Manual of the exercisesheet Class

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Introduction

The aim of this class is to provide a set of useful macros for typesetting high-quality exercise sheets for both students and teachers. This is the official manual. It contains tutorials on how to use this class and, moreover, a comprehensive list of the available commands. Files with the complete code of the templates are available with this package; You can download them from

> `https://github.com/christophstockhusen/exercisesheet`

Currently, this class is a victim to heavy development action which may result in several conceptual changes in the future. Please be patient and help me creating an even more useful LaTeX class by submitting bugs, issues, and comments on the website above. Thank you! I hope you enjoy using this class.

Christoph Stockhusen

Contents

Chapter 1

Tutorials

This chapter contains two tutorials: The first tutorial aims at students because is suppose that the majority of the users of this class will be students. It contains the most important things needed for using this class and I strongly recommend to everyone who uses this class to read this tutorial at least once. The second tutorial aims at teachers and gives more detailed information about the more sophisticated features of this class.

Section 1.1

A Tutorial for the Student Lia

This semester, Lia, student of Computer Science, plans to typeset her solutions of all the exercise sheets she has to work on with LaTeX. In the last semesters she wrote her solutions via hand which had several drawbacks: Often her first solutions to exercises contained little errors that she had to correct. Very small errors were easy to correct, but many times she had to insert some sentences or formulas into her solution which results in rewriting several pages of solutions repeatedly. Furthermore, Lia simply prefers the beautiful appearance of typeset solutions.

As this will be Lia's first experience with LaTeX she asks her tutor Bo for help. He feels happy about Lia's plans because he thinks that this will be a good preparation for her bachelor's thesis. Bo recommends the exercisesheet class that he often used for typesetting his own solutions for exercise sheets.

At home from university, Lia downloads and installs a common LaTeX distribution and starts to create a simple template file that she plans to use for her next exercise sheets. She creates a file `template_student.tex` and opens it in her favorite text editor *GVim*. She sets up her file with the following lines.

```
\documentclass[a4paper]{exercisesheet}

\sheetconf{
    lecture   = Specimen of a Title of a Lecture,
    lecturer  = Prof.~Foo~Bar,
    semester  = Winter~Semester~2011/2012,
    author    = Lia,
}
```

Lia passes the `a4paper` to the `\documentclass{exercisesheet}` command because she wants the paper layout to be DIN A 4. Then Lia specifies the name of the lecture, the name of the lecturer, the semester, and her name by using the `\sheetconf` command. Within these commands the makes use of the tilde ~ in order to suppress undesirable line breaks, like Don Knuth recommended in the TeXbook. With this setup Lia is now ready to typeset her first exercise sheet. Hence, she types in the following lines.

```
\begin{document}
\sheet[
    topic={Specimen of a Title of an Exercise Sheet}
]

\end{document}
```

Lia uses the `\sheet` command to start a new exercise sheet. The command requires no argument but accepts an optional list of key-value pairs that affect the appearance of the sheet. She decides to use the keys `topic` to set a temporary topic.

That was easy! At this point nothing can stop her typesetting her first solution. She uses the following lines to typeset a solution for an exercise that is split into two subexercises.

```
\exercise[
    topic={Specimen of a Title of an Exercise}
  ]

\subexercise[
  topic={Specimen of a Title of a Subexercise}
    ]

Here I will type in the first part of my solution!

\subexercise[
  topic={Specimen of a Title of a Subexercise}
    ]

And over here the second part!
```

Lia is really happy about the simplicity of the exercisesheet class. She notices that the can typeset multiple exercise sheets within a single LaTeX document by simply using the `\sheet` macro repeatedly. Therefore, she asks herself whether the exercisesheet class is capable of typesetting a title page and a table of contents. She tries whether the following standard LaTeX macros will work.

```
\maketitle
\tableofcontents
```

After two runs a table of contents appears in her document that lists the exercise sheets and the exercises to her complete satisfaction. Altogether, Lia has written the following template code.

```
\documentclass[a4paper]{exercisesheet}

\sheetconf{
    lecture   = Specimen of a Title of a Lecture,
    lecturer  = Prof.~Foo~Bar,
    semester  = Winter~Semester~2011/2012,
    author    = Lia,
  }

\begin{document}

\maketitle

\tableofcontents

\sheet[
    topic={Specimen of a Title of an Exercise Sheet}
  ]

\exercise[
    topic={Specimen of a Title of an Exercise}
  ]

\subexercise[
  topic={Specimen of a Title of a Subexercise}
    ]
```

```
Here I will type in the first part of my solution!

\subexercise[
  topic={Specimen of a Title of a Subexercise}
    ]

And over here the second part!

\sheet[
    topic={Specimen of a Title of an Exercise Sheet}
  ]

\end{document}
```

