The exesheet class and package

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1 Introduction

The \texttt{exesheet} package is used for typesetting exercise or exam sheets. In addition, the \texttt{exesheet} class loads the \texttt{schooldocs} package. This one makes adjustments for margins and title and defines various layout styles with particular header and footer, appropriate for exercise sheets (among others). See the \texttt{schooldocs} documentation for more details. The \texttt{exesheet} class is based on \texttt{article} and has the same options.

Many other packages are dedicated to exercise sheets. Most propose to encapsulate each exercise in an environment while \texttt{exesheet} begins each exercise with the \texttt{\exercise} command, which works like a subsection (with same features) and is suitable for documents consisting exclusively of exercises. The package provides also alternative formatting, more relevant for short exercises.

Another specificity of the \texttt{exesheet} package is specific settings for enumeration lists, different from \LaTeX\ standard settings, useful for the numbering of questions or answers inside an exercise.

Other packages provide often more or less elaborate mechanisms to manage the placement of answers. \texttt{exesheet} has no such ambitions: for all exercises of the sheet, we can display subject only, answer only or both, but always at the place they are inserted in the source file. On the other hand this choice may be very flexible: we can do a correct version for all exercises together, or a correct version per exercise, per part (subpart of exercise), per question, per sub-question.

Finally the original functionality of this package is the display of a detailed marking scheme, with optional explanations, in the margin of exercise answers.

There are two possible options: \texttt{notoc} (see \ref{sec:notoc}) and \texttt{nosectlist} (see \ref{sec:nosectlist}).

In the current document, a frame is used to highlight examples beside the rest of the documentation.

2 Titles

2.1 The \texttt{\exercise} command

Each exercise begins with the \texttt{\exercise[⟨opt⟩]} command. This command typesets \texttt{Exercise}, as a document subsection, followed by automatic numbering, unique for the whole document. The optional parameter \texttt{(opt)} is used to put additional text on the same title line, for example to precise a subject or a marking scheme. \texttt{\exercise[ ⟨to begin⟩]} yields:

\begin{quote}
Exercise 1 \texttt{(to begin)}
Try to use this first command now, it’s easy.
\end{quote}

\texttt{\hrulefill} can be put in the optional argument to produce an horizontal rule.

To bring additional text closer to the exercise number, we can use the \texttt{\unskip} command which eliminates preceding space, see the following example, obtained with \texttt{\exercise[\unskip : calculation\ \hrulefill]}:
Exercise 2: calculation

Calculate 1 + 1.

The word Exercise has automatic translation in a few languages according to the loaded language (by babel or polyglossia). It can be redefined, with \renewcommand, or else we can use macros from the translations package (allowing dynamic language change), e.g. (in the preamble)
\DeclareTranslation{Swedish}{exsheet-exercise}{"Ovning"}.

This command calls \ exercisename following by the exercise number. It can be redefined. For example, to add a period after the exercise number:
\renewcommand{\labelexercise}{\ exercisename \theexercise.}

To change only the numbering type, redefine the \ theexercise command, based on the exercise counter.

This macro (which is empty by default) allows to define a particular style for exercise titles. In the present document, we defined in the preamble:
\renewcommand{\labelexercisestyle}{\rmfamily\color{black}}

The starred version \exercise*[⟨{opt}⟩]{⟨label⟩} allows to choose another ⟨label⟩ for a particular exercise and removes the numbering. For instance:
\exercise*[⟨⟨Fermat theorem⟩⟩]{Problem} yields:

Problem (Fermat theorem)

Prove that there are no positive integers x, y, z such that \(x^n + y^n = z^n\) for any integer n greater than 2.

2.2 The \subpart command

An exercise may contain several parts that we obtain with the \subpart[(opt)] command, typeset like a sub-subsection.

Exercise 3

Part A (preliminary)

First of all, prepare your cup of tea.

Part B

Now you are ready to make the current exercise.

By default, the subpart numbering uses letters: A, B, C, etc. This numbering type can be redefined with the \thesubpart command based on the subpart counter, for instance \renewcommand{\thesubpart}{\arabic{subpart}}.

Translation is currently integrated into the package for the following languages: French, German, Spanish, Italian, Portuguese.

In the present document, to highlight real sections and subsection titles, their color and font have been modified with the \allsectionsfont macro from the sectsty package.
As for \exercise, the \subpart command uses \subpartname (with automatic translation in a few languages according to the selected language), \labelsubpart and \labelsubpartstyle, which are editable.

Like \exercise*, the starred version \subpart*[⟨opt⟩]{⟨label⟩} allows to freely typeset the subpart {⟨label⟩}, for instance \subpart*[First part].

\textbf{2.3 The \annex command}

\annex The \annex[⟨opt⟩] command typesets the title ANNEX, in uppercase letters, centered and in the subsection style, with an optional parameter, added on the same line.

\begin{center}
ANNEX (to return)
\end{center}

\annexname The word Annex has automatic translation in a few languages. It can be extended to other languages or modified by redefining \annexname or with macros from the \texttt{translations} package.

\annexstyle The annex title style is set by the \annexstyle macro, defined as follows:
\begin{verbatim}
\newcommand\annexstyle{\MakeUppercase}
\end{verbatim}
This command may be redefined as one wants.

\textbf{2.4 Exercise titles in table of contents (notoc package option)}

\notoc By default, the titles Exercise, Part or Annex, appear in the table of contents (or in the pdf file summary when \texttt{hyperref} package is used). To avoid this, you can set the boolean \notoc to \texttt{true} or call the \texttt{exesheet} package (or class) with \notoc option. But notice that title optional arguments will always be ignored in the table of contents.

