Beweis”, “Gegeben”, and “Zu zeigen”, respectively<sup>1</sup>. They are not mentioned in the table of contents.  
`\proof`  
`\given`  
`\toShow`

### 3.2.2 ‘better’ Sectioning

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

`\newproblem` These commands require no argument, and automatically create a numbered title. The optional Argument is the new value for the corresponding counter.  
`\newsproblem`  
`\newsproblem`  
`\newsproblem`

## 3.3 Useful Macros

### 3.3.1 Quod Erat Demunstarndum, End of Proof

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

`\eop` <sup>1</sup>As of v1.6, Translations are added, depending on the chosen Language, there may be an other Text displayed.  
See 8.2 for all Translations

### 3.3.2 Quod Non Erat Demunstarndum at iucundum est

`\QNED` Display a flushed-right  $\triangle$ . `\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.

### 3.4 Stolen Goods

»Das ist alles nur geklaut«

~Tobias Künzel

These Commands are not mine, they are all stolen from Alexander Bartolomey's<sup>2</sup> `amath-Class`<sup>3</sup>

<code>\N</code>	<sup>45</sup> Defines a set of mathematical fields, which are very usefull (see Table 1)		
<code>\Z</code>			
<code>\R</code>	Command	Output	Description
<code>\Q</code>	<code>\N</code>	$\mathbb{N}$	Natural Numbers
<code>\C</code>	<code>\Z</code>	$\mathbb{Z}$	Whole? Numbers
<code>\F</code>	<code>\Q</code>	$\mathbb{Q}$	Rational Numbers
<code>\Primes</code>	<code>\R</code>	$\mathbb{R}$	Real Numbers
	<code>\C</code>	$\mathbb{C}$	Complex Numbers
	<code>\F</code>	$\mathbb{F}$	Prime-Field?
	<code>\Primes</code>	$\mathbb{P}$	Set of all Primes

Table 1: Field-Commands

**Functions and Operators** Output usefull Plaintext-Operators and Functions.  
All, except `\dif{<1>}` print the 'themselve' as text, `\diff{<1>}` outputs  $\frac{d}{d<1>}$ .

## 4 Pagestyle

### 4.1 Headers

<sup>2</sup>"Occloxiium" on GitHub:<https://github.com/occloxiium>

<sup>3</sup>`Amath.sty` is part of Alexander Bartolomey's Alphabet Classes: <https://github.com/occloxiium/AlphabetClasses>

<sup>4</sup>Has to be  $\mathbb{P}$ , because  $\P$  is already in use

<sup>5</sup>not a Field

## 5 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.

## 6 Changelog

**v1.0 - 2016/10/23** Intial

**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 - 2017/05/09** Change Margins,  
Add Option to select older Page-Style,  
Change standardlayout to twocolumn and twoside

## 7 Examples

For examples, please see the Git-Repo at <https://github.com/ACHinrichs/LaTeX-templates>

## 8 Implementation

The following part is very boring, but I have not found a solution to create a .cls-file without including the implementation into the document. Loads L<sup>A</sup>T<sub>E</sub>X<sub>2</sub> $\epsilon$  and sets the Version Loads the `article`, which is the base-class.

