

XSIM

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EXERCISE SHEETS IMPROVED
the official successor of the EXSHEETS package

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1. Licence, Requirements and README

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1. Licence, Requirements and README

Permission is granted to copy, distribute and/or modify this software under the terms of the L^AT_EX Project Public License (LPPL), version 1.3c or later (<http://www.latex-project.org/lppl.txt>). The software has the status “maintained.”

xSIM loads the packages expl3 [L3Pa], xparse [L3Pb], array [MC21] booktabs [Fea20] and translations [Nie22]. All of these packages are present on a modern and up to date T_EX distribution such as T_EX Live or MiK_TE_X so no further action should be needed. When you are using **xSIM** you should be using an up to date T_EX distribution, anyway.

2. Motivation, Background

Please be aware that `xSIM` is in an experimental state and actively developed. Many aspects may change from one update to another until a stable version 1 will be reached. However, I will try my best to keep the interface stable.

Newer versions of `xSIM` may depend on newer versions of the support packages. Remember: it is always dangerous to update single packages. Always update your \TeX distribution if you want an up to date version of a package. Be careful: if you're in the middle of an important project it might be better to wait with the update until you've finished the project. Every update might be breaking some things.

2. Motivation, Background

It has been quite a while since I first published exsheets [Nie19] in June 2012. Since then it has gained a user base and a little bit of popularity as the number of questions on `tex.sx` shows (151 at the time of writing) [var]. User questions, bug reports and feature requests improved it over the time. It still has a version number starting with a zero, though, which in my versioning system means I still consider it experimental.

This is due to several facts. It lacks a few features which I consider essential for a full version 1. For one thing it is not possible to have several kinds of exercises numbered independently. Using verbatim material such as listings inside exercises and solutions is not possible and the current workaround isn't that ideal either. One request which dates back quite a while now was to have different types of points to exercises...

All of those aren't easy to add due to the way exsheets is implemented right now. As a consequence I wanted to re-implement exsheets for a long time. This is what lead to `xSIM`. Internally the package works completely different.

`xSIM` will be the official successor of exsheets which is now considered obsolete but will stay alive and will still receive bugfix releases. However, new features will not be added to exsheets any more.

3. How to Read the Manual

3.1. Nomenclature

Throughout this manual certain terms are used. This section explains their meaning in this manual.

collection A *collection* bundles a number of exercises of one type or all types of exercises within certain barriers in the document. Those exercise collections can be printed at any place in the document.

goal *Goals* are a certain type of properties with a numerical value the sum of which is available throughout the document.

3. How to Read the Manual

parameter *Parameters* are options of exercise types which are the same for each exercise of a type and can be retrieved and used in exercise templates.

property *Properties* are options of exercises which are individual for each exercise and can be retrieved and used in exercise templates.

tag *Tags* are a certain type of properties with a csv list as value which can be used for selective usage of exercises.

template *Templates* are generic code frameworks which are used for typesetting **xSIM**'s objects such as exercises, solutions, or grading tables.

3.2. Package Options

xSIM has these package options:

verbose

Writes extensive information about what **xSIM** is doing into the log file.

final

If used the exercise and solution environments will not rewrite the environment body files.

clear-aux

If used every time the total number of exercise changes **xSIM** will write *less* information to the auxiliary file on the next run and only if the number of exercises stays stable between compilations the needed information will be written to the auxiliary file. *This needs more compilations until everything stabilizes but should reduce the probability of possibly faulty exercises after changes to the document.* The **final** option automatically disables this option. See also sections 5 on page 7 and B.2 on page 54.

no-files

Default: true

This option prevents **xSIM** from writing the exercises and solutions to external files. This will keep your working folder “clean” but will also prevent using verbatim material in exercises and solutions.

Introduced in version 0.13
(Oct 6, 2019)

use-files

Default: false

This is the opposite of the option **no-files**.

Introduced in version 0.20
(Jan 31, 2021)

use-aux

With this option enabled **xSIM** will use the regular auxiliary file `\jobname.aux` instead of its own auxiliary file `\jobname.xsim`.

Introduced in version 0.15
(Nov 2, 2019)

blank

With this option enabled **xSIM** will not define the default environments `exercise` and `solution`.

Introduced in version 0.17
(Feb 21, 2020)

Those options are load-time options and are used the usual way as package options:

```
1 \usepackage[use-files]{xsim}
```



Although those options technically belong to the `package` module (see also section 3.3) it is *not* possible to set them via `\xsimsetup`.

3.3. Setting Options

Apart from the package options already described in section 3.2 on the previous page `xsim` has further options. All those options are set using the following command:

```
\xsimsetup{<options>}
```

Set up `xsim`'s package options and all other options described at other places in the manual.

Options can be “toplevel” options or options belonging to a module:

```
toplevel = {<value>}
```

A `toplevel` option.

```
module/sublevel = {<value>} A sublevel option belonging to the module module
```

Both kinds of options are set with the setup command:

```
1 \xsimsetup{
2   topLevel = {value} ,
3   module/sublevel = {value}
4 }
```

3.4. Command descriptions

Some commands do have a `*` symbol printed next to their names. This indicates that the command is expandable, *i. e.*, it is usable in an `\edef` or `\write` context and will expand according to its description. All other commands are engine protected, *i. e.*, in the sense of ϵ - \TeX 's `\protected`.

Some command name descriptions end with `TF`.

```
\SomeCommandTF<arguments>{<>true>}{<>false>}
```

A command with maybe some arguments and ending with the two arguments `<true>` and `<false>`.

This means two things: the command is a conditional which tests something and depending on the outcome of the test leaves either the `<true>` argument (T) or the `<false>` argument (F) in the input stream. It also means two additional commands exist:

4. Exercises and Solutions

`\SomeCommandT⟨arguments⟩{⟨true⟩}`

The same as `\SomeCommandTF` but only with the `⟨true⟩` argument and no `⟨false⟩` argument.

`\SomeCommandF⟨arguments⟩{⟨false⟩}`

The same as `\SomeCommandTF` but only with the `⟨false⟩` argument and no `⟨true⟩` argument.

4. Exercises and Solutions

The two predefined environments for exercises and solutions are the following ones¹:

`\begin{exercise}[⟨properties⟩]`

Input and typeset an exercise. See section 7 on page 12 for details on exercise properties.

`\begin{solution}[⟨options⟩]`

Input and typeset the solution to the exercise of the previous exercise environment. See section 11 on page 27 for details on options of solutions.

```
1 \begin{exercise}
2   A first example for an exercise.
3 \end{exercise}
4 \begin{solution}
5   A first example for a solution.
6 \end{solution}
```

Exercise 1

A first example for an exercise.

As can be seen in the example a solution is not printed with the default setup. This can be changed using the following option.

`solution/print = true|false`

Default: false

Set if solutions are printed or not.

The option (belonging to the module `solution`) can either be set locally as option to the `solution` environment

```
1 \begin{solution}[print=true]
2   A first example for a solution.
3 \end{solution}
```

or with the setup command for all following solutions:

1. When you load `xsim` with the `blank` those environments will *not* be defined!

5. How the Exercise Environments Work

```
1 \xsimsetup{
2   solution/print = true
3 }
```

There is an completely analogous option for the exercise environment:

`exercise/print = true|false`

Default: true

Set if exercises are printed or not.

More details on those two environments can be found in section 8 on page 19.

5. How the Exercise Environments Work

Introduced in version 0.13
(Oct 6, 2019)

Depending on the options `no-files/use-files` the bodies of exercises and solutions is either just another property (see section 7 on page 12) – this is the default behavior – or is written to an external file.

If the option `no-files = {true}` is set the exercise and solution bodies are saved as properties `exercise-body` and `solution-body`. This is the default behavior of `xSIM` since version 0.20 and should work fine in most cases. One obvious downside is that verbatim material cannot be used in exercises and solutions.

If the option `use-files = {true}` is set both the exercise and the solution environments write the contents of their bodies verbatim to external files following a certain naming structure:

- `<jobname>-<type>-<id>-exercise|solution-body.tex`

The name starts with the name of the job (which is the name of the document itself) followed by type and id of the corresponding exercise and then followed by the environment type. For example both environments from the first example have been written to files named

- `xsim-manual-exercise-1-exercise-body.tex` and
- `xsim-manual-exercise-1-solution-body.tex`, respectively.

These external files are input when the respective exercise or solution is printed. An advantage of using external files is that *verbatim material is allowed* inside the environments. Details on the `<type>` of an exercise will be given in section 6 on page 9. *The <id> of an exercise is a positive integer unique to each exercise environment regardless if the exercise is being printed or used at all.*

Each of those files contains some information about itself and where and why it was generated²:

2. In this example the sourcecode line number is misleading as the example where the file was generated itself was an external file where the exercise environment indeed *was* on line 1.

5. How the Exercise Environments Work

```
1 % -----
2 % file `xsim-manual-exercise-1-exercise-body.tex'
3 %   in folder `exercises/'
4 %
5 %     exercise of type `exercise' with id `1'
6 %
7 % generated by the `exercise' environment of the
8 %   `xsim' package v0.21 (2022/02/12)
9 % from source `xsim-manual' on 2022/02/12 on line 1
10 % -----
11 A first example for an exercise.
```

Arguably one downside of the approach using external files for each exercise and its solution is that your project folder will be cluttered with files. In order to deal with this somehow **XSIM** offers the following option:

path = $\{\langle path\ name\rangle\}$ (initially empty)

With this option a subfolder or path within the main project folder can be given. Exercises will be written to and included from this path. *The path must exist on your system before you can use it!* This document uses **path** = {exercises}.

file-extension = $\{\langle string\rangle\}$ Default: tex

This option let's you choose the extension of the external files.



Another thing to keep in mind: the environment in many ways works the same way as the `filecontents` environment. *This also means that you cannot have comments or `\labels` or anything else on the first line of the environments!*

```
1 \begin{exercise}[points=2] % this comment will cause trouble
2   Lorem ipsum
3 \end{exercise}
```


6. New Exercise Types

XSIM writes a lot of stuff to an auxiliary file called $\langle file\ name \rangle$.xsim (or the common $\langle file\ name \rangle$.aux if you use option `use-aux`) for re-using information on subsequent compilations. If you add exercises, change properties *etc.* it might happen that wrong information is staying in the auxiliary file and is wrongly used by **XSIM**. In such cases deleting the auxiliary file and doing a few fresh compilations may resolve your problems.

Sometimes the *existence of exercise or solution files from earlier compilations* may lead to wrong lists of exercises or solutions. In such cases it can be useful to delete all those files and doing a fresh compilation. It may be helpful to use a subfolder for those external files which will make deleting them a little bit easier. (Don't forget to both create the subfolder and set `path` accordingly then.)

Using the `clear-aux` option might help to reduce erroneous exercises.

A lot of the lines **XSIM** writes to the auxiliary file and reads in a subsequent run look like this:

```
1 \XSIM{points}{exercise-2=={4}||exercise-10=={2.5}||problem-11=={5}}
```

As you can see different entries of the various properties of exercises are separated with `||`. This means that you cannot use this symbol combination inside properties. For this reason **XSIM** provides an option to change the marker.

`split-aux-lists = { $\langle string \rangle$ }`

Default: `||`

Set the string that is used to separate the property entries in the auxiliary file.

Introduced in version 0.11
(Feb 12, 2018)

6. New Exercise Types

It is easy to define new exercise environments together with a corresponding solution environment using the following command:

`\DeclareExerciseType{ $\langle type \rangle$ }{ $\langle parameters \rangle$ }`

Declare a new exercise type analogous to the exercise and solution environments.

Declaring a new exercise type will also define a new command:

`\numberof{ $\langle exercise-env \rangle$ s}`

These commands hold the absolute number of used exercises of type $\langle type \rangle$. The meaning of $\langle exercise-env \rangle$ will become clear below when the exercise parameters are explained. It is always the same as the exercise environment name.

6. New Exercise Types

```
1 There are \numberofexercises~exercises and \numberofproblems~problem in this
2 manual.
```

There are 7 exercises and 1 problem in this manual.

Changed in version 0.14
(Oct 13, 2019)

XSIM's pre-defined environment pair has been defined as follows:

```
1 \DeclareExerciseType{exercise}{
2   exercise-env      = exercise ,
3   solution-env      = solution ,
4   exercise-name     = \XSIMtranslate{exercise} ,
5   exercises-name    = \XSIMtranslate{exercises} ,
6   solution-name     = \XSIMtranslate{solution} ,
7   solutions-name    = \XSIMtranslate{solutions} ,
8   exercise-template = default ,
9   solution-template = default ,
10  exercise-heading  = \subsection* ,
11  solution-heading  = \subsection*
12 }
```

The above already is an example for almost all parameters that can (and often must) be set. Here is the complete list:

exercise-env = $\{\langle exercise\ environment\ name\rangle\}$

The name for the environment used for the exercises of type $\langle type\rangle$. *This parameter is mandatory.* It can't be changed afterwards.

solution-env = $\{\langle solution\ environment\ name\rangle\}$

The name for the environment used for the solutions of type $\langle type\rangle$. *This parameter is mandatory.* It can't be changed afterwards.

exercise-name = $\{\langle exercise\ name\rangle\}$

The name of the exercises of type $\langle type\rangle$ – used for typesetting. *This parameter is mandatory.*

exercises-name = $\{\langle exercises\ name\rangle\}$

The plural name of the exercises of type $\langle type\rangle$ – used for typesetting. If this is not set explicitly an **s** is appended to the singular name.

solution-name = $\{\langle solution\ name\rangle\}$

The name of the solutions of type $\langle type\rangle$ – used for typesetting. *This parameter is mandatory.*

solutions-name = $\{\langle solutions\ name\rangle\}$

The plural name of the solutions of type $\langle type\rangle$ – used for typesetting. If this is not set explicitly an **s** is appended to the singular name.

Introduced in version 0.12
(Sep 26, 2019)

Introduced in version 0.12
(Sep 26, 2019)

6. New Exercise Types

`exercise-template` = $\{\langle exercise\ template\rangle\}$

The template used for typesetting the exercises of type $\langle type\rangle$. *This parameter is mandatory.* See section 13 on page 31 for details on templates.

`solution-template` = $\{\langle solution\ template\rangle\}$

The template used for typesetting the exercises of type $\langle type\rangle$. *This parameter is mandatory.* See section 13 on page 31 for details on templates.

`counter` = $\{\langle counter\ name\rangle\}$

The counter used for the exercises of type $\langle type\rangle$. If not explicitly set the counter with the same name as `exercise-env` is used. Otherwise the specified counter is used. This enables to have different types of exercises sharing a common counter. *This parameter can't be changed afterwards.* If the explicit or implicit counter does not exist, yet, it will be defined.

`within` = $\{\langle counter\ name\rangle\}$

Adds `counter` to the reset list of $\langle counter\ name\rangle$ by applying `\counterwithin`.

Introduced in version 0.20
(Jan 31, 2021)

`the-counter` = $\{\langle code\rangle\}$

Redefines the corresponding representation command `\the...` of `counter` to $\langle code\rangle$.

Introduced in version 0.20
(Jan 31, 2021)

`solution-counter` = $\{\langle counter\ name\rangle\}$

The counter used for the solutions of type $\langle type\rangle$. If not explicitly set the counter with the same name as `solution-env` is used. Otherwise the specified counter is used. This enables to have different types of solutions sharing a common counter although this doesn't actually make much sense. But it can be useful to avoid using an already existing counter. *This parameter can't be changed afterwards.* If the explicit or implicit counter does not exist, yet, it will be defined. The sole purpose of this counter is to be able to label solutions so they can be `\pagerefed`.

`number` = $\{\langle integer\rangle\}$

An internal parameter that is used to keep track of the number of exercises of a type. This parameter cannot be set or changed by the user.

`exercise-heading` = $\{\langle exercise\ heading\ command\rangle\}$

The command used for typesetting of the heading of exercises of type $\langle type\rangle$ – used for typesetting with the command `\GetExerciseHeadingF`.

Introduced in version 0.14
(Oct 13, 2019)

`solution-heading` = $\{\langle solution\ heading\ command\rangle\}$

The command used for typesetting of the heading of solutions of type $\langle type\rangle$ – used for typesetting with the command `\GetExerciseHeadingF`.

Introduced in version 0.14
(Oct 13, 2019)

It is possible to change some of the parameters after an exercise type has been defined. Those include `exercise-name`, `solution-name`, `exercise-template`, and `solution-template`. It is also possible to define new parameters.

`\DeclareExerciseParameter*` $\{\langle parameter\rangle\}$

Declares the new parameter $\langle parameter\rangle$. The optional star declares a fixed parameter which cannot be changed once it is set. *You probably will never need this command. Most tasks can be solved using properties (see section 7 on the next page) instead.*

7. Exercise Properties

`\SetExerciseParameter{<type>}{<parameter>}{<value>}`

Usable to set a single parameter to a new value.

`\SetExerciseParameters{<type>}{<parameters>}`

Set several parameters at once. `<parameters>` is a csv list of key/value pairs.

If you try to set an already set but fixed parameter like `exercise-env` a warning will be written to the log file. For all parameters that can be changed also options exist which can be set via `\xsimsetup`. They are explained in section 8.2 on page 20.



All exercises of a type use the parameters (e. g., `exercise-template`) that are *currently active*. If you want exercises with a different look or different names in the same document you should use different exercises types.

7. Exercise Properties

7.1. Predefined Properties

Exercise like the exercise environment and possibly others defined with `\DeclareExerciseType` have a number of predefined properties:

`id = {<integer>}`

Holds the internal id of an exercise. *Cannot be set by the user.*

`ID = {<text>}`

Holds the user id of an exercise if defined. Otherwise it is equal to `id`.

`counter = {<text>}`

Holds the counter value representation of an exercise (i. e., what you usually know as `\the<counter>`). *Cannot be set by the user.*

`counter-value = {<integer>}`

Holds the counter value of an exercise (i. e., what you usually know as `\the\value{<counter>}`). *Cannot be set by the user.*

`subtitle = {<text>}`

Holds the subtitle of an exercise.