\textbf{2.5 Short exercises: the \exe command}

\exe The \exe command starts an exercise by the abbreviation Ex. followed by the exercise number, without using sectioning commands, and the exercise body begins on the same line. An exercise starts a new paragraph without indentation.

\begin{center}
\begin{tabular}{|l|}
\hline
Ex. 4 — This is a short exercise who can contain several paragraphs or questions however.  
Here for example starts a new paragraph. 

Ex. 5 — This is another short exercise. 
\hline
\end{tabular}
\end{center}

\exname The abbreviation Ex may be changed by redefining \exname or with macros from the \texttt{translations} package. The \exlabel macro calls \exname following by a period then the exercise number, and \exsepmark typesets a long dash. We may change these features by redefining these commands.

\exe* The starred version prints no separator as shown below:

\begin{center}
\begin{tabular}{|l|}
\hline
Ex. 6 Another short exercise without separator. 
\hline
\end{tabular}
\end{center}
2.6 The \points command

The \points\{pts\} command displays the number of points awarded to an exercise. It is intended to be entered in the optional argument of the \exercise command. \exercise[\points{5}] yields:

Exercise 7
Try to read this whole document without drinking tea and you get five points.

Like before, the word points and in the singular point (if \langle \text{pts} \rangle is inferior to 2) get automatic translation in a few languages and are modifiable.

The style used by the \points command may be redefined with \pointsstyle.

The color is set by pointscolor with the \definecolor command (from the xcolor package by Uwe Kern, loaded by exesheet), for instance:
\definecolor{pointscolor}{named}{blue}.

3 Enumerations and lists

3.1 List settings (nosetlist package option)

Enumeration lists are intended to represent questions and sub-questions inside exercises. For a good highlight, labels are typeset in bold. Moreover, they are left aligned, at the start of the line, without indentation, and the vertical space between items is increased compared with \LaTeX standard lists. These settings are done by the \setlist command from the enumitem package by Javier Bezos.

Lists with itemize environment are kept in their default configuration.

Exercise 8
1. First question
   (a) First sub-question
   (b) Second sub-question
2. Second question

We can avoid enumeration list modifications and restore the \LaTeX default settings by passing the option nosetlist to the exesheet class or package.

3.2 List of exercises: the exenumerate environment

When an exercise sheet is made of short independent exercises, it would be ill-advised to display the complete title Exercise for each. In addition to the \exe command, previously presented, we provide an even lighter solution with the

\footnote{This command which has to be used in the optional argument of \exercise, as several others presented below, is incompatible with the memoir class which redefines section commands.}

\footnote{Labels may also be changed by the \labelenumi and \labelenumii commands.}

\footnote{The french option of the babel package alters itemize lists behavior and uses long dash as labels for each list level. This behavior is problematic when mathematics follows the dash symbol because the latter may be confused with the minus sign. Modifications of the french option (which supersedes frenchb of babel) are canceled to restore \LaTeX default settings.}
The \texttt{exenumerate} environment, which is only an enumeration list in which spaces between items are further increased compared with those of \texttt{enumerate}. Here is an example (the main list is an \texttt{exenumerate} environment but sub-lists are produced with regular \texttt{enumerate} environments):

1. Translate the following sentences in English:
   
   (a) Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi.
   
   (b) Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus.

2. Translate the following sentence in German:
   
   Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi.

3. Translate the following sentences in French:
   
   (a) Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus.
   
   (b) Nulla ullamcorper vestibulum turpis.

The environment takes an optional parameter, like \texttt{enumerate}, which enables, among others, to typeset alternative list labels, e.g. \texttt{\begin{exenumerate}[A.]}. There are many other options (see the \texttt{enumitem} package documentation).

### 3.3 Items aligned by lines

These three environments are used to typeset short questions (\texttt{tablenum1}), subquestions (\texttt{tablenuma}) or \texttt{itemize} lists (\texttt{tablitem}) on the same line. They have the same syntax: \texttt{\begin{tablenum1}[(opt)]\langle cols\rangle\end{tablenum1}}. The \texttt{(cols)} parameter is the number of columns used by the environment. It must be in parentheses. This parameter can be omitted, then its value is 2. As for classic lists, each item begins with the \texttt{item} command.

These three environments are defined by the \texttt{\NewTasksEnvironment} macro, from the \texttt{tasks} package by Clemens Niederberger. They take an optional argument \texttt{(opt)} explained in the documentation of this package, e.g. \texttt{\begin{tablenum1}[(opt)]\langle cols\rangle\end{tablenum1}}. The \texttt{(cols)} parameter is the number of columns used by the environment. It must be in parentheses. This parameter can be omitted, then its value is 2. As for classic lists, each item begins with the \texttt{item} command.

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**Exercise 9**

Give the derivative of the following functions:

1. \( f(x) = \frac{1 - x^2}{e^x + e^{-x}} \),

2. \( g(x) = \ln\left(\frac{1 - x}{1 + x^2}\right) \),

3. \( h(x) = \int_0^1 e^{xy} \, dy \),

4. \( k(x) = \sum_{i=1}^{\infty} \frac{1}{x^i} \),

5. \( l(x) = \int_1^x \frac{1}{\ln t} \, dt \).
For \texttt{tablenuma}, labels are letters (a, b, c, \ldots) surrounded by parentheses. This cannot be modified globally (except by redefining the environment with \texttt{\RenewTasksEnvironment}). If the \texttt{exesheet} package is called with option \texttt{noresetlist}, labels of \texttt{tablenum1} and \texttt{tablenuma} environments are displayed in normal font instead of boldface, with indentation.