Section 1.2

A Tutorial for the Teacher Walter

When Walter sees Lia's solutions he is really impressed. Not only are her solutions almost perfectly correct, also the appearance is very beautiful in comparison with his exercise sheets. Hence, he asks Lia whether he may use her template to type his exercise sheets. Lia – really happy for this to happen – tells Walter about the exercisesheet class and emails her template to him. Walter immediately opens the template file and starts customizing the template for his requirements.

First, Walter tells the exercisesheet class that he is a teacher by adding `teacher=true` to the `\sheetconf` command. This will change the appearance of the title page and the sheet headings accordingly. Also he sets the `solutions` option to false by `solutions=false`. This allows Walter to use the solution environment: Within this enviorment Walter can typeset sample solutions to his exercises for his assistants. These solutions will only be typeset when `solutions=true` is set, otherwise, that is `solutions=false`, they will be removed. This way, Walter won't have to create several documents for versions with and without solutions.

```
\documentclass[a4paper]{exercisesheet}

\sheetconf{
    lecture      = Specimen of a Title of a Lecture,
    semester     = Winter~Semester~2011/2012,
    author       = Prof.~Walter,
    teacher      = true,
    solutions    = false,
  }
```

Walter often places the sample solutions to his exercises at the very end of the sheet and not immediately behind them. Therefore he uses the build-in referencing mechanism to link the exercises with it's sample solutions. To do so, he has to label the corresponding exercises by using the `label` option. Moreover, he uses the `credits` option to assign credit points to his exercises. To typeset a sample solution to an exercise, Walter uses the `solution` environment. This environment accepts the option `of` which he can use to pass the label of the corresponding exercise to the solution environment.

```
\exercise[
    topic={Specimen of a Title of an Exercise},
    credits=4,
    label={very_hard_exercise}
  ]

\subexercise[
  topic={Specimen of a Title of a Subexercise},
  credits=1
    ]
```

```
This might be an easy exercise\ldots

\subexercise[
  topic={Specimen of a Title of a Subexercise},
  credits=3
    ]

\ldots but this one will be really complicated!

\begin{solution}[
    of={very_hard_exercise}
  ]
  And here I will explain how easily everything can be solved.
\end{solution}
```

When Walter typesets his document (which takes two runs to create the table of contents and get the references right) he notices that his exercise sheet has a very large margin at the right. He immediately understands that this must be intentional by the author of the exercisesheet class to provide space for detailed corrections on the solutions of the students. First, he uses the option `narrowfactor=1` within the `\sheetconf` call to remove the margin completely, but then he thinks that it would be more clever to allow a litte more space for his students to take some notes. Therefore, he changes this option to `narrowfactor=.85` which satisfies him.

```
\documentclass[a4paper]{exercisesheet}

\sheetconf{
    narrowfactor = .85,
    lecture      = Specimen of a Title of a Lecture,
    semester     = Winter~Semester~2011/2012,
    author       = Prof.~Walter,
    teacher      = true,
    solutions    = false,
  }
```

Then Walter changes the appearance of his exercise sheets by also changing the fonts (he doesn't want his sheets to look like Lia's). He decides to switch everything to Bitstream's *Charter* and also add some color. Therefore, he loads the `xcolor` package and defines a `maincolor` to be a nice dark blue. Then he uses the `setsheetfont` command to re-set the font of the main sheet title and the sheet topic.

```
\usepackage{xcolor}
\colorlet{maincolor}{blue!50!black}

\usepackage[T1]{fontenc}
\usepackage[bitstream-charter]{mathdesign}
\let\sffamily=\rmfamily

\setsheetfont{sheet title}{\sffamily\bfseries\Huge}
\setsheetfont{sheet topic}{\sffamily\bfseries\Huge\color{maincolor}}
```