`points = {<number>}`

Holds the reachable points of an exercise.

`bonus-points = {<number>}`

Holds the reachable bonus-points of an exercise.

`print = true|false`

Holds the print boolean of an exercise.

7. Exercise Properties

`print!` = `true`|`false`

Holds a special print boolean of an exercise, see page 19.

`use` = `true`|`false`

Holds the usage boolean of an exercise.

`use!` = `true`|`false`

Holds a special usage boolean of an exercise, see page 19.

`used` = `true`|`false`

True if an exercise has been used at least once. For an existing exercise this is only false for exercises that have been collected (*cf.* section 9 on page 22).

`solution` = `true`|`false`

Holds the solution boolean of an exercise. If this is true then a solution has the same text/environment body as the corresponding exercise. (This might be useful for multiple choice questions for example.)

`tags` = `{<csv list of tags>}`

Holds the list of tags the exercise should be associated with.

`topics` = `{<csv list of topics>}`

Holds the list of topics the exercise should be associated with.

`page` = `{<text>}`

Holds the page counter value representation of an exercise (*i. e.*, what you usually know as `\thepage`).

`page-value` = `{<integer>}`

Holds the page counter value of an exercise (*i. e.*, what you usually know as `\the\value{page}`).

`section` = `{<text>}`

Holds the section counter value representation of an exercise (*i. e.*, what you usually know as `\thesection`).

`section-value` = `{<integer>}`

Holds the section counter value of an exercise (*i. e.*, what you usually know as `\the\value{section}`).

`chapter` = `{<text>}`

Holds the chapter counter value representation of an exercise (*i. e.*, what you usually know as `\thechapter`).

Only if a command `\chapter` and a counter `chapter` exist.

`chapter-value` = `{<integer>}`

Holds the chapter counter value of an exercise (*i. e.*, what you usually know as `\the\value{chapter}`).

Only if a command `\chapter` and a counter `chapter` exist.

7. Exercise Properties

`sectioning` = $\{\langle\text{section numbers}\rangle\}$

Holds five brace groups which in turn hold the section numbers (integers) of the exercise in the order $\{\langle\text{chapter}\rangle\}\{\langle\text{section}\rangle\}\{\langle\text{subsection}\rangle\}\{\langle\text{subsubsection}\rangle\}\{\langle\text{paragraph}\rangle\}$.

`exercise-body` = $\{\langle\text{T}\text{E}\text{Xcode}\rangle\}$

When the package option `no-files` is set this property is defined and holds the environment body of an exercise.

`solution-body` = $\{\langle\text{T}\text{E}\text{Xcode}\rangle\}$

When the package option `no-files` is set this property is defined and holds the environment body of the corresponding solution.

Some of these properties are fixed and cannot be set by the user. Those include `id`, `counter`, and `counter-value`. The others can be set using the optional argument of the exercise environment.

```
1 \begin{exercise}[subtitle={This is a subtitle},points=4,bonus-points=1]
2   An exercise where some properties have been set.
3 \end{exercise}
```

Exercise 2 *This is a subtitle*

An exercise where some properties have been set.

7.2. Declaring Own Properties

`XSIM` offers the possibility to declare additional exercise properties:

`\DeclareExerciseProperty!` * - $\{\langle\text{property}\rangle\}$

Declares the property $\langle\text{property}\rangle$.

If used with the optional `!` a **unique property** is defined which means that each exercise must have a property value distinct from all other exercises (all means all – *independent from the exercise type*).

If used with the optional `*` a **boolean property** is defined which means that it only should get the values `true` or `false` and if used without value it gets the value `true` instead of an empty value. If any other value is used the property is set to `false`. A boolean property obviously cannot be unique. The optional `*` takes precedence over the optional `!`, *i. e.*, if both are present the property is boolean *but not* unique.

If used with the optional `-` a property is defined which won't get updated through subsequent compilation runs but is only set when the exercise is used.

`\DeclareExercisePropertyAlias` $\{\langle\text{property 1}\rangle\}\{\langle\text{property 2}\rangle\}$

Declares $\langle\text{property 1}\rangle$ to be an alias of $\langle\text{property 2}\rangle$. This means that each time $\langle\text{property 2}\rangle$ is set $\langle\text{property 1}\rangle$ will be set to the same value *unless* it has been set already. As an example: property `ID` is an alias of property `id`.

7. Exercise Properties

This is better demonstrated with an example:

```
1 \begin{exercise}
2   \verb+\GetExerciseProperty{id}+: \GetExerciseProperty{id} \par
3   \verb+\GetExerciseAliasProperty{ID}+: \GetExerciseAliasProperty{ID} \par
4   \verb+\GetExerciseProperty{ID}+: \GetExerciseProperty{ID}
5 \end{exercise}
6 \begin{exercise}[ID=foo-bar]
7   \verb+\GetExerciseProperty{id}+: \GetExerciseProperty{id} \par
8   \verb+\GetExerciseAliasProperty{ID}+: \GetExerciseAliasProperty{ID} \par
9   \verb+\GetExerciseProperty{ID}+: \GetExerciseProperty{ID}
10 \end{exercise}
```

Exercise 3

```
\GetExerciseProperty{id}: 3
\GetExerciseAliasProperty{ID}: 3
\GetExerciseProperty{ID}: 3
```

Exercise 4

```
\GetExerciseProperty{id}: 4
\GetExerciseAliasProperty{ID}: 4
\GetExerciseProperty{ID}: foo-bar
```

The power of properties will get more clear when reading section 13 on page 31 about templates.

7.3. A Special Kind of Property: Exercise Goals

Exercise goals are a generic concept in *xSIM* for exercise properties like *points* or *bonus-points*. Those are properties which can (only) get a decimal number as value the sum of which is calculated and available (after a compilation) throughout the document.

```
\DeclareExerciseGoal{<goal>}
```

Declare a new exercise goal named *<goal>* and also a property called *<goal>*.

```
\TotalExerciseTypeGoal{<type>}{<goal>}{<singular>}{<plural>}
```

Get the sum of goal *<goal>* for all exercises of type *<type>*. *<singular>* and *<plural>* are placed after the sum in the input stream depending on whether the sum equals 1 or not.

```
\TotalExerciseTypeGoals{<type>}{<list of goals>}{<singular>}{<plural>}
```

Get the sum of goal all goals in *<list of goals>* for all exercises of type *<type>*. The goal names in *<list of goals>* must be separated with +. *<singular>* and *<plural>* are placed after the sum in the input stream depending on whether the sum equals 1 or not.

7. Exercise Properties

`\TotalExerciseGoal`{*goal*}{*singular*}{*plural*}

Get the sum of goal *goal* for all exercises. *singular* and *plural* are placed after the sum in the input stream depending on whether the sum equals 1 or not.

`\TotalExerciseGoals`{*list of goals*}{*singular*}{*plural*}

Get the sum of goal all goals in *list of goals* for all exercises. The goal names in *list of goals* must be separated with +. *singular* and *plural* are placed after the sum in the input stream depending on whether the sum equals 1 or not.

`\AddtoExerciseTypeGoal`{*type*}{*goal*}{*value*}

Adds *value* to the goal *goal* of exercise type *type*.

`\AddtoExerciseTypeGoalPrint`{*type*}{*goal*}{*value*}{*singular*}{*plural*}

Adds *value* to the goal *goal* of exercise type *type*. The value and – depending on whether the value equals 1 or not – *singular* or *plural* are left in the input stream.

`\AddtoExerciseGoal`{*goal*}{*value*}

Adds *value* to the goal *goal* of the current exercise type. (To be used within exercises.)

`\AddtoExerciseTypeGoalPrint`{*goal*}{*value*}{*singular*}{*plural*}

Adds *value* to the goal *goal* of the current exercise type. The value and – depending on whether the value equals 1 or not – *singular* or *plural* are left in the input stream. (To be used within exercises.)

`\ExerciseGoalValuePrint`{*value*}{*singular*}{*plural*}

Print *value* and – depending on whether the value equals 1 or not – *singular* or *plural*.

`\printgoal`{*value*}

Print *value* according to option `goal-print`. Defined in terms of `\ExerciseGoalValuePrint`.

`\printpoints`{*type*}

Print the sum of points for all exercises of type *type* followed by an appropriate translation of the words “point” or “points”, respectively.³ Defined in terms of `\TotalExerciseTypeGoal`.

`\printtotalpoints`

Print the sum of points for all exercises followed by an appropriate translation of the words “point” or “points”, respectively. Defined in terms of `\TotalExerciseGoal`.

`\addpoints*`{*value*}

Adds *value* to the points of the current exercise type. (To be used within exercises.) Prints the value followed by an appropriate translation of the words “point” or “points”, respectively. The starred version prints nothing. Defined in terms of `\AddtoExerciseGoal` and `\AddtoExerciseGoalPrint`.

`\points`{*value*}

Print *value* followed by an appropriate translation of the words “point” or “points”, respectively. Defined in terms of `\ExerciseGoalValuePrint`.

3. See section 14 on page 48 for details on the definition and usage of language dependent words.

7. Exercise Properties

`\printbonus{<type>}`

Print the sum of bonus points for all exercises of type *<type>* followed by an appropriate translation of the words “point” or “points”, respectively. Defined in terms of `\TotalExerciseTypeGoal`.

`\printtotalbonus`

Print the sum of bonus points for all exercises followed by an appropriate translation of the words “point” or “points”, respectively. Defined in terms of `\TotalExerciseGoal`.

`\addbonus*{<value>}`

Adds *<value>* to the bonus points of the current exercise type. (To be used within exercises.) Prints the value followed by an appropriate translation of the words “point” or “points”, respectively. The starred version prints nothing. Defined in terms of `\AddtoExerciseGoal` and `\AddtoExerciseGoalPrint`.

The two existing goals are defined with

```
1 \DeclareExerciseGoal{points}
2 \DeclareExerciseGoal{bonus-points}
```

When goal values are printed the decimal number is fed to a function which can be changed using the following option:

`goal-print = {<code>}`

Default: #1

How to format goal values. Use #1 to refer to the actual number.

At last some examples for a custom command: let’s say you want a command which prints the complete sum for all exercises of all exercise types of both `points` and `bonus-points` added up:

```
1 \NewDocumentCommand\printsumofpointsandbonus{}{%
2   \TotalExerciseGoals{points+bonus-points}
3   {\,\XSIMtranslate{point}}
4   {\,\XSIMtranslate{points}}%
5 }
```

Here is how you could mimick the command `\totalpoints` from exsheets:

```
1 \NewDocumentCommand\pointsandbonus{}{%
2   \TotalExerciseGoal{points}{}{}%
3   \IfExerciseGoalsSumF{bonus-points}{=0}
4   {\,(+\,\TotalExerciseGoal{bonus-points}{}{})}%
5   \,\XSIMtranslate{points}%
6 }
```

7.4. A Special Kind of Property: Exercise Tags

Exercise tags are a generic concept in `xSIM` for exercise properties like `tags` or `topics`. Those are properties which can (only) get a csv list of strings as value. Those strings can be used to selectively use exercises. See section 8 on the following page for details on *usage* of exercises and the difference to *printing* an exercise and how to use exercise tags for selection.

`\DeclareExerciseTagging{<tag>}`

This defines an exercise tagging group named `<tag>`. It also defines a property named `<tag>`. In addition two options are defined: an option named `<tag>` which can be used for selection and an boolean option `<tag>/ignore-untagged`.

`\ProvideExerciseTagging{<tag>}`

The same as `\DeclareExerciseTagging` but does nothing when `<tag>` already exists.

Introduced in version 0.11
(Feb 12, 2018)

The two existing tagging groups have been defined and preset with the following code:

```
1 \DeclareExerciseTagging{tags}
2 \DeclareExerciseTagging{topics}
3 \xsimsetup{tags/ignore-untagged=false}
```

For each new tag new options are defined and available. They are described for the two predefined tags:

`tags = {<csv list of tags>}`

Choose the set of tags whose associated exercises should be printed.

`topics = {<csv list of topics>}`

Choose the set of topics whose associated exercises should be printed.

`tags/ignore-untagged = true|false`

Default: false

If set to true exercises with no tags will be printed even if tags have been chosen with the option `tags`.

`topics/ignore-untagged = true|false`

Default: true

If set to true exercises with no topics will be printed even if topics have been chosen with the option `topics`.

`tags/use-unmatched = true|false`

Default: false

Introduced in version 0.21
(Feb 12, 2022)

If set to true exercises with no matching tags will be used (i.e., for example the counter gets stepped).

`topics/use-untagged = true|false`

Default: true

Introduced in version 0.21
(Feb 12, 2022)

If set to true exercises with no matching topics will be used (i.e., for example the counter gets stepped).

8. Using and Printing an Exercise

It may happen that you choose certain tags for printing and want one or two exercises to be printed or used even if they don't match the tagging criteria. For this reason two additional properties exist which can be set to an exercise:

`print! = true|false`

If set to true the exercise will be printed (and thus used) regardless of other conditions.

`use! = true|false`

If set to true the exercise will be used regardless of other conditions.

8. Using and Printing an Exercise

8.1. What the Environments do

When an exercise is started with `\begin{exercise}` (or other environments defined through `\DeclareExerciseType`) then three things happen depending on the setup:

1. where the environment is placed in the document the **base setup** happens: this sets the `id` of the exercise and sets the properties chosen in the optional argument.
2. in the default setting also the **usage setup** happens: this increments the counter and sets the counter related properties like `counter`. Also the properties related to section numbers and the `page` are set.
3. in the default setting also the **print setup** happens: this mostly does nothing. It initiates recording goals that are set inside of the exercise body.

Depending on whether the option `exercise/use` has been set to false or whether the property `use` has been set to false the *usage setup* can be delayed. The usage happens when the exercise is *inserted* the first time elsewhere in the document, for example as part of a collection, see section 9 on page 22.

Depending on whether the option `exercise/print` has been set to false or if the property `print` has been set to false the *print setup* can be suppressed. It happens each time an exercise is inserted.

```
1 \begin{exercise}[print=false,ID=invisible]
2   This exercise will not be printed but the exercise counter will be
3   incremented nonetheless. Its solution will be printed in the list of
4   solutions.
5 \end{exercise}
6 \begin{solution}
7   The solution of the exercise that has not been printed.
8 \end{solution}
```

The schematic structure of an exercise is shown in figure 1 on the following page.

8. Using and Printing an Exercise

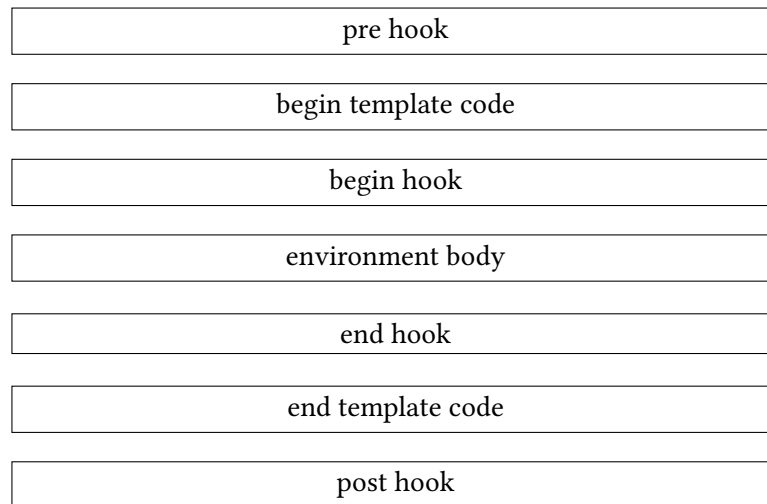


FIGURE 1: Schematic structure of an exercise or solution.

8.2. Environment Options & Hooks

For each exercise type there are the following options for both environments, the environments' names are the module names for the options (here using the “exercise” type):

`exercise/print = true|false` Default: true
Determines if exercises of type “exercise” are printed.

`exercise/use = true|false` Default: true
Determines if exercises of type “exercise” are used.

`exercise/collect = true|false` Default: false
Sets both `print` and `use` to false when `collect = {true}` is set and vice versa.

Introduced in version 0.20
(Jan 31, 2021)

`exercise/within = {<counter>}` (initially empty)

Changed in version 0.20
(Jan 31, 2021)

Adds the exercise counter to the reset list of the counter `<counter>` using `\counterwithin`.
Beware that if the counter is a shared counter this will affect all objects using this counter!

`exercise/the-counter = {<code>}`
An interface for redefining the counter representation command `\the<counter>`.

`exercise/template = {<template>}`
An interface for `\SetExerciseParameter{exercise}{exercise-template}{<template>}`.

`solution/template = {<template>}`
An interface for `\SetExerciseParameter{exercise}{solution-template}{<template>}`.

`exercise/name = {<name>}`
An interface for `\SetExerciseParameter{exercise}{exercise-name}{<name>}`.

8. Using and Printing an Exercise

`solution/name = {<name>}`

An interface for `\SetExerciseParameter{exercise}{solution-name}{<name>}`.

`exercise/heading = {<heading command>}`

Introduced in version 0.14 (Oct 13, 2019) An interface for `\SetExerciseParameter{exercise}{exercise-heading}{<heading command>}`.

`solution/heading = {<heading command>}`

Introduced in version 0.14 (Oct 13, 2019) An interface for `\SetExerciseParameter{exercise}{solution-heading}{<heading command>}`.

`exercise/pre-hook = {<code>}`

(initially empty)

The code for the *pre exercise hook* for exercises of the type “exercise”.

`exercise/begin-hook = {<code>}`

(initially empty)

The code for the *begin exercise hook* for exercises of the type “exercise”.

`exercise/end-hook = {<code>}`

(initially empty)

The code for the *end exercise hook* for exercises of the type “exercise”.