### 3.4 Items aligned by columns: \texttt{colsenum}

\texttt{colsenum} To get numbering of items by columns, we have the \texttt{colsenum} environment: \begin{colsenum}\[⟨\text{opt}⟩\]{⟨cols⟩}. The mandatory parameter is the number of columns and the optional one will be passed to \texttt{enumerate}, allowing, for example, to change the type of numbering (a, A, etc.). To use this environment, we have to load the \texttt{multicol} package in the preamble.

#### Exercise 10

Give the derivative of the following functions:

1. \( f(x) = \frac{1 - x^2}{e^x + e^{-x}} \),
2. \( g(x) = \ln \left( \frac{1 - x}{1 + x^2} \right) \),
3. \( h(x) = \int_0^1 e^{xy} \, dy \),
4. \( k(x) = \sum_{i=1}^{\infty} \frac{1}{x^i} \),
5. \( l(x) = \int_{\frac{1}{2}}^x \frac{1}{\ln t} \, dt \).

\texttt{colsenum*} We will notice that, on each line, items are not necessarily well aligned, what can produce inelegant effects. On the other hand, the \texttt{colsenum} environment doesn’t try to align columns from the bottom by adjusting space between items. If we want to get this (which is the default option in \texttt{multicol}) we have the \texttt{colsenum*} environment (same syntax than \texttt{colsenum}). Here what we get in that case, with the same exercise.

#### Exercise 11

Give the derivative of the following functions:

1. \( f(x) = \frac{1 - x^2}{e^x + e^{-x}} \),
2. \( g(x) = \ln \left( \frac{1 - x}{1 + x^2} \right) \),
3. \( h(x) = \int_0^1 e^{xy} \, dy \),
4. \( k(x) = \sum_{i=1}^{\infty} \frac{1}{x^i} \),
5. \( l(x) = \int_{\frac{1}{2}}^x \frac{1}{\ln t} \, dt \).

We can see that these alignments are less good than those obtained by numbering of items by line. The numbering of items by columns may nevertheless be preferable when there are many items with variable heights, and a number of items which can be different from one column to the other. Moreover, an advantage of \texttt{colsenum} is that the choice of labels is automatic depending on the list level (and the language), unlike \texttt{tablenum1} or \texttt{tablenuma}.

\texttt{colsitem} For \texttt{itemize} lists, the environment \texttt{colsitem} produces items aligned by columns rather than by lines as for \texttt{tablitem}: \begin{colsitem}\[⟨\text{opt}⟩\]{⟨cols⟩}. The optional parameter, which is passed to the underlying \texttt{itemize} environment,
allows to change the item label (bullet by default). And, as for `colsenum*`, the `colsitem*` environment produces an alignment of columns from the bottom.

4 Questions and solutions

4.1 The questions and answers environments

The package provides the two environments `questions` and `answers` to make appear or disappear questions and answers of exercises. Display is controlled by two booleans: `questions` and `answers`. Their default value is `true`.

The `\questionsonly` command allows to display the questions without the answers and `\answersonly` displays the solutions without the questions.

In the case (by default) where questions and answers are displayed both, answers are then typeset in the style `\correctionstyle`, which uses the color `\correctioncolor`. This color may be chosen with the `\definecolor` macro (by default `\definecolor{correctioncolor}{rgb}{0,0.2,0.6} = kind of dark blue`). Moreover, in that case, the title `Correction` is displayed at the beginning of the `answers` environment. It is defined by the `\correctionname` macro (with translation in a few languages and that we can change: for example we may prefer `Solution` than `Correction`). The style defined by `\correctionstyle` will apply to the title but also to the whole environment. Here an example.

```
Exercise 12  
1. Is the `esesheet` package useful?  
2. Isn’t there any other packages that deal with exercises?  

Correction  
1. Yes, the `esesheet` package is very useful.  
2. There are many other packages that deal with exercises, and give the ability to produce separately questions and solutions, for example `exercise` by Paul Pichaureau, `exercises` by Roger Jud, `esesheets` (superseded by `xsim`) by Clemens Niederberger, `exframe` by Niklas Beisert, `exam` by Philip Hirschhorn, `answers` by Mike Piff and Joseph Wright, `probsoln` by Nicola Talbot, etc.  
```

\points When only answers are displayed, the text color remains black, the word `Correction` is not displayed and the `\points` macro is patched to suppress the display of points. An extended solution for a variable display of points will be discussed in section 5.2 with the `\totalpoints` macro.

\footnote{Of course we can also assign the booleans `questions` and `answers` directly with the \LaTeX command `\setboolean`.}

\footnote{Except for English, if you want to change package keywords you have to do it after `\begin{document}` because `babel` will modify these definitions at the end of the preamble.}
4.2 More about answers environment

Internally, we have used the \comment and \endcomment macros from the versions package by Uwe Lück. Other excellent packages allow to manage selectively piece of code. Let us mention verbatim by Rainer Schöpf, comment by Victor Eijkhout, version by Donald Arseneau and Stephen Bellantoni, optional by Donald Arseneau and codesection by Matthias Pospiech.

The versions package used provides furthermore the \includeversion{⟨env⟩} and \excludeversion{⟨env⟩} macros who allow to make appear or disappear any environment ⟨env⟩ and these optional environments may be nested\footnote{The codesection package also allows such nesting, including in the preamble, as well as the optional package, but the latter only manages short optional code.}.