### 8.1 Packages & Options

```
1 \RequirePackage{kvoptions}
2 \SetupKeyvalOptions{ family=hwa,
3   prefix=hwa@ }
4 \DeclareStringOption[arabic]{problemsty}
5 \DeclareStringOption[alph]{subproblemsty}
6 \DeclareStringOption[roman]{subsubproblemsty}
7 \DeclareBoolOption[false]{listings}
8 \DeclareStringOption[v2]{design}
9 \DeclareBoolOption[true]{twoside}
10 \DeclareComplementaryOption{oneside}{twoside}
11 \DeclareBoolOption[true]{twocolumn}
12 \DeclareComplementaryOption{onecolumn}{twocolumn}
13 % Redefine the article-options
14 %   \begin{macrocode}
15 \DeclareDefaultOption{\PassOptionsToClass{\CurrentOptionKey}{article}}

    Processes the Options and loads article
16 \ProcessKeyvalOptions*
17 \ifhwa@twoside
18 \PassOptionsToClass{twoside}{article}
19 \else
20 \PassOptionsToClass{oneside}{article}
21 \fi
22 \ifhwa@twocolumn
23 \PassOptionsToClass{twocolumn}{article}
24 \else
25 \PassOptionsToClass{onecolumn}{article}
26 \fi
27 \LoadClass{article}

    Loads required Packages
28 \RequirePackage{suffix}
29 \RequirePackage{fancyhdr}
30 \RequirePackage{ifthen}
31 \RequirePackage{translations}
32 \RequirePackage{amssymb}
```

```

33 \RequirePackage{ams,ath}
34 \ifhwa@listings
35 \RequirePackage{listings}
36 \lstset{
37   frame = single,
38   breaklines = true,
39   postbreak=\raisebox{0ex}[0ex][0ex]{\ensuremath{\hookrightarrow}\space}},
40   basicstyle=\scriptsize
41 }
42 \else
43 \empty
44 \fi
45
46 % Make sure that this is the last Package loaded
47 \ifthenelse{\equal{\hwa@design}{v2}}{
48   \RequirePackage{geometry}
49   \ifhwa@twocolumn
50     \geometry{top=2cm, bottom=2cm, left=2cm,
51       headsep=14pt,hmarginratio={1:1}}
52   \else
53     \geometry{top=2cm, bottom=2cm, width=35em,
54       headsep=14pt,hmarginratio={4:3}}
55   \fi
56 }{
57   \ifthenelse{\equal{\hwa@design}{v1}}{
58     \empty
59   }{
60     \ClassError{HomeworkAssignment}{Value '\hwa@design' for key 'design'
61       is not known}{The option design takes an argument to set the
62       Pagestyle to the one of a previous version. Acceptable values are
63       'v1', or 'v2'}
64   }
65 }

```

## 8.2 Translations

Load translations, currently supports English and German, Fallback is German

```

66 \DeclareTranslationFallback{aufgabe}{Aufgabe}
67 \DeclareTranslationFallback{loesung}{L"osung}
68 \DeclareTranslationFallback{beweis}{Beweis}
69 \DeclareTranslationFallback{uebungsgruppe}{\ "Ubungsgruppe}
70 \DeclareTranslationFallback{abgabe}{Abgabe}
71 \DeclareTranslationFallback{zuZeigen}{Zu zeigen}
72 \DeclareTranslationFallback{gegeben}{Gegeben}
73 \DeclareTranslationFallback{falls}{falls}
74 \DeclareTranslationFallback{Falls}{Falls}
75
76 \DeclareTranslation{German}{aufgabe}{Aufgabe}
77 \DeclareTranslation{German}{loesung}{L"osung}
78 \DeclareTranslation{German}{beweis}{Beweis}

```

```

79 \DeclareTranslation{German}{uebungsgruppe}{\ "Ubungsgruppe}
80 \DeclareTranslation{German}{abgabe}{Abgabe}
81 \DeclareTranslation{German}{zuZeigen}{Zu zeigen}
82 \DeclareTranslation{German}{gegeben}{Gegeben}
83 \DeclareTranslation{German}{falls}{falls}
84 \DeclareTranslation{German}{Falls}{Falls}
85
86 \DeclareTranslation{English}{aufgabe}{Problem}
87 \DeclareTranslation{English}{loesung}{Solution}
88 \DeclareTranslation{English}{beweis}{Proof}
89 \DeclareTranslation{English}{uebungsgruppe}{Tutorial}
90 \DeclareTranslation{English}{abgabe}{Deadline}
91 \DeclareTranslation{English}{zuZeigen}{To show}
92 \DeclareTranslation{English}{gegeben}{Given}
93 \DeclareTranslation{English}{falls}{if}
94 \DeclareTranslation{English}{Falls}{If}

```

### 8.3 Headers & Footers

Sets the page-headers.

All headers are cleread before they get any Text — just to be sure.