`exercise/post-hook = {<code>}`

(initially empty)

The code for the *post exercise hook* for exercises of the type “exercise”.

`solution/print = true|false`

Default: false

Determines if solutions of type “exercise” are printed.

`solution/pre-hook = {<code>}`

(initially empty)

The code for the *pre solution hook* for solutions of the type “exercise”.

`solution/begin-hook = {<code>}`

(initially empty)

The code for the *begin solution hook* for solutions of the type “exercise”.

`solution/end-hook = {<code>}`

(initially empty)

The code for the *end solution hook* for solutions of the type “exercise”.

`solution/post-hook = {<code>}`

(initially empty)

The code for the *post solution hook* for solutions of the type “exercise”.

8.3. (Re-) Inserting a Certain Exercise

If you know type and `id` of an exercise you can (re-)insert every existing exercise, *i. e.*, every exercise whose external file exists.

`\printexercise{<type>}{<csv of ids>}`

Changed in version 0.17 (Feb 21, 2020) Inserts the exercise or exercises of type `<type>` with the `ids` or `IDs` given in `<csv of ids>`.

`\xprintexercise{<type>}{<csv of ids>}`

Introduced in version 0.16, changed with version 0.17 (Feb 21, 2020) The same as `\printexercise` but expands `<type>` and the items of `<csv of ids>` before it uses them.

```
1 \printexercise{exercise}{invisible}
```

Exercise 5

This exercise will not be printed but the exercise counter will be incremented nonetheless. Its solution will be printed in the list of solutions.

9. Collecting Exercises



The whole collection mechanism has been changed completely with version 0.20. Please check this section carefully and update and adapt your collections.

9.1. Background

XSIM knows the concept of *exercise collections*. A collection of exercises can be used in two cases, basically:

1. When you want to print a certain group of exercises several times. In this case you add the exercise to a collection while also using it in the running text. Somewhere later (or earlier actually) in the document you can the reprint the collection.⁴
2. If you only want to print exercises which have certain tags. Maybe you have some kind of exercise library in an external which you include into you document and want to print only those exercises which fit certain conditions.

Each collection must have a unique name with which you can refer to the corresponding collection. A collection is realized by declaring the collection in the preamble and by activating the collection.

9.2. Usage

9.2.1. Declaring collections

A *collection must be declared in the preamble*. Using a pair of commands explained below exercises between those commands are added to the corresponding collection but not printed. After a collection is completed the collection can be printed as often as needed.

```
\DeclareExerciseCollection[<tag values>]{<collection name>}
```

Define a new collection *<collection name>* in the document preamble. An example could look like this: `\DeclareExerciseCollection[topics=algebra,level=1]{easy-algebra}`. Choosing tags automatically activates the collection which means that all exercises which fit the tags are automatically added to the new collection.

⁴ There is another way to do that, but...

9. Collecting Exercises

Introduced in version 0.21
(Feb 12, 2022)

You have a choice whether *any* or *all* of the tags should match. So `[topics=algebra, level=1]` should probably match *all* conditions but the choice is up to you. For each defined collection an option exists:

`collection/<name>/match-all = true|false` Default: true
If set to true *all* conditions must be met.

`collection/<name>/match-any = true|false` Default: false
The inverse option to `match-all`. If set to true *any* of the conditions must be met.

9.2.2. Activating collections

If a collection is not activated per default it can be activated (or deactivated in the opposite case) with these commands:

Introduced in version 0.20
(Jan 31, 2021)

`\activatecollection{<collection name>}`
Activates the collection `<collection name>` which now collects all exercises until the collection is deactivated. `<collection name>` can be a csv list of collection names.

Introduced in version 0.20
(Jan 31, 2021)

`\deactivatecollection{<collection name>}`
Deactivates the collection `<collection name>`. `<collection name>` can be a csv list of collection names.

These commands do not influence exercises in other ways other than adding them to collections.

`\collectexercises{<collection name>}`
Activates the collection `<collection name>` which now collects all exercises until the collection is deactivated, starts a group with `\begingroup` and sets the option `collect`, see below.

`\collectexercisesstop{<collection name>}`
Deactivates the collection `<collection name>` and ends a group with `\endgroup`.

`collect = true|false` Default: false
A shortcut option which sets the options `<type>/collect` for each exercise type.

9.2.3. Printing collections

`\printcollection[<options>]{<collection name>}`
Prints the collection `<collection name>`, i. e., all exercises collected earlier. This command cannot be used before the corresponding collection has been closed correctly.

Valid options are the following:

`print-collection/headings = true|false` Default: false
If true a heading for each exercise type is inserted.

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`print-collection/headings-template = {<template>}` Default: collection
The heading template used when `headings = {true}`.

`print-collection/print = exercises|solutions|both` Default: exercises
Determines whether `\printcollection` prints the exercises or the solutions of the collection. When you choose both exercises and solutions are printed alternately.

Those options can also be set via `\xsimsetup` using the module `print-collection`.



Please be aware that exercises are not used or printed while they are collected. Nonetheless the property `use` is set to `true` (so that solutions can be printed even if the exercises are not) and the property `print` is set to `false`. Also their counters are *not stepped* during the process. This only happens when they are printed the first time, cf. the `used` property. At that time also the properties `page`, `section` and `chapter` are set and the property `print` is set to `true`.

The usage should be clear:

```
1 \collectexercises{foo}
2 \begin{exercise}
3   This exercise is added to the collection `foo`.
4 \end{exercise}
5 \begin{exercise}
6   This exercise is also added to the collection `foo`.
7 \end{exercise}
8 \begin{exercise}
9   So is this.
10 \end{exercise}
11 \begin{exercise}
12   As well as this one.
13 \end{exercise}
14 \collectexercisesstop{foo}
```

Once the collection is closed it can be printed:

```
1 \printcollection{foo}
```

Exercise

This exercise is added to the collection 'foo'.

9. Collecting Exercises

Exercise

This exercise is also added to the collection ‘foo’.

Exercise

So is this.

Exercise

As well as this one.

You can open several collections at the same time:

```
1 \collectexercisefoo}
2 ...
3 \activatecollectionbar}
4 ...
5 \deactivatecollectionfoo}
6 ...
7 \collectexercisestopbar}
```

Exercises will be added to each open collection.

There is one generic collection called “all exercises”. As the name already suggests it will hold all exercises. So if you say

```
1 \printcollectionall exercises}
```

all exercises will be printed.

If you use `\labels` inside of exercises and you print exercises more than once in your document (by reusing a collection for example) you will get

```
1 LaTeX Warning: There were multiply-defined labels.
```

Equally if you have environments like `\begin{equation}` which step a counter inside an exercise or solution the counter will be stepped each time the exercise is used.

At last now an example using external files, collections and tags:

10. Printing Random Exercises From a Collection

```
1 % preamble:
2 % \DeclareExerciseCollection{foo-easy}
3 % \DeclareExerciseCollection{foo-medium}
4 % \DeclareExerciseTagging{difficulty}
5
6 % document:
7 \collectexercisestop{foo-easy}
8 \xsimsetup{difficulty=easy}
9 \input{foo.tex}
10 \collectexercisestop{foo-easy}
11 % collection `foo-easy' now contains all exercises of file `foo.tex' tagged
12 % with `difficulty=easy'
13
14 \collectexercisestop{foo-medium}
15 \xsimsetup{difficulty=medium}
16 \input{foo.tex}
17 \collectexercisestop{foo-medium}
18 % collection `foo-medium' now contains all exercises of file `foo.tex'
19 % tagged with `difficulty=medium'
```

The recommended usage is similar to the last example. Actually a collection can be printed *before* it is opened, too. (This needs *at least* two compilations, though.) However, it is safer printing a collection only once and only *after it has been collected*. No guaranties are given that properties are set correctly if you use the collection before. You usually also will make sure that the exercises in a collection are unique, *i. e.*, that an exercise is not part of several collections – at least not if both collections are printed in the same document.

10. Printing Random Exercises From a Collection

XSIM provides the possibility of selecting random exercises from a collection (*cf.* section 9 on page 22).

! Please be aware that this feature is *not* available in X_YL^AT_EX!

`\prinrandomexercisestop[<options>]{<number>}`

This command prints *<number>* random exercises from the collection chosen with option **collection**, see below. When this command is used it generates a random list of integers which is written to the aux file. On the subsequent compilations the according exercises are printed. *If you want to regenerate the random list you have to delete the aux file before compiling.*

Valid options for this command are:

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`random/sort = true|false` Default: true
Determines whether the random chosen exercises should be sorted according to their order of definition in the collection or not.

`random/collection = {<collection>}` Default: all exercises
The collection from which the exercises are to be chosen from.

`random/exclude = {<csv list of ids>}`
A list of **ids** or **IDs** of exercises *not* to be chosen.

`random/print = exercises|solutions|both` Default: exercises
Determines whether `\printrandomexercises` prints the exercises or the solutions. When you choose both exercises and solutions are printed alternately.

```
1 \printrandomexercises[collection=foo]{2}
```

Exercise

This exercise is also added to the collection 'foo'.

Exercise

So is this.

The example above of course doesn't make much sense but if you have a collection which collects exercises from an external file and the exercises haven't been printed in the document before then you will get a list of subsequently numbered exercises.

11. Printing Solutions

There are different commands for printing the solutions to exercises:

`\printsolutionstype*[{<options>}]{<exercise type>}`

Prints the solutions of all used exercises of type *<exercise type>*. The starred version only prints the solutions of all printed exercises of type *<exercise type>*.

`\printsolutions*[{<options>}]`

Prints the solutions of all used exercises of all types ordered by type. The starred version only prints the solutions of all printed exercises of all types.

`\printallsolutions*[{<options>}]`

Prints the solutions of all used exercises of all types ordered by appearance in the document. The starred version only prints the solutions of all printed exercises of all types.

`\printsolution[{<options>}]{<type>}{<id>}`

Prints the solution of the exercise of type *<type>* with the **id** *<id>*.

`\xprintsolution{<type>}{<id>}`

Introduced in version 0.16
(Nov 10, 2019)

The same as `\printsolution` but expands `<type>` and `<id>` before it uses them.

```
1 \printsolutionstype{exercise}
```

Solutions to the Exercises

Solution 1

A first example for a solution.

Solution 5

The solution of the exercise that has not been printed.

Solution 6

Try to fill in these blanks. All of them are created by using the `\blank` command.

The options can be divided into two groups. The ones in the first group modify the layout.

`print-solutions/headings = true|false` Default: true

If true a heading for each exercise type is inserted.

`print-solutions/headings-template = {<template>}` Default: default

The heading template used when `headings = {true}`.

The ones in the second group set conditions selecting which solutions are printed. If you combine those conditions a solution is printed if it meets either of the conditions.

`print-solutions/section = true|false|<integer>` Default: false

If you set `section = {true}` only solutions of exercises of the current section are printed. If you set `section = {4}` only solutions of exercises in a section with number 4 are printed.

`print-solutions/chapter = true|false|<integer>` Default: false

If you set `chapter = {true}` only solutions of exercises of the current chapter are printed. If you set `chapter = {4}` only solutions of exercises in a chapter with number 4 are printed.

`print-solutions/collection = false|<collection name>` Default: false

If used only solutions of exercises belonging to collection `<collection name>` are printed.

The conditions can be combined. The following call will only print solutions from exercises in section 3 of chapter 2:

```
1 \printsolutions[chapter=2,section=3]
```



The selection per section or per chapter relies on the *counter numbers* of the sections or chapters, respectively. This means if section numbers are reset (e. g. by `\chapter` or `\appendix`) and you have exercises from *different* sections with *the same section number* the solutions of *all those exercises* will be printed. This means you only should use the `section` selection when section are the top document level headings (apart from parts) and you have no exercises in the appendix. Similar considerations are valid for the `chapter` selection.

All options can also be set via `\xsimsetup` using the module `print-solutions`.

```
\printsolutions[section=4,headings-template=per-section]
```

Solutions to the Exercises of Section 4

Solution 1

A first example for a solution.

```
\printsolution{exercise}{5}
```

Solution 5

The solution of the exercise that has not been printed.

12. Grading Tables

When you create exercises it may not only be desirable to be able to add points and bonus-points to a question (see section 7.3 on page 15 about exercise goals) but also to be able to output a grading table. `XSIM` has built-in means for this.

```
\gradingtable[<options>]
```

Print a grading table.

Valid options for this command are

```
template = {<template>}
```

Choose the template used for the grading table.

Default: default

```
type = {<exercise type>}
```

Choose the exercise type for which the table is printed.

(initially empty)

Both option defaults can be changed with `\xsimsetup` setting the options using `grading-table`:

12. Grading Tables

```
1 \xsimsetup{
2   grading-table/template = default*
3 }
```

An example:

```
1 \gradingtable[type=exercise]
```

Exercise	Points	reached
6	0	
7	0	
1	0	
2	4	
3	0	
4	0	
5	0	
total	4	

Or using the “default*” template:

```
1 \gradingtable[template=default*,type=exercise]
```

Exercise	6	7	1	2	3	4	5	total
Points	0	0	0	4	0	0	0	4
reached								

Available templates and how to define new ones are explained in sections 13.4.3 on page 40 and 13.6 on page 41. `XSIM` per default provides two templates “default” and “default*”, the first one has a vertical layout, the second a horizontal layout. Both templates can be used per type like in the examples above or for all types at once by leaving the specification `type` away:

```
1 \gradingtable
```

	Points reached
Exercise 6	0
Exercise 7	0
Exercise 1	0
Exercise 2	4
Exercise 3	0
Exercise 4	0
Exercise 5	0
Problem 1	5
total	9

13. Styling the Exercises – Templates

13.1. Background

Whenever **xSIM** outputs something to be typeset it uses so-called templates for the task. **xSIM** knows of three different kinds of templates:

- environment templates (see section 13.4.1 on page 39),
- heading templates (see section 13.4.2 on page 40) and
- grading table templates (see section 13.4.3 on page 40)

The most important one for the styling of the exercises are the environment templates. Those templates give you complete control over the look and arrangement of an exercise. To be able to do this **xSIM** provides a large number of commands which can be used only inside template definitions.⁵ Those commands are explained in the next section. Their usage will hopefully become clear in the examples in section 13.6 on page 41. Having full control over the layout comes at a price: you need to be able to program yourself in order to achieve certain layouts.⁶

13.2. Templates Provided by the Package

xSIM comes with a few predefined layouts:

default The template activated per default and the only one available without further action.

5. The last sentence is wrong: those commands can be used anywhere but most of them only give useful results inside of templates.

6. I plan to incorporate the most common layouts – and maybe some fancy ones, too – in the examples section 13.6 on page 41 but at the time of writing this is still up in the air.

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runin A layout rather similar to the one by package `exsheets`, see section 13.6.3 on page 43. Available through the style file `layouts` (see section 13.5 on page 40 for more information on style files).

margin A layout rather similar to the one by package `exsheets`, see section 13.6.4. Available through the style file `layouts`.

minimal A minimalistic layout, see section 13.6.5. As the others inspired by an `exsheets` layout. Available through the style file `layouts`.

inline A minimalistic layout, the same as `minimal` but doesn't add `\par` at the beginning and end. Available through the style file `layouts`.

centered A layout with a centered heading. Available through the style file `layouts`.

Layout "default"

Exercise *The Subtitle*

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem.

_____/2.5 p

Layout "runin"

Exercise *The Subtitle* Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem.

2.5 points

Layout "margin"

Exercise (2.5 p.) Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem.

Layout “inline”

(2.5 points) Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem.

Layout “minimal” (Like “inline” but as own paragraph.)

(2.5 points) Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem.

Layout “centered”

Exercise *The Subtitle*

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem.

2.5 points

13.3. Commands for Usage in Template Definitions

13.3.1. Goals

`\IfExerciseGoalTF{<goal>}{<relation and value>}{<true>}{<false>}`
 Checks the sum of goal <goal> against <relation and value>.

`\IfExerciseGoalSingularTF{<goal>}{<true>}{<false>}`
 Checks if the value of the goal <goal> of the current exercise equals 1. This is the same as `\IfExerciseGoalTF{<goal>}{=1}{<true>}{<false>}`.

`\IfExerciseTypeGoalsSumTF{<type>}{<list of goals>}{<relation and value>}{<true>}{<false>}`
 Checks the sum of all goals in <list of goals> for the exercises of type <type> against <relation and value>.

`\IfExerciseGoalsSumTF{<type>}{<list of goals>}{<relation and value>}{<true>}{<false>}`
 Checks the sum of all goals in <list of goals> for all exercises of all types against <relation and value>.

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`\TotalExerciseTypeGoal{<goal>}{<type>}{<singular>}{<plural>}`

Print the sum of goal `<goal>` for the exercises of type `<type>` and append `<singular>` or `<plural>` depending on whether the sum equals 1 or not.

`\TotalExerciseGoal{<goal>}{<singular>}{<plural>}`

Print the sum of goal `<goal>` for all exercises of all types and append `<singular>` or `<plural>` depending on whether the sum equals 1 or not.

13.3.2. Properties

* `\IfExercisePropertyExistTF{<property>}{<>true>}{<>false>}`

Tests whether an exercise property with the name `<property>` is defined.

* `\IfExercisePropertySetTF{<property>}{<>true>}{<>false>}`

Tests whether the exercise property `<property>` has been set for the current exercise.

* `\GetExerciseProperty{<property>}`

Retrieves the value of the property `<property>` for the current exercise.

`\GetExercisePropertyTF{<property>}{<>true>}{<>false>}`

Tests whether the exercise property `<property>` has been set for the current exercise. Inside the `<true>` branch you can refer to the retrieved value either with `#1` or with `\PropertyValue`. *This command expands its contents inside a group.*

`\GetExerciseBody{exercise|solution}`

Retrieves the environment body of either the exercise or the corresponding solution of the current exercise.