However the questions and answers environments perform another task, not only making appear or disappear piece of text. Indeed, there is a problem with the title Correction. In which format to typeset it and at which level to put it in the table of contents (or in the summary of the pdf file)? In fact it depends on which level the environment has been nested. We can make a single answers environment for all the exercises of the sheet or an answers environment for each exercise, for each exercise part, for each question or sub-question. In fact, the typeset of the title Correction and his level in the table of contents will be adjusted automatically.

\([⟨level⟩]\) Nevertheless, we can imagine twisted situations in which the title level will not be correctly calculated. It is then possible to force the level of the title Correction with \begin{answers}⟨level⟩\end{answers}. The optional ⟨level⟩ parameter is defined as follows: 1 for section level titles, 2 for subsections (like Exercise), 3 for sub-subsections (like Part), another number for lower levels (then they will not appear in the table of contents).

\texttt{answers*} The starred version answers* allows to make the title Correction completely disappear.

4.3 The \texttt{question} command

\texttt{question} Instead of the questions and answers environments, we can also use the simple \question{⟨ques⟩}{⟨ans⟩} macro in which display of ⟨ques⟩ and ⟨ans⟩ arguments is controlled by the same previous commands \questiononly and \answersonly. It can be more readable (in the source code) when questions and answers are short. In the case of displaying both questions and answers, the Correction title will appear on a new line, in bold, as for levels lower than sub-subsection in the answers environment (and without entries in the table of contents). But this command doesn’t work with verbatim inside.

5 Marginal notes for marking scheme

The exesheet package allows the display of a marking scheme with comments and explanations for answers.
5.1 The \pts command

\pts When exercises are typeset with the \exe macro, or as a list with the exenumerate environment, the marking scheme is displayed in the margin, on the line where we put the \pts\{⟨num⟩\} command (in general the first line of the exercise). The ⟨num⟩ parameter is the number of points assigned to the exercise.

| (3 pts) | Ex. 13 — The first exercise with marking scheme. |
| (1.5 pt) | Ex. 14 — The second one. |

\ptstname The abbreviation pts (or pt when the number of points is inferior to 2) \ptstname is automatically added thanks to the macro \ptstname or \ptstname (translated in a few languages if babel is loaded). The display color of the points \ptstcolor is defined by \ptstcolor which can be changed with \definecolor: by default \definecolor\{ptstcolor\}\{named\}\{red\}. The display style is defined by \ptststyle.

\displaypts The display of the marking scheme, as above, is internally controlled by the marginpts boolean. The \displaypts command, which has to be placed in the preamble, defines marginpts to true, places marginal notes to the left (and not to the right which is the default behavior of LATEX) and shifts the text body right to increase the left margin compared with the right one, with a ratio 3:2, as it is in the present document. This ratio is defined by the geometry macro from the geometry package (by Hideo Umeki) and is valid for the whole document.

5.2 The \totalexe, \note and \totalpoints commands

\totalexe To give a more detailed marking scheme, the esesheet package provides some extended commands: \totalexe\{⟨num⟩\} to display the total number of points of an exercise and especially \note\{⟨pts⟩\}\{⟨comment⟩\}, to indicate some marking detail in answers. The optional parameter ⟨pts⟩ is the number of points of the question and the mandatory parameter ⟨comment⟩ is used to give details about the marking scheme. Below the title has been obtained with \exercise[\totalexe\{4\}] and the first comment (on next page) with \note[1]\{0,5 for the anti-derivative\}\{0,5 for simplification of $\ln$\}.

Exercise 15

For each following question, say if the assertion is true or false. Justify the answer carefully.

1. $\int_0^{\sqrt{3}} \frac{1}{x + \sqrt{3}} \, dx = \ln 2,$

2. $\int_2^{e} \frac{1}{x \ln x} \, dx = -\ln 2,$

3. The function $F$ defined on $\mathbb{R}$ by $F(x) = \int_0^{x} \frac{1}{t^2 + t + 1} \, dt$ is increasing on $\mathbb{R}$.  

4 pts
1. We calculate:

\[
\int_0^{\sqrt{3}} \frac{1}{x + \sqrt{3}} \, dx = \left[ \ln(x + \sqrt{3}) \right]_0^{\sqrt{3}} = \ln(2\sqrt{3}) - \ln(\sqrt{3}) = \ln\left(\frac{2\sqrt{3}}{\sqrt{3}}\right) = \ln 2.
\]

TRUE.

2. We have \(\frac{1}{x \ln x} = \frac{1}{\ln x} = \frac{u'(x)}{u(x)}\) with \(u(x) = \ln x\), which is positive on \([2, e]\).

Hence

\[
\int_2^{e} \frac{1}{x \ln x} \, dx = \left[ \ln(\ln x) \right]_2^{e} = \ln(\ln e) - \ln(\ln 2) = \ln 1 - \ln(\ln 2) = -\ln(\ln 2).
\]

FALSE.

3. The function \(F\) defined on \(\mathbb{R}\) by

\[F(x) = \int_0^x \frac{1}{t^2 + t + 1} \, dt\]

is derivable on \(\mathbb{R}\) and its derivative is such that \(F'(x) = \frac{1}{x^2 + x + 1}\). The denominator is a quadratic polynomial, always positive because its discriminant is \(\Delta = -3 < 0\). Thus \(F\) is increasing on \(\mathbb{R}\).

TRUE.