The headers look like specified above (4.1). Also inserts the Titlepage.

```

95 \fancypagestyle{firstpage}{
96   %
97   \fancyhf{}
98   % clear all six fields
99   \renewcommand{\headrulewidth}{.7pt}
100  \renewcommand{\footrulewidth}{0pt}
101  \fancyfoot[R]{\thepage}
102  \fancyhead[L]{\hwa@tutorium}
103  \fancyhead[R]{\@date } }
104 \fancypagestyle{followingpage}{
105   %
106   \fancyhf{}
107
108   \ifthenelse{\equal{\hwa@design}{v2}}{
109     \ifhwa@twoside % IF
110
111     \fancyhead[RO]{\@author}
112     \fancyhead[LO]{\hwa@kurs\
113       \hwa@tutorium}
114     \fancyhead[LE]{\GetTranslation{abgabe}: \hwa@abgabe}
115     \fancyfoot[RO,LE]{\thepage}
116
117     \else %ELSE
118
119     \fancyhead[R]{\hwa@kurs\
120       \@author}
121     \fancyhead[L]{\hwa@tutorium\

```

```

122     \GetTranslation{abgabe}: \hwa@abgabe}
123     \fancyfoot[R]{\thepage}
124     \fi %ENDIF
125   }{
126     \ifthenelse{\equal{\hwa@design}{v1}}{
127       \fancyhead[RE,LO]{\@author}
128       \fancyhead[LE,RO]{\hwa@kurs\
129         \GetTranslation{abgabe}: \hwa@abgabe}
130       \fancyfoot[RE,LO]{\thepage}
131     }{
132       \ClassError{HomeworkAssignment}{Value '\hwa@design' for key 'design'
133         is not known}{The option design takes an argument to set the
134         Pagestyle to the one of a previous version. Acceptable values are
135         'v1', or 'v2'}
136     }
137   }
138
139
140   \renewcommand{\headrulewidth}{0.7pt}
141   \renewcommand{\footrulewidth}{0pt} } \pagestyle{followingpage}
142 \AtBeginDocument{ \thispagestyle{firstpage}
143   \setlength{\headheight}{25pt} }

```

## 8.4 Internal commands

### 8.4.1 Counter-Commands

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

```

144 \newcommand{\hwa@problemno}{\arabic{problem}}
145 \newcommand{\hwa@subproblemno}{\alph{subproblem}}
146 \newcommand{\hwa@subsubproblemno}{\roman{subsubproblem}}

```

### 8.4.2 Counter-Style Parser

**Counter--Style Parser** 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 8.4.3 for example usement.

```

147 \newcommand{\hwa@parseCounterStyle}[3]{
148   \ifthenelse{\equal{#1}{arabic}}{ \renewcommand{#2}{\arabic{#3}} }{
149     \ifthenelse{\equal{#1}{roman}}{ \renewcommand{#2}{\roman{#3}} }{
150       \ifthenelse{\equal{#1}{alph}}{ \renewcommand{#2}{\alph{#3}} }{
151         \ifthenelse{\equal{#1}{Alph}}{ \renewcommand{#2}{\Alph{#3}} }{
152           \ifthenelse{\equal{#1}{Roman}}{
153             \renewcommand{#2}{\Roman{#3}} }{
154               \ClassError{HomeworkAssignment}{Invalid Value #1 for
155                 option Counter-Styling}{Possible Values are alph,
156                 arabic, Arabic, roman or Roman.} } } } } }

```



### 8.4.3 Counter-Commands II

ounter--Style ParserCommands II Redefines the three counter-commands

```

157 \hwa@parseCounterStyle{\hwa@problemsty}{\hwa@problemno}{problem}
158 \hwa@parseCounterStyle{\hwa@subproblemsty}{\hwa@subproblemno}{subproblem}
159 \hwa@parseCounterStyle{\hwa@subsubproblemsty}{\hwa@subsubproblemno}{subsubproblem}