* `\GetExerciseIdForProperty{<property>}{<value>}`

Retrieves the property `id` of the exercise where the property `<property>` has the value `<value>`. *This only works for unique properties!*

`\GetExerciseTypeForProperty{<property>}{<value>}`

Retrieves the property `type` of the exercise where the property `<property>` has the value `<value>`. *This only works for unique properties!*

`\SetExerciseProperty{<property>}{<value>}`

Set the property `<property>` of the current exercise to `<value>`.

`\SetExpandedExerciseProperty{<property>}{<value>}`

Expand `<value>` `\edef`-like and set the property `<property>` of the current exercise to the result of the expansion.

`\ExerciseSetProperty{<type>}{<id>}{<property>}{<value>}`

Set the property `<property>` of the exercise of type `<type>` and id `<id>` to `<value>`.

Introduced in version 0.10
(Sep 19, 2017)

Changed in version 0.9 (Jun
20, 2017)

Introduced in version 0.9
(Jun 20, 2017)

Introduced in version 0.9
(Jun 20, 2017)

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`\ExerciseSetExpandedProperty{⟨type⟩}{⟨id⟩}{⟨property⟩}{⟨value⟩}`

Expand `⟨value⟩` `\edef`-like and set the property `⟨property⟩` of the exercise of type `⟨type⟩` and id `⟨id⟩` to the result of the expansion.

* `\IfExerciseBooleanPropertyTF{⟨property⟩}{⟨true⟩}{⟨false⟩}`

Checks whether the boolean property `⟨property⟩` has value `true` or `⟨false⟩` and leaves the corresponding argument in the input stream. Gives an error if `⟨property⟩` is not a boolean property.

* `\GetExerciseAliasProperty{⟨property⟩}`

Retrieves the value of the property of which `⟨property⟩` is an alias of for the current exercise.

`\SaveExerciseProperty{⟨property⟩}⟨macro⟩`

Saves the value of the property `⟨property⟩` for the current exercise in macro `⟨macro⟩`.

`\GlobalSaveExerciseProperty`

Globally saves the value of the property `⟨property⟩` for the current exercise in macro `⟨macro⟩`.

`\ExercisePropertyIfSetTF{⟨type⟩}{⟨id⟩}{⟨property⟩}{⟨true⟩}{⟨false⟩}`

Test if the property `⟨property⟩` has been set for the exercise of type `⟨type⟩` with id `⟨id⟩`.

* `\ExercisePropertyGet{⟨type⟩}{⟨id⟩}{⟨property⟩}`

Retrieves the value of the property `⟨property⟩` for the exercise of type `⟨type⟩` with id `⟨id⟩`.

* `\ExercisePropertyGetAlias{⟨type⟩}{⟨id⟩}{⟨property⟩}`

Retrieves the value of the property of which `⟨property⟩` is an alias of for the exercise of type `⟨type⟩` with id `⟨id⟩`.

`\ExercisePropertySave{⟨type⟩}{⟨id⟩}{⟨property⟩}⟨macro⟩`

Saves the value of the property `⟨property⟩` for the exercise of type `⟨type⟩` with id `⟨id⟩` in macro `⟨macro⟩`.

`\ExercisePropertyGlobalSave{⟨type⟩}{⟨id⟩}{⟨property⟩}⟨macro⟩`

Globally saves the value of the property `⟨property⟩` for the exercise of type `⟨type⟩` with id `⟨id⟩` in macro `⟨macro⟩`.

13.3.3. Parameters

* `\GetExerciseParameter{⟨parameter⟩}`

Retrieves the value of the parameter `⟨parameter⟩` for the current exercise type.

`\GetExerciseParameterTF{⟨parameter⟩}{⟨true⟩}{⟨false⟩}`

Retrieves the value of the parameter `⟨parameter⟩` for the current exercise type. Inside the `⟨true⟩` branch you can refer to the retrieved value either with `#1` or with `\ParameterValue`. This command expands its contents inside a group.

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* `\GetExerciseName`

Retrieves the value of the parameter `exercise-name` for the current exercise or of the parameter `solution-name` for the current solution.

* `\GetExerciseHeadingF{<false>}`

Introduced in version 0.14
(Oct 13, 2019)

Retrieves the value of the parameter `exercise-heading` for the current exercise or of the parameter `solution-heading` for the current solution. Inserts `<false>` if the corresponding parameter has not been set.

* `\ExerciseParameterGet{<type>}{<parameter>}`

Retrieves the value of the parameter `<parameter>` for the exercise of type `<type>` with id `<id>`.

* `\IfExerciseParameterSetTF{<parameter>}{<true>}{<false>}`

Introduced in version 0.9
(Jun 20, 2017)

Test if the parameter `<parameter>` has been set for the current exercise type.

* `\ExerciseParameterIfSetTF{<type>}{<parameter>}{<true>}{<false>}`

Introduced in version 0.9
(Jun 20, 2017)

Test if the parameter `<parameter>` has been set for the exercise type `<type>`.

13.3.4. Tags

`\ForEachExerciseTag{<type>}{<code>}`

Loops over all tags of tag type `<type>` for the current exercise applying `<code>` each time. Inside `<code>` you can refer to the corresponding tag with `#1`.

`\ListExerciseTags{<type>}{<between>}`

Lists all tags of tag type `<type>` for the current exercise using `<between>` as a separator.

`\UseExerciseTags{<type>}{<between two>}{<between>}{<between last two>}`

Lists all tags of tag type `<type>` for the current exercise using `<between>` as a separator and `<between last two>` as separator between the last two tags of the list. If the list only consists of two tags `<between two>` is used as separator.

`\IfExerciseTagSetTF{<value>}{<true>}{<false>}`

Introduced in version 0.11
(Feb 12, 2018)

In order to insert text (also *outside* of exercises) depending on the chosen tags this command lets you check if value `<value>` has been set for **tags**.

`\IfExerciseTopicSetTF{<value>}{<true>}{<false>}`

Introduced in version 0.11
(Feb 12, 2018)

In order to insert text (also *outside* of exercises) depending on the chosen tags this command lets you check if value `<value>` has been set for **topics**.

13.3.5. Further Commands for Usage in Template Definitions

`\UseExerciseTemplate{<type>}{<name>}`

Retrieve template `<name>` of type `<type>`. This can be useful if you want to define a template which just adds some code to an existing template (an automated `\label`, say).

* `\ExerciseType`

Can be used to refer to the current exercise type.

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- * `\ExerciseID`
Can be used to refer to the current exercise id.
- * `\ExerciseText`
Can be used inside solutions to retrieve the text of the corresponding solution. This is probably seldom useful as in most use cases the exercise property `solution` is the easier alternative.
- * `\ExerciseCollection`
Can be used in certain templates to refer to the collection that is currently inserted.
- * `\numberofusedexercises`
Holds the total number of used exercises. Useful in table template definitions.
- * `\ExerciseTableType{<code>}`
In table template definitions this macro either expands to the given exercise type or – if no type has been given – to `<code>`.
- * `\IfInsideSolutionTF{<true>}{<false>}`
Tests if the template is used inside a solution environment or not.
- * `\IfSolutionPrintTF{<true>}{<false>}`
Tests if the option `print` for the solutions of the current `\ExerciseType` is set to true or false.
- `\IfExistSolutionTF{<true>}{<false>}`
Tests if a solution for the current exercise exists.
- `\ForEachPrintedExerciseByType{<code>}`
Loops over each *printed* exercise ordered by the exercise types and within each type by id. Inside `<code>` you can refer to several properties of the corresponding exercise:
 - #1: the type of the exercise
 - #2: the id of the exercise
 - #3: the `counter` property of the exercise
 - #4: the `subtitle` property of the exercise
 - #5: the `points` property of the exercise
 - #6: the `bonus-points` property of the exercise
- `\ForEachUsedExerciseByType{<code>}`
Loops over each *used* exercise ordered by the exercise types and within each type by id. Inside `<code>` you can refer to several properties of the corresponding exercise:
 - #1: the type of the exercise
 - #2: the id of the exercise
 - #3: the `counter` property of the exercise

Introduced in version 0.9
(Jun 20, 2017)

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- #4: the `subtitle` property of the exercise
- #5: the `points` property of the exercise
- #6: the `bonus-points` property of the exercise

`\ForEachUsedExerciseByOrder{<code>}`

Loops over each *used* exercise ordered by the exercise types and within each type by the order they have been used in the document. Inside `<code>` you can refer to several properties of the corresponding exercise:

- #1: the type of the exercise
- #2: the id of the exercise
- #3: the `counter` property of the exercise
- #4: the `subtitle` property of the exercise
- #5: the `points` property of the exercise
- #6: the `bonus-points` property of the exercise

`\ForEachPrintedExerciseByID{<code>}`

Loops over each *printed* exercise order by the exercise id. Inside `<code>` you can refer to several properties of the corresponding exercise:

- #1: the type of the exercise
- #2: the id of the exercise
- #3: the `counter` property of the exercise
- #4: the `subtitle` property of the exercise
- #5: the `points` property of the exercise
- #6: the `bonus-points` property of the exercise

`\ForEachUsedExerciseByID{<code>}`

Loops over each *used* exercise order by the exercise id. Inside `<code>` you can refer to several properties of the corresponding exercise:

- #1: the type of the exercise
- #2: the id of the exercise
- #3: the `counter` property of the exercise
- #4: the `subtitle` property of the exercise
- #5: the `points` property of the exercise
- #6: the `bonus-points` property of the exercise

`\XSIMprint{exercise|solution}{<type>}{<id>}`

Inserts the either the exercise or the solution of type `<type>` with the `id` or `ID` `<id>`.

Introduced in version 0.21
(Feb 12, 2022)

Introduced in version 0.16,
changed with version 0.17
(Feb 21, 2020)

`\XSIMxprint{exercise|solution}{<type>}{<id>}`

Introduced in version 0.16,
changed with version 0.17
(Feb 21, 2020)

The same as `\XSIMprint` but expands `<type>` and `<id>` before it uses them.

* `\XSIMtranslate{<keyword>}`

Delivers the translation of `<keyword>` according to the current document language (in the meaning of a babel [Bra22] or polyglossia [Chaz1] language). Existing keywords and keyword translations (and how to add new ones) are explained in section 14 on page 48.

`\XSIMexpandcode{<code>}`

Expands `<code>` like `\edef` does and leaves the result in the input stream.

* `\XSIMifchapterTF{<true>}{<false>}`

Returns `<true>` if both a macro `\chapter` and a counter `chapter` are defined and `<false>` otherwise.

`\XSIMmixedcase{<code>}`

Converts the full expansion of `<code>` to mixed case:

`\XSIMmixedcase{this is some text}` This is some text

This command expands `<code>` before converting it.

`\XSIMputright<macro>{<code>}`

Extends the macro definition of `<macro>` with `<code>` putting it to the right. This is more or less a local version of the LaTeX kernel macro `\g@addto@macro`.

* `\XSIMifeqTF{<code 1>}{<code 2>}{<true>}{<false>}`

Checks if the full expansion of `<code 1>` and `<code 2>` is the same tokenlist.

* `\XSIMifblankTF{<code>}{<true>}{<false>}`

Checks if the full expansion of `<code>` is blank (*i. e.*, if it is empty or only consists of spaces).

`\XSIMatbegindocument{<code>}`

Introduced in version 0.16
(Nov 10, 2019)

Adds `<code>` to `xsim`'s begin document hook. Should be used inside style files instead of `\AtBeginDocument`.

`\XSIMatenddocument{<code>}`

Introduced in version 0.16
(Nov 10, 2019)

Adds `<code>` to `xsim`'s end document hook. Should be used inside style files instead of `\AtEndDocument`.

13.4. Declaring Templates

13.4.1. Environment Templates

`\DeclareExerciseEnvironmentTemplate{<name>}{<begin code>}{<end code>}`

Declare the environment template `<name>`.

Environment templates are used by the exercise and solution environments. Those are the templates set with the parameters `exercise-template` and `solution-template`.

The predefined template is called “default”, see section 13.6.1 on page 41.

13.4.2. Heading Templates

`\DeclareExerciseHeadingTemplate{<name>}{<code>}`

Declare the heading template *<name>*.

Heading templates are used by `\printsolutions`, `\printsolutionstype` and `\printcollection`. Those are the templates set with the option `headings-template` of the modules `print-solutions` and `print-collection`.

The predefined templates are “default”, “collection”, “per-section” and “per-chapter” see section 13.6.6 on page 45.

13.4.3. Grading Table Templates

`\DeclareExerciseTableTemplate{<name>}{<code>}`

Declare the grading table template *<name>*.

Table templates are used by `\gradingtable`. Those are the templates set with the option `template` of module `grading-table`

The predefined templates are “default” and “default*”, see sections 13.6.7 on page 45 and 13.6.8 on page 46.

13.5. Create and Use `xSIM` Style Files

`xSIM` offers you the possibility to create own *style files*. Let’s say you want to have a style called `math-exam`. Then you need to save all necessary definitions in a file called:

`xsim.style.math-exam.code.tex`

The first command in the file should be `\xsimstyle{math-exam}`. This file can now be loaded into your document using `\loadxsimstyle{math-exam}` or by using `\xsimsetup{load-style=math-exam}`:

```

1 \documentclass[DIV=18,parskip=half]{scrartcl}
2 \usepackage[T1]{fontenc}
3 \usepackage[utf8]{inputenc}
4
5 \usepackage[clear-aux]{xsim}
6 \loadxsimstyle{math-exam}
7
8 \title{Math Exam \#3}
9 \date{2017-03-28}

```

In this style file stuff like template and property definitions should happen. This is more or less a convenient way to

- keep the preamble “clean” and

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- define re-usable styles without the need of copying the document preamble to another document.

A style file is like a package or class file, *i. e.*, @ has category code 11 (letter).

The formal description of the commands:

`\xsimstyle*{<style name>}`

The first command in a **XSIM** style file called `xsim.style.<style name>.code.tex` which defines the **XSIM** style `<style name>`. The starred version activates `expl3` syntax.⁷

`\loadxsimstyle{<csv list of style names>}`

Load one or more styles into the document.

`load-style = {<csv list of style names>}`

Another interface for `\loadxsimstyle{<csv list of style names>}`.



At the moment this mechanism offers no advantages over creating a custom package or simply `\input`ing a file. Future versions might provide additional features.

13.6. Examples

The repository of this package⁸ currently includes 42 example documents demonstrating how different aspects of this package work or how different kinds of problems can be solved or how different kinds of layouts can be achieved as well as how solve concrete problems that have come up in different \LaTeX forums, see section F on page 61.

13.6.1. The default Exercise Template

Below the definition of the default exercise template provided by **XSIM** is shown:

```
1 \DeclareExerciseEnvironmentTemplate{default}{%
2   \GetExerciseHeadingF{\subsection*}%
3   {%
4     \XSIMmixedcase{\GetExerciseName}\nobreakspace
5     \GetExerciseProperty{counter}%
6     \IfInsideSolutionF
7       {%
8         \GetExercisePropertyT{subtitle}
9         { {\normalfont\itshape\PropertyValue}}%
10      }%
11   }
12   \GetExercisePropertyT{points}
```

7. Those users who want this will know what it means. If you don't know what it means you will not need it.

8. GitHub: <https://github.com/cgnieder/xsim/>, CTAN: <http://www.ctan.org/pkg/xsim/>

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```
13   {%
14     \marginpar
15     {%
16       \IfInsideSolutionF{\rule{1.2cm}{1pt}\slash}%
17       \printgoal{\PropertyValue}
18       \GetExercisePropertyT{bonus-points}{~(+\printgoal{\PropertyValue})}
19     }%
20     ~\XSIMtranslate {point-abbr}%
21   }%
22 }
23 {\par}
```

13.6.2. A New Exercise Type Using tcolorbox

Let's say we want exercises to be put in a `tcolorbox`. We want a bold title and, if given, an italic subtitle. Exercises should also have the points after the subtitle in parentheses if given. Let's also say we want those to be an additional exercise type in addition to the ones `XSIM` already provides. This is shown with the following code which is also how the problems in this manual have been defined:

```
1 \DeclareExerciseEnvironmentTemplate{tcolorbox}
2   {%
3     \tcolorbox[
4       colback = red!5!white ,
5       colframe = red!75!black ,
6       colbacktitle = yellow!50!red ,
7       coltitle = red!25!black ,
8       breakable ,
9       drop shadow ,
10      beforeafter skip = .5\baselineskip ,
11      title =
12        \textbf{\GetExerciseName~\GetExerciseProperty{counter}}%
13        \GetExercisePropertyT{subtitle}{ \textit{\PropertyValue}}%
14        \IfInsideSolutionF{%
15          \GetExercisePropertyT{points}{ % notice the space
16            (%
17              \printgoal{\PropertyValue}
18              \IfExerciseGoalSingularTF{points}
19                {\XSIMtranslate{point}}
20                {\XSIMtranslate{points}}%
21            )%
22          }%
23        }%
24    ]%
```

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```
25 }
26 {\endcolorbox}
27
28 \DeclareExerciseType{problem}{
29   exercise-env = problem ,
30   solution-env = answer ,
31   exercise-name = Problem ,
32   solution-name = Answer ,
33   exercise-template = tcolorbox ,
34   solution-template = tcolorbox
35 }
```

See it in action:

```
1 \begin{problem}[subtitle=My subtitle,points=5]
2   This is a problem using a subtitle and points.
3 \end{problem}
4 \begin{answer}
5   This is the answer to problem~\GetExerciseProperty{counter}.
6 \end{answer}
```

Problem 1 *My subtitle* (5 points)

This is a problem using a subtitle and points.