In the comment of answer 2, a wider vertical space is produced at line break with the optional argument \(\texttt{[2ex]}\). The last comment, not placed beside the number of points of answer 3, has been produced by placing on the first line after the formula: \texttt{\note{0.5 for $F'$\1 for the sign of $F'$ and conclusion}}.

If we don’t want to add comment, we have the \texttt{\note*{\{}\texttt{pts}}\} command (better than \texttt{\note{\{}\texttt{pts}}\}{}), used here in answer 3: \texttt{\note*{1.5}}.

The display color of the points, in \texttt{\totelexe} and \texttt{\note}, is defined by \texttt{\markingcolor} and the style by \texttt{\markingstyle}, which are modifiable. The oval box produced by \texttt{\totelexe} is obtained with the \texttt{\ovalbox} command of the fancybox package by Timothy Van Zandt, with corner arcs set by \texttt{\cornersize{1}}. The box length is not adjusted to content but depends of the value of \texttt{\ptsboxlength} in order to keep a uniform appearance from one exercise to the other.

Comment notes are typeset by default in a dark green color defined by \texttt{\definecolor{notecolor}{rgb}{0.0,0.4,0.0}}. The style of the comment is set by the \texttt{\notestyle} macro and itself uses the \texttt{\noteragged} macro. The latter is set by default as \texttt{\raggedleft} to obtain a \texttt{right} alignment (what is customary for notes in the left margin).

Display of points and comments is optional. It is internally controlled by the booleans \texttt{marginpoints} and \texttt{marginfullnotes}. The \texttt{\displaypoints} macro, to place in the preamble, sets \texttt{marginpoints} to \texttt{true}, chooses the left margin for points and comments and sets \texttt{marginfullnotes} to \texttt{false}.

\footnote{When a marginal note at the end of a page, is followed by another one at the top of the next page, the latter is shifted down. We can raise this note, by adding at the line break a negative vertical space: \texttt{\note*{}}\texttt{[\hspace{-5ex}]}}.
display marginal notes and sets the ratio between left and right margins to 3:2\textsuperscript{10}. Points will then be displayed without the comments.

\texttt{\displaynotes}  \quad The \texttt{\displaynotes}[\langle align \rangle] macro, to be placed also in the preamble, defines both booleans to \texttt{true} and allows then the complete display of points and comments. The ratio between left/right margins is then set to 5/1\textsuperscript{11}. The optional parameter \langle \texttt{align} \rangle is used to define alignment: \texttt{\raggedleft} by default, but we could use \texttt{centering} or \texttt{\raggedright} (not recommended in left margin).

\texttt{\displaynotesright}  \quad The \texttt{\displaynotesright}[\langle align \rangle] macro displays a detailed marking scheme with comments in the right margin, with the same type of settings as \texttt{\displaynotes} but an optional parameter \langle \texttt{align} \rangle set by default to \texttt{\raggedleft}.

\texttt{\totalpoints}  \quad The \texttt{\totalpoints}\{\langle num \rangle\} macro is intended to replace \texttt{\points} when using a detailed marking scheme. When the scale is not displayed (\texttt{\marginpoints} boolean to \texttt{false}), it uses \texttt{\points} and when the scale is displayed, it uses \texttt{\totalexe}. For example, in the exercise 15, we should use \texttt{\totalpoints} rather than \texttt{\totalexe}, because, when the detailed marking scheme is not displayed, the total points will be typeset as in the exercise 12 rather than in the margin.

6 Implementation

6.1 Class and package basic instructions

The \texttt{exesheet} class is based on the \texttt{article} class and gives it all its options, except explicit options \texttt{notoc} and \texttt{nosetlist}.

\begin{verbatim}
1 \langle∗class⟩
2 \DeclareOption{notoc}{\PassOptionsToPackage{notoc}{exesheet}}
3 \DeclareOption{nosetlist}{\PassOptionsToPackage{nosetlist}{exesheet}}
4 \DeclareOption*{\PassOptionsToClass{\CurrentOption}{article}}
5 \ProcessOptions \relax
6 \LoadClass{article}
7 \RequirePackage{exesheet}
8 \RequirePackage{schooldocs}
9 \langle*/class⟩
\end{verbatim}

Then we define initialization instructions of the \texttt{exesheet} package.

The \texttt{shortlabel} option in the \texttt{enumitem} package allows to use labels like in the \texttt{enumerate} package e.g. 1., a), A. etc.

\begin{verbatim}
10 \langle∗package⟩
11 \RequirePackage{ifthen}
12 \newboolean{notoc}
13 \newboolean{nosetlist}
14 \DeclareOption{notoc}{\setboolean{notoc}{true}}
15 \DeclareOption{nosetlist}{\setboolean{nosetlist}{true}}
16 \ProcessOptions \relax
17 \RequirePackage{xcolor}
18 \RequirePackage[shortlabels]{enumitem}
\end{verbatim}

\textsuperscript{10}So that the effect on the margin ratio is correct, the \texttt{\displaypoints} macro must be placed after other commands that could alter the page geometry, for example the \texttt{\pagestyle} of the\texttt{schooldocs} package.

\textsuperscript{11}The present document kept a ratio of 3/2 because the \texttt{\ltxdoc} class, used here, leaves large enough margins and previous examples are not concerned with display of comments.
6.2 Internationalization

Here we define the keywords and their translation in French, German, Spanish, Italian, Portuguese, thanks to macros of the `translations` package by Clemens Niederberger. It detects the used language loaded by `babel` or `polyglossia`.