Altogether Walter is really satisfied by his work and starts thinking about easy and difficult exercises. His template file now looks as follows.

```
\documentclass[a4paper]{exercisesheet}

\sheetconf{
    narrowfactor = .85,
    lecture      = Specimen of a Title of a Lecture,
    semester     = Winter~Semester~2011/2012,
    author       = Prof.~Walter,
    teacher      = true,
    solutions    = false,
```

```
  }

\usepackage{xcolor}
\colorlet{maincolor}{blue!50!black}

\usepackage[T1]{fontenc}
\usepackage[bitstream-charter]{mathdesign}
\let\sffamily=\rmfamily

\setsheetfont{sheet title}{\sffamily\bfseries\Huge}
\setsheetfont{sheet topic}{\sffamily\bfseries\Huge\color{maincolor}}

\begin{document}

\maketitle

\tableofcontents

\sheet[
    topic={Specimen of a Title of an Exercise Sheet},
    deadline={1.~November~2011}
  ]

\exercise[
    topic={Specimen of a Title of an Exercise},
    credits=4,
    label={very_hard_exercise}
  ]

\subexercise[
  topic={Specimen of a Title of a Subexercise},
  credits=1
    ]

This might be an easy exercise\ldots

\subexercise[
  topic={Specimen of a Title of a Subexercise},
  credits=3
    ]

\ldots but this one will be really complicated!

\begin{solution}[
    of={very_hard_exercise}
  ]
  And here I will explain how easily everything can be solved.
\end{solution}

\sheet[
    topic={Specimen of a Title of an Exercise Sheet}
  ]

\end{document}
```

Chapter 2

Installation

There are several ways to install the exercisesheet class. In this section two of them are presented, namely the system-wide installation into the local texmf-tree and the easy installation for a single document.

Section 2.1

Easy Installation for a Single Document

The easiest way to use the exercisesheet class is to put the class file `exercisesheet.cls` into the same folder as your source file. For example, to create a new exercise sheet, you create a new folder, for instance called `mysheets/`, and put the class file into this folder. Afterwards, you can create a new file, for instance `mysheets.tex`, in the same folder or copy one of the templates that ship with this class. This will suffice to use the class.

Section 2.2

System-Wide Installation

For a longer-lasting installation you have to put the class file into one of your `texmf` trees. Depending on your operating system, TEX looks for the class file at several places:

– The root tree at `/usr/share/texmf/` or `c:\texmf\`. This folders contain classes and style files that ship with your TEX distribution.
– The local tree at `/usr/local/share/texmf/` or `c:\localtexmf\` that is intended to contain files that are installed manually by the user for system-wide use, that is, every user of the system has access to these files.
– Your personal tree at `~/texmf/` or, for Mac OS X, at `~/Library/texmf/`.

If you want to install the exercisesheet class into one of the folders named above, you should make use of the archive file `exercisesheet-tds.zip` whose contained files are already in the TEX Directory Structure (TDS). Just unzip this file into one of the above folders. The archive is created in such a way that the files are automatically placed into the correct subfolders. After this you might have to run `texhash` or `mktexlsr` to introduce the new files to TEX. That's it.

Chapter 3

Using the exercisesheet Class

This chapter contains a (more or less) comprehensive explanation of the underlying concepts and design principles of the exercisesheet class. Moreover, a complete list of the available user commands is given.

Section 3.1

The Central Command for Setting up Things

The exercisesheet class provides a single command that can be used to set up most of the information needed by the class: the `\sheetconf` command.

`\sheetconf{`*key-value list*`}`

> This is the central command for setting the basic information. As arguments it accepts a comma-separated key-value list. (For examples, see the tutorials above.) The following sections mostly contain descriptions of all available key-value pairs for this command.

Unfortunately not everything can be set up by he `\sheetconf` command. Due to historical reasons many arguments have to be specified within the call of the document class. As this class is build upon the report class, all optional arguments that are available for the report class are also available for the exercisesheet class, but some of them may have no affect. You should simply try to use them if you want to.

Section 3.2

Setting up the Basic Information

Students (as well as teachers) have to place a lot of information on their exercise sheets. For instance, Students typically have to place their name, their matriculation number, the name of the corresponding lecture, and a lot more on their sheets. The following keys can be used within the `\sheetconf` command to set these information.

`lecture={`*string*`}`

> This sets the name of the lecture. For example, use `lecture={Computational Complexity}` if the lecture is named *Computational Complexity*.

`lecturer={`*string*`}`

> This sets the name of the lecturer. Walter would use `lecturer={Prof.~Walter}` for his exercise sheets. Note the ~ to prevent unintended line breaking.