13.6.3. Mimicking exsheets' runin Template

The following example shows how you could mimick exsheets' runin template. The outcome isn't exactly the same since exsheets doesn't use `\marginpar` but the result should look very similar. A safer definition would use a real sectioning command for the title.

```
1 \usepackage{needspace}
2 \DeclareExerciseEnvironmentTemplate{runin}
3   {%
4     \par\vspace{\baselineskip}
5     \Needspace*{2\baselineskip}
6     \noindent
7     \textbf{\XSIMixedcase{\GetExerciseName}~\GetExerciseProperty{counter}}%
8     \GetExercisePropertyT{subtitle}{ \textit{#1}} % <<< notice the space
9     \IfInsideSolutionF{%
10       \GetExercisePropertyT{points}{%
11         \marginpar{%
```

13. Styling the Exercises – Templates

```
12     \printgoal{\PropertyValue}%
13     \GetExercisePropertyT{bonus-points}{+\printgoal{\PropertyValue}}%
14     \,\IfExerciseGoalSingularTF{points}
15         {\XSIMtranslate{point}}
16         {\XSIMtranslate{points}}%
17     }%
18 }%
19 }%
20 }
21 {}
```

13.6.4. Mimicking exsheets' margin Template

The following example shows how you could mimick exsheets' margin template.

```
1 \DeclareExerciseEnvironmentTemplate{margin}
2 {%
3   \trivlist
4   \item[\llap{%
5     \smash{%
6       \tabular[t]{@{}r@{}}
7       \textbf{\XSIMmixedcase{\GetExerciseName}~\GetExerciseProperty{
counter}}
8       \IfExercisePropertySetT{points}{%
9         \tabularnewline
10        (%
11          \printgoal{\GetExerciseProperty{points}}%
12          \GetExercisePropertyT{bonus-points}{+\printgoal{#1}}%
13          \,\XSIMtranslate{point-abbr}%
14        )%
15      }%
16    \endtabular
17  }%
18  ]\relax
19 }
20 {\endtrivlist}
```

13.6.5. A minimal Template

This shows the implementation of the minimal template:

```
1 \DeclareExerciseEnvironmentTemplate{minimal}
2 {%
3   \par
```

13. Styling the Exercises – Templates

```
4 \textbf{\GetExerciseProperty{counter}}%
5 \IfInsideSolutionF{%
6   \GetExercisePropertyT{points}{%
7     \GetExercisePropertyT{bonus-points}{+\printgoal{\PropertyValue}}%
8     \,\IfExerciseGoalSingularTF{points}
9       {\XSIMtranslate{point}}
10      {\XSIMtranslate{points}}%
11   }%
12 }%
13 }
14 {\par}
```

13.6.6. The Headings Templates

XSIM defines four heading templates which only differ by which text they output:

```
1 \DeclareExerciseHeadingTemplate{default}
2   {\section*{\XSIMtranslate{default-heading}}}
3 \DeclareExerciseHeadingTemplate{collection}
4   {\section*{\XSIMtranslate{collection-heading}}}
5 \DeclareExerciseHeadingTemplate{per-section}
6   {\section*{\XSIMtranslate{per-section-heading}}}
7 \DeclareExerciseHeadingTemplate{per-chapter}
8   {\section*{\XSIMtranslate{per-chapter-heading}}}
```

Section 14 on page 48 shows how the translations are defined.

13.6.7. The default Table Template

This template is the one used for grading tables per default. It has a vertical layout.

```
1 \DeclareExerciseTableTemplate{default}{%
2   \XSIMputright\ExerciseTableCode{%
3     \toprule
4     \XSIMifblankF{\ExerciseType}
5       {\XSIMmixedcase{\GetExerciseParameter{exercise-name}}}
6     &
7     \XSIMmixedcase{\XSIMtranslate{points}} &
8     \XSIMtranslate{reached} \\
9     \midrule
10  }%
11 \ForEachUsedExerciseByType{%
12   \XSIMifeqT{#1}{\ExerciseTableType{#1}}
13   {%
```

13. Styling the Exercises – Templates

```
14     \XSIMifblankT{\ExerciseTableType{}}
15     {%
16         \XSIMputright\ExerciseTableCode{%
17             \XSIMmixedcase{\ExerciseParameterGet{#1}{exercise-name} }%
18         }%
19     }%
20     \XSIMputright\ExerciseTableCode
21     {#3 & \XSIMifblankTF{#5}{\printgoal{0}}{\printgoal{#5}} & \ }%
22 }%
23 }
24 \XSIMputright\ExerciseTableCode{%
25     \midrule
26     \XSIMtranslate{total} &
27     \XSIMifblankTF{\ExerciseType}
28     {\TotalExerciseGoal{points}{}}{}
29     {\TotalExerciseTypeGoal{\ExerciseType}{points}{}}{} &
30     \ \bottomrule
31 }%
32 \XSIMexpandcode{%
33     \noexpand\begin{tabular}{\XSIMifblankTF{\ExerciseType}{l}{c}cc}
34     \noexpand\ExerciseTableCode
35     \noexpand\end{tabular}%
36 }%
37 }
```

The part

```
1 \XSIMifblankTF{\ExerciseType}{ ... }{ ... }
```

repeatedly checks if an exercise type has been given for the table. This makes it possible to design the table differently if it is for one exercise type only (the true case) or for all exercise types (the false case). `\ExerciseTableType{<code>}` either expands to the given exercise type or to `<code>`.

13.6.8. The default* Table Template

The second of the predefined grading table templates. It has a horizontal layout.



If you have a lot of exercises the width of a table with this layout may exceed the text width of the document!

```
1 \DeclareExerciseTableTemplate{default*}{%
2     \XSIMputright\ExerciseTableCode{%
```

13. Styling the Exercises – Templates

```

3   \toprule
4   \XSIMifblankF{\ExerciseType}
5     {\XSIMmixedcase{\GetExerciseParameter{exercise-name}}}
6     &%
7   }%
8   \ForEachUsedExerciseByType{%
9     \XSIMifeqT{#1}{\ExerciseTableType{#1}}
10    {
11      \XSIMifblankT{\ExerciseTableType{}}
12      {%
13        \XSIMputright\ExerciseTableCode{%
14          \XSIMmixedcase{\ExerciseParameterGet{#1}{exercise-name} }%
15        }%
16      }%
17      \XSIMputright\ExerciseTableCode{#3 &}
18    }%
19  }%
20  \XSIMputright\ExerciseTableCode{%
21    \XSIMtranslate{total} \
22    \midrule
23    \XSIMmixedcase{\XSIMtranslate{points}} &
24  }%
25  \ForEachUsedExerciseByType{%
26    \XSIMifeqT{#1}{\ExerciseTableType{#1}}
27    {%
28      \XSIMputright\ExerciseTableCode{%
29        \XSIMifblankTF{#5}{\printgoal{0}}{\printgoal{#5}} &}%
30      }%
31    }%
32    \XSIMputright\ExerciseTableCode{%
33      \XSIMifblankTF{\ExerciseType}
34      {\TotalExerciseGoal{points}{}}{}
35      {\TotalExerciseTypeGoal{\ExerciseType}{points}{}}{}%
36      \ \midrule
37      \XSIMtranslate{reached} &%
38    }%
39    \ForEachUsedExerciseByType{%
40      \XSIMifeqT{#1}{\ExerciseTableType{#1}}
41      {\XSIMputright\ExerciseTableCode{&}}%
42    }%
43    \XSIMputright\ExerciseTableCode{ \ \bottomrule }%
44    \edef\numberofcolumns{%
45      \XSIMifblankTF{\ExerciseType}
46      {\numberofusedexercises}
47      {\csname numberof \ExerciseType s\endcsname}%
48    }%
49    \XSIMifeqF{\numberofcolumns}{0}

```

14. Exercise Translations

```
50   {%  
51     \begin{tabular}{l*{\numberofcolumns}{c}c}  
52       \ExerciseTableCode  
53     \end {tabular}%  
54   }%  
55 }
```

The part

```
1 \XSIMifblankTF{\ExerciseType}{ ... }{ ... }
```

repeatedly checks if an exercise type has been given for the table. This makes it possible to design the table differently if it is for one exercise type only (the `true` case) or for all exercise types (the `false` case). `\ExerciseTableType{<code>}` either expands to the given exercise type or to `<code>`.

14. Exercise Translations

`\DeclareExerciseTranslation{<language>}{<keyword>}{<translation>}`

Declare the translation of `<keyword>` for language `<language>`.

`\DeclareExerciseTranslations{<keyword>}{<translations>}`

Declare the translations of `<keyword>` for several languages at once. See an example of the usage below.

* `\XSIMtranslate{<keyword>}`

Delivers the translation of `<keyword>` according to the current document language (in the meaning of a babel [Bra22] or polyglossia [Cha21] language).

`\ForEachExerciseTranslation{<code>}`

Loops over all translations of all keywords known to `XSIM`. Inside `<code>` you can refer to the keyword with `#1`, to the language with `#2`, and to the translation with `#3`.

As an example how to use `\DeclareExerciseTranslations` here is how the translations for exercise have been defined:

```
1 \DeclareExerciseTranslations{exercise}{  
2   Fallback = exercise ,  
3   English  = exercise ,  
4   French   = exercice ,  
5   German   = \ "Ubung  
6 }
```


14. Exercise Translations

Table 1 shows all existing keywords with all predefined translations.

TABLE 1: Translation keywords predefined by **XSIM**.

keyword	language	translation
exercise	Fallback	exercise
exercise	English	exercise
exercise	French	exercice
exercise	German	\ "Ubung
exercises	Fallback	exercises
exercises	English	exercises
exercises	French	exercices
exercises	German	\ "Ubungen
question	Fallback	question
question	English	question
question	French	question
question	German	Aufgabe
questions	Fallback	questions
questions	English	questions
questions	French	questions
questions	German	Aufgaben
solution	Fallback	solution
solution	English	solution
solution	French	solution
solution	German	L\ "osung
solutions	Fallback	solutions
solutions	English	solutions
solutions	French	solutions
solutions	German	L\ "osungen
point-abbr	Fallback	p.
point-abbr	English	p.
point-abbr	French	p.
point-abbr	German	P.
point	Fallback	point
point	English	point
point	French	point
point	German	Punkt
points	Fallback	points
points	English	points
points	French	points
points	German	Punkte
reached	Fallback	reached

continues

14. Exercise Translations

keyword	language	translation
reached	English	reached
reached	French	obtenus
reached	German	erreicht
total	Fallback	total
total	English	total
total	French	total
total	German	insgesamt
default-heading	Fallback	\XSIMmixedcase {\GetExerciseParameter {solutions-name}} to the \XSIMmixedcase {\GetExerciseParameter {exercises-name}}
default-heading	English	\XSIMmixedcase {\GetExerciseParameter {solutions-name}} to the \XSIMmixedcase {\GetExerciseParameter {exercises-name}}
default-heading	French	\XSIMmixedcase {\GetExerciseParameter {solutions-name}} des \GetExerciseParameter {exercises-name}}
default-heading	German	\XSIMmixedcase {\GetExerciseParameter {solutions-name}} zu den \XSIMmixedcase {\GetExerciseParameter {exercises-name}}
collection-heading	Fallback	\XSIMmixedcase {\GetExerciseParameter {exercises-name}}
collection-heading	English	\XSIMmixedcase {\GetExerciseParameter {exercises-name}}
collection-heading	French	\XSIMmixedcase {\GetExerciseParameter {exercises-name}}
collection-heading	German	\XSIMmixedcase {\GetExerciseParameter {exercises-name}}
per-section-heading	Fallback	\XSIMmixedcase {\GetExerciseParameter {solutions-name}} to the \XSIMmixedcase {\GetExerciseParameter {exercises-name}} of Section\nobreakspace \ExerciseSection
per-section-heading	English	\XSIMmixedcase {\GetExerciseParameter {solutions-name}} to the \XSIMmixedcase {\GetExerciseParameter {exercises-name}} of Section\nobreakspace \ExerciseSection
per-section-heading	French	\XSIMmixedcase {\GetExerciseParameter {solutions-name}} des \GetExerciseParameter {exercises-name} de la section\nobreakspace \ExerciseSection

continues

keyword	language	translation
per-section-heading	German	\XSIMmixedcase {\GetExerciseParameter {solutions-name}} zu den \XSIMmixedcase {\GetExerciseParameter {exercises-name}} in Abschnitt\nobreakspace \ExerciseSection
per-chapter-heading	Fallback	\XSIMmixedcase {\GetExerciseParameter {solutions-name}} to the \XSIMmixedcase {\GetExerciseParameter {exercises-name}} of Chapter\nobreakspace \ExerciseChapter
per-chapter-heading	English	\XSIMmixedcase {\GetExerciseParameter {solutions-name}} to the \XSIMmixedcase {\GetExerciseParameter {exercises-name}} of Chapter\nobreakspace \ExerciseChapter
per-chapter-heading	French	\XSIMmixedcase {\GetExerciseParameter {solutions-name}} des \GetExerciseParameter {exercises-name} du chapitre\nobreakspace \ExerciseChapter }
per-chapter-heading	German	\XSIMmixedcase {\GetExerciseParameter {solutions-name}} zu den \XSIMmixedcase {\GetExerciseParameter {exercises-name}} in Kapitel\nobreakspace \ExerciseChapter

15. Cloze Tests and Blank Lines

Similar to exsheets `xsim` provides a command `\blank`:

`\blank*[\langle options \rangle]{\langle text to be filled in \rangle}`

Creates a blank in normal text or in an exercise but fills the text of its argument if inside a solution. If used at the *begin of a paragraph* `\blank` will do two things: it will set the linespread according to an option explained below and will insert `\par` after the lines. The starred version doesn't do these things.

Those are the options for customization:

`blank/blank-style = {\langle code \rangle}` Default: `\underline{\#1}`

Instructions for typesetting the blank cloze. Refer to the filled in space with `\#1`.

`blank/filled-style = {\langle code \rangle}` Default: `\underline{\#1}`

Instructions for typesetting the filled cloze. Refer to the filled in text with `\#1`

`style = {\langle code \rangle}`

Shortcut for setting both `blank-style` and `filled-style` at once.

`blank/scale = {\langle decimal number \rangle}` Default: 1

Scales the blank to `\langle decimal number \rangle` times its natural width.

15. Cloze Tests and Blank Lines

`blank/width = {⟨dim⟩}` (initially empty)
Sets the blank to a width of ⟨dim⟩. This takes precedence over `scale`.

`blank/linespread = {⟨decimal number⟩}` Default: 1
Set the linespread for the blank lines. This only has an effect if `\blank` is used at the begin of a paragraph.

`blank/line-increment = {⟨dim⟩}` Default: `0.001\linewidth`
The blank line is built in multiples of this value. If the value is too large you may end up with uneven lines. If the value is too small you may end up with a non-ending compilation. Experiment with values to find the suiting one for your use case.

`blank/line-minimum-length = {⟨dim⟩}` Default: `2em`
The minimal length a line must have before it is built step by step.

`blank/fill = true|false` Default: `false`
If set to true, this will show the correct answers in the blanks within an exercise as well.

```
1 This is a \blank{blank} outside in normal text.
2 \begin{exercise}
3 Try to fill in \blank[width=4cm]{these} blanks. All of them
4 \blank{are created} by using the \cs{blank} \blank{command}.
5 \end{exercise}
6 \xsimsetup{blank/filled-style=\textcolor{red}{#1}}
7 \begin{solution}[print]
8 Try to fill in \blank[width=4cm]{these} blanks. All of them
9 \blank{are created} by using the \cs{blank} \blank{command}.
10 \end{solution}
```

This is a _____ outside in normal text.

Exercise 6

Try to fill in _____ blanks. All of them _____ by using the `\blank` _____.

Solution 6

Try to fill in **these** blanks. All of them **are created** by using the `\blank` **command**.

A number of empty lines are easily created by setting the `width` option:

```
1 Write up the pros and cons of \xsim\ over \pkg{exsheets}:
2
3 \blank[width=4.8\linewidth,linespread=1.5]{}

```

A. Future Plans

Write up the pros and cons of `xSIM` over exsheets:

A. Future Plans

`xSIM` is complete in so far as it is perfectly usable to create exams or exercise and solution sections in books with the most freedom in layout already. But still there are features which would be useful additions. Below I list all ideas that I currently plan to add to `xSIM`:

- a document class `xsim-exam` for creating exams; this class should itself feature the possibility of creating different versions of an exam, maybe already provide multiple choice questions and so on; one could also think about automatic creation of running headers and footers, *i. e.*, means for changing the layout of the exam; following the spirit of `xSIM` this should probably be done using templates as well.

I am very open to suggestions regarding features, both in general and specifically regarding the document class.

B. FAQ & How to...

This section serves as a kind of gallery showing solutions to common problems. I expect this section to grow over the years. Some examples especially regarding other layouts are also shown in example files added to this package.

B.1. ...Know if `xSIM` Needs Another Compilation?

If `xSIM` wants you to recompile your document it issues a warning and writes the following to the logfile:

```
1 Package xsim Warning: Exercise properties may have changed. Rerun to get
   them
2 (xsim)                synchronized.
```

So just check the logfile regularly (which you should be doing anyway) and keep your eyes open.

B.2. ...Resolve Getting Repeatedly Wrong Exercise Properties or Wrong Exercise Lists?

`xsim` writes a lot of stuff to an auxiliary file called $\langle file\ name \rangle.xsim$ (or the common $\langle file\ name \rangle.aux$ if you use option `use-aux`) for re-using information on subsequent compilations. If you add exercises, change properties *etc.* it might happen that wrong information is staying in the auxiliary file and is wrongly used by `xsim`. In such cases deleting the auxiliary file and doing a few fresh compilations may resolve your problems.

Sometimes the *existence of exercise or solution files from earlier compilations* may lead to wrong lists of exercises or solutions. In such cases it can be useful to delete all those files and doing a fresh compilation. It may be helpful to use a subfolder for those external files which will make deleting them a little bit easier. (Don't forget to both create the subfolder and set `path` accordingly then.)

Using the `clear-aux` option might help to reduce erroneous exercises.

B.3. ...Resolve Strange Errors After Updating?

`xsim` writes a lot of stuff to the auxiliary file. An update may well change how this is done so deleting the auxiliary file and doing a few fresh compilations may resolve your problems.