```

## 8.5 Commands

```

\subject Defines \kurs. \subject equals \kurs
160 \newcommand{\hwa@kurs}{?\GetTranslation{subject}??}
161 \newcommand{\subject}[1]{\renewcommand{\hwa@kurs}{#1}}
162 \newcommand{\kurs}[1]{\subject{#1}}

\tutorial Defines \tutorial. \tutorial equals \tutorial
163 \newcommand{\hwa@tutorial}{?\GetTranslation{uebungsgruppe}??}
164 \newcommand{\tutorial}[1]{\renewcommand{\hwa@tutorial}{#1}}
165 \newcommand{\tutorial}[1]{\tutorial{#1}}

\deadline Defines \deadline. \abgabe equals \deadline
166 \newcommand{\hwa@abgabe}{\today}
167 \newcommand{\deadline}[1]{\def\hwa@abgabe{#1}}
168 \newcommand{\abgabe}[1]{\deadline{#1}}

\maketitle Overrides maketitle.
169
170 \renewcommand{\maketitle} {
171   \twocolumn[{\%
172     \begin{centering}
173       \huge{\textbf{\hwa@kurs}} \vspace{.25cm} {\hrule height 2pt}
174       \vspace{.25cm} \large
175       \GetTranslation{abgabe}: \hwa@abgabe\\
176       \vspace{.5cm} \hrule \vspace{.25cm}
177       \normalsize{\@author}\\
178       \vspace{.25cm} \hrule \vspace{.25cm} \normalsize
179     \end{centering}
180   }]
181 }

Defines and initialize all counters.
182 \newcounter{problem} \setcounter{problem}{0}
183 \newcounter{subproblem}[problem] \setcounter{subproblem}{0}
184 \newcounter{subsubproblem}[subproblem] \setcounter{subsubproblem}{0}
185

Defines ‘plain’ sectioning-commands. See 3.2 for more informations.
186 \newcommand{\problem}[1]{\@startsection{problem}%Name
187   {1}%Level
188   {\z@}%indent

```

```

189 {-2em \@plus -1em \@minus -1em}%beforeskip
190 {1ex \@plus .5ex}%afterskip
191 {\normalfont\Large\bfseries}%style
192 *{#1} \addcontentsline{toc}{section}{#1} }
193
194 \newcommand{\subproblem}[1]{\@startsection{subproblem}%Name
195 {2}%Level
196 {\z@}%indent
197 {-1em \@plus -.5em \@minus -.5em}%beforeskip
198 {.5ex \@plus .5ex}%afterskip
199 {\normalfont\large\bfseries}%style
200 *{#1} \addcontentsline{toc}{subsection}{#1} }
201
202 \newcommand{\subsubproblem}[1]{\@startsection{subsubproblem}%Name
203 {3}%Level
204 {\z@}%indent
205 {-.5em}%beforeskip
206 {.5em}%afterskip
207 {\normalfont\bfseries}%style
208 *{#1} }
209
210 \newcommand{\solution}[1] [] {\@startsection{solution}%Name
211 {4}%Level
212 {\parindent}%indent
213 {-.1em}%beforeskip
214 {\z@}%afterskip
215 {\normalfont\bfseries}%style
216 *{\GetTranslation{loesung}\ifthenelse{\equal{#1}{}} {} { #1}:~~ } }
217
218 \newcommand{\proof}[1] [] {\@startsection{proof}%Name
219 {4}%Level
220 {\parindent}%indent
221 {-.1em}%beforeskip
222 {\z@}%afterskip
223 {\normalfont\bfseries}%style
224 *{\GetTranslation{beweis}\ifthenelse{\equal{#1} {} } {} { #1}:~~ } }
225
226 \newcommand{\toShow}[1] [] {\@startsection{to show}%Name
227 {4}%Level
228 {\parindent}%indent
229 {-.1em}%beforeskip
230 {\z@}%afterskip
231 {\normalfont\bfseries}%style
232 *{\GetTranslation{zuZeigen}\ifthenelse{\equal{#1} {} } {} { #1}:~~ } }
233
234 \newcommand{\given}[1] [] {\@startsection{given}%Name
235 {4}%Level
236 {\parindent}%indent
237 {-.1em}%beforeskip
238 {\z@}%afterskip