`semester={`*string*`}`

> Sets the current semester. For example, use `semester={Summer~Semester~2011}`. Note the ~ to prevent unintended line breaking.

author={*string*}

> This sets the name of the author that has worked out this sheet or the solutions on this sheet. A list of names can be passed as an argument to this macro if a group of people has been working on the sheets. For example, use `author={Justus~Jonas, Peter~Shaw, and Bob~Andrews}`. Note the ~ that prevents line breaking. If you want to add matriculation numbers, this is the right place. For example, you may use `author={Justus~Jonas~(31337)}`. If the lecturer and the author are the same person, you should set the lecturer to the empty string by using `lecturer={}`.

Section 3.3

Wide and Narrow Page Layout

A common problem of exercise sheets typeset by students is the small margin that makes it nearly impossible for the correctors to place helpful notes on the sheet. The exercisesheet class supports a simple method for producing enough white space for corrections without completely destroying the good look of the page: The textwidth is changed accordingly to the type of text currently typeset. While the sheet headings, the exercise headings, and many more things may use the full text width, the base text may use only a fraction of the text width and leaves the rest as additional white margin on the right. The text width of these two modes can be set by using the following options within the call of `\sheetconf`:

textwidth={*a dimension*}   `\textwidth`

> The full width that is used when typesetting headings.

narrowtextwidth={*a dimension*}   `.7\textwidth`

> The width that is used when typesetting the base text.

Note that due to the implementation of the LaTeX kernel, the given dimensions for the above two commands are stored fully expanded, i.e. if you change `\textwidth` after invoking `\sheetconf` with the options above, this has no effect on the text widths produced by the page layout mechanism, but on the width of other elements like headlines or footers. That is, if you want to change the page layout, for instance by making use of the well-known *geometry*-Package you should invoke the `\sheetconf` command afterwards to make sure that the page layout parameters are set up correctly.

Section 3.4

Setting up the Fonts

The exercisesheet provides an easy way to adjust the fonts used for the elements of the sheet. The central command is the `\setsheetfont` command.

`\setsheetfont`{*name of element*}{*font definition*}

> For instance, in order to set the font of the sheet title to a large italic sans-serif, you have to insert `\setsheetfont{sheet title}{\large\sffamily\itshape}` into the preamble of the document. Table 3.1 on page 11 contains a complete list of font elements that can be changes. Moreover, you can define and set your own font elements this way. To use the fonts, you have to use the `\usesheetfont` command.

`\usesheetfont`{*name of element*}

> This command inserts the font definition of the specified element. It works with the default font elements as well as with your own font elements defined by the use of `\setsheetfont`.

Table 3.1: Default Font Elements

Font Element	Default Value
basic	\normalfont\rmfamily
sheet title	\sffamily\fontsize{36}{40}\selectfont
sheet topic	\sffamily\Huge
sheet deadline	\sffamily\LARGE
sheet author	\sffamily\small
sheet lecture	\sffamily\scriptsize
sheet lecturer	\sffamily\scriptsize
sheet semester	\sffamily\scriptsize
exercise topic	\sffamily\small
exercise label	\sffamily\small
subexercise topic	\sffamily\footnotesize
subexercise label	\sffamily\footnotesize
lecture on titlepage	\sffamily\huge
lecturer on titlepage	\sffamily\large
author on titlepage	\sffamily\large
semester on titlepage	\sffamily\large
type on titlepage	\sffamily\Large

Section 3.5

Setting up Titles and Names

To customize titles and names used by the exercisesheet class – for instance because you want to use the class in a non-english environment – two basic commands are proviced: \setsheettemplate for defining a template and \usesheettemplate for using defined templates. The exercisesheet class makes heavy use of this template mechanism.

\setsheettemplate{*template name*}{*template definition*}

This is one of the few central commands for customizing the appearance of an exercise sheet. The first argument is a string, the name of the template to be set. The second argument may be arbitrary TeX code. For instance, in order to typeset the title of an exercise sheet (in the teachers version without sample solutions) in german, you can do the following:

```
\setsheettemplate{sheet title (teacher without solutions)}{%
  Aufgabenblatt~\thesheet
}
```

Table 3.2 on page 12 lists some of the predefined template elements and their default values. In fact there are lots more, but many of them are not of interest for most users. If you are interested in these templates, feel free to look into the source code. Moreover, feel free to use the above command to define your own templates that can be used by \usesheettemplate.

\usesheettemplate{*template name*}

This command inserts the template with the specified name.

Section 3.6

Creating Sheets

To typeset a new exercise sheet the \sheet command has to be used. This section provides all information related to this command.