B.4. ! TeX capacity exceeded, sorry [text input levels=15]. Why?

Did you try to use an exercise or solution in a macro of some sort? This generally will fail if you also use the option `use-files`.⁹ But there should never be the need to hide the environments inside of a macro, anyway.

B.5. Runaway argument? !File ended while scanning use of ^^M. Why?

Did you try to use an exercise or solution in a macro of some sort? This generally will fail if you also use the option `use-files`. But there should never be the need to hide the environments inside of a macro, anyway.

B.6. ...Put a Star (or Another Symbol) in Headings of Exercises That Are Special?

The code below shows one possible modification of an exercise template which allows to easily create bonus exercises:

```
1 % preamble:
2 \usepackage{amsmath}
3 % declare boolean property:
4 \DeclareExerciseProperty*{bonus}
5 \DeclareExerciseEnvironmentTemplate{bonus}
```

⁹ The reasons are similar to the ones given here: <https://tex.stackexchange.com/a/295422/>.

```

6  {%
7  \subsection*
8  {%
9  % test for boolean property and insert star symbol if true:
10 \IfExerciseBooleanPropertyT{bonus}{\llap{${\bigstar$ }Bonus }}%
11 \XSIMmixedcase{\GetExerciseName}\nobreakspace
12 \GetExerciseProperty{counter}%
13 \IfInsideSolutionF
14 {%
15 \IfExercisePropertySetT{subtitle}
16 { {\normalfont\itshape\GetExerciseProperty{subtitle}}}%
17 }%
18 }
19 \GetExercisePropertyT{points}
20 {%
21 \marginpar
22 {%
23 \IfInsideSolutionF{\rule{1.2cm}{1pt}\slash}%
24 \PropertyValue
25 \GetExercisePropertyT{bonus-points}
26 {\nobreakspace(+\PropertyValue)}%
27 \nobreakspace\XSIMtranslate{point-abbr}%
28 }%
29 }%
30 }
31 {}

```

The usage is now as follows:

```

1 \xsimsetup{exercise/template = bonus}
2 % set the boolean property to true
3 \begin{exercise}[bonus]
4 A bonus question.
5 \end{exercise}

```

★ Bonus Exercise 7

A bonus question.

B.7. ...Print All Solutions Grouped by Section?

Here is an idea how to get a list of all solutions grouped by the section the corresponding exercises are appearing in.

```
1 % preamble:
2 % \usepackage{etoolbox}
3 % \newcounter{sections}
4
5 % document:
6 \setcounter{sections}{1}
7 \whileboolexpr
8 { test {\ifnumless{\value{sections}}{\value{section}+1}} }
9 {
10   \printsolutions[section=\value{sections},headings-template=per-section]
11   \stepcounter{sections}
12 }
```

For this manual we then get the following list.¹⁰

Solutions to the Exercises of Section 4

Solution 1

A first example for a solution.

Solutions to the Exercises of Section 8

Solution 5

The solution of the exercise that has not been printed.

Answers to the Problems of Section 13

Answer 1 *My subtitle*

This is the answer to problem 1.

Solutions to the Exercises of Section 15

Solution 6

Try to fill in these blanks. All of them are created by using the `\blank` command.

10. Taking care of the fact that we're in the appendix now which means we can't use `\value{section}`. Therefore this manual does `\edef\lastsection{\arabic{section}}` right before `\appendix`

C. The xsimverb package

xsimverb version 0.4 (Feb 12, 2022)

XSIM comes bundled with another package called xsimverb. This package loads a very small subset of **XSIM** which allows to create environments that write their contents verbatim to external files. It provides the following commands (which of course are also available in **XSIM**, too):

`\XSIMfilewritestart*{⟨file name⟩}`

Start writing to the file named *⟨file name⟩*. This should be the *last* command in the *begin* definition of an environment. If it is used in an environment with arguments where the *last* argument is optional you should check if the optional argument is given and use the starred version if the test is negative. This is demonstrated in an example below using xparse's `\NewDocumentEnvironment`. *If you want an environment with only an optional argument you should use xparse's commands to define it. Due to the way how `\newenvironment` scans for optional arguments you'll otherwise may end up with leading spaces gobbled from the first line in your environment.*

`\XSIMfilewritestop`

Stop writing to the file. This should be the *first* command in the *end* definition of an environment.

`\XSIMsetfilebegin{⟨code⟩}`

This command can be used to write something to the external file *before* the environment contents. Must be set before `\XSIMfilewritestart` in the *begin* definition.

`\XSIMsetfilebeginX{⟨code⟩}`

The same as `\XSIMsetfilebegin` but expands its argument first.

`\XSIMsetfileend{⟨code⟩}`

This command can be used to write something to the external file *after* the environment contents. Must be set before `\XSIMfilewritestart` in the *begin* definition.

`\XSIMsetfileendX{⟨code⟩}`

The same as `\XSIMsetfileend` but expands its argument first.

`\XSIMgobblechars{⟨integer⟩}`

Determines how many characters are cut off of the beginning of each line of the environment body before it is written to the file. The default value is 0.

The following code shows an example of how to use those commands:

```

1 \documentclass{article}
2 \usepackage{xsimverb,listings}
3
4 \makeatletter
5 \NewDocumentEnvironment{example}{0}

```

Introduced in version 0.21
(Feb 12, 2022)

Introduced in version 0.21
(Feb 12, 2022)

D. All Exercise Examples

```
6  {%
7  \XSIMsetfilebeginX{\@percentchar\space file `\'jobname.tmp'}%
8  \XSIMsetfileendX{\@percentchar\space bye bye}%
9  \IfNoValueTF{#1}
10     {\XSIMfilewritestart*{\'jobname.tmp}}
11     {\XSIMfilewritestart{\'jobname.tmp}}%
12  }
13  {%
14  \XSIMfilewritestop
15  \lstinputlisting[language={\LaTeX\TeX}]{\'jobname.tmp}%
16  \input{\'jobname.tmp}
17  }
18  \makeatother
19
20  \begin{document}
21
22  \begin{example}
23  bla bla \LaTeX
24  \end{example}
25
26  \end{document}
```

The tmp file produced by the above example will contain the following three lines (if the file itself was called test.tex):

```
1 % file `test.tmp'
2 bla bla \LaTeX
3 % bye bye
```

D. All Exercise Examples



You will notice that some exercises from section 13.6 on page 41 look differently in this section. That is because all exercises of a type use the template that's *currently active*. If you want exercises with a different look you should use different exercises types.

The following list is created with this code:

```
1 \xsimsetup{exercise/template = bonus}
2 \printcollection[headings]{all exercises}
```

Exercises

Exercise 1

A first example for an exercise.

Exercise 2 *This is a subtitle*

An exercise where some properties have been set.

Exercise 3

```
\GetExerciseProperty{id}: 3  
  \GetExerciseAliasProperty{ID}: 3  
  \GetExerciseProperty{ID}: 3
```

Exercise 4

```
\GetExerciseProperty{id}: 4  
  \GetExerciseAliasProperty{ID}: 4  
  \GetExerciseProperty{ID}: foo-bar
```

Exercise 5

This exercise will not be printed but the exercise counter will be incremented nonetheless. Its solution will be printed in the list of solutions.

Exercise

This exercise is added to the collection 'foo'.

Exercise

This exercise is also added to the collection 'foo'.

Exercise

So is this.

Exercise

As well as this one.

_____/4 (+1

Exercise *The Subtitle*

_____ /2.5 P
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem.

Exercise 6

Try to fill in _____ blanks. All of them _____ by using the `\blank` _____.

★ Bonus Exercise 7

A bonus question.

Problems

Problem 1 *My subtitle* (5 points)

This is a problem using a subtitle and points.

E. All Solution Examples

Solutions to the Exercises

Solution 1

A first example for a solution.

Solution 5

The solution of the exercise that has not been printed.

Solution 6

Try to fill in these blanks. All of them are created by using the `\blank` command.

Answers to the Problems

Answer 1 *My subtitle*

This is the answer to problem 1.

F. Example Documents Coming With This Package

The repository of this package¹¹ currently includes 42 example documents demonstrating how different aspects of this package work or how different kinds of problems can be solved or how different kinds of layouts can be achieved as well as how to solve concrete problems that have come up in different \LaTeX forums.

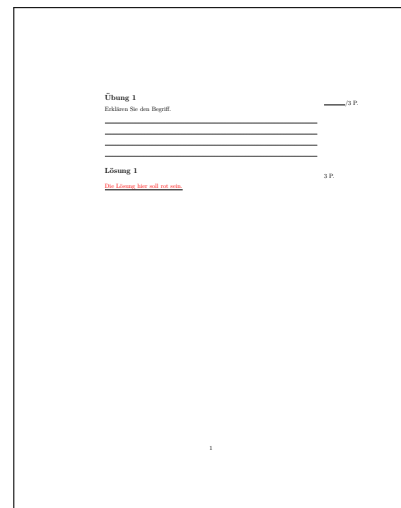
Besides showing excerpts of the code and the resulting pdf the examples below also link to both the tex source the resulting pdf.

Example 1: Create blank lines

Links: [\[\$\TeX\$ \]](#) [\[PDF\]](#)

File: `xsim.blanks.tex`

```
7 solution/print = true ,
8 blank/filled-style = \underline{\textcolor
  {red}{#1}}
9 }
10
11 \begin{document}
12
13 \begin{exercise}[points=3]
14 Erklären Sie den Begriff.
```



¹¹. GitHub: <https://github.com/cgnieder/xsim/>, CTAN: <http://www.ctan.org/pkg/xsim/>

F. Example Documents Coming With This Package

Example 2: Put headings in a box

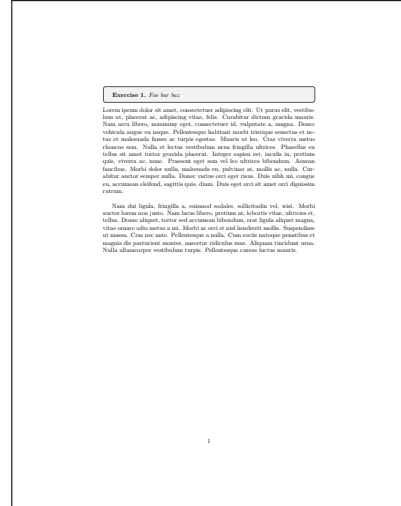
Links: [\[T_EX\]](#) [\[PDF\]](#)

File: `xsim.boxed-headings.tex`

```

7 \DeclareExerciseEnvironmentTemplate{custom}
8   {%
9     \Needspace*{5\baselineskip}
10    \begin{tcolorbox}
11      \textbf{\XSIMmixedcase{\
12      GetExerciseName}~\GetExerciseProperty{
13      counter}.}%
14      \GetExercisePropertyT{subtitle}{\
15      textit{#1}}}%
16    \end{tcolorbox}
17    \noindent
18  }

```



Example 3: Create code examples

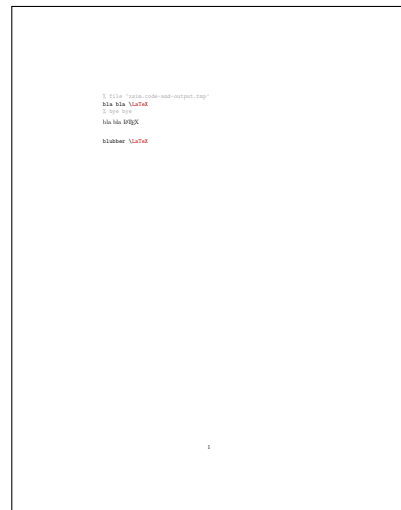
Links: [\[T_EX\]](#) [\[PDF\]](#)

File: `xsim.code-and-output.tex`

```

7 columns = fullflexible ,
8 commentstyle = \color{gray!70} ,
9 keywordstyle = \color{red!70!black}
10 }
11
12 \makeatletter
13 \NewDocumentEnvironment{example}{!o}
14   {%
15     \XSIMgobblechars{2}%

```



F. Example Documents Coming With This Package

Example 4: How to use collections

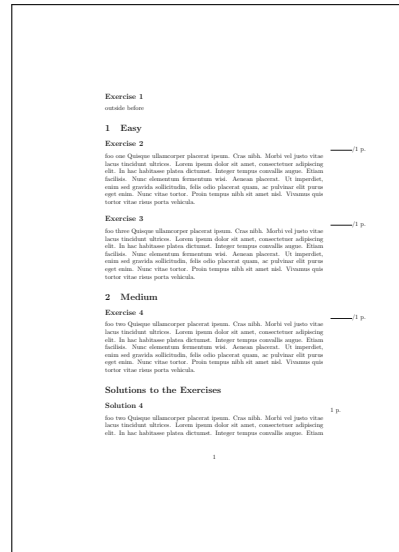
Links: [\[T_EX\]](#) [\[PDF\]](#)

File: `xsim.collections.tex`

```

7 \DeclareExerciseTagging{difficulty}
8
9 \xsimsetup{collect}
10
11 \begin{document}
12
13 \begin{exercise}[use,print]
14   outside before
15 \end{exercise}

```



Example 5: Crossreferencing between problems and answers

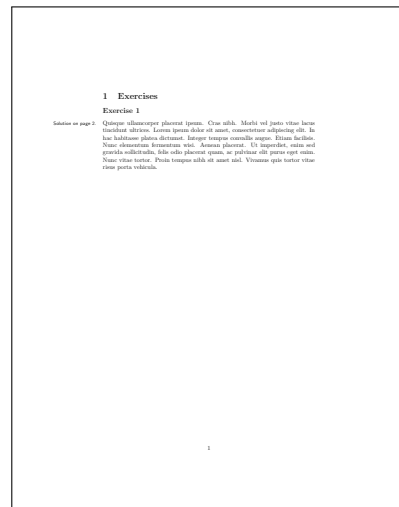
Links: [\[T_EX\]](#) [\[PDF\]](#)

File: `xsim.crossref.tex`

```

7 \DeclareExerciseEnvironmentTemplate{custom}
8   {%
9     \IfInsideSolutionTF
10      {\label{sol:\ExerciseID}}
11      {\label{ex:\ExerciseID}}
12     \subsection*
13     {%
14       \XSIMmixedcase{\GetExerciseName}}%
15     \IfInsideSolutionTF

```



F. Example Documents Coming With This Package

Example 6: Exercises as a description list

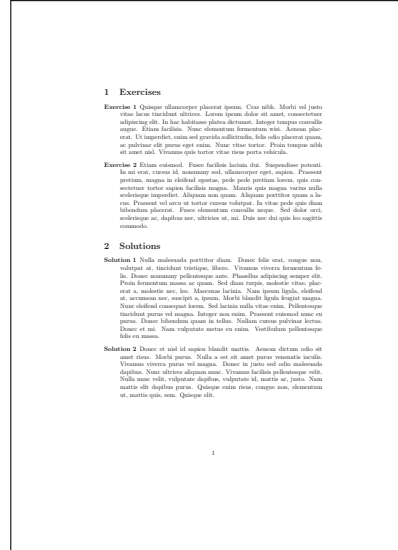
Links: [\[T_EX\]](#) [\[PDF\]](#)

File: `xsim.description-list.tex`

```

7 \xsimsetup{
8   exercise/template=item,
9   solution/template=item,
10  print-solutions/headings-template=none
11 }
12
13 \newenvironment{exercises}
14   {\section{Exercises}\description}
15   {\enddescription}

```



Example 7: A custom point scheme

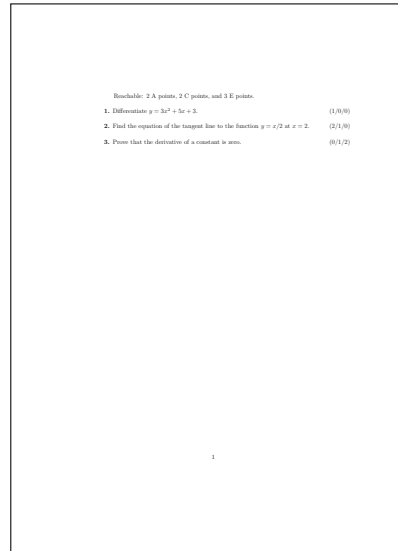
Links: [\[T_EX\]](#) [\[PDF\]](#)

File: `xsim.different-point-types.tex`

```

7
8 \newcommand*\printA{\TotalExerciseGoal{A}{~A
9   ~point}{~A~points}}
10 \newcommand*\printC{\TotalExerciseGoal{C}{~C
11   ~point}{~C~points}}
12 \newcommand*\printE{\TotalExerciseGoal{E}{~E
13   ~point}{~E~points}}
14
15 \usepackage{needspace}
16 \DeclareExerciseEnvironmentTemplate{custom}
17   {%
18     \par\vspace{\baselineskip}
19   }

```



F. Example Documents Coming With This Package

Example 10: Using the grade distribution macros

Links: [\[T_EX\]](#) [\[PDF\]](#)

File: `xsim.grade-distribution.tex`

```

7 1 = 1 ;
8 1,5 = .9167 ;
9 2 = .8333 ;
10 2,5 = .75 ;
11 3 = .6667 ;
12 3,5 = .5833 ;
13 4 = .5
14 }
```

Exercice 1	_____	1 p.
Exercice 2	_____	1 p.
Exercice 3	_____	1 p.
Exercice 4	_____	1 p.
Exercice 5	_____	1 (+10) p.
Exercice 6	_____	1 p.
<small>22 points 20 points</small>		
<small>24 points 22 points 20 points 18 points 16 points 14 points 12 points</small>		
<small>10 points 8 points 20 points 20 points 22 points 20 points 17 points</small>		

Example 11: Give hints

Links: [\[T_EX\]](#) [\[PDF\]](#)

File: `xsim.hints.tex`

```

7 \DeclareExerciseProperty{hint}
8
9 % we'll use a description list for the hints
10 :
11 \newcommand\printhints{%
12   \begin{description}
13     \ForEachUsedExerciseByType{%
14       \GetExercisePropertyT{hint}
15       {\item[\XSIMmixedcase{\GetExerciseName}~##3]###1}%
16     }%
17 }
```

1 Problems
Exercice 1 Pythagorus
This is the first problem.
Exercice 2 Another Problem
This is the second problem.
Exercice 3 Yet Another Problem
This is the third problem.
2 Hints
Exercice 1 This is a hint to the first problem.
Exercice 2 This is a hint to the third problem.
3 Solutions
Solution 1
This is the solution to the first problem.
Solution 2
This is the solution to the second problem.
Solution 3
This is the solution to the third problem.