Accented characters cannot be used here because they are not recognized if `inputenc` is loaded after `exesheet`. So we have used the basic \LaTeX{} commands to produce them.
6.3 Colors

The color pointscolor is used by the macro \points and markingcolor by the macros \totalexe, \notename and also for the optional argument of \notename; notecolor is used by the mandatory argument of \notename.

\definecolor{pointscolor}{named}{red}
\definecolor{ptscolor}{named}{red}
\definecolor{markingcolor}{named}{red}
\definecolor{notecolor}{rgb}{0.0, 0.4, 0.0} % kind of dark green
6.4 Titles

The `exercise` counter numbers exercises for the whole document regardless of any section. To reset the counter at some point, just write `\setcounter{exercise}{0}` and if we want an automatic reset at each section, add in the preamble `\makeatletter \@addtoreset{exercise}{section} \makeatother`.

The parts counter depends on `exercise` and is reset at each new exercise.

The `\labelexercise` and `\labelsubpartstyle` commands are empty, but allow to customize the style, for instance:

```
\renewcommand\labelexercisestyle\{\sffamily\}
```

By default, the table of contents displays the titles of exercises and parts. The `notoc` boolean is used to modify this behavior. If we want to display only exercise titles but not parts, we can place in the preamble `\setcounter{tocdepth}{2}`.

```
\exercise
\newcounter{exercise}
\newcommand\labelexercise\{\exercisename~\theexercise\}
\newcommand\labelexercisestyle\{}
\newcommand*\@exercise\[1\]\{\{
  \refstepcounter{exercise}
  \subsection*{\labelexercisestyle\labelexercise\ #1}
  \ifthenelse{\boolean{notoc}}{}{\addcontentsline{toc}{subsection}{\labelexercise}}
\}\}
\newcommand*\@@exercise\[2\]\{\{
  \subsection*{\labelexercisestyle #2 #1}
  \setcounter{subpart}{0} % resets the parts counter
  \ifthenelse{\boolean{notoc}}{}{\addcontentsline{toc}{subsection}{#2}}
\}\}
\newcommand\exercise\{\@ifstar\@@exercise\{\@exercise\}
```

```
\subpart
\newcounter{subpart}\{exercise\} %
\renewcommand\thesubpart\{\Alph{subpart}\}
\newcommand\labelsubpart\{\subpartname\thesubpart\}
\newcommand\labelsubpartstyle\{}
\newcommand*\@subpart\[1\]\{\{
  \refstepcounter{subpart}\%
  \subsection*{\labelsubpartstyle\labelsubpart\ #1}
  \ifthenelse{\boolean{notoc}}{}{\addcontentsline{toc}{subsection}{\labelsubpart}}
\}\}
```

```
\subpart
\newcommand\subpart\{exercise\} %
\renewcommand\thesubpart\{\Alph{subpart}\}
\newcommand\subpart\{subpartname\thesubpart\}
\newcommand\subpart\{\subpartstyle\}
\newcommand*\@subpart\[1\]\{\{
  \refstepcounter{subpart}\%
  \subsubsection*{\subpartstyle\subpart\ #1}
  \ifthenelse{\boolean{notoc}}{}{\addcontentsline{toc}{subsubsection}{\subpart}}
\}\}
```

\newcommand*{\@subpart}[2][]{%
  \subsubsection*{#2}
  \ifthenelse{\boolean{notoc}}{}{
    \addcontentsline{toc}{subsection}{#2}
  }
}
\newcommand{\subpart}{\@ifstar{\@@subpart}{\@subpart}}
\newcommand{\annexstyle}{\MakeUppercase}
\newcommand*{\annex}[1][]{%
  \subsection*{\annexname #1}
  \ifthenelse{\boolean{notoc}}{}{
    \addcontentsline{toc}{subsection}{\annexname}
  }
}
\newcommand{\exlabel}{\exname.~\theexercise}
\newcommand{\exsepmark}{---}
\newcommand{\@exe}{\bigskip\refstepcounter{exercise}
  \par
  \noindent
  \textbf{\exlabel}~}
\newcommand{\@@exe}{\bigskip\refstepcounter{exercise}
  \par
  \noindent
  \textbf{\exlabel}}
\newcommand{\exe}{\@ifstar{\@@exe}{\@exe}}
\newcommand{\pointsstyle}{\small\mdseries\sffamily\color{pointscolor}\fbox}
\newcommand*{\points}[1][]{%
  \hfill\pointsstyle{#1~%
    \ifthenelse{\lengthtest{#1 cm < 2cm}}{\pointname}{\pointsname}~%
  }
}
\points (ini)
\percent symbols are necessary to avoid spaces between the \fbox and its inner text. Note that, without \lengthtest, the test \#1 < 2 doesn’t work with decimal numbers.

### 6.5 Enumerations and lists

When using babel with the french option\textsuperscript{12}, itemize lists are modified with the same dash label for each list level. These modifications are canceled here to restore default \LaTeX itemize lists (labels and spaces). As for \texttt{exetranslate}, we have create the \standardfrenchlists command who must be called into \texttt{AtBeginDocument} or not, depending on whether \texttt{exesheet} is loaded before babel or after.