Table 3.2: Some Predefined Template Elements

Template Element	Default Value
sheet title (student)	Solutions for Exercise~Sheet~\thesheet{}
sheet title (teacher without solutions)	Exercise~Sheet~\thesheet{}
sheet title (teacher with solutions)	Exercise~Sheet~\thesheet{} with Solutions
credit name	Credit
credits name	Credits
sheet name	Sheet
exercise name	Exercise
subexercise name	Subexercise
deadline name	Deadline
solution title (with reference)	Solution~of~\ref{\useexerciselabelofsolution}
solution title (without reference)	Solution
sheet type (exercises)	Exercises
sheet type (solutions)	Solutions
sheet type (exercises with sample solutions)	Exercises with Sample Solutions
annotation	\insertannotationbody

\sheet[*key-value-list*]

The \sheet command starts a new exercise sheet. For this, is ships out all remaining floats of the previous exercise sheets, starts a new page, and prints the heading of the exercise sheet. Depending on the current mode, the appearance of the title is adjusted. The \sheet command requires no argument. However, you can pass optional arguments as a key-value-list to it. The following keys are provided:

deadline={*string*}

Sets the deadline of the sheet. For example, use deadline={January~13,~2012}. Note the ~ that prevents line breaking.

label={*string*}

By using the label option, the exercise can be referenced later on with the \ref command or by the solution environment.

number={*a natural number*}

Sets the number of the exercise sheet. This is useful if you missed working on a sheet, for example. If this option is omitted, the number of the current exercise sheet is the number of the last sheet plus one or one if it is the first sheet.

topic={*string*}

Sets the topic of the sheet. For example, use topic={Turing Machines} if that's what the exercises on the sheet are about.

Section 3.7

Exercises and Subexercises

The exercisesheet class supports two sectioning commands for structuring exercises: The \exercise command and the \subexercise command.

\exercise[*key-value-list*]

The \exercise command starts a new exercise. This command needs no argument, but can be provided with a key-value-list to change the appearance of the exercise title. The following list may also be used for the \subexercise command.

`credits`={*a natural number*}

This sets the credits points that can be achieved by successfully working on this exercise.

`label`={*string*}

By using the label option the exercise can be referenced later on with the `\ref` command or by the `solution` environment.

`topic`={*string*}

This sets the topic for the exercise.

`\subexercise`[*key-value-list*]

This command is intended for structuring exercises and takes the same arguments as the `\exercise` command.

Section 3.8

Solutions

Depending on the setting, solutions can be typeset in two ways: First, by simply writing them directly after an `\exercise` command. This is recommend if the sheet should contain the solutions of a student. The second way is to use the `solution` environment. This environment should be used if the `teacher`=`true` parameter is passed to the `sheetconf` call. Of course, the `solution` environment may also be used in the `student` mode if the text of the exercise should also be presented on the sheet. However, in this section the `solution` environment is explained.

`\begin{solution}`[*key-value-list*]
    solution text
`\end{solution}`

The contents of the solution, above denoted by *solution text*, only appears if `solutions`=`true` is passed to the document class (this is the default). If the solutions mode is turned of (by using `solutions`=`false` option), the solution is removed from the exercise sheet.

`of`={*label of the corresponding exercise*}

The solution can be linked to the exercise by adding a label to the exercise and referencing this label by the `of` option. For example, consider the following example.

```
\exercise[
    label={foolabel}
  ]

  % Some content.

\begin{solution}[
    of={foolabel}
  ]
  % The solution.
\end{solution}
```

By using this kind of linking, the title of solution contains the number of the corresponding exercise.

Section 3.9

Annotations

Often the possibility of adding annotations to exercises or solutions whose appearance can be turned on and off globally is required. Suppose you use the exercisesheet class as a teacher and you want to typeset exercises and solutions. Besides these tasks you want to give little advices to all your helping hands that correct the

students solutions, for example how many points some answers deserve or on what things special attention should be payed when correcting. For this, you can use the `annotation` environment.

```
\begin{annotation}
    annotation text
\end{annotation}
```

The annotation text is only typeset when `annotations=true` is set within the `sheetconf` command. If you set `annotations=false` the annotations are not typeset. By default, the annotations appear in-line, i.e. exactly where you use the `annotation` environment, but you can change the appearance by using the template system. For example, if you want to make the annotation appear within the margin of the document, use the following command:

```
\setsheettemplate{annotation}{\marginpar{\raggedright\insertannotationbody}}
```

Here, \insertannotationbody inserts the annotation text.