```

```

239 {\normalfont\bfseries}%style
240 *{\GetTranslation{gegeben}\ifthenelse{\equal{#1} {} } {} { #1:~ } }
241
    Defines ‘better’ sectioning commands. See 3.2 and 3.2.2 for more informations.
242 \newcommand{\newproblem}[1][\stepcounter{problem}
243 \ifthenelse{\equal{#1}{} } {} {\setcounter{problem}{#1}}
244 \problem{\GetTranslation{aufgabe} \hwa@problemno} }
245
246 \newcommand{\newsubproblem}[1][\stepcounter{subproblem}
247 \ifthenelse{\equal{#1}{} } {} {\setcounter{subproblem}{#1}}
248 \subproblem{\GetTranslation{aufgabe} \hwa@problemno}.\hwa@subproblemno} }
249
250 \newcommand{\newsubsubproblem}[1][\stepcounter{subsubproblem}
251 \ifthenelse{\equal{#1}{} } {} {\setcounter{subsubproblem}{#1}}
252 \subsubproblem{\hwa@subsubproblemno}} }
253

```

End of Proof

```

254 \newcommand{\QED}{\begin{flushright}
255 \textit{QED}
256 \end{flushright}
257 }
258 \newcommand{\EOP}{\begin{flushright}
259 $\square$
260 \end{flushright}
261 }
262 \newcommand{\eop}{\hfill$\blacksquare$}

```

c demonstrandum at iucundum est

```

263 \newcommand{\QNE}{\begin{flushright}
264 $\triangle$
265 \end{flushright}
266 }
267 \newcommand{\qne}{\hfill$\triangle$}

```

The following Macros are all stolen (and adapted) from occloxiun (see 3.4)

Math Common Set Symbols

```

268 \newcommand{\N}{\ensuremath{\mathbb{N}}}
269 \newcommand{\Z}{\ensuremath{\mathbb{Z}}}
270 \newcommand{\R}{\ensuremath{\mathbb{R}}}
271 \newcommand{\Q}{\ensuremath{\mathbb{Q}}}
272 \newcommand{\C}{\ensuremath{\mathbb{C}}}
273 \newcommand{\F}{\ensuremath{\mathbb{F}}}
274 % The last one is mine
275 \newcommand{\Primes}{\ensuremath{\mathbb{P}}}

```

Mathematical Functions

```

276 \newcommand{\GL}{\ensuremath{\text{GL}}}

```

```

277 \newcommand{\id}{\ensuremath{\text{id}}}
278 \newcommand{\diff}[1]{\ensuremath{\frac{d}{d\#1}}}
279 \newcommand{\dx}{\:dx}

```

#### Mathematical Functions

```

280 \newcommand{\divides}{\ensuremath{\mid}}
281 \newcommand{\property}{\ensuremath{\mid}}
282
283 \newcommand{\Var}{\ensuremath{\text{Var}}}
284 \newcommand{\Perm}{\ensuremath{\text{Perm}}}
285 \newcommand{\MComb}{\ensuremath{\text{MComb}}}
286 \newcommand{\Comb}{\ensuremath{\text{Comb}}}
287
288 \renewcommand{\dim}[1][\ ]{\ensuremath{\text{dim}_{\#1}}}
289 \renewcommand{\Im}{\ensuremath{\text{Im}}}
290 \newcommand{\modulo}[2]{\#1/\!\#2\!:}
291
292 \newcommand{\Pot}{\ensuremath{\text{Pot}}}
293 \newcommand{\Map}{\ensuremath{\text{Map}}}
294
295 \newcommand{\excup}{\ensuremath{\stackrel{.}{\cup}}}
296
297 \newcommand{\falls}{\text{\ \GetTranslation{falls}}\ }
298
299 \newcommand{\Bin}{\ensuremath{\text{Bin}}}

```

#### Math Big Quantors

```

300 \let\forall\forall
301 \let\exists\exists
302 \renewcommand{\forall}{\hspace{2pt}\forall\hspace{2pt}}
303 \renewcommand{\exists}{\hspace{2pt}\exists\hspace{2pt}}
304 \newcommand{\bigforall}{\mbox{\raisebox{-2pt}{\Large $\mathsurround{4pt}\forall$}}}
305 \newcommand{\bigexists}{\mbox{\raisebox{-2pt}{\Large $\mathsurround{4pt}\exists$}}}

```

*The End*

```

306 \endinput

```