\textsuperscript{12}The french option of babel supersedes the frenchb option.
The `\setlist` command comes from the `enumitem` package (\setenumerate is deprecated). By default `itemsep=1ex` for lists of first level, and `leftmargin=1.5em` allows to align labels on the start of lines.

```latex
\newcommand\standardfrenchlists{\%
  \@ifpackagewith{babel}{frenchb}{\frenchbsetup{StandardLists=true}}{}
  \@ifpackagewith{babel}{french}{\frenchsetup{StandardLists=true}\frenchsetup{StandardLists=True}}{}
}\%
\ifthenelse{\boolean{nosetlist}}{\AtBeginDocument{% if loaded before babel package\standardfrenchlists\standardfrenchlists % necessary when loaded after babel\setlist[enumerate]{font=\bfseries}\setlist[enumerate,1]{topsep=1.5ex plus 1ex minus 1ex,leftmargin=1.5em}\setlist[enumerate,3]{noitemsep,nolistsep}\setlist[itemize]{noitemsep,nolistsep}\begin{enumerate}[#1]}}{\setlist[enumerate,1]{topsep=1.5ex plus 1ex minus 1ex,leftmargin=1.5em}\setlist[enumerate,3]{noitemsep,nolistsep}\setlist[itemize]{noitemsep,nolistsep}\begin{enumerate}[#1]}}
\exenumerate
\newenvironment{exenumerate}[1][]{\%
  \setlist[enumerate]{font=\bfseries}\setlist[enumerate,1]{leftmargin=1.5em,\itemsep=3ex plus 1ex minus 1ex,topsep=3ex plus 1ex minus 1ex}\setlist[enumerate,3]{noitemsep,nolistsep}\setlist[itemize]{noitemsep,nolistsep}\begin{enumerate}[#1]}}{\end{enumerate}}
\NewTasks
\NewTasksEnvironment[label=\arabic*.,\begin{enumerate}]{tablenum1}{\item}(2)
\NewTasksEnvironment[label=(\alph*),\begin{enumerate}]{tablenuma}{\item}(2)
\NewTasksEnvironment[label=\arabic*.,\begin{enumerate}]{tablenum1}{\item}(2)
\NewTasksEnvironment[label=(\alph*),\begin{enumerate}]{tablenuma}{\item}(2)
\NewTasksEnvironment[label=\arabic*.,label-format=\bfseries,\begin{enumerate}]{tablenum1}{\item}(2)
\NewTasksEnvironment[label=(\alph*),label-format=\bfseries,\begin{enumerate}]{tablenuma}{\item}(2)
```

The \NewTasks command comes from the `tasks` package. It allows to define the environments `tablenum1`, `tablenuma` and `tablitem`. The horizontal spaces are adjusted to get a good alignment with items of other `enumerate` (or `itemize`) environments.
219 } 
\PackageWarning{exesheet}{Environment tablenum is deprecated and replaced by tablenum1} 
221

\NewTasksEnvironment[label=\labelitemi, 
label-align=right, 
item-indent=2.3333em,label-offset=0.5em, 
after-item-skip=0.5ex plus 0.5ex minus 0.5ex]{tablitem}[\item](2)

\newenvironment{colsenum}[2][][]{% 
  \setlength{\multicolsep}{2ex} 
  \raggedcolumns % default is \flushcolumns 
  \begin{multicols}{#2} % #2 = number of columns 
    \begin{enumerate}[#1] % #1 = options of enumerate 
      \{ 
    \end{enumerate} 
  \end{multicols} 
}\end{multicols}

\newenvironment{colsenum*}[2][][]{% 
  \setlength{\multicolsep}{2ex} 
  \begin{multicols}{#2} % #2 = number of columns 
    \begin{enumerate}[#1] % #1 = options of enumerate 
      \{ 
    \end{enumerate} 
  \end{multicols} 
}\end{multicols}

\newenvironment{colsitem}[2][][]{% 
  \setlength{\multicolsep}{2ex} 
  \raggedcolumns 
  \begin{multicols}{#2} 
    \begin{itemize}[#1] 
      \{ 
    \end{itemize} 
  \end{multicols} 
}\end{multicols}

\newenvironment{colsitem*}[2][][]{% 
  \setlength{\multicolsep}{2ex} 
  \begin{multicols}{#2} 
    \begin{itemize}[#1] 
      \{ 
    \end{itemize} 
  \end{multicols} 
}\end{multicols}
6.6 Questions and answers

The `questions` and `answers` booleans control the display of corresponding environments. When created, a boolean has the `false` value by default, but we define them to `true`. The `questionsonly` and `answersonly` macros are used as a user interface to display only one of the two environments.

\newboolean{questions}
\newboolean{answers}
\setboolean{questions}{true}
\setboolean{answers}{true}
\newcommand{\questionsonly}{\setboolean{questions}{true}\setboolean{answers}{false}}
\newcommand{\answersonly}{\setboolean{questions}{false}\setboolean{answers}{true}}

It is the `\comment` and `\endcomment` macros, provided by the `versions` package, that allow the magic of conditional displays (we can also find them in the `verbatim` or `version` packages). The noteworthy `codesection` package allows to encapsulate optional code between the macros `\BeginCodeSection{⟨skip⟩}` and `\EndCodeSection{⟨skip⟩}`, both in the text body and in the preamble, but these macros cannot be used inside an environment as we did here for `\comment` and `\endcomment`.

\newcounter{exe@ini}
\newcounter{subpart@ini}
\newenvironment{questions}{\ifthenelse{\boolean{questions}}{\setcounter{exe@ini}{\value{exercise}}\setcounter{subpart@ini}{\value{subpart}}}{\comment}}{\ifthenelse{\boolean{questions}}{}{\endcomment}}

The internal macro `\set@toclevel` calculates the title level of the word `Correction` to display at the start of an `answers` environment (when `questions` and `answers` are displayed together). The principle is to compare the state of the counters `exercise` and `subpart` with those saved at the time of the call of `questions`. The `\@enumdepth` counter indicates the `enumerate` list level in which we are (0 = out of lists). The optional parameter of the `answers` environment allows to force this title level.