Section 3.10

Title Pages

To typeset a title page you can make use of the \maketitle command. This creates a title page that contains the following information
1. The title of the lecture.
2. The name of the lecturer.
3. The type of sheets that you typeset (i.e. *Exercises*, *Exercises with Sample Solutions*, or *Solutions*.) This is adjusted automatically according to the options set with the call of the \sheetconf command.
4. The name of the author of the sheets.
5. The current semester.
You can look at the title pages of the templates that Lia and Walter have created for her exercise sheets (see the tutorials above) in figure 3.1.

Depending on the options set with the \sheetconf command the string that describes the type of sheets that are type set is changed. To adjust these to your personal needs you can use the \setsheettemplate command to redefine the following three templates:
1. sheet type (exercises),
2. sheet type (solutions),
3. sheet type (exercises with sample solutions).
For a more detailed description of the \setsheettemplate command see section 3.5.

Specimen of a Title of a Lecture
Prof. Foo Bar

Solutions

Lia
Winter Semester 2011/2012

Specimen of a Title of a Lecture
NO LECTURER DEFINED!
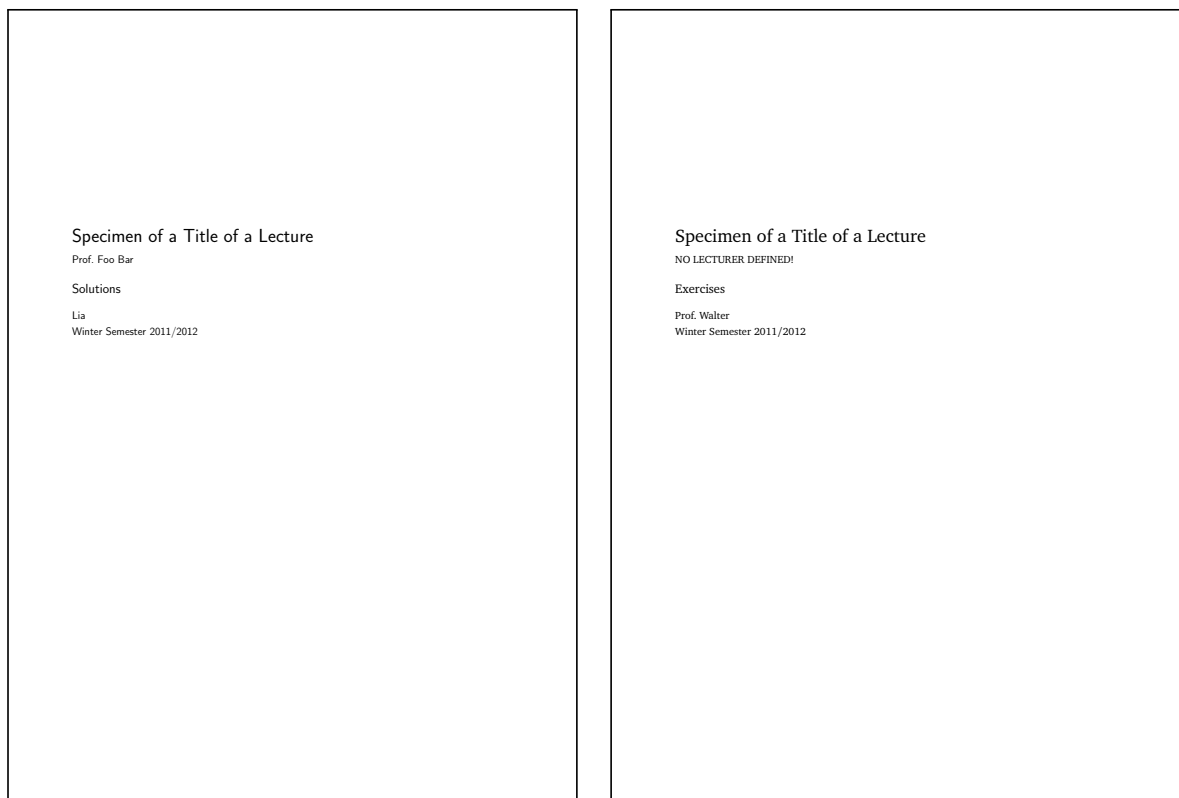
Exercises

Prof. Walter
Winter Semester 2011/2012

Figure 3.1: The title pages of Lia's and Walter's templates.