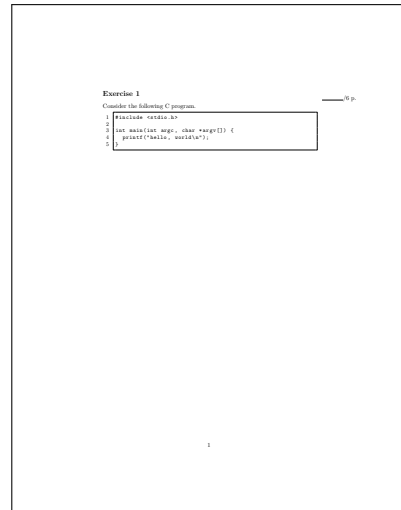
F. Example Documents Coming With This Package

Example 12: Use listings in exercises

Links: [\[T_EX\]](#) [\[PDF\]](#)

File: `xsim.listings.tex`

```
7
8 \lstset{
9   frame=single,
10  xleftmargin=20pt,
11  numbers=left,
12  numberstyle=\small,
13  tabsize=2,
14  breaklines,
15  showspaces=false,
```

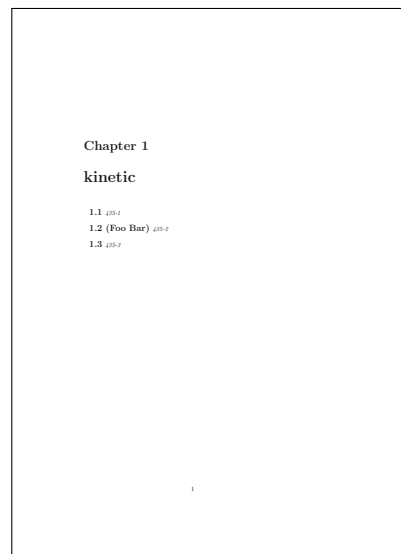


Example 13: A custom list of exercises

Links: [\[T_EX\]](#) [\[PDF\]](#)

File: `xsim.listofexercises.tex`

```
7   exercise/within=chapter,
8   exercise/template=theorem ,
9   exercise/the-counter=\thechapter.\arabic{
exercise}
10 }
11
12 \DeclareExerciseEnvironmentTemplate{theorem}
13   {%
14   \par\addvspace{\baselineskip}
15   \noindent
```



F. Example Documents Coming With This Package

Example 14: Multiplechoice exercises

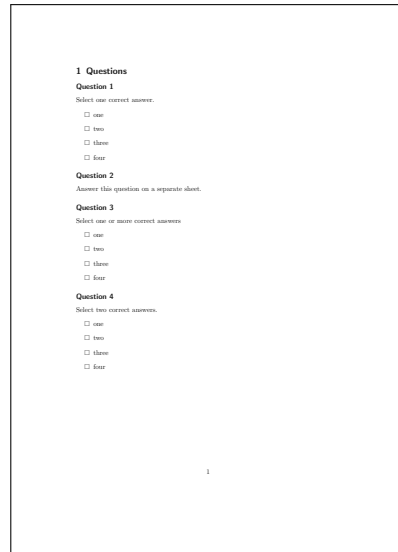
Links: [T_EX] [PDF]

File: xsim.multiplechoice.tex

```

7 \newcommand*\choice{\item}
8
9 \DeclareExerciseProperty{choices}
10 \DeclareExerciseProperty*{multiple}
11 \DeclareExerciseEnvironmentTemplate{mc}
12   {%
13     \UseExerciseTemplate{begin}{default}%
14     \IfExerciseBooleanPropertyTF{multiple}
15       {Select one or more correct answers}

```



Example 15: Sum of points

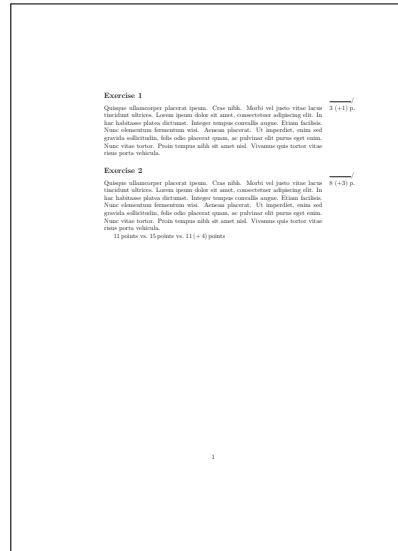
Links: [T_EX] [PDF]

File: xsim.pointsums.tex

```

7   {\,\XSIMtranslate{points}}%
8 }
9
10 \NewDocumentCommand\pointsumandbonus{}{%
11   \TotalExerciseGoal{points}{}{}%
12   \IfExerciseGoalsSumTF{bonus-points}{=0}
13     {}
14   {\, (+\,\TotalExerciseGoal{bonus-points}
15     )}{}}}%
16 \,\XSIMtranslate{points}%

```



F. Example Documents Coming With This Package

Example 16: Random exercises from a collection

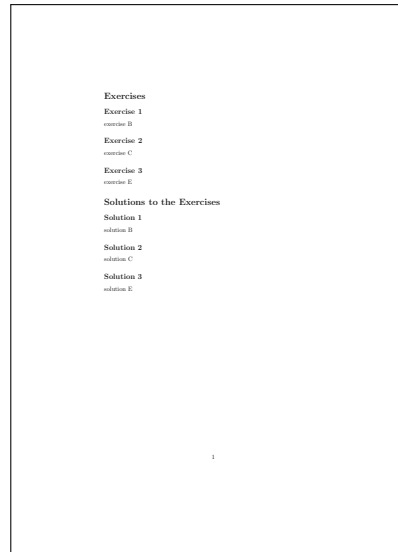
Links: [\[T_EX\]](#) [\[PDF\]](#)

File: `xsim.randomexercises.tex`

```

7
8 \begin{exercise}[ID=A]
9   exercise A
10 \end{exercise}
11 \begin{solution}
12   solution A
13 \end{solution}
14 \begin{exercise}[ID=B]
15   exercise B

```



Example 17: Various aspects of

Links: [\[T_EX\]](#) [\[PDF\]](#)

File: `xsim.various.tex`

```

7   solution-env = hint ,
8   exercise-name = Question ,
9   solution-name = Hint ,
10  exercise-template = default ,
11  solution-template = default ,
12  counter = exercise % shares a counter with
   the `exercise' type
13 }
14
15 \DeclareExerciseType{problem}{

```



F. Example Documents Coming With This Package

Example 18: Exercises like theorems

Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: xsim.texsx-13635.tex

```

7   \par\addvspace{\baselineskip}
8   \noindent
9   \textit{%
10    \IfInsideSolutionF{\XSIMmixedcase{\
GetExerciseName}~}%
11    \GetExerciseProperty{counter}}%
12    \GetExercisePropertyT{subtitle}{ \textup
{(#1)}}%
13    . %
14   }
15  {\par\addvspace{\baselineskip}}
```



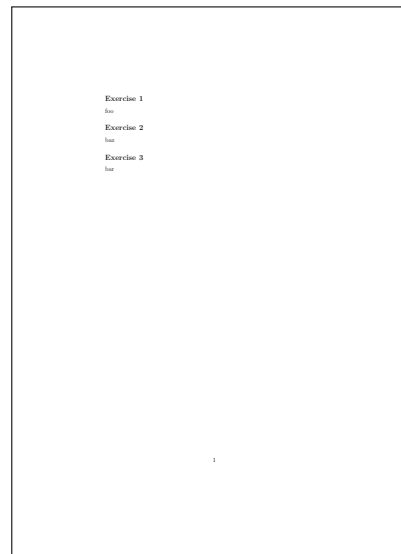
Example 19: Random/custom order of exercises

Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: xsim.texsx-155630.tex

```

7
8  \begin{document}
9
10 \begin{exercise}
11   foo
12 \end{exercise}
13 \begin{exercise}
14   bar
15 \end{exercise}
```



F. Example Documents Coming With This Package

Example 20: Exercises and solutions in a tcolorbox

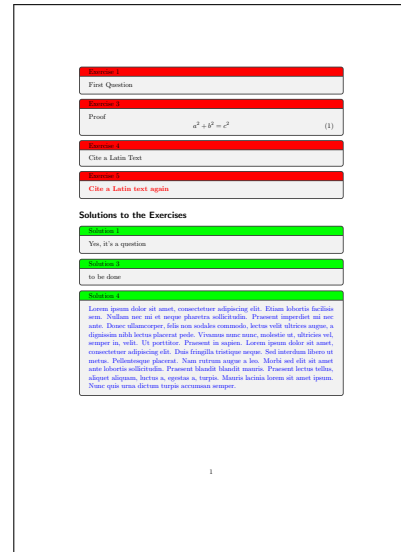
Links: [T_EX] [PDF] [forum]

File: xsim.texsx-199360.tex

```

7 \DeclareExerciseEnvironmentTemplate{custom}
8   {%
9     \begin{tcolorbox}[
10      width = \textwidth ,
11      colbacktitle = \IfInsideSolutionTF{
12        green}{red} ,
13      coltitle = black ,
14      title = {\XSIMmixedcase{\
15        GetExerciseName}~\GetExerciseProperty{
16        counter}}}]

```



Example 21: Using pythontex

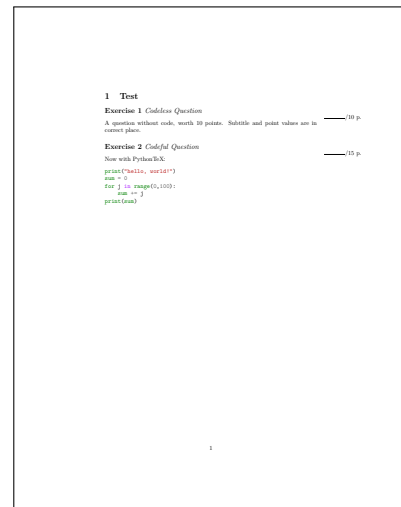
Links: [T_EX] [PDF] [forum]

File: xsim.texsx-299534.tex

```

7
8 \section{Test}
9
10 \begin{exercise}[subtitle = Codeless
11   Question,points=10]
12   A question without code, worth 10 points.
13   Subtitle and point values are in
14   correct place.
15 \end{exercise}
16 \begin{solution}
17   Solution 1

```



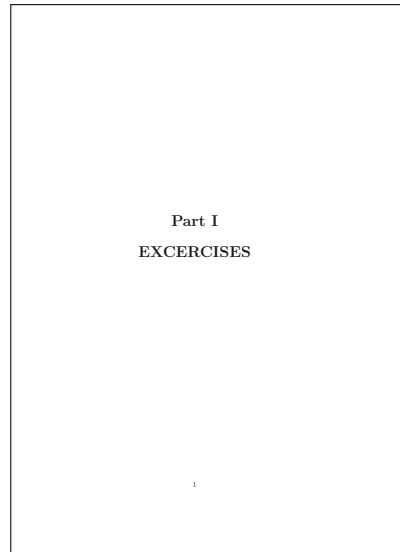
F. Example Documents Coming With This Package

Example 22: Print solutions per chapter/section

Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: `xsim.texsx-305110.tex`

```
7 exercise/the-counter = \thesection.\arabic
  {exercise}
8 }
9
10 \begin{document}
11 \part{EXERCISES}
12 \chapter{Topic 1}
13
14 \section{Section}
```

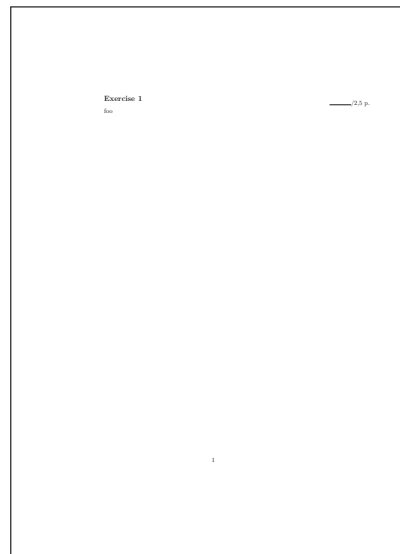


Example 23: Adapt how points are printed

Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: `xsim.texsx-308883.tex`

```
7 \begin{document}
8
9 \begin{exercise}[points=2.5]
10   foo
11 \end{exercise}
12
13 \end{document}
```



F. Example Documents Coming With This Package

Example 24: Another tcolorbox example

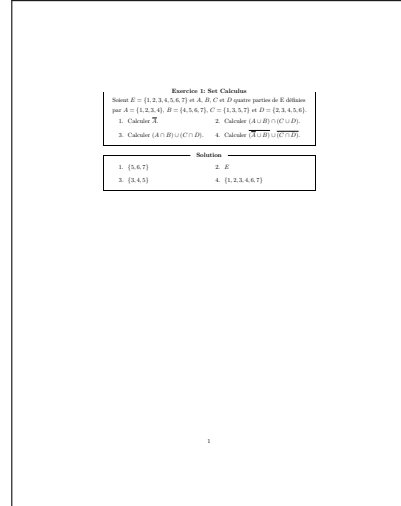
Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: xsim.texsx-338165.tex

```

7 \usepackage{tasks}
8 \usepackage{xsim}
9 \usepackage{tcolorbox}
10 \tcbuselibrary{breakable, skins}
11 \settasks{ label = \arabic*. }
12
13 \DeclareExerciseEnvironmentTemplate{boxed}{%
14   \tcolorbox[
15     enhanced ,

```



Example 25: Fancy tcolorbox and crossreferencing

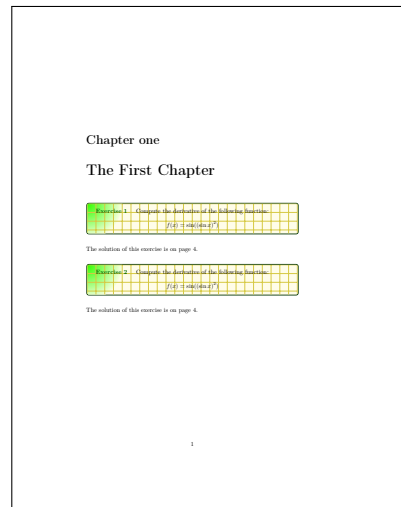
Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: xsim.texsx-350028.tex

```

7
8 \DeclareExerciseEnvironmentTemplate{
9   tcolorbox}{%
10   \tcolorbox[
11     enhanced,
12     colframe=green!20!black,
13     colback=yellow!10!white,
14     coltitle=green!40!black,
15     fonttitle=\bfseries,
16     underlay={%

```



F. Example Documents Coming With This Package

Example 26: Custom layout

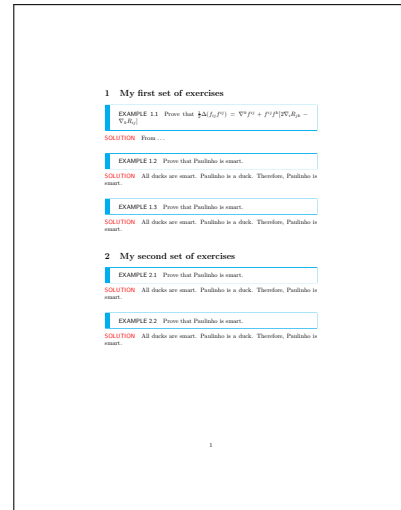
Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: `xsim.texsx-369065.tex`

```

7 exercise/the-counter = \thesection.\arabic
  {exercise} ,
8 exercise/template=cyan-box ,
9 exercise/name=Example ,
10 solution/template=red ,
11 solution/print=true
12 }
13
14 \DeclareExerciseEnvironmentTemplate{cyan-box
  }{%
15 \begin{tcolorbox}[arc=0mm,boxrule=1pt,
  colback=white,colframe=cyan,leftrule=3mm]

```



Example 27: An empty box for points

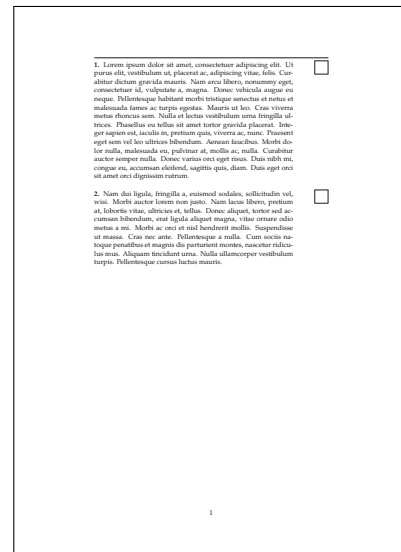
Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: `xsim.texsx-369636.tex`

```

7 \usepackage{tgpagella}
8
9 \usepackage{xsim,needspace,adjustbox,
  scrextend}
10
11 \xsimsetup{
12 exercise/the-counter = \arabic{exercise}.
  ,
13 exercise/template = square
14 }

```



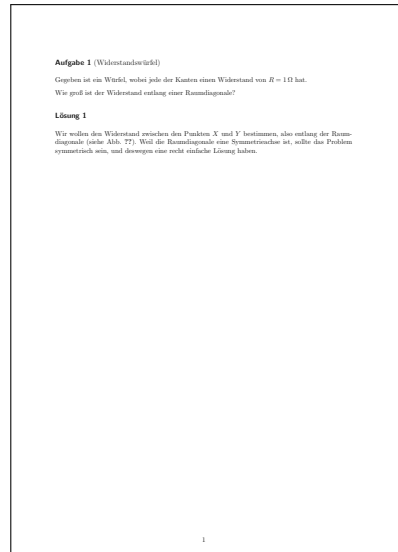
F. Example Documents Coming With This Package