\newcommand{\set@toclevel}{[1][]}\{\ifthenelse{\equal{#1}{}}{\ifthenelse{\value{exercise} > \value{exe@ini}}{\setcounter{@toclevel}{1}}{\ifthenelse{\equal{\the@enumdepth}{0}}{\ifthenelse{\value{subpart} > \value{subpart@ini}}{\setcounter{@toclevel}{2}}{\setcounter{@toclevel}{3}}}}}{\setcounter{@toclevel}{4}}}
In the \textbf{answers} environment, if we place \texttt{\correctionstyle} before \texttt{\subsubsection}, the preceding vertical space may be too wide.

\question
\newcommand{\question}{2}{%}
\ifthenelse{\boolean{questions}}{#1}{%}
\bgroup
\ifthenelse{\boolean{answers}}{%}
\ifthenelse{\boolean{questions}}{%}
\ifx#2\empty\else
\par\textbf{\correctionstyle}\par
\fi
\fi
\egroup
\par
\correctionstyle\textbf{\correctionname}\par
\}{
\ifthenelse{\boolean{answers}}{\comment}}%}
\endcomment}}

\newenvironment{answers*}{\ifthenelse{\boolean{answers}}{}{\comment}}{%}
\ifthenelse{\boolean{answers}}{}{\endcomment}}

\points (patched)
\let\@oldpoints\points
\renewcommand*{\points}{% ifthenelse{boolean{questions}}{\@oldpoints{#1}}{}}

6.7 Marginal notes

The commands \displaypts, \displaypoints and \displaynotes change the ratio between left and right margins.

\pts
\displaypts
\newboolean{marginpts}
\newcommand*{\pointmark}{#1}{% ifthenelse{\lengthtest{#1 cm < 2cm}}{#1 \ptname}{#1 \ptsname}}
\newcommand{\ptsstyle}{% footnotesize\centering\sffamily\color{ptscolor} (#1)}\newcommand{\pts}{% ifthenelse{boolean{marginpts}}{\mbox{}\marginpar{\hspace{0pt}\ptsstyle{\pointmark{#1}}}}{}}\newcommand{\displaypts}{% reversemarginpar\geometry{hmarginratio=3:2}\setboolean{marginpts}{true}}

\totalexe
In the following macros using \marginpar, percent symbols and \ignorespaces are necessary to avoid too much space in the text (or the margin) where these macros are inserted.
\newlength{\ptsboxlength}\setlength{\ptsboxlength}{3.1em}\cornersize{1}\newcommand{\totalexe}{% ifthenelse{boolean{marginpoints}}{\mbox{}\marginpar{\markingstyle{\ovalbox{% makebox[\ptsboxlength]{\pointmark{#1}}}}}}{}}\ignorespaces

\note
The booleans marginpoints and marginfullnotes control the display of marginal notes. If marginpoints is false, marginfullnotes will be ignored. The \noteragged command is initialized outside \displaynotes such that we can use the \note command without \displaynotes (see further).

\footnote{So that the effect on the margin ratio is correct, these macros must be called, in the preamble, after other commands that also could alter the page geometry.}
\newboolean{marginpoints}
\newboolean{marginfullnotes}

\newcommand{\markingstyle}[1]{\hspace{0pt}\footnotesize\sffamily\centering\color{markingcolor}\textbf{#1}}
\newcommand{\noteragged}{\raggedleft}
\newcommand{\notestyle}[1]{\hspace{0pt}\footnotesize\sffamily\noteragged\noindent\color{notecolor} #1}
\newcommand{\@note}[2][\{}{%
  \ifthenelse{\boolean{marginpoints}}{\mbox{}\marginpar{\ifthenelse{\equal{#1}{}}{}{\markingstyle{#1}\}}%\ifthenelse{\boolean{marginfullnotes}}{\notestyle #2}{}%\ignorespaces
  \ignorespaces
\newcommand{\@@note}[1]{%\ifthenelse{\boolean{marginpoints}}{\mbox{}\marginpar{\markingstyle{#1}}\ignorespaces
\newcommand{\note}{\@ifstar{\@@note}{\@note}}

\newcommand{\displaypoints}{%\reversemarginpar\geometry{hmarginratio=3:2}\setboolean{marginpoints}{true}
\newcommand{\displaynotes}[1][\{}\reversemarginpar\renewcommand{\noteragged}{#1}\geometry{hmarginratio=5:1}\setlength{\marginparwidth}{\oddsidemargin}\addtolength{\marginparwidth}{1in}\addtolength{\marginparwidth}{-\marginparsep}\setlength{\marginparwidth}{0.8\marginparwidth}\setboolean{marginfullnotes}{true}\setboolean{marginpoints}{true}
\newcommand{\displaynotesright}[1][\{}\normalmarginpar\renewcommand{\noteragged}{#1}\geometry{hmarginratio=1:5}\setlength{\marginparwidth}{\paperwidth}\addtolength{\marginparwidth}{-\textwidth}}

In \displaynotes, the additional length 1 in matches the default free space to the left of \oddsidemargin.
The formatting of marginal notes can possibly be made more regular with the `ragged2e` package, not loaded by `exesheet`. We will then have to enter, as an optional parameter of `\displaypoints`: `RaggedLeft`, `Centering`, `RaggedRight` or justifying.

\totalpoints
\newcommand{\totalpoints}{\%
\ifthenelse{\boolean{marginpoints}}{\totalexe}{\points}}
\end{package}