Example 28: Layout adjustments

Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: `xsim.texsx-369803.tex`

```
7 \usepackage{amsfonts}
8 \usepackage{amssymb}
9
10 \usepackage[left=2cm, right=2.5cm, top=2.5cm,
    bottom=2cm]{geometry}
11
12 \usepackage{xsim, siunitx}
13 \DeclareExerciseTagging{difficulty}
14 \DeclareExerciseEnvironmentTemplate{custom}{
    %
15 \subsection*{%
```

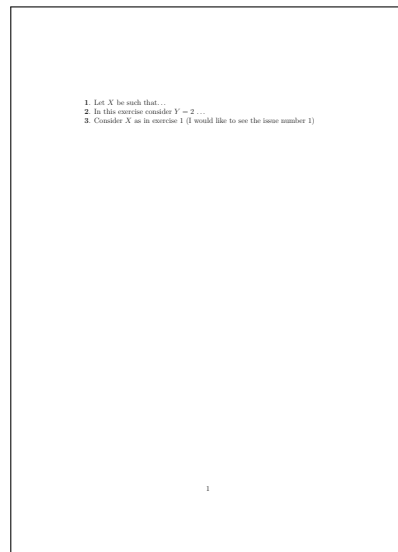


Example 29: Minimalistic layout

Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: `xsim.texsx-370642.tex`

```
7 {\par}
8 \xsimsetup{exercise/template=simple}
9
10 \begin{document}
11
12 \begin{exercise}\label{eq1}
13 Let  $X$  be such that\dots
14 \end{exercise}
```



F. Example Documents Coming With This Package

Example 30: Exercises and sub-exercises

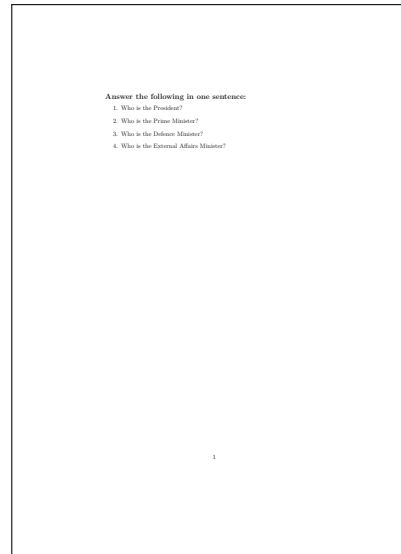
Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: `xsim.texsx-391530.tex`

```

7  solution-env = answer ,
8  exercise-name = Question ,
9  solution-name = Answer ,
10 exercise-template = item ,
11 solution-template = item
12 }
13
14 \DeclareExerciseProperty{title}

```



Example 31: Different aspects of exercises, highlighted solutions

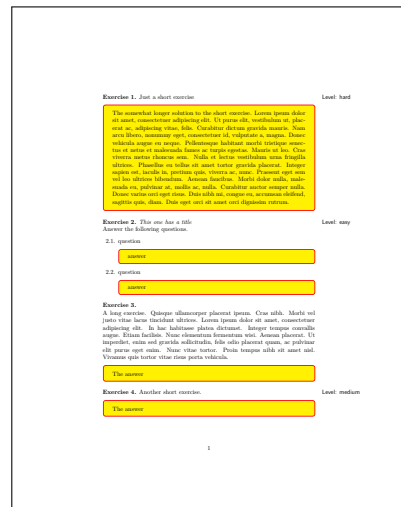
Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: `xsim.texsx-395273.tex`

```

7  \DeclareExerciseTagging{level}
8
9  % declare a template which typesets
   exercises differently according to given
10 % properties:
11 \DeclareExerciseEnvironmentTemplate{exercise
   }
12 {%
13   \renewcommand*\theenumi{\theexercise.\
   arabic{enumi}}%
14   \par\addvspace{\baselineskip}
15   \Needspace*{2\baselineskip}

```



F. Example Documents Coming With This Package

Example 32: Flushright Solutions

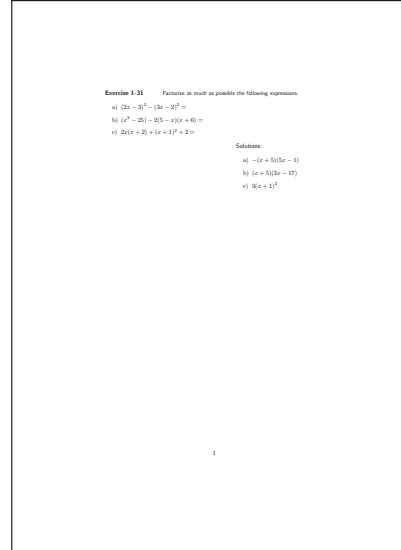
Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: xsim.texsx-466584.tex

```

7 \DeclareExerciseEnvironmentTemplate{exandsol
  }{%
8 \par\vspace{\baselineskip}
9 \Needspace*{2\baselineskip}
10 \noindent\sffamily
11 \textbf{\XSIMmixedcase{\GetExerciseName}}~\
  GetExerciseProperty{counter}}%
12 \GetExercisePropertyT{subtitle}{\hspace{3
  em}{\small#1}}\par
13 \normalfont
14 }{}

```



Example 33: Multiple choice questions with automated solutions (1)

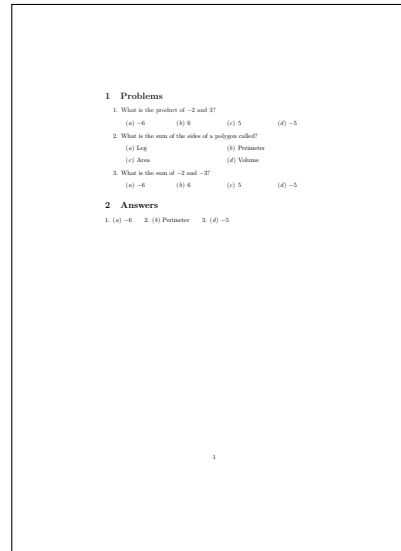
Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: xsim.texsx-498299.tex

```

7 {\item[\GetExerciseProperty{counter}]}
8 {}
9
10 \DeclareExerciseProperty{answer}
11
12 \newcommand*{answer[1]}{%
13 \XSIMexpandcode{%
14 \SetExerciseProperty{answer}
15 { (\noexpand\textit{\alph{task}}) \
  unexpanded{#1}}}%

```



F. Example Documents Coming With This Package

Example 34: Multiple choice questions with automated solutions (2)

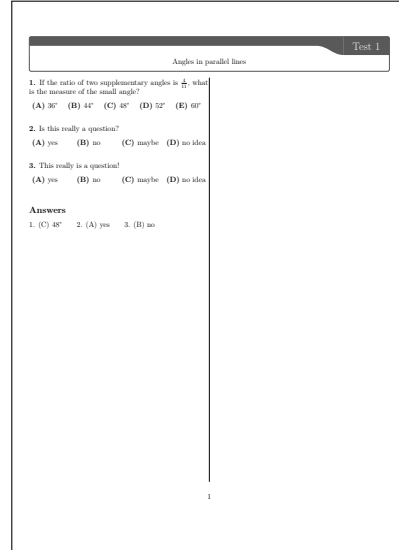
Links: [T_EX] [PDF] [forum]

File: xsim.texsx-549540.tex

```

7 \geometry{ a4paper, left=5mm, right=5mm, top
  =15mm }
8
9 \usepackage{amsmath,amssymb}
10
11 \usepackage{multicol}
12 \setlength{\columnsep}{1mm}
13 \setlength{\columnseprule}{0.2pt}
14
15 \usepackage[most]{tcolorbox}

```



Example 35: Exercises at the end of section and sectionwise solutions

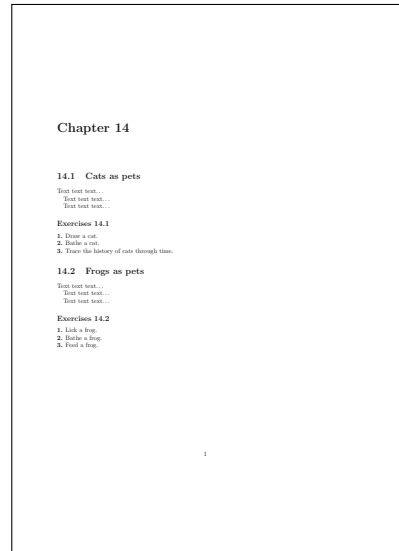
Links: [T_EX] [PDF] [forum]

File: xsim.texsx-576998.tex

```

7 \textbf{\GetExerciseProperty{counter}}%
8 \GetExercisePropertyT{subtitle}{ \textit
  {#1}} %
9 }{\par}
10
11 \newcommand\printsectionexercises{%
12 \ForEachUsedExerciseByType{%
13 \ifnum\ExercisePropertyGet{##1}{##2}{
  chapter-value}=\value{chapter}
14 \ifnum\ExercisePropertyGet{##1}{##2}{
  section-value}=\value{section}
15 \XSIMprint{exercise}{##1}{##2}%

```



F. Example Documents Coming With This Package

Example 36: Multiple hints per exercise with backlinks

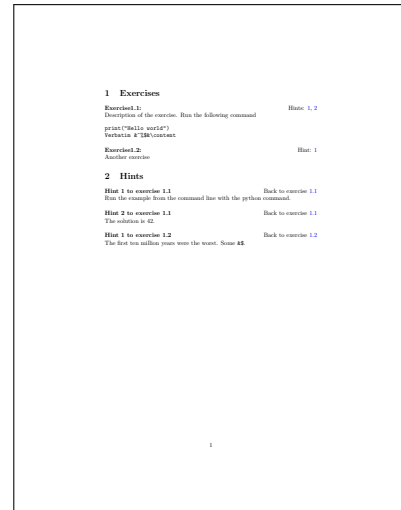
Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: `xsim.texsx-580636.tex`

```

7 \DeclareExerciseProperty{hints}
8 \newcounter{hint}
9 \renewcommand\theHhint{\ExerciseID.\arabic{
  hint}}
10 \newcounter{hints}
11 \newcounter{step}
12
13 \NewDocumentEnvironment{hint}{}{%
14   \stepcounter{hint}%
15   \XSIMsetfilebegin{%

```



Example 37: Custom list of exercises

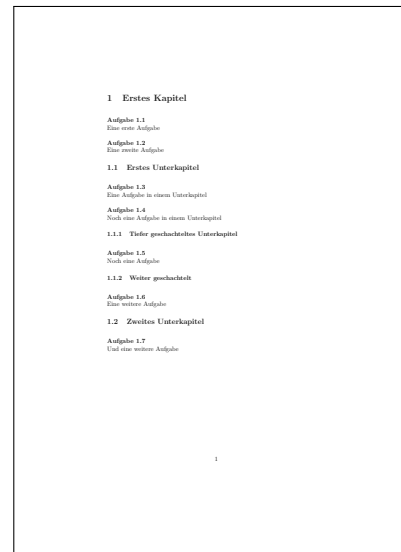
Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: `xsim.texwelt-6698.tex`

```

7 \xsimsetup{
8   exercise/name = Aufgabe ,
9   solution/name = Lösung ,
10  exercise/within = section ,
11  exercise/the-counter = \thesection.\arabic
  {exercise} ,
12  exercise/template = mine
13 }
14
15 \newif\iflist

```



F. Example Documents Coming With This Package

Example 38: Indicate difficulty level

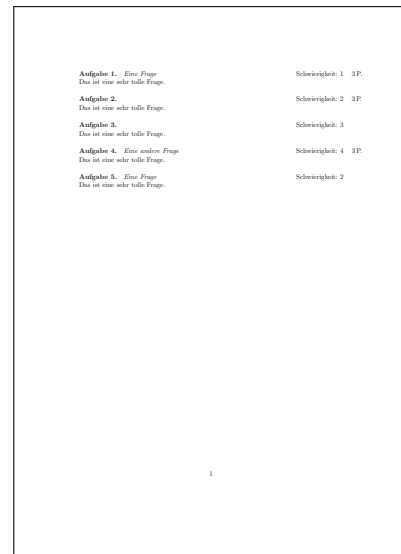
Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: `xsim.texwelt-15093.tex`

```

7 \DeclareExerciseTagging{AFB}
8 \DeclareExerciseEnvironmentTemplate{myexam}
9 {
10   \par\vspace{\baselineskip}
11   \Needspace*{3\baselineskip}
12   \noindent
13   \textbf{\IfInsideSolutionTF{Lösung}{
14     Aufgabe}~\GetExerciseProperty{counter}.}%
15   \GetExercisePropertyT{subtitle}{\quad\
16     textit{#1}}}%
17   \hfill

```



Example 39: Long and short solutions

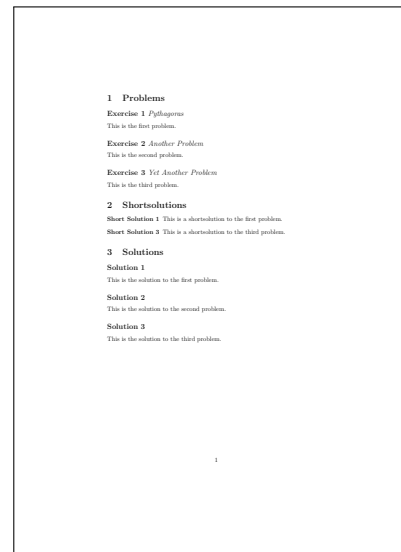
Links: [\[T_EX\]](#) [\[PDF\]](#) [\[forum\]](#)

File: `xsim.texwelt-23968.tex`

```

7
8 % new environment:
9 \NewDocumentEnvironment{shortsolution}{+b}
10 {
11   \edef\ExerciseType{\csname g_xsim_
12     exercise_type_tl\endcsname}%
13   \edef\ExerciseID{\csname g_xsim_exercise
14     _id_tl\endcsname}%
15   \SetExerciseProperty{shortsolution}{#1}%
16 }
17 {}

```



F. Example Documents Coming With This Package

Example 40: Different versions for students and teachers

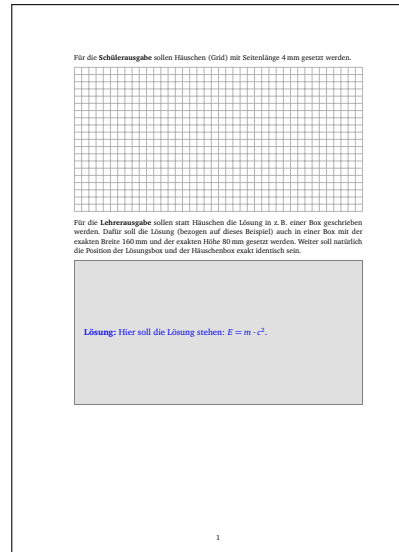
Links: [T_EX] [PDF] [forum]

File: xsim.golatex-80640.tex

```

7 \setlength\breite{160mm}
8 \newlength\hoehe
9 \setlength\hoehe{80mm}
10
11 \usepackage[
12   hdivide={3.0cm,\breite},,
13   vdivide={2.2cm,,2.2cm}]{geometry}
14 \usepackage[bitstream-charter]{mathdesign}

```



Example 41: Another custom layout with rules

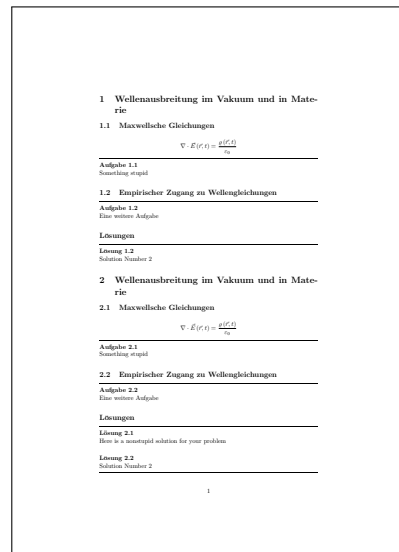
Links: [T_EX] [PDF] [forum]

File: xsim.golatex-91339.tex

```

7 \xsimsetup{
8   exercise/within = section ,
9   exercise/the-counter = \thesection.\arabic
   {exercise} ,
10  print-solutions/headings-template=none
11 }
12 \SetExerciseParameters{exercise}{
13   exercise-template = mine ,
14   solution-template = mine
15 }

```



Example 42: Different ideas for exams

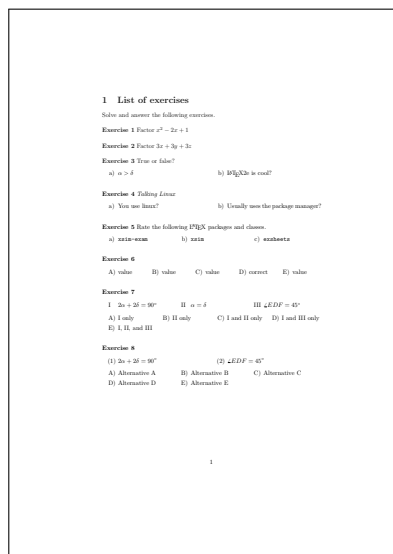
Links: [T_EX] [PDF] [github]

File: xsim.issues-49.tex

```

7   solution/template = runin
8 }
9
10  \usepackage{tasks,fontawesome,fmtcount,
    multicol}
11  \NewTasksEnvironment[label=\Alph*],label-
    width=12pt]{choices}{\choice}
12  \newcommand*\correct{\refstepcounter{task}\
    thetask\expanded{\SetExerciseProperty{
    choice}{\thetask}}}
13
14  \NewTasksEnvironment[label=\Roman*,label-
    width=12pt]{options}{\option}

